## EXPANSION JOINTS

### UNRESTRAINED EXPANSION JOINTS

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</tr>
</thead>
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### RESTRAINED EXPANSION JOINTS

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### RUBBER BELLows

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<td>Hose Data EA82/71</td>
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### CAESAR PIPE STRESS ANALYSIS

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**Thick Wall Multi-ply Bellows - The Right Choice**

Engineering Appliances has been supplying expansion joints for Mechanical Building Services, Power Generation and Industrial Process Systems for 50 years. Our experience and knowledge of customer requirements has led us to choose thick wall spirally wrapped multi-ply bellows membranes, being the most technically advanced available anywhere. Such membranes have advantages over all conventional single and multi-ply designs where only 2 or 3 ply technology is used. Thick wall multi-ply membranes are typically 2 to 3mm thick and 6-12 ply resulting in the final product being robust, immensely strong yet highly flexible.

The membranes have thick walls and yet due to the many layers or plies the bellows remain very flexible, therefore the overall length is short and the thermal cycle life is high.

The spiral wrapping gives the bellows an in-built early warning which indicates when the inner ply has been damaged. The visual sign being a slow weep from a hole in the outer layer only, drilled for this purpose. A catastrophic failure is therefore virtually impossible.

---

**Construction of BOA thick wall spirally wound multi-ply bellows**

1. **Cutting of the thin stainless steel strip which forms the plies of the bellows**
2. **Welding of the outer and inner ply**
3. **Preparation of the spiral and welded inner and outer ply**
4. **Assembly of the single elements**
5. **Increased safety because of the spiral and weephole**
6. **Elastomer forming of the bellows**
7. **Thick wall multi-ply bellows after forming**
Unrestrained Expansion Joints

Quality is Assured
EA has a Lloyds Register accredited Quality Management System to ISO 9001. BOA as major suppliers are also accredited to ISO 9001. EA expansion joints are designed to the American EJMA standard, which incorporates large safety factors. All products are manufactured and finished to the highest standard using approved weld procedures to EN 288. Material certificates to EN 10204 and pressure test certificates are available on request.

Advice Service
We have many years experience in analysing pipework expansion compensation. We stake our reputation on only including expansion joints where there is no alternative. Our engineers can often reduce the cost of a system providing they are involved at an early design stage, as the most economical solution should not just consider the cost of the expansion joint but also take into account the cost of anchoring, guiding and installation. Frequently expansion joints are not required and can be designed out by using the natural flexibility of the pipework. Our Area Engineers are always pleased to advise you.

SECTION 1
Unrestrained Expansion Joints
Axial Expansion Joints are the simplest way of absorbing expansion in pipework systems. They are designed to be installed in a straight run of pipe where they absorb axial (or longitudinal) expansion by being compressed. The fact that they can only compensate for expansion in one plane limits their application and offers little opportunity for engineering initiative (Fig. 1).

When applying an axial expansion joint it is crucial to understand the concept of pressure thrust. Under pressure a convoluted bellows acts like a piston (Fig. 2) and will extend unless it is restrained. Axial expansion joints are unrestrained and therefore the pipework needs to be securely anchored to resist this tendency to extend. The forces exerted by an unrestrained expansion joint can be very significant and is calculated as follows: -

\[
\text{Pressure thrust} = \text{Effective area of bellows} \times \text{pressure}
\]

\[
F_{pt} = CSA \times (\text{Cm}^2) \times P \text{ (bar)} \text{ kgf}
\]

The effective cross sectional area of the bellows is given in the data sheets. For anchor load calculations always use the highest pressure, usually the test pressure, and take into consideration the total thrust from multiple pipes.

Example: A pipe system which has a 150mm n.b. flow and 100mm n.b. return, with an axial bellows installed in both at a test pressure of 15 bar. The total thrust exerted by both bellows is: -

\[
(267.1 \text{cm}^2 + 129.3 \text{cm}^2) \times 15 = 58.8 \text{ kN})
\]

If it is not possible to build anchors of sufficient strength, a restrained expansion joint must be used. It is usually either not possible or uneconomical to use unrestrained units at high level. Axial bellows also introduce an instability into the pipe run and therefore the rules on guiding detailed in BS 6129 must be strictly adhered to. (Also see EA’s Guide to the use of Expansion Joints).

The first guide should be spaced 4 pipe diameters from the expansion joint, and the second 14 pipe diameter from the first guide, Fig. 1. As this may not always be possible for small diameter pipe runs, EA have introduced a range of bellows where the above rule can be stretched (see data sheet for EA15, 16, 04).

For further information, please consult the EA Guide to the use of Expansion Joints or contact one of our engineers.
AXIAL EXPANSION JOINT - EA01/02 - 6

Specification
Engineering Appliances Type EA01/02 axial movement bellows expansion joint with integral BSP female swivel unions both ends complete with fibre washers, and stainless steel convoluted bellows.

Materials
Bellows: Stainless steel 316Ti (1.4571)
Union adaptors: EA01–malleable iron
EA02–gun metal
Union Backing Nuts: EA01–malleable iron
EA02–malleable iron

Recommended Applications
Small diameter steel/non-ferrous pipework in heating and chilled water systems. Cold or hot water services and condensate lines.
EA02 for non ferrous service.

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<tr>
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<th>movement/1000 cycles</th>
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<th>adaptor hex A/F</th>
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<th>product code</th>
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<td>mm</td>
<td>mm</td>
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<td>mm</td>
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Installation
Recommendations contained in our literature on correct installation of expansion joints in pipework should be followed. This expansion joint will extend under pressure unless restrained which should be by the proper positioning of anchors and guides, the unit is supplied at its maximum length, which should not be exceeded during installation or the working conditions. Particular care should be taken to avoid excessive torsion forces being applied to this expansion joint either during tightening of the unions or during installation of adjacent pipework.

Applications
The EA01/02 range are small bore threaded pipework expansion joints designed to absorb movement in an axial direction, in most applications the pipework movement is due to thermal expansion and contraction.

Performance
Movements and pressure ratings apply for temperatures up to 20°C, at higher temperatures the pressure ratings and movement capabilities are reduced.

Tolerances
Spring rates: +/-30%
Threads: BS21, ISO 7/1
Other tolerances on request.

Test Pressure
The maximum allowed is 9 bar g.

Non-Ferrous pipework
For non-ferrous pipework, such as copper, the Engineering Appliances type EA02 has a gunmetal adaptor and hence only gunmetal and stainless steel internal surfaces.

Non Standard variations
For applications where the EA01/02 is not suitable Engineering Appliances can offer alternative standard products or purpose designed special expansion joints.
AXIAL EXPANSION JOINT - EA04-16

Specification
Engineering Appliances Type EA04-16 axial movement bellows expansion joint with copper capillary ends, bronze convoluted bellows, copper inner and outer sleeve, anti-torsion and pretension devices fitted. All welded construction.

Materials
Bellows: bronze
Connectors: copper
Outer sleeve: copper
Inner sleeve: copper

Recommended Applications
Small diameter non-ferrous pipework, ideal for applications where guiding is difficult and the expansion joint is exposed. Suitable for high pressure applications up to 16 bar g.

<table>
<thead>
<tr>
<th>nominal diameter (mm)</th>
<th>supplied length (mm)</th>
<th>axial movement for 5000 cycles (mm)</th>
<th>spring rate (N/mm)</th>
<th>effective area (cm²)</th>
<th>pressure rating (bar g)</th>
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Installation
Recommendations contained in our literature on correct installation of expansion joints in pipework should be followed. This expansion joint will extend under pressure unless restrained which should be by the proper positioning of anchors and guides. This unit supplied at maximum length is fixed by a removable clip. The maximum length should not be exceeded during working conditions. This unit is internally guided so some liberty may be taken with the normal guiding rules. The first guide can be positioned at the intermediate guide spacing or within 2-3m whichever is the smaller. The flow arrow should be upwards in the direction of the flow.

Applications
The EA04-16 range are small bore pipework expansion joints designed to absorb movements in an axial direction, in most applications the pipework movement is due to thermal expansion and contraction. It is particularly designed for drinking and potable water supply in sanitary installations, perimeter heating, radiator runs and small condensate lines.

Performance
Movements and pressure ratings apply for temperatures up to 180°C, at higher temperatures the pressure ratings and movement capabilities are reduced. The maximum temperature for this unit is 180°C.

Tolerances
Spring rates: +/-30%
Other tolerances on request.

Test Pressure
The maximum allowed is 24 bar g.

