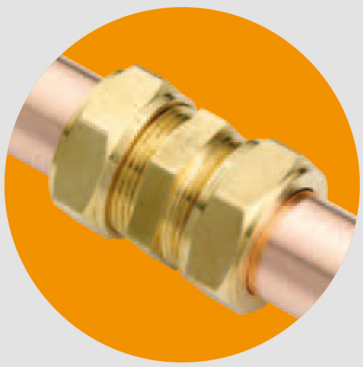
Kuterlite

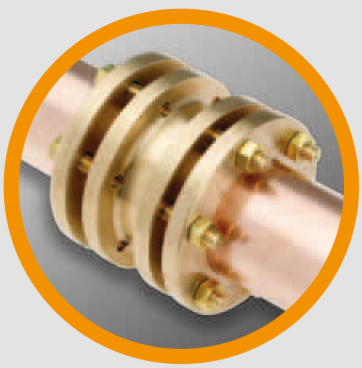
Compression Fittings



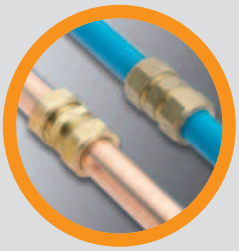








PEGLER PY
Valve technology



The principle of the Kuterlite fitting

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Design considerations
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MARKINGS



a **UNIVERSAL MARKING**
All dezincification resistant Kuterlite fittings carry the distinctive CR mark.



b **GUNMETAL**
Some Kuterlite fittings and valves are manufactured from gunmetal, and can be identified by the GM mark on the body.

c **At Yorkshire Fittings we are constantly striving to develop jointing solutions that meet the changing needs of specifiers and installers alike. The Kuterlite suite of compression fittings comprises a number of product ranges which suit a broad spectrum of applications across the domestic and commercial sectors.**

The principle of the Kuterlite joint

d The Kuterlite joint consists of a body with a built-in stop for receiving the tube, a compression ring the same size as the tube's outside diameter, and a compression nut. To make the joint, the tube and fitting are assembled, and the compression nut tightened with a spanner. This quick and simple action compresses the compression ring onto the tube, creating a sound mechanical joint.

Advantages of Kuterlite

e One of the major advantages of Kuterlite compression fittings is that the installer joins the tube by mechanical means. This heat-free system means no hot works permits are required, and joints can be made where it would otherwise be dangerous to use a naked flame.

f Kuterlite joints can be taken apart and remade without adversely affecting their performance. Joints can be made on wet pipework, making them ideal for use in maintenance and repair applications where the complete draining of pipework is difficult.

g Manufactured from duplex brass, dezincification resistant alloy (DZR) or gunmetal, the Kuterlite range offers choice and versatility.

h Many Kuterlite items are available with a chrome plated finish for functionality and maximum aesthetic appeal, for example in bathrooms and kitchens. Most are also available with a polished quality chrome plated finish to special order.

i Users of Kuterlite fittings can be confident that they are purchasing an established product with a proven reputation for reliability and quality which spans fifty years.

Presenting the range

j Kuterlite compression products have been designed for use with a variety of materials including light gauge plain and chrome plated copper tube, stainless steel and carbon steel tube, PEX, PB and two ranges specifically for polyethylene pipe. In addition to standard line fittings, the range includes an extensive selection of valves and accessories.

Kuterlite 600



k Kuterlite 600 are non-manipulative (Type A) duplex brass compression fittings in sizes from 6mm to 54mm. The range is suitable for use on closed circuit central heating systems, in above ground hot and cold water services, on compressed air lines, oil and other fluids, LPG and low pressure gas services. For fuel oils, refer to OFTEC advice. K600 fittings have a one-piece body of duplex brass, symmetrical compression rings of dezincification resistant alloy and hexagonal duplex brass nuts.

l The range is suitable for jointing copper tube manufactured to BS EN 1057 (R250 or R290), or – in sizes up to 28mm – with PEX pipe to BS 7291 Part 3, PB pipe to BS 7291 Part 2, stainless steel tube to BS EN 10312 (formerly BS 4127) DVGW GW541, and carbon steel tube to DIN 2394/NEN 1982 (carbon steel tube is not suitable for potable water applications). Additionally, in maintenance applications, selected imperial sized tubes can be jointed with metric Kuterlite 600 fittings. See page 8 paragraph n for more information.

m For Type A jointing of soft copper tube (R220) above ground, a supporting K690 pipe support liner should be used. Similarly, the appropriate liner should be used for installations made with PEX or PB pipe. Kuterlite fittings in sizes 12mm (⅜" BSP) and 15mm (½" BSP) have BSP coupling threads as standard, which enables connection directly to female BSP fittings and valves.

Kuterlite flexible hose connectors

n Kuterlite Flexifit flexible connectors make installations in confined spaces easy. The connectors comprise an EPDM hose covered in single braided stainless steel, and are available for connection to ½" taps with ½" or 15mm inlets, and ¾" taps with 15mm or 22mm inlets. Kuterlite Flexifit connectors are suitable for connection to any suitable hot and/or cold water appliance, and can

Introducing the Kuterlite range



also be used where a temporary connection to a primary heating circuit is required to ensure compliance with The Water Supply (Water Fittings) Regulations 1999.

Kuterlite waste fittings

a Kuterlite 600 waste fittings are designed for connecting to basins, baths, sinks and other sanitary appliances in domestic and commercial properties. Available in sizes from 28mm to 54mm, the range is manufactured from duplex brass and/or copper with an option of a chrome-plated finish for aesthetic appeal. The range comprises line fittings, shallow and deep seal traps, and fittings with rodding eyes to enable inspection and maintenance of the pipework. Bends, tees and crosses have been designed with built in fall, in line with good plumbing practice.

Kuterlite 900



b Kuterlite 900 is a range of non-manipulative (Type A) dezincification resistant (DZR) compression fittings in sizes from 8mm to 108mm. The range is suitable for use on closed circuit central heating systems, in above ground hot and cold water services, on compressed air lines, and for oil and other fluids. In sizes up to 54mm they can also be used on low pressure gas services. For fuel oils, refer to OFTEC advice. K900 fittings have a one-piece body of DZR alloy or gunmetal, DZR symmetrical compression rings and hexagonal duplex brass compression nuts.

c The Kuterlite 900 range can be used for jointing the same range of tubes and pipes as Kuterlite 600 fittings.

d For Type A jointing of soft copper tube (R220), a supporting K690 pipe support liner should be used. Underground, a Type B joint is required. To achieve this, use Kuterlite 900 fittings in conjunction with soft copper tube (R220) and 1870 Kufit adaptors.

Kuterlite 700



e Kuterlite 700 is a range of non-manipulative (Type A) compression fittings in sizes from 20mm to 63mm for use on cold water services with metric medium density polyethylene pipe (MDPE). Blue MDPE to BS EN 12056-2:2000 and black MDPE to BS 6730 are for use below and above ground respectively. The range is ideal for horticultural installations and for temporary water supplies, for example construction sites, exhibitions and market gardens. The fittings are also suitable for use with certain industrial fluids, but not for gas services.

f K700 fittings have a one-piece body manufactured from dezincification resistant (DZR) alloy or gunmetal, copper compression rings and liners, and DZR nuts. A full range of adaptors allows for easy connection to existing polyethylene pipework.

g Polyethylene pipe can be connected to copper tube through a range of couplings and stopvalves which form part of the K1700/Kuterlite valves ranges.

Kuterlite 1700



h Kuterlite 1700 is a range of imperial non-manipulative (Type A) compression fittings for use on cold water services above and below ground with imperial high and low density black polyethylene pipe (HDPE/LDPE). Available in sizes from ⅜" to 1", applications and fitting materials are the same as Kuterlite 700. Kuterlite 1700 fittings are not suitable for use on gas services.

CHROME PLATE



i **The Kuterlite range includes a selection of commercial quality chrome plated fittings and valves. The range is ideal for use where products are on show, for example in kitchens and bathrooms. For maximum aesthetic appeal, Kuterlite fittings are also available with a polished quality chrome plated finish to special order.**

WASTE FITTINGS



j **The Kuterlite range includes a variety of waste fittings for connection to sanitaryware.**

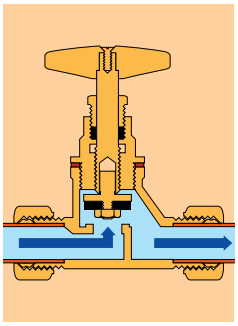
ACCESSORIES

k **The Kuterlite range is complemented by a range of accessories. These include compression nuts, compression rings, washers, liners, bushes, and a copper tube forming tool for Type B joints.**



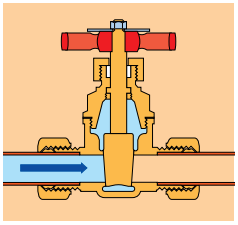
Stopvalves, gate valves, appliance and check valves

STOPVALVES

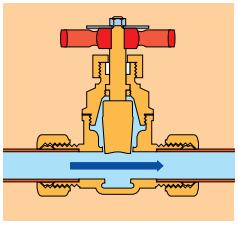


a HIGH PERFORMANCE VALVES
The stopvalve design incorporates a rubber washer that is screwed down onto a brass seat to create a seal suitable for use with mains pressure water.

GATE VALVES



b GATE VALVE
In Kuterlite gate valves the primary sealing surfaces are brass. Flow is stopped by screwing down the gate into a groove in the valve body.



c NON RESTRICTIVE
Kuterlite gate valves are full bore. When the valve is fully open the gate moves up into the valve body to leave flow unhindered.

Kuterlite valves

d Yorkshire Fittings recognises that different service environments place a variety of demands on pipeline systems. With this in mind, a comprehensive selection of Kuterlite valves have been developed, designed to suit both domestic and commercial service requirements, from hot and cold water services and heating, to oil, gas and steam installations. Valves are assembled using exactly the same jointing procedure as Kuterlite compression fittings.

e **Stopvalves** with compression ends have gunmetal bodies, with brass or gunmetal headworks. In sizes from 15mm to 54mm they are suitable for use with copper tube to BS EN 1057 (R250, R290); and in sizes up to 28mm with PB and PEX pipe to BS 7291 Parts 2 and 3 (with liner). In sizes from 20mm to 63mm and ⅜" to ¾" they are suitable for use with metric and polyethylene pipe respectively.

f Stopvalves are used wherever the flow of hot or cold water services needs to be regulated, either above or below ground, for which the correct type must be selected. Certain Kuterlite stopvalves are designed for use in specific instances. Examples include lockshield stopvalves for preventing unauthorised adjustment, and combined stopvalves and draining taps for easy isolation and system drain down.

g **Gate valves** in size from 15mm to 76mm are suitable for use with copper tube to BS EN 1057 (R250, R290). They can also be used in sizes up to 28mm with PB and PEX pipe to BS 7291 Parts 2 and 3 (with liner); XPress Stainless System tube or stainless steel tube to BS EN 10312, DVGW GW541; and XPress Carbon System tube or carbon steel tube to DIN 2394/NEN 1982 (on non-potable closed circuit systems only).

h Gate valves are ideal for use as shut off valves in hot and cold water services, central heating systems, oil lines – particularly heating oils – steam installations, gas and compressed air lines and other engineering services. Wheelhead and lockshield variants are manufactured in brass in sizes from 15mm to 28mm; and in gunmetal in sizes from 15mm to 76mm. A precision-made wedge, seated at a right-angle to the direction of flow, allows water regulation.

i **Appliance valves** are designed for use on hot and cold water systems when connecting washing machines, dishwashers and other appliances to the



water supply in domestic or commercial situations. They are suitable for use with copper tube to BS EN 1057 (R250, R290), and with PB and PEX pipe to BS 7291 Parts 2 and 3 (with liner). With 15mm inlets and ¾" BSP outlets, appliance valves allow the water supply to be shut off for maintenance, repair, or when the appliance is not in use. The Kuterlite range of appliance valves is highly durable. All are fitted with double "O" rings for reliability and to withstand regular operation. Appliance valves are manufactured from duplex brass with a high quality protective and decorative chrome plated finish. Both blue and red discs are supplied and can be fitted for easy identification of hot and cold outlets.

j **Check valves** are a cost-effective means of preventing the contamination of the water supply from backflow, back siphonage or cross flow. Kuterlite double check valves are suitable for use with fluid categories 1, 2 and 3, as defined in The Water Supply (Water Fittings) Regulations 1999. They ensure the filling of primary heating circuits meet the requirements of these Regulations. They are also advisable where a hose is connected to a hose union bibtap, and should be installed as close to the tap as possible. Kuterlite single check valves are suitable for use with fluid categories 1 and 2, and are best utilised to protect central heating systems, mains water supplies during the regeneration cycle of water softeners, or for installation downstream of water meters.



