Saint-Gobain PAM UK is the UK’s leading supplier of ductile iron pipe systems for potable water and sewerage applications.

Saint-Gobain PAM UK is part of the Saint-Gobain Pipe Division, a global company with a presence in Europe, Asia, South America and the Far East. The pipe division has over 10600 employees and sells products in 120 different countries with over 40,000km of ductile iron pipes being installed worldwide per year.

The Saint-Gobain Pipe Division is part of the Saint-Gobain Group, one of the world’s leading multi-nationals, which currently employs over 209,000 people in 59 countries and over 1200 consolidated companies.

Everyone at Saint-Gobain PAM UK is dedicated to meeting customer expectations. We encourage open communication between staff, customers and related organisations to make a positive impact on the future of the marketplace and help improve the quality of life for people worldwide.

UK customers benefit from the global network of the Pipe Division through our long term commitment to improve and develop innovative products and processes. We achieve this through continual investment in Research and Development on a global scale. In excess of £10 million per annum is spent on R&D programmes worldwide, meaning an unrivalled product range of next-generation, ductile iron pipe systems being constantly developed and delivered to the UK market.

Sustainable development lies at the heart of Saint-Gobain’s corporate culture.

Its state-of-the art technologies and focus on research and development have enabled us to consistently provide our customers with quality, sustainable, reliable and ergonomic solutions.

Water and sewerage pipelines are infrastructures created to last for several generations. Sustainable development depends on ‘long lasting’ rather than ‘disposable’ installations.

Saint-Gobain PAM UK has taken on board these principles and works to provide effective solutions for the environment.

For further information on Saint-Gobain PAM UK visit

www.saint-gobain-pam.co.uk
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The products illustrated within this guide are directly available from Saint-Gobain PAM UK or from a network of distributors and stockists across the UK and Ireland.

Quotations and order information within the UK and Ireland can be obtained from the following number:

Sales Enquiries: Tel: 0115 930 0630
Fax: 0115 930 0648

Overseas
For quotations and order information outside the UK and Ireland please contact:

Tel: +44 115 930 0645
Fax: +44 115 989 8011
Saint-Gobain PAM UK offers the most comprehensive range of ductile iron pipe systems for use in both potable water and sewerage application in the UK. Being at the forefront of innovation means that its customers continuously receive state-of-the-art products and top class services. At the same time all products and facilities are subject to stringent quality controls and conform to relevant BS, EN and ISO standards.

What is Ductile Iron?

Ductile Iron is an iron/carbon/silicon alloy. When magnesium is added to the molten iron the graphite forms in spheres rather than in flakes. This transformation virtually eliminates brittleness and produces a strong, ductile material.

Strength of Ductile Iron

Mechanical Properties

Ductile iron displays excellent mechanical properties, such as high resistance to tensile stresses and impact loads, high elongation and high yield strength. These properties make the material the most universally applicable pipeline material today.

| Minimum ultimate Tensile Strength: 420 MN/m² |
| Modulus of Elasticity: 170 GN/m² |

Ductile Iron is the most versatile pipe material today offering solutions to specific pipeline demands whether determined by the application or the installation requirements. Ductile iron can be used above or below ground, is safe to specify even if future demands change from specifications today.

Structural Design: Ductile Iron Guarantees Safety

As a result of the ductility of the material, which gives a high capacity for absorbing work or energy, Saint-Gobain ductile iron pipes and fittings have a high safety margin, allowing the opportunity to operate at up-rated pressures in the future.

- The inherent structural strength of the pipe guarantees durability and reliability for long term service.
- The high factor of safety of ductile iron gives continued performance even if future demands change, for example through increased usage from housing developments.
- The inherent material strength of ductile iron compensates for unforeseen environmental changes, for example change of land use or ground settlement.
- Easy to design and specify
- Excellent resistance to second comer damage
- No long term reduction in pipe stiffness
- Ductile iron takes the risk out of pipeline design
High strength and stiffness

Ductile iron is suitable for installation in open fields or high traffic load areas and can be laid at a variety of depths. The high material strength minimises the need for imported bedding and surround, hence minimising the impact on the environment.

- Can be laid in narrow and/or shallow trenches
- Can be laid at a wide range of depths with no detrimental effect on the performance of the pipe
- Minimises risk due to unforeseen site hazards, such as second-comer damage
Reducing Failure Rates: Ductile Iron assured long term reliability

Through a continual programme of developments and innovations the failure rates of ductile iron systems consistently reduce compared to alternative materials.

- Reliable long term solution
- Can adapt to future changes in external load

Installation & Testing: Install Test and Forget

Saint-Gobain PAM UK offers pipe systems which have well proven and highly engineered jointing solutions. These jointing solutions are able to withstand the rigours of installation, testing and provide long term reliability once in service.

- The Rapid push-fit joint is simple and robust and provides high flexibility in both application and installation
- Simple jointing techniques, for easy installation
- Testing ductile iron pipe systems is simple, once passed there is no need to repeat test at a later time. Install, Test and Forget, requires less supervision on-site.
- Jointing solutions which allows installation whatever the weather conditions
- No specialist equipment required
- Capable of angular deflection and axial withdrawal, providing opportunity to reduce the number of fittings required.
- Caters for unforeseen ground movements
Hydraulic Flow: Ductile Iron gives constant performance

The nominal bore of ductile iron pipe remains constant regardless of pressure requirements. Ductile iron pipe internal bore is clear: for example DN200 = 200mm internal bore, regardless of pressure required.

- Hydraulic flow characteristics are not altered by pressure increases or decreases
- An increase in working pressure does not mean an increase in diameter requirement

Pressure Capability: Ductile Iron offers the solution whatever the pressure

Saint-Gobain PAM UK water & sewer pipe systems are designed to give long term performance whatever the pressure requirements.

- Ductile Iron systems cover a wide spectrum of pressure requirements
- Ability to cope with increases in main pressure requirement
- Simple to specify

Soil Conditions: Ductile Iron offers advance technical solutions

Saint-Gobain pipe systems are designed to cope with the most aggressive of soil conditions whilst offering cost effective solutions.

- Revolutionary zinc/aluminium alloy coating system, available on PAM Blutop, Natural and Integral Plus: can be used in over 90% of UK soils.
- For very aggressive ground conditions Saint-Gobain PAM UK offers solutions which are optimised for Brownfield or contaminated sites.
- Complete range of Epoxy coated fittings, suitable for use in all conditions

- Easy to specify, design, lay and test
- Simple to joint, means high speed of installation
- Difficult to get wrong, due to high safety factors
- Corrosion not an issue
- Versatile: solutions to meet any requirements
- INSTALL, TEST & FORGET
Software Support Tools:
- PipeSpec
- PAMCad

Onsite-Support:
- Induct Plus
- Logistics

Technical Support:
- Drawing Take-Off
- Optimisation of Design
- Soil Surveys
- Telephone Help-line

Full Project Life Support
Section 1: Full Project Life Support

To ensure cost effective solutions Saint-Gobain PAM UK offers full project support from early design advice, soil surveys and drawing take-offs to on-site support and installation certification for contractors and engineers.

Design Software

PipeSpec is a design software tool developed by Saint-Gobain PAM UK as a support tool to assist engineers in the design and specification of pipeline schemes. The software features five analytical tools that can be utilised throughout the planning and design stages of the project:

- Hydraulics - Full Pipe
- Hydraulics - Part-full Pipe
- Embedment
- Anchorage
- Installed Cost

To download a copy of PipeSpec free of charge, visit www.saint-gobain-pam.co.uk. Alternatively a copy of the PipeSpec software can be requested from the Brochure Hotline, Tel: 0800 028 2134.

PAMCAD

Design Software

To assist engineers and specifiers in the creation and modification of a pipework design, a complete database of water pipeline products is available. The software enables accurate drawings to be produced quickly and easily by calling up pipeline components and arranging them on screen.

PAMCAD is compatible with AutoCAD. PAMCAD features a floating menu for easy, efficient pipework design.

Benefits:

- Enables pipe runs to be drawn quickly and easily
- Make-up pipe facility
- Use of standard products to minimise cost and lead time
- Automatically allows joint gaps
- Bill of materials function gives a clear list of products used

Download PAMCAD free of charge at www.saint-gobain-pam.co.uk/watersewer/wscad.cfm. Alternatively a CD-ROM is available from the Brochure Hotline, Tel: 0800 028 2134.
Drawing Take-off Service

A team of experienced engineers is able to carry out drawing take-offs, providing a detailed list of products required. The service includes optimisation of design to ensure that the most cost-effective solution is achieved.

Saint-Gobain PAM UK has the facility to accept drawings in electronic format. Please consider the following instructions for use of this facility:

- All drawings to be compatible with AutoCAD
- All drawings sent to relate only to pipework for take-off
- All drawings to be ‘clean’, i.e. drawings to fill the whole screen in a reasonable and printable size

To avoid delays in dealing with requests, please ensure that the relevant sections of the specification are sent at the same time as the drawings, either by mail or e-mail.

Technical Support Helpline

A technical support helpline is available to all existing and potential customers, staffed by an experienced team of engineers offering a broad range of expertise and advice on:

- Product and material compatibility
- Installation and testing
- Embedment and hydraulic flow calculations
- Regulatory requirements

Please call our Technical Sales Department, Tel: 0115 930 0700 or email technical.pipes.uk.pam@saint-gobain.com

Induct Plus

This scheme, offered by Saint-Gobain PAM UK, aims to give confidence to water utilities and contractors that pipes and fittings will be installed effectively and in optimum condition. The scheme offers contractors hands-on training in handling, storing, installing and commissioning Saint-Gobain PAM UK ductile iron pipes and fittings. A process of on-site evaluation and assessment of actual installation is used to support the certification of contractors successfully completing the scheme.

For more information on the installation of ductile iron pipes, fittings and valves, please refer to the Installation Guide at www.saint-gobain-pam.co.uk. This set of instructions is based on best practices which are acknowledged within the industry. This guide provides clear and concise guidance for the installation of ductile iron pipelines from delivery through to on-site commissioning and is designed to ensure that the performance of ductile iron pipes and fittings is not adversely affected during installation.

Please call our Technical Sales Department, Tel: 0115 930 0700 or email technical.pipes.uk.pam@saint-gobain.com
Quality Assurance

Saint-Gobain PAM UK regards quality as essential to the success of its business. From detailed metallurgical analysis of the molten metal to tight control of coating and lining applications, procedures have been developed to ensure consistent high quality of each individual pipe and fitting. Additionally, every pipe and fitting is pressure tested in accordance with BS EN 545/BS EN 598.

The “quality-is-key” principle applies to every stage of the manufacturing process and includes:

- Validation of suppliers and/or their materials
- Continuous assessment of quality systems
- On-going monitoring of product quality
- Technical support prior to and after sales
- On-time delivery of products and supporting information

Compliance with Standards

Saint-Gobain PAM UK products comply with and are tested according to relevant British, European and International Standards. All pipes and fittings are manufactured under the quality management system BS EN ISO 9001, 2000.

All Saint-Gobain PAM UK’s ductile iron pipes and fittings for water application conform to the latest version of BS EN 545 and for sewer applications they conform to the latest version of BS EN 598. Development of pipes and fittings can take place across the Saint-Gobain PAM UK Pipe Division. As such, third party accreditation is always achieved with the relevant auditing body e.g. BSI in the UK, Bureau Veritas (BV) in France and MPA-NRW in Germany. All of these certification bodies are also independently accredited, for example BSI is accredited by UKAS.

In addition, all materials in contact with potable water used by Saint-Gobain PAM UK have been approved by the Secretary of State for the Environment, Food and Rural Affairs in accordance with Regulation 31.4.a of the Water Supply (Water Quality) Regulations 2000 (England) (2001 in Wales), and by the Scottish Ministers in accordance with Regulation 27 of the Water Supply (Water Quality) (Scotland) Regulations.

Saint-Gobain PAM UK can carry out a detailed soil resistivity survey along the route of a proposed pipeline. The results of the assessment provide a detailed analysis of ground conditions, allowing the most appropriate external protection system to be specified. Our soil assessment procedure has been awarded independent approval by WRc.

Please contact Technical Sales Department for more information, Tel: 0115 930 0700.
Key Dimensions - Push-fit

Pipe

Bend

Duckfoot Bend

All Socket Tee

Flange on Double Socket Tee

Concentric Taper

Flanged & Socket

Flanged Spigot

45° Angle Branch

Kameleo

Collar
Key Dimensions - Flanged
**Pipe:**
Saint-Gobain PAM UK supply pipes for potable water and sewerage applications in diameter range DN60-2000. All Saint-Gobain PAM UK pipes are manufactured in accordance with the latest versions of BS EN 545 for potable water and BS EN 598 for sewerage.

**Table 1: Standard offer, water**

<table>
<thead>
<tr>
<th>DN</th>
<th>Pipe Class</th>
<th>Pipe Length (mm)</th>
<th>Weight (kg)</th>
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</thead>
<tbody>
<tr>
<td>80</td>
<td>Class 40</td>
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<tr>
<td>2000</td>
<td>K9</td>
<td>8130</td>
<td>10190</td>
</tr>
</tbody>
</table>

The small diameter pipe without compromise
Blutop is an innovative ductile iron pipe system dedicated to small diameter potable water distribution which combines the strength of ductile iron with the lightness of plastic. It is available in DN/OD 75, 90, 110, 125 and 160. Blutop is approved for potable water under regulation 31.4.a. It is also WRc approved and conforms with functional performance aspects of EN545.

**Benefits**
- Lighter pipe system as there is no cement mortar lining, which facilitates manual handling
- Compatible with plastic pipes*, DN/OD dimensions
- Easy to assemble, new push fit joint with low insertion force
- Better hydraulic capacity than plastics thanks to an increased internal diameter allowing:
  - Downsizing of pipe
  - Lower carbon emissions
  - Reduced pumping requirements
- Lower requirement for imported/exported bedding materials, thanks to the use of excavated material as backfill
- Optimum water quality thanks to the innovative ‘Ductan’ lining
- Self-anchoring gasket available for restrained pipes application, eliminating the need for concrete thrust blocks
- Eco friendly product designed to be environmentally sustainable:
  - Recycled and infinitely recyclable
  - Reduction in energy consumption linked to transport
  - Reduction in energy consumption for pumping

**Technical Details**

<table>
<thead>
<tr>
<th>Diameter Range</th>
<th>DN/OD 75, 90, 110, 125 and 160.</th>
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<tr>
<td>Joint</td>
<td>Manual push-fit</td>
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<tr>
<td>Gasket</td>
<td>Blutop non-restrained, PFA = 25 bar</td>
</tr>
<tr>
<td></td>
<td>Blutop restrained Vi (self-anchored), PFA = 16 bar</td>
</tr>
<tr>
<td>Pipes - Coating &amp; Lining</td>
<td>Coating: (Zinalium Zn/Al 85/15 400g/m² plus 100 μm epoxy)**</td>
</tr>
<tr>
<td></td>
<td>Lining: Ultramarine blue DUCTAN thermoplastic 300 μm, nominal adhesion 8MPa</td>
</tr>
<tr>
<td>Fittings - Coating &amp; Lining</td>
<td>Epoxy powder (EN14901 compliant)</td>
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<tr>
<td>Angular deflection</td>
<td>6 degrees</td>
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</tbody>
</table>

For further information on how to joint a Blutop pipe, please refer to “Section 3: Joints” of this brochure (page 67)

* Blutop socket compatible with PVC & HPPE spigot but PVC or HPPE socket not compatible with Blutop spigot
** For information on special coatings for Blutop please refer to ‘Section 5: Pipe Coatings’ on page 94

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**Note:**
- Lengths and weights are provided for estimation purposes only and actual values may vary from those provided in these tables
Saint-Gobain PAM UK supplies pipes for potable water and sewerage applications in diameter range DN60-2000. All Saint-Gobain PAM UK pipes are manufactured in accordance with the latest versions of BS EN 545 for potable water and BS EN 598 for sewerage.

### Table 1: Standard offer, water - System CL

<table>
<thead>
<tr>
<th>DN</th>
<th>Natural Prod Code</th>
<th>Classic Prod Code</th>
<th>Pipe Class</th>
<th>Length (mm)</th>
<th>Spigot OD (ØDE)</th>
<th>Socket OD (ØB)</th>
<th>Weight (Kg/m)</th>
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<td>80</td>
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</tbody>
</table>

* Preferred option

Notes:-
- Lengths and weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- DN1100 and DN1500 pipes available on request (limited range of fittings).
- For further information on the Rapid joint, please refer to ‘Section 3: Joints’ of this brochure, page 67.

### Table 2: Standard offer, water - System XL

<table>
<thead>
<tr>
<th>DN</th>
<th>Natural Prod Code</th>
<th>Pipe Class</th>
<th>Length (mm)</th>
<th>Spigot OD (ØDE)</th>
<th>Socket OD (ØDE)</th>
<th>Weight (Kg/m)</th>
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Notes:-
- Lengths and weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- Saint-Gobain is expecting to manufacture 6m long pipes in the 2nd half of 2012. The above table will be updated accordingly in due course.
### Table 2: Standard offer, sewer

*Note: Length and weight may vary from the detail provided in these tables. DN125 are available upon request.*

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<th>DN</th>
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<th>Length (mm)</th>
<th>Spigot OD mm øDE</th>
<th>Socket OD mm øDE</th>
<th>Weight (kg)</th>
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### Table 3: Standard offer sewer

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<th>Weight (Kg/m)</th>
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**Notes:**
- Lengths and weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- DN1100 and DN1500 pipes available on request (limited range of fittings).
- The differentiation between Integral Plus and Integral relates to the coating of the pipe. For further information, please refer to ‘Section 5: Pipe Coating’ of this brochure, page 93.

For information on the different types of **linings and coatings** (including TT) that Saint-Gobain PAM UK has available please refer to:
- Section 4, Pipe Lining, page 85
- Section 5, Pipe Coating, page 93

Also, for further information on the different types of **joints** available from Saint-Gobain PAM UK please refer to ‘Section 3: Joints’ of this brochure, page 67.
Saint-Gobain PAM UK offers a range of fabricated pipe tailored to customer requirements: flange spigot, flange socket, double flanged, double spigot and short length socket spigot pipe in diameters DN80 to DN2000 for both water and sewer applications. Fabricated pipes are manufactured in accordance with BS EN 545 for potable water and BS EN 598 for sewerage.

The Standard flange rating is PN16, but PN10, PN25 and PN40 are also available on request. Please contact the Technical Sales Department for further information, Tel: 0115 930 0700

Puddle Flanges

Fabricated pipes can be supplied with puddle flanges where required.

Note: Where multiple puddle flanges are required it is recommended that a drawing is sent with the enquiry.

Table 4: Standard fabricated pipe offer

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Table 5 - Fabricated pipe minimum and maximum lengths (mm)

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Notes:-
- Please contact our technical team:
- For any requirements outside the above minimum and maximum dimensions
- For information on DN1800 and DN2000
Table 2: Standard offer, sewer

Note: Length and weight may vary from the detail provided in these tables. DN125 are available upon request.