Non Standard variations
NOT AVAILABLE
AXIAL EXPANSION JOINT - EA15-MM

Recommendations contained in our literature on correct installation of expansion joints in pipework should be followed. This expansion joint will extend under pressure unless restrained which should be by the proper positioning of anchors and guides. This unit is internally guided so some liberty may be taken with the normal guiding rules. The first guide can be positioned at the intermediate guide spacing or within 2-3m whichever is the smaller. This unit is supplied fixed by a removable clip at its maximum length, the maximum length should not be exceeded during working conditions. Particular care should be taken to avoid excessive torsion forces being applied to this expansion joint either during tightening of the connectors or during the installation of adjacent pipework, the limit clip should be removed after installation of the unit.

Applications
The EA15-MM range are small bore Mannesmann tube ended pipework expansion joints designed to absorb movement in an axial direction, in most applications the pipework movement is due to thermal expansion and contraction.

Specification
Engineering Appliances Type EA15-MM axial movement bellows expansion joint with Mannesmann tubing both ends, multi-ply stainless steel convoluted bellows, aluminium outer sleeve with integral length limit device, heavy duty carbon steel inner sleeve.

Materials
Bellows: Stainless steel 321 (1.4541)
Connectors: Stainless steel 316 (1.4401)
Outer sleeve: Aluminium
Inner sleeve: Carbon steel

Recommended Applications
For small bore Mannesman pipework, ideal where guiding is difficult and the bellows is in an exposed position.

<table>
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<tr>
<th>nominal diameter</th>
<th>supplied length</th>
<th>axial movement for 1000 cycles</th>
<th>axial movement for 5000 cycles</th>
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Performance
Movements and pressure ratings apply for temperatures up to 120°C, at higher temperatures the pressure ratings and movement capabilities are reduced.

Tolerances
Spring rates: +/- 30%
Other tolerances on request.

Test Pressure
The maximum allowed is 24 bar g.

Non Standard variations
For applications where the EA15-MM is not suitable Engineering Appliances can offer alternative products.
AXIAL EXPANSION JOINT - EA15-16

Specification
Engineering Appliances Type EA15-16 axial movement bellows expansion joint with fixed carbon steel BSP male taper connectors both ends, multi-ply stainless steel convoluted bellows, aluminium outer sleeve with integral length limit device, heavy duty carbon steel inner sleeve.

Materials
Bellows: Stainless steel 321 (1.4541)
Connectors: Carbon steel
Outer sleeve: Aluminium
Inner sleeve: Carbon steel

Recommended Applications
For small bore carbon steel pipework, ideal where guiding is difficult and the bellows is in an exposed position.

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<th>axial movement for 5000 cycles</th>
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</table>

Installation
Recommendations contained in our literature on correct installation of expansion joints in pipework should be followed. This expansion joint will extend under pressure unless restrained which should be by the proper positioning of anchors and guides. This unit is internally guided so some liberty may be taken with the normal guiding rules. The first guide can be positioned at the intermediate guide spacing or within 2-3m whichever is the smaller. This unit is supplied fixed by a removable clip at its maximum length, the maximum length should not be exceeded during working conditions. Particular care should be taken to avoid excessive torsion forces being applied to this expansion joint either during tightening of the connectors or during the installation of adjacent pipework, the limit clip should be removed after installation of the unit.

Applications
The EA15-16 range are small bore threaded pipework expansion joints designed to absorb movement in an axial direction, in most applications the pipework movement is due to thermal expansion and contraction.

Performance
Movements and pressure ratings apply for temperatures up to 120°C, at higher temperatures the pressure ratings and movement capabilities are reduced.

Tolerances
Spring rates: +/- 30%
Threads: BS21, ISO 7/1
Other tolerances on request.

Test Pressure
The maximum allowed is 24 bar g for 15 to 32 nb, and 15 bar g for the 40 nb and 50 nb sizes.

Non Standard variations
For applications where the EA15 is not suitable Engineering Appliances can offer alternative products.
AXIAL EXPANSION JOINT - EA16-16

Specification
Engineering Appliances type EA16-16 axial movement bellows expansion joint with fixed carbon steel flanges drilled to BS4504 PN16 both ends, multi-ply stainless steel convoluted bellows, aluminium outer sleeve with integral length limit device, heavy duty carbon steel inner sleeve.

Materials
Bellows: Stainless steel 321 (1.4541)
Connectors: Carbon steel
Outer sleeve: Aluminium
Inner sleeve: Carbon steel

Recommended Applications
For small bore carbon steel pipework, ideal where guiding is difficult and the bellows is in an exposed position.

<table>
<thead>
<tr>
<th>nominal diameter</th>
<th>supplied length</th>
<th>axial movement for 1000 cycles</th>
<th>axial movement for 5000 cycles</th>
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Installation
Recommendations contained in our literature on correct installation of expansion joints in pipework should be followed. This expansion joint will extend under pressure unless restrained which should be by the proper positioning of anchors and guides. This unit is internally guided so some liberty may be taken with the normal guiding rules. The first guide can be positioned at the intermediate guide spacing or within 2-3m whichever is the smaller. This unit is supplied fixed by a removable clip at its maximum length, the maximum length should not be exceeded during working conditions, the limit clip should be removed after installation of the unit.

Applications
The EA16-16 range are small bore pipework expansion joints designed to absorb movement in an axial direction, in most applications the pipework movement is due to thermal expansion and contraction.

Performance
Movements and pressure ratings apply for temperatures up to 120°C, at higher temperatures the pressure ratings and movement capabilities are reduced, details of derating factors are available on request.

Tolerances
Spring rates: +/- 30%
Flange drilling: BS4504 PN16
Other tolerances on request.

Test Pressure
The maximum allowed is 24 bar g for 15 to 32 nb, and 15 bar g for the 40 nb and 50 nb sizes.

Non Standard variations
For applications where the EA16 is not suitable Engineering Appliances can offer alternative products.
AXIAL EXPANSION JOINT - EA05-16

Specification
Engineering Appliances type EA05-16 axial movement bellows expansion joint with weld ends to BS1387, BS3600, thick wall multi-ply convoluted stainless steel bellows. Designed to EJMA*.

Materials
Bellows: Stainless steel 316Ti (1.4571)
Weld ends: Carbon steel, A106Gr.B/BS1387
Also available with grooved ends to suit Victaulic, zero flex.

Recommended Applications
Thick wall multiply expansion joints should be selected where high integrity, safety, and an extended life are of paramount importance.
Suitable for L.T.H.W., M.T.H.W., H.P.H.W.

* EJMA - Expansion Joint Manufacturers Association.

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Installation
Recommendations contained in our literature on correct installation of expansion joints in pipework should be followed. This expansion joint will extend under pressure unless restrained which should be by the proper positioning of anchors and guides. The EA05-16 is supplied at its free length and will usually require cold drawing during installation to allow the expected pipework movement to occur without over compressing the unit.

Applications
The EA05-16 range are weld-end pipework expansion joints designed to absorb axial movements in steel pipework, in most applications the pipework movement is due to thermal expansion and contraction. Ends are available grooved to suit Victaulic zero flex.

Performance
Movements and pressure ratings apply for temperatures up to 120°C, at higher temperatures the pressure ratings and movement capabilities are reduced.

Tolerances
Spring rates: +/-30%
Tube ends: A106Gr.B STD Sch/BS1387
Other tolerances on request.

Test Pressure
The maximum allowed is 24 bar g.

Non Standard variations
For applications where the EA05-16 is not suitable Engineering Appliances can offer variations with higher pressure ratings up to 40 bar g, greater movements, different materials, larger sizes up to 1000 nb or, if required, purpose designed special expansion joints.
AXIAL EXPANSION JOINT - EA06-16

Installation
Recommendations contained in our literature on correct installation of expansion joints in pipework should be followed. This expansion joint will extend under pressure unless restrained which should be by the proper positioning of anchors and guides. The EA06-16 is supplied at its free length and will usually require cold drawing or stretching during installation to allow the expected pipework movement to occur without over compressing the unit.

Applications
The EA06-16 range are flanged pipework expansion joints designed to absorb axial movements in steel pipework, in most applications the pipework movement is due to thermal expansion and contraction.

For steam applications the EA06-16 can be fitted with inner sleeves.

Performance
Movements and pressure ratings apply for temperatures up to 120°C, at higher temperatures the pressure ratings and movement capabilities are reduced, details of derating factors are available on page 26.

Tolerances
Spring rates: +/-30%
Flange drilling: BS4504-PN16
Other tolerances on request.

Test Pressure
The maximum allowed is 24 bar g.

Non Standard variations
For applications where the EA06-16 is not suitable Engineering Appliances can offer variations with higher pressure ratings up to 40 bar g, greater movements, different materials, larger sizes up to 1000 nb or, if required, purpose designed special expansion joints.

Specification
Engineering Appliances Type EA06-16 axial movement bellows expansion joint with fixed carbon steel raised face flanges drilled to BS4504 PN16, thick wall multi-ply stainless steel convoluted bellows. Designed to EJMA*. 