Service valves, draining taps and QTBVs



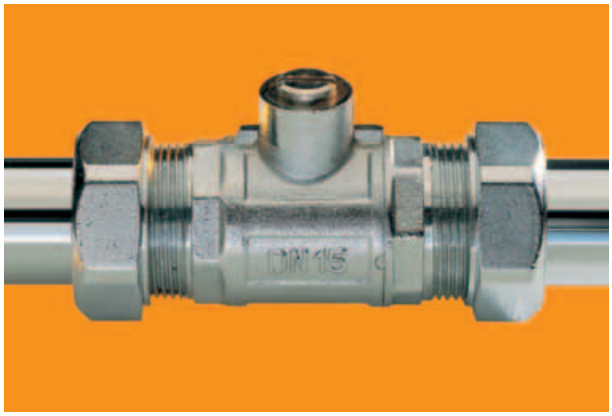
a Kuterlite check valves are suitable for use with copper tube to BS EN 1057 (R250, R290), with PB and PEX pipe to BS 7291 Parts 2 and 3, and with XPress Stainless System tube or stainless steel tube to BS EN 10312, DVGW GW541. They are manufactured from DZR alloy and are available in sizes from 15mm to 28mm and with female threaded ends in ½" BSP to 2" BSP. Double check valves incorporate a ¼" BSP centre test point. All Kuterlite check valves operate silently with a low pressure loss, via a spring loaded mechanism which closes the valve under neutral and reverse flow conditions.

b For check valve installation and location directions, refer to The Water Supply (Water Fittings) Regulations 1999.

c **Servicing valves** help conserve precious water resources by allowing sections of pipework to be isolated for repair or maintenance work without the need to drain down the entire system. They should be fully open or shut, and not be used as regulating valves.

d Kuterlite servicing valves are suitable for use with copper tube to BS EN 1057 (R250, R290), PB and PEX pipe to BS 7291 Parts 2 and 3, and with XPress Stainless System tube or stainless steel tube to BS EN 10312, DVGW GW541. They are available in 15mm and 22mm sizes with compression ends, and in sizes 15mm and ½" BSP for connecting to swivel end – for directly connecting to taps, float valves and other similar devices. Manufactured from duplex brass, the servicing valves have a protective and decorative chrome plated finish, with hexagonal nuts and a closing mechanism operated with a screwdriver or coin.

e **Draining taps** are for installation at strategic points in hot and cold water services and central heating systems, to allow easy draining when repair and maintenance is required. Kuterlite draining taps are available in Type 1 and Type 2 varieties, signifying their operational capabilities and compliance with BS 2879 Types 1 and 2 respectively.



f Kuterlite draining taps are suitable for use with copper tube to BS EN 1057 (R250, R290), with PB and PEX pipe to BS 7291 Parts 2 and 3, with XPress Stainless System tube or stainless steel tube to BS EN 10312, DVGW GW541; and with XPress Carbon System tube or carbon steel tube to DIN 2394/NEN 1982 (on non-potable closed circuit systems only). Brass draining taps are available with 15mm, 22mm and 28mm compression ends and ½" BSP parallel male ends, and selected DZR varieties also have ¾" and 1" BSP parallel male ends.

g Kuterlite draining taps feature a secure and non-removable spindle. An "O" ring seal eliminates leakage along the spindle while draining.

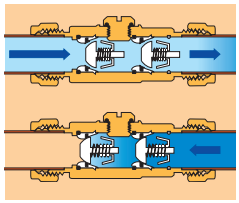
h **Quarter turn ball valves** are a safe, reliable and cost effective way to control the flow of water. With a full bore design, Kuterlite quarter turn ball valves are suitable for use in hot and cold water services, central heating systems, gas installations, oil lines, steam installations, compressed air lines, solvent and certain chemical supply lines within the domestic and commercial sectors. The range is available in sizes from 15mm to 28mm, and with parallel female ends from ¼" BSP to 2" BSP.

i Kuterlite quarter turn ball valves are suitable for use with copper tube to BS EN 1057 (R250, R290), with PB and PEX pipe to BS 7291 Parts 2 and 3, with XPress Stainless System tube or stainless steel tube to BS EN 10312, DVGW GW541; and with XPress Carbon System tube or carbon steel tube to DIN 2394/NEN 1982 (on non-potable closed circuit systems only).

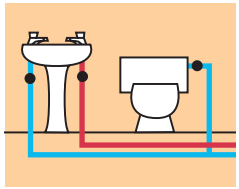
j Quarter turn ball valves have wear-resistant PTFE conical seals to ensure their durability over long periods of time. A simple quarter-turn action provides a positive shut-off point and a readily identifiable on/off position, and a special anti blow-out design ensures the valve spindle does not detach from the body even under the most extreme conditions. The valves are available with levers or T-handles in plated brass or DZR alloy. Handle extension sets are available to accommodate pipework insulation.

k Other valves in the Kuterlite range include a gas **plugcock** in 15mm and a **bibtap** in ½".

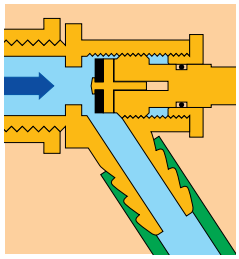
VALVES



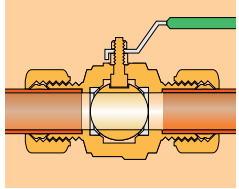
l **CHECK VALVES**
Double check valves have two integral discs which water can push aside to flow through. In-built rim "stops" prevent backflow.



m **SERVICING VALVES**
Where servicing valves have been correctly located, terminal fittings such as taps and float valves can be easily isolated for repair or maintenance.



n **DRAINING VALVES**
Draining fittings are designed to be installed at strategic points in pipework or on appliances to simplify repair and maintenance when sections or systems need to be 'drained down' quickly and with the minimum of fuss.



o **QUARTER TURN BALL VALVES**
The integral sphere in Kuterlite quarter turn ball valves reveals its closed or open side through the operation of a 'T' or lever handle.



Current and future standards

KEYWORD IS QUALITY

FM 27630

MGMT. SYS. RvA C 030

a QUALITY SYSTEMS
Yorkshire Fittings Ltd is a British Standards Institution registered company.

b EVALUATED BY WRAS
The Kuterlite 600, 900, 700 and valves ranges have been certified by WRAS and are audited periodically.

c INTERNATIONAL STANDARDS ORGANISATION
International standards are conformed to where appropriate.

d The Dutch gas institute has awarded the Gastec QA mark to a selection of K600 and K900 fittings.

e KIWA, the Dutch water institute, has also approved the same patterns.

f We at Yorkshire Fittings are dedicated to designing, developing and manufacturing products of the highest quality. We are members of numerous standards committees and take an active part in their development. Kuterlite fittings and valves all comply with the relevant British, European and International standards. Whatever the latest developments, we guarantee that our products will always meet the latest and highest standards.

g Our strategy of continuous development means we invest in both the design and development of new products, and in refining existing ones. Our manufacturing processes are monitored and evaluated to ensure optimum performance and quality. The Kuterlite range meets the following standards:

Kuterlite 600 and Kuterlite 900 fittings

h **WRAS** All Kuterlite 600 and Kuterlite 900 fittings and Flexifit connectors are listed and comply with the requirements of the United Kingdom Water Regulations/Byelaws (Scotland).

i **EN 1254 Part 2** Specification for copper and copper alloy fittings with compression ends for copper tubes.

j **ISO 7/EN10226-1** (formerly BS 21/ISO 7) Specification for tubes and fittings where pressure-tight joints are made on the threads (metric dimensions).

k **BS EN ISO 228:2003** (formerly BS 2779/ISO R228/1) Specification for tubes and fittings where pressure-tight joints are not made on the threads (metric dimensions).

l A selection of K600 and K900 fittings are approved by KIWA, the Dutch water institute, and hold the GASTEC QA mark issued by Gastec, the Dutch gas institute.





Kuterlite 700 fittings

m **WRAS** Kuterlite 700 fittings are WRAS approved.

n **BS 864 Part 5** Specification for compression fittings of copper and copper alloy for use with polyethylene pipes with outside diameters to BS 5556 (20mm to 32mm).

o **ISO 7/EN10226-1** Refer to K600/K900.

Kuterlite 1700 fittings

p **BS 864 Part 3** (obsolescent) Specification for compression fittings of copper and copper alloy for polyethylene pipes.

q **ISO 7/EN10226-1** Refer to K600/K900.

r **BS 5114** (obsolescent) Specification for performance requirements for joints and compression fittings for use with polyethylene pipes.

Valves

s All Kuterlite valves have ends in accordance with EN 1254 Part 2 and are WRAS approved.

Gate valves

t **BS 5154** Specification for copper alloy globe, globe stop and check, check and gate valves.

Material specifications and guarantees





Stop valves

a **BS 1010 Part 2** (obsolescent) Draw-off taps and above ground stop valves.

b **BS 2879** Specification for draining taps (screw-down pattern).

c **BS 5433** Specification for underground stop valves for water services.

d **ISO 7/EN10226-1** Refer to K600/K900.

Quarter turn ball valves

e **ISO 7/EN10226-1** Refer to K600/K900.

Check valves

f **BS 6282 Part 1** Specification for check valves of nominal size up to and including DN 54.

g **ISO 7/EN10226-1** Refer to K600/K900.

Draining fittings

h **BS 2879** Specification for draining taps (screw-down pattern).

i **ISO 7/EN10226-1** Refer to K600/K900.

Material specifications

j The materials used in Kuterlite fittings and valves are manufactured to the following specifications.

k **BS EN 1982** Specification for copper and copper alloys, ingots and castings.

l **BS EN 12162** Specification for profiles and rectangular bar for general purposes.

m **BS EN 12163** Specification for copper and copper alloy rod for general purposes. Including testing for dezincification resistance of alloys CZ121 (CW614N), CZ122 (CW617N) and CZ132 (CW602N).

n **BS EN 12164** Specification for copper and copper alloy rod for free machining purposes. Including testing for dezincification resistance of alloys CZ121 (CW614N), CZ122 (CW617N) and CZ132 (CW602N).

o **BS EN 12165** Specification for copper and copper alloys, wrought and unwrought forging stocks.

p **BS EN 12168** Specification for hollow rod for free machining purposes.

q Under EN 1254 products may be manufactured from differing grades of DZR material – grade A and grade B. DZR quality Kuterlite products will be manufactured from highly resistant grade A material and carry the recognised CR symbol.

