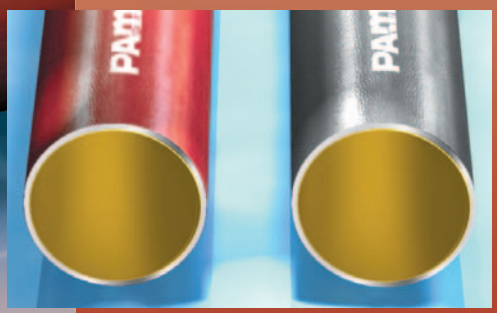
PAM-GLOBAL®

Worldwide

- PAM-GLOBAL® S
- PAM-SMU® S
- PAM-ENSIGN® S

- PAM-GLOBAL® Plus
- PAM-SMU® Plus
- PAM-ENSIGN® Plus



Complete Cast Iron Gravity drainage systems for buildings

May 2008

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ranks among

the world's largest

industrial companies

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For drainage systems PAM-GLOBAL® S has become synonymous with socketless, cast-iron drainage systems that have been manufactured for the past 25 years by the PONT-A-MOUSSON works (PAM) which is a member of the SAINT-GOBAIN Group.

PAM-GLOBAL® S stands for a new age in socketless drainage systems.

PAM pipes, fittings and couplings are manufactured and marketed exclusively throughout the world by SAINT-GOBAIN in the very highest quality standards.

New future prospects for cast-iron PAM-GLOBAL® S Soil and Drain Systems.

PAM-GLOBAL® S

An internationally protected trade mark for socketless drainage pipes and fittings made of cast iron.

PAM-GLOBAL® S

Index

General information on Saint-Gobain CANALISATION building cast iron.

Saint-Gobain CANALISATION does not guarantee the performances of its products when installed with pipes not manufactured by Saint-Gobain CANALISATION. All the diagrams, drawings and installation proposal of the present document have no contractual value and are given only as an indication.
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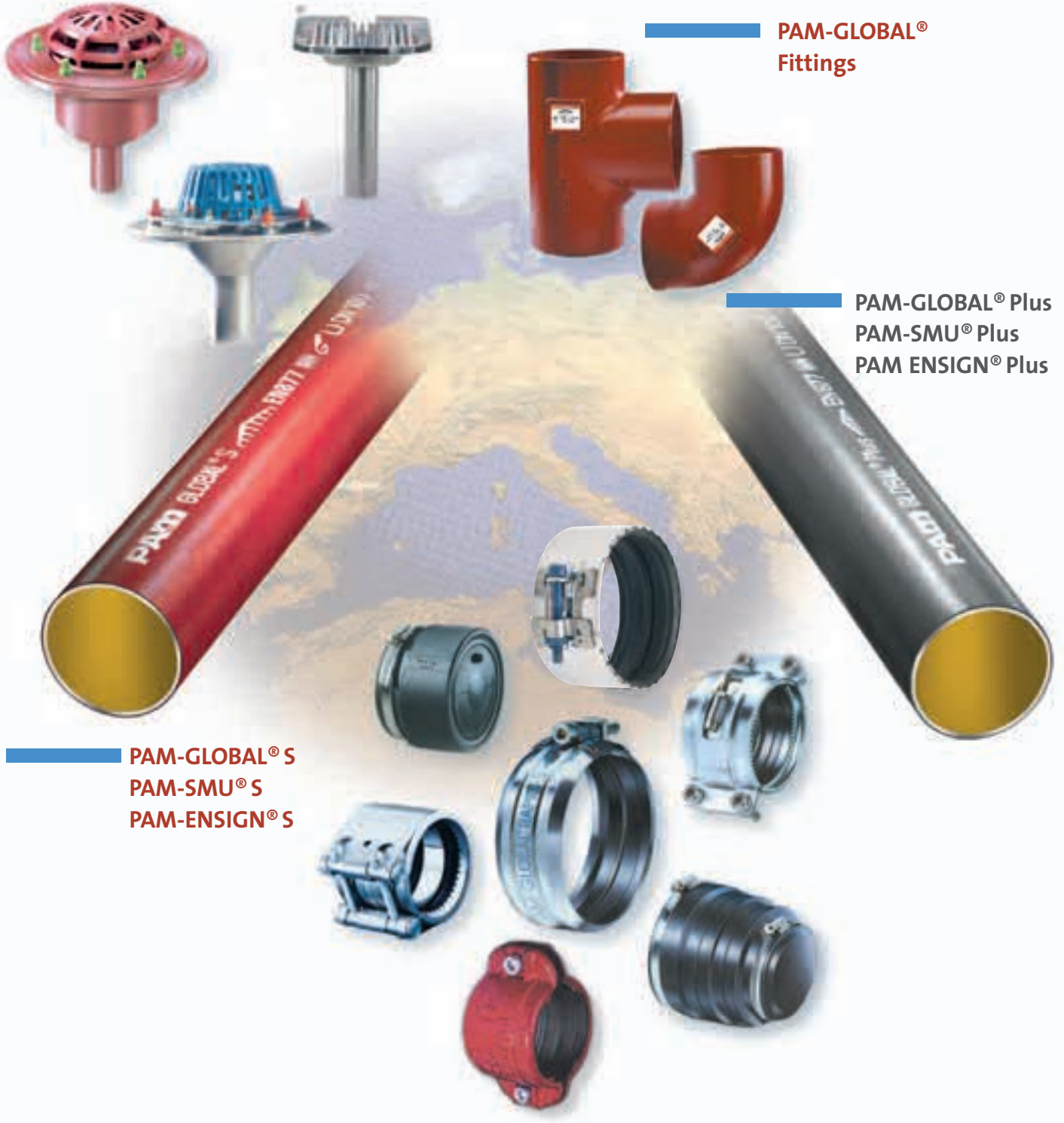
Cast iron, quality material

