

**PAM**

# Potable water distribution



New product  
range

**blutop**

Small  
diameters,  
innovating  
together.

A complete ductile  
iron pipeline  
system DN/OD  
90, 110 and 125



  
SAINT-GOBAIN

PAM UK

# THE BLUTOP RANGE

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## IN TUNE WITH CHANGING NEEDS

We are becoming increasingly aware exactly how scarce and precious water is. Sustainable management is essential in order to conserve this resource for future generations. Ensuring an ongoing supply of quality potable tap water is a daily challenge for all, and as the last link in the water cycle prior to reaching our homes and consumption, distribution pipelines play a key role in successfully meeting that challenge. They are crucial in order to guarantee the availability and quality of potable water.

Water suppliers are generating new demands in order to meet the challenges water presents in the twenty-first century.

Keeping in tune with your needs and providing the necessary solutions are our main concerns. We have channelled our skill and know-how on a European scale to offer highly original and innovative advances.

**PAM** has combined the very latest innovations in ductile iron pipelines with the highly practical characteristics of plastics.

With Blutop, our brand new solution in small diameters, you will never again have to make the choice between

- Flexibility and resistance!
- Competitiveness and durability!
- Innovation and tradition!

A complete pipeline system, Blutop offers a whole new approach to the use of ductile iron in small diameter pipes.

**Blutop, small diameters, “innovating together”**

### NEW DEMANDS IN WATER DISTRIBUTION

*Modern day water distribution is becoming increasingly high-tech.*

*Each part of the distribution system plays a key role in guaranteeing the standards of the water supply service. In addition to collection systems and treatment plants, the transport and distribution networks are also crucially important. Indeed, potable water pipeline requirements have become highly sophisticated.*



## THE ADVANTAGES OF BLUTOP

### THE NEED FOR NEW SOLUTIONS

Renewing or maintaining the network is a key issue. Underground potable water networks are often made of grey or ductile cast iron but also of plastics that may be almost 50 years old.

Blutop allows for the replacement of lengths of old plastic, taking advantage of the latest advances in ductile iron, in sizes that are compatible with the existing network.

### SUSTAINABLE DEVELOPMENT

Like roadways, water and sewerage pipelines are infrastructures that are built to serve several generations.

Sustainable development is based on the use of 'long-lasting' rather than 'throwaway' equipment. PAM has applied these principles to the design of its Blutop range, providing an environmentally-friendly solution.

### DURABILITY

The level of finance allocated to renewing water networks is falling in relative terms, resulting in a need to increase the network's useful life. In Europe, where annual renewal rates stand at between 0.6% and 0.7%, we should therefore be aiming for an average life of more than 100 years.

### LEAKTIGHTNESS

Reducing leakage in water networks is one of the major concerns of all water companies. Blutop provides a two-fold solution: the renowned leaktightness and pressure resistance of the ductile iron components, pipes, fittings, gate valves and accessories. The ductile iron elements are resistant to ageing and warping and their mechanical properties remain unaltered over time. Studies have been carried out on the joints in the Blutop range to guarantee an ongoing pressure resistance of 25 bar. A series of performance tests allow for guaranteed leaktightness ranging from the initial hydraulic reception test (up to 35 bar) to the end of its lifecycle (simulated ageing) including resisting water hammer of up to 30 bar.

### OPERATION

In terms of network maintenance, old plastic pipes can be replaced with Blutop pipes directly on site, and it is also possible to use the wide range of maintenance and angle branch accessories. This means that maintenance teams do not need to keep several types of spare parts in stock. The larger hydraulic section of Blutop pipes increases the hydraulic capacity of the network and results in significant savings in pumping costs.

### WATER QUALITY

The materials used in the Blutop range (Ductan coating, epoxy, elastomers, lubricating paste, repair products) all hold the potability approval certificate required for materials and products in contact with drinking water. They conform to French, UK, German and Belgian standards or regulations in this area. We are currently in the process of obtaining similar certification in other countries.

Blutop joints are designed to resist extremely high pressures and distortion, thereby preventing ground water from filtering into the pipes.

### INSTALLATION

Blutop has revolutionised installation and operation procedures, backed up by your professional skill and know-how.

Thanks to the easy manual handling of the pipes and fittings, and ease of jointing, on-site laying is faster and more efficient.

### BLUTOP, INNOVATING TOGETHER

Blutop is a brand new bespoke solution created after taking careful note of your specific needs and requirements.

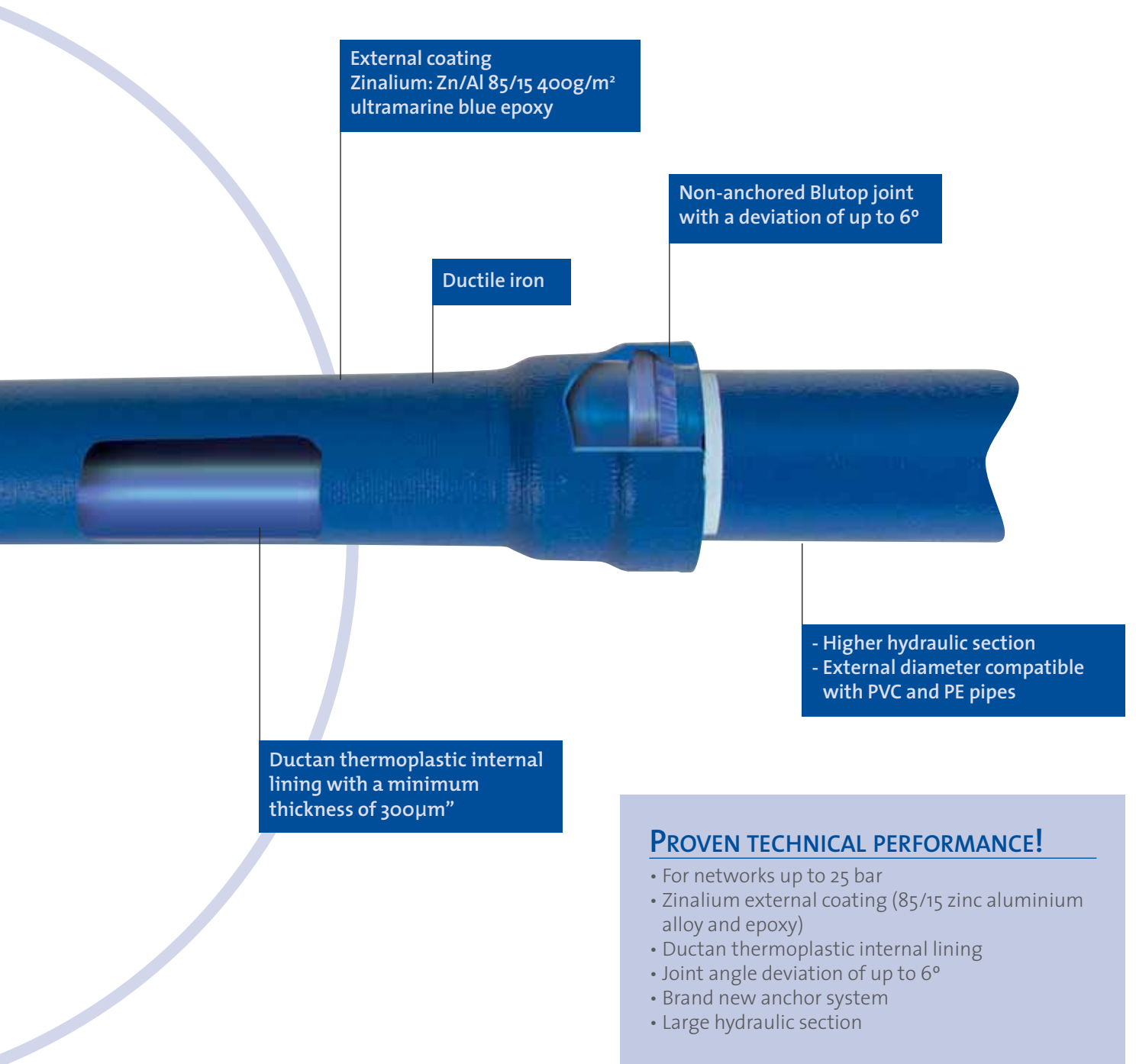
PAM has made full use of its technological know-how and capacity to design, create and develop Blutop.

