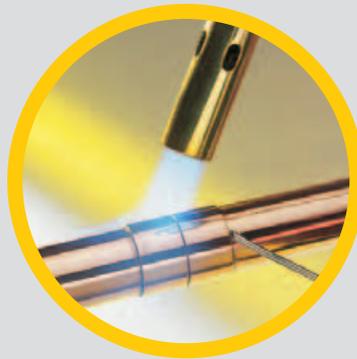
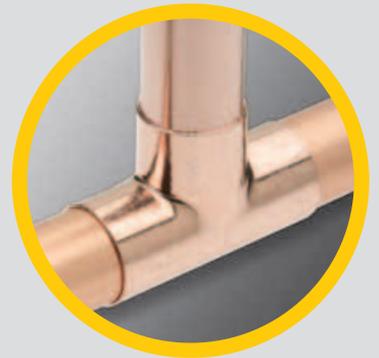


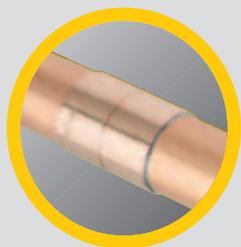
# *Endex*

End Feed Fittings



**Yorkshire**

# The principle of the Endex joint



## CONTENTS

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

## The principle of the Endex joint

- b** The Endex joint is created through the process of capillary attraction. When the fitting and tube are assembled and heated to the correct temperature, solder applied to the mouth of the fitting becomes molten. Capillary attraction ensures the solder is drawn into the gap between tube and fitting, forming a sturdy and reliable joint.

## Advantages of Endex

- c** Endex end feed fittings are a simple and cost-effective method of jointing copper tubes to BS EN 1057. Light and neat, they make handling and installation easy. The fittings' compact dimensions make them the ideal choice for use in areas where there is limited space. Additionally, their smooth lines minimise flow restrictions and are unobtrusive on exposed pipelines.

- d** Endex end feed fittings are manufactured from copper, gunmetal or other dezincification resistant alloy (DZR).

Users of Endex fittings can be confident that they are purchasing an established product with a proven reputation for reliability and quality.

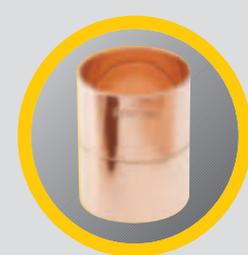
## Presenting the range

- e** The Endex end feed fittings range includes standard line fittings, large size and waste fittings, and an extensive selection of flanges and accessories.



- f** Endex general range end feed fittings are available in sizes from 6mm to 54mm and are designed for jointing copper tube manufactured to BS EN 1057 using soft or hard solder (brazing alloy). Endbrazing fittings in size 67mm can also be soft soldered. The range is suitable for use on above ground hot and cold domestic water services, in small bore and minibore central heating systems and in low-pressure steam heating and pressurised unvented heating systems. In addition, the Endex general range can be used for sanitation services and compressed air lines, gas distribution systems for natural and manufactured gases, with fuel oils (hard solder only) and kerosene, and on engineering pipelines services that convey liquids, oils, air and gases at temperatures up to 110°C. For fuel oils, refer to OFTEC advice. Endex fittings are available degreased and individually bagged for use on medical gas lines.
- g** Endex general range fittings are manufactured from copper, gunmetal or other DZR alloy, with nuts supplied in duplex brass (DZR versions are also available).

# Introducing the Endex range



- a Available in sizes from 67mm to 219mm, Endbrazed large sized end feed fittings are designed for jointing copper tubes to BS EN 1057 using hard solder (brazing alloy). In addition, 67mm fittings can be soft soldered. The range is suitable for use in hot and cold water services, heating systems, gas installation pipework and many engineering applications. Endbrazed fittings are available degreased and individually bagged for use on medical gas lines.
- b Endbrazed fittings are manufactured from copper or copper alloy, with sizes 133mm and above fabricated from copper components.
- c The Endbrazed range is complemented by bi-metal, gunmetal and slip-on flanges designated PN10, all of which have been designed to aid pipework assembly.