Iron : 100% recyclable
Environnemental Friendly

EPAMS®

Syphonic Cast Iron Rainwater Drainage System



PAM-GLOBAL® Fittings

PAM-GLOBAL® Plus
PAM-SMU® Plus
PAM ENSIGN® Plus

PAM-GLOBAL® S
PAM-SMU® S
PAM-ENSIGN® S

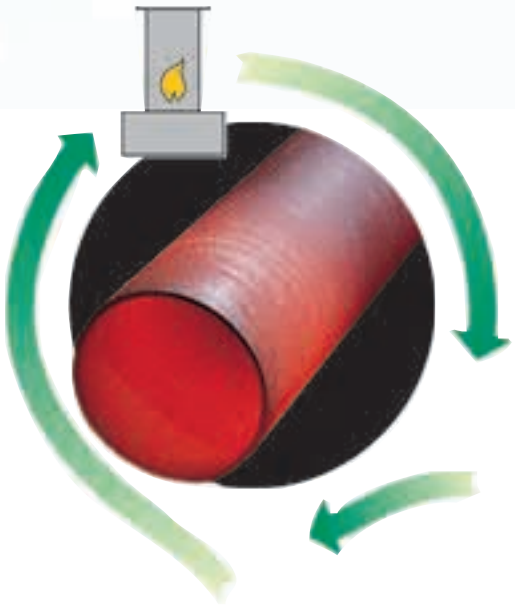
Couplings

PAM-GLOBAL® S
PAM-SMU® S
PAM-ENSIGN® S

Cast iron, quality material

Cast iron for building drainage is produced from carefully selected recycled ferrous products.

- Cast iron pipes and fittings are made from 100 % recycled scrap metals.
- Iron is a totally recyclable material.
- Iron is therefore more environmentally friendly than most other materials and enables to save natural resources.