# THE NEW BLUTOP SOLUTION

## A HOST OF INNOVATIONS

- *Ideal for small diameter water distribution networks*
- *Manual handling and easy jointing for rapid on-site work*
- *Conservation of water quality*
- *Reuse of natural backfill*
- *Compatible with plastic pipes and accessories*
- *A full and coherent range*
- *Designed to last more than 100 years*
- *Guaranteed leaktightness*





## BLUTOP IS A FURTHER STEP FORWARD IN SAINT-GOBAIN PAM'S COMMITMENT TO SUSTAINABLE DEVELOPMENT

### *At the core of our corporate culture*

*Sustainable development lies at the core of our corporate culture. Saint-Gobain PAM rapidly took on board the early principles of sustainable development put forward by the Brundtland Commission. Since 1987 this international commission has urged today's generations to "satisfy their needs without compromising the capacity of future generations to satisfy their own".*

*Saint-Gobain PAM's commitment covers the following key areas:*

- **Environment**
- **Industry and finance**
- **Social factors**

*PAM products have been installed in more than 100 capitals and over 1,000 major cities worldwide. Saint-Gobain PAM is currently involved in a large number of water conveyance and sewerage systems, thereby contributing to the development of countries in South America and Africa, as well as in China and the Middle East.*

*Its state-of-the-art technologies and commitment to ongoing research and development enables the company to offer its customers quality, long-lasting, reliable and ergonomic solutions.*

*Saint-Gobain currently ranks on the Global 100 List of the world's most sustainable companies. These companies are selected from those included on the MSCI World, a worldwide financial index maintained by Morgan Stanley Capital International, which assesses corporate management of environmental, social and governance risks and opportunities.*

### SPECIFIC COMMITMENTS ON A DAILY BASIS

Saint-Gobain PAM's strategy in terms of sustainable development is divided into numerous specific actions. Below are just a few examples of these:

#### THE ENVIRONMENT

- Saint-Gobain PAM is fully committed to water cycle projects.
- Emerging nations such as China, India and Russia have opted to base their water conveyance networks on ductile iron pipelines.
- Saint-Gobain PAM is actively involved in the development of hydroelectric micro power stations, particularly in Norway and Austria.
- The launch of the Urbital range aims to boost the use of recycled water.
- Saint-Gobain PAM encourages the use of natural backfills instead of imported materials, thereby drastically reducing truck journeys.
- Anchor technologies allow for the elimination of large and heavy concrete thrust blocks, thereby generating additional space underground.
- Ductile iron is fully and permanently recyclable.

#### Industry and finance

- Saint-Gobain PAM uses charcoal from its plantations to product coke its blast furnaces in Brazil.
- The aim is to cut energy consumption by a quarter between now and 2040.
- Energy consumption during transportation is reduced thanks to the lower weight of products.
- 19% of Saint-Gobain PAM's investments in France are spent on the environment and safety.
- 66% of its products are transported by rail, river and sea:
  - 1 train = 30 trucks
  - 1 barge = 20 trucks
- In just 10 years, Saint-Gobain PAM has cut its energy needs by 30%.
- 80% of its waste products are reused.
- By 2010 all its factories will hold ISO 14001 certifications.

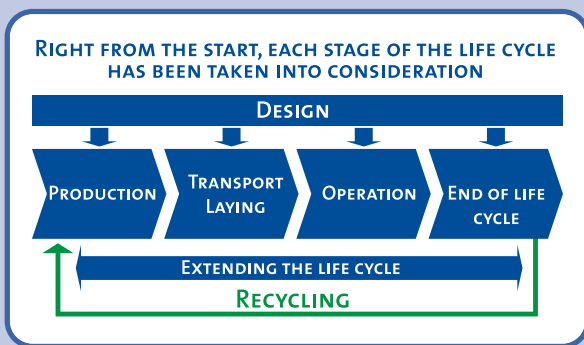
#### Social

- The company's social policy is based on 3 principles:
  - Respect for individuals,
  - Respect for health and safety in the workplace,
  - Respect for employees' rights.
- 3.5% of the wages budget is spent on training (50,000 hours).
- The Work Assistance Centre is dedicated to the integration of the disabled.
- Saint-Gobain has signed up to the UN's Global Compact, Caring for Climate and the CEO Water Mandate.



## BLUTOP, AT THE SERVICE OF SUSTAINABLE DEVELOPMENT

Blutop is a brand new water distribution solution designed for a world in which natural resources are becoming increasingly scarce. Minimising the impact on the environment has been an ongoing objective, covering all stages of the project, from the initial design stages and including the entire product life cycle.



### • Reduction in the amount of materials used

- A DN/OD 110 Blutop pipe contains just 45 kg of iron compared with the 95 kg of a previous generation K9 pipe
- 15 kg of cement mortar have been replaced by less than 1 kg of Ductan

### • Extended product durability

- The Zinalium external coating increases the life of pipelines in aggressive soils by a factor of at least 2 to 3.
- The Ductan internal lining is totally inert when in contact with potable water, thereby guaranteeing long life

### • Production technologies

- PAM uses optimised state-of-the-art technologies in its production of ductile iron pipelines
- Scrap iron is used in the production of Blutop pipelines
- Natural charcoal is used to produce Blutop fittings

### • More efficient laying techniques

- The manual handling of the pipelines makes for simpler, faster and more efficient laying
- In most cases it is possible to reuse natural backfill

### • Operation

- The excellent leaktightness of Blutop pipelines and their resistance to all types of external forces enhance the network performance levels, preventing water wastage
- The large hydraulic section, combined with the perfectly smooth inner surfaces, reduces energy consumption during pumping

### • And finally, the quality of the water transported by Blutop pipelines encourages consumers to drink tap water – the most economical way of drinking water

Blutop pipe and fitting facilities hold the ISO 14001 Environmental Management Standard Certification.



## A RANGE DESIGNED TO LAST OVER 100 YEARS

### Why set our sights on more than 100 years?

Pipelines for the distribution of potable water form part of the agenda of local groups, authorities and water companies. They represent a major investment aimed at providing consumers with a faultless standard of service.

Today, water network renewal rates are less than 1% a year (e.g. in France the annual average is between 0.6% and 0.7%). This means that the pipelines currently in existence will have to last more than 100 years – a figure that goes far beyond practical depreciation time periods and normal design specifications. Yet in the light of these investment rates, this figure must prevail above all others. Saint-Gobain PAM products are designed to meet this demand for durability

Blutop is able to meet this durability objective thanks to the following factors:

- High degree of mechanical resistance
- Protection against soil aggression
- Protection against water
- Joint flexibility