Quality

r Quality is of paramount importance to Yorkshire Fittings. Our products conform to current British, European and International standards where applicable and also meet our own rigorous internal quality approvals. The Company is at the forefront of standards development, and has members on a variety of relevant committees.

s Yorkshire Fittings operates a Quality Management System for the development, manufacture and supply of fittings, tube, valves and accessories which complies with the requirements of BS EN ISO 9001:2000.

t Guarantees

Our policy of continuously and rigorously testing Kuterlite products means we are confident they will give you years of trouble free service. To demonstrate the total confidence we have in our products and our commitment to customer service, all Kuterlite fittings and valves carry extensive guarantees against manufacturing defects when installed in accordance with our instructions on specified tube materials and applications, as shown in Table 1 below.

TRADE BODIES

u **CONTACT WITH THE TRADE**
Yorkshire Fittings is an industrial associate of the Institute of Plumbing & Heating Engineering
www.iphe.org.uk

v **LINKS WITH MERCHANT GROUPS**
Industry trends can be monitored through the BMF.
www.bmf.org.uk

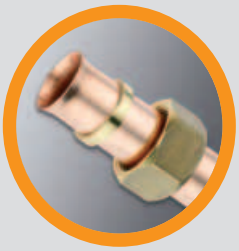
w **LINKS WITH END USER GROUPS**
The Company is a member of the Association of Plumbing and Heating Contractors.
www.aphc.co.uk

x **REGIONAL LINKS**
Association with regional bodies like SNIPEF also helps to monitor a broad picture of the industry.
www.snipef.org

y **OFTEC**
Yorkshire Fittings recommends contacting OFTEC for fuel oils advice.
www.oftec.co.uk

1 **Kuterlite fittings guarantees when correctly assembled with the stated tubes and pipe**

Fitting and tube/pipe	Length of guarantee
Kuterlite fittings and valves installed with specified tubes and pipes with the exception of those listed below	25 years
Kuterlite Flexifit flexible connectors	10 years
Kuterlite 600/900 fittings and valves installed with XPress Carbon Steel System tube in sizes up to 28mm	10 years
Kuterlite 600/900 fittings and valves installed with other manufacturers carbon steel tube to DIN 2394/NEN 1982 in sizes up to 28mm	5 years



Kuterlite tube and pipe compatibility

TUBE AND PIPE



a COPPER TUBE
Kuterlite 600 and Kuterlite 900 fittings offer optimum performance when used with copper tube to BS EN 1057.



b PEX AND PB PIPE
Kuterlite 600 and Kuterlite 900 fittings can be used to joint to PEX pipe to BS 7291 Part 3 and PB pipe to BS 7291 Part 2 in sizes up to 28mm, providing the correct pipe support liner is used.



c STAINLESS STEEL TUBE
Kuterlite 600 and Kuterlite 900 fittings can be used to joint XPress Stainless System tube and other stainless steel tube to BS EN 10312, DVGW GW541 in sizes up to 28mm.



d CARBON STEEL TUBE
Kuterlite 600 and Kuterlite 900 fittings can be used to joint XPress Carbon System tube and other carbon steel tubes to DIN 2394/NEN 1982 in sizes up to 28mm.



e POLYETHYLENE PIPE
Kuterlite 700 and 1700 fittings are used to joint selected polyethylene pipes.

Tube and pipe compatibility

f Kuterlite compression fittings are suitable for connecting a variety of tubes and pipes. There are specific standards the tube must achieve to be suitable for connection with Kuterlite fittings.

Copper tube

g Copper tubes used with Kuterlite 600 and Kuterlite 900 must meet the requirements of BS EN 1057.

h **BS EN 1057** Specification for copper and copper alloy – seamless round copper tubes for water (and gas) in sanitary and heating applications.

i BS EN 1057 includes specified temper conditions (material strength) expressed as an "R" number. Quite simply, the higher the number, the harder the material. As a result, tube diameter, wall thickness, length and the material temper must all be specified for full product designation.

j **R220** Annealed condition with a tensile strength of 220N/mm² supplied in coils and suitable for connection by push-fit, capillary and compression fittings. Can be bent with suitable bending tools.

k Refer to page 16 for information on using Kuterlite 600 and 900 fittings to joint R220 copper tube.

l **R250** Half hard condition with a tensile strength of 250N/mm² supplied in straight lengths and suitable for connection by push-fit, press-fit, capillary and compression fittings. Can be bent with suitable bending tools.

m **R290** Hard condition with a tensile strength of 290N/mm² supplied in straight lengths suitable for connection by push-fit, press-fit, capillary and non-manipulative compression fittings. Not suitable for bending.

Imperial copper tubes

n Tubes to BS 659 and BS 3931 can be jointed with Kuterlite 600 and Kuterlite 900 fittings. For ⅜" tube use 12mm fittings, for ½" use 15mm, for 1" use 28mm, for 2" use 54mm, and for 2½" use 67mm. For other sizes up to and including 42mm, the use of an adaptor ring (K978C) will convert any metric compression fitting to be used with imperial tube. A K910IM can be used to convert sizes 22mm, 76mm and 108mm.

PEX and PB pipe

o Kuterlite 600 and 900 fittings can be used in sizes up to 28mm to joint Tectite System PEX, and other PB and PEX pipes to BS 7291 Parts 2 and 3 respectively, providing the correct pipe support liner is used.

1 BS EN 1057 copper tube compatible with Kuterlite 600/900 fittings

Outside diameter	Wall thickness (mm) 0.6	0.7	0.8	0.9	1.0	1.2	1.5	2.0	2.5
6mm	R220/ R250		R220/ R250						
8mm	R220/ R250		R220/ R250						
10mm	R250	R220	R220/ R250						
12mm	R250		R220/ R250						
15mm		R250			R220/ R250				
22mm				R250		R220/ R250			
28mm				R250		R220/ R250			
35mm					R290	R250	R250		
42mm					R290	R250	R250		
54mm					R290	R250		R250	
67mm						R220/ R250		R250	
76mm							R290	R250	
108mm							R290		R250

Stainless steel tube

p Kuterlite 600 and Kuterlite 900 fittings can be used to joint stainless steel tube in sizes up to and including 28mm to BS EN 10312 (formerly BS 4127), DVGW GW541, and our own XPress Stainless System tube.

2 Stainless steel tube specifications

Outside diameter	Wall thickness EN 10312 Table 1 GW541 Table 2 (formerly BS 4127)	EN 10312 Table 2 GW541 Table 3	Xpress Stainless System tube
15mm	0.6mm	1.0mm	0.6mm
18mm	0.7mm	1.0mm	0.6mm
22mm	0.7mm	1.2mm	0.6mm
28mm	0.8mm	1.2mm	0.8mm

Carbon steel tube

q Kuterlite 600 and Kuterlite 900 fittings can be used to joint carbon steel tube to DIN 2394/NEN 1982 in sizes up to and including 28mm. Our own XPress Carbon steel System tube is an ideal choice.

3 Carbon steel System tube specification

Outside diameter	Wall thickness Galvanised tube
15mm	1.2mm
18mm	1.2mm
22mm	1.5mm
28mm	1.5mm

Working temperatures and pressures – fittings



Polyethylene pipes

(a) Blue medium density polyethylene pipe (MDPE) to BS EN 12056-2:2000 or black MDPE to BS 6730 should be jointed using Kuterlite 700 fittings.

(b) **Blue MDPE** is used for underground potable water, as service connections from mains distribution to individual properties.

(c) **Black MDPE** is for above ground applications including potable water.

(d) Kuterlite 1700 fittings are used to joint high and low density polyethylene pipe to BS 6572, BS 6730, and BS EN 12201:2003 for above ground cold water services.

(e) The Kuterlite 700 and 1700 ranges may also be converted to older polyethylene pipe specifications via the use of the appropriate copper pipe support liner. For more information refer to page 18.

Working temperatures and pressures

Kuterlite 600 and Kuterlite 900

(f) Kuterlite 600 brass and Kuterlite 900 DZR compression fittings are manufactured to EN 1254 Part 2. This standard specifies the maximum permissible working pressures and temperatures for fittings assembled with copper tube to BS EN 1057.

(g) Kuterlite 600 and 900 fittings in sizes from 6mm to 28mm exceed the requirements of EN 1254 Part 2. The data given in Table 1 for sizes 6mm to 28mm indicates the fittings' performance rather than the requirements of the standard.

(h) Performance data for Kuterlite 600 and 900 fittings assembled with stainless and carbon steel tube is given in Table 1, while performance for PEX and PB pipe is given in Table 5.

High performance

(i) Compression fittings used with copper tube will withstand pressures never reached under normal service conditions.

Flexifit

(j) When assembled with copper tube to BS EN 1057, Kuterlite Flexifit connectors perform at 10 bar across a temperature range from 5°C to 90°C.

Kuterlite 700

(k) When assembled with medium density polyethylene pipe to BS 6572 or BS 6730 (with outside diameters to BS 5556), Kuterlite 700 fittings are suitable for use at a maximum sustained working pressure of 12 bar at 20˚C.

Kuterlite 1700

(l) When assembled with polyethylene pipe to BS 6572, BS 6730 and BS EN 12201:2003, Kuterlite 1700 fittings are suitable for use at a maximum sustained working pressure of 12 bar at 20˚C. They can also be used at the higher temperatures given in Table 1 of the Code of Practice 312 for plastics pipework (thermoplastic material, 1973).

1 Kuterlite 600/900 performance when correctly assembled with copper tube to BS EN 1057, XPress Stainless System tube and other stainless steel tube to BS EN 10312; and XPress Carbon System tube and other carbon tube to DIN 2394/NEN 1982 for water and oil applications

Size	Service temperature Min -40°C*†	30°C*	95°C	Max 120°C
6mm to 10mm	70 bar	70 bar	40 bar	25 bar
12mm to 28mm	20 bar	20 bar	16 bar	10 bar
35mm to 54mm	16 bar	16 bar	13 bar	5 bar

2 Kuterlite 600 performance when correctly assembled with copper tube toBS EN 1057 for the following applications

Application and size	Service temperature Min -20°C	Max 30°C
Compressed air - 6mm to 28mm	7 bar	7 bar
LPG, natural gases: 6mm to 10mm	4.5 bar	4.5 bar
LPG, natural gases: 12mm to 28mm	1 bar	1 bar

3 Kuterlite 900 performance when correctly assembled with copper tube to BS EN 1057 for water applications

Size	Service temperature Min -40°C*†	30°C*	95°C	Max 120°C
67mm to 108mm	10 bar	10 bar	10 bar	4 bar

* When operating below the dew point, the stress corrosion cracking notes (page 19) must be taken into account.

† For products used in water systems, working temperatures of less than 4°C can only be achieved if antifreeze is added to the system. Antifreeze must not be added to potable water systems.