Materials
Bellows: Stainless steel 316Ti (1.4571)
Flanges Carbon steel, zinc plated

Recommended Applications
Thick wall multi-ply expansion joints should be selected where high integrity, safety, and an extended life are of paramount importance.

Suitable for L.T.H.W., M.T.H.W., H.P.H.W.

For small axial movement.

* EJMA - Expansion Joint Manufacturers Association.

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AXIAL EXPANSION JOINT - EA08-16

Specification
Engineering Appliances Type EA08-16 axial movement bellows expansion joint with fixed carbon steel raised face flanges drilled to BS4504 PN16, thick wall multiply stainless steel convoluted bellows, complete with stainless steel telescopic inner sleeves. Designed to EJMA*.

Materials
- Bellows: Stainless steel 316Ti (1.4571)
- Flanges: Carbon steel, zinc plated
- Inner Sleeves: Stainless steel 321/S31

Recommended Applications
Thick wall multiply expansion joints should be selected where high integrity, safety, and an extended life are of paramount importance. Suitable for L.T.H.W., M.T.H.W., H.P.H.W. and steam.

For large axial movement.

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</table>

Installation
Recommendations contained in our literature on correct installation of expansion joints in pipework should be followed. This expansion joint will extend under pressure unless restrained which should be by the proper positioning of anchors and guides. The EA08-16 is supplied at its free length and will usually require cold drawing or stretching during installation to allow the expected pipework movement to occur without over compressing the unit.

Applications
The EA08-16 range are flanged pipework expansion joints designed to absorb particularly large axial movements in steel pipework, in most applications the pipework movement is due to thermal expansion and contraction.

* EJMA - Expansion Joint Manufacturers Association.

Performance
Movements and pressure ratings apply for temperatures up to 120°C, at higher temperatures the pressure ratings and movement capabilities are reduced.

Tolerances
- Spring rates: +/-30%
- Flange drilling: BS4504-PN16
- Other tolerances on request.

Test Pressure
The maximum allowed is 24 bar g.

Non Standard variations
For applications where the EA08-16 is not suitable Engineering Appliances can offer variations with higher pressure ratings up to 40 bar g, greater movements, different materials, larger sizes up to 1000 nb or, if required, purpose designed expansion joints.
NON FERROUS

Engineering Appliances Type EA07-16 axial movement bellows expansion joint with swivel carbon steel flat face flanges drilled to BS4504 PN16, thick wall multiply stainless steel convoluted bellows. Designed to EJMA*

**Materials**
- Bellows: Stainless steel 316Ti (1.4571)
- Flanges: Carbon steel, galvanised
- Van Stone: Stainless steel

**Recommended Applications**
Thick wall multiply expansion joints should be selected where high integrity, safety, and an extended life are of paramount importance. Suitable for Non-ferrous service such as cold water systems, hot water systems or condensate.

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**Installation**
Recommendations contained in our literature on correct installation of expansion joints in pipework should be followed. This expansion joint will extend under pressure unless restrained which should be by the proper positioning of anchors and guides. The EA08-16 is supplied at its free length and will usually require cold drawing or stretching during installation to allow the expected pipework movement to occur without over compressing the unit.

**Applications**
The EA07-16 range are flanged pipework expansion joints designed to absorb axial movements in non ferrous pipework, in most applications the pipework movement is due to thermal expansion and contraction.

*EJMA - Expansion Joint Manufacturers Association.*

**Performance**
Movements and pressure ratings apply for temperatures up to 120°C, at higher temperatures the pressure ratings and movement capabilities are reduced.

**Tolerances**
- Spring rates: +/- 30%
- Flange drilling: BS4504-PN16
- Other tolerances on request.

**Test Pressure**
The maximum allowed is 24 bar g.

**Non Standard Variations**
For applications where the EA07-16 is not suitable Engineering Appliances can offer variations with higher pressure ratings up to 40 bar g, greater movements, different materials, larger sizes up to 1000 nb or, if required, purpose designed expansion joints.
Restrained Expansion Joints

Restrained Expansion Joints are designed not to extend when an internal pressure is applied. The pressure thrust reaction force is restrained by means of hinges or tie bars, Fig. 1.

Fig. 1

Lateral expansion joints included in this manual incorporate two bellows which are restrained using tie bars. They can move in two planes which makes them extremely versatile, Fig. 3. They are sometimes called articulated expansion joints.

Fig. 3

Restrained Expansion Joints are versatile and can be used in many different configurations and combinations. The loads imposed on anchors is generally much lower than for unrestrained types.

Movement in angular expansion joints and lateral expansion joints is achieved by controlled angulation of two bellows in opposite directions. They can only absorb movement at 90° to their axis.

Angular expansion joints have to be used in pairs (2 pin system) or in threes (3 pin system), Fig. 2.

Fig. 2

The anchor load imposed by all restrained units is the sum of their spring rate plus restraint friction losses. However, generally the frictional loads caused by the pipe supports are by far the largest component of anchor load.

No special guiding is required and they are therefore suitable for mounting at high level or wherever guiding and anchoring may prove difficult or expensive.

Restrained expansion joints are more complex than axial units and are therefore more expensive. However, to offset the higher cost, savings can result from a reduced need for guiding anchoring and number of expansion Joints.
LATERAL EXPANSION JOINT - EA0-16

**Specification**
Engineering Appliances Type EA20-16 universal lateral movement bellows expansion joint with fixed carbon steel raised face flanges drilled to BS4504 PN16, thick wall multi-ply stainless steel convoluted bellows, carbon steel centre pipe and tie bars, complete with stainless steel telescopic inner sleeves. Designed to EJMA*.

**Materials**
- Bellows: Stainless steel type 316Ti (1.4571)
- Flanges: Carbon steel, zinc plated
- Inner sleeves: Stainless steel BS1449 321/S31
- Tie bars: ISO 898 Gr 8.8 Zinc plated
- Swivel nuts: ST52.3/En50D
- Intermediate pipe: 40-80 A312 TP 316L
  - 100 & above ASTM A106 Gr.B

**Recommended Applications**
Thick wall multi-ply expansion joints should be selected where high integrity, safety, and an extended life are of paramount importance. Suitable for L.T.H.W., M.T.H.W., H.P.H.W. and steam.

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**Installation**
Recommendations contained in our literature on correct installation of expansion joints in pipework must be followed. This expansion joint will not extend under pressure, but anchors and guides should be properly positioned to ensure correct functioning of the unit.

**Applications**
The EA20-16 range are flanged pipework expansion joints designed to absorb lateral movement in two planes, in steel pipework. In most applications pipework movements are due to thermal expansion and contraction and/or building settlement.

* EJMA- Expansion Joint Manufacturers Association.
** Not Fitted with Inner sleeves.

**Performance**
Movements and pressure ratings apply for temperatures up to 120°C, at higher temperatures the pressure ratings and movement capabilities are reduced.

**Tolerances**
- Spring rates: +/-30%
- Flange drilling: BS4504-PN16
- Other tolerances on request.

**Test Pressure**
The maximum allowed is 24.0 bar g.

**Non Standard variations**
For applications where the EA20-16 is not suitable, Engineering Appliances can offer variations with higher pressure ratings up to 40 bar g, greater movements, different materials, larger sizes up to 1000 nb or if required, purpose designed special expansion joints.
Specification
Engineering Appliances Type EA23-16 universal lateral movement bellows expansion joint with carbon steel fixed flanges drilled to BS4504 PN16, thick wall multi-ply stainless steel convoluted bellows, stainless steel centre pipe and carbon steel tie bars. Designed to EJMA*.

Materials
Bellows: Stainless steel 316Ti (1.4571)
Flanges: Carbon steel, zinc plated
Tie bars: ISO 898 Gr 8.8 Zinc plated
Swivel nuts: ST52.3/En50D

Recommended Applications
Thick wall multiply expansion joints should be selected where high integrity, safety, and an extended life are of paramount importance.
Suitable for L.T.H.W, M.T.H.W, H.P.H.W.

Installation
Recommendations contained in our literature on correct installation of expansion joints in pipework should be followed. This expansion joint will not extend under pressure but anchors and guides should be properly positioned to ensure correct functioning of the unit.

Applications
The EA23-16 range are flanged pipework expansion joints designed to absorb lateral movement in two planes, in steel pipework. In most applications pipework movements are due to thermal expansion and contraction and/or building settlement.

* EJMA- Expansion Joint Manufacturers Association.

Performance
Movements and pressure ratings apply for temperatures up to 120°C, at higher temperatures the pressure ratings and movement capabilities are reduced.