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</tbody>
</table>

Notes:
- Please contact our technical team:
- For any requirements outside the above minimum and maximum dimensions
- For information on DN1800 and DN2000
A simple and effective ductile iron solution to situations where open cut trenches are not suitable or possible.

The PAM Direxional range is Saint-Gobain PAM UK’s Directional drilling pipe which can be used for both water and sewer applications.

**Range overview and technical details**

<table>
<thead>
<tr>
<th>Diameter Range</th>
<th>DN100 to 700: ZMU coating</th>
<th>DN800 to 1000: PUX based coating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint</td>
<td>Self-anchored pushfit, Universal TIS-K (Tyton) or Universal Ve (Standard/Rapid) according to diameter</td>
<td></td>
</tr>
<tr>
<td>Coating</td>
<td>ZMU : 200mg Zinc plus 5mm cement</td>
<td>PUX: thick sprayed polyurethane based coating</td>
</tr>
<tr>
<td>Lining</td>
<td>Water (EN545) - Blast furnace cement</td>
<td>Sewer (EN596) - Alumina cement</td>
</tr>
</tbody>
</table>

- **Robustness of ZMU coating and PUX coating**
  
  ZMU is a highly robust protective coating. In NO circumstances is further protection required. This coating is suitable for drilling pipelines through rocky conditions without detrimental effect on the performance of the coating or pipe. SGG have devised a “shock test” for this coating to prove its robustness.

  PUX is a polyurethane coating intended for use with high aggressive soils. Each pipe is tested individually after coating by a ‘Holiday detector’ test in order to check the protective quality of the coating.

- **Joint**

  PAM Direxional is assembled using a simple anchored push fit jointing system. The double chambered socket allows for the use of a locking ring which acts as both a restraint to enable the pipe to be pulled through the required drilling channel and a thrust restraint for the pipeline. This joint is protected from abrasive conditions with the use of a rubber protective collar and a metal sheet cone.

For further information on how to joint a PAM Direxional pipe, please refer to ‘Section 3: Joints’ of this brochure (page 67).

**Installation calculations and technical support**

Saint-Gobain has developed a tool that will calculate the pulling forces required and will also make weight and lift calculations to ensure that the pipe is correctly balanced in the drilling channel. For further information on this tool please contact the technical department, Tel: 0115 930 0700

**Benefits of Ductile Iron vs. Plastics**

<table>
<thead>
<tr>
<th>SAFETY FACTORS</th>
<th>Ductile Iron</th>
<th>Plastics</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH (2.5)</td>
<td>LOW (1.2)</td>
<td>LOW SAFETY FACTORS IN PLASTICS MEAN FAILURES ARE A VERY REAL RISK</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TESTING</th>
<th>Ductile Iron</th>
<th>Plastics</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASY</td>
<td>DUCTILE IRON ALLOWS A CONTRACTOR TO INSTALL TEST AND FORGET</td>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th>JOINTS</th>
<th>Ductile Iron</th>
<th>Plastics</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANCHORED PUSH FIT</td>
<td>DUCTILE IRON CAN BE JOINTED DURING THE PULLING OF THE PIPE REDUCING STOP/START STRAINS ON PIPE/MACHINERY</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOATATION CONSIDERATION</th>
<th>Ductile Iron</th>
<th>Plastics</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMALL</td>
<td>SIMPLE CALCULATION TOOL AVAILABLE FOR SGP DUCTILE IRON</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>PLANNING COMPLEXITY</th>
<th>Ductile Iron</th>
<th>Plastics</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 PROCESS 1 PRODUCT</td>
<td>HIGH VARIETY OF PRODUCTS AVAILABLE WITH VARYING QUALITY -- ADDS COMPLEXITY TO DESIGN</td>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th>UNPREDICTABLE GROUND CONDITIONS</th>
<th>Ductile Iron</th>
<th>Plastics</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO LITTLE PROBLEM</td>
<td>DUCTILE IRON OFFERS ONE SOLUTION TO COVER A WIDE VARIETY OF CONDITIONS -- EASY TO SPECIFY, HARD TO GET WRONG</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PULLING FORCES</th>
<th>Ductile Iron</th>
<th>Plastics</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAN WITHSTAND HIGH FORCES</td>
<td>MANY NEW MACHINES IN MARKET HAVE ABILITY TO PULL AT WITH VERY HIGH FORCES, IN CERTAIN CASES THIS COULD BE MORE THAN MATERIAL CAN TAKE</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>MACHINERY</th>
<th>Ductile Iron</th>
<th>Plastics</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO ADDITIONAL EQUIPMENT REQUIRED FOR PULLING DUCTILE IRON PIPES.</td>
<td></td>
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</tbody>
</table>
Pipe:
Saint-Gobain PAM UK supply pipes for potable water and sewerage applications in diameter range DN60-2000. All Saint-Gobain PAM UK pipes are manufactured in accordance with the latest versions of BS EN 545 for potable water and BS EN 598 for sewerage.

### Table 1: Standard offer, water

<table>
<thead>
<tr>
<th>DN</th>
<th>Product code</th>
<th>Joint</th>
<th>Allowable deflection</th>
<th>Length (mm)</th>
<th>Allowable Operating Pressure (PFA)</th>
<th>Spigot O/D (mm)</th>
<th>Socket* O/D (mm)</th>
<th>Weight (Kg/m)</th>
<th>Pipe Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>224302</td>
<td>UNV TIS-K</td>
<td>3º</td>
<td>5970</td>
<td>64</td>
<td>128</td>
<td>220</td>
<td>22.50</td>
<td>C100</td>
</tr>
<tr>
<td>100</td>
<td>224305</td>
<td>UNV TIS-K</td>
<td>3º</td>
<td>5970</td>
<td>60</td>
<td>180</td>
<td>260</td>
<td>32.50</td>
<td>C64</td>
</tr>
<tr>
<td>150</td>
<td>224307</td>
<td>UNV TIS-K</td>
<td>3º</td>
<td>5970</td>
<td>52</td>
<td>232</td>
<td>320</td>
<td>45.00</td>
<td>C64</td>
</tr>
<tr>
<td>200</td>
<td>224308</td>
<td>UNV TIS-K</td>
<td>3º</td>
<td>5970</td>
<td>46</td>
<td>284</td>
<td>380</td>
<td>59.00</td>
<td>C50</td>
</tr>
<tr>
<td>250</td>
<td>224309</td>
<td>UNV TIS-K</td>
<td>3º</td>
<td>5970</td>
<td>41</td>
<td>336</td>
<td>440</td>
<td>74.00</td>
<td>C50</td>
</tr>
<tr>
<td>300</td>
<td>224310</td>
<td>UNV STD Ve</td>
<td>3º</td>
<td>5970</td>
<td>38</td>
<td>378</td>
<td>495</td>
<td>92.50</td>
<td>C40</td>
</tr>
<tr>
<td>350</td>
<td>224311</td>
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<td>3º</td>
<td>5970</td>
<td>35</td>
<td>439</td>
<td>540</td>
<td>108.00</td>
<td>C40</td>
</tr>
<tr>
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<td>224312</td>
<td>UNV STD Ve</td>
<td>3º</td>
<td>5970</td>
<td>32</td>
<td>490</td>
<td>600</td>
<td>On request</td>
<td>C40</td>
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<td>450</td>
<td>On request</td>
<td>UNV STD Ve</td>
<td>3º</td>
<td>5970</td>
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<td>542</td>
<td>655</td>
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</tr>
<tr>
<td>500</td>
<td>224313</td>
<td>UNV STD Ve</td>
<td>2º</td>
<td>5970</td>
<td>30</td>
<td>645</td>
<td>770</td>
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<tr>
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<td>224314</td>
<td>UNV STD Ve</td>
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<td>5970</td>
<td>27</td>
<td>748</td>
<td>885</td>
<td>246.00</td>
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</tbody>
</table>

For pipes with a deflection of 3º the minimum radius achievable will be 115m and for pipes with a deflection of 2º the minimum radius achievable will be 172m.

**Notes:**
- Lenghts and weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- For information on DN800-DN1000 range, please contact our Technical Department on 0115 930 0700.
Pipe:
Saint-Gobain PAM UK supply pipes for potable water and sewerage applications in diameter range DN60-2000. All Saint-Gobain PAM UK pipes are manufactured in accordance with the latest versions of BS EN 545 for potable water and BS EN 598 for sewerage.

Table 1: Standard offer, water

<table>
<thead>
<tr>
<th>DN</th>
<th>Product code</th>
<th>WATER Product Code</th>
<th>SEWER Product Code</th>
<th>Product code</th>
<th>Product code</th>
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<tbody>
<tr>
<td>80</td>
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<td>110325</td>
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<td>JKB50E</td>
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<td>JSB70BB</td>
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PAM Direxional

Other Components

<table>
<thead>
<tr>
<th>DN</th>
<th>Pulling Heads</th>
<th>Gaskets</th>
<th>Locking ring</th>
<th>Socket sleeve</th>
<th>Metallic cone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Product code</td>
<td>WATER</td>
<td>SEWER</td>
<td>Product code</td>
<td>Product code</td>
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<td>110823</td>
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<tr>
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<td>JSB70BA</td>
<td>JSB70BB</td>
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Jointing

<table>
<thead>
<tr>
<th>DN</th>
<th>Products required to make a joint:</th>
<th>Products required for dismantling a joint:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Product code</td>
<td>Description</td>
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<tr>
<td>100</td>
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<tr>
<td>700</td>
<td>111166</td>
<td>Assembly Wedges</td>
</tr>
</tbody>
</table>
Saint-Gobain PAM UK supplies a comprehensive range of ductile iron fittings in diameter range DN60-2000. Please note that a selection of flanged fittings are supplied with adjustable flanges. Further information on adjustable flanges is available on page 83 of this guide.

Flanged fittings are supplied as standard with PN16 flanges. For availability of PN10, PN25 or PN40 items please contact the Technical Sales Department, Tel: 0115 930 0700.

Saint-Gobain PAM UK supplies two ranges of fittings:
- Blutop fittings, which are available on DN/OD 75, 90, 110, 125 and 160.
- Traditional range of push-fit and flanged fittings, available on DN80-2000.

Gasket Identification

It is important that the appropriate gasket is used, EPDM for potable water application and Nitrile for sewerage applications. Rapid joint gaskets are easily identifiable being marked EPDM for use with potable water or marked NBR, indicating Nitrile, for sewer applications. In addition, to help with identification and eliminating potential confusion on site, Rapid joint gaskets are colour-coded.

- Nitrile gaskets for sewer applications can be identified by a double yellow ring throughout the size range DN80-2000.
- EPDM gaskets for water applications can be identified by a light blue double ring in the size range DN80-600.

Notes:
- Anchor gaskets do not have colour markings
- For further information on the rapid joint, please refer to ‘Section 3: Joints’ of this brochure, page 67

Blutop Gasket

The Blutop range of products utilizes a unique gasket available in non-anchored and anchored versions:
### Table 2: Standard offer, sewer

Note: Length and weight may vary from the detail provided in these tables. DN125 are available upon request.

<table>
<thead>
<tr>
<th>DN/OD</th>
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</tr>
</tbody>
</table>

### Range (Fittings)

The small diameter pipe without compromise. Blutop is an innovative ductile iron pipe system dedicated to small diameter potable water distribution and is available in DN/OD 75, 90, 110, 125 and 160.

#### FITTINGS

<table>
<thead>
<tr>
<th>DN/OD</th>
<th><strong>90° BEND</strong></th>
<th><strong>45° BEND</strong></th>
<th><strong>22½° BEND</strong></th>
<th><strong>11¼° BEND</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>90</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>110</td>
<td></td>
<td></td>
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<td>125</td>
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</tr>
<tr>
<td>160</td>
<td></td>
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</tr>
</tbody>
</table>

#### DN 80 FLANGED DUCKFOOT BEND

<table>
<thead>
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<th>Product Code</th>
</tr>
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<tr>
<td>90</td>
<td>11.40</td>
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<tr>
<td>110</td>
<td>13.60</td>
<td>KXM12DF0E</td>
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#### FLANGED SOCKET

<table>
<thead>
<tr>
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<th>Weight (Kg)</th>
<th>Product Code</th>
</tr>
</thead>
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<td>5.00</td>
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<td>90</td>
<td>5.50</td>
<td>KXL90BE1E</td>
</tr>
<tr>
<td>110</td>
<td>6.70</td>
<td>KXM11BE1F</td>
</tr>
<tr>
<td>125</td>
<td>8.20</td>
<td>KXM12BE1G</td>
</tr>
<tr>
<td>160</td>
<td>11.00</td>
<td>KXM16BE1J</td>
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#### FLANGED SPIGOT

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</thead>
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<td>3.85</td>
<td>KXL75BU1C</td>
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<tr>
<td>90</td>
<td>4.70</td>
<td>KXL90BU1E</td>
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<tr>
<td>110</td>
<td>6.00</td>
<td>KXM11BU1F</td>
</tr>
<tr>
<td>125</td>
<td>7.90</td>
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<tr>
<td>160</td>
<td>12.10</td>
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#### DOUBLE SOCKETTEE WITH FLG BRANCH

<table>
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<th>Weight (Kg)</th>
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</thead>
<tbody>
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<td>6.80</td>
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<td>90x60</td>
<td>8.60</td>
<td>KXL90TD1C</td>
</tr>
<tr>
<td>90x80</td>
<td>9.40</td>
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<td>110x40</td>
<td>7.60</td>
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<td>110x60</td>
<td>9.40</td>
<td>KXM11TD1C</td>
</tr>
<tr>
<td>110x80</td>
<td>11.00</td>
<td>KXM11TD1E</td>
</tr>
<tr>
<td>110x100</td>
<td>12.20</td>
<td>KXM11TD1F</td>
</tr>
<tr>
<td>125x40</td>
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<td>KXM12TD1F</td>
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<tr>
<td>125x125</td>
<td>15.00</td>
<td>KXM12TD1G</td>
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<tr>
<td>160x40</td>
<td>11.30</td>
<td>KXM16TD1A</td>
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<tr>
<td>160x60</td>
<td>12.90</td>
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<td>160x150</td>
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#### ALL SOCKET TEE

<table>
<thead>
<tr>
<th>DN/OD</th>
<th>Weight (Kg)</th>
<th>Product Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>90x90</td>
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<td>110x110</td>
<td>8.70</td>
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<td>125x110</td>
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<td>KXM12TE0G</td>
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<td>160X100</td>
<td>13.00</td>
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<tr>
<td>160X125</td>
<td>13.6</td>
<td>KXM16TE0G</td>
</tr>
</tbody>
</table>

Note:-
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
Saint-Gobain PAM UK offers a range of fabricated pipe tailored to customer requirements. Flange spigot, flange socket and double flanged pipes are available in a variety of lengths in diameter range DN80-1600 for both water and sewer application. Fabricated pipes are manufactured in accordance with BS EN 545 for potable water and BS EN 598 for sewerage. The standard flange rating is PN16. PN10, PN25 and PN40 are also available, contact Technical Sales Department, Tel: 0115 930 0650/0700.

**SUDDLE FLANGES**

Flanged, double spigot and spigot socket pipes can be supplied with puddle flanges where required. Note: Where multiple puddle flanges are required it is recommended that a drawing is sent with the enquiry.

### Table 3: Standard fabricated pipe offer

Please refer to PAMRF04 datasheet for fabricated pipe minimum lengths.

<table>
<thead>
<tr>
<th>DN/OD</th>
<th>Clean Water (EN 545)</th>
<th>Sewerage (EN 598)</th>
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<tbody>
<tr>
<td></td>
<td>Lining</td>
<td>Coating</td>
</tr>
<tr>
<td>DN80-800</td>
<td>System CL, cement lined</td>
<td>Zinc/Aluminium and blue epoxy external</td>
</tr>
<tr>
<td>DN900+</td>
<td>System CL, cement lined</td>
<td>Zinc and bitumen external</td>
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</tbody>
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### VALVES

**PUSH FIT VALVE FOR BLUTOP OR PLASTIC PIPES**

<table>
<thead>
<tr>
<th>DN/OD</th>
<th>Anticlockwise Close with cap top</th>
<th>Clockwise Close no cap top</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weight (Kg)</td>
<td>Product Code</td>
</tr>
<tr>
<td>75</td>
<td>12.30</td>
<td>RDL75KDXH</td>
</tr>
<tr>
<td>90</td>
<td>12.80</td>
<td>RDL90KDXH</td>
</tr>
<tr>
<td>110</td>
<td>16.20</td>
<td>RMD11KDXH</td>
</tr>
<tr>
<td>125</td>
<td>22.80</td>
<td>RMD12KDXH</td>
</tr>
<tr>
<td>160</td>
<td>30.00</td>
<td>RMD16KDXH</td>
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### ACCESSORIES

**LUBRICANT**

<table>
<thead>
<tr>
<th>Contents (Kg)</th>
<th>Product Code</th>
<th>Weight (Kg)</th>
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<tbody>
<tr>
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<td>158128</td>
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<td>213686</td>
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**DRILLING & TAPPING SADDLE**

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<th>Weight (Kg)</th>
<th>Product Code</th>
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<tbody>
<tr>
<td>75</td>
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</tr>
<tr>
<td>160</td>
<td>Please enquire</td>
<td>Please enquire</td>
</tr>
</tbody>
</table>

Note:-
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables
Kameleo is a variable angle fitting designed for use with water supply pipelines. It consists of a main component or body and a range of accessories (kits) that combine together to produce different types of joints: double socket, double flange, socket/flange, mechanical, etc.

It has a continuous variable angle from 0 to 45° which allows to make any connection with a single bend, without the need of using several bends.

It has an allowable operating pressure (PFA) of 16 bar, a 250 μm epoxy coating and hot dipped galvanised steel nuts and bolts.

Compliance with standards and regulations:
- Type tests carried out on Kameleo comply with EN 545
- The epoxy coating complies with EN 14901
- The components in contact with drinking water are in accordance with European regulations on potable water

For maintenance and repairs
- In its flanged socket and collar versions, Kameleo slides along the pipe completely (at 0°) and can be used in insertion.
- Its variable angle allows Kameleo to slip into small gaps, between two pipe spigots, for easy maintenance and durable repairs to small damaged pipe sections.
- The different versions of Kameleo can be easily pre-assembled outside the trench for ease of installation.