### HIGH DEGREE OF MECHANICAL RESISTANCE

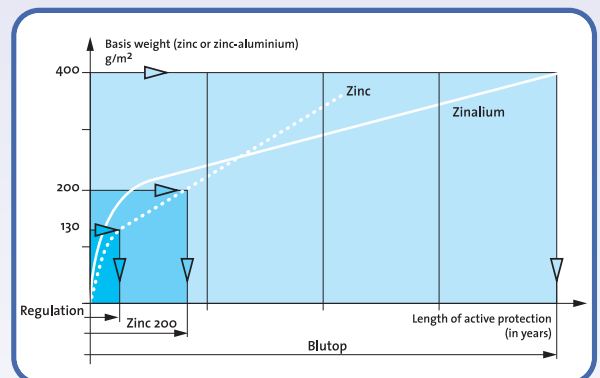
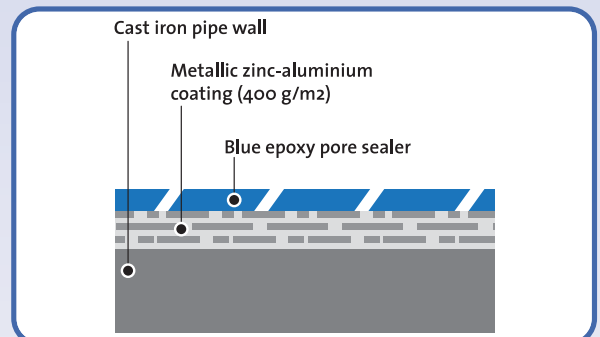
The Blutop range offers excellent mechanical properties. The pipes, fittings and joints are all class 25. The bursting pressure values are in excess of 150 bar. All the pipes are individually tested at 40 bar. The high degree of diameter rigidity prevents a reduction in the cross section caused by the earth loads due to pipe ovalisation.

| DN/OD             | 90                          | 110                         | 125                         |
|-------------------|-----------------------------|-----------------------------|-----------------------------|
| Diameter rigidity | 373,000<br>N/m <sup>2</sup> | 201,000<br>N/m <sup>2</sup> | 136,000<br>N/m <sup>2</sup> |

### PROTECTION AGAINST SOIL AGGRESSION

Potable water pipelines are in direct contact with the soil. One of the widely-acknowledged advantages of iron pipelines is their resistance to soil corrosion. The modern Zinalium external coating, based on 400 g/m<sup>2</sup> 85/15 zinc-aluminium true alloy and blue epoxy is a further step forward in increasing resistance levels:

- An increase in the durability of the protection by a factor of at least 2 to 3, depending on the type of soil
- Possibility of using the range in a wider range of soils (please refer to Regulation EN 545: 2007, Appendix D.2.3. for further details)



Zinalium coating, the result of research at Saint-Gobain PAM, has a worldwide patent

### PROTECTION AGAINST WATER AGGRESSION

Potable waters can have an aggressive impact on pipelines, either due to their mineral content or treatment products such as disinfectants. It is for this reason that all ductile iron pipelines come with an internal lining.

Traditionally, ductile iron pipelines have been lined with cement mortar.

With Blutop, this cement mortar has been replaced by the new Ductan thermoplastic ultramarine blue lining.

This coating has the same functional characteristics as the powder epoxy coating applied to gate valves. The following are particularly worthy of note:

- Fully adherent with an average value of 15 MPa (150 kg/cm<sup>2</sup>) and a minimum value of 8 MPa. This is of particular interest in case of:
  - Under pressure tapping
  - On-site cutting
- Perfectly smooth for laminar flow
- Seamless protection of the barrel, socket and the pipe spigot
- Ductan is lightweight, reducing the weight of Blutop pipes by 25%.

In addition, the Ductan coating is also impact-resistant and adapts perfectly to on-site laying conditions

### PROTECTION AGAINST EARTH MOVEMENTS

The bending moment reflects the pipes capacity to resist deformation caused by movements of the earth.

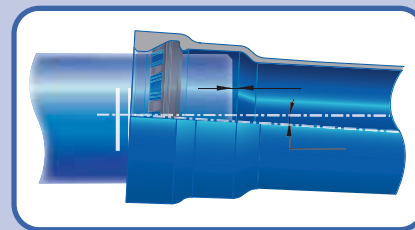
| DN/OD          | 90        | 110       | 125       |
|----------------|-----------|-----------|-----------|
| Bending moment | 3,328 N/m | 5,017 N/m | 6,511 N/m |

The joint maximum angular deflection enables the main to absorb earth movements without affecting the pipe integrity. Consequently, Blutop joints have a particularly high deviation capacity of up to 6° in both the anchored and non-anchored version for pipes and fittings.

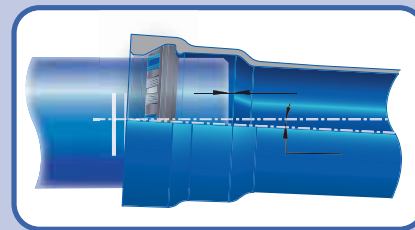
| Maximum angular deflection | DN/OD | DN/OD | DN/OD |
|----------------------------|-------|-------|-------|
|                            | 90    | 110   | 125   |
| Non-anchored joint         | 6°    | 6°    | 6°    |
| Anchored joint             | 6°    | 6°    | 6°    |

The increased jointing depth also allows for greater earth movements whilst reducing the risk of the joints becoming separated. These values exceed those specified in regulation EN 12842: 2000.

| DN/OD          | 90    | 110   | 125   |
|----------------|-------|-------|-------|
| Jointing depth | 57 mm | 60 mm | 61 mm |

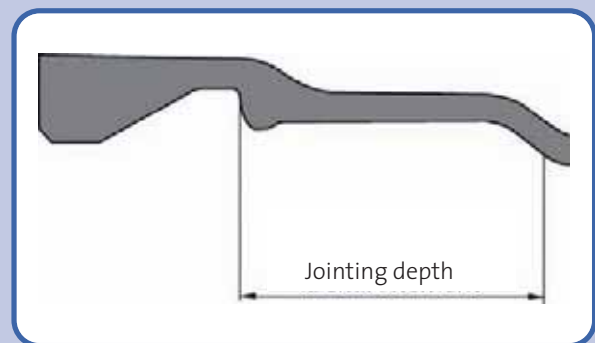


Angle of deflection with the non-anchored joint



Angle of deflection with the anchored joint

This also eliminates the risks of the joints becoming separated due to thermal expansion, as ductile iron expands around 5 times less than PVC and approximately 15 times less than polyethylene.



## LEAKTIGHTNESS

### Guaranteed leaktightness

Joint performance determines the reliability of the pipelines during the following operations:

- Jointing
- Pressurising

And also during:

- The product's life cycle,
- All conditions of use

PAM has combined all its design skill and know-how, together with that of the very finest gasket manufacturers, in order to create the Blutop joint.

One of Blutop's major advantages is the pipeline anchor system, which eliminates the need for heavy concrete thrust blocks.

The technology developed and patented by Saint-Gobain PAM has greatly enhanced the competitiveness of its anchor systems.



### CHANNELLING THE JOINTING FORCE

The Blutop joint has been specially designed in order to guarantee:

- Easy laying with a lower force requirement to allow for jointing using a crowbar
- Safe laying thanks to a mechanism to prevent the gasket from becoming loose during assembly
- Support points along the fittings make for easy jointing along the correct axis plane

This unique design, which has been perfected in close collaboration with several installers, allows for faster laying without causing additional tiredness and fatigue.



### HIGH PERFORMANCE LEVELS

The full use of Saint Gobain PAM technologies has made it possible to create high performance Blutop joints.

| Joint        | PFA Allowable operating pressure | PMA Allowable maximum pressure | PEA Allowable Test Pressure |
|--------------|----------------------------------|--------------------------------|-----------------------------|
| Non-anchored | 25 bar                           | 30 bar                         | 35 bar                      |
| Anchored     | 16 bar                           | 19 bar                         | 20 bar                      |

### STUDY OF THE FULL RANGE OF PRESSURE OPTIONS

During their useful lifetime, water distribution pipelines are subjected to numerous types of pressure. This naturally includes standard service pressure, but also the following:

- Day / night time pressure cycles
- Water hammer
- Pressure drops
- External pressure from the earth, groundwater
- Period without pressure prior to commencement of operations

In each of these situations, the joints are subjected to specific types of stress.