4 Kuterlite 600/900 performance when correctly assembled with copper tube to BS EN 1057 for dry steam applications

Size	Service temperature Max 120°C
6mm to 108mm	1 bar

5 Kuterlite 600/900 performance when correctly assembled with Tectite PEX and other PEX pipe to BS 7291 Part 3, and PB pipe to BS 7291 Part 2

Size	Service temperature Min -20°C	20°C	65°C	Max 92°C
10mm to 28mm	12 bar	12 bar	6 bar	3 bar

GAS FAMILIES

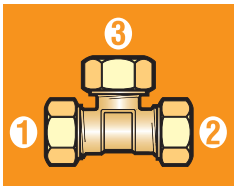
(m) **There are three gas families:**
- **1st Family – manufactured gas.**
- **2nd Family – natural gas.**
- **3rd Family – LPG, compressed propane and butane.**

FLEXIFIT LENGTH

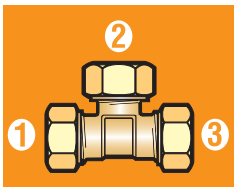
6

Product	Size	Total length
FF25	½" x ½"	300mm
FF26	15mm x ½"	400mm
FF26	15mm x ¾"	300mm
FF26	22mm x ¾"	290mm
FF27	15mm x ½"	400mm

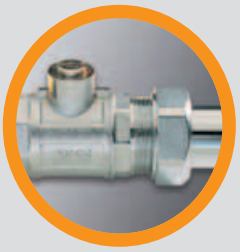
TEE SPECIFICATION



(n) **UK SPECIFICATION**
First quote the ends on the run (larger end first) and then the branch.



(o) **EUROPEAN SPECIFICATION**
Quote the larger end first, then the branch, followed by the remaining end.



Performance – stopvalves, gate valves and QTBVs

PRESSURE EQUIPMENT DIRECTIVE (P.E.D.)

a From 30th May 2002 most pressure equipment and assemblies on the market in the United Kingdom must comply with the Pressure Equipment Directive (P.E.D.) 1999. Fittings are exempt from the P.E.D. unless they are incorporated into pressure equipment such as pressurised storage containers, heat exchangers, shell and water tube boilers. This means that all Kuterlite fittings are exempt.

b Selected Kuterlite valves are classified under the P.E.D. – details are given in the main text.

c For a detailed explanation of the P.E.D. visit our website www.yorkshirefittings.co.uk

Valves

d The recommended working temperature and pressure ratings for valves within the Kuterlite range are shown in the tables on these two pages.

Stopvalves

e Graph 2 (right) indicates the pressure drop and flow rate of cold water through Kuterlite stopvalves for connection to metric and imperial polyethylene pipe. Table 3 (right) indicates temperature and pressure performance.

Gate valves

f Kuterlite gate valves in all sizes are classified as, and meet the requirements of, Sound Engineering Practice (S.E.P.) under the Pressure Equipment Directive (P.E.D.). For temperature and pressure performance refer to Table 1 on page 9.

Appliance and servicing valves

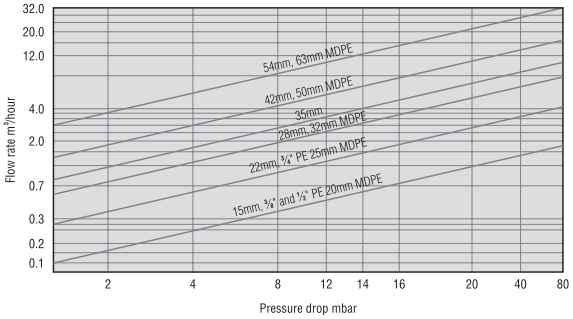
g Kuterlite appliance and servicing valves perform to the same temperature and pressure ratings as one another. Service valves should not be used as control valves where full bore is a requirement.

1 Kuterlite appliance and servicing valve performance for hot and cold water services

Size	Service temperature Min 4°C	Max 65°C
15mm and 22mm	10 bar	10 bar



2 Head loss for cold water flowing through Kuterlite stopvalves



3 Kuterlite stopvalve performance

Size	Service temperature Min 4°C	Max 30°C
15mm to 54mm with copper tube to BS EN 1057	16 bar	16 bar
20mm to 63mm with metric polyethylene pipe	16 bar	16 bar
⅜" to ¾" with imperial polyethylene pipe	16 bar	16 bar

4 Kuterlite quarter turn ball valve (female BSP ends) performance when correctly assembled with appropriate union fittings and copper tube to BS EN 1057

Size	Service temperature Min -15°C	20°C	Max 150°C
¼"	45 bar	45 bar	20 bar
⅜"	45 bar	45 bar	16 bar
½"	45 bar	45 bar	14 bar
¾"	35 bar	35 bar	11 bar
1"	35 bar	35 bar	9 bar
1¼"	30 bar	30 bar	5 bar
1½"	30 bar	30 bar	5 bar
2"	25 bar	25 bar	4 bar

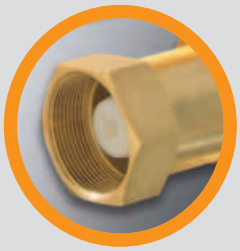
Quarter turn ball valves

h Kuterlite quarter turn ball valves in sizes from 15mm to 28mm and from ¼" to 1" are classified as, and meet the requirements of, S.E.P. under the P.E.D. Female threaded quarter turn ball valves in sizes from 1¼" BSP to 2" BSP meet the requirements of the P.E.D. Category II. Temperature and pressure performance for water applications are indicated in Tables 4 and 5. In gas applications, ¼" to 2" Kuterlite quarter turn ball valves perform to a service pressure of 0.35 bar.

5 Kuterlite quarter turn ball valve (compression ends) performance when correctly assembled with copper tube to BS EN 1057

Size	Service temperature Min -15°C	20°C	Max 120°C
15mm to 28mm	16 bar	16 bar	5 bar

Performance – check valves and draining taps

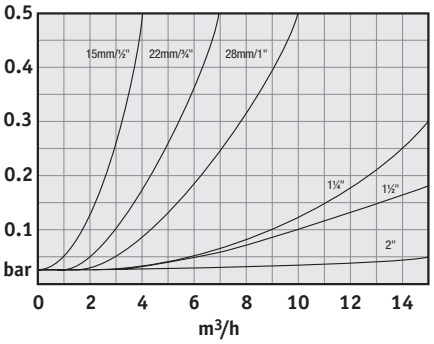




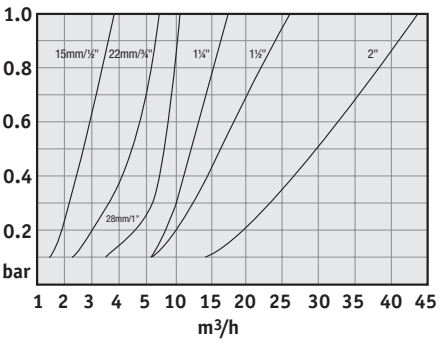
Check valves

a Graphs 1 and 2 below indicate the pressure drop for different flow rates of water passing through Kuterlite single check valves and double check valves respectively.

1 Pressure drop chart for Kuterlite single check valves



2 Pressure drop chart for Kuterlite double check valves



3 Kuterlite check valve performance for central heating and water services applications

Size	Service temperature Min 4°C	Max 100°C
15mm to 28mm	16 bar	10 bar

Draining taps

b The majority of Kuterlite draining taps perform to BS 2879 Type 1. However, the K526DZR, K526DZRLS and K526S all perform to BS 2879 Type 2.

4 Kuterlite draining taps to BS 2879 Type 1 performance

Size	Service temperature Min 4°C	Max 70°C
½" to 1" and 15mm to 28mm	16 bar	10 bar

5 Kuterlite draining taps to BS 2879 Type 2 performance

Size	Service temperature Min 4°C	Max 120°C
½" to 1" and 15mm	16 bar	6 bar



ACHIEVING LOW TEMPERATURES

c **For products used in water systems, working temperatures of less than 4°C can only be achieved if antifreeze is added to the system. Antifreeze must not be added to potable water systems.**



Kuterlite fittings specification clauses

a **Once the appropriate Kuterlite product has been selected the use of one of the following specification clauses will provide the exact wording required to ensure that the correct product is used.**

Kuterlite 600 specification

b "Non-manipulative (Type A) compression fittings shall be to EN 1254 Part 2, of duplex brass and certified by WRAS. They will be suitable for use with copper tube to BS EN 1057 (R250, R290) and, in sizes up to 28mm, with PEX pipe to BS 7291 Part 3, PB pipe to BS 7291 Part 2 (both with liner); R220 copper tube; XPress Stainless System tube or stainless steel tube to BS EN 10312, DVGW GW541; and XPress Carbon System tube or carbon steel tube to DIN 2394/NEN 1982 (on non potable closed circuit systems only). They shall be suitable for use on above ground hot and cold water services and heating installations, and oil and low-pressure gas distribution pipelines. They will have a guarantee of 25 years against all manufacturing defects (10 years with XPress Carbon System tube, 5 years with other carbon steel tube), and be drawn from the Kuterlite 600 range manufactured by Yorkshire Fittings Limited."

Flexifit specification

c "Flexifit flexible connectors shall be certified by WRAS. With ½", 15mm and 22mm connections, they will be suitable for use in hot and cold water services. They will have a guarantee of 10 years against all manufacturing defects, and be drawn from the Kuterlite range manufactured by Yorkshire Fittings Limited."

Kuterlite 900 specification 8mm to 54mm

d "Non-manipulative (Type A) compression fittings shall be to EN 1254 Part 2, of a DZR alloy or gunmetal and certified by WRAS. They will be suitable for use with copper tube to BS EN 1057 (R250, R290) and, in sizes up to 28mm, with PEX pipe to BS 7291 Part 3, PB pipe to BS 7291 Part 2 (both with liner); R220 copper tube; XPress Stainless System tube or stainless steel tube to BS EN 10312, DVGW GW541; XPress Carbon System tube or carbon steel tube to DIN 2394/NEN 1982 (on non potable closed circuit systems only). They shall be suitable for use on above ground hot and cold water services and heating installations, and oil and low-pressure gas distribution pipelines. Underground they shall be used in conjunction with soft copper tube (R220) and 1870 Kufit adaptors. They will have a guarantee of 25 years against all manufacturing defects (10 years with XPress Carbon System tube, 5 years with other carbon steel tube), and be drawn from the Kuterlite 900 range manufactured by Yorkshire Fittings Limited."

Kuterlite 900 specification 67mm to 108mm

e Non-manipulative (Type A) compression fittings shall be of a DZR alloy or gunmetal and be certified by WRAS. In sizes from 67mm to 108mm, they will be suitable for use with copper tube to BS EN 1057 (R250, R290), on above ground hot and cold water services and heating installations, and oil distribution pipelines. They will have a guarantee of 25 years against all manufacturing defects, and be drawn from the Kuterlite 900 range manufactured by Yorkshire Fittings Limited."

Kuterlite 700 specification

f "Non-manipulative (Type A) compression fittings shall be to BS 864 Part 5, of DZR alloy and certified by WRAS. In sizes from 20mm to 63mm they will be suitable for use with metric sized medium density polyethylene pipe (MDPE) to BS 6572 below ground or BS 6730 above ground on cold water services. They will have a guarantee of 25 years against all manufacturing defects, and be drawn from the Kuterlite 700 range manufactured by Yorkshire Fittings Limited."

Kuterlite 1700 specification

g "Non-manipulative (Type A) compression fittings shall be to BS 864 Part 3 and of a DZR alloy. In sizes from ⅜" to 1", they will be suitable for use with imperial high and low density polyethylene pipe to BS 6572, BS 6730 or BS EN 12201:2003 on above or below-ground cold water services. They will have a guarantee of 25 years against all manufacturing defects, and be drawn from the Kuterlite 1700 range manufactured by Yorkshire Fittings Limited."