### VARIABLE ANGLE BEND

<table>
<thead>
<tr>
<th>DN/OD</th>
<th>Product Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>SZA80CV00TT</td>
</tr>
<tr>
<td>100</td>
<td>SZB10CV00TT</td>
</tr>
<tr>
<td>150</td>
<td>SZB15CV00TT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Push-Fit Gasket</th>
</tr>
</thead>
<tbody>
<tr>
<td>185405</td>
<td>JSA80CA</td>
</tr>
<tr>
<td>185406</td>
<td>JSB10CA</td>
</tr>
<tr>
<td>185407</td>
<td>JSB15DA</td>
</tr>
</tbody>
</table>

### FLANGED JOINT
(Flange, gland, bolts, nuts and washers)

<table>
<thead>
<tr>
<th>DN/OD</th>
<th>Product Code</th>
</tr>
</thead>
<tbody>
<tr>
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<td>JZA80KB</td>
</tr>
<tr>
<td>100</td>
<td>JZB10KB</td>
</tr>
<tr>
<td>150</td>
<td>JZB15KB</td>
</tr>
</tbody>
</table>

### MECHANICAL JOINT
(Flange, gland, rapid gasket, bolts, nuts & washers)

<table>
<thead>
<tr>
<th>DN/OD</th>
<th>Product Code</th>
</tr>
</thead>
<tbody>
<tr>
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<td>JZA80KE</td>
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<tr>
<td>100</td>
<td>JZB10KE</td>
</tr>
<tr>
<td>150</td>
<td>JZB15KE</td>
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</table>

### MECHANICAL ANCHORED JOINT
(Flange, gland, rapid anchored gasket, bolts, nuts and washers)

<table>
<thead>
<tr>
<th>DN/OD</th>
<th>Product Code</th>
</tr>
</thead>
<tbody>
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<td>JZB10KL</td>
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<tr>
<td>150</td>
<td>JZB15KL</td>
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### MECHANICAL ANCHORED JOINT (SPECIAL INSERTION)
(Flange, 2 x glands, rapid gasket, rapid anchored gasket, rods, nuts and washers)

<table>
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<tr>
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<td>JZB15KM</td>
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### DN80

**Push-fit (Rapid)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Product code</th>
<th>Allowable Operating Pressure (PFA) bar</th>
<th>Key dimensions</th>
<th>Weight Per Unit (Kg)</th>
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</thead>
<tbody>
<tr>
<td><strong>RAPID</strong></td>
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<td></td>
</tr>
<tr>
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<td>16</td>
<td>11.0</td>
</tr>
<tr>
<td>Bend</td>
<td>SZA80CA00TT</td>
<td>TSA80CA</td>
<td>64</td>
<td>8.0</td>
</tr>
<tr>
<td>90°</td>
<td>SZA80CB00TT</td>
<td>TSA80CB</td>
<td>64</td>
<td>7.5</td>
</tr>
<tr>
<td>45°</td>
<td>SZA80CD00TT</td>
<td>TSA80CD</td>
<td>64</td>
<td>6.5</td>
</tr>
<tr>
<td>22.5°</td>
<td>SZA80CE00TT</td>
<td>TSA80CE</td>
<td>64</td>
<td>7.0</td>
</tr>
<tr>
<td>11.25°</td>
<td>SZA80CF00TT</td>
<td>SSA80CF00FF</td>
<td>64</td>
<td>12.0</td>
</tr>
<tr>
<td>Duckfoot</td>
<td>SSA80CF00TT</td>
<td>SSA80CF00FF</td>
<td>64</td>
<td>12.0</td>
</tr>
<tr>
<td>Hydrant Duckfoot</td>
<td>SSA80CG1ETT</td>
<td>-</td>
<td>16</td>
<td>12.5</td>
</tr>
<tr>
<td>All socket tee</td>
<td>SSA80TE0ETT</td>
<td>TSA80TE0E</td>
<td>64</td>
<td>11.5</td>
</tr>
<tr>
<td>Flange on Double Socket Tee*</td>
<td>SSA80UD1ETT</td>
<td>TSA80UD1E</td>
<td>16</td>
<td>13.0</td>
</tr>
<tr>
<td>45° Angle Branch</td>
<td>SSA80TU0ETT</td>
<td>SSA80TU0EFF</td>
<td>64</td>
<td>15.0</td>
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<tr>
<td>Flange &amp; Socket Piece*</td>
<td>SSA80BE10TT</td>
<td>TSA80BE1</td>
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<td>8.0</td>
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<tr>
<td>Flange &amp; spigot Piece</td>
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<td>BBA80BU10FF</td>
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<tr>
<td>Bend</td>
<td>SFA80CA00TT</td>
<td>-</td>
<td>64</td>
<td>11.5</td>
</tr>
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<td>90°</td>
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<td>SFA80CE00TT</td>
<td>-</td>
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<td>10.0</td>
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<tr>
<td>11.25°</td>
<td>SFA80BE10TT</td>
<td>-</td>
<td>16</td>
<td>9.0</td>
</tr>
</tbody>
</table>

*Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83.
* Kameleo length at 0°

**Notes:**
- For information on gaskets and joint sets (Rapid, Universal and flange) please refer to 'Section 3: Joints' on page 67. Please note that our fixed flange joint sets are CESWI 7th edition compliant.
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- Codes starting with ‘T’ are gasket inclusive.
<table>
<thead>
<tr>
<th>Description</th>
<th>Product code</th>
<th>Allowable Operating Pressure (PFA) bar</th>
<th>Key dimensions</th>
<th>Weight Per Unit (Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Water</td>
<td>Sewer</td>
<td>L mm</td>
<td>H mm</td>
</tr>
<tr>
<td>Riser piece</td>
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<td>BBA80MT1UFF</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>100mm long</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150mm long</td>
<td>BBA80MT1ZTT</td>
<td>BBA80MT1ZFF</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>200mm long</td>
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<td>BBA80MT1VFF</td>
<td>16</td>
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</tr>
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<td>BBA80MT1ATT</td>
<td>BBA80MT1AFF</td>
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<td>BBA80MT1WFF</td>
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<tr>
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<td>16</td>
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<tr>
<td>400mm long</td>
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<tr>
<td>Bend</td>
<td>BBA80CA10TT</td>
<td>BBA80CA10FF</td>
<td>16</td>
<td>165</td>
</tr>
<tr>
<td>90°</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>45°</td>
<td>BBA80CB10TT</td>
<td>BBA80CB10FF</td>
<td>16</td>
<td>130</td>
</tr>
<tr>
<td>22.5°</td>
<td>BBA80CD10TT</td>
<td>BBA80CD10FF</td>
<td>16</td>
<td>100</td>
</tr>
<tr>
<td>11.25°</td>
<td>BBA80CE10TT</td>
<td>BBA80CE10FF</td>
<td>16</td>
<td>113</td>
</tr>
<tr>
<td>90° Long radius bend</td>
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<td>BBA80CH10FF</td>
<td>16</td>
<td>380</td>
</tr>
<tr>
<td>Duckfoot</td>
<td>BBA80CF10TT</td>
<td>BBA80CF10FF</td>
<td>16</td>
<td>165</td>
</tr>
<tr>
<td>All Flange Tee</td>
<td>DN80</td>
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<td></td>
<td></td>
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<tr>
<td>All Flange Radial</td>
<td>BBA80TW1ETT</td>
<td>BBA80TW1EFF</td>
<td>16</td>
<td>545</td>
</tr>
<tr>
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Notes:
- For information on fixed flange joint sets please see page 81. Please note that our fixed flange joint sets are CESWI 7th edition compliant.
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
### Push-fit (Rapid)

<table>
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<tr>
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* Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83
  · Kameleo length at 0°

Notes:
- For information on gaskets and joint sets (Rapid, Universal and flange) please refer to ‘Section 3: Joints’ on page 67. Please note that our fixed flange joint sets are CESWI 7th edition compliant
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables
- Codes starting with ‘T’ are gasket inclusive
**Flanged (PN16 Flanges)**

The table below provides details on various flanged components, including their product codes, allowable operating pressures, key dimensions, and weights per unit (kg). Additional notes highlight that weights are provided for estimation purposes and actual values may vary from those provided in the tables.

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<tr>
<th>Description</th>
<th>Product code</th>
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**Delivered with studs, washers and nuts**

Notes:
- For information on fixed flange joint sets, please see page 81. Please note that our fixed flange joint sets are CESWI 7th edition compliant.
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
### Section 2: Product Range

#### DN150 Push-fit (Rapid)

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* Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83.
* Kameleo length at 0°.

Notes:-
- For information on gaskets and joint sets (Rapid, Universal and flange) please refer to Section 3: Joints on page 67. Please note that our fixed flange joint sets are CESWI 7th edition compliant.
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- Codes starting with 'T' are gasket inclusive.
## Flanged (PN16 Flanges)

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<tr>
<th>Description</th>
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<th>Weight Per Unit (Kg)</th>
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**Delivered with studs, washers and nuts

Notes:
- For information on fixed flange joint sets please see page 81. Please note that our fixed flange joint sets are CESWI 7th edition compliant
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables
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* Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83

Notes:
- - For information on gaskets and joint sets (Rapid, Universal and flange) please refer to Section 3: Joints on page 67. Please note that our fixed flange joint sets are CESWI 7th edition compliant
- - Weights are provided for estimation purposes only and actual values may vary from those provided in these tables
- - Codes starting with “T” are gasket inclusive
## DN200 Flanged (PN16 Flanges)

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<tr>
<th>Description</th>
<th>Product code</th>
<th>Allowable Operating Pressure (PFA) bar</th>
<th>Key dimensions</th>
<th>Weight Per Unit (Kg)</th>
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<tbody>
<tr>
<td>Water</td>
<td>Sewer</td>
<td></td>
<td>L mm</td>
<td>H mm</td>
</tr>
<tr>
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<td>BBB20MT2ATT</td>
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<td>300mm long</td>
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**Delivered with studs, washers and nuts

Notes:-
- For information on fixed flange joint sets please see page 81. Please note that our fixed flange joint sets are CESWI 7th edition compliant
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables
### Push-fit (Rapid)

#### DN250

**Adjustable flanges, for bolt lengths refer to adjustable flange datasheet ref: PAMRF03.**

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* Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83

**Notes:**
- For information on gaskets and joint sets (Rapid, Universal and flange) please refer to ‘Section 3: Joints’ on page 67. Please note that our fixed flange joint sets are CESWI 7th edition compliant
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables
- Codes starting with ‘T’ are gasket inclusive

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Section 2: Product Range

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### Flanged (PN16 Flanges)

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<tr>
<th>Description</th>
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**Delivered with studs, washers and nuts

Notes:
- For information on fixed flange joint sets please see page 81. Please note that our fixed flange joint sets are CESWI 7th edition compliant
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables
### Product Range

**Description**

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* Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83

Notes:
- For information on gaskets and joint sets (Rapid, Universal and flange) please refer to 'Section 3: Joints' on page 67. Please note that our fixed flange joint sets are CESWI 7th edition compliant.
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- Codes starting with "T" are gasket inclusive.
# Flanged (PN16 Flanges)

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**Delivered with studs, washers and nuts**

**Notes:**
- For information on fixed flange joint sets please see page 81. Please note that our fixed flange joint sets are CESWI 7th edition compliant.
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
### Section 2: Product Range

#### Push-fit (Rapid)

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* Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83

**Notes:**
- For information on gaskets and joint sets (Rapid and flange) please refer to ‘Section 3: Joints’ on page 67. Please note that our fixed flange joint sets are CESWI 7th edition compliant
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables
- Codes starting with “T” are gasket inclusive
<table>
<thead>
<tr>
<th>Description</th>
<th>Product code</th>
<th>Allowable Operating Pressure (PFA) bar</th>
<th>Key dimensions</th>
<th>Weight Per Unit (Kg)</th>
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</table>

Notes:-
- For information on fixed flange joint sets please see page 81. Please note that our fixed flange joint sets are CESWI 7th edition compliant
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables
### RAPID

#### Bend
- **90°**
  - Product Code: SSB40CA00TT
  - Pressure: 40 bar PFA
  - Water: 436 L mm
  - Weight: 141.0 kg
- **45°**
  - Product Code: SSB40CB00TT
  - Pressure: 40 bar PFA
  - Water: 189 L mm
  - Weight: 88.5 kg
- **22.5°**
  - Product Code: SSB40CD00TT
  - Pressure: 40 bar PFA
  - Water: 92 L mm
  - Weight: 68.5 kg
- **11.25°**
  - Product Code: SSB40CE00TT
  - Pressure: 40 bar PFA
  - Water: 58 L mm
  - Weight: 61.5 kg

#### Duckfoot
- Product Code: SSB40CF00TT
  - Pressure: 40 bar PFA
  - Water: 436 L mm
  - Weight: 182.0 kg

#### All Socket Tee
- **DN80**
  - Product Code: SSB40TE00TT
  - Pressure: 40 bar PFA
  - Water: 560 L mm
  - Weight: 128.0 kg
- **DN100**
  - Product Code: SSB40TE01TT
  - Pressure: 40 bar PFA
  - Water: 360 L mm
  - Weight: 86.0 kg
- **DN150**
  - Product Code: SSB40TE02TT
  - Pressure: 40 bar PFA
  - Water: 370 L mm
  - Weight: 102.5 kg
- **DN200**
  - Product Code: SSB40TE03TT
  - Pressure: 40 bar PFA
  - Water: 380 L mm
  - Weight: 107.0 kg
- **DN250**
  - Product Code: SSB40TE04TT
  - Pressure: 40 bar PFA
  - Water: 390 L mm
  - Weight: 124.5 kg
- **DN300**
  - Product Code: SSB40TE05TT
  - Pressure: 40 bar PFA
  - Water: 400 L mm
  - Weight: 136.0 kg

#### Flange on Double Socket Tee
- **DN80**
  - Product Code: SSB40UD1ETT
  - Pressure: 16 bar PFA
  - Water: 195 L mm
  - Weight: 86.5 kg
- **DN100**
  - Product Code: SSB40UD1FTT
  - Pressure: 16 bar PFA
  - Water: 195 L mm
  - Weight: 86.0 kg
- **DN150**
  - Product Code: SSB40UD1JTT
  - Pressure: 16 bar PFA
  - Water: 315 L mm
  - Weight: 102.5 kg
- **DN200**
  - Product Code: SSB40UD2KTT
  - Pressure: 16 bar PFA
  - Water: 315 L mm
  - Weight: 107.0 kg
- **DN250**
  - Product Code: SSB40UD2LTT
  - Pressure: 16 bar PFA
  - Water: 429 L mm
  - Weight: 124.5 kg
- **DN300**
  - Product Code: SSB40UD2MTT
  - Pressure: 16 bar PFA
  - Water: 429 L mm
  - Weight: 136.0 kg
- **DN400**
  - Product Code: SSB40UD2NTT
  - Pressure: 16 bar PFA
  - Water: 545 L mm
  - Weight: 168.5 kg

#### Flange on Socket Level invert tee
- **DN80**
  - Product Code: SSB40UT1ETT
  - Pressure: 16 bar PFA
  - Water: 226 L mm
  - Weight: 76.0 kg

#### Concentric Taper
- **DN250**
  - Product Code: SSB40VE0LTT
  - Pressure: 40 bar PFA
  - Water: 335 L mm
  - Weight: 65.0 kg
- **DN300**
  - Product Code: SSB40VE0MTT
  - Pressure: 40 bar PFA
  - Water: 260 L mm
  - Weight: 60.0 kg
- **DN350**
  - Product Code: SSB40VE0YTT
  - Pressure: 40 bar PFA
  - Water: 176 L mm
  - Weight: 62.0 kg

#### Double Socket Collar
- Product Code: SSB40MM00TT
  - Pressure: 40 bar PFA
  - Water: 40 L mm
  - Weight: 52.0 kg

#### Flange & Socket Piece
- Product Code: SSB40BE20TT
  - Pressure: 16 bar PFA
  - Water: 140 L mm
  - Weight: 69.0 kg

#### Flange & Spigot Piece
- Product Code: BBB40BU20TT
  - Pressure: 16 bar PFA
  - Water: 480 L mm
  - Weight: 70.0 kg

#### End Cap
- **Socket**
  - Product Code: 110064
  - Pressure: -
  - Water: -
  - Weight: 0.2 kg
- **Spigot**
  - Product Code: 110065
  - Pressure: -
  - Water: -
  - Weight: 0.2 kg

### UNIVERSAL

#### Bend
- **90°**
  - Product Code: SFB40CA00TT
  - Pressure: 40 bar PFA
  - Water: 430 L mm
  - Weight: 141.0 kg
- **45°**
  - Product Code: SFB40CB00TT
  - Pressure: 40 bar PFA
  - Water: 195 L mm
  - Weight: 109.0 kg
- **22.5°**
  - Product Code: SFB40CD00TT
  - Pressure: 40 bar PFA
  - Water: 110 L mm
  - Weight: 93.5 kg
- **11.25°**
  - Product Code: SFB40CE00TT
  - Pressure: 40 bar PFA
  - Water: 65 L mm
  - Weight: 84.5 kg

#### Flange on Double Socket Tee
- **DN80**
  - Product Code: SFB40UD1ETT
  - Pressure: 16 bar PFA
  - Water: 185 L mm
  - Weight: 85.5 kg
- **DN100**
  - Product Code: SFB40UD1FTT
  - Pressure: 16 bar PFA
  - Water: 210 L mm
  - Weight: 98.0 kg
- **DN150**
  - Product Code: SFB40UD1JTT
  - Pressure: 16 bar PFA
  - Water: 270 L mm
  - Weight: 106.5 kg
- **DN200**
  - Product Code: SFB40UD2KTT
  - Pressure: 16 bar PFA
  - Water: 325 L mm
  - Weight: 115.5 kg
- **DN250**
  - Product Code: SFB40UD2LTT
  - Pressure: 16 bar PFA
  - Water: 440 L mm
  - Weight: 138.0 kg
- **DN300**
  - Product Code: SFB40UD2MTT
  - Pressure: 16 bar PFA
  - Water: 560 L mm
  - Weight: 170.0 kg

#### Concentric Taper
- **DN300**
  - Product Code: SFB40VE0MTT
  - Pressure: 40 bar PFA
  - Water: 40 L mm
  - Weight: 86.5 kg

#### Flange & Socket Piece
- Product Code: SFB40BE20TT
  - Pressure: 16 bar PFA
  - Water: 160 L mm
  - Weight: 62.0 kg

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* Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83

**Notes:**
- For information on gaskets and joint sets (Rapid, Universal and flange) please refer to ‘Section 3: Joints’ on page 67. Please note that our fixed flange joint sets are CESWI 7th edition compliant
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables
- Codes starting with ‘T’ are gasket inclusive
### Flanged (PN16 Flanges)

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<tr>
<th>Description</th>
<th>Product code</th>
<th>Allowable Operating Pressure (PFA bar)</th>
<th>Key dimensions</th>
<th>Weight Per Unit (Kg)</th>
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</tr>
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**Notes:**
- For information on fixed flange joint sets please see page 81. Please note that our fixed flange joint sets are CESWI 7th edition compliant.
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
**Push-fit (Rapid)**

### Key Dimensions

<table>
<thead>
<tr>
<th>Description</th>
<th>Allowable Operating Pressure (PFA) bar</th>
<th>Key dimensions</th>
<th>Weight Per Unit (Kg)</th>
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<tbody>
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<td>L mm</td>
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<tr>
<td><strong>Bends</strong></td>
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*Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83*

**Notes:**
- For information on gaskets and joint sets (Rapid and flange) please refer to ‘Section 3: Joints’ on page 67. Please note that our fixed flange joint sets are CESWI 7th edition compliant.
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- Codes starting with ‘T’ are gasket inclusive.
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* Product offered with PN16 adjustable flanges. For information on joint sets please refer to page 83.