## Waste fittings

- d Endex waste fittings in sizes from 35mm to 54mm are designed for use in domestic and commercial waste systems for connecting basins, baths, sinks and other sanitary appliances. The range includes bends, tees and crosses; 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.



## Accessories

- e The Endex range of end feed fittings is complemented by a range of accessories which includes solders, fluxes and tap connector washers.
- f **Traditional Craftsman's Flux** (from the Yorkshire range) will maintain its consistency over a long period of time. It has excellent lubricating properties, which enables close-fitting joints to be readily assembled. It can be used with all types and sizes of soft solder fittings for applications including gas, and is char-resistant to normal heating levels of 250°C.
- g **Yorkshire Flux** (from the Yorkshire range), like Traditional Craftsman's, will maintain its consistency and can be used with all types and sizes of soft solder fittings. However, it must not be used for gas applications.
- h **Degussa H** ready-mixed paste is for brazing copper and copper alloys, such as Endbrazed large sized fittings.

## MARKINGS



- i **UNIVERSAL MARKING**  
All dezincification resistant Endex fittings carry the distinctive CR mark.



- j **GUNMETAL**  
Some Endex fittings and valves are manufactured from gunmetal and can be identified by the GM mark on the body.

# Standards and material specifications



## KEYWORD IS QUALITY



FM 27630



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



- b** **EVALUATED BY WRAS**  
The Endex ranges have been certified by WRAS and are audited periodically.



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

- d** We at Yorkshire 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. Endex end feed fittings 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.

- e** 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 Endex range meets the following standards:

### Endex general range

- f** **WRAS** All Endex general range fittings are listed and comply with the requirements of The Water Supply (Water Fittings) Regulations/Byelaws (Scotland).
- g** **BS EN 1254 Part 1** Specification for copper and copper alloy fittings with capillary ends for soldering and brazing for use with copper tubes.
- h** **BS EN ISO 228** (formerly BS 2779/ISO 228/1) Specification for tubes and fittings where pressure tight joints are not made on the threads (metric dimensions).
- i** **BS 7786** Specification for PTFE tape for water and general applications.
- j** **BS EN 751-3** (formerly BS 6974) Specification for PTFE tape for gas applications.

### Endbrazed fittings

- k** **WRAS** All Endbrazed fittings are listed and comply with the requirements of The Water Supply (Water Fittings) Regulations/Byelaws (Scotland).



- l** **BS EN 1254 Part 5** Specification for copper and copper alloy fittings with short ends for capillary brazing to copper tube.

- m** **BS 10** (obsolescent) Specification for flanges and bolting for pipes, valves and fittings.

- n** **BS EN 1092-3** (formerly BS 4504 Part 3.3) Specification for copper alloy circular flanges and their joints. PN designated.

- o** **BS EN 1044** (formerly BS 1845) Specification for filler metals for brazing.

### Endex waste fittings

- p** Endex waste fittings are manufactured to our own exacting standards.

### Material specifications

- q** The materials used to manufacture Endex end feed fittings meet the following specifications:

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

- s** **BS EN 12162** Specification of profiles and rectangular bar for general purposes.

- t** **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).

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

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

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

# Guarantees and tube compatibility



## Quality

- a Quality is of paramount importance to Yorkshire. Our products conform to current British, European and International standards where applicable and also meet our own rigorous internal quality approvals.
- b Yorkshire 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.

## Guarantees

Our policy of continuously and rigorously testing Endex end feed fittings 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 Endex end feed fittings are guaranteed against manufacturing defects for 25 years, when installed in accordance with our instructions on specified tube materials and applications.

## Tube compatibility

- d Endex end feed fittings are suitable for jointing copper tube, which must meet the requirements of BS EN 1057.
- e BS EN 1057 Specification for copper and copper alloy – seamless round copper tubes for water (and gas) in sanitary and heating applications.