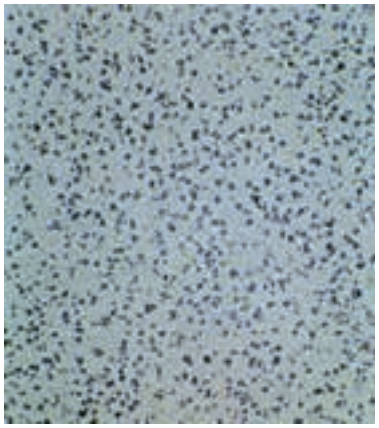


The quality of metal is strictly controlled from the fusion in the cupolas.

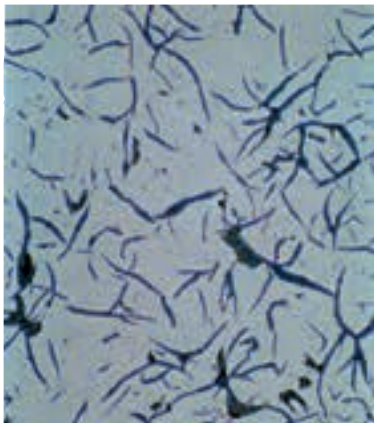
Analyses by spectrograph and mechanical tests are performed during the casting operations and confirm for iron the very high level of quality before further transformation.

Liquid cast iron

Chemical analyses by spectrograph



SEM photo:
Rosette-shaped graphite formation of **PAM-GLOBAL® pipes**



SEM photo:
Customary graphite formation in grey-cast iron

Principal advantages of the De Lavaud process:

After the pipes have been cast they are specifically heat treated to temperature of 950 °C and then allowed to cool down slowly and uniformly. This heat treatment results in a rosette-shaped graphite formation which substantially improves the mechanical properties of the cast iron, i.e. diminished internal stress and higher tensile strength.

Cast iron, quality material

An efficient manufacturing process: the De Lavaud process

In the De Lavaud process the molten metal is directly poured onto the bare steel mould (without any refractory barrier), and thus undergoes a very fast cooling speed, which results into a very fine and specific structure.
After spinning, the Saint-Gobain CANALISATION pipes are submitted to a 2 step heat treatment (graphitization + ferritization) which gives the pipes higher mechanical characteristics.

For pipes	Saint-Gobain CANALISATION's Process	Others	EN 877 Requirement
Tensile Strength on samples in MPa (average value)	300	270	200 minimum
Ring Crush Strength in MPa (average value, DN 100 pipes)	470	360	350 minimum
Surface Brinell Hardness in HB degree (average value)	205	245	260 maximum

Definitions:

Graphitization: is an annealing above 950 °C allowing enough time to eliminate/dissolve the carbides, and transform them into graphite and iron. The secondary graphite so produced is not a lamellar type but a nodular type, smaller in size, in rosette shape which ensures the cast iron a better mechanical behaviour, in particular when crush loaded.

Ferritization: slower cooling at lower temperature range (800-700 °C), transforming the matrix into ferrite, which leads to a higher impact resistance of the cast iron.

Tensile strength and crushing strength: load characteristics to determine the ability of cast iron pipes to resist mechanical stress such as bending and crushing.

Surface hardness: the lower it is the easier and quicker pipes can be cut using either of the methods described on page 104. Ensure that the cut ends are square and any burrs removed and also ensure that whatever cutting method used, complies with all relevant health and safety regulations and with guidelines from the cutting tool manufacturer's operating manual.

Furnace for heat treatment

Metallurgical analyses and mechanical tests confirm that the manufacturing process of Saint-Gobain CANALISATION assures a very high quality level for pipes. For owners and project managers, these properties constitute a guarantee of performance and durability. They assure a fast and reliable implementation for the installers.

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Cast iron, quality material

ISO 9000 standards

Definitions
Products
Certification:

The ISO certification is the recognition by a third party – an accredited organisation – that the quality systems of the company fully complies recognised in more than 70 countries.