Tolerances
Spring rates: +/-30%
Flange drilling: BS4504-PN16
Other tolerances on request.

Test Pressure
The maximum allowed is 24.0 bar g.

Non Standard variations
For applications where the EA23-16 is not suitable Engineering Appliances can offer variations with higher pressure ratings up to 40 bar g, greater movements, different materials, larger sizes up to 1000 nb or, if required, purpose designed special expansion joints.

<table>
<thead>
<tr>
<th>nominal diameter</th>
<th>supplied length</th>
<th>movement/1000 cycles lateral</th>
<th>spring rate</th>
<th>bellows wall thickness</th>
<th>frictional resistance</th>
<th>No. of tie bars</th>
<th>pressure rating</th>
<th>product code</th>
</tr>
</thead>
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<tr>
<td>mm</td>
<td>mm</td>
<td>+/-mm</td>
<td>N/mm</td>
<td>mm</td>
<td>N/bar</td>
<td>bar g</td>
<td></td>
<td></td>
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<tr>
<td>40</td>
<td>368</td>
<td>50</td>
<td>7</td>
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</table>
LATERAL EXPANSION JOINT - EA24-16

Recommendations contained in our literature on correct installation of expansion joints in pipework should be followed. This expansion joint will not extend under pressure but anchors and guides should be properly positioned to ensure correct functioning of the unit.

Applications
The EA24-16 range are flanged pipework expansion joints designed to absorb lateral movement in two planes, in non-ferrous pipework. In most applications pipework movements are due to thermal expansion and contraction and/or building settlement.

* EJMA - Expansion Joint Manufacturers Association.

### Specification
Engineering Appliances type EA24-16 universal lateral movement bellows expansion joint with carbon steel flat face swivel flanges drilled to BS4504 PN16, thick wall multi-ply stainless steel convoluted bellows, stainless steel centre pipe and carbon steel tie bars. Unit constructed to have all stainless steel internal surfaces. Designed to EJMA*.

### Materials
- Bellows: Stainless steel 316Ti (1.4571)
- Flanges: Carbon steel, zinc plated
- Tie bars: ISO 898 GR 8.8 Zinc plated
- Swivel nuts: ST52.3/En50D
- Van stone: Stainless Steel

### Recommended Applications
Thick wall multi-ply expansion joints should be selected where high integrity, safety, and an extended life are of paramount importance. Suitable for HWS or condensate. Suitable for non-ferrous service.

<table>
<thead>
<tr>
<th>Nominal Diameter (mm)</th>
<th>Supplied Length (mm)</th>
<th>Movement/1000 Cycles Lateral (mm)</th>
<th>Spring Rate (N/mm)</th>
<th>Bellows Wall Thickness (mm)</th>
<th>Frictional Resistance (N/bar)</th>
<th>No. of Tie Bars</th>
<th>Pressure Rating (bar g)</th>
<th>Product Code</th>
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<td>358</td>
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</table>

### Performance
Movements and pressure ratings apply for temperatures up to 120°C, at higher temperatures the pressure ratings and movement capabilities are reduced.

### Tolerances
- Spring rates: +/-30%
- Flange drilling: BS4504 PN16
- Other tolerances on request.

### Test Pressure
The maximum allowed is 24.0 bar g.

### Non Standard variations
For applications where the EA24-16 is not suitable Engineering Appliances can offer variations with higher pressure ratings up to 40 bar g, greater movements, different materials, larger sizes up to 1000 nb or, if required, purpose designed special expansion joints.
ANGLULAR EXPANSION JOINT - EA31-16

Specification
Engineering Appliances type EA31-16 angular movement bellows expansion joint with fixed carbon steel raised face flanges drilled to BS4504 PN16, thick wall multi-ply stainless steel convoluted bellows, carbon steel hinges, complete with stainless steel telescopic inner sleeves. Designed EJMA*

Materials
- Bellows: Stainless steel type AISI 316Ti
- Flanges: Carbon steel, zinc plated/grey primer
- Inner sleeves: Stainless steel BS1449 321/S31
- Hinges: Carbon steel, zinc plated

Recommended Applications
Thick wall multiply expansion joints should be selected where high integrity, safety, and an extended life are of paramount importance. Suitable for L.T.H.W., M.T.H.W., H.P. H.W. and steam.

<table>
<thead>
<tr>
<th>nominal diameter</th>
<th>supplied length</th>
<th>movement/1000 cycles</th>
<th>spring rate</th>
<th>bellows wall thickness</th>
<th>frictional resistance</th>
<th>pressure rating</th>
<th>product code</th>
</tr>
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<tbody>
<tr>
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<td>mm</td>
<td>+/- deg.</td>
<td>Nm/deg</td>
<td>mm</td>
<td>Nm/bar</td>
<td>bar g</td>
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<tr>
<td>040**</td>
<td>137</td>
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<td>1.25</td>
<td>0.53</td>
<td>16</td>
<td>EA31-040-16</td>
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<tr>
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<td>1.25</td>
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<tr>
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<td>1.5</td>
<td>1.57</td>
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<td>EA31-080-16</td>
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</table>

Installation
Recommendations contained in our literature on correct installation of expansion joints in pipework should be followed. This expansion joint will not extend under pressure but anchors and guides should be properly positioned to ensure correct functioning of the unit. Angular movement expansion joints are nearly always installed in twos or threes. (Two or three pin system).

Applications
The EA31-16 range are flanged angular movement pipework expansion joints designed to be installed in steel pipework in twos or threes thus absorbing movements in a lateral direction in steel pipework, in most applications the pipework movement is due to thermal expansion and contraction and/or building movement.

Performance
Movements and pressure ratings apply for temperatures up to 120°C, at higher temperatures the pressure ratings and movement capabilities are reduced.

Tolerances
- Spring rates: +/-30%
- Flange drilling: BS4504-PN16
- Other tolerances on request.

Test Pressure
The maximum allowed is 24 bar g.

Non Standard variations
For applications where the EA31-16 is not suitable Engineering Appliances can offer variations with higher pressure ratings up to 40 bar g, greater movements, different materials, larger sizes up to 1000mm nb or, if required, purpose designed special expansion joints.

* EJMA - Expansion Joint Manufacturers Association.
** Not fitted with inner sleeves
† Hinges welded to flanges. Hinges & flanges grey primer finish.
**ANGULAR EXPANSION JOINT - EA32-6**

**NON FERROUS**

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Engineering Appliances Type EA32-6 angular movement bellows expansion joint with carbon steel flange's drilled to BS4504 PN16, thick wall multiply stainless steel convoluted bellows, carbon steel hinges, constructed to have all stainless steel internal surfaces.

**Materials**
- Bellows: Stainless steel type 316Ti (1.4571)
- Flanges: Carbon steel, zinc plated
- Van stone: Stainless steel
- Hinges: Carbon steel, zinc plated

**Recommended Applications**
Thick wall multiply expansion joints should be selected where high integrity, safety, and an extended life are of paramount importance. Suitable for non-ferrous service, HWS, condensate systems.

<table>
<thead>
<tr>
<th>nominal diameter</th>
<th>supplied length</th>
<th>movement/1000 cycles</th>
<th>spring rate</th>
<th>bellows wall thickness</th>
<th>frictional resistance</th>
<th>pressure rating</th>
<th>product code</th>
</tr>
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<tbody>
<tr>
<td>mm</td>
<td>mm</td>
<td>+/- deg.</td>
<td>Nm/deg</td>
<td>mm</td>
<td>Nm/bar</td>
<td>bar g</td>
<td></td>
</tr>
<tr>
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<td>1.2</td>
<td>0.9</td>
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</table>

**Performance**
Movements and pressure ratings apply for temperatures up to 120°C, at higher temperatures the pressure ratings and movement capabilities are reduced.

**Tolerances**
- Spring rates: +/-30%
- Flange drilling: BS4504-PN16
- Other tolerances on request.

**Test Pressure**
The maximum allowed is 1.5 x pressure rating.

**Non Standard variations**
For applications where the EA32-6 is not suitable Engineering Appliances can offer alternative standard products or purpose designed special expansion joints.

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Installation
Recommendations contained in our literature on correct installation of expansion joints in pipework should be followed. This expansion joint will not extend under pressure but anchors and guides should be properly positioned to ensure correct functioning of the unit. Angular movement expansion joints are nearly always installed in twos or threes. (Two or three pin system).

Applications
The EA32-6 range are flanged angular movement pipework expansion joints designed to be installed in twos or threes thus absorbing movements in a lateral direction in copper, or non-ferrous pipework, in most applications the pipework movement is due to thermal expansion and contraction and/or building movement.
**GIMBAL EXPANSION JOINT - EA38-16**

**Specification**
Engineering Appliances type EA38-16 gimbal bellows expansion joint with fixed carbon steel flat face flanges drilled to BS4504-PN16, thick wall multi-ply convoluted bellows with inner and outer plies in corrosion resistant stainless steel, gimbal ring and hinges in carbon steel, complete with inner sleeves. This expansion joint angulates in two planes. Designed to EJMA*.