Waste fittings specification

h "Non-manipulative (Type A) compression waste fittings shall be of duplex brass or copper. In sizes from 28mm to 54mm, they will be suitable for use with copper tube to BS EN 1057 (R250, R290) on waste water services. They will have a guarantee of 25 years against all manufacturing defects, and be drawn from the Kuterlite 600 range manufactured by Yorkshire Fittings Limited."

Stopvalve specification

i "Non-manipulative (Type A) stopvalves shall be to BS 1010 Part 2 with ends to EN 1254 Part 2. Of gunmetal or DZR alloy, they will be certified by WRAS. In sizes from 15mm to 54mm, they will be suitable for use with copper tube to BS EN 1057 (R250, R290) and, in sizes up to 28mm, with PEX pipe to BS 7291 Part 3 and PB pipe to BS 7291 Part 2 (both with liner); and XPress Stainless System tube or stainless steel tube to BS EN 10312, DVGW GW541. They shall be suitable for use on above ground hot and cold water services. They will have a guarantee of 25 years against all manufacturing defects, and be drawn from the Kuterlite valves range manufactured by Yorkshire Fittings Limited."

Stopvalves specification for polyethylene pipe

j "Non-manipulative (Type A) stopvalves shall be to BS 1010 Part 2 with ends to BS 864 Part 5 and be of gunmetal or DZR alloy. In sizes from 20mm to 63mm and ⅜" to ¾" BSP, they will be suitable for use with metric and imperial polyethylene pipe on above ground cold water services. They will have a guarantee of 25 years against all manufacturing defects, and be drawn

Kuterlite valves specification clauses



from the Kuterlite valves range manufactured by Yorkshire Fittings Limited."

Stopvalves specification underground

a "Stopvalves shall be to BS 1010 Part 2 with ends to BS 864 Part 5 and be of gunmetal. In sizes from 20mm to 25mm, they will be suitable for use with metric polyethylene pipe on underground water services. They will have a guarantee of 25 years against manufacturing defects, and be drawn from the Kuterlite valves range manufactured by Yorkshire Fittings Limited."

Gate valves specification

b "Non-manipulative (Type A) gate valves shall be to BS 5154 of gunmetal or brass, and be certified by WRAS. In sizes from 15mm to 54mm they will have ends to EN 1254 Part 2. In sizes from 15mm to 76mm, they will be suitable for use with copper tube to BS EN 1057 (R250, R290), and in sizes up to 28mm with PEX pipe to BS 7291 Part 3 and PB pipe to BS 7291 Part 2 (both with liner); XPress Stainless System tube or stainless steel tube to BS EN 10312, DVGW GW541; and XPress Carbon System tube or carbon steel tube to DIN 2394/NEN 1982 (on non potable closed circuit systems only). They shall be suitable for use in hot and cold water services, central heating systems and a variety of engineering services. They will have a guarantee of 25 years against all manufacturing defects (10 years with XPress Carbon System tube, 5 years with other carbon steel tube), and be drawn from the Kuterlite valves range manufactured by Yorkshire Fittings Limited."

Appliance valves specification

c "Non-manipulative (Type A) appliance valves shall have ends to EN 1254 Part 2, a chrome plate finish, and be certified by WRAS. In 15mm with ¾" ends, they will be suitable for use with copper tube to BS EN 1057 (R250, R290), and PEX pipe to BS 7291 Part 3 and PB pipe to BS 7291 Part 2 (both with liner) for connecting hot and cold water services to appliances (dishwashers, washing machines etc) via a flexible appliance hose. They will have a guarantee of 25 years against all manufacturing defects, and be drawn from the Kuterlite valves range manufactured by Yorkshire Fittings Limited."

Check valves specification

d Check valves shall be to BS 6282 Part 1, of DZR alloy and be certified by WRAS. In sizes from 15mm to 28mm and ½" to 2" with female parallel BSP ends, they will be suitable for use with copper tube to BS EN 1057 (R250, R290), PEX pipe to BS 7291 Part 3 and PB pipe to BS 7291 Part 2 (both with liner); and XPress Stainless System tube or stainless steel tube to BS EN 10312, DVGW GW541; in central heating and water services installations. They will have a guarantee of 25 years against all manufacturing defects, and be drawn from the Kuterlite valves range manufactured by Yorkshire Fittings Limited."

Servicing valves specification

e "Non-manipulative (Type A) servicing valves shall have ends to EN 1254 Part 2, be of duplex brass with a chrome plate finish and be certified by WRAS. In sizes 15mm x ½", 15mm and 22mm they will be suitable for use as terminal connectors in hot and cold water services with copper tube to BS EN 1057 (R250, R290); PEX pipe to BS 7291 Part 3 and PB pipe to BS 7291 Part 2 (both with liner), XPress Stainless System tube or stainless steel tube to BS EN 10312, DVGW GW541; XPress Carbon System tube or carbon steel tube to DIN 2394/NEN 1982 (on non potable closed circuit systems only). They will have a guarantee of 25 years against all manufacturing defects (10 years with XPress Carbon System tube, 5 years with other carbon steel tube), and be drawn from the Kuterlite valves range manufactured by Yorkshire Fittings Limited."

Draining taps specification

f "Draining taps shall be to BS 2879 Type 1 or 2, of brass or DZR alloy and be certified by WRAS. Available in sizes from 15mm to 28mm and ½" BSP, they will be suitable for use in hot and cold water services with copper tube to BS EN 1057 (R250, R290); PEX pipe to BS 7291 Part 3 and PB pipe to BS 7291 Part 2 (both with liner); XPress Stainless System tube or stainless steel tube to BS EN 10312, DVGW GW541; and XPress Carbon System tube or carbon steel tube to DIN 2394/NEN 1982 (on non potable closed circuit systems only). They will have a guarantee of 25 years against all manufacturing defects (10 years with XPress Carbon System tube, 5 years with other carbon steel tube), and be drawn from the Kuterlite valves range manufactured by Yorkshire Fittings Limited."

Quarter turn ball valves specification

g "Quarter turn ball valves shall have ends to EN 1254 Part 2 or BS 21 and be of plated brass or DZR alloy. In sizes from 15mm to 28mm and ¼" to 2" BSP, they will be full bore and be suitable for use in hot and cold water services, heating systems and other engineering applications with copper tube to BS EN 1057 (R250, R290); PEX pipe to BS 7291 Part 3 and PB pipe to BS 7291 Part 2 (both with liner); XPress Stainless System tube or stainless steel tube to BS EN 10312, DVGW GW541; and XPress Carbon System tube or carbon steel tube to DIN 2394/NEN 1982 (on non portable closed circuit systems only). They will have a guarantee of 25 years against all manufacturing defects (10 years with XPress Carbon System tube, 5 years with other carbon steel tube), and be drawn from the Kuterlite valves range manufactured by Yorkshire Fittings Limited."

Website downloads

h For your convenience the specification clauses on these pages are available on our website at www.yorkshirefittings.co.uk

Also available on our website to download is a PDF version of this and all our other data books, and a comprehensive product catalogue.



Installation instructions Kuterlite 600/900

INSTALLATION TIPS

a
1. Ensure the jointing surfaces and threads remain clean and free from grit.
2. If there is a slight weep from the joint, this will be readily corrected by the application of PTFE tape or a smear of an approved jointing compound to the sealing faces.
3. For advice on avoidance of stress corrosion cracking see page 19.
4. A few drops of light oil on the threads will assist the joint making operation, particularly for sizes 35mm and above.
5. More torque is required to tighten the compression nuts of 42mm and 54mm fittings, so spanners no shorter than 750mm (30") should be used.

TAKING APART AND REMAKING KUTERLITE JOINTS

b **Kuterlite fittings can be easily dismantled and remade without the loss of joint efficiency, providing the components are kept clean and undamaged. No sealing compound is usually needed to remake a Kuterlite joint, but care should be taken not to trap particles of foreign matter when reassembling. When re-tightening the coupling nut use just enough torque to "nip" the ring. Do not over tighten. Kuterlite fittings can replace union fittings where an infrequent disconnection facility is required.**

c **The following instructions illustrate just how easy it is to make a Kuterlite joint. These cover Kuterlite 600, Kuterlite 900 and waste fittings in sizes up to and including 54mm. Details of how to joint large size Kuterlite 900 fittings can be found on page 17; and Kuterlite 700 and 1700 fittings on page 18.**

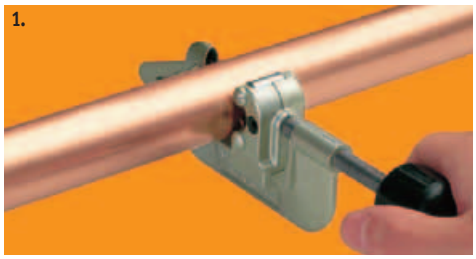
Preliminaries

d Select the correct size of tube and fitting for the job. Ensure that both are clean, in good condition and free from damage and imperfections. If the tube is oval or damaged, use a re-rounding tool.

e Copper tube should be of half-hard (R250) or hard (R290) temper. Annealed soft temper tube (R220) may be jointed using Kuterlite fittings. Refer to page 16 for further details.

f Preparation

1. Cut the tube square using a rotary tube cutter wherever possible. If a hacksaw is used to cut the tube, a fine toothed blade should be used.



2. Remove any burr from the inside and outside of the tube ends using a fine toothed file or a S120 deburring tool from the XPress accessories range.

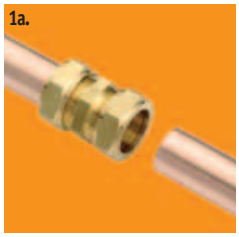


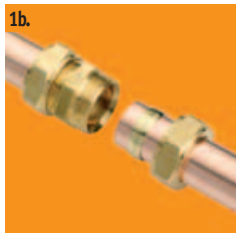
g Jointing copper tube

There are two methods of assembling a Kuterlite joint.

1a. Insert the tube firmly into the compression fitting, ensuring that the compression ring seats centrally and that the tube makes firm contact with the tube stop in the body of the fitting.

1b. Remove the compression nut and compression ring, then put the nut and then the ring on the tube. Insert the tube end up to the fitting's tube stop. Slide the ring and the nut down to the fitting body.