Notes:-
- For information on fixed flange joint sets please see page 81. Please note that our fixed flange joint sets are CESWI 7th edition compliant
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
### Section 2: Product Range

#### Weights

Weights are provided for estimation purposes only and actual values may vary from those provided in these tables. All our Joint sets are CESWI 7th edition compliant. For information on gaskets and joint sets (Rapid, Universal and flange) please refer to Section 3: Joints on page 67. Please note that our fixed flange joint sets are CESWI 7th edition compliant.

**Notes:**
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- Product offered with adjustable flange. For information on bolt lengths, please refer to datasheet PAMRF03.
- Flange joint sets are available to order, please contact your customer service representative.

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* Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83.

**Notes:**
- For information on gaskets and joint sets (Rapid, Universal and flange) please refer to Section 3: Joints on page 67. Please note that our fixed flange joint sets are CESWI 7th edition compliant.
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- Codes starting with ‘F’ are gasket inclusive.
## Flanged (PN16 Flanges)

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Notes:-
- For information on fixed flange joint sets please see page 81. Please note that our fixed flange joint sets are CESWI 7th edition compliant
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables
### Push-fit (Rapid)

#### RAPID

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*Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83.

**Notes:**
- For information on gaskets and joint sets (Rapid, Universal and flange) please refer to "Section 3: Joints" on page 67. Please note that our fixed flange joint sets are CESWI 7th edition compliant.
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- Codes starting with "T" are gasket inclusive.
## DN600 Flanged (PN16 Flanges)

### Description

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### Notes:

- For information on fixed flange joint sets please see page 81. Please note that our fixed flange joint sets are CESWI 7th edition compliant.
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
### Push-fit (Rapid)

**Allowable Operating Pressure (PFA) bar**

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* Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83

**Notes:**
- For information on gaskets and joint sets (Rapid, Universal and flange) please refer to ‘Section 3: Joints’ on page 67. Please note that our fixed flange joint sets are CESWI 7th edition compliant.
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- Codes starting with ‘T’ are gasket inclusive.
## Flanged (PN16 Flanges)

<table>
<thead>
<tr>
<th>Description</th>
<th>Product code</th>
<th>Allowable Operating Pressure (PFA) bar</th>
<th>Key dimensions (L mm, H mm)</th>
<th>Weight Per Unit (Kg)</th>
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* Product offered with PN16 adjustable flanges. For information on joint sets please refer to page 83.

**Notes:**
- For information on fixed flange joint sets please see page 81. Please note that our fixed flange joint sets are CESWI 7th edition compliant
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables
### Section 2: Product Range

#### DN800

**Push-fit (Rapid)**

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<td>Sewer</td>
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<td>H mm</td>
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*Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83

Notes:-
- For information on gaskets and joint sets (Rapid, Universal and flange) please refer to 'Section 3: Joints' on page 67. Please note that our fixed flange joint sets are CESWI 7th edition compliant
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables
- Codes starting with ‘T’ are gasket inclusive
## Flanged (PN16 Flanges)

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<td>H mm</td>
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* Product offered with PN16 adjustable flanges. For information on joint sets please refer to page 83

Notes:
- For information on fixed flange joint sets please see page 81. Please note that our fixed flange joint sets are CESWI 7th edition compliant
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables
# Section 2: Product Range

## DN900 Push-fit (Rapid)

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* Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83

**Notes:**
- For information on gaskets and joint sets (Rapid, Universal and flange) please refer to “Section 3: Joints’ on page 67. Please note that our fixed flange joint sets are CESWI 7th edition compliant
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables
- Codes starting with ‘T’ are gasket inclusive
## Description

<table>
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<th>Description</th>
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*Product offered with PN16 adjustable flanges. For information on joint sets please refer to page 83.

**Notes:**
- For information on fixed flange joint sets please see page 81. Please note that our fixed flange joint sets are CESWI 7th edition compliant.
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
<table>
<thead>
<tr>
<th>Description</th>
<th>Product code</th>
<th>Allowable Operating Pressure (PFA) bar</th>
<th>Key dimensions</th>
<th>Weight Per Unit (Kg)</th>
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* Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83

Notes:
- For information on gaskets and joint sets (Rapid, Universal and flange) please refer to “Section 3: Joints’ on page 67. Please note that our fixed flange joint sets are CESWI 7th edition compliant
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables
- Codes starting with "T" are gasket inclusive
### Flanged (PN16 Flanges)

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<th>Description</th>
<th>Product code</th>
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<th>Sewer</th>
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<th>Key dimensions</th>
<th>Weight Per Unit (Kg)</th>
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- Product offered with PN16 adjustable flanges. For information on joint sets please refer to page 83
- For information on fixed flange joint sets please see page 81. Please note that our fixed flange joint sets are CESWI 7th edition compliant
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables
### Push-fit (Rapid)

<table>
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* Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83

Notes:-
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### Product Code and Dimensions

<table>
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<th>Weight Per Unit (Kg)</th>
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*Product offered with PN16 adjustable flanges. For information on joint sets please refer to page 83*

**Notes:**
- For information on fixed flange joint sets please see page 81. Please note that our fixed flange joint sets are CESWI 7th edition compliant
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables
<table>
<thead>
<tr>
<th>Description</th>
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* Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83.

Notes:-
- For information on gaskets and joint sets (Rapid and flange) please refer to “Section 3: Joints” on page 67. Please note that our fixed flange joint sets are CESWI 7th edition compliant.
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### Flanged (PN16 Flanges)

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**Notes:**
- For information on fixed flange joint sets please see page 81. Please note that our fixed flange joint sets are CESWI 7th edition compliant.
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### Push-fit (Rapid)

#### Key Dimensions

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*Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83.*

**Notes:**
- For information on gaskets and joint sets (Rapid and flange) please refer to ‘Section 3: Joints’ on page 67. Please note that our fixed flange joint sets are CESWI 7th edition compliant.
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# Flanged (PN16 Flanges)

<table>
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* Product offered with PN16 adjustable flanges. For information on joint sets please refer to page 83

Notes:-
- For information on fixed flange joint sets please see page 81. Please note that our fixed flange joint sets are CESWI 7th edition compliant
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### Push-fit (Rapid)

<table>
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<tr>
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<td>H mm</td>
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* Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83

Notes:
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**Notes:**
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### Push-fit (Rapid)

<table>
<thead>
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* Product offered with PN16 adjustable flange. For information on joint sets please refer to page 83

Notes:
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<td>BBC20CE20TT</td>
<td>BBC20CE20FF</td>
<td>16</td>
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</tr>
<tr>
<td>All Flange Tee</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DN1000</td>
<td>BBC20TE2VTT</td>
<td>BBC20TE2VFF</td>
<td>16</td>
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</tr>
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<td>DN1400</td>
<td>BBC20TE2CTT</td>
<td>BBC20TE2CFF</td>
<td>16</td>
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<tr>
<td>Concentric Taper</td>
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<td>BBC20VE2BFF</td>
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<td>1825</td>
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<tr>
<td>DN1400</td>
<td>BBC20VE2CTT</td>
<td>BBC20VE2CFF</td>
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<td>BBC20VE2EFF</td>
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<td>BBC20VE2FTT</td>
<td>BBC20VE2FFF</td>
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<td>1030</td>
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<td>Blank Flange</td>
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<tr>
<td></td>
<td>BBC20QN20TT</td>
<td>BBC20QN20FF</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- For information on fixed flange joint sets please see page 81. Please note that our fixed flange joint sets are CESWI 7th edition compliant.
- Weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
Saint-Gobain PAM UK offers a comprehensive range of valves and accessories for the water and sewerage industry. Our valves range includes:

- Gate valves, resilient and metal faced DN50-300
- Non return valves DN80-300
- Flap valves DN80-600
- Air valves
- Fire Hydrants
- Butterfly valves

Our range of adaptors and couplings offer sustainable solutions to pipeline connections. They are available as standard products or as part of specifically engineered packages to suit customer requirements. Our range includes:

- Wide tolerance couplings and flange adaptors (50-300mm)
- Dedicated couplings and flange adaptors (350-1200mm)
- Dismantling joints (50-1200mm)
- Flexlock couplings and flange adaptors
- Repair clamps
Section 3

Joints
Jointing Systems

Saint-Gobain PAM UK’s pipes and fittings are available with a range of jointing systems to suit a range of applications or installation needs. Cost effective alternatives to the use of thrust blocks are available using either Rapid anchor gaskets, Rapid mechanical or the Universal joint.

Table 4: Overview

Table 5: Pressure capabilities

Table 6: Pressure capabilities overview

<table>
<thead>
<tr>
<th>Diameter Band</th>
<th>Joint offer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-anchored</td>
</tr>
<tr>
<td></td>
<td>Blutop</td>
</tr>
<tr>
<td></td>
<td>Unanchored</td>
</tr>
<tr>
<td>UTI DN600</td>
<td>64 - 62*</td>
</tr>
<tr>
<td>DN700-1200</td>
<td>50 - 40*</td>
</tr>
<tr>
<td>DN1400-2000</td>
<td>34 - 32</td>
</tr>
<tr>
<td>DN150</td>
<td>64 - 62*</td>
</tr>
<tr>
<td>DN200-400</td>
<td>50 - 40*</td>
</tr>
<tr>
<td>DN250</td>
<td>28 - 26</td>
</tr>
<tr>
<td>DN300</td>
<td>28 - 26</td>
</tr>
<tr>
<td>DN350</td>
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<tr>
<td>DN400</td>
<td>25 - 16</td>
</tr>
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<td>DN450</td>
<td>25 - 16</td>
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<tr>
<td>DN500</td>
<td>25 - 16</td>
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<td>DN600</td>
<td>25 - 16</td>
</tr>
<tr>
<td>DN700</td>
<td>25 - 16</td>
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<tr>
<td>DN800 - 1000</td>
<td>25 - 16</td>
</tr>
<tr>
<td>DN1200</td>
<td>25 - 16</td>
</tr>
<tr>
<td>DN1400 - 2000</td>
<td>25 - 16</td>
</tr>
</tbody>
</table>

* Except DN2000. Please enquire

Blutop Joint (non-anchored)

The Blutop Joint is a push-fit joint to be used with Saint-Gobain PAM UK’s Blutop range of products. Suitable for drinking water networks for sizes DN/OD75-160. It has been designed to last more than 100 years.

Blutop Joints are compatible with PVC pipe conforming to EN 1452 or with HDPE pipe conforming to EN 12201, i.e PVC and HDPE spigots conforming to the mentioned standards can be inserted into Blutop pipe. Please note that Blutop pipe spigots must not be fitted into sockets designed for other joints (plastic, or other cast iron parts).

How does it work?

The seal is achieved by the compression of the main body of the elastomeric gasket. As the pressure in the main increases, the ‘concave’ design of the gasket ensures that the seal tightens proportionally to the pressure.
Rapid Joint

The Rapid joint is the standard joint for both potable water and sewerage application for all sizes from DN80-2000. The introduction of internally and externally harmonised sockets for all Saint-Gobain PAM UK’s pipes and fittings offers substantial benefits to customers in the UK and world-wide. Harmonisation of sockets means that just one joint can be used for both potable water and sewer products, with easy identification of gaskets to ensure correct installation. The Rapid joint is a proven system and has been used successfully and extensively throughout Europe and the rest of the World for over 50 years.

How it works:

The seal is achieved by the compression of the main body of the elastomeric gasket. As the internal pressure increases, the ‘fish-tail’ design of the gasket ensures that the seal tightens proportionally to the pressure.

Benefits:
- Quick to install and dismantle
- Capable of angular deflection and longitudinal withdrawal with no loss of performance
- Provides opportunity to reduce the number of fittings
- Flexible joint to cope with ground movement
- Easy identification of gaskets for water or sewerage
- One joint whatever the application

Table 7: Blutop pipe, non-anchored gasket

<table>
<thead>
<tr>
<th>DN/OD</th>
<th>Pipe Class</th>
<th>Allowable Operating Pressure (PFA)</th>
<th>Allowable Deflection (Degree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>C25</td>
<td>25</td>
<td>6</td>
</tr>
<tr>
<td>90</td>
<td>C25</td>
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<td>110</td>
<td>C25</td>
<td>25</td>
<td>6</td>
</tr>
<tr>
<td>125</td>
<td>C25</td>
<td>25</td>
<td>6</td>
</tr>
<tr>
<td>160</td>
<td>C25</td>
<td>25</td>
<td>6</td>
</tr>
</tbody>
</table>

Note:
Allowable test pressure (PEA) and allowable maximum operating pressure (PMA) can easily be calculate for the above pipes by using the following formulas:
PMA = PFA x 1.2
PEA = PMA + 5 bar
Tables 6 & 7 give additional information regarding the joint specification and dimensions.

Table 6: Water pipe: (EPDM gasket)

Note: Pipe length and weight may vary from the detail provided in these tables. Allowable negative internal pressure DN60-2000 is -1 bar, allowable external pressure is +3 bar.

<table>
<thead>
<tr>
<th>DN</th>
<th>Pipe Class</th>
<th>Pressure Rating (bar)</th>
<th>Pipe Length (mm)</th>
<th>Allowable Operating Pressure (PFA)</th>
<th>Allowable Deflection (Degree)</th>
<th>Rapid Gasket Water (EPDM)</th>
<th>Prod Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>C40</td>
<td>64</td>
<td>82</td>
<td>5</td>
<td>6000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>C40</td>
<td>64</td>
<td>82</td>
<td>5</td>
<td>5500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>C40</td>
<td>64</td>
<td>82</td>
<td>5</td>
<td>5500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>C40</td>
<td>64</td>
<td>82</td>
<td>5</td>
<td>5500</td>
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</tr>
<tr>
<td>200</td>
<td>C40</td>
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<td>82</td>
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<td>6000</td>
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<td></td>
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<tr>
<td>250</td>
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<td>64</td>
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<td>5</td>
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<td>C40</td>
<td>64</td>
<td>82</td>
<td>5</td>
<td>5500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>350</td>
<td>C30</td>
<td>60</td>
<td>82</td>
<td>4</td>
<td>5500</td>
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<tr>
<td>400</td>
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<td>C30</td>
<td>60</td>
<td>82</td>
<td>4</td>
<td>5500</td>
<td></td>
<td></td>
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<tr>
<td>500</td>
<td>C30</td>
<td>60</td>
<td>82</td>
<td>4</td>
<td>5500</td>
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<tr>
<td>600</td>
<td>C30</td>
<td>60</td>
<td>82</td>
<td>4</td>
<td>5500</td>
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<tr>
<td>700</td>
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<tr>
<td>900</td>
<td>C25/C30**</td>
<td>25/30</td>
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<td>JSB90BA</td>
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<td>C25*/C30**</td>
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<td>JS10BA</td>
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<td></td>
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<td>JSC12BA</td>
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<td></td>
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<tr>
<td>1400</td>
<td>C25</td>
<td>25</td>
<td>82</td>
<td>3</td>
<td>JSC14BA</td>
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<td></td>
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<tr>
<td>1600</td>
<td>C25</td>
<td>25</td>
<td>82</td>
<td>3</td>
<td>JSC16BA</td>
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<td></td>
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<tr>
<td>1800</td>
<td>C25</td>
<td>25</td>
<td>82</td>
<td>2.5</td>
<td>JSC18BA</td>
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<td></td>
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<tr>
<td>2000</td>
<td>C25</td>
<td>25</td>
<td>82</td>
<td>2</td>
<td>JSC20BA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Preferred option

Notes:
- For information on product codes, weights and lengths for water pipe please refer to table 1 & 2 on page 15
- Allowable negative internal pressure DN80-DN2000 is -0.9 bar, allowable external pressure is +5 bar
- Allowable test pressure (PEA) and allowable maximum operating pressure (PMA) can easily be calculated for the above pipes by using the following formulas:
  PMA = PFA x 1.2
  PEA = PMA + 5 bar

Tables 8 & 9 give additional information regarding the joint specification and dimensions.

Table 8: Water pipe (EPDM gasket)
Table 9: Sewer Pipe (Nitrile gasket)

<table>
<thead>
<tr>
<th>DN</th>
<th>Allowable Operating Pressure (PFA)</th>
<th>Allowable Deflection (Degree)</th>
<th>Rapid Gasket Sewer (Nitrile) Prod Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>40</td>
<td>5</td>
<td>JSA80BB</td>
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<tr>
<td>100</td>
<td>40</td>
<td>5</td>
<td>JSB10BB</td>
</tr>
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<td>150</td>
<td>40</td>
<td>5</td>
<td>JSB15BB</td>
</tr>
<tr>
<td>200</td>
<td>40</td>
<td>5</td>
<td>JSB20BB</td>
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<td>38</td>
<td>5</td>
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<td>300</td>
<td>35</td>
<td>5</td>
<td>JSB30BB</td>
</tr>
<tr>
<td>350</td>
<td>32</td>
<td>4</td>
<td>JSB35BB</td>
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<td>3</td>
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</tr>
<tr>
<td>2000</td>
<td>26</td>
<td>2</td>
<td>JSC20BB</td>
</tr>
</tbody>
</table>

Notes: -
- For information on product codes, weights and lengths for sewer pipe please refer to table 3 on page 16
- Allowable negative internal pressure DN80-DN2000 is -0.9 bar, allowable external pressure is +5 bar
- Allowable test pressure (PEA) and allowable maximum operating pressure (PMA) can easily be calculated for the above pipes by using the following formulas:
  \[ \text{PMA} = \text{PFA} \times 1.2 \]
  \[ \text{PEA} = \text{PMA} + 5 \text{ bar} \]
Why do pipelines need anchoring?

Pressure pipelines are subject to forces at changes of direction, blank ends, valves, tapers etc. At these points restraint is required to avoid joint separation.

Saint-Gobain PAM UK offers a wide range of cost effective self anchoring solutions for such situations. These solutions eliminate the need for thrust blocks so pipelines can be installed in areas where space is limited or in unstable ground conditions where thrust blocks are not an option.

Vi Joint

The Vi Joint is a push-fit joint to be used with Saint-Gobain PAM UK’s Vi range of products. Suitable for drinking water networks for sizes OD75-160. It has been designed to last more than 100 years.

The Vi Joint is an alternative to those situations where the use of thrust blocks are available using either Rapid anchor gaskets, Rapid mechanical systems or the Universal joint.

How it works:

When the joint is under pressure the teeth grip the pipe spigot and prevent separation of the joint, making this a self-restrained joint. The Vi gasket can only be used once, although the joint can be re-made using a new gasket.