**Materials**
- Bellows: Stainless steel 316Ti (1.4571)
- Flanges: Carbon steel
- Inner sleeves: Stainless steel
- Hinges: Carbon steel - Grey Primer
- Gimbal: Carbon steel - Grey Primer

**Recommended Applications**
Thick wall multi-ply expansion joints should be selected where high integrity, safety, and an extended life are of paramount importance. Suitable for L.T.H.W, M.T.H.W, H.P.H.W and steam.

**Performance**
Movements and pressure ratings apply for temperatures up to 120°C, at higher temperatures the pressure ratings and movement capabilities are reduced.

**Tolerances**
- Spring rates: +/-30%
- Flange drilling: BS4504-PN16
- Other tolerances on request.

**Test Pressure**
The maximum allowed is 24 bar g.

**Non Standard variations**
For applications where the EA38-16 is not suitable Engineering Appliances can offer variations with higher pressure ratings up to 40 bar g, greater movements, different materials, larger sizes up to 1000mm nb or, if required, purpose designed special expansion joints.

---

**Table:**

<table>
<thead>
<tr>
<th>Nominal Diameter</th>
<th>Supplied Length</th>
<th>Angular Movement for 1000 Cycles</th>
<th>Spring Rate</th>
<th>Friction Resistance</th>
<th>Wall Thickness</th>
<th>Pressure Rating</th>
<th>Product Code</th>
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<td>2.4 Nm/deg</td>
<td>0.75 Nm/bar</td>
<td>1.5 mm</td>
<td>16 bar g</td>
<td>EA38-050-16</td>
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<tr>
<td>65**</td>
<td>137</td>
<td>15°</td>
<td>4.2 Nm/deg</td>
<td>1.25 Nm/bar</td>
<td>1.5 mm</td>
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<td>3.41 Nm/bar</td>
<td>2.4 mm</td>
<td>16 bar g</td>
<td>EA38-150-16</td>
</tr>
<tr>
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<td>11.77 Nm/bar</td>
<td>3.6 mm</td>
<td>16 bar g</td>
<td>EA38-300-16</td>
</tr>
</tbody>
</table>

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* EJMA - Expansion Joint Manufacturers Association.
** Not fitted with inner sleeves
If a higher cycle life is required than the 1000 cycles shown in the data sheets use the graph to determine the maximum movement.

Example: An expansion joint for 1000 (5000) full load cycles is selected. At 100% of its movement capacity, the expansion joint can effect 1000 (5000) full load cycles. If the actual movement reaches only 50% of the chart value, service life will increase to 18000 (180000) full load cycles. However, if a service life of 650 (3000) full load cycles is satisfactory, the allowable movement will increase to about 110% of the nominal movement.
Reduction Factors for Movement & Pressure

For temperatures above 120° C, the nominal pressure should be determined from the above graph according to the operating pressure and temperature.

Example: Nominal pressure of 16.0 bar g, operating temperature 300° C. Solution: Considering the reduction factor for pressure, the allowable pressure = 74.2% = 11.9 bar g.

For temperatures above 120° C, the maximum movement of the expansion joint should be reduced according to the temperature. The above table enables to work out the reduced movements.

Example: Axial expansion joint; permitted movement +/- 30mm; temperature 300° C. Solution: taking the reduction of movement as from 120° C into account, the operating movement becomes 89.3% of permitted movement = +/- 26.8mm.
Expansion Joints - Handling and Installation

Handling

• Handle and store so that flange faces are not damaged
• Protect convolutions from accidental mechanical damage, i.e. falling debris
• In storage, prevent foreign matter from becoming lodged in the inside or outside of convolutions or sleeves.
• Do not roll Bellows Expansion Joints on convolutions.

Installation

• Ensure that you have the correct joint for the application and that it will accept the calculated movement - having due regard to differences between installation and lowest shut-down temperatures.
• Always check if Expansion Joint is preset or requires cold pull. The majority require cold pull by approximately 50% of their rated movement to ensure full utilisation of their movement capacity.
• Ensure that the joint will not be subjected to any torsional movement that it is not designed to accept. Torsion causes drastic reduction in cyclic life.
• Ensure that the joint is not installed within four pipe diameters from any damper, gate valve, butterfly valve etc. If this is impossible heavy sleeves should be fitted.
• Ensure that the joint is not used to correct pipe misalignment and/or fitting errors outside of design parameters.
• When indicated install joint with flow arrow pointing in the direction of the main pipeline flow.
• Ensure that the maximum joint design and test pressure is not exceeded in line pressure testing and that main anchors are designed to withstand this pressure. If sections are tested intermediate anchors may have to withstand main anchor loads.
• Not more than one axial expansion joint should be installed between any two main anchors without the addition of and intermediate anchors.
• The position of the guides nearest to the expansion joints is most critical. The first guide must be located within a distance of four pipe-diameters from the expansion joint and the second within fourteen pipe-diameters from the first guide.
• Ensure that the guide clearance is not greater than 1.6mm
• Hinge units should be positioned to ensure pivot pins are in a correct plane.

• Bellow units should be stored under cover, not piled on top of the other, and placed on chocks clear of the floor.
• Protect Stainless Steel from cement, plaster and/or concrete mixtures.
• Do not use slings near convolutions
• Do not sling from sizing bars or tie bars.

• Protect convolutions from weld splatter, cement, plaster or concrete mixtures. Ensure that any insulation used is not chloride based. Ensure chloride based fluxes do not come into contact with Stainless Steel convolutions. All cause rapid pitting corrosion.
• Protect convolutions from mechanical damage e.g. spanner slip on tightening nuts and bolts.
• Some of our Expansion Joints have a weep hole. If water drips from weep holes contact EA immediately. Do not be alarmed, replacement at next routine shutdown will probably suffice.
• Internal sleeves are recommended where internal flows exceed the following:

Air, Steam and other Gases
Up to 150mm diameter - 0.05 m/sec per mm of dia.
Over 150mm diameter - 8 m/sec.

Slurries, Water and other Liquids
Up to 150mm diameter - 0.02 m/sec per mm of dia.
Over 150mm diameter - 3 m/sec

• Remove installation bars, if fitted, prior to commissioning.

More detailed information can be found in the following standards.

EJMA - Expansion Joint Manufacturers Association
BS6129 - The selection and application of bellows expansion joints in pressure systems.
BS3974 - Pipe supports

*Comprehensive instructions will be supplied with goods.
Introduction to ‘Easyslide’ Guides

Engineering Appliances Ultra Low Friction Slide Guides

Introduction

The new Easyslide range of pipe guides from Engineering Appliances have been specifically developed to minimise guide friction and to accurately control the thermal expansion of pipes.

Engineering Appliances has over 50 years of experience in compensating for thermal expansion in pipe work. All this experience has gone into the design of the Easyslide guide to make it the most advanced in the market.

Easyslide guides are precision engineered and incorporate a unique ultra low friction bearing surface to minimise anchor loads.

It is important that pipe work expansion is accurately controlled allowing easy axial movement while guiding the pipe with minimal lateral tolerances. The Easyslide design limits lateral movement to less than 1mm while allowing up to 80mm of expansion as standard.

The Easyslide range has been developed specifically to work in conjunction with the Engineering Appliances expansion joints. By only using highly flexible multiply bellows with low reactive loads and ultra low friction guides, anchor forces and loads on the building structure can be substantially reduced resulting in tangible cost savings.

Accurate guiding and reduced loads also means that flanges and other joints are more lightly stressed and thus reducing the likelihood of leaks.

Low Friction Technology

Conventional low friction guides utilise PTFE buttons on a stainless steel surface to reduce friction. PTFE has unusual properties as its friction coefficient μ reduces by a factor of 10 with increasing load. This means the smaller the area of the button for a given load the lower the friction. However PTFE is a relatively soft material which is prone to creeping under load. Even when it is glass reinforced it will still permanently deform under load over time. To prevent this large diameter buttons or pads are conventionally used.

The Engineering Appliances Easyslide guides use stainless steel buttons on a special metal layered surface which has been impregnated with a PTFE compound. This material can withstand very high loads without creep and has excellent wear properties and a low friction coefficient. The contact area of the stainless steel buttons has been optimised to increase the load on the bearing surface. This results in a much lower friction coefficient up to 10 times less than that of conventional PTFE guides.