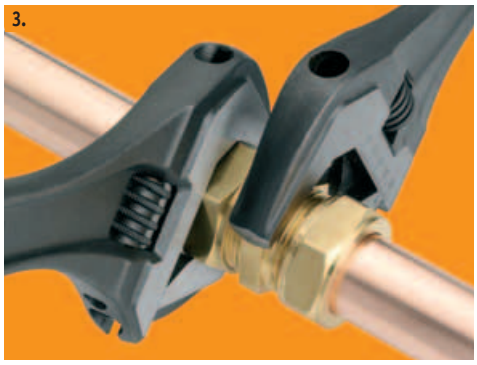




2. Tighten the nut using your fingers until tight.

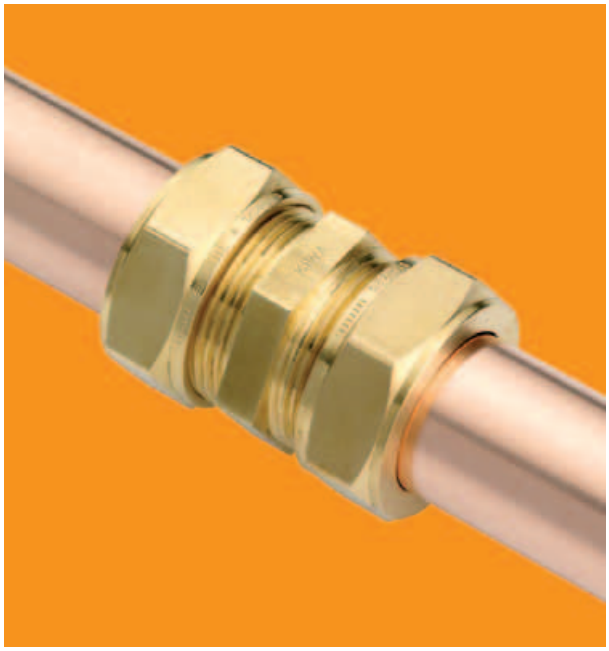


3. Tighten the nut further using high quality open ended or adjustable spanners. Spanner flats are incorporated into the design of Kuterlite fitting bodies. The second spanner must be used to prevent the fitting rotating as the nut is tightened. For normal joint making, tighten the nut 1 turn (360°) for fittings in sizes from 6mm to 12mm, or ¾ turn (270°) for fittings in sizes from 15mm to 54mm. A few drops of light oil on the threads will assist, especially on sizes 35mm and above. When jointing stainless steel or R220 copper tube some variation may be needed – the nut may be tightened further if necessary. Take care not to over tighten the compression nut, as this will not result in a stronger joint and could lead to problems in service.



Installation instructions Kuterlite 600/900





Jointing half-hard thick walled R250 copper tube

a This copper tube is significantly thicker than other varieties – refer to Table 1 on page 8 for specifications. Special care needs to be taken during installation. Follow steps one to three opposite, but with the following additional precautions:

1. Ensure pipework is supported during and after installation, as thick-walled copper tube is less tolerant of stress on the joints. The pipework should be clipped as close as possible to the fittings, particularly where long runs are involved.

2. Use spanners of the correct size and length. More torque is required to tighten Kuterlite fittings with thick walled copper tube, and care should be taken to ensure neighbouring joints are not disturbed.

3. Apply a light oil to the threads and chamfers where possible. This will reduce assembly torque and minimise the risk of damage. This is essential on sizes above 28mm.

4. If a sealant is required, use a suitable PTFE based compound, eg Loctite 577 or PTFE tape.

Jointing imperial copper tube

b Selected Kuterlite 600 and Kuterlite 900 fittings can be used in maintenance applications to connect copper tube to former imperial sizes, such as BS 3931. For ⅜" use 12mm, ½" use 15mm, 1" use 28mm, 2" use 54mm, 2½" use 67mm. For other Kuterlite sizes up to and including 42mm, the use of an imperial by metric adaptor ring (K978C) will convert any metric compression fitting to be used with imperial tube. A K910IM can be used to convert sizes 22mm, 76mm and 108mm.

Jointing PEX and PB pipe

c PEX pipe to BS 7291 Part 3 and PB pipe to BS 7291 Part 2 can be jointed using Kuterlite 600 or Kuterlite 900 fittings in sizes up to 28mm. To achieve sound joints, ensure the pipe is cut square, and is not damaged or scored in any way. The correct sized pipe support liner must be fully inserted into the PEX or PB pipe before jointing commences. Use the appropriate liner as recommended by the pipe manufacturer.

d Jointing carbon steel and stainless steel tube

XPress Stainless System tube or other stainless steel tube to BS EN 10312 (formerly BS 4127), DVGW GW541; and XPress Carbon steel System tube or other carbon steel tube to DIN 2394/ NEN 1982, can be jointed in sizes up to and including 28mm using Kuterlite 600 or Kuterlite 900 compression fittings. Carbon steel tubes are for use on non potable closed circuit systems only. To achieve sound joints, the following precautions should be taken:

1. Ensure no flats or score marks are visible on the outside surface of the tube. The weld bead should not be visible.

2. A suitable jointing compound should be applied to the sealing faces prior to tightening of the compression nuts. Sealants with PTFE fillers are preferred, with PTFE tape as an alternative.



SYSTEM TESTING

e We recommend all systems are thoroughly tested upon completion. In hydraulic based installations the system may be tested to 1.5 times the working pressure of the system (see tables on page 9 for data). If higher test pressures are required advice should be sought from Yorkshire Fittings.

f On completion, compressed air pipeline systems must be properly tested. The system designer and installation contractor must ensure safe methods are selected for system testing which will comply with all current Health and Safety regulations.

g This may include testing compressed air lines with fluids or compressed air at a limited pressure, or a combination. In any event we do not recommend the maximum working pressure of the product be exceeded during this procedure.

h N.B. The maximum temperature and pressure range in any system is dictated by the component with the lowest performance rating.

THREADED CONNECTORS

i Kuterlite threaded connectors have taper male or parallel female BSP threads, and the most popular sizes have parallel male BSP threads. These are for jointing pipework to boilers, pumps or backplate elbows. For taper male threads, a small amount of inert jointing compound or PTFE tape should be applied before installation. When installing parallel male threads, for example to cisterns and cylinders, a good quality jointing washer should be used.



Installation underground and using reducers

JOINTING CHROME PLATED COPPER TUBE

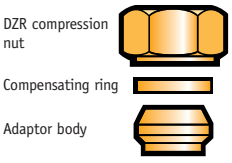
a **Kuterlite chrome plated fittings can be used on chrome plated copper tube without the need for any additional preparation. Assemble the joint in the usual way – refer to instructions on page 14.**

TYPE A & B FITTINGS

b **TYPE A COMPRESSION FITTINGS**
Type A, or non-manipulative fittings enable the installer to make a compression joint without carrying out any work on the tube ends other than ensuring that they are clean, burr free, and cut square.

c **TYPE B COMPRESSION FITTINGS**
Type B, or manipulative fittings are used with soft (R220) copper tube and require the installer to flare the tube end before the joint is assembled.

d **TYPE B ADAPTORS**
If soft copper is found in existing installations, the use of an 1870 Kufit adaptor allows conversion of the standard Kuterlite 900 Type A fitting to a Type B connection. The adaptor consists of an adaptor body, compensating ring and a DZR compression nut.



Jointing R220 soft copper tube.

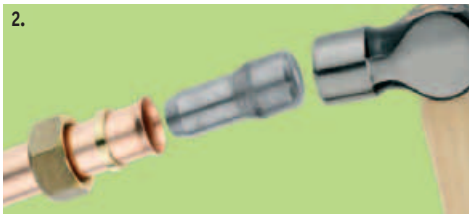
e Kuterlite 600 and 900 fittings can be used to joint R220 soft copper tube in the applications in Table 1.

Using K900 fittings underground

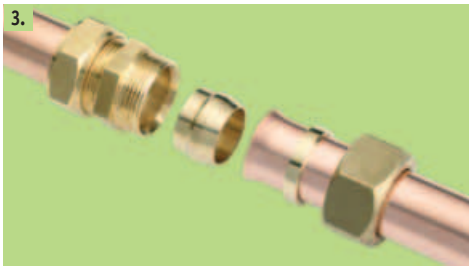
f Kuterlite 900 fittings can be used underground in conjunction with soft copper tube (R220) and an 1870 Kufit adaptor. A hacksaw should be used to cut the tube – a tube cutter must not be used for this application. All jointing surfaces must be kept clean throughout the process. Following preparation of the fitting and tube, assembly is carried out as follows:

1. Slip the compression nut and compensating ring over the tube.

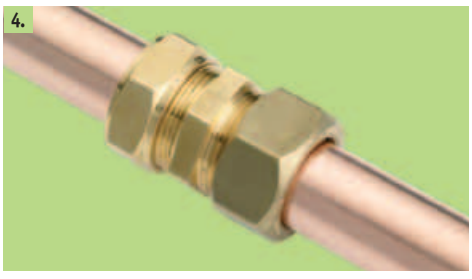
2. Flare the end of the tube using a clean K1822 forming tool of the correct size by dealing a few blows with a hammer. This operation can be made easier with the use of a few drops of light oil.



3. Insert the parallel end of the adaptor piece in the fitting socket and locate the flared tube end onto the tapered face of the adaptor piece.



4. Slide the ring and the nut down to the fitting body and first tighten by hand. Then, using spanners, tighten the nut one full turn. This is generally sufficient to provide a sound, leakproof joint.



1 R220 soft copper tube applications compatible with K600/K900

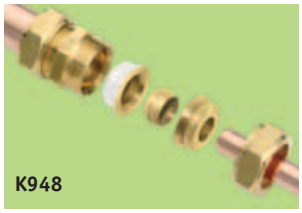
Application	K600 fittings	K900 fittings
Above ground water and heating	In sizes up to 15mm, no pipe support liner is required. In sizes 15mm and above, use a K690 pipe support liner.	In sizes up to 15mm, no pipe support liner is required. In sizes 15mm and above, use a K690 pipe support liner.
Above ground fuel oil	Use a K690 pipe support liner.	Use a K690 pipe support liner.
Below ground water and oil	Not suitable.	In sizes 15mm to 42mm in conjunction with an 1870 Kufit adaptor.
Fuel oil below ground in access chambers as per BS 5410 Part 1	Not suitable.	In sizes 15mm to 42mm in conjunction with an 1870 Kufit adaptor. In sizes 6mm to 22mm in conjunction with a K690 pipe support liner.

Jointing K947 and K948 reducers

Reducing sets can be used to convert the size of a socket in the fitting. Kuterlite K947 one-piece reducers and Kuterlite K948 reducing sets are used as follows:

1. The use of a suitable PTFE based compound or PTFE tape between the fitting body and reducing set is required when assembling the reducer into the fitting.





2a. **K947 only.** Tighten the nut until sufficient force is achieved to snap the reducer. This can be confirmed by an audible click, which is part of the design and does not indicate a fault.

2b. **K948 only.** Tighten the nut slowly until the tube is just prevented from rotating.

3. Tighten the nut a further ⅓ to ⅔ of a turn. An arrowhead stamped on the bottom of the nut provides a reference point for this.



Only one reducing set can be used per end. For multiple diameter reductions (eg 54mm x 28mm) or double diameter reductions (eg 35mm x 22mm), use only the correct reducing sets.

Installation instructions Kuterlite 900 large size

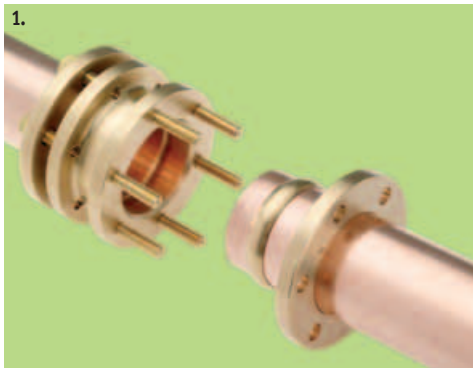


a Making a large size Kuterlite 900 joint 67mm to 108mm

The same preliminaries and preparation guidelines as Kuterlite 600 and Kuterlite 900 in sizes up to 54mm apply.

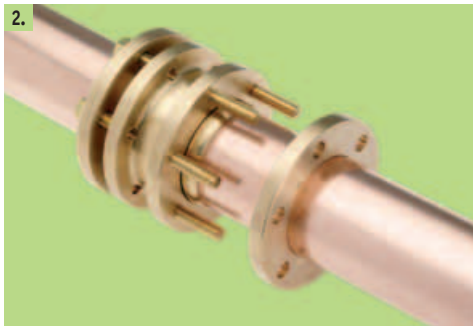
1. Place the flange and compression ring onto the tube.