Benefits:
- Ease of laying
  - Quick push fit joint with low insertion forces
  - Fittings designed with handles for easy of insertion
- Angular deflection of up to 6 degrees
  - Enables long bends without the use of fittings
  - Additional safety against the hazards of earth and trench movements
- Low cost, high performance pipeline anchorage
- Eliminates the need for thrust blocks at changes in direction

Table 10: Blutop pipe, Vi gasket

<table>
<thead>
<tr>
<th>DN/OD</th>
<th>Pipe Class</th>
<th>Allowable Operating Pressure (PFA)</th>
<th>Allowable Deflection (Degree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>C25</td>
<td>16</td>
<td>6</td>
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<tr>
<td>90</td>
<td>C25</td>
<td>16</td>
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<tr>
<td>110</td>
<td>C25</td>
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<td>125</td>
<td>C25</td>
<td>16</td>
<td>6</td>
</tr>
<tr>
<td>160</td>
<td>C25</td>
<td>16</td>
<td>6</td>
</tr>
</tbody>
</table>

Note:
Allowable test pressure (PEA) and allowable maximum operating pressure (PMA) can easily be calculated for the above pipes by using the following formulas:

PMA = PFA x 1.2
PEA = PMA + 5 bar
The Rapid Vi joint uses the same socket as the non-anchored version. The gasket features stainless steel teeth moulded into the rubber.

**How it works:**

When the joint is under pressure the teeth grip the pipe spigot and prevent separation of the joint. Rapid Vi gaskets can only be used once, although the joint can be remade using a new gasket.

**Benefits:**

- Low cost, high performance pipeline anchorage
- Quick and easy to install
- Eliminates the need for thrust blocks at changes in direction
- DN80-600
- Proven solution over many years
- Ideal for unstable ground or where space is limited

To determine the number of anchored joints required please contact Technical Sales Department, Tel: 0115 930 0700 or use PipeSpec. For guidance on how to install Rapid Vi gaskets, please request our Installation Guide. This is available to download from our website, www.saint-gobain-pam.co.uk or call our Brochure Hotline, Tel: 0800 028 2134.

Rapid Vi Joint utilises EPDM gaskets. EPDM may not be suitable for all sewerage applications, please consult Technical Sales Department for information, Tel: 0115 930 0700.

Note: Rapid Vi Gaskets are not colour coded.

**Rapid Vi Joint Specification**

Tables 11 to 13 give additional information regarding the joint specification.

**Table 11: Water pipe (Natural, System CL or System XL) - Rapid Vi joint, EPDM anchor gasket**

<table>
<thead>
<tr>
<th>DN</th>
<th>Pipe Class</th>
<th>Allowable Operating Pressure (PFA)</th>
<th>Allowable Deflection (Degree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>C40</td>
<td>22</td>
<td>5</td>
</tr>
<tr>
<td>100</td>
<td>C40</td>
<td>16</td>
<td>5</td>
</tr>
<tr>
<td>150</td>
<td>C40</td>
<td>16</td>
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</tr>
<tr>
<td>200</td>
<td>C40</td>
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<tr>
<td>600</td>
<td>C30</td>
<td>10</td>
<td>2</td>
</tr>
</tbody>
</table>

**Note:**
- For information on product codes, weights and lengths for both system CL or system XL, please refer to tables 1 & 2 on page 15
- Allowable test pressure (PEA) and allowable maximum operating pressure (PMA) for the above pipes can easily be calculated by using the following formulas:
  - PMA = PFA x 1.2
  - PEA = PMA + 5 bar
Rapid Anchor Joint Specification

Tables 8, 9 & 10 give additional information regarding the joint specification.

Table 8: Rapid (EPDM Gasket) Water Pipe, C40

Table 9: Rapid Anchor (EPDM Gasket) Water Pipe, K9

Following the introduction of the new BS EN 545, Saint-Gobain PAM UK are introducing C30 pipe in 2010. The Rapid Anchor Joint will be available for C30 pipes.

### Table 12: Push-fit Anchor Gaskets (Rapid Vi) - EPDM

<table>
<thead>
<tr>
<th>DN</th>
<th>Product Code</th>
</tr>
</thead>
<tbody>
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<td>JSA80CA</td>
</tr>
<tr>
<td>100</td>
<td>JSB10CA</td>
</tr>
<tr>
<td>150</td>
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</table>

*New anchor gasket developed by Saint-Gobain

### Table 13: Sewer pipe-Rapid Vi joint, EPDM anchor gasket

<table>
<thead>
<tr>
<th>DN</th>
<th>Allowable Operating Pressure (PFA)</th>
<th>Allowable Deflection (Degree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>16</td>
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<tr>
<td>100</td>
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<td>600</td>
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<td>2</td>
</tr>
</tbody>
</table>

Notes:
- Rapid anchor gaskets are manufactured from EPDM rubber for further information on gaskets please refer to table 12
- For information on product codes, weights and lengths please refer to table 3 on page 16
- Allowable test pressure (PEA) and allowable maximum operating pressure (PMA) for the above pipes can easily be calculated by using the following formulas:
  - PMA = PFA x 1.2
  - PEA = PMA + 5 bar

Nitrile anchor gaskets are currently being developed by Saint-Gobain PAM UK and are expected to be available in 2012. The above table will be updated accordingly in due course.
Section 3: Joints

Universal Joint

For very demanding applications such as trenchless installation or for restrained requirements under high pressures Saint-Gobain PAM UK recommends the Universal Joint. The Universal joint offers boltless restraint solutions featuring a double chambered socket design. The Universal joint uses the same sealing socket and gasket as the Rapid joint, with a second chamber providing anchorage using either an anchored gasket or a weld bead and locking ring.

Universal Rapid Vi Joint

The Universal Rapid Vi joint is available in DN80-600. Universal Rapid Vi operates up to a pressure of 60 bar depending on diameter. There is no need for a weld bead on the pipe spigot.

How it works:

Anchorage is provided by the use of a separate Universal anchoring gasket with moulded-in stainless steel teeth to grip the pipe spigot to avoid joint separation.

Benefits:
- Boltless anchoring solution
- Simple push-fit joint with separate anchoring gasket
- Up to 60 bar working pressure

Universal Rapid Vi Joint Specification:

Tables 14 & 15 provide additional information regarding the joint performance.

Table 14: Universal Rapid Vi, water

<table>
<thead>
<tr>
<th>DN</th>
<th>Prod Code Pipe</th>
<th>Pipe Class</th>
<th>Allowable Operating Pressure (PFA)</th>
<th>Allowable Deflection (Degree)</th>
<th>Pipe Length (mm)</th>
<th>Spigot OD (ØDE)</th>
<th>Socket OD (ØDE)</th>
<th>Pipe Weight (Kg/m)</th>
<th>Prod Code Universal Anchoring Gasket</th>
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</thead>
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<td>JNB60CA</td>
</tr>
</tbody>
</table>

Notes:
- Lengths and weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- For information on Rapid gaskets water please refer to page 70.
- Allowable test pressure (PEA) and allowable maximum operating pressure (PMA) for the above pipes can easily be calculated by using the following formulas:
  PMA = PFA x 1.2
  PEA = PMA + 5 bar
- Limited range of Universal fittings available for DN350 and DN450. Please contact our Technical Sales Department for further details, Tel. 0115 930 0700.
Table 15: Universal Rapid Vi, Sewer

<table>
<thead>
<tr>
<th>DN</th>
<th>Prod Code Pipe</th>
<th>Allowable Operating Pressure (PFA)</th>
<th>Allowable Deflection (Degree)</th>
<th>Pipe Length (mm)</th>
<th>Spigot OD mm (ØDE)</th>
<th>Socket OD mm (ØDE)</th>
<th>Pipe Weight (Kg/m)</th>
<th>Prod Code Universal Anchoring Gasket</th>
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<tr>
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<td>5970</td>
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<td>230</td>
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<tr>
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</table>

Notes:
- Lengths and weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- For information on Rapid gaskets sewer please refer to page 71.
- Allowable test pressure (PEA) and allowable maximum operating pressure (PMA) for the above pipes can easily be calculated by using the following formulas:
  \[ PMA = PFA \times 1.2 \]
  \[ PEA = PMA + 5 \text{ bar} \]
- Limited range of Universal fittings available for DN350 and DN450. Please contact our Technical Sales Department for further details, Tel: 0115 930 0700.

Universal Rapid Ve Joint

The Universal Rapid Ve joint is available in DN100 - 1200. The joint is capable of operating pressure of up to 64 bar (depending on diameter) and is the joint used on PAM Directional pipes.

How it works:

Anchorage is provided by a locking ring which abuts a weld bead on the pipe spigot to prevent joint separation.

Benefits:
- Boltless anchoring system
- Up to 64 bar working pressure
- Used on PAM Directional pipe
- Up to 3° angular deflection
- Can be used in trenchless applications
Table 16: Universal Rapid Ve, water

<table>
<thead>
<tr>
<th>DN</th>
<th>Prod Code Pipe</th>
<th>Pipe Class</th>
<th>Allowable Operating Pressure (PFA)</th>
<th>Allowable Deflection (Degree)</th>
<th>Pipe Length (mm)</th>
<th>Spigot OD mm (ØDE)</th>
<th>Socket OD mm (ØDE)</th>
<th>Weight (Kg/m)</th>
<th>Prod code Universal Locking Ring</th>
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Notes: -
- Lengths and weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- For information on Rapid gaskets water please refer to page 70.

Table 17: Universal Rapid Ve, sewer

<table>
<thead>
<tr>
<th>DN</th>
<th>Prod Code</th>
<th>Allowable Operating Pressure (PFA)</th>
<th>Allowable Deflection (Degree)</th>
<th>Pipe Length (mm)</th>
<th>Spigot OD mm (ØDE)</th>
<th>Socket OD mm (ØB)</th>
<th>Weight (Kg/m)</th>
<th>Prod code Universal Locking Ring</th>
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<td>863</td>
<td>228.5</td>
<td>110671</td>
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</tbody>
</table>

Notes: -
- Lengths and weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- For information on Rapid gaskets water please refer to page 70.
- For information on DN800 - 1200 please contact our Technical Department.
- Allowable test pressure (PEA) and allowable maximum operating pressure (PMA) for the above pipes can easily be calculated by using the following formulas:
  \[ PMA = PFA \times 1.2 \]
  \[ PEA = PMA + 5 \text{ bar} \]
The PAMLOCK joint is used on pipes and fittings DN1400-2000 where self restrained joints are required.

**How it works:**

Anchorage is provided by the addition of a weld bead onto the pipe spigot, and a segmented locking ring which abuts the weld bead and a conformator which restricts the diameter of the socket mouth and is held in place by two locking clamps. The conformator is filled with steel shot to complete the joint.

**Benefits:**

- Boltless anchoring system
- Up to 25 Bar working pressure

**PAMLOCK Joint Specification**

Table 18 provides additional information regarding joint performance.

### Table 18: PAMLOCK

<table>
<thead>
<tr>
<th>DN</th>
<th>Prod code</th>
<th>Pipe Class</th>
<th>Allowable Operating Pressure (PFA)</th>
<th>Allowable Deflection (Degree)</th>
<th>Pipe Length (mm)</th>
<th>Spigot OD mm (ØDE)</th>
<th>Socket OD mm (ØDE)</th>
<th>Weight (Kg/m)</th>
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Notes:-

- Lengths and weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- Allowable test pressure (PEA) and allowable maximum operating pressure (PMA) for the above pipes can easily be calculated by using the following formulas:
  - \( PMA = PFA \times 1.2 \)
  - \( PEA = PMA + 5 \text{ bar} \)
Rapid Ve (Mechanical) Joint

The Rapid Ve joint utilises the same socket and gasket as the Rapid push-fit version.

How it works:

Anchorage is provided by the addition of the Rapid mechanical anchor kit which comprises:
1. Factory-applied weld bead on the pipe spigot. Where pipes have been cut, the bead can also be welded on site, please refer to the Installation Guide.
2. A locking ring (single piece DN80-700, segmented DN800-1200) which abuts the weld bead.
3. A bolted gland which tightens against the pipe socket using hook bolts and retains the locking ring.

Benefits:
- Provision for anchorage whilst maintaining flexibility
- Eliminates need for thrusts blocks
- Ideal for unstable ground or where space is limited
- Suitable for higher pressure mains
- Weld bead can be applied on site
- Requires a minimal number of fittings compared to other ductile iron anchor solutions

Note:-
Please refer to the Installation Guide for required equipment.

Rapid Ve Joint Specification

Tables 19 & 20 provide additional information regarding the joint specification and dimensions.

Table 19: Rapid Ve (Mechanical) water pipe

<table>
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<tr>
<th>DN</th>
<th>Prod code</th>
<th>Pipe Class</th>
<th>Allowable Operating Pressure (PFA)</th>
<th>Allowable Deflection (Degree)</th>
<th>External Diameter (OD)</th>
<th>Pipe Length (mm)</th>
<th>Weight (Kg/m)</th>
<th>Bolts</th>
</tr>
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<tbody>
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<td>NQB35G60</td>
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Notes:
- Lengths and weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- For anchoring solutions DN80-DN300 please refer to Universal joint or enquire.
- Allowable test pressure (PEA) and allowable maximum operating pressure (PMA) for the above pipes can easily be calculated by using the following formulas:
  \[ PMA = PFA \times 1.2 \]
  \[ PEA = PMA + 5 \text{ bar} \]
Table 20: Rapid Ve (Mechanical) sewer pipe

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<th>External Diameter (OD)</th>
<th>Weight (Kg/m)</th>
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Notes:–
- Lengths and weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- For anchoring solutions DN80-DN100 please refer to Universal joint or enquire.
- Allowable test pressure (PEA) and allowable maximum operating pressure (PMA) for the above pipes can easily be calculated by using the following formulas:
PMA = PFA x 1.2
PEA = PMA + 5 bar
Flanged joints are rigid and are typically used in above ground applications. Due to the risk of excessive bending moments being imposed it is recommended that flanged pipework is **NOT** buried. In certain situations it may be necessary to bury flange pipework, please contact Technical Sales Department for advice, Tel: 0115 930 0700.

**Benefits:**
- Strength of DI supports external bending moment making it ideally suited for above ground applications
- High beam strength accommodates spans up to 16m
- No risk of performance loss through UV degradation
- Wide range of flanges available in PN10-PN40.

**Fixed Flange Joint Sets:**
Joint sets are available to order for use with fixed flanges, these sets contain all components required for fixed flanged joints.
- Full face gasket 80° IRHD hardness
- Mild steel (grade 4.6) bolts, nuts and washers rilsan coated to water industry specification WIS 4-52-03

EPDM gaskets are supplied for use in potable water applications and Nitrile gaskets for sewerage applications.

**All PN16 fixed flange joint sets supplied by Saint-Gobain as standard comply with the Civil Engineering Specification for the Water Industry (CESWI) 7th edition.**
Table 21: Fixed flanges PN16

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<th>b</th>
<th>Bolt Hole Details</th>
<th>Bolt size</th>
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<td>Water</td>
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*Bolt length will be calculated on a project by project basis.

Note: PN10 & 40 available on request

Table 22: Fixed flanges PN25

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<th>Bolt size</th>
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<td>500</td>
<td>730</td>
<td>609</td>
<td>36.5</td>
<td>32.5</td>
<td>660 20 37 M33</td>
<td>130</td>
</tr>
<tr>
<td>600</td>
<td>845</td>
<td>720</td>
<td>42.0</td>
<td>37.0</td>
<td>770 20 40 M36</td>
<td>145</td>
</tr>
<tr>
<td>700</td>
<td>960</td>
<td>820</td>
<td>46.5</td>
<td>41.5</td>
<td>875 24 43 M39</td>
<td>160</td>
</tr>
<tr>
<td>800</td>
<td>1085</td>
<td>928</td>
<td>51.0</td>
<td>46.0</td>
<td>990 24 49 M45</td>
<td>170</td>
</tr>
<tr>
<td>900</td>
<td>1185</td>
<td>1028</td>
<td>55.5</td>
<td>50.5</td>
<td>1090 28 49 M45</td>
<td>180</td>
</tr>
<tr>
<td>1000</td>
<td>1320</td>
<td>1140</td>
<td>60.0</td>
<td>55.0</td>
<td>1210 28 56 M52</td>
<td>205</td>
</tr>
<tr>
<td>1200</td>
<td>1530</td>
<td>1350</td>
<td>69.0</td>
<td>64.0</td>
<td>1420 32 56 M52</td>
<td>220</td>
</tr>
<tr>
<td>1400</td>
<td>1755</td>
<td>1560</td>
<td>74.0</td>
<td>69.0</td>
<td>1640 36 62 M56</td>
<td>Enquire*</td>
</tr>
<tr>
<td>1600</td>
<td>1975</td>
<td>1780</td>
<td>81.0</td>
<td>76.0</td>
<td>1860 40 62 M56</td>
<td>Enquire*</td>
</tr>
<tr>
<td>1800</td>
<td>2195</td>
<td>1985</td>
<td>88.0</td>
<td>83.0</td>
<td>2070 44 70 M64</td>
<td>Enquire*</td>
</tr>
<tr>
<td>2000</td>
<td>2425</td>
<td>2210</td>
<td>95.0</td>
<td>90.0</td>
<td>2300 48 70 M64</td>
<td>Enquire*</td>
</tr>
</tbody>
</table>

*Bolt length will be calculated on a project by project basis.

Saint-Gobain PAM UK supplies fixed flange joint sets with full face EPDM/Nitrile gasket and bolts (as per above lengths), nuts and two washers per bolt as standard. These joint sets are CESWI 7th edition compliant.

Tables 21 & 22 provide additional information regarding fixed flange joint dimensions.
Saint-Gobain PAM UK is able to offer adjustable flanges on a range of fittings in DN80-600. On a selected number of flanged fittings Saint-Gobain PAM UK will provide adjustable flanges as the standard product range. Please refer to the product range section for details.

Adjustable flanges have been used for over 25 years in Europe. Adjustable flanges facilitate flange assembly by allowing the loose flange to be rotated and positioned to align bolt holes. Saint-Gobain PAM UK can also offer an additional range of flange fittings with adjustable flanges, please contact Technical Sales department for further information, Tel: 0115 930 0700.

The key benefits offered by adjustable flanges are time & effort saved on site, particularly above ground or in pumping stations/treatment works.

- Adjustable for easy alignment if flanges are off-set
- Able to quickly change flange to higher/lower rating

Joint sets are available to order for use with adjustable flanges, these sets contain all components required for adjustable flanged joints.

- Metal insert gasket
- Mild steel bolts, nuts and washers

Note: Adjustable flanges utilise different bolt lengths to fixed flanges. Please refer to adjustable data sheet for bolt lengths; ref: PAMRF03. This is available from www.saint-gobain-pam.co.uk.