1987:
Publication of standards of the ISO 9000

Aims:
Creating international models for the quality assurance of companies. Setting up a reference in contractual relations between customers and suppliers in the world markets.

ISO 9001 and ISO 9002:
2 models for the quality assurance

ISO 9002:
a strict quality control of manufacturing process support after the sale

ISO 9001:
ISO 9002 + know how of production design

1988
Certification ISO 9002 for the quality assurance system of the Saint-Gobain PAM plants of Bayard and Liverdun. For our cast iron ranges, this certification facilitates recognition of the quality on the export markets.

1993
Certification ISO 9001 for the quality assurance system of the department in charge of development and design

1994
From now on, Saint-Gobain CANALISATION has a single quality assurance system which covers all the activities of the company: as a result of meticulous audit carried out through the whole establishments and activities of the company: the B.V.Q.I. – Bureau Veritas Quality International – certifies that the quality of the Organisation conforms to ISO 9001.

2000
New ISO 9001 : 2000 standard replaces ISO 9001 and ISO 9002 standards

certified ISO 9001 : 2000 by

BVQI

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CANALISATION

Cast iron, quality material

Certified EN 877

The European standard EN 877 "Cast iron pipes and fittings, their joints and accessories for the evacuation of water from buildings" determines technical specifications and clarifies test methods and products control.
This leads to:

- Strict iron composition
- High mechanical performances
- Respect of dimensions
- High level protection against corrosion
- Durability of coatings, including buried applications
- Special requirements on couplings
- Efficient traceability of production sites

This standard is used as reference to the ranges:

- PAM-GLOBAL® S: above ground
- PAM-GLOBAL® Plus: below ground

The NF label/mark delivered by the French Standardisation Association (AFNOR) to Saint-Gobain CANALISATION building products after the C.S.T.B.

- Assures that PAM-GLOBAL® S and PAM-GLOBAL® Plus ranges conforms to standards
- Testifies to the efficiency of the quality Organisation of the company

	International	Europe	France	Great-Britain	Germany	Australia
Standards Organisation	ISO	cen	afnor	BSI TESTING	DIN	
Stamps and Marks of quality			NF	BBA	Ü	Certified Product
Control Organisation			CSTB	BSI TESTING, BBA	MPA DIBt	QAS
ISO 9001 certified quality control			certified by ISO 9001:2000 AFAQ	BSI TESTING	TÜV CERT	
Accreditation committee			cofrac			

PAM-GLOBAL® S
PAM-SMU® S
PAM-ENSIGN® S

Cast Iron is fireproof and safe

Cast Iron is non-inflammable and non-combustible whatever the time duration of a fire

Cast Iron = Mo French classification	=	**Non - combustible = A1** European classification

To guarantee fire safety, the principles of construction aim at:

- isolating buildings from the adjoining establishments
- creating within the considered building a partitioning of the premises to contain fire in a specific area
- leaving premises and exits free of smoke

For that, it is necessary:

- install active protection through detectors, alarms, sprinklers...
- **from the building design:** to choose materials, which will block the feeding and the transmission of the fire (passive protection) by their features (fire performance, fire resistance). Cast iron meets this criteria.

Reaction to fire

Cast Iron = Mo = non-comustible material French classification	=	**Cast Iron = A1 = No constribution to the fire** European classification