### 1 BS EN 1057 copper tube specifications compatible with Endex end feed fittings

Outside diameter	Wall thickness								
	0.6mm	0.7mm	0.8mm	0.9mm	1.0mm	1.2mm	1.5mm	2.0mm	2.5mm
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						R250/R290		R250	
76mm							R290	R250	
108mm							R290		R250
133mm							R290		
159mm								R290	

- f 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.
- g R220 Annealed condition with a tensile strength of 220N/mm<sup>2</sup> supplied in coils and suitable for connection by push-fit, capillary and compression fittings. Can be bent with suitable bending tools.
- h R250 Half hard condition with a tensile strength of 250N/mm<sup>2</sup> supplied in straight lengths and suitable for connection by push-fit, press-fit, capillary and compression fittings. Can be bent with suitable bending tools.
- i R290 Hard condition with a tensile strength of 290N/mm<sup>2</sup> supplied in straight lengths suitable for connection by push-fit, press-fit, capillary and non-manipulative compression fittings. Not suitable for bending.

## Imperial copper tube

- j Endex end feed fittings with metric or BSP ends are not compatible with imperial copper tube. However, the Endex range includes a number of imperial x metric adaptors, which are specifically designed for the purpose of connecting to imperial copper tube found in an existing installation.

## Stainless steel tube

- k The use of Endex fittings with stainless steel tube is not recommended.

## TRADE BODIES



- l CONTACT WITH THE TRADE  
Yorkshire is an industrial associate of the Institute of Plumbing & Heating Engineering  
[www.iphe.org.uk](http://www.iphe.org.uk)



- ll LINKS WITH MERCHANT GROUPS  
Industry trends can be monitored through the BMF.  
[www.bmf.org.uk](http://www.bmf.org.uk)



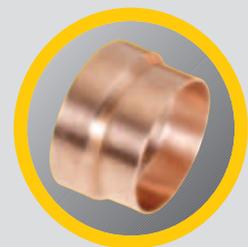
- lll LINKS WITH END USER GROUPS  
The Company is a member of the Association of Plumbing and Heating Contractors.  
[www.aphc.co.uk](http://www.aphc.co.uk)



- o REGIONAL LINKS  
Association with regional bodies like SNIPEF also helps to monitor a broad picture of the industry.  
[www.snipef.org](http://www.snipef.org)



- p OFTEC  
Yorkshire recommends contacting OFTEC for fuel oils advice.  
[www.oftec.co.uk](http://www.oftec.co.uk)



# Working temperatures and pressures

## 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 Endex end feed fittings are exempt.

**b** For a detailed explanation of the P.E.D. visit our website [www.yorkshirefittings.co.uk](http://www.yorkshirefittings.co.uk)

## GAS FAMILIES

**c** There are three gas families:

- 1st Family – manufactured gas.
- 2nd Family – natural gas.
- 3rd Family – LPG, compressed propane and butane.

## EQUIPOTENTIAL BONDING

**d** Ensure all metallic pipework systems comply with the equipotential bonding requirements of the current edition of the IEE electrical wiring regulations (BS 7671:2001).

**e** All Endex end feed fittings provide electrical continuity when the joint has been completed with copper tube.

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

## Working temperatures and pressures

### Endex general range fittings

**g** Endex general range end feed fittings can be assembled using a variety of soft or hard solders (brazing alloy). Their working temperatures and pressures vary according to which solder has been used. When correctly assembled with copper tube to BS EN 1057, the applicable temperatures and pressures are indicated in Tables 1 and 2 on this page, and Table 1 apposite.

### Endbraze fittings

**h** Endbraze fittings should be assembled with silver brazing alloys to BS EN 1044 (formerly BS 1845). When correctly assembled with copper tube to BS EN 1057, Endbraze fittings are designed for the working temperatures and pressures shown in Table 2 opposite. Please contact us for performance information for Endbraze 219mm fittings.

### Flanges

**i** Endbraze flanges are designed for assembly with silver brazing alloys to BS EN 1044 (formerly BS 1845). When correctly assembled with copper tube to BS EN 1057, they perform at the temperatures and pressures shown in Table 3.

### Achieving low temperatures

**j** 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.

## High performance

**k** Endex end feed fittings used with copper tube to BS EN 1057 will withstand pressure ratings never reached under normal service conditions.