<table>
<thead>
<tr>
<th>DN</th>
<th>D</th>
<th>g</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>Bolt No.</th>
<th>Bolt size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dia</td>
<td>Length (mm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>200</td>
<td>132</td>
<td>23.0</td>
<td>20.0</td>
<td>3</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>100</td>
<td>220</td>
<td>156</td>
<td>23.0</td>
<td>20.0</td>
<td>3</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>150</td>
<td>285</td>
<td>211</td>
<td>26.0</td>
<td>23.0</td>
<td>3</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>200</td>
<td>340</td>
<td>266</td>
<td>29.0</td>
<td>26.0</td>
<td>3</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>250</td>
<td>400</td>
<td>319</td>
<td>32.0</td>
<td>29.0</td>
<td>3</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>300</td>
<td>455</td>
<td>370</td>
<td>36.0</td>
<td>32.0</td>
<td>4</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>350</td>
<td>520</td>
<td>429</td>
<td>39.0</td>
<td>35.0</td>
<td>4</td>
<td>16</td>
<td>24</td>
</tr>
<tr>
<td>400</td>
<td>580</td>
<td>480</td>
<td>42.0</td>
<td>38.0</td>
<td>4</td>
<td>16</td>
<td>27</td>
</tr>
<tr>
<td>450</td>
<td>640</td>
<td>527</td>
<td>45.0</td>
<td>41.0</td>
<td>4</td>
<td>20</td>
<td>27</td>
</tr>
<tr>
<td>500</td>
<td>715</td>
<td>582</td>
<td>48.0</td>
<td>44.0</td>
<td>4</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>600</td>
<td>840</td>
<td>682</td>
<td>55.0</td>
<td>50.0</td>
<td>5</td>
<td>20</td>
<td>33</td>
</tr>
</tbody>
</table>

Table 23: Adjustable Flanges dimensions
### Table 24: Adjustable flanges joint sets

<table>
<thead>
<tr>
<th>DN</th>
<th>WATER</th>
<th>SEWER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kit reference (incl. gasket, bolts, nuts and washers)</td>
<td>Gasket</td>
</tr>
<tr>
<td>80</td>
<td>JBA80KV1</td>
<td>JBA80GW1</td>
</tr>
<tr>
<td>100</td>
<td>JBB10KV1</td>
<td>JBB10GW1</td>
</tr>
<tr>
<td>150</td>
<td>JBB15KV1</td>
<td>JBB15GW1</td>
</tr>
<tr>
<td>200</td>
<td>JBB20KV2</td>
<td>JBB20GW1</td>
</tr>
<tr>
<td>250</td>
<td>JBB25KV2</td>
<td>JBB25GW1</td>
</tr>
<tr>
<td>300</td>
<td>JBB30KV2</td>
<td>JBB30GW1</td>
</tr>
<tr>
<td>350</td>
<td>JBB35GV1</td>
<td>JXM24BM130</td>
</tr>
<tr>
<td>400</td>
<td>JBB40GV1</td>
<td>JXM27BM150</td>
</tr>
<tr>
<td>450</td>
<td>JBB45GV1</td>
<td>JXM27BM130</td>
</tr>
<tr>
<td>500</td>
<td>JBB50GV1</td>
<td>JXM30BM160</td>
</tr>
<tr>
<td>600</td>
<td>JBB60GV1</td>
<td>JXM33BM180</td>
</tr>
</tbody>
</table>

- Metal insert gasket
- Mild steel bolts, nuts and washers

Note: Adjustable flanges utilise different bolt lengths to fixed flanges. Please refer to adjustable data sheet for bolt lengths; ref: PAMRF03. This is available from www.saint-gobain-pam.co.uk.
Saint-Gobain PAM UK is highly experienced in providing high performance and fit-for-purpose linings for use with both potable water and sewage. All linings used by Saint-Gobain PAM UK conform to the requirements of the latest versions of BS EN 545 for use with potable water. Sewage linings conform to BS EN 598.

The standard linings offered by Saint-Gobain PAM UK are suitable for virtually all water and sewer applications within the UK. However, Saint-Gobain PAM UK has access to a wide range of specific solutions to suit even the most demanding requirements.

### Table 25: Matrix of pipe linings offered by Saint Gobain PAM UK

<table>
<thead>
<tr>
<th>Product Range</th>
<th>Dia Range</th>
<th>Ductan</th>
<th>System CL</th>
<th>System XL</th>
<th>HAC</th>
<th>pH1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Pipe</td>
<td>OD75-OD160</td>
<td>Standard (Blutop)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DN80-DN800</td>
<td>Standard (Natural)</td>
<td>Standard (Natural)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DN900-DN2000</td>
<td>Standard (Classic)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sewerage Pipe</td>
<td>Uti DN800</td>
<td></td>
<td>Standard (Integral)</td>
<td>Standard (Integral)</td>
<td>Special Request (Integral)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DN900-DN2000</td>
<td></td>
<td>Standard (Integral)</td>
<td></td>
<td>Special Request (Integral)</td>
<td></td>
</tr>
<tr>
<td>Directional Drill pipes</td>
<td>DN100-DN1000</td>
<td>Standard for potable water (PAM Direxional)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Since potable water may prove aggressive for pipelines due to its mineral composition or to treatment products, ductile iron pipelines are lined with an internal coating.

All ductile iron pipes for use with potable water are approved by the Secretary of State for use in public water supplies under Regulation 31.4.a of the Water Supply (Water Quality) Regulations 2000, Regulation 27 of the Water Supply (Water Quality) (Scotland) Regulations 2001 and are listed in the “List of Approved Products and Processes” published by the DWI.
Ductan: Potable water OD75-160 - Blutop range

Traditionally, the internal lining for ductile iron pipes has been cement mortar. For the Blutop range, the cement mortar is replaced by an innovative thermoplastic coating called Ductan.

Main characteristics:
- 300μm thick
- Perfectly adherent, with an adhesion value greater than 8MPa (80kg/cm²) the same as fusion bonded epoxy. DUCTAN withstands without damage:
  - perforation under load
  - cuts on site
- Approved by the Secretary of State under Regulation 31.4.a of the Water Supply (Water Quality) Regulations 2000

Advantages:
- Perfectly smooth internal surface, DUCTAN minimizes head losses
- Extra-light, DUCTAN reduces the pipe weight by 25 %
- Thinner than the cement coating, DUCTAN increases the pipe's hydraulic cross-section.
- Exceptional abrasion resistance
- Anti-corrosion protection for 100 years

In addition, the DUCTAN lining is impact resistant and therefore does not flake in case of point impact.

The Ductan lining covers the inside of the pipe completely from the socket to the end of the spigot.

Cement mortar linings

Cement mortar linings create an alkaline environment at the metal surface of the pipe thereby producing conditions under which corrosion cannot take place. Cement mortar linings are applied in accordance with BS EN 545. Saint-Gobain PAM UK applies two types of cement mortar linings: System CL and System XL

1) System CL : Potable Water DN80-2000, Natural range

Saint-Gobain PAM UK System CL is the standard pipe system for diameters DN80-2000. System CL comprises blast furnace cement which fully complies with BS EN 545 and is applied as a pipe lining under strict factory conditions.

When used in accordance with Saint-Gobain PAM UK System CL “Instructions for Use” document, System CL gives excellent pH and leachate performance for hard and soft waters, even with extended residence times.

Features and benefits of Saint-Gobain PAM UK System CL:
- Available in diameters DN80-2000
- pH controlled within regulatory limits
- Residence times compatible with normal commissioning and operating conditions
- Approved by the Secretary of State under Regulation 31.4.a of the Water Supply (Water Quality) Regulations 2000
- Excellent hydraulic performance

Socket areas which come into contact with potable water are coated with an approved blue epoxy paint.
2) System XL: Potable Water DN80-700, Natural range

Saint-Gobain PAM UK System XL is the standard pipe system for diameters up to and including DN700. The system comprises an epoxy seal coat applied to the cement mortar lining under factory conditions with tight control over process parameters. Saint-Gobain PAM UK System XL controls both inorganic and organic leachates to exceptionally low levels.

When used in accordance with Saint-Gobain PAM UK’s “Instructions for Use”, System XL controls the pH within regulatory limits.

Features and benefits of Saint-Gobain PAM UK System XL:
- Available in diameters up to DN700
- Recommended for soft water areas
- pH controlled within regulatory limits
- Residence times compatible with normal commissioning and operating conditions
- Approved by the Secretary of State under Regulation 31.4.a of the Water Supply (Water Quality) Regulations 2000
- Excellent Hydraulic Performance

Socket areas which come into contact with potable water are coated with an approved blue epoxy paint.

Note:- The Saint-Gobain PAM UK instructions for use documents for System XL and System CL are available on request. Please contact our Technical Sales Department on 0115 930 0700.

Sewerage Pipes

High Alumina Cement Mortar Lining: Sewerage DN80-2000, Integral Range

Saint-Gobain PAM UK supplies its standard sewer pipes with a high alumina cement mortar lining to allow for operating conditions ranging from pH 4 (highly acidic) to pH 12 (highly alkaline). High alumina cement mortar linings conform to the requirements of BS EN 598 and offer high abrasion resistance.

Socket areas which could come into contact with effluent receive a coating of red epoxy paint.

Benefits of high alumina cement:
- Resistance to septic attack
- Resistance to chemical attack
- Resistance to abrasion
Sewers are occasionally at risk from attack due to the septicity of effluents, particularly during periods of low flow or high temperature. A two year test (see fig 1) to compare the resistance of High Alumina and other cements found that High Alumina cement offers excellent resistance to septic attack.

<table>
<thead>
<tr>
<th>Type of Cement</th>
<th>Attack depth at water line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blast Furnace</td>
<td>1.7mm to 2mm</td>
</tr>
<tr>
<td>Portland A</td>
<td>1.9mm to 2.3mm</td>
</tr>
<tr>
<td>Portland B</td>
<td>1.7mm</td>
</tr>
<tr>
<td>Sulphate Resisting</td>
<td>4.4mm</td>
</tr>
<tr>
<td>High Alumina</td>
<td>0.6mm (surface layer only)</td>
</tr>
</tbody>
</table>

Resistance to Chemical Attack

Sewers are at risk from attack by chemicals found in industrial discharges. Table 26 shows the resistance of high alumina cement, compared to ordinary Portland cement, against some common aggressive substances.

Table 26: Resistance of High Alumina Cement vs. Portland Cement

<table>
<thead>
<tr>
<th>Effluent Example</th>
<th>Aggressive Substance</th>
<th>Limitation of Resistance (mg/2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Portland Cement</td>
</tr>
<tr>
<td>Chemical Condensate</td>
<td>Ammonia</td>
<td>&lt; 30</td>
</tr>
<tr>
<td>Effluents</td>
<td>Magnesium</td>
<td>&lt; 300</td>
</tr>
<tr>
<td>Mine Waters</td>
<td>Sulphates</td>
<td>&lt; 400</td>
</tr>
<tr>
<td>Raw Waters</td>
<td>CO₂</td>
<td>&lt; 20</td>
</tr>
<tr>
<td></td>
<td>pH Range</td>
<td>&gt; 5.5</td>
</tr>
</tbody>
</table>

The chemical resistance of Saint-Gobain PAM UK Integral range under maximum allowable concentrations at 20°C is given in table 27.
Table 27: Chemical Resistance

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Pipe Linings</th>
<th>Fittings</th>
<th>Gasket Nitrile</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alcohols</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethanol</td>
<td>50%</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td>Methanol</td>
<td>50%</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td>Glycol</td>
<td>No limit</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td><strong>Aliphatic Hydrocarbons</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White Spirit</td>
<td>No limit</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td>Petrol, Diesel, Gas, Oil</td>
<td>No limit</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td>Kerosene</td>
<td>No limit</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td><strong>Aromatic Hydrocarbons</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Xylene Toluene</td>
<td>No limit</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td>Benzene, Styrene, Naphtha</td>
<td>No limit</td>
<td>No limit</td>
<td>Not suitable</td>
</tr>
<tr>
<td><strong>Oils</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lubricants, Petrol, Derivatives</td>
<td>No limit</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td>Organic</td>
<td>No limit</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td><strong>Detergents</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teepol</td>
<td>No limit</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td><strong>Water</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soft Water</td>
<td>No limit</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td>Saline Solution</td>
<td>No limit</td>
<td>10%</td>
<td>No limit</td>
</tr>
<tr>
<td>Distilled Water</td>
<td>No limit</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td>Chlorinated Water</td>
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<td>No limit</td>
</tr>
<tr>
<td>Chlorinated Solution</td>
<td>No limit</td>
<td>10%</td>
<td>Not suitable</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>No limit</td>
<td>10%</td>
<td>Not suitable</td>
</tr>
<tr>
<td>Chloroform</td>
<td>No limit</td>
<td>10%</td>
<td>Not suitable</td>
</tr>
<tr>
<td>Genklene</td>
<td>No limit</td>
<td>10%</td>
<td>Not suitable</td>
</tr>
<tr>
<td><strong>Acids</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actic</td>
<td>40 ppm</td>
<td>40 ppm</td>
<td>No limit</td>
</tr>
<tr>
<td>Chromic</td>
<td>10 ppm</td>
<td>10 ppm</td>
<td>No limit</td>
</tr>
<tr>
<td>Citric</td>
<td>20 ppm</td>
<td>20 ppm</td>
<td>No limit</td>
</tr>
<tr>
<td>Hydrochloric</td>
<td>3 ppm</td>
<td>3 ppm</td>
<td>No limit</td>
</tr>
<tr>
<td>Lactic</td>
<td>15 ppm</td>
<td>15 ppm</td>
<td>No limit</td>
</tr>
<tr>
<td>Nitric</td>
<td>6 ppm</td>
<td>6 ppm</td>
<td>No limit</td>
</tr>
<tr>
<td>Oxalic</td>
<td>12 ppm</td>
<td>12 ppm</td>
<td>No limit</td>
</tr>
<tr>
<td>Phosphoric</td>
<td>10 ppm</td>
<td>10 ppm</td>
<td>No limit</td>
</tr>
<tr>
<td>Sulphuric</td>
<td>10 ppm</td>
<td>10 ppm</td>
<td>No limit</td>
</tr>
<tr>
<td>Tannic</td>
<td>200 ppm</td>
<td>10%</td>
<td>No limit</td>
</tr>
<tr>
<td>Tartaric</td>
<td>50 ppm</td>
<td>50 ppm</td>
<td>No limit</td>
</tr>
<tr>
<td><strong>Bases</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ammonia</td>
<td>18%</td>
<td>40%</td>
<td>No limit</td>
</tr>
<tr>
<td>Aniline</td>
<td>No limit</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td>Dimethylamine</td>
<td>0.6%</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td>Phenol/Cresol</td>
<td>No limit</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td>Potassium Hydroxide</td>
<td>560 ppm</td>
<td>500 ppm</td>
<td>No limit</td>
</tr>
<tr>
<td>Pyridine</td>
<td>No limit</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td>Quinoline</td>
<td>No limit</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>400 ppm</td>
<td>400 ppm</td>
<td>No limit</td>
</tr>
<tr>
<td><strong>Salt</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium Chloride</td>
<td>25%</td>
<td>10%</td>
<td>No limit</td>
</tr>
<tr>
<td>Potassium Chloride</td>
<td>25%</td>
<td>10%</td>
<td>No limit</td>
</tr>
<tr>
<td>Ammonium Sulphate</td>
<td>5%</td>
<td>10%</td>
<td>No limit</td>
</tr>
</tbody>
</table>

Please consult us regarding the suitability of Integral for conveyance of other industrial effluents.
Resistance to Abrasion

Abrasion is the degradation of the internal lining of the pipe due to the impact of solid particles contained in the effluent.

It is likely to be a problem in the following instances:
- a) Combined sewers conveying surface waters, where there is likely to be a high concentration of solids.
- b) Steep slopes, leading to high effluent velocity.
- c) Industrial effluent, where a high concentration of solid particles is envisaged.

High alumina cement lining used by Saint-Gobain PAM UK offers excellent resistance to abrasion. The lining allows regular maximum flow rates of 7m/s with minimal abrasive attack in each of the applications.

The effect of abrasion can be calculated from the formula: 
\[ U = K \times V^{3/2} \times 10^{-4} \]
- \( U \) = Wear in mm per annum
- \( K \) = The coefficient characteristic of the material (the lower the value, the greater the resistance to abrasion)
- \( V \) = Flow rate m/s
- \( N \) = Characteristic of particle abrasiveness (according to the “Miller Index”)

Table 28 demonstrates the superior abrasion resistance of High Alumina cement in comparison with most other common sewer pipeline materials. As greater effluent velocities can be permitted, savings at the design stage can be achieved by avoiding manhole backdrops or flow control chambers on steep inclines.

### Table 28 Abrasion resistance of High Alumina Cement vs. Other materials

<table>
<thead>
<tr>
<th>Abrasive</th>
<th>K value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basalt/Polyurethane</td>
<td>5 to 15</td>
</tr>
<tr>
<td>High alumina cement/Natural rubber</td>
<td>15 to 30</td>
</tr>
<tr>
<td>Unlined iron</td>
<td>30 to 50</td>
</tr>
<tr>
<td>Blast furnace cement/concrete/PIC</td>
<td>50 to 100</td>
</tr>
<tr>
<td>GR</td>
<td>300</td>
</tr>
<tr>
<td>Asbestos cement</td>
<td>&gt; 1000</td>
</tr>
</tbody>
</table>

The lower the K value, the greater the resistance to abrasion.

**Special requirements**

**Integral pH1**

For effluents <pH4 or >pH12 Saint-Gobain PAM UK plc offers a pH1 pipe-system. For information please contact Technical Sales Department, Tel: 0115 930 0700.
Thickness
Lining thicknesses for pipes are in accordance with the latest version of BS EN 545/BS EN 598. The standard allows for the lining thickness to taper down at the end of pipes and fittings. Please refer to BS EN 545/BS EN 598 for lining thicknesses.

Lining Condition
The surface of the lining will be substantially smooth but may occasionally contain longitudinal and circumferential shrinkage cracks which do not affect the stability of the lining. The widths of the cracks and any radial displacement at the cracks will not exceed the values given in BS EN 545/BS EN 598. These shrinkage cracks are permissible under the relevant product standards and close on continuous exposure to water - a process known as autogenous healing. Jointing surfaces i.e the inside of sockets and flange faces are free from cement mortar.

Installation Instructions
For guidance on testing and commissioning of pipelines, lining repair, installation guidance and storage instructions please download the Installation Guide from our website, www.saint-gobain-pam.co.uk.
Saint-Gobain PAM UK offers a range of proven external coatings to suit all types of ground conditions. The standard coating is Zinalium, Saint-Gobain PAM UK’s zinc and aluminium alloy system. First launched with PAM Natural Water pipe. This coating is now available on PAM Integral Plus sewer pipe and on Blutop water pipe as standard.

For extreme soil conditions a wide variety of special coating systems can be offered.

To ensure the most cost effective and appropriate solution is supplied, Saint-Gobain PAM UK offers soil resistivity surveys, please see page 10.

Table 29: Matrix of coating available from Saint-Gobain PAM UK.