1.



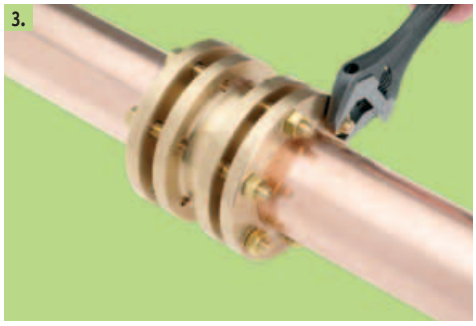
2. Insert the tube firmly into the compression fitting, ensuring that the compression ring seats centrally in the fitting body and that the tube makes firm contact with the tube stop.

2.



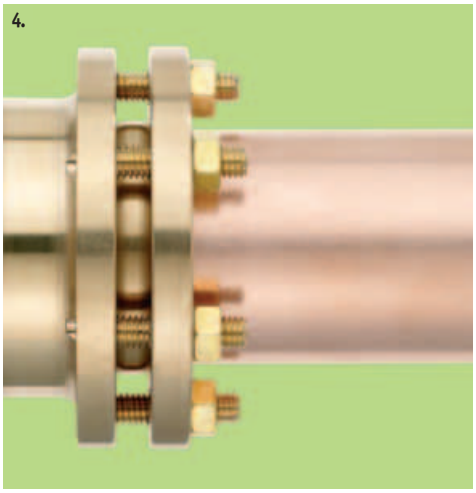
3. Bring up the compression flange, and tighten the nuts by hand. Using a spanner, continue to tighten the nuts diagonally in increments of ½ turn, to a total minimum of 2 turns and maximum of 2½ turns. DO NOT OVERTIGHTEN THE NUTS as this may distort the flange or shear the nuts.

3.



4. The compression flange should be parallel to the face of the body to indicate that a sound joint has been made.

4.



5. If after assembling the joint in accordance with the instructions above a slight weep is experienced - as occasionally may happen - it will readily be corrected by the application of a smear of an approved sealing compound to the sealing faces.

5.



EXTENDED RANGE

b The Kuterlite 900 range now includes large size fittings in sizes 67mm, 76mm and 108mm.



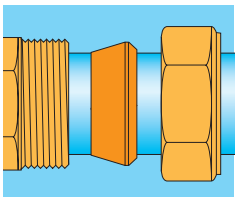


Installation instructions Kuterlite 700/1700

POLYETHELENE

a **Polythene and polyethylene are one and the same material, the latter being the preferred term of the British Standards Institution.**

K700 FITTINGS



b **K700 fittings in sizes 50mm and 63mm have a distinct wedge shape.**

Making Kuterlite 700 and Kuterlite 1700 joints

c **The same jointing procedure applies for both Kuterlite 700 and 1700 fittings.**

Preliminaries

d Select the correct size, type and class of polyethylene pipe, and ensure it is appropriate to the application. Pipe support liners should also be of the correct size and class.

e Preparation

1. Cut the pipe to length using a hacksaw with a fine-toothed blade or pipe shears, ensuring the end is cut square.



2. Remove any burr from the inside and outside of the pipe ends with a sharp trimming knife.

3. Ensure the threads of the fitting body and nut are free of dirt and grit.

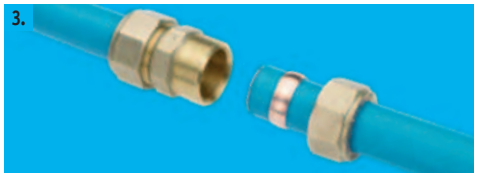
f Jointing

1. Remove the compression nut and compression ring from the fitting, then put the nut and then the ring on the pipe. Put the compression ring in approximately the correct position on the pipe. The compression rings of K700 fittings in 50mm and 63mm have a distinct wedge shape. It is important they are correctly positioned on the pipe during assembly, with the longest side being inserted into the fitting socket.

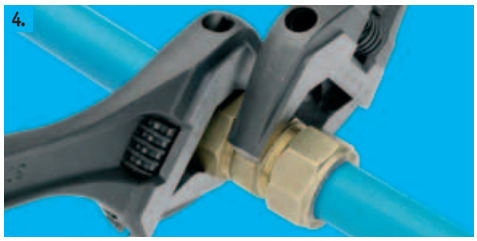
2. Insert the pipe support liner into the bore of the pipe and push home until the flange is in contact with the end of the pipe. Where the pipe is at or near the minimum bore size, it may be difficult to fully insert the liner due to interference from the tapered portion of the liner (K700) or raised bead on the liner (K1700). In this case, we recommend a small chamfer is produced in the pipe bore using a sharp knife.



3. Push the prepared end of the pipe firmly into the fitting socket until it contacts the stop within the body of the fitting.



4. Tighten the compression nut by hand, then with spanners for approximately 1 to 1½ turns beyond the point at which the compression ring begins to grip the pipe. The identification marks on the coupling nut will aid this.



Pipe support liners

g The liner, which is inserted into the bore of the pipe, supports the pipe wall during the tightening of the joint. Liners are colour coded according to class for easy identification.

h **Kuterlite 700** liners are for MDPE pipe only and are slightly tapered with a small flange.

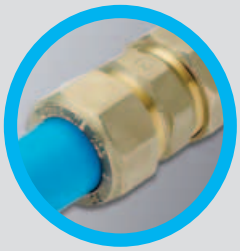
i **Kuterlite 1700** liners have a more prominent flange. A raised bead on the barrel of the liner compensates for variations in bore sizes and prevents the liner from becoming dislodged during assembly.

j **Kuterlite 1700** fittings can be converted to older polyethylene pipe specifications BS 1972 and BS 3284 via the use of the appropriate copper liner. Liners are marked with colour codes to enable easy identification.

1 **Liners compatible with Kuterlite 1700 fittings to convert BS 1972 and BS 3284 pipe specifications**

Pipe Spec/class	Pipe size(s)	Liner(s) and size	Liner marking
BS 1972:61 normal gauge	¾" to 1½"	K1766A ¾" to 1½"	None
BS 1972:61 normal gauge	½"	K1766C ⅜"	Blue – flange
BS 1972 Class B	¾"	K1766B ¾" K1784C ¾"	Red – flange Blue – barrel
BS 1972 Class B	1"	K1766B 1" K1784C 1"	Red – flange Blue – barrel
BS 1972 Class C	⅜" to 1½"	K1788D ⅜" to 1½"	Blue – flange
BS 3284 Class C	½" to 1"	K1784C ½" to 1"	Blue – barrel
BS 1972 Class C	1¼"	K1784C 1¼"	Blue – barrel
BS 1972 Class D	⅜" to ¾"	K1766D ⅜" to ¾"	Green – flange
BS 1972 Class D	1"	K1784C ¾"	Blue – barrel
BS 1972 Class D	1¼"	K1784C 1"	Blue – barrel
BS 1972 Class D	1½"	K1784C 1¼"	Blue – barrel
BS 3284 Class D	⅜" to 1"	K1784D ⅜" to 1"	Green – barrel

System design considerations



a Here are details of some of the specific design considerations it is important to take account of when designing and installing pipework systems incorporating Kuterlite fittings.

Design considerations

b Some contracts may require the use of proprietary chemicals to cleanse and flush pipework before full commissioning. Kuterlite is compatible with a selection of products – contact us to find out more.

Pipeline supports

c Pipelines should always be constructed so that the joints are under neutral or compressive stress. Clipping to support the assembled pipeline is essential and tube manufacturer's recommendations should be adhered to. Yorkshire Fittings offers a wide range of pipe clips and brackets to ensure safe and secure installations. Pipe joist clips are also available, and are designed to protect pipework against accidental piercing when nailing or screwing down floorboards. For data on the spacing of supporting brackets, refer to the tables below.

Stress corrosion cracking

d Stress corrosion cracking (SCC) is a phenomenon that occurs occasionally with brass compression fittings. It is almost always introduced during installation, either from over-tightening of fittings or contamination from a corrosive substance.

e The usual corrosive substance involved in SCC is ammonia or ammoniacal compounds, which can be found in cleaning fluids, refrigeration gases, sewage waste products, building materials, insulating materials (especially foams) and flame and smoke retarding treatments. An essential ingredient in the SCC process is moisture. Moisture on the fitting or pipework allows the corrosive substance to collect and become more concentrated. This is a particular problem in chilled water installations, where insulating materials allow the condensed moisture to be retained and kept in close contact with the fitting surface.

f Yorkshire Fittings Ltd does not recommend the use of brass components in chilled water applications. Instead, we recommend fittings made from SCC resistant or immune materials, such as copper or gunmetal. Fittings from our XPress, Tectite, Yorkshire or Endex ranges are the preferred products for chilled water applications. If compression fittings are used then they should be assembled exactly in accordance with our published instructions and securely bound by a moisture barrier such as Densotape® to prevent moisture build up on the fitting.

g The following installation practices should be adhered to when installing compression fittings in order to avoid SCC:

h
1. Do not overtighten brass components.
2. Use correctly fitting spanners.
3. Use a drop or two of light oil on the threads of fittings of sizes 35mm and above.
4. Avoid contaminating the threads or nuts with jointing compounds.
5. Use parallel threaded adaptors to avoid stressing the female threaded ends.

i Minimise the risk of contamination from a potential corrosive substance. Wrapping susceptible fittings in a vapour barrier or applying impermeable paints can be helpful in preventing contact with a corrosive substance.

EQUIPOTENTIAL BONDING

j Please ensure all metallic pipework systems comply with the equipotential bonding requirements of the current edition of the IKE electrical wiring regulations (BS 7671: 2001).

k Kuterlite 600 and Kuterlite 900 fittings provide guaranteed electrical continuity when correctly assembled with copper, stainless steel or carbon steel tube.

l Kuterlite 700 and Kuterlite 1700 fittings assembled with PE pipes, and Kuterlite 600 and Kuterlite 900 fittings assembled with PEX or PB pipe, do not provide electrical continuity.

m After all plumbing work has been completed, always ensure continuity checks are conducted by a qualified electrician in accordance with regulations.