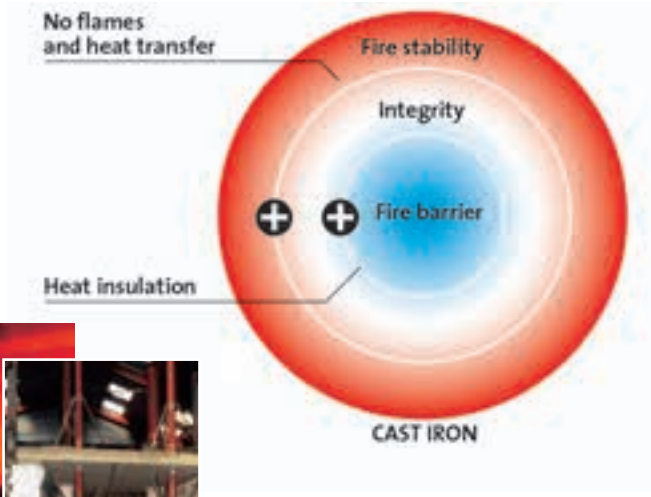
Fire resistance

- **Fire stability:** Preservation of mechanical features.
- Cast iron is mechanically fire resistant for at least 4 hours (maximum time of tests carried out up to now)

- **Integrity degree:** No transfer of flames and hot gases between adjoining rooms.
- In the event of fire, toxic gases constitute the main danger for the life of occupants and rescue team. Cast iron provides integrity up to 4 hours following conflagration.

- **Fire barrier degree:** No heat transfer between adjoining rooms.
- Cast iron is fire barrier up to 4 hours following configuration

Fire tests realized in the C.T.I.C.M



Tests were carried out in the C.T.I.C.M, a laboratory approved by the Ministry of the Interior (Direction of the Civil Security) and by the insurance companies. Their results are recorded in the minutes of classification, which are at your disposal on request.

Standards in Germany

Fire proofing requirements with the use of PAM-GLOBAL® S pipe systems

System characteristics

PAM-GLOBAL® cast iron pipe systems are provided with outstanding flame proofing and fire barrier characteristics. This is confirmed by studies conducted both at home and abroad (C.T.I.C.M./IBMB). Test certificate No.: P-3725/4130-MPA BS.
For high fire proofing requirements in the structural engineering sector, PAM-GLOBAL® pipe systems are practically indispensable.

The most important benefits of the PAM-GLOBAL® cast iron pipe system

Material classification

PAM-GLOBAL® pipes and fittings are made of cast iron with lamellar graphite according to DIN EN 1561. This material conforms with the Class A1 Building Material according to DIN 4102 in Germany and is non-combustible.

Fire load

Cast iron downpipes and fittings are considered non-combustible. Fire loads do not need to be taken into account.
The term fire load is defined as follows:
The fire load of a material is the quantity of energy released by combustion. It depends on the type and quantity of flammable materials used to produce the material. Previously, a fire load of 7 KWh/m was authorised in emergency corridors.
This classification is no longer applicable due to the general pipe system guidelines, whereby no fire loads are permitted on emergency corridors or emergency exits.

Comparison:
1 kg of polyethylene (PE) produces a fire load of 12 KWh.
1 kg of heating oil has a gross calorific value of 11.7 KWh

Smoke development

The system remains sealed in the event of a fire; smoke developing inside the pipes is dissipated via the rooftop main ventilation.
Comparison:
10 kg of polyethylene (PE) or polypropylene (PP) produces approximately 23,000 m3 of highly toxic smoke, consisting of carbon monoxide, carbon dioxide and soot, which could fill 100 large homes with a surface area of 100 m2, leaving no chance of survival for the inhabitants.

Thermal expansion

The thermal expansion coefficient of cast iron is only 0.0105 m/mK. In the event of a temperature change of 50 K and a DN 100 pipe length of 10 m, the expansion is only 5.3 mm.
This expansion is absorbed by the couplings.
Comparison:
In the event of a temperature change of 50 K, the thermal expansion of a 10 m long DN 100 polyethylene (PE) is 45 mm. For this reason, expansion devices are required.

General pipe system guidelines - (MLAR) 03/2000 edition

Scope

The fire proofing of pipe systems must be designed and assembled in accordance with the general pipe system guidelines MLAR 03/2000.
You will find details on design in the following pages.
The guidelines are implemented in planning and building legislation and regulations in all German states as the pipe system guidelines (LAR) without substantial amendments.
Deviations are only to be taken into account if reference is made to the paragraphs of the applicable state building regulations.