<table>
<thead>
<tr>
<th>Product Range</th>
<th>Dia Range</th>
<th>Zinalium (Zinc/Aluminium) + Epoxy</th>
<th>Zinc &amp; Bitumen</th>
<th>Zinc &amp; Epoxy</th>
<th>PE sleeving</th>
<th>Tape Wrap 25mm or 55%</th>
<th>ZM-U</th>
<th>PE (Polyethylene)</th>
<th>PUX (Polyurethane)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Pipe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OD75 - OD160</td>
<td>Standard</td>
<td>Blutop</td>
<td></td>
<td></td>
<td>Special request</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DN80 - DN600</td>
<td>Standard</td>
<td>Natural</td>
<td></td>
<td></td>
<td>Special request</td>
<td>Special request (TT range)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DN700</td>
<td>Standard</td>
<td>Natural</td>
<td>Optional</td>
<td>Special request*</td>
<td>Special request</td>
<td>Special request (TT range)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DN800</td>
<td>Standard</td>
<td>Natural</td>
<td>Optional</td>
<td>Special request*</td>
<td>Special request</td>
<td>Special request (TT range)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DN900-DN10000</td>
<td>Optional</td>
<td>(Classic) - Black</td>
<td>Special request*</td>
<td>Special request</td>
<td>Special request (TT range)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DN900-DN2000</td>
<td>Standard</td>
<td>(Classic) - Black</td>
<td>Special request</td>
<td>Special request</td>
<td>Special request (TT range)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sewerage Pipe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uti DN800</td>
<td>Standard</td>
<td>Integral Plus</td>
<td>Special request*</td>
<td>Special request</td>
<td>Special request (TT range)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DN900-DN2000</td>
<td>Standard</td>
<td>Integral</td>
<td>Special request</td>
<td>Special request</td>
<td>Special request (TT range)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Directional Drill pipes - Water &amp; Sewer</td>
<td>DN100-DN700</td>
<td>Standard (PAM Direxional)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Potentially required if Zinalium is not used
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural soils with resistivity above 2500 ohm/cm</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>A</td>
<td>R</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Natural soils with resistivity between 1500-2500 ohm cm without water table</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>A</td>
<td>R</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Natural soils with resistivity between 1500-2500 ohm cm with seasonal water table or permanent waterlogging</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>A</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Natural soils with resistivity between 500-1500 ohm cm without water table</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>A</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Natural soils containing coal, ironstone or peat</td>
<td>R</td>
<td>A</td>
<td>a</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural soils with resistivity below 500 ohm-cm</td>
<td>R</td>
<td>A</td>
<td>a</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural soils with resistivity between 500 and 1500 ohm cm with seasonal water table or permanent waterlogging</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>A</td>
<td>a</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Made up ground with light chemical contamination, e.g. Refuse sites. Farmyard waste without water table</td>
<td>R</td>
<td>A</td>
<td>a</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Made up ground with light chemical contamination, e.g. Refuse sites. Farmyard waste with water table</td>
<td>R</td>
<td>A</td>
<td>a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stray electrical currents, e.g. Crossing cathodically protected pipelines and DC traction systems</td>
<td>R</td>
<td>A</td>
<td>a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stray electrical currents, e.g. Parallel to cathodically protected pipelines and DC traction systems</td>
<td>A</td>
<td>A</td>
<td>a</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural soils with a pH&lt; 5 without water table</td>
<td>R</td>
<td>A</td>
<td>a</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural soils with a pH&lt; 5 with water table or permanent water-logging</td>
<td>R</td>
<td>A</td>
<td>a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Made up ground with flints, clinker etc material likely to cause mechanical damage with or without water table</td>
<td>R</td>
<td>A</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Made up ground with solid chemical contamination. Ex-industrial or chemical sites</td>
<td>R</td>
<td>A</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Made up ground with liquid chemical contamination. Ex-industrial or chemical sites</td>
<td>R</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tidal waters. E.g. estuarine conditions</td>
<td>R</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R = Recommended coating  
A = Alternative recommended coating option  
a = technically acceptable (but not recommended) coating option
### The exceptional protection of Zinalium

Saint-Gobain PAM UK supplies a zinc/aluminum coating (Zinalium) for all water and sewer pipes up to DN800 as standard. The development of this coating is an example of Saint-Gobain PAM UK’s continual research and development programme.

Branded as Pam Natural (Water) and PAM Integral Plus (Sewer) and later extended to the new Blutop range, this coating is a revolutionary and evolutionary pipeline product.

The coating utilises an 85% zinc / 15% aluminium alloy which increases the longevity of both the active and barrier protection for the pipe. This alloy, coupled with an epoxy topcoat (Blue for Pam Blutop & Natural and Red for PAM Integral Plus), gives significant benefits compared to previously available coating systems.

### Advantages:

- **Ease and Speed of Pipe Laying**
  The PAM Blutop, Natural and Integral Plus system provides a complete protection system in nearly all natural soil conditions and eliminates the need for PE-sleeving and the associated time consuming installation. Consequently, the time to install pipes will reduce significantly.

- **Risk Elimination**
  The risk of specifying an inappropriate protective system is virtually eliminated as tests have shown that PAM Blutop/Natural/Integral Plus is suitable for use in more than 90% of UK soil conditions and is insensitive to soil variations over short distances.

- **Extended Service Life**
  The use of an external coating consisting of a zinc/aluminium alloy extends the longevity of ductile iron pipes. Increasing the weight of Zinc does not give the same degree of improvement, nor does it extend the range of soils for which the pipe is suitable. A performance study of the PAM Natural system in comparison to enhanced zinc systems, Technical Reference Document, SGP-Ref: TP1H/TRD/0303/March 2003 is available on request.

- **Reduced Stock Levels**
  With one coating type covering the vast majority of UK soil conditions, stock may be reduced both at the end customer, and throughout the supply chain.

- **Robustness**
  The PAM Blutop/Natural/Integral Plus system has been tested under ‘real life’ conditions and has been shown to withstand the extremes of handling, transportation and laying without compromising the protective coating.

- **Reduced Work ‘On-site’**
  With the elimination of the need to apply polyethylene sleeving to PAM Blutop/Natural/Integral Plus pipes and the reduction in pre-jointing preparation, installation times with PAM pipes are reduced, thus increasing productivity and reducing consequential delay.
Zinc/Aluminium Alloy

40 years of Research and Development

Using zininc aluminium alloys instead of zinc means:

- A Galvanic protection offered by zinc
- An Improved chemical and mechanical stability of the coating thanks to the use of aluminium

The scientific explanation

Zinalium offers an active protection to ductile iron pipes, thanks to the power of galvanic protection offered by the alloy ZnAL 85-15.

Zinc ions within the alloy provide sacrificial galvanic protection to areas which may have been damaged during the transportation, handling or installation of the pipe.

Once the pipe has been installed and is in contact with the surrounding soil the zinc/aluminium alloy provides a long term barrier through the formation of a stable insoluble protective layer.

Although a coating of pure zinc provides galvanic protection for the ductile pipe, it is 100% active, and its effect can be rapidly depleted. Similarly, although zinc provides a protective layer when it transforms into a dense, impermeable layer of zinc salts, these salts can only form under specific conditions.

If zinc transforms too quickly the resulting passive layer is of poor quality. The presence of aluminium slows this conversion, by considerably decreasing the rate at which the zinc is transformed and creates a more stable protective layer compared to zinc alone, whilst allowing the sacrificial galvanic healing process to take place.

The dual structure (islands of zinc within the aluminium skeleton) of the alloy used on PAM Blutop/Natural/Integral Plus means the duration of active protection increases significantly.
The quantity of alloy applied

Saint-Gobain PAM has increased the quantity of metallic coating from 200g/m² (minimum specified by standard EN 545 and EN 598) to 400g/m² of zinc aluminium alloy which results in exponential increase in the longevity of the coating, offering greater protection in a wider range of soils.

The very significant increase in the thickness of the coating means:

- Improved formation of long-term protective layers
- Improved performance of galvanic protection provided by the zinc aluminium alloy
- Greater mechanical resistance of the protective layer

Will increasing the thickness of zinc have the same effect as Zinalium?

Increasing the weight of zinc does not significantly extend the lifetime when exposed to an aggressive environment. The extra zinc is rapidly consumed by auto-corrosion and does not produce the stable conversion layer that is needed for long term durability. Fig 2 shows how the protection given to ductile iron by zinc rapidly ceases in aggressive environments.

A negative potential of more than 750 mV (with respect to a saturated calomel electrode) is required to prevent corrosion of the ductile iron. This graph shows how that potential changes after about 450 days for the zinc coatings but remains constant for the zinc/aluminium coating.

The role of the epoxy layer

With ZINALIUM, the conventional black pore-sealer is replaced by blue epoxy coating (signal blue for the Natural range and ultramarine for the Blutop range) or by red epoxy coating (for the Integral Plus range).

This tough porous epoxy coating is applied at an optimum thickness to provide durability and robustness to the coating but also allow the galvanic action of the zinc to continue.

The main improvements provided by the epoxy includes:

- Greater chemical stability
- Better long-term performance in soil as it ages
- Better control of the zinc-aluminium alloy conversion process (controlled porosity allows the zinc’s galvanic action to take place)
- Better mechanical resistance of the coating (during transport and use), scrape tests fail to expose bare metal
- Improved resistance to solvents present in the soil (contaminated soil)
- Possibility of colouring the pipe to enable easier identification
- Better organoleptic (taste/odour) performance
- Severe impact and drop tests fails to crack the epoxy seal (WRc Ref, UC 3841)
Coating Systems

Introduction

Saint-Gobain PAM UK offers a range of external coating systems to suit different ground conditions. PAM Blutop (OD 75-160), Natural (DN80-800) and Integral Plus (DN80-800) pipe is the standard pipeline product from Saint-Gobain PAM and can be used in the majority of soil conditions found in the U.K.

Zinc + a Topcoat

For diameters greater than DN800 Saint-Gobain PAM UK offers a coating system of zinc plus a top coat. For water (PAM Classic) the top coat is bitumen and for waste water and sewage (PAM Integral), red epoxy is applied.

Zinc coating is an active protection, due to the galvanic action of the zinc/iron.

The Zinc and top coat works in two ways:

**Formation of a stable protective layer**
Under the top coating, the zinc is transformed into a passive barrier protection layer, which adheres tightly to the iron surface.

**Damage self-healing**
If the zinc coating is damaged during transport and laying, the zinc metal adjacent to the damage site cathodically protects the exposed iron until a healing layer of zinc transformation products forms over the damage site.

200g/m² Zinc + Bitumen: Large Diameter Water Pipes DN900-2000

In the diameter range DN900-2000 Saint-Gobain PAM UK offers a ductile iron pipe externally coated with 200g/m² zinc plus bitumen topcoat. This allows a high degree of protection against the majority of soil conditions. This protection system conforms to the latest version of BS EN 545.

200g/m² Zinc + Red Epoxy: PAM Integral DN80-2000

PAM Integral pipes are supplied with a 200g/m² zinc coating and finished with a tough red epoxy layer applied in accordance with BS EN 598. The PAM Integral coating provides a high degree of protection in most soil conditions. In specific conditions where Saint-Gobain’s standard offer is not suitable, the use of PE sleeving may be appropriate.
### Special Applications

In certain soils and under specific conditions, PAM Blutop/Natural/Integral Plus and PAM Classic/Integral, may not offer sufficient protection. For these instances, Saint-Gobain PAM UK can offer various alternative protection systems. See table 30 detailing types of soil conditions and the appropriate recommended protection system.

#### Zinc + PE Sleeving

**How Slewing Works:**

The principal function of the polyethylene slewing is to separate the pipe from contact with the soil environment thus preventing non-uniform contact with the soil solids. The system is therefore relatively insensitive to minor handling damage and the presence of ground water inside the slewing. Where major damage to the slewing is caused however, repairs must be carried out before laying.

**Application of PE slewing**

Polyethylene slewing may be obtained from Saint-Gobain PAM UK for application on site. Polyethylene slewing can be fitted on site and no special equipment is needed other than that necessary to lift the pipes and fittings.

Details on the size of slewing required for each pipe diameter with the weight and approximate length of slewing per standard roll can be found in the Installation Guide, www.saint-gobain-pam.co.uk

#### Zinc + TT (PEC and PUX Coating)

Saint-Gobain PAM UK is also able to supply an external protective systems called TT (Total Terrain). The TT external coating system comprises thick organic coatings. (Extruded polyethylene PEC DN80-700 & sprayed polyurethane PUX DN800-2000).

**How TT works:**

The TT external coating system uses thick organic coatings. These coatings provide a complete barrier between the pipe and the surrounding soil. The TT coating system is suitable for use in highly aggressive soils.

**Application of TT**

DN80-700 pipes are supplied with a nominally 2mm thick polyethylene coating, which is applied using a heat bonding adhesive, co-extrusion technique. DN800-2000 pipes are supplied with a sprayed polyurethane coating, 900 microns thick. The TT coating system minimises risk of damage during transportation and installation.
In certain soils and under specific conditions, PAM Natural/Integral Plus and PAM Large DN Water Pipe/Integral may not offer sufficient protection. For these instances, Saint-Gobain PAM UK can offer various alternative protection systems. See table 26 detailing types of soil conditions and the appropriate recommended protection system.

How Sleeving Works:

The principal function of the polyethylene sleeving is to separate the pipe from contact with the soil environment thus preventing non-uniform contact with the soil solids. The system is therefore relatively insensitive to minor handling damage and the presence of ground water inside the sleeving. Where major damage to the sleeving is caused however, repairs must be carried out before laying.

Application of PE sleeving

Polyethylene sleeving may be obtained from Saint-Gobain PAM UK for application on site. Polyethylene sleeving can be fitted on site and no special equipment is needed other than that necessary to lift the pipes and fittings.

Details on the size of sleeving required for each pipe diameter with the weight and approximate length of sleeving per standard roll can be found in the Installation Guide, www.saint-gobain-pam.co.uk

Tape Wrapping

In highly aggressive soils a more robust type of protection may be necessary. Saint-Gobain PAM UK is able to supply pipes wrapped with heavy duty self-adhesive tape throughout the diameter range. The tape consists of a combined anti-corrosion mastic and pressure sensitive adhesive, laminated to a flexible PVC backing.

How Tape Wrap Works:

The tape exhibits high resistance to bacterial attack, low water vapour transmission and low water absorption as well as providing high electrical resistance.

Application of Tape Wrap

Tape is factory applied around the body of the pipe. The tape is applied around and along the pipe until it covers the pipe from the back of the socket to a point sufficiently removed from the spigot such that it will not interfere with jointing. Each wrap overlaps the preceding one by approximately 25mm or 55%, depending upon the degree of protection required. The tension in the tape results in a protective wrap which adheres strongly to the pipe body, completely isolating it from the soil.

Table 31: TT Water Pipe, Rapid Joint

<table>
<thead>
<tr>
<th>DN</th>
<th>Product Code</th>
<th>Pipe Class</th>
<th>Allowable Operating Pressure (PFA)</th>
<th>Allowable Deflection (Degree)</th>
<th>Pipe Length (mm)</th>
<th>Spigot OD (ØDE) mm</th>
<th>Socket OD (ØB) mm</th>
<th>Weight (Kg/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>SSA80F60AG</td>
<td>C40</td>
<td>40</td>
<td>5</td>
<td>6000</td>
<td>98</td>
<td>167.0</td>
<td>13.5</td>
</tr>
<tr>
<td>100</td>
<td>SSB10F60AG</td>
<td>C40</td>
<td>40</td>
<td>5</td>
<td>6000</td>
<td>118</td>
<td>188.0</td>
<td>16.5</td>
</tr>
<tr>
<td>150</td>
<td>SSB15F60AG</td>
<td>C40</td>
<td>40</td>
<td>5</td>
<td>6000</td>
<td>170</td>
<td>242.0</td>
<td>25.0</td>
</tr>
<tr>
<td>200</td>
<td>SSB20F60AG</td>
<td>C40</td>
<td>40</td>
<td>5</td>
<td>6000</td>
<td>222</td>
<td>295.0</td>
<td>35.0</td>
</tr>
<tr>
<td>250</td>
<td>SSB25F60AG</td>
<td>C40</td>
<td>40</td>
<td>5</td>
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Notes:-
- Lengths and weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- For information on Rapid gaskets water please refer to page 70.
- Allowable test pressure (PEA) and allowable maximum operating pressure (PMA) can easily be calculated for the above pipes by using the following formulas:
  - PMA = PFA x 1.2
  - PEA = PMA + 5 bar
In certain soils and under specific conditions, PAM Natural/Integral Plus and PAM Large DN Water Pipe/Integral, may not offer sufficient protection. For these instances, Saint-Gobain PAM UK can offer various alternative protection systems. See table 26 detailing types of soil conditions and the appropriate recommended protection system.

**How Sleeving Works:**
The principal function of the polyethylene sleeving is to separate the pipe from contact with the soil environment thus preventing non-uniform contact with the soil solids. The system is therefore relatively insensitive to minor handling damage and the presence of ground water inside the sleeving. Where major damage to the sleeving is caused however, repairs must be carried out before laying.

**Application of PE sleeving**
Polyethylene sleeving may be obtained from Saint-Gobain PAM UK for application on site. Polyethylene sleeving can be fitted on site and no special equipment is needed other than that necessary to lift the pipes and fittings.

**Details on the size of sleeving required for each pipe diameter with the weight and approximate length of sleeving per standard roll can be found in the Installation Guide, www.saint-gobain-pam.co.uk**

**Tape Wrapping**
In highly aggressive soils a more robust type of protection may be necessary. Saint-Gobain PAM UK is able to supply pipes wrapped with heavy duty self-adhesive tape throughout the diameter range. The tape consists of a combined anti-corrosion mastic and pressure sensitive adhesive, laminated to a flexible PVC backing.

**How Tape Wrap Works:**
The tape exhibits high resistance to bacterial attack, low water vapour transmission and low water absorption as well as providing high electrical resistance.

**Application of Tape Wrap**
Tape is factory applied around the body of the pipe. The tape is applied around and along the pipe until it covers the pipe from the back of the socket to a point sufficiently removed from the spigot such that it will not interfere with jointing. Each wrap overlaps the preceding one by approximately 25mm or 55%, depending upon the degree of protection required. The tension in the tape results in a protective wrap which adheres strongly to the pipe body, completely isolating it from the soil.

---

**Table 32: TT Water Pipe, Universal Vi Joint**

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<tr>
<th>DN</th>
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<th>Spigot OD mm (ØDE)</th>
<th>Socket OD mm (ØB)</th>
<th>Weight (Kg/m)</th>
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**Notes:**
- Lengths and weights are provided for estimation purposes only and actual values may vary from those provided in these tables
- For information on Rapid gaskets water please refer to page 70
- For information on Universal Vi Anchoring gasket please refer to page 75
- Allowable test pressure (PEA) and allowable maximum operating pressure (PMA) can easily be calculated for the above pipes by using the following formulas:
  - PMA = PFA x 1.2
  - PEA = PMA + 5 bar
In certain soils and under specific conditions, PAM Natural/Integral Plus and PAM Large DN Water Pipe/Integral may not offer sufficient protection. For these instances, Saint-Gobain PAM UK can offer various alternative protection systems. See table 26 detailing types of soil conditions and the appropriate recommended protection system.