For this reason all joints for ductile iron pipelines are designed and tested in accordance with strict methods:

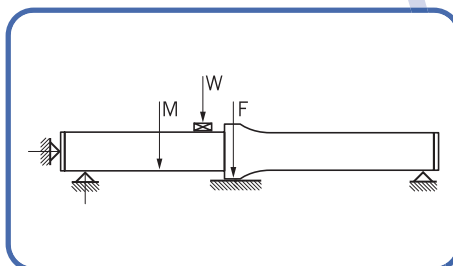
- In accordance with EN 545 testing: 4 tests
- PAM's own specific testing consisting of 4 additional tests

These tests are carried out on both non-anchored and anchored joints, taking into account the full impact of said tests, with a safety factor of  $1.5 \times PFA + 5$ , namely 29 bar, in the case of 16 bar pressure.

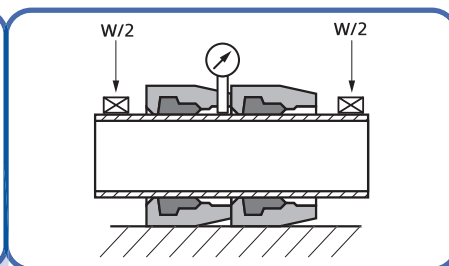
In addition, PAM carefully studies all its new joints using scientific finite element calculus methods similar to those used in the aeronautical and car industries. These design methods and tests guarantee unbeatable durability and reliability.

| Method                     | Conditions   | Pressure                                | Objective   | Reference |
|----------------------------|--|---|---|-----------|
| Positive internal pressure | Maximum deviation<br>Shear force 30 DN                             | 1,5 PFA+5 bar                           | To prove the joint's capacity to withstand the hydraulic pressure | EN 545    |
| Negative internal pressure | Maximum deviation<br>Shear force 30 DN                             | -0,9 bar                                | To prove that the joint is airtight                               | EN 545    |
| Cyclic internal pressure   | Shear force 30 DN  | 24000 cycles<br>PMA-5 ->PMA             | To prove the joint's fatigue performance                          | EN 545    |
| Positive external pressure | Maximum deviation<br>Shear force 30 DN                             | 2 bar                                   | To prove that the joint is resistant to groundwater               | EN 545    |
| Positive internal pressure | Maximum deviation<br>Shear force 30 DN                             | Set up using seal bush at 1.5 PFA+5 bar | To prove joint performance at all pressure levels                 | PAM       |
| Ageing                     | Water at 80°C  | 3 months of cycles<br>PMA-5 ->PMA       | To prove the joint's ageing performance                           | PAM       |
| Fine sand infestation      | Fine sand heavily compacted around the joint prior to pressurising | First three EN 545 tests                | To prove the resistance to sand entering the joint                | PAM       |
| Silt infestation           | Compaction of silt around the joint prior to pressurising          | First three EN 545 tests                | To prove the resistance to mud and silt under the gasket          | PAM       |

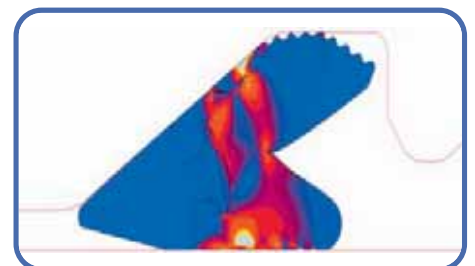
### Test methods



Method to test resistance to positive, negative and cyclic internal pressure



Method to test resistance to external pressure



Finite element calculus study of the Blutop joint  
Joint modelling

## MANUAL INSTALLATION

### *Improving laying conditions is a key issue in the Blutop project.*

*Laying small diameter pipelines looks set to remain an essentially manual task for some considerable time to come. Distribution pipes often have to be transported to sites that are difficult to reach. Accessing the trenches, occasionally situated between shoring, may often turn into a complex operation. Assembling the pipes, fittings and accessories in a confined space is extremely complex.*

***Any advance that can reduce these hard, laborious tasks will therefore contribute to site competitiveness.***



## MANUAL HANDLING

When it comes to laying, the first advantage the Blutop range offers is that the products can be handled manually by two people, and do not require mechanical methods.

| Mass        | DN/OD 90 | DN/OD 110 | DN/OD 125 |
|-------------|----------|-----------|-----------|
| 6 m pipe    | 36.6 kg  | 45 kg     | 52 kg     |
| Metric mass | 6.1 kg/m | 7.5 kg/m  | 8.6 kg/m  |

The pipes can be situated close to the trench, even in sites that are difficult to access. They can also be laid at the bottom of the trench manually, without the need for mechanical assistance. The pipes can be installed by a single person, as can the fittings which come with handles making them easy to grip.

## CROWBAR JOINTING

The second advantage of the Blutop range is that pipes and fittings can be jointed with a simple crowbar. Jointing using a crowbar is a particular advantage, and especially in the case of bends. This is possible because of the following factors:

- The Blutop socket has been specially designed to minimise the effort required for jointing
- The fittings feature support points which allows easy position of the bar and for effort to be applied along the jointing axis.

## FASTER ON-SITE PROGRESS

The third advantage Blutop offers is the direct consequence of the first two. Thanks to the possibility of manual handling and jointing, the mechanical digger on the site can continue working on the trenches, whilst the team assembles the pipes and fittings. The result is optimised use of the mechanical equipment and faster on-site progress.

In addition, smaller digging equipment can be used, with the corresponding reduction in machinery and fuel costs.



Learn more about laying and setting up the Blutop range by consulting our "Laying Guide"

## « EXTRAS » THAT MAKE THE DIFFERENCE

Numerous aspects of the products have been studied in order to facilitate on-site operations. Below are just a few examples:

- Easy to clean jointing  
The smooth shape of the jointing makes it easy to clean any dirt accumulated from the trench.
- Smooth leaktight surfaces  
The smooth surfaces of the pipe coating and fitting joints make it possible to check the cleanliness of the joints at a glance
- Easy to insert joints  
The gasket slides easily into the pre-lubricated socket, removing the need to alter the gasket shape.

- Fast cutting  
The use of Ductan instead of cement mortar for the internal lining, helps to reduce cutting time and disk wear and tear.
- Recovery of the tapping disk  
The Blutop pipe tapping tools, required to create the service connections, allow for the precise cutting of the Ductan coating, as well as the full recovery of the disk.
- Fewer fittings  
The angular deviation of the joint, which can be up to 6°, can be used to reduce the number of bends, thereby cutting site costs. This also contributes to improving the water flow.



## OPERATING FACTORS PLAYED A KEY ROLE IN THE DESIGN PHASE

### ***An increasingly important consideration***

*The Blutop range has been designed to provide solutions to operational difficulties. Careful attention was given to the mechanical design of the joints in order to guarantee leaktightness under all conditions (see pages 12 and 13) and throughout the product's lifetime.*

*The increase in the hydraulic section of the pipes is a crucial aspect in the development of the Blutop range.*

*Size compatibility with PVC or PE pipes is also a major asset as most networks are plastic and it is necessary to ensure that old or prematurely aged sections can be easily replaced.*

### **REDUCTION IN PUMPING COSTS**

Guaranteeing the appropriate flow and pressure of the water may prove complex in particularly long sections and complex networks or those requiring additional extensions. The hydraulic diameter of Blutop pipelines is greater than those of standard plastic pipes and they can operate at higher pressures.

### **A large hydraulic section will cut pumping costs by reducing head losses; the head loss is proportional to the diameter to the power of 6!**

At the given flow, each extra % on the diameter represents 5% less head loss!