This system is used on the main load bearing side of the guide usually the bottom. The side plates whose only function it is to accurately guide the pipe are subjected to much lower loads and therefore use conventional PTFE pads on a stainless surface. The side plates are angled so that they can also prevent the pipe from lifting. This is essential for steam pipes which can ‘banana’ on initial heat up.

Application

Two types of guides are available depending on application. The ‘light’ guide is designed for pipes which expand through natural flexibility or which use restrained expansion joints to compensate for thermal movement. The ‘heavy’ guides have been specifically designed for use as the first 2 critical guides with unrestrained or axial expansion joints. These guides have to take a lateral load of up to 15% of the axial pressure thrust.

The guides have a durable galvanised finish as standard and are therefore suitable for inside and outside use. The base plate can be supplied in a variety of designs depending on the supporting steel work used on site.

They can be welded or bolted into position. They come complete with two pipe clamps which can be angled to allow minimum space between pipes. The guides can be clamped either directly to the pipe or used with insulating blocks which act as a temperature break.
'Easyslide' Guides Dimensions

**Dimensions**

![Diagram of 'Easyslide' Guides](image)

### 'Easyslide' GUIDES 65mm - 400mm NB for use with restrained expansion joints (light)

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### 'Easyslide' GUIDES 125mm - 400mm NB for use with all expansion joints (heavy)

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Notes: These are the basic dimensions for our range of PTFE slide guides for use with all types of expansion joints. Base plate mounting holes drilled per client specifications. Pipe clips and insulation supplied as per client specifications.
Standard Specification

- All LTHW, MTHW, HPHW or STEAM pipes with a diameter over 50mmNB or larger shall be supported using Ultra Low Friction sliding guides.

- The main bearing surface of the guide shall be made from a low multi layer material with an impregnated PTFE compound. The material must be creep free over the duration of its life span.

- The other half of the bearing shall consist of stainless steel buttons with a cross sectional area that ensures a load between …N/mm² and ….N/mm².

- The friction coefficient of the guide shall be between 0.01 and 0.1 to reduce anchor forces and minimise loadings on the building fabric.

- The guides shall allow a maximum of 1mm of lateral movement through out their life span.

- The guide should be suitable for a minimum movement of 80mm and it must be possible to allow for cold draw.

- The guide’s design shall prevent the pipe from lifting off its supports during heat up.

- The guides should have two pipe clamps to allow accurate alignment with the pipe.

- The first 2 guides either side of an axial expansion joint shall be a heavy duty and withstand at least 15% of the bellows pressure thrust as a lateral load.

- The guides should be galvanised and suitable for internal and external use.

- Were required insulating blocks shall be used between the clamps and the pipe. The material should be suitable for the maximum and minimum service temperatures.

- The guides shall be completely maintenance free requiring no lubrication or adjustment.

- The guides shall form an integral part of the control mechanism for thermal expansion and must be fully compatible with the expansion joints used.

- The Guides and the Expansion Joints shall be supplied by the same manufacturer who shall also provide maximum guide spacing and anchor load calculations.
APPLICATION
Rubber bellows are primarily used to absorb noise and vibration between rotating equipment such as pumps or chillers and pipework. Their high flexibility also make them suitable for compensating small installation misalignments. Rubber bellows can be used just like a metal expansion joint to compensate for axial, lateral or angular movement. As any other unrestrained expansion joint, rubber bellows will extend under pressure. Their pressure thrust however varies with length as the shape of the bellows changes. However the forces involved are just as large. The pressure thrust is calculated by multiplying the effective cross sectional area, times the maximum pressure. To prevent the bellows from extending, the pipework needs to be anchored. Typical applications for unrestrained bellows are taking up thermal expansion in plastic pipework or noise isolation in small diameter pipework at low pressures. In general, tied rubber bellows are recommended for larger diameter and pressures over 1.5 bar. They are also recommended for use with equipment that is mounted on inertia bases or springs.

EA Stenflex bellows are thin walled and therefore extremely flexible, ensuring the highest degree of noise and vibration isolation.

SELECTION
Not all rubber bellows are the same. To ensure a long and trouble free working life, it is vital to select the right bellows for the application. Temperature and pressure are the most important, but not the only criteria that need to be considered.

PRESSURE
Most bellows in these data sheets are rated at a maximum pressure of 16 bar g. However this needs to be de-rated at temperatures above 50 deg C as the factor of safety is reduced.

TEMPERATURE
The maximum temperature ratings vary for the different types of bellows. Nylon reinforced bellows should never be used at temperatures above 90 deg C. Steel wire mesh reinforced bellows such as the EA53 or the EA58 may be used up to 100 deg C. For service above 100 deg C, only a stainless steel bellows (EA46/49) will give an acceptable service life.

MEDIUM
EPDM rubber is the most suitable for heating and chilled water. For HWS or cold water services, a good quality Butyl is recommended such as the EA67-B or the EA68-B. For duty with oil or oil contaminated water EPDM is unsuitable and a bellows with a Perbunan inner liner should be selected such as the EA67-P or the EA68-P.

LIFE
All rubber bellows have a limited life. Rubber is an organic compound which will age with time. The life is determined by external influences such as ultraviolet light, ozone etc., but the main influence is temperature. The higher the working temperature, the shorter the life expectancy. When making a selection it is not just important to state the maximum working conditions, but also the required life. The life expectancy of nylon reinforced bellows deteriorates rapidly at temperatures above 70 deg C. Where temperatures are continuous throughout the year, steel wire reinforced bellows such as the EA53 and the EA58 should be considered.

LOCATION
The location and the criticality of the installation should also be considered. At the end of the service life a nylon reinforced bellows will fail catastrophically. This can have grave consequences in rooftop installations or in vital systems such as hospitals. In these cases a steel wire mesh reinforced bellows is preferable as it is much less likely to fail (EA53/58).

QUALITY
EA Stenflex bellows are of the highest quality standard. They are manufactured in Germany under strict quality control. All bellows have their date of manufacture moulded into the body. The steel wire mesh reinforced bellows Stenflex type AS, EA53 and EA58 (up to 200mm NB) have been type approved by the German TUV to DIN4809 (The use of rubber bellows in heating systems). This standard requires that bellows after a service life of 10 years at 100 deg C must have a burst pressure of not less than 30 bar. The type AS is marked accordingly and each bellows has a unique number for full traceability. A Certificate is available on request.

INSTALLATION AND MAINTENANCE
Comprehensive installation instructions accompany each delivery of bellows. These must be followed to ensure maximum service life. They also include instructions for care and maintenance.

SUPPORT
If there are any doubts regarding the selection and installation of Rubber Bellows please contact your local Area Manager who will be pleased to give advice.
STENFLEX TYPE ‘R’

**Specification**
Engineering Appliances rubber bellows type EA65 with EPDM rubber liner and high tensile synthetic fibre reinforcement and steel wire reinforced raised faces fitted with flanges drilled to BS4504 PN16 in carbon steel with integral bellows stabilizing collar.

**Materials**
- Liner: EPDM Rubber
- Reinforcement: Synthetic Fibre
- Cover: EPDM Rubber
- Flanges: Carbon Steel type ST37.2, Zinc Plated

**Identification**
- Colour Code: EPDM -Orange Band, Butyl - White Band, Perbunan - Red Band
- Markings: Stenflex ‘R’, Size, Date of Manufacture, Pressure rating.

**EA65-E,B,P**
EPDM / Butyl / Perbunan, Untied, Nylon Reinforced

**Specification**
Engineering Appliances rubber bellows type EA66 with EPDM rubber liner and high tensile synthetic fibre reinforcement and steel wire reinforced raised faces fitted with flanges drilled to BS4504 PN16 in carbon steel with integral bellows stabilizing collar and adjustable tie bar assembly.

**Materials**
- Liner: EPDM Rubber
- Reinforcement: Synthetic Fibre
- Cover: EPDM Rubber
- Flanges: Carbon Steel type ST37.2, Zinc Plated
- Tie Bars: ISO 898 Gr.8.8 Carbon Steel, Zinc Plated
- Isolation: Up to 150mm N.B EPDM rubber top hats, 200mm and above - spherical washers, steel Zinc plated

**Identification**
- Colour Code: EPDM -Orange Band, Butyl - White Band, Perbunan - Red Band
- Markings: Stenflex ‘R’, Size, Date of Manufacture, Pressure rating.

### Maximum Working Pressure
- EA65: 16 bar g at 50°C, 10 bar at 80°C, 6 bar at 90°C
- EA66: 16 bar g at 50°C, 10 bar at 80°C, 6 bar at 90°C

### Temperature Range
- -40°C to 90°C

### Burst Pressure
- EA65: >48 bar g
- EA66: >48 bar g

### Vacuum
- Support rings may be required

### Nominal Diameter

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STENFLEX TYPE ‘A’

**EA67-E**
EPDM, Butyl, Perbunan, Untied, Nylon Reinforced

**EA68-E**
EPDM, Butyl, Perbunan, Tied, Nylon Reinforced

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**Specification**
Engineering Appliances rubber bellows type EA67 with EPDM, Butyl or Perbunan rubber liner and high tensile synthetic fibre reinforcement and steel wire reinforced raised faces fitted with flanges drilled to BS4504 PN16 in carbon steel with integral bellows stabilizing collar.