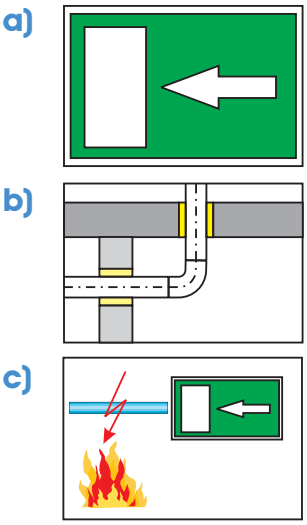
These guidelines are applicable for :

a) pipe systems in emergency stairways, in rooms between emergency stairways and outdoor exits, in emergency corridors and open passageways in front of the outer walls of buildings,

b) the penetration of pipes through specific walls and surfaces,

c) functional maintenance of electrical pipe systems in the event of a fire.

They do not apply to ventilation and hot-air heating systems.



Scope
Building types

- Residential, office and administrative buildings, agricultural buildings
  - Low buildings
  - Buildings of medium height

- Buildings of particular types and uses (section 51 of German general building regulations)
  - Hospitals
  - Schools
  - Nurseries
  - Retirement homes
  - High-rise buildings etc.

- Industrial buildings and building complexes

Depending on the German state, F30 quality surfaces and walls must also be produced for low buildings

MLAR Section 4

4 Penetration of pipes through specific walls and slabs

In accordance with section 37 paragraph 1 of German general building regulations[1)], pipes are only installed with penetrations through fire walls, walls in accordance with section 28 paragraph 1 clause 2 and paragraph 4 clause 2, stairway walls, walls of rooms in accordance with section 32 paragraph 5 clause 2 and partitions and slabs, which must be fireproof, if there is no risk of the transmission of fire and smoke or appropriate preventative precautions are taken ; this does not apply to slabs inside homes.
These conditions are met if the pipe systems comply with the requirements of sections 4.1 and 4.2.

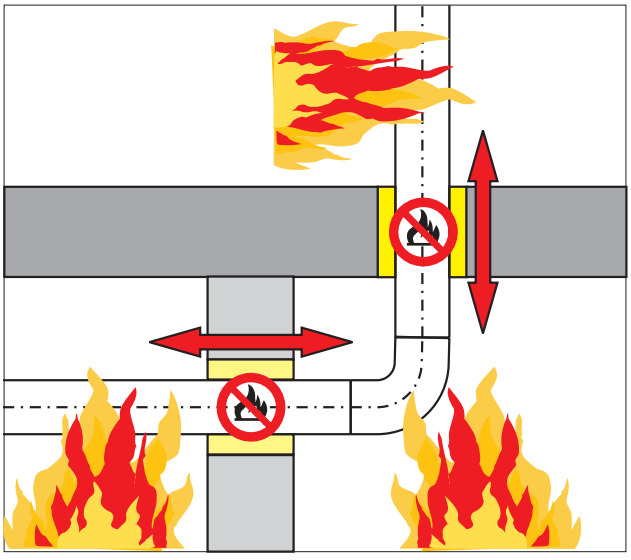
[1)] According to the wording of the current German general building regulations, 2002 edition :
Section 40 Pipe systems, installation shafts and ducts
Pipes may only be installed through space-enclosing structural parts for which fire resistance is stipulated, if there is no risk of fire propagation for a sufficiently long time or appropriate preventative precautions are taken; this does not apply to slabs
1. in buildings which belong to building classes 1 and 2,
2. inside homes,
3. inside the same service unit with not more than a total of 400 m2 in not more than two storeys.