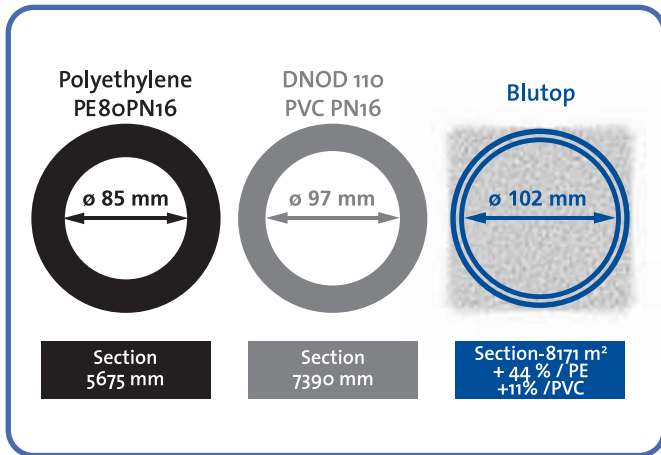
The rigidity of the Blutop pipes, combined with the long term stability of their mechanical properties, prevents the ovalisation of the pipelines during trench compaction and over time. The hydraulic cross section therefore remains unaltered.

For fire protection, hydraulic sections are playing an increasingly important role. Ensuring the 60 m<sup>3</sup>/h required by law (Circular dated 10 December 1951) is often complex in the case of remote areas. Practical and convenient hydraulic sections, as with Blutop pipes, can make a significant contribution to solving this requirement without the need for any additional investment.





A comparison of the Blutop hydraulic section with DN/OD 110 PVC and PE tubes



These data highlight a number of advantages of the Blutop pipelines:

- The hydraulic diameter of Blutop pipelines is always considerably greater than that of standard plastic pipe.
- In many cases, smaller Blutop pipe can replace larger plastic pipes.

For example a Blutop DN/OD 110 pipe can replace a PE80 PN 16 DN/OD 125

Hydraulic diameters of PVC, PEhd and Blutop pipes

|        | PVC    | Polyethylene |          | Blutop    |
|--------|--------|--------------|----------|-----------|
| PN/PFA | PVC 16 | PE80 16      | PE100 16 | Blutop 25 |
| 90     | 77     | 70           | 74       | 82        |
| 110    | 97     | 85           | 90       | 102       |
| 125    | 110    | 97           | 102      | 117       |
| 140    | 123    | 109          | 115      | –         |

PVC tube pursuant to regulation EN 1452 and a PE tube in accordance with regulation EN 12201

**COMPATIBILITY WITH EXISTING PLASTIC NETWORKS**

Blutop pipes and fittings have been designed to be compatible with plastic pipes. This means that the spigots of PVC or HDPE pipes that comply with current regulations may be jointed with Blutop pipes or fittings.

This compatibility allows for the homogeneous design of mainly plastic networks, as well as for existing accessory stocks to be used up.

Saint-Gobain PAM service connections for plastic pipes may be fitted to Blutop pipes.

The same is also applicable to those accessories provided by other suppliers that have validated their products with Blutop (you should contact these suppliers to check whether their products are compatible with Blutop).

**SMOOTH SURFACES**

The coatings internal used in the Blutop range – Ductan for the pipes and epoxy for the fittings – guarantee perfectly smooth surfaces.

The roughness coefficient of Blutop pipes is less than 0.01 mm. This extremely low rate also contributes to reducing head losses, although the key factor in this aspect is undoubtedly the increase in the cross sectional area.

## QUALITY WATER

### A key concern

Recent international surveys have confirmed that a growing number of consumers are showing increased satisfaction with supplied water.

This is positive for sustainable development as it helps to limit the impact on the environment caused by the

preparation and transportation of bottled water. The development of the Blutop range has also contributed to this trend by offering pipes, fittings and joints that respect the water they transport

### EUROPEAN APPROVAL

The European dimension of the Blutop range is clearly shown by the fact that the Ductan internal lining currently holds water potability standard certificates in several European countries:

- Compliance with the French regulation "Attestation de Conformité Sanitaire" for Ductan, epoxy, lubricant and gaskets.
- Compliance with Belgium's 'Hydrocheck' certification procedure, issued by Belgaqua.
- Compliance with the German UBA-Guideline and DVGW-W270 certification procedures, issued by the Ruhrgebiets Hygiene Institute in Gelsenkirchen.
- Compliance with UK BS 6920 standards issued by the WRAS.
- Compliance with "regulation 31 (4) (a)" in England, Wales and Scotland.

Other certification procedures in several other European countries are currently in progress.

### INERT IN CONTACT WITH WATER

Tests on the migration of organic particles in water reveal extremely low levels of migration and migration speed, the result of Ductan's, inert nss.

|                           | Organic carbon total COT (mg/l) | Migration speed mg/dm <sup>2</sup> /day |
|---------------------------|---------------------------------|---|
|                           | Non-chlorinated water           |   |
| 1 <sup>st</sup> immersion | 0.06                            | <0.01                                   |
| 2 <sup>nd</sup> immersion | 0.01                            | <0.01                                   |
| 3 <sup>rd</sup> immersion | <0.01                           | <0.01                                   |
|                           | Chlorinated water (1 mg/l)      |   |
| 1 <sup>st</sup> immersion | 0.19                            | 0.01                                    |
| 2 <sup>nd</sup> immersion | 0.38                            | 0.03                                    |
| 3 <sup>rd</sup> immersion | 0.11                            | 0.01                                    |

### LONG-LASTING INTERNAL SURFACES

The internal surfaces of the Blutop pipelines are coated with Ductan in the case of pipes and epoxy for fittings. These 2 coatings provide a uniform internal covering for the pipelines.

Epoxy is well-known as a coating material for valves and is highly valued for its chemical inertness in water.

The same is also true of Ductan, with similar characteristics to epoxy and enhanced impact resistance.

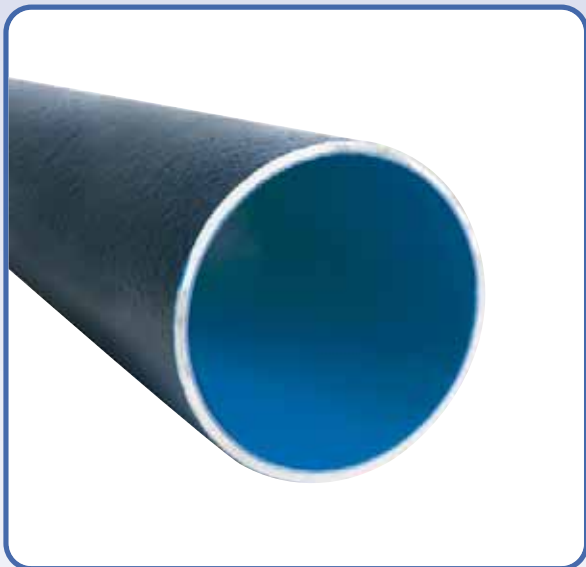
The surfaces are smooth and inert, thereby helping to prevent deposits from building up in the mains.

The performance of Ductan has been studied over several thousand hours at a temperature of 40°C and in contact with various disinfection products such as

- Sodium hypochlorite
- Chlorine dioxide

The main conclusions of these studies are listed below:

- Excellent stability of the chemical structure
- Absence of chemical change as shown by the lack of surface erosion or cracking
- The mechanical properties undergo no significant changes during elongation – traction



### UNFAVOURABLE CONDITIONS FOR BACTERIAL GROWTH

From the point of view of the bacteriological of the water, the inert and long-lasting nature of the Ductan internal lining does not support bacterial growth (as confirmed by the tests carried out by Hydrocheck in Belgium).

Indeed, the inertness of the Ductan internal lining prevents the transfer of carbon compounds that may favour the growth of bacterial colonies by supplying them with the necessary nutrients.