**1** Endex (and Endbraze 67mm) performance when correctly assembled with copper tube to BS EN 1057 using tin/copper soft solder BS EN 29453 S-Sn99Cu1 or tin/silver soft solder BS EN 29453 L-SnAg5 DIN 1707

Size	Service temperature			
	Min -40°C	30°C	65°C	Max 110°C
6mm to 28mm	25 bar	25 bar	25 bar	16 bar
35mm to 54mm	25 bar	25 bar	16 bar	10 bar
67mm	16 bar	16 bar	16 bar	10 bar

**2** Endex (and Endbraze 67mm) performance when correctly assembled with copper tube to BS EN 1057 using tin/lead soft solder BS EN 29453 D-Pb60Sn40  
Not suitable for use in potable water systems

Size	Service temperature			
	Min -15°C	30°C	65°C	Max 110°C
6mm to 54mm	16 bar	16 bar	10 bar	6 bar
67mm	10 bar	10 bar	6 bar	4 bar

**3** Endbraze flange performance when correctly assembled with copper tube to BS EN 1057 with silver brazing alloy to BS EN 1044 Ag103 (formerly BS 1845 Ag14)

Size	Service temperature	
	Min 180°C	Max 200°C
42mm to 219mm	10 bar	8.5 bar



# Performance and specification clauses



- 1** Maximum hydraulic working pressure for Endex fittings when assembled with copper tube to BS EN 1057 using hard solder (brazing alloy) to BS EN 1044 (formerly BS 1845)\*

Size	Service temperature					Max 200°C
	Min† -196°C	65°C	120°C	150°C	175°C	
6mm	81.1 bar	81.1 bar	76.2 bar	60.5 bar	46.0 bar	30.3 bar
8mm	62.5 bar	62.5 bar	58.8 bar	46.7 bar	35.5 bar	23.3 bar
10mm	50.9 bar	50.9 bar	47.9 bar	38.0 bar	28.9 bar	19.0 bar
12mm	42.9 bar	42.9 bar	40.3 bar	32.0 bar	24.3 bar	16.0 bar
15mm	40.3 bar	40.3 bar	37.9 bar	30.1 bar	22.8 bar	15.0 bar
22mm	35.6 bar	35.6 bar	33.5 bar	26.6 bar	20.2 bar	13.3 bar
28mm	28.2 bar	28.2 bar	26.5 bar	21.1 bar	16.0 bar	10.5 bar
35mm	25.2 bar	25.2 bar	23.7 bar	18.8 bar	14.3 bar	9.4 bar
42mm	23.2 bar	23.2 bar	21.8 bar	17.3 bar	13.1 bar	8.6 bar
54mm	19.8 bar	19.8 bar	18.6 bar	14.7 bar	11.2 bar	7.4 bar

- 2** Endbraze performance when correctly assembled with copper tube to BS EN 1057 with silver brazing alloy to BS EN 1044 (formerly BS 1845)

Size	Service temperature				Max 200°C
	Min† -196°C	65°C	120°C	150°C	
67mm	18.6 bar	18.6 bar	17.5 bar	14.0 bar	6.9 bar
76mm	18.6 bar	18.6 bar	17.5 bar	14.0 bar	6.9 bar
108mm	17.2 bar	17.2 bar	16.2 bar	12.9 bar	6.4 bar
133mm	10.5 bar	10.5 bar	8.5 bar	7.7 bar	4.1 bar
159mm	11.7 bar	11.7 bar	9.7 bar	8.6 bar	4.6 bar

\* Not applicable to products containing non-metallic components.

† Copper and gunmetal fittings only.

## Specification clauses

- a** Once the appropriate Endex product has been selected, the use of one of the following specification clauses will provide the exact wording required to ensure the correct product is used. All clauses can be copied from our website, [www.yorkshirefittings.co.uk](http://www.yorkshirefittings.co.uk)

### Endex general range specification

- b** "End feed fittings shall be to BS EN 1254 Part 1, of copper, gunmetal or other DZR alloy, and certified by WRAS. In sizes from 6mm to 54mm they will be suitable for use with copper tube to BS EN 1057 in hot and cold water services, central heating systems, fuel services and general engineering applications. They will have a guarantee of 25 years against all manufacturing defects, and be drawn from the Endex general range manufactured by Yorkshire."