**Materials**
Liner: EPDM, Butyl or Perbunan Rubber
Reinforcement: Synthetic Fibre
Cover: EPDM Rubber (Perbunan Rubber has weather resistant Chloropen (CR))
Flanges: Carbon Steel type ST37.2, Zinc Plated

**Identification**
Colour Code: EPDM -Orange Band, Butyl - White Band, Perbunan - Red Band
Markings: Stenflex ‘A’, Size, Date of Manufacture, Pressure rating.

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Maximum Working Pressure: 16 bar g at 50°C, 10 bar at 80°C, 6 bar at 90°C
Allowable Test Pressure: 24 bar g
Burst Pressure: >48 bar g

Temperature Range: -40°C to 90°C
Minimum Design Life: 5 years at 82°C
Vacuum: Support rings may be required

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**EA68-E**
EPDM, Butyl, Perbunan, Untied, Nylon Reinforced

**Specification**
Engineering Appliances rubber bellows type EA68 with EPDM, Butyl or Perbunan rubber liner and high tensile synthetic fibre reinforcement and steel wire reinforced raised faces fitted with flanges drilled to BS4504 PN16 in carbon steel with integral bellows stabilizing collar.

**Materials**
Liner: EPDM, Butyl or Perbunan Rubber
Reinforcement: Synthetic Fibre
Cover: EPDM Rubber (Perbunan Rubber has weather resistant Chloropen (CR))
Flanges: Carbon Steel type ST37.2, Zinc Plated
Tie Bars: ISO 898 Gr.8.8 Carbon Steel Zinc Plated
Isolation: Up to 150mm N.B EPDM rubber top hats, 200mm and above - spherical washers, steel Zinc plated.

**Identification**
Colour Code: EPDM -Orange Band, Butyl - White Band, Perbunan - Red Band
Markings: Stenflex ‘A’, Size, Date of Manufacture, Pressure rating.
**STENFLEX TYPE ‘AS’**

### EA53-E
EPDM, Perbunan, Untied, Steel Reinforced

**DIN4809**

### EA58-E
EPDM, Perbunan, Tied, Steel Reinforced

**DIN4809**

#### Specification
Engineering Appliances rubber bellows type EA53 with EPDM, or Perbunan rubber liner and corrosion resistant steel wire mesh reinforcement throughout. Fitted with flanges drilled to BS4504 PN16 in carbon steel with integral bellows stabilizing collar.

#### Materials
- **Liner**: EPDM, or Perbunan Rubber
- **Reinforcement**: Corrosion resistant steel wire mesh
- **Cover**: EPDM Rubber (Perbunan Rubber has weather resistant Chloropen (CR))
- **Flanges**: Carbon Steel type ST37.2, Zinc Plated

#### Identification
- **Colour Code**: EPDM - Orange/Blue Band, Perbunan - Red/Blue Band
- **Markings**: Stenflex ‘A’, Size, Date of Manufacture, Pressure rating.

#### Type approvals
Stenflex type AS has been approved by the German TUV to DIN4089, PRUFNR 910 10 30. Flame resistant test in engine and plant rooms, German Lloyd. GL-NR 33576HH.

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#### Specification
Engineering Appliances rubber bellows type EA58 with EPDM, or Perbunan rubber liner and corrosion resistant steel wire mesh reinforcement throughout. Fitted with flanges drilled to BS4504 PN16 in carbon steel with integral bellows stabilizing collar.

#### Materials
- **Liner**: EPDM, or Perbunan Rubber
- **Reinforcement**: Corrosion resistant steel wire mesh
- **Cover**: EPDM Rubber (Perbunan Rubber has weather resistant Chloropen (CR))
- **Flanges**: Carbon Steel type ST37.2, Zinc Plated
- **Tie Bars**: ISO 898 Gr.8.8 Carbon Steel Zinc Plated
- **Isolation**: Up to 150mm N.B EPDM rubber top hats, 200mm and above - spherical washers, steel Zinc plated.

#### Identification
- **Colour Code**: EPDM - Orange/Blue Band, Perbunan - Red/Blue Band
- **Markings**: Stenflex ‘A’, Size, Date of Manufacture, Pressure rating.

#### Type approvals
Stenflex type AS has been approved by the German TUV to DIN4089, PRUFNR 910 10 30. Flame resistant test in engine and plant rooms, German Lloyd. GL-NR 33576HH.

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### Maximum Working Pressure:
16 bar g at 60°C, 10 bar at 100°C

### Temperature Range:
-40°C to 100°C

### Vacuum:
Support rings may be required

### Nominal Diameter

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<th>Supplied Length (mm)</th>
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**01932 788888**

For assistance.
STENFLEX TYPE ‘RS’

EA51-E
EPDM, Perbunan, Untied, Steel Reinforced

EA52-E
EPDM, Perbunan, Tied, Steel Reinforced

Specification
Engineering Appliances rubber bellows type EA51 with EPDM, or Perbunan rubber liner and corrosion resistant steel wire mesh reinforcement throughout. Fitted with flanges drilled to BS4504 PN16 in carbon steel with integral bellows stabilizing collar.

Materials
Liner: EPDM, or Perbunan Rubber
Reinforcement: Corrosion resistant steel wire mesh
Cover: EPDM Rubber (Perbunan Rubber has weather resistant Chloropen (CR))
Flanges: Carbon Steel type ST37.2, Zinc Plated

Identification
Colour Code: EPDM -Orange/Blue Band, Perbunan - Red/Blue Band
Markings: Stenflex ‘R’, Size, Date of Manufacture, Pressure rating.

EA52-E
EPDM, Perbunan, Tied, Steel Reinforced

Specification
Engineering Appliances rubber bellows type EA68 with EPDM, Butyl or Perbunan rubber liner and high tensile synthetic fibre reinforcement and steel wire reinforced raised faces fitted with flanges drilled to BS4504 PN16 in carbon steel with integral bellows stabilizing collar.

Materials
Liner: EPDM, Butyl or Perbunan Rubber
Reinforcement: Synthetic Fibre
Cover: EPDM Rubber (Perbunan Rubber has weather resistant Chloropen (CR))
Flanges: Carbon Steel type ST37.2, Zinc Plated
Tie Bars: ISO 898 Gr.8.8 Carbon Steel Zinc Plated
Isolation: Up to 150mm N.B EPDM rubber top hats, 200mm and above - spherical washers, steel Zinc plated.

Identification
Colour Code: EPDM - Orange Band, Butyl - White Band, Perbunan - Red Band
Markings: Stenflex ‘R’, Size, Date of Manufacture, Pressure rating.

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Maximum Working Pressure: 16 bar g at 60°C, 10 bar at 100°C
Allowable Test Pressure: 24 bar g
Burst Pressure: >50 bar g
Temperature Range: -40°C to 100°C
Minimum Design Life: 10 years at 100°C
Vacuum: Support rings may be required
### PL61
**EPDM, Nylon Reinforced**

### PL62
**EPDM, Tied, Nylon Reinforced**

---

**Specification**

Engineering Appliances budget rubber bellows type PL61 with EPDM rubber liner and nylon reinforcement fitted with flanges drilled to BS4504 PN16 in carbon steel.

**Materials**

- Liner: EPDM Rubber
- Reinforcement: Nylon
- Cover: EPDM Rubber
- Flanges: Carbon Steel, Zinc Plated

**Identification**

- Colour Code: Yellow Label ‘Plantlink’
- Markings: Size
- PN6 Drilling option available.

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**BUDGET**

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**Maximum Working Pressure:** 10 bar g

**Allowable Test Pressure:** 15 bar g

**Maximum working Temperature:** 82°C

**Maximum Design Life:** 3 years at 82°C
**Specification**

The EA46/49 is a multi-ply stainless steel bellows designed to absorb vibration occurring from reciprocating plant such as pumps, compressors, burners, generators, diesel engines etc. The spirally wrapped multi-ply bellows construction results in a high degree of isolation. The bellows is constructed from a corrosion resistant stainless steel for all wetted parts which offers a long service life and a high degree of safety. Tie bars complete with noise absorbing rubber top hat washers (EA46) or complete with steel wire mesh washers for higher temperatures (EA49).