# THE BLUTOP RANGE

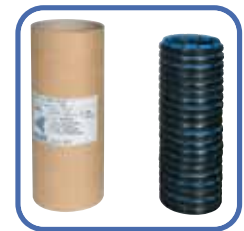
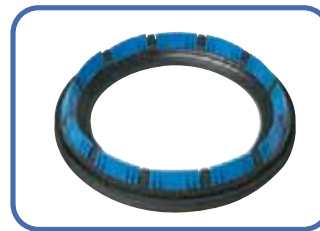


## BLUTOP PIPES

| DN/OD mm | Lu m | Class | Nominal e mm | DE mm | DI mm | P mm | B mm  | Mass kg/m | Reference |
|----------|------|-------|--------------|-------|-------|------|-------|-----------|-----------|
| 90       | 6    | 25    | 3.0          | 90.0  | 92.7  | 86.0 | 128.0 | 6.1       | KXL90H60  |
| 110      | 6    | 25    | 3.0          | 110.0 | 112.8 | 89.0 | 148.0 | 7.5       | KXM11H60  |
| 125      | 6    | 25    | 3.0          | 125.0 | 128.0 | 98.5 | 163.0 | 8.6       | KXM12H60  |

## BLUTOP NON-ANCHORED JOINTS

| DN/OD mm | PFA bar | Mass kg/m | Reference |
|----------|---------|-----------|-----------|
| 90       | 25      | 0.060     | JXL90BA   |
| 110      | 25      | 0.075     | JXM11BA   |
| 125      | 25      | 0.090     | JXM12BA   |



## BLUTOP ANCHORED JOINTS

| DN/OD mm | PFA bar | Mass kg/m | Reference |
|----------|---------|-----------|-----------|
| 90       | 16      | 0.095     | JXL90CA   |
| 110      | 16      | 0.115     | JXM11CA   |
| 125      | 16      | 0.130     | JXM12CA   |



## BLUTOP COLLARS

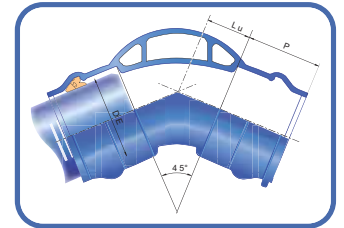
| DN/OD mm | P mm  | Lu mm | Mass kg/m | Reference |
|----------|-------|-------|-----------|-----------|
| 90       | 93.0  | 40    | 3.86      | KXL90MN   |
| 110      | 99.0  | 40    | 4.91      | KXM11MN   |
| 125      | 105.0 | 40    | 5.70      | KXM12MN   |



Availability schedule  
 DN/OD 110 = available  
 DN/OD 90 = available  
 DN/OD 125 = available

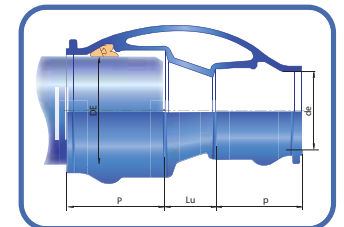
## BLUTOP BENDS

| ANGLE degree   | DN/OD mm | P mm  | Lu mm | Mass kg | Reference |
|----------------|----------|-------|-------|---------|-----------|
| 1/4<br>90°     | 90       | 93.0  | 75.0  | 5.22    | KXL90CA   |
|                | 110      | 99.0  | 85.0  | 6.70    | KXM11CA   |
|                | 125      | 105.0 | 110.0 | 8.31    | KXM12CA   |
| 1/8<br>45°     | 90       | 93.0  | 50.0  | 4.88    | KXL90CB   |
|                | 110      | 99.0  | 60.0  | 6.40    | KXM11CB   |
|                | 125      | 105.0 | 65.0  | 7.40    | KXM12CB   |
| 1/16<br>22°30' | 90       | 93.0  | 30.0  | 4.17    | KXL90CD   |
|                | 110      | 99.0  | 30.0  | 5.25    | KXM11CD   |
|                | 125      | 105.0 | 30.0  | 6.06    | KXM12CD   |
| 1/32<br>11°15' | 90       | 93.0  | 30.0  | 3.90    | KXL90CE   |
|                | 110      | 99.0  | 30.0  | 5.20    | KXM11CE   |
|                | 125      | 105.0 | 30.0  | 5.90    | KXM12CE   |



## BLUTOP DUCKFOOT BENDS

| DN/OD mm | DN | Mass kg | Reference |
|----------|----|---------|-----------|
| 90       | 80 | 9.10    | KXL90DFOE |
| 110      | 80 | 11.90   | KXM11DFOE |
| 125      | 80 | 14.50   | KXM12DFOE |



## BLUTOP TAPERS

| DN/OD mm | Ø D1 mm | P1 mm | Lu mm | DE mm | P2 mm | Lt mm | Mass kg | Reference |
|----------|---------|-------|-------|-------|-------|-------|---------|-----------|
| 90       | 123     | 93    | 40    | 63    | 83    | 216   | 3.30    | KXL90VE0B |
|          |         |       |       | 75    | 87    | 220   | 3.56    | KXL90VE0C |
| 110      | 146     | 99    | 50    | 63    | 83    | 232   | 3.96    | KXM11VE0B |
|          |         |       |       | 75    | 87    | 236   | 4.21    | KXM11VE0C |
|          |         |       |       | 90    | 93    | 242   | 4.59    | KXM11VE0D |
| 125      | 162     | 104   | 45    | 90    | 93    | 147   | 4.99    | KXM12VE0D |
|          |         |       |       | 110   | 99    | 248   | 5.40    | KXM12VE0E |

## BLUTOP FLANGED SPIGOTS

| DN/OD mm | PN bar | Lu mm | L mm | B mm | Mass kg | Reference |
|----------|--------|-------|------|------|---------|-----------|
| 90       | 10-16  | 102   | 167  | 200  | 4.96    | KXL90BU1E |
| 110      | 10-16  | 110   | 180  | 220  | 6.48    | KXM11BU1F |
| 125      | 10-16  | 114   | 188  | 250  | 8.33    | KXM12BU1G |



# THE BLUTOP RANGE

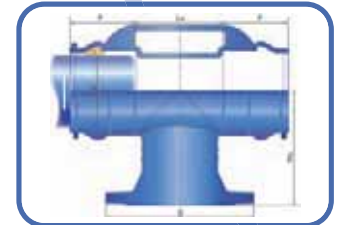
## BLUTOP FLANGED SOCKETS

| DN/OD mm | PN bar | Lu mm | L mm | B mm | Mass kg | Reference |
|----------|--------|-------|------|------|---------|-----------|
| 90       | 10-16  | 93    | 68   | 200  | 5.44    | KXL90BE1E |
| 110      | 10-16  | 99    | 68   | 220  | 6.96    | KXM11BE1F |
| 125      | 10-16  | 105   | 66   | 250  | 8.65    | KXM12BE1G |



## BLUTOP FLANGE ADAPTERS

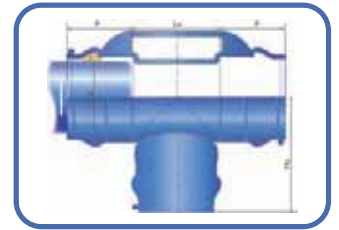
| DN/OD mm | DN - | PN bar | Non-anchored |           | Anchored |           |
|----------|------|--------|--------------|-----------|----------|-----------|
|          |      |        | Mass kg      | Reference | Mass kg  | Reference |
| 90       | 80   | 10-16  | 2.60         | MAL90DACH | 2.80     | 216901    |
| 110      | 100  | 10-16  | 3.20         | 160754    | 3.40     | 216902    |
| 125      | 125  | 10-16  | 4.10         | 160755    | 4.30     | 216906    |