## Endbraze fittings specification

- c** "End feed brazing fittings shall be to BS EN 1254 Part 5, of copper or copper alloy and certified by WRAS. In sizes from 67mm to 219mm they will be suitable for use with copper tube to BS EN 1057 in hot and cold water services, heating systems, gas service pipework and many engineering applications. They will have a guarantee of 25 years against all manufacturing defects, and be drawn from the Endbraze range manufactured by Yorkshire."

## Endex waste fittings specification

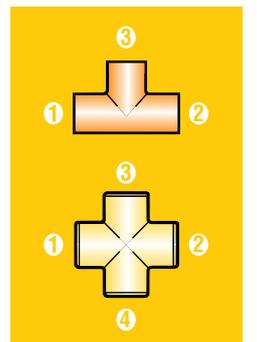
- d** "End feed waste fittings shall be of copper or copper alloy. In sizes from 35mm to 54mm they will be suitable for use with copper tube to BS EN 1057 for sanitary and waste applications. They will have a guarantee of 25 years against all manufacturing defects, and be drawn from the Endex waste fittings range manufactured by Yorkshire."

## WASHERS

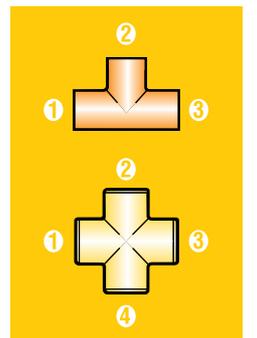


- e** Where tap connectors or other fittings are assembled with washers, service temperatures must not exceed 100°C. Washers are not suitable for use on gas service pipelines.

## TEE SPECIFICATION



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



- g** **EUROPEAN SPECIFICATION**  
Quote the larger end first, then the branch, followed by the remaining end.

# Installation instructions for soft solder



## FLUXES

- a** Yorkshire Flux, Traditional Craftsman's Flux and Degussa H high duty flux are subject to the requirements of the Control of Substances Hazardous to Health (COSHH) regulations. COSHH sheets are available to download from our website, [www.yorkshirefittings.co.uk](http://www.yorkshirefittings.co.uk)

## HEATING DZR BRASS

- b** The corrosion resistance of DZR brass can be adversely affected by heating to temperatures in excess of 400°C. Care should be taken when using hard solder to avoid over heating DZR components.

## THREADED CONNECTORS

- c** Jointing compounds should comply with BS 6956 Part 5 and be WRAS listed. PTFE tape for water and general applications should comply with BS 7786 and satisfy the requirements of BS 6920 Part 1. For gas applications, PTFE tape should comply with BS EN 751-3 (formerly BS 6974).
- d** Female threaded connectors have internal threads to BS EN ISO 228 and should be used for general connections from male threaded fittings to copper pipework.
- e** Male threaded connectors have taper male BSP threads and may require the use of jointing materials. Complete the soldering operation, then apply a WRAS listed jointing compound or PTFE tape to the threads. When installing fittings with parallel connector threads, a good quality jointing washer should be used.

## UNION FITTINGS

- f** Union fittings have metal-to-metal cone joints to BS 1010. Avoid damaging the mating faces and, if required, apply a WRAS listed jointing compound or PTFE tape. Tighten the joint with a spanner.

- g** The following instructions illustrate just how easy it is to make an Endex end feed joint. The fittings use the principle of capillary attraction to allow solder to fill the gap between fitting and tube to form a completely reliable joint.

### Endex general range fittings

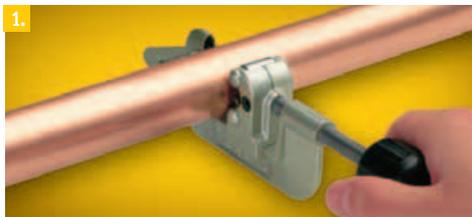
- h** The reliability of soft soldered joints is greatly influenced by the type of flux used. Yorkshire flux and Traditional Craftsman's flux are specially formulated for jointing copper tubes with Endex end feed fittings. All fluxes are to some extent, corrosive, but special care should be taken with so-called self cleaning fluxes.