1 **Maximum spacing of support brackets for internal fixing of copper tube to BS EN 1057 R250 and R290**

Size	Wall thickness	Horizontal pitch	Vertical pitch
6mm	0.6mm	0.40m	0.60m
8mm	0.6mm	0.60m	0.90m
10mm	0.6mm	0.80m	1.20m
12mm	0.6mm	1.00m	1.50m
15mm	0.7mm	1.20m	1.80m
22mm	0.9mm	1.80m	2.40m
28mm	0.9mm	1.80m	2.40m
35mm	1.2mm	2.40m	3.00m
42mm	1.2mm	2.40m	3.00m
54mm	1.2mm	2.70m	3.00m
67mm	1.2mm	3.00m	3.60m
76mm	1.5mm	3.00m	3.60m
108mm	1.5mm	3.00m	3.60m

2 **Maximum spacing of support brackets for internal fixing of Tectite-PEX barrier pipe and other PEX and PB pipes to BS 7291 Parts 2 and 3**

Size	Spacing on Horizontal Run Average service temperature 20°C	60°C	80°C	Spacing on Vertical Run Average service temperature 20°C	60°C	80°C
10mm	500mm	400mm	300mm	800mm	600mm	500mm
15mm	500mm	400mm	300mm	800mm	600mm	500mm
22mm	800mm	600mm	500mm	1200mm	1000mm	800mm
28mm	800mm	600mm	500mm	1200mm	1000mm	800mm

3 **Maximum spacing of support brackets for internal fixing of XPress Stainless System tube, BS EN 10312 and DVGW GW541 stainless steel tube; and XPress Carbon System tube and other carbon steel tube to DIN 2394/NEN 1982**

Size	Horizontal run spacing	Vertical run spacing
15mm	1200mm	1800mm
18mm	1500mm	2100mm
22mm	1800mm	2400mm
28mm	1800mm	2400mm

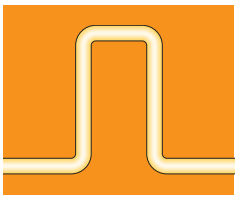


System design considerations

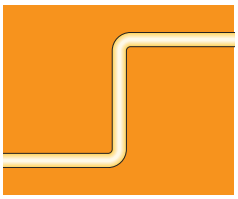
WATER REGULATIONS

a **The Water Supply (Water Fittings) Regulations 1999 can be downloaded from www.hmso.gov.uk**

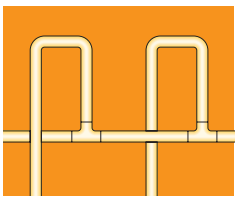
TECHNIQUES FOR EXPANSION STRESS RELIEF



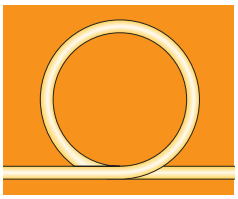
b **Horseshoe expansion link**



c **Offset**



d **Crossover tee arrangement**



e **Expansion loop**
Suitable for 10mm tube only.

Insulation

f For all Kuterlite installations, we recommend you adhere to the insulation requirements for copper tube as specified by The Water Supply (Water Fittings) Regulations 1999. These requirements are equally applicable to stainless steel and carbon steel tube.

Thermal movement

g Thermal movement is a major consideration when designing plumbing and heating systems.

h Pipework systems expand and contract with changes in temperature. If they are fixed too rigidly and their movement restricted the installation will be subject to stress, which must be avoided. It is therefore important to take the effect of this thermal movement into account when designing and installing plumbing and heating systems.

i Stress concentrations between "fixed points", typically found at radiators, valves and other fittings should be avoided.

Expansion of copper tube

j Copper has a coefficient of linear expansion of 17 x 10^{-6}/°C. For example, a 10 metre length of copper tube carrying hot water at 60°C will increase in length by almost 7mm when heated from an ambient temperature of 20°C.

k Assuming that temperature cycling of the system is 20°C, there will be a continuous cycle of expansion and contraction of 3.4mm. Refer to Table 1 opposite.

Expansion of Tectite-PEX barrier pipe

l Tectite-PEX barrier pipe has a coefficient of linear expansion of 1.5 x 10^{-4}/°C at 20°C to approximately 2.8 x 10^{-4}/°C at 82°C. As an example, we recommend you allow for 12.5mm expansion on a length of pipe when installed at 20°C for use up to 82°C. Refer to Table 2 opposite.

Expansion of PB pipe

m For details of the expansion of PB pipe refer to the manufacturers instructions.

Expansion of stainless steel System tube

n Stainless steel tube has a coefficient of linear expansion of 16 x 10^{-6}/°C. For example, a 10 metre length of stainless steel tube carrying hot water at 60°C will increase in length by almost 6.5mm when heated from an ambient temperature of 20°C.

o Assuming that temperature cycling of the system is 20°C, there will be a continuous cycle of expansion and contraction of 3.2mm. Refer to Table 3 opposite.

Expansion of carbon steel System tube

p Carbon steel System tube has a coefficient of linear expansion of 12 x 10^{-6}/°C. For example, a 10 metre length of carbon steel System tube carrying hot water at 60°C will increase in length by almost 5mm when heated from an ambient temperature of 20°C.

q What's more, assuming that temperature cycling of the system is 20°C, then there will be a continuous cycle of expansion and contraction of 2.4mm. Refer to Table 4 opposite.

Correct anchoring

r Always ensure the spur used to anchor the branch of a tee or connect to a radiator is long enough to allow normal thermal movement. Not doing this can lead to installation failure.

Covered pipework

s Making provision for thermal movement is vital where pipework of any material is installed under screed or plaster, or passes through brick or blockwork.

t The preferred practice is to pass tubes and pipes through sleeves or conduits or to lay them in ducts surrounded by loose, non-rigid material such as vermiculite or glass wool. For further information, consult the standard BS 6700:1997.

Local Water Authority

u It's wise to take the advice of the local water authority into account when it comes to pipework accessibility.

Copper tube bending

v Portable bending machines are ideal for copper tubes up to 28mm. Most machines bend the tube between matched formers and back guides that support the outside diameter (OD) of the tube.

System design considerations



a This eliminates the risk of the tube wall collapsing. The point at which the bending pressure is exerted must be maintained at the correct distance in front of the formers' point of support. It's also important to keep formers and guides well lubricated. Bending tubes correctly will avoid any wrinkling and flattening that can affect flow conditions. Using adjustable bending machines (which allow the pressure on the back guide to be adjusted) will ensure perfect bends every time so long as the root (inside) bending radius is at least 3 times the outside diameter of the tube.

1 **Copper tube expansion**

Temperature change	Tube length 3m	4m	5m	6m	7m	8m	9m	10m	12m	25m
10°C	0.5mm	0.7mm	0.9mm	1.0mm	1.2mm	1.4mm	1.5mm	1.7mm	2.0mm	4.3mm
20°C	1.0mm	1.4mm	1.7mm	2.0mm	2.4mm	2.7mm	3.0mm	3.4mm	4.0mm	8.5mm
30°C	1.5mm	2.0mm	2.6mm	3.1mm	3.6mm	4.1mm	4.6mm	5.1mm	6.1mm	13mm
40°C	2.0mm	2.7mm	3.4mm	4.1mm	4.8mm	5.4mm	6.1mm	6.8mm	8.2mm	17mm
50°C	2.6mm	3.4mm	4.3mm	5.1mm	6.0mm	6.8mm	7.7mm	8.5mm	10.2mm	21mm
60°C	3.1mm	4.1mm	5.1mm	6.1mm	7.1mm	8.2mm	9.2mm	10.2mm	12.2mm	26mm
70°C	3.6mm	4.8mm	6.0mm	7.1mm	8.3mm	9.5mm	10.7mm	11.9mm	14.3mm	30mm
80°C	4.1mm	5.4mm	6.8mm	8.2mm	9.5mm	10.9mm	12.2mm	13.6mm	16.3mm	34mm
90°C	4.6mm	6.1mm	7.7mm	9.2mm	10.7mm	12.2mm	13.8mm	15.3mm	18.4mm	38mm
100°C	5.1mm	6.8mm	8.5mm	10.2mm	11.9mm	13.6mm	15.3mm	17.0mm	20.4mm	43mm

2 **Tectite-PEX barrier pipe expansion**

Upper working temperature	Lower working temperature 0°C	10°C	20°C	30°C	40°C	50°C	60°C	70°C	80°C	90°C
90°C	17.6mm	16.4mm	15.1mm	13.5mm	11.6mm	9.4mm	7.4mm	5.0mm	2.6mm	0.0mm
80°C	15.0mm	13.8mm	12.5mm	10.9mm	9.0mm	6.8mm	4.8mm	2.4mm	0.0mm	
70°C	12.6mm	11.4mm	10.1mm	8.5mm	6.6mm	4.0mm	2.4mm	0.0mm		
60°C	10.2mm	9.0mm	7.7mm	6.1mm	4.2mm	2.0mm	0.0mm			
50°C	8.2mm	7.0mm	5.7mm	4.1mm	2.2mm	0.0mm				
40°C	6.0mm	4.8mm	3.5mm	1.9mm	0.0mm					
30°C	4.1mm	2.9mm	1.6mm	0.0mm						
20°C	2.5mm	1.3mm	0.0mm							
10°C	1.2mm	0.0mm								
0°C	0.0mm									

3 **Stainless Steel System tube expansion**

Temperature change	Tube length 3m	4m	5m	6m	7m	8m	9m	10m	12m	25m
10°C	0.5mm	0.6mm	0.8mm	1.0mm	1.1mm	1.3mm	1.4mm	1.6mm	1.9mm	4.0mm
20°C	1.0mm	1.3mm	1.6mm	1.9mm	2.2mm	2.6mm	2.9mm	3.2mm	3.8mm	8.0mm
30°C	1.4mm	1.9mm	2.4mm	2.9mm	3.4mm	3.8mm	4.3mm	4.8mm	5.8mm	12.0mm
40°C	1.9mm	2.6mm	3.2mm	3.8mm	4.5mm	5.1mm	5.8mm	6.4mm	7.7mm	16.0mm
50°C	2.4mm	3.2mm	4.0mm	4.8mm	5.6mm	6.4mm	7.2mm	8.0mm	9.6mm	20.0mm
60°C	2.9mm	3.8mm	4.8mm	5.8mm	6.7mm	7.7mm	8.6mm	9.6mm	11.5mm	24.0mm
70°C	3.4mm	4.5mm	5.6mm	6.7mm	7.8mm	9.0mm	10.1mm	11.2mm	13.4mm	28.0mm
80°C	3.8mm	5.1mm	6.4mm	7.7mm	9.0mm	10.2mm	11.5mm	12.8mm	15.4mm	32.0mm
90°C	4.3mm	5.8mm	7.2mm	8.6mm	10.1mm	11.5mm	13.0mm	14.4mm	17.3mm	36.0mm
100°C	4.8mm	6.4mm	8.0mm	9.6mm	11.2mm	12.8mm	14.4mm	16.0mm	19.2mm	40.0mm

4 **Carbon Steel System tube expansion**

Temperature change	Tube length 3m	4m	5m	6m	7m	8m	9m	10m	12m	25m
10°C	0.4mm	0.5mm	0.6mm	0.7mm	0.8mm	1.0mm	1.1mm	1.2mm	1.4mm	3.0mm
20°C	0.7mm	1.0mm	1.2mm	1.4mm	1.7mm	1.9mm	2.2mm	2.4mm	2.9mm	6.0mm
30°C	1.1mm	1.4mm	1.8mm	2.2mm	2.5mm	2.9mm	3.2mm	3.6mm	4.3mm	9.0mm
40°C	1.4mm	1.9mm	2.4mm	2.9mm	3.4mm	3.8mm	4.3mm	4.8mm	5.8mm	12.0mm
50°C	1.8mm	2.4mm	3.0mm	3.6mm	4.2mm	4.8mm	5.4mm	6.0mm	7.2mm	15.0mm
60°C	2.2mm	2.9mm	3.6mm	4.3mm	5.0mm	5.8mm	6.5mm	7.2mm	8.6mm	18.0mm
70°C	2.5mm	3.4mm	4.2mm	5.0mm	5.9mm	6.7mm	7.6mm	8.4mm	10.1mm	21.0mm
80°C	2.9mm	3.8mm	4.8mm	5.8mm	6.7mm	7.7mm	8.6mm	9.6mm	11.5mm	24.0mm
90°C	3.2mm	4.3mm	5.4mm	6.5mm	7.6mm	8.6mm	9.7mm	10.8mm	13.0mm	27.0mm
100°C	3.6mm	4.8mm	6.0mm	7.2mm	8.4mm	9.6mm	10.8mm	12.0mm	14.4mm	30.0mm



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