## BLUTOP FLANGE ON DOUBLE SOCKET TEES

| DN/OD mm | PN bar | P mm  | Lu mm | Hu mm | B mm  | Mass kg | Reference |
|----------|--------|-------|-------|-------|-------|---------|-----------|
| 90x40    | 10-16  | 93.0  | 65.0  | 135.0 | 150.0 | 6.43    | KXL90TD1A |
| 90x60    | 10-16  | 93.0  | 90.0  | 155.0 | 175.0 | 7.97    | KXL90TD1C |
| 90x65*   | 10-16  | 93.0  | 90.0  | 155.0 | 175.0 | 8.20    | KXL90TD1D |
| 90x80    | 10-16  | 93.0  | 105.0 | 160.0 | 200.0 | 9.22    | KXL90TD1E |
| 110x40   | 10-16  | 99.0  | 65.0  | 145.0 | 150.0 | 7.52    | KXM11TD1A |
| 110x60   | 10-16  | 99.0  | 90.0  | 165.0 | 175.0 | 9.13    | KXM11TD1C |
| 110x65*  | 10-16  | 99.0  | 90.0  | 165.0 | 175.0 | 9.13    | KXM11TD1D |
| 110x80   | 10-16  | 99.0  | 105.0 | 170.0 | 200.0 | 10.41   | KXM11TD1E |
| 110x100  | 10-16  | 99.0  | 125.0 | 170.0 | 220.0 | 11.94   | KXM11TD1F |
| 125x40   | 10-16  | 104.0 | 65.0  | 160.0 | 150.0 | 8.43    | KXM12TD1A |
| 125x60   | 10-16  | 104.0 | 90.0  | 160.0 | 175.0 | 9.93    | KXM12TD1C |
| 125x65*  | 10-16  | 104.0 | 90.0  | 160.0 | 175.0 | 10.00   | KXM12TD1D |
| 125x80   | 10-16  | 104.0 | 105.0 | 170.0 | 200.0 | 11.26   | KXM12TD1E |
| 125x100  | 10-16  | 104.0 | 125.0 | 180.0 | 220.0 | 12.95   | KXM12TD1F |
| 125x125  | 10-16  | 104.0 | 150.0 | 180.0 | 250.0 | 14.86   | KXM12TD1G |

\* on demand

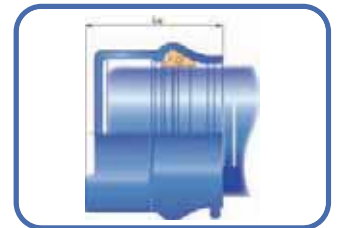


### BLUTOP ALL SOCKET TEES

| DN/OD mm | Ø D1 mm | P1 mm | Lu mm             | DE mm            | Ø d1 mm           | P2 mm           | Hu mm | Lt mm             | Mass kg/m             | Reference                           |
|----------|---------|-------|-------------------|------------------|-------------------|-----------------|-------|-------------------|-----------------------|-------------------------------------|
| 90       | 123     | 92.5  | 105               | 90               | 123               | 92.5            | 56    | 290               | 6.53                  | KXL90TE0D                           |
| 110      | 146     | 99    | 125<br>134        | 90<br>110        | 123<br>146        | 92.5<br>99      | 67    | 303<br>332        | 7.82<br>8.70          | KXM11TE0D<br>KXM11TE0E              |
| 125      | 162     | 104   | 105<br>125<br>150 | 90<br>110<br>125 | 123<br>146<br>162 | 93<br>99<br>104 | 74    | 313<br>333<br>358 | 8.74<br>9.59<br>10.36 | KXM12TE0D<br>KXM12TE0E<br>KXM12TE0G |

### BLUTOP PLUGS

| DN/OD mm | Ø D1 Mm | Lt mm | Mass kg/m | Reference |
|----------|---------|-------|-----------|-----------|
| 90       | 123     | 107   | 1.96      | KXL90BH   |
| 110      | 146     | 113   | 2.55      | KXM11BH   |
| 125      | 162     | 118   | 3.02      | KXM12BH   |



### BLUTOP REPAIR PRODUCTS

| Name                  | Mass kg | Reference |
|-----------------------|---------|-----------|
| Eurokote 438 RAL 5002 | 1       | 213686    |



### FULL TAPPING KIT FOR BLUTOP PIPES

| Name       | Mass kg | Reference |
|------------|---------|-----------|
| 20 (19 mm) | 0.19    | 214191    |
| 25 (24 mm) | 0.20    | 214193    |
| 32 (30 mm) | 0.26    | 214195    |
| 40 (38 mm) | 0.27    | 214196    |



### BLUTOP LUBRICATING PASTE

| Name                     | Mass kg | Reference |
|--------------------------|---------|-----------|
| Blutop lubricating paste | 0.85    | 214611    |



### EXCLUSIVE BLUTOP MULTI-TOOTH SAW (SPARE PART)

| Name       | Mass kg | Reference |
|------------|---------|-----------|
| 20 (19 mm) | 0.10    | 215444    |
| 25 (24 mm) | 0.12    | 215445    |
| 32 (30 mm) | 0.17    | 215446    |
| 40 (38 mm) | 0.24    | 215447    |



### PIPE TAPPING MACHINE

| Name                               | Mass kg | Reference |
|------------------------------------|---------|-----------|
| Service connection tapping machine | 16      | 215439    |



# DETAILED TECHNICAL SPECIFICATIONS

## PIPE AND FITTING METALLURGICAL SPECIFICATIONS

The metallurgical specifications of the Bluto pipes and fittings are included in European Standard EN 545.

| Specification              | Unit | Pipes | Fittings |
|----------------------------|------|-------|----------|
| Minimum tensile strength   | MPa  | 420   | 420      |
| Minimum elongation         | %    | 10    | 5        |
| Maximum Brinell hardness   | HB   | 230   | 250      |
| Minimum elasticity modulus | GPa  | 170   | 170      |

## PIPE TECHNICAL SPECIFICATIONS

The technical specifications are the following.

| DN/OD                       | Unit    | 90  |                | 110   |                | 125   |                |
|-----------------------------|---------|-----|----------------|-------|----------------|-------|----------------|
|                             |         | 90  | + 0.6<br>- 1.0 | 110.0 | + 0.7<br>- 1.0 | 125.0 | + 0.8<br>- 1.0 |
| External diameter tolerance | Mm      | 90  | + 0.6<br>- 1.0 | 110.0 | + 0.7<br>- 1.0 | 125.0 | + 0.8<br>- 1.0 |
| Average internal diameter   | Mm      | 82  |                | 102   |                | 117   |                |
| Cast iron nominal thickness | Mm      | 3.0 |                | 3,0   |                | 3.0   |                |
| Calculation thickness (1)   | Mm      | 2.2 |                | 2.2   |                | 2.2   |                |
| Nominal metric mass (2)     | Kg/m    | 6.1 |                | 7.5   |                | 8.6   |                |
| Nominal pipe mass (2)       | Kg/pipe | 37  |                | 45    |                | 52    |                |

(1) Thickness in point 1 cannot be less than the calculation thickness

(2) Indicative mass of iron for average wall thickness of 3 mm

## TECHNICAL SPECIFICATIONS OF THE DUCTAN INTERNAL LINING

The principal specifications of Ductan are given in the table below:

| Specification                                       | Value                                |
|---|--------------------------------------|
| Colour  | Ultramarine blue (close to RAL 5002) |
| Density (dry film)                                  | 0.96 g/cm <sup>3</sup>               |
| Adherence (ISO 4624)                                | ≥ 10 MPa on shot blasted steel plate |
| Shore hardness D                                    | 44                                   |
| Breaking length (ISO 527)                           | ≥ 400%                               |
| Stress cracking (ASTM D1693)                        | > 1000h                              |
| Induction time prior to oxidation at 200°C (EN 728) | > 10 min under O <sub>2</sub>        |



The principal properties of Ductan lining inside Blutop pipe barrels are given in the table below

| Specification                                   | Criteria   |
|---|--|
| Adhesion  | <ul style="list-style-type: none"> <li>• average value 15 MPa (minimum value 8 MPa )</li> </ul>  |
| Non porosity<br>(electric brush control)        | <ul style="list-style-type: none"> <li>• When measured with a voltage of 1 500 V, the internal surface of the pipe must be free from porosity</li> </ul> |
| Resistance to reverse impact<br>(opposite side) | <ul style="list-style-type: none"> <li>• Brush with no porosity following a 10 J impact</li> </ul>   |
| Roughness coefficient                           | < 0.01mm   |