### Preliminaries

- i** 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.

### i 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 burrs from the inside and outside of the tube ends using a fine toothed file or a S120 deburring tool from the XPress accessories range.



- 3.** Clean the inside of the fitting socket and the outside of the tube with a Yorkshire cleaning pad, fine sandpaper or steel wool.



### k Jointing – soft solder

- 1.** Using a suitable brush, apply adequate – but not excessive – flux to both the outside of the tube and the inside of the fitting socket. Do not use your finger.



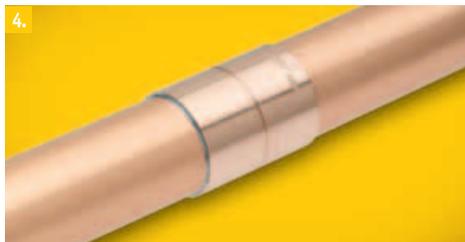
- 2.** Insert the tube into the fitting until it reaches the tube stop, then wipe off any excess flux. Heat the assembled joint evenly on all sides.



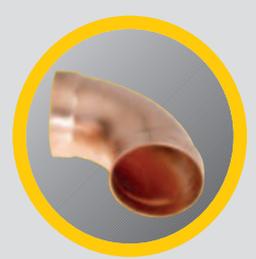
- 3.** Apply solder to the mouth of the fitting. When the correct temperature has been reached the solder will flow freely and be drawn into the joint. Briefly reapply the blowtorch and wipe off any excess solder.



- 4.** Allow the joint to cool without disturbance. Clean the joint generally, wiping off any external flux residues. This will prevent unsightly stains or (in extreme cases) corrosion of pipework. Flush out the pipework.



# Installation instructions for brazing alloys



## Unmade ends

- a If one or more ends of an Endex fitting are to remain unmade, a short length of correctly sized, uncleaned tube should be inserted into the unjointed end. Keep this section cool by wrapping a wet rag around it while heating the remaining end.

## Taking apart and remaking Endex joints

- b Remaking of Endex general range joints is generally not recommended. However, in some situations, joints can be remade by fluxing the tinned portion of the tube and reinserting this into the fitting. Then, heat the joint and end feed the solder. If a new tube is to be used, clean and flux the tube before assembly.
- c If it is necessary to break into existing pipes for repairs or to fit new branches, slip couplings or tees which have no tube stops make the job easier and avoid disturbing the rest of the system.

## Adapting imperial to metric with Endex

- d Endex general range fittings can be easily connected to older imperial sized tube installations through the use of an Endex imperial to metric adaptor coupling. One end of the adaptor fits onto imperial pipe and the other onto metric pipe. Adaptors are available in a variety of size combinations.

## Brazing alloy (hard solder) installation – Endex general range and Endbraz

- e The same preliminaries and preparation guidelines apply as for soft soldering.

## Blowtorches and their use

- f For brazing joints, an oxy-propane, oxy-acetylene or other torch with a large soft, neutral or slightly reducing flame should be used. This should be kept moving throughout the making of the joint to avoid excessive local heating. It is better to melt the alloy by conduction than by heating it directly with the torch, although a combination of the two techniques can be used to aid the flow of alloy into the joint. The gap between the socket and the tube should be filled with the brazing alloy to leave a small, uniform bead of this alloy around the mouth of the socket.

## Jointing – brazing alloy

- g Follow steps 1 and 2 (Jointing – soft solder) if the use of a flux is required. Continue jointing as per the instructions given here in points 3 to 5.

- 3. Heat the assembled joint evenly on all sides to 700-750°C (red heat in poor daylight).



- 4. Apply the filler rod to the mouth of the fitting, allowing the brazing alloy to melt and flow into the annular gap.



- 5. Allow the joint to cool without disturbance. Clean the joint generally and flush out the pipework.



## Use of flux with brazing alloys

- h Refer to Table 1 below for details of which fittings and brazing alloys require the use of a flux. Where required, Yorkshire recommends Degussa H ready mixed flux.