**How Sleeving Works:**

The principal function of the polyethylene sleeving is to separate the pipe from contact with the soil environment thus preventing non-uniform contact with the soil solids. The system is therefore relatively insensitive to minor handling damage and the presence of ground water inside the sleeving. Where major damage to the sleeving is caused however, repairs must be carried out before laying.

**Application of PE sleeving**

Polyethylene sleeving may be obtained from Saint-Gobain PAM UK for application on site. Polyethylene sleeving can be fitted on site and no special equipment is needed other than that necessary to lift the pipes and fittings.

Details on the size of sleeving required for each pipe diameter with the weight and approximate length of sleeving per standard roll can be found in the Installation Guide, www.saint-gobain-pam.co.uk

**Tape Wrapping**

In highly aggressive soils a more robust type of protection may be necessary. Saint-Gobain PAM UK is able to supply pipes wrapped with heavy duty self-adhesive tape throughout the diameter range. The tape consists of a combined anti-corrosion mastic and pressure sensitive adhesive, laminated to a flexible PVC backing.

**How Tape Wrap Works:**

The tape exhibits high resistance to bacterial attack, low water vapour transmission and low water absorption as well as providing high electrical resistance.

**Application of Tape Wrap**

Tape is factory applied around the body of the pipe. The tape is applied around and along the pipe until it covers the pipe from the back of the socket to a point sufficiently removed from the spigot such that it will not interfere with jointing. Each wrap overlaps the preceding one by approximately 25mm or 55%, depending upon the degree of protection required. The tension in the tape results in a protective wrap which adheres strongly to the pipe body, completely isolating it from the soil.

---

**Table 33: TT Water Pipe, Universal Ve Joint**

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<tr>
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<th>Spigot OD mm (ØDE)</th>
<th>Socket OD mm (ØB)</th>
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**Notes:**
- Lengths and weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- For information on Rapid gaskets water please refer to page 70.
- For information on Universal Ve Locking ring please refer to page 77.
- Allowable test pressure (PEA) and allowable maximum operating pressure (PMA) can easily be calculated for the above pipes by using the following formulas:
  - PMA = PFA x 1.2
  - PEA = PMA + 5 bar
In certain soils and under specific conditions, PAM Natural/Integral Plus and PAM Large DN Water Pipe/Integral, may not offer sufficient protection. For these instances, Saint-Gobain PAM UK can offer various alternative protection systems. See table 26 detailing types of soil conditions and the appropriate recommended protection system.

How Sleeving Works:
The principal function of the polyethylene sleeving is to separate the pipe from contact with the soil environment thus preventing non-uniform contact with the soil solids. The system is therefore relatively insensitive to minor handling damage and the presence of ground water inside the sleeving. Where major damage to the sleeving is caused however, repairs must be carried out before laying.

Application of PE sleeving
Polyethylene sleeving may be obtained from Saint-Gobain PAM UK for application on site. Polyethylene sleeving can be fitted on site and no special equipment is needed other than that necessary to lift the pipes and fittings.

Details on the size of sleeving required for each pipe diameter with the weight and approximate length of sleeving per standard roll can be found in the Installation Guide, www.saint-gobain-pam.co.uk

Tape Wrapping
In highly aggressive soils a more robust type of protection may be necessary. Saint-Gobain PAM UK is able to supply pipes wrapped with heavy duty self-adhesive tape throughout the diameter range. The tape consists of a combined anti-corrosion mastic and pressure sensitive adhesive, laminated to a flexible PVC backing.

How Tape Wrap Works:
The tape exhibits high resistance to bacterial attack, low water vapour transmission and low water absorption as well as providing high electrical resistance.

Application of Tape Wrap
Tape is factory applied around the body of the pipe. The tape is applied around and along the pipe until it covers the pipe from the back of the socket to a point sufficiently removed from the spigot such that it will not interfere with jointing. Each wrap overlaps the preceding one by approximately 25mm or 55%, depending upon the degree of protection required. The tension in the tape results in a protective wrap which adheres strongly to the pipe body, completely isolating it from the soil.

---

Table 34: TT Sewer Pipe, Rapid Joint

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<th>DN</th>
<th>Product Code</th>
<th>Allowable Operating Pressure (PFA)</th>
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<td>3</td>
<td>8160</td>
<td>1668</td>
<td>1815.9</td>
<td>859.0</td>
</tr>
<tr>
<td>1800</td>
<td>TSC18N80BH</td>
<td>27</td>
<td>2.5</td>
<td>8150</td>
<td>1875</td>
<td>2032.2</td>
<td>1045.0</td>
</tr>
<tr>
<td>2000</td>
<td>TSC20N80BH</td>
<td>26</td>
<td>2</td>
<td>8130</td>
<td>2082</td>
<td>2259.0</td>
<td>1252.0</td>
</tr>
</tbody>
</table>

Notes:-
- Lengths and weights are provided for estimation purposes only and actual values may vary from those provided in these tables
- For information on Rapid gaskets sewer please refer to page 71
- Allowable test pressure (PEA) and allowable maximum operating pressure (PMA) can easily be calculated for the above pipes by using the following formulas:
  \[ PMA = PFA \times 1.2 \]
  \[ PEA = PMA + 5 \text{ bar} \]
In certain soils and under specific conditions, PAM Natural/Integral Plus and PAM Large DN Water Pipe/Integral, may not offer sufficient protection. For these instances, Saint-Gobain PAM UK can offer various alternative protection systems. See table 26 detailing types of soil conditions and the appropriate recommended protection system.

How Sleeving Works:
The principal function of the polyethylene sleeving is to separate the pipe from contact with the soil environment thus preventing non-uniform contact with the soil solids. The system is therefore relatively insensitive to minor handling damage and the presence of ground water inside the sleeving. Where major damage to the sleeving is caused however, repairs must be carried out before laying.

Application of PE sleeving:
Polyethylene sleeving may be obtained from Saint-Gobain PAM UK for application on site. Polyethylene sleeving can be fitted on site and no special equipment is needed other than that necessary to lift the pipes and fittings. Details on the size of sleeving required for each pipe diameter with the weight and approximate length of sleeving per standard roll can be found in the Installation Guide, www.saint-gobain-pam.co.uk

Tape Wrapping:
In highly aggressive soils a more robust type of protection may be necessary. Saint-Gobain PAM UK is able to supply pipes wrapped with heavy duty self-adhesive tape throughout the diameter range. The tape consists of a combined anti-corrosion mastic and pressure sensitive adhesive, laminated to a flexible PVC backing.

How Tape Wrap Works:
The tape exhibits high resistance to bacterial attack, low water vapour transmission and low water absorption as well as providing high electrical resistance.

Application of Tape Wrap:
Tape is factory applied around the body of the pipe. The tape is applied around and along the pipe until it covers the pipe from the back of the socket to a point sufficiently removed from the spigot such that it will not interfere with jointing. Each wrap overlaps the preceding one by approximately 25mm or 55%, depending upon the degree of protection required. The tension in the tape results in a protective wrap which adheres strongly to the pipe body, completely isolating it from the soil.

### Table 35: TT Sewer Pipe, Universal Ve Joint

<table>
<thead>
<tr>
<th>DN</th>
<th>Prod code</th>
<th>Allowable Operating Pressure (PFA)</th>
<th>Allowable Deflection (Degree)</th>
<th>Pipe Length (mm)</th>
<th>Spigot OD mm (ØDE)</th>
<th>Socket OD mm (ØB)</th>
<th>Weight (Kg/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Enquire</td>
<td>64</td>
<td>3</td>
<td>5970</td>
<td>118</td>
<td>188</td>
<td>20.0</td>
</tr>
<tr>
<td>150</td>
<td>Enquire</td>
<td>60</td>
<td>3</td>
<td>5970</td>
<td>170</td>
<td>230</td>
<td>29.0</td>
</tr>
<tr>
<td>200</td>
<td>TFB20N60BG</td>
<td>52</td>
<td>3</td>
<td>5970</td>
<td>222</td>
<td>290</td>
<td>40.5</td>
</tr>
<tr>
<td>250</td>
<td>TFB25N60BG</td>
<td>46</td>
<td>3</td>
<td>5970</td>
<td>274</td>
<td>350</td>
<td>54.0</td>
</tr>
<tr>
<td>300</td>
<td>TFB30N60BG</td>
<td>41</td>
<td>3</td>
<td>5970</td>
<td>326</td>
<td>408</td>
<td>68.0</td>
</tr>
<tr>
<td>350</td>
<td>TFB35N60BG</td>
<td>38</td>
<td>3</td>
<td>5970</td>
<td>378</td>
<td>463</td>
<td>85.0</td>
</tr>
<tr>
<td>400</td>
<td>TFB40N60BG</td>
<td>35</td>
<td>3</td>
<td>5970</td>
<td>429</td>
<td>510</td>
<td>100.0</td>
</tr>
<tr>
<td>450</td>
<td>TFB45N60BG</td>
<td>32</td>
<td>3</td>
<td>5970</td>
<td>480</td>
<td>570</td>
<td>118.5</td>
</tr>
<tr>
<td>500</td>
<td>TFB50N60BG</td>
<td>30</td>
<td>2</td>
<td>5970</td>
<td>532</td>
<td>625</td>
<td>137.5</td>
</tr>
<tr>
<td>600</td>
<td>TFB60N60BG</td>
<td>30</td>
<td>2</td>
<td>5970</td>
<td>635</td>
<td>740</td>
<td>179.0</td>
</tr>
<tr>
<td>700</td>
<td>TFB70N60BG</td>
<td>27</td>
<td>2</td>
<td>5970</td>
<td>738</td>
<td>855</td>
<td>229.0</td>
</tr>
</tbody>
</table>

Notes:
- Lengths and weights are provided for estimation purposes only and actual values may vary from those provided in these tables.
- For information on Rapid gasketing water please refer to page 70.
- For information on Universal Ve Locking ring please refer to page 77.
- Allowable test pressure (PEA) and allowable maximum operating pressure (PMA) can easily be calculated for the above pipes by using the following formulas:
  \[ \text{PMA} = \text{PFA} \times 1.2 \]
  \[ \text{PEA} = \text{PMA} + 5 \text{ bar} \]

### Table 36: Socket sleeve for TT Pipes

<table>
<thead>
<tr>
<th>DN</th>
<th>Product Code</th>
<th>Material</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>JSA80YAT</td>
<td>EPDM</td>
<td>Rubber sleeve</td>
</tr>
<tr>
<td>100</td>
<td>JSB10YAT</td>
<td>EPDM</td>
<td>Rubber sleeve</td>
</tr>
<tr>
<td>150</td>
<td>JSB15YAT</td>
<td>EPDM</td>
<td>Rubber sleeve</td>
</tr>
<tr>
<td>200</td>
<td>JSB20YAT</td>
<td>EPDM</td>
<td>Rubber sleeve</td>
</tr>
<tr>
<td>250</td>
<td>JSB25YAT</td>
<td>EPDM</td>
<td>Rubber sleeve</td>
</tr>
<tr>
<td>300</td>
<td>JSB30YAT</td>
<td>EPDM</td>
<td>Rubber sleeve</td>
</tr>
<tr>
<td>350</td>
<td>205S84</td>
<td>MPSM</td>
<td>Heat shrink sleeve</td>
</tr>
<tr>
<td>400</td>
<td>111234</td>
<td>MPSM</td>
<td>Heat shrink sleeve</td>
</tr>
<tr>
<td>450</td>
<td>110301</td>
<td>MEPS</td>
<td>Heat shrink sleeve</td>
</tr>
<tr>
<td>500</td>
<td>110078</td>
<td>MPSM</td>
<td>Heat shrink sleeve</td>
</tr>
<tr>
<td>600</td>
<td>123649</td>
<td>MPSM</td>
<td>Heat shrink sleeve</td>
</tr>
</tbody>
</table>

Above 700mm sleeve generally not required. For further information please contact our Technical Sales Department, Tel 0115 930 0700

<table>
<thead>
<tr>
<th>DN</th>
<th>Prod Code</th>
<th>Material</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>800 - 2000</td>
<td>158030</td>
<td>HEPS</td>
<td>Heat shrink Roll (30m)</td>
</tr>
<tr>
<td>800 - 2000</td>
<td>158098</td>
<td>HEPS</td>
<td>Raychem fastners - Pk 25</td>
</tr>
</tbody>
</table>
Zinc + ZM-U

For trenchless installations Saint-Gobain PAM UK can offer PAM Direxional, a ductile iron pipe specifically designed for trenchless installation. PAM Direxional (DN100-700) has a coating which is able to cope with the rigors of trenchless installations. 200mg/m² of Zinc + ZM-U is applied to Pam Direxional pipes to ensure protection from potentially damaging conditions. ZM-U provides protection against damage to pipes being pulled through rocky conditions and performs in the most extreme conditions.

How ZM-U works:
ZM-U is a fibre cement coating applied on top of 200mg/m² of zinc. The tough nature of the ZM-U coating means that there are no special handling requirements. ZM-U provides a total barrier between the pipe and the surrounding ground conditions eliminating any risk of corrosion. The coating provides an extremely robust protection system and no further protection is required.

Zinc + Tape Wrap

Tape Wrapping
In highly aggressive soils a more robust type of protection may be necessary. Saint-Gobain PAM UK is able to supply pipes wrapped with heavy duty self-adhesive tape throughout the diameter range. The tape consists of a combined anti-corrosion mastic and pressure sensitive adhesive, laminated to a flexible PVC backing.

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For guidance on how to install and handle pipes and fittings with any of the protection systems in this product guide please refer to the Installation Guidelines on our website: www.saint-gobain-pam.co.uk

Cathodic Protection

Ductile iron mains which contain sections that may be buried adjacent to pipelines with cathodic protection systems or other sources of electrical currents such as train or tram lines may be subject to eddy currents. In these circumstances further advice should be sought from Technical Sales Department, Tel: 0115 930 0700.

The use of Cathodic protection systems for new ductile iron mains is not recommended by Saint-Gobain PAM UK for the following reasons:

- Other effective and maintenance free protection systems provide suitable protection for iron pipelines, e.g. PAM Blutop/Natural/Integral Plus, polyethylene sleeving and tape wrapping.

- Most types of joint used in ductile iron pipelines provide a degree of insulation between both pipes and fittings. This insulation prevents the establishment of the long-line corrosion currents which are a feature of welded steel pipelines.

If a cathodic protection system is applied to a ductile iron pipeline, it will be necessary to bond across the joints to guarantee electrical continuity. This will add significantly to the cost of installation, and takes away the advantages related to the insulating joints.

All ductile iron fittings in the sizes DN60-2000 are supplied with an epoxy coating conforming to BS EN 14901.

Potable water fittings are coated internally and externally with blue epoxy. The blue epoxy is approved to BS 6920.

Coated products are also approved by the Secretary of State under Regulation 31.4.a of the Water Supply (Water Quality) Regulations 2000. These are listed as “PAM Natural Pipeline Components” in the DWI list of approved products.

Sewerage fittings are internally and externally coated with a red epoxy.

Compatibility with Pipe Systems

Epoxy coated fittings are designed to form a complete system with Saint-Gobain PAM UK pipes. The tough epoxy is able to cope with aggressive soil conditions without the need for additional protection and PAM epoxy coated fittings are therefore suitable for use in conjunction with any pipe coating systems offered by Saint-Gobain PAM UK.
Products and services available from Saint-Gobain PAM UK:

Blutop™
A small diameter, push fit water pipe system compatible with plastic pipe made from ductile iron. It has the added advantages of a corrosion resistant exterior coating and the innovative Ductan lining to prevent the risk of corrosion.

Natural™
A new generation of potable water pipeline products available DN80 to DN800 with a new revolutionary system of external protection, fully compliant with the requirements of BS EN 545.

Large diameter water pipes
Large diameter water pipeline products available DN900 to DN2000, fully compliant with the requirements of BS EN 545.

Integral and Integral Plus™
A complete range of sewerage pipeline products available from DN80 to DN2000, fully compliant with the requirements of BS EN 598.

Valves
A comprehensive range of valves and accessories suitable for water and sewerage applications. All valves are supplied in compliance with WRAS requirements where applicable, and manufactured in accordance with ISO 9001.
- Gate valves, resilient and metal faced DN30 to DN300
- Non return valves DN80 to DN300
- Tidal flap valves DN80 to DN600
- Air valves
- Fire hydrants
- Butterfly valves DN50 to DN2000
- Control valves

Couplings and flange adaptors
Accommodating a wide range of external diameters and pipe materials in accordance with British, European Standards and ISO 9001 requirements. A diversified range from wide tolerance fittings to dedicated products.

Induct Plus™
An installation accreditation scheme, designed to give peace of mind and confidence to water utilities and contractors in the knowledge that the ductile iron pipeline that they have purchased will be installed effectively and in its optimum condition.

Access covers and gratings
A comprehensive range of ductile iron access covers and gratings. For high performance products which meet the increasing demands from traffic to a purpose designed range for low density applications, Saint-Gobain PAM UK access cover products provide targeted solutions for the key civil engineering, utility and infrastructure sectors.

PAM Estate™
Designed to meet the requirements and expectations of the housing and commercial sectors.

Ensign™
Cast iron above and below ground drainage system BSI Kitemark approved to BS EN 877. Used for soil and waste, rainwater, suspended, buried and bridge drainage applications, providing lifetime service for commercial and public buildings.

Ensign EEZI-FIT™
A new range of cast iron push-fit fittings and couplings in 100 diameter, Kitemarked to BS EN 877 for gravity sanitary installations.

Timesaver™
Cast iron above ground system BSI Kitemark approved to BS 416 part 2, used for soil and waste refurbishment, and external soil stacks for traditional appearance.

Cast iron below ground system BSI Kitemark approved to BS 437, favoured for under building drainage, and unstable ground conditions due to its superior strength performance.

Classical – Classical Plus™
Cast iron rainwater and gutter systems to BS 460 BBA certified. Seven gutter profiles and circular and rectangular downpipes systems supplied in a black primer coat. Classical Plus is a standard range of gutters and downpipes available in a factory applied semi-gloss black finish coat for immediate installation.

EPAMS™
A complete syphonic rainwater system, consisting of steel syphonic roof outlets and cast iron pipework to BS EN 877 BBA certified.

Visit: www.saint-gobain-pam.co.uk

The information given in this literature is, to the best of our knowledge, correct at the time of going to print. However, Saint-Gobain PAM UK is constantly looking at ways of improving their products and services and therefore reserve the right to change, without prior notice, any of the data contained in this publication. Any orders placed will be subject to our Standard Conditions of Sale, available on request.

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Quality Assurance
(Registered firm: 12908)

Environmental Standard
Environmental Management Systems BS EN ISO 14001:2004
(Registered firm: EM583973)