The principal properties of Ductan lining inside Blutop pipe barrels in terms of resistance to ageing in water are given in the table below.

| Durability – Resistance to thermal ageing in water  | Defect criteria   | Non-defect criteria   |
|---|---|---|
| <p>The durability of the Ductan internal anti-corrosion protection is measured in accordance with a water immersion test pursuant to regulation EN ISO 2812-2-1995, at a temperature of 50°C. The material is exposed for 480 hours. An upside-down V is scratched (from an acute angle) onto each sample measuring at least 1 mm wide and 50 mm long. Two sections are assessed.</p> | <ul style="list-style-type: none"> <li>• Length of blistering on both sides of scratch: requirement &lt; 5mm</li> </ul> | Di<2 and De<2 blistering pursuant to EN ISO 4628-2                      |
|   | <ul style="list-style-type: none"> <li>• Extent of rust on both sides of scratch: requirement &lt; 5mm</li> </ul>       | Rusting < Ri1<br>According to EN ISO 4628-3                             |
|   | –   | Traction test in accordance with EN ISO 4624-2003 : requirement ≥ 6MPa. |

## TECHNICAL SPECIFICATIONS OF THE EPOXY COATING ON FITTINGS

The principal properties of the epoxy coating on Blutop fittings are given in the table below. They comply fully with the regulation EN 14901.

| Performance tests                                     | Criteria   |
|---|--|
| Non-porosity  | No holidays at 1,500 V   |
| Resistance to impact                                  | No holidays at 1,500 V after an impact of 5J   |
| Durability -<br>Resistance to thermal ageing in water | Following the application of the test operating mode the average adhesion of the coating must be at least 6 MPa  |
| Resistance to indentation                             | <p>The depth of the indent measured after 48 hours must not exceed 30% of the initial coating measurement.</p> <p>Any increase in indent depth noted between 24 and 48 hours must be less than that between 0 and 24 hours and must not exceed 5% of the initial coating thickness measured.</p> |
| Durability - Resistance to thermal ageing in water    | Following the application of the test operating mode the coating must be porosity free.  |

# DETAILED TECHNICAL SPECIFICATIONS

## SCOPE OF USE IN ACCORDANCE WITH SOIL TYPES

Products included in the Blutop range may be laid in most types of soils, except the following:

- acidic peaty soils;
- soils containing refuse, orders, slag, or polluted by waste or industrial effluents;
- soil below the marine water table with a resistivity lower than 500  $\Omega$  cm.

In the case of the soil types listed above, and also in the event of stray currents, we recommend using products from the PAM TT Standard range

## SCOPE OF USE IN ACCORDANCE WITH WATER CHARACTERISTICS

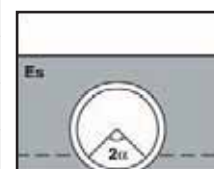
Products in the Blutop range may be used to carry all types of potable water in accordance with directive 98/83/EC.

| Water characteristics                       | Unit | Blutop range |
|---|------|--------------|
| Minimum pH value                            | -    | 4            |
| Maximum pH value                            | -    | 10           |
| Minimum hardness                            | °    | Unlimited    |
| Maximum level of aggressive CO <sub>2</sub> | mg/l | Unlimited    |
| Maximum sulphate level                      | mg/l | Unlimited    |
| Maximum magnesium level                     | mg/l | Unlimited    |
| Maximum ammonium level                      | mg/l | Unlimited    |

## MAXIMUM COVER DEPTHS FOR BLUTOP PIPELINES

Various cases studies

| Case   | Pipe bed               | Backfill           | Compaction            | Es*     | 2 $\alpha$ mini |
|--------|------------------------|--------------------|-----------------------|---------|-----------------|
| Case 1 | Levelled trench bottom | Group 4, 3, 2 or 1 | Non-compacted         | < 3 bar | 30°             |
| Case 2 | Levelled trench bottom | Group 3, 2 or 1    | Controlled compaction | 7 bar   | 30°             |
| Case 3 | Selected materials     | Group 3, 2 or 1    | Controlled compaction | 10 bar  | 90°             |
| Case 4 | Selected materials     | Group 1            | Controlled compaction | 20 bar  | 90°             |



(\*) Es, backfill modulus of reaction.

Maximum cover depths for Blutop pipelines without traffic loads

| Unit | Case 1<br>m | Case 2<br>m | Case 3<br>m | Case 4<br>m |
|------|-------------|-------------|-------------|-------------|
| 90   | 22.2        | 23.2        | 37.1        | 45.5        |
| 110  | 9.3         | 15.8        | 25.4        | 32.1        |
| 125  | 7.3         | 8.0         | 20.2        | 26.2        |

Maximum cover depths for Blutop pipelines with traffic loads

| DN/OD | Case 1<br>m | Case 2<br>m | Case 3<br>m | Case 4<br>m |
|-------|-------------|-------------|-------------|-------------|
| 90    | 22.2        | 23.2        | 37.1        | 45.4        |
| 110   | 9.2         | 15.7        | 25.4        | 32.1        |
| 125   | 7.1         | 7.8         | 20.2        | 26.2        |

# QUALITY, STANDARDS AND CERTIFICATIONS

## QUALITY, STANDARDS AND CERTIFICATIONS

### <Quality management

Saint-Gobain PAM's quality management system complies with ISO 9001 Standards.

Compliance with this quality management system is certified by a third party.

### Environmental management

The production sites for the pipes and fittings in the Blutop range hold the ISO 14001 Standard certification

### European regulations

The following European regulations are applicable to the Blutop range:

- EN 805 - General design of the Blutop range
- EN 681.1 - Gaskets
- EN 12842 - Blutop range fittings
- EN 14901 - Epoxy coating applied to Blutop fittings and accessories

In addition, the terms and conditions of regulation EN 545 are also applicable to the Blutop range with the following exceptions:

- Standard diameters type DN/OD (applicable to regulation EN 805-2000)
- Standard pressure class: C25 (PFA 25 bar)
- Thermoplastic type internal lining

The performance tests to determine the product specifications of the Blutop range were carried out in accordance with EN 545 requirements.

### National certifications

Due to its highly innovative nature, Blutop has not yet been certified on a European scale. In order to guarantee performance standards, the Blutop range is currently undergoing evaluation certification processes by competent and independent organisations in a number of countries. Several examples of these are listed below:

- France - CSTB Technical evaluation – currently in progress
- UK - WRC Evaluation – currently in progress
- Germany - DIN experimental evaluation (PAS) currently under approval
- Belgium - Belgaqua Certification currently in progress
- The Netherlands - KIWA Certification currently in progress

Full details of the granting of these certifications are available on our website:

[www.blutop.co.uk](http://www.blutop.co.uk) <<http://www.blutop.co.uk>> or  
[www.blutop.com](http://www.blutop.com) <<http://www.blutop.com>>



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Other products and services available from Saint-Gobain PAM UK:



### Natural™

A range 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.

### Directional

A ductile iron pipe solution for horizontal directional drilling applications. Available from DN100 to DN700 and fully compliant with BS 545 and BS 598.

### 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.

### 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 DN50 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

### RapidFlange™

A business unit dedicated to offering fast and flexible service to M&E and pump market sectors – specialising in providing high quality flanged products and offering technical support and rapid response.

### 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.

### 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 and 150mm 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 finished 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.

### 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.

Your local stockist is:

### Quality Assurance



Quality Management Systems BS EN ISO 9001:2000  
(Registered firm: FM 12908)

### Environmental Standard



Environmental Management Systems BS EN ISO 14001:2004

visit: [www.saint-gobain-pam.co.uk](http://www.saint-gobain-pam.co.uk)

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