### 1 Type of brazing alloys

	Copper/phosphorous brazing alloy to BS EN 1044 CP104, CP105 (formerly BS 1845 CP4, CP2)	Silver brazing alloy to BS EN 1044 Ag103 (formerly BS 1845 Ag14)
Tube to fitting		
Copper to copper	No flux	Flux
Copper to gunmetal	Flux	Flux

## SYSTEM TESTING

- i 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 pages 6 and 7 for data). If higher test pressures are required advice should be sought from Yorkshire Fittings.
- j 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.
- k 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.
- l N.B. The maximum temperature and pressure range in any system is dictated by the component with the lowest performance rating.

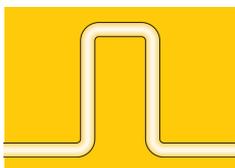


# System design considerations

## CHEMICALS

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

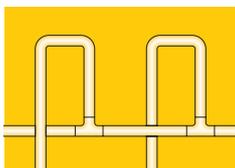
## TECHNIQUES FOR EXPANSION STRESS RELIEF



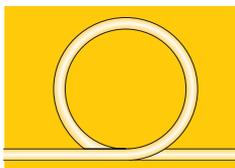
**b** Horseshoe expansion link



**c** Offset



**d** Crossover tee arrangement



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

## CORRECT ANCHORING

- f** Always ensure the free length of tube between the branch of the tee and the first anchor point (bracket or radiator valve) is long enough to allow normal thermal movement. Not doing this can lead to installation failure.

- g** Here are details of some of the specific design considerations it is important to take account of when designing and installing pipework systems containing Endex fittings.

### Pipeline supports

- h** Pipelines should always be assembled 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 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 the maximum spacing of supporting brackets refer to Table 1.

### Insulation

- i** For all Endex installations, we recommend you adhere to the insulation requirements for copper tube as specified by The Water Supply (Water Fittings) Regulations 1999. These can be downloaded from [www.hms.gov.uk](http://www.hms.gov.uk).

### Phenolic foam

- j** When using rigid phenolic foam (or other thermal insulation) to lag pipework, always remember to refer to the lagging manufacturer's fixing instructions. To avoid the risk of external corrosion of pipework, the European Phenolic Foam Association

recommends that such insulation products be installed with a moisture barrier, such as Densopaste or a plastic covering applied by the tube manufacturer.

- k** If you need to add a barrier product, we recommend that all Endex fittings are fully installed and are completely coated before these are applied.

### Thermal movement

- l** Thermal movement is major consideration when designing and installing plumbing and heating systems and should be taken into account.
- m** 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. Stress concentrations between "fixed points" – typically found at radiators, valves and other fittings – should be avoided wherever possible.

### Expansion of copper tube

- n** Copper has a coefficient of linear expansion of  $17 \times 10^{-6}/^{\circ}\text{C}$ . For example, a 10 metre length of copper tube carrying hot water at  $60^{\circ}\text{C}$  will increase in length by almost 7mm when heated from  $20^{\circ}\text{C}$ . Assuming that temperature cycling of the system is  $20^{\circ}\text{C}$ , there will be a continuous cycle of expansion and contraction of 3.4mm. Refer to Table 2.

### Covered pipework

- o** Making provision for thermal movement is vital where pipework is installed under screed or plaster, or passes through brick or blockwork.
- p** 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.

### Pipework accessibility

- q** It's wise to take advice from the local water authority when it comes to pipework accessibility.

## 1 Maximum spacing of support brackets for 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, 28mm	0.9mm	1.80m	2.40m
35mm, 42mm	1.2mm	2.40m	3.00m
54mm	1.2mm	2.70m	3.00m
67mm	1.2mm	3.00m	3.60m
76mm, 108mm	1.5mm	3.00m	3.60m

## 2 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

# Endex range data finder



Use the index to find the precise location of specific information about the Endex range. Pages, paragraphs, and tables are numbered or lettered throughout the document to help you find the detail you require.

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Registered Company No. 00401507. Place of Registration: England

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