**Materials**
- Bellows: 316Ti (1.4571)
- Flanges: Carbon Steel type ST37.2, Zinc Plated
- Tie Bars: ISO 898 Gr.8.8 Carbon Steel Zinc Plated
- Isolation: EA46 EPDM rubber top hats, EA49 Steel wire Mesh

**Maximum Working Pressure:** 16 bar g at 120°C

**Temperature Range:**
- EA46: -40°C to 120°C
- EA49/EA07: -40°C to 300°C

**Minimum Design Life:** 15 years

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### Identification

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  - EA65/66-E, EPDM
  - Identification: orange
- **Stenflex Type A**
  - EA67/68-E, EPDM
  - Identification: orange
- **Stenflex Type A**
  - EA67/68-B, Butyl
  - Identification: white
- **Stenflex Type A**
  - EA67/68-P, Perbunan
  - Identification: red
- **Stenflex Type AS**
  - EA53/58-E, EPDM
  - Identification: orange/blue
- **Stenflex Type AS**
  - EA53/58-P, Perbunan
  - Identification: red/blue
Introduction to Flexible Hoses

APPLICATION
Hoses are very versatile as a small diameter flexible connections to equipment such as Fan Coils, VAV Boxes, small pumps, Chilled Ceilings, Chilled Beams or to absorb small amounts of thermal movement in branched pipework and radiator connections. Not only do they absorb noise and vibration and movement but the can also greatly reduce fitting times. Hoses perform reliably that the correct type of hose is used for the service conditions and that it is properly installed.

There are many different hoses on the market. Materials of construction can be rubber, plastic, PTFE or stainless steel. Some are reinforced and some are braided. Most common types of end connector can be used as termination. EA offer two basic types of hose, stainless steel convoluted and smooth bore unreinforced rubber with stainless steel wire braid. These cover all possible building services applications. All EA hoses have been specifically developed and tested for their application. Please note: BSRIA, HMSA hydraulic hoses are unsuitable for flowing water services.

STAINLESS STEEL
Stainless steel convoluted hoses are all welded alternatively for applications where rubber is not suitable or where 100% reliability over a long period of time is required. Stainless steel braided hoses can withstand very high temperatures and pressures and still offer a good degree of flexibility (see EA71 & EA73.)

SPECIAL APPLICATIONS - FAN COILS
Hoses as final connections to fan coils can save a great deal in fitting time. If the fittings are correctly selected, they can also be used to form a bypass loop during pressure testing and flushing to protect the fan coil. During service they will prevent noise transmission and can compensate for pipe work expansion.

CHILLED CEILINGS
Hoses are very useful in connecting chilled ceiling panels. when fitted with a special Push fit connector, ceiling panels can be coupled with the minimum of force.

RUBBER
The rubber hose shown in the following data sheets consist of an unreinforced EPDM rubber liner with a stainless steel braid. All end connections are brass nickel plated which are swaged utilising stainless steel ferrules. This entirely non ferrous construction makes the hoses suitable for both heating and chilled water service. The rubber liner is at least 3mm thick to prevent kinking when bent. The EA82 hose’s reliability has been proven over many years with over 1/2 a million installed. EA rubber hoses have been tested by BSRIA to the standard of the HMSA (Hose Manufacturers and Suppliers Association) (Certificate Ref: BG41 2004). EA rubber hoses come with a 10 year manufacturers warranty.

EXPANSION
In certain applications hoses can be used to absorb small amounts of expansion e.g. riser branches. the pipe size should be less that 50mm NB.

SETTLEMENT
Hoses can also be used to compensate for building settlement. Larger sizes are permissible as the movement is only a one off.

INSTALLATION
All hoses should be fitted in line with the HMSA 'Code of Practice'. A copy is available from EA or FETA.
Hose Product Data

**TYPE EA82 & EA83**

**Construction**
The EA82 hose is constructed from an unreinforced rubber liner with a stainless steel wire braid. The Liner is made from a high grade EPDM rubber which is highly resistant to hot water ageing. The fittings are swaged using stainless steel ferrules making the hose suitable for both hot and chilled water applications. The EA83 hose is supplied insulated with closed cell class ‘O’ lagging.

**Specification**
EPDM rubber hose with stainless steel braid. Connections swaged using stainless steel ferrules.

**Materials**
Hose: High Grade EPDM
Braid: AISI 304 Stainless Steel
Fittings: SEE OPTIONS & CODING INFORMATION
Ferrules: AISI 304 Stainless Steel

**Identification**
Red and Blue braid marking, Manufacturer’s I.D., Date on ferrule.

**DESIGN TEMPERATURE:** -10 TO +100 deg C

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**TYPE EA71 & EA75**

**Construction**
The EA 71 hose is made from longitudinally welded thin walled stainless steel convoluted tube. It has a stainless steel wire braid which gives the hose a high pressure performance. The EA75 hose is supplied insulated with closed cell class ‘O’ lagging.

**Specification**
Convoluted Stainless Steel flexible hose, with a stainless steel wire braid, all welded construction with a range of endfittings in carbon or stainless steel.

**Materials**
Hose: AISI 321
Braid: AISI 304
Ferrules: AISI 304
Fittings: SEE OPTIONS & CODING INFORMATION

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**TYPE EA73 & EA77**

**Construction**
The EA 73 is a highly flexible yet robust hose made from longitudinally welded stainless steel convoluted tube. It is specially designed to be used without a braid up to a working pressure of 12 bar g. The EA77 hose is supplied insulated with closed cell class ‘O’ lagging.

**Specification**
Convoluted Stainless Steel flexible hose, unbraided, all welded construction with a range of endfittings in carbon or stainless steel.

**Materials**
Hose: AISI 316
Fittings: SEE OPTIONS & CODING INFORMATION

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**OPTIONS AND CODING INFORMATION**

| EA71 | 25 | 45 | SS |

This example describes a type EA71 hose of 25mm NB, 450mm in length with fixed flange PN16 both ends

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>BSPP Swivel Female Flat Seat, Carbon Steel</td>
</tr>
<tr>
<td>B</td>
<td>BSPP Male Taper, Carbon Steel</td>
</tr>
<tr>
<td>C</td>
<td>BSPP Male Parallel, Carbon Steel</td>
</tr>
<tr>
<td>D</td>
<td>Copper Compression inc. Nut &amp; Olive</td>
</tr>
<tr>
<td>E</td>
<td>Tecite Type Push Fit Connection</td>
</tr>
<tr>
<td>F</td>
<td>BSPP Swivel Female Conical Seat, Carbon Steel</td>
</tr>
<tr>
<td>G</td>
<td>Copper Tube End, 40mm long</td>
</tr>
<tr>
<td>H</td>
<td>Carbon Steel Tube End</td>
</tr>
<tr>
<td>I</td>
<td>Stainless Steel Tube End</td>
</tr>
<tr>
<td>J</td>
<td>Mannesman Coupling, Stainless Steel</td>
</tr>
<tr>
<td>K</td>
<td>BSPP 90 Deg Elbow, Swivel Female Flat Seat, Carbon Steel</td>
</tr>
<tr>
<td>L</td>
<td>Not in use</td>
</tr>
<tr>
<td>M</td>
<td>Carbon Steel Tube Weld End</td>
</tr>
<tr>
<td>N</td>
<td>Mannesman Tube End, 40mm long, Stainless Steel</td>
</tr>
<tr>
<td>O</td>
<td>BSPT Full Male Union, Carbon Steel</td>
</tr>
<tr>
<td>P</td>
<td>BSPT Full Female Union, Carbon Steel</td>
</tr>
<tr>
<td>Q</td>
<td>BSPT Full Male Union, Stainless Steel</td>
</tr>
<tr>
<td>R</td>
<td>BSPT Full Female Union, Stainless Steel</td>
</tr>
<tr>
<td>S</td>
<td>Fixed Flange PN16, Carbon Steel</td>
</tr>
<tr>
<td>T</td>
<td>Swivel Flange PN16, Carbon Steel</td>
</tr>
<tr>
<td>U</td>
<td>Fixed Flange PN16, Stainless Steel</td>
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<tr>
<td>V</td>
<td>Swivel Flange PN16, Stainless Steel</td>
</tr>
<tr>
<td>W</td>
<td>Swivel Flange PN16, Stainless Steel Van Stone</td>
</tr>
<tr>
<td>X</td>
<td>BSPT Male Taper, Stainless Steel</td>
</tr>
<tr>
<td>Y</td>
<td>BSPP Swivel Female Flat Seat, Stainless Steel</td>
</tr>
<tr>
<td>Z</td>
<td>Copper Tap Connector on 90 deg Elbow</td>
</tr>
</tbody>
</table>
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In a commitment to improve understanding of expansion compensation, the application of rubber bellows and the sick system syndrome, EA have a range of CPD seminars which have been registered by CIBSE.