4.1 General requirements

The pipe systems must be installed through partitions with a fire protection seals in order to reach a fire resistance time of at least 90 minutes (electrical pipes: S90 fire resistance class according to DIN 4102 part 9, May 1990 edition; **Piping: R90 fire resistance class** according to DIN 4102 part 11, December 1985 edition); the minimum distance between two seals is obtained on the basis of the specifications on the respective building permits or general building test certificates; in the absence of the corresponding data, a distance of at least 50 mm is required, or pipe systems should be installed inside shafts and ducts which, including opening seals, have a fire resistance time of at least 90 minutes (L90 fire resistance class as per DIN 4102 part 11, December 1985 edition, or L90 as per DIN 4102 part 6, September 1977 edition) and be made of non-combustible materials.

Summary

Pipes may only be installed through walls and slabs, which must be fireproof, if there is no risk of the transmission of fire and smoke, or appropriate preventative precautions are taken.

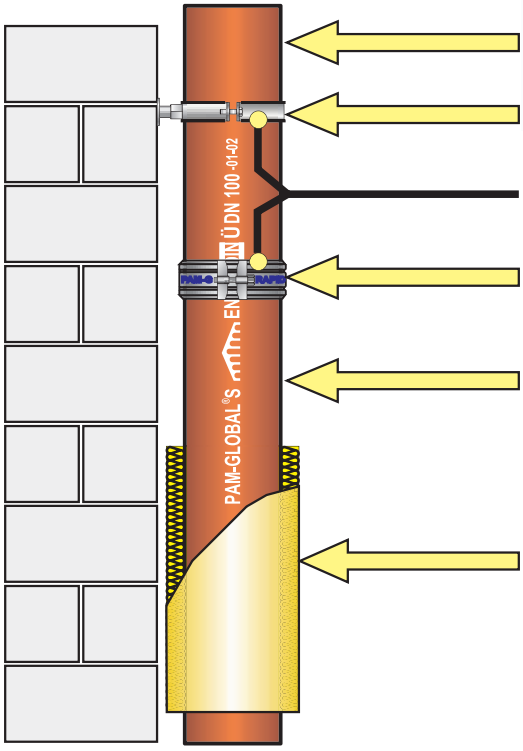


Pipe must be installed through R90 partitions!

MLAR Section 3

Pipe systems in emergency corridors, stairways and rooms between such stairways and outdoor exits (emergency exits)

Requirements for apparent downpipes



Non-combustible pipe

Fixing with metal brackets

Slightly flammable fixing and sealing means are authorised

Couplings (PAM-GLOBAL® RAPID)*

Flammable coating, max. 0.5 mm

If applicable, non-flammable insulation (e.g. condensation insulation for rainwater pipes)

*Couplings with exposed rubber parts (e.g. CV) are not recommended.

3 Pipe systems in emergency stairways, in rooms between emergency stairways and outdoor exits, in emergency corridors and open passageways in front the outer walls of buildings

According to sections 32 paragraphs 8 and 33 paragraph 5 in conjunction with paragraph 4 of the German general building regulations, pipe systems in :
- emergency stairways (see section 32 paragraph 1 of German general building regulations),
- emergency corridors (see section 33 paragraph 1 of German general building regulations) or
- open passageways in front of the outer walls of buildings, offering the connection between recreation rooms and stairways (see section 33 paragraph 4 of German general building regulations),

may only be installed if there are no reservations with respect to fire proofing.
This condition is met if the pipe systems in these premises and open passageways comply with the following requirements.

3.1 General requirements
3.1.1. Pipe systems may only be used in walls and surfaces and installation shafts if the remaining cross-sections ensure the required fire resistance time.

3.1.2. In emergency stairways (see section 17 paragraph 4 of German general building regulations) and in rooms between emergency stairways and outdoor exits, only pipe systems which are exclusively used for the direct supply of these rooms or fire control are authorised.

3.3 Pipe systems for non-combustible liquids, vapours, gases or dusts.

3.3.1 Pipe systems including insulating materials made of non-combustible materials – also with flammable sealing and connection means and with flammable pipe coatings of up to 0.5 mm thick – may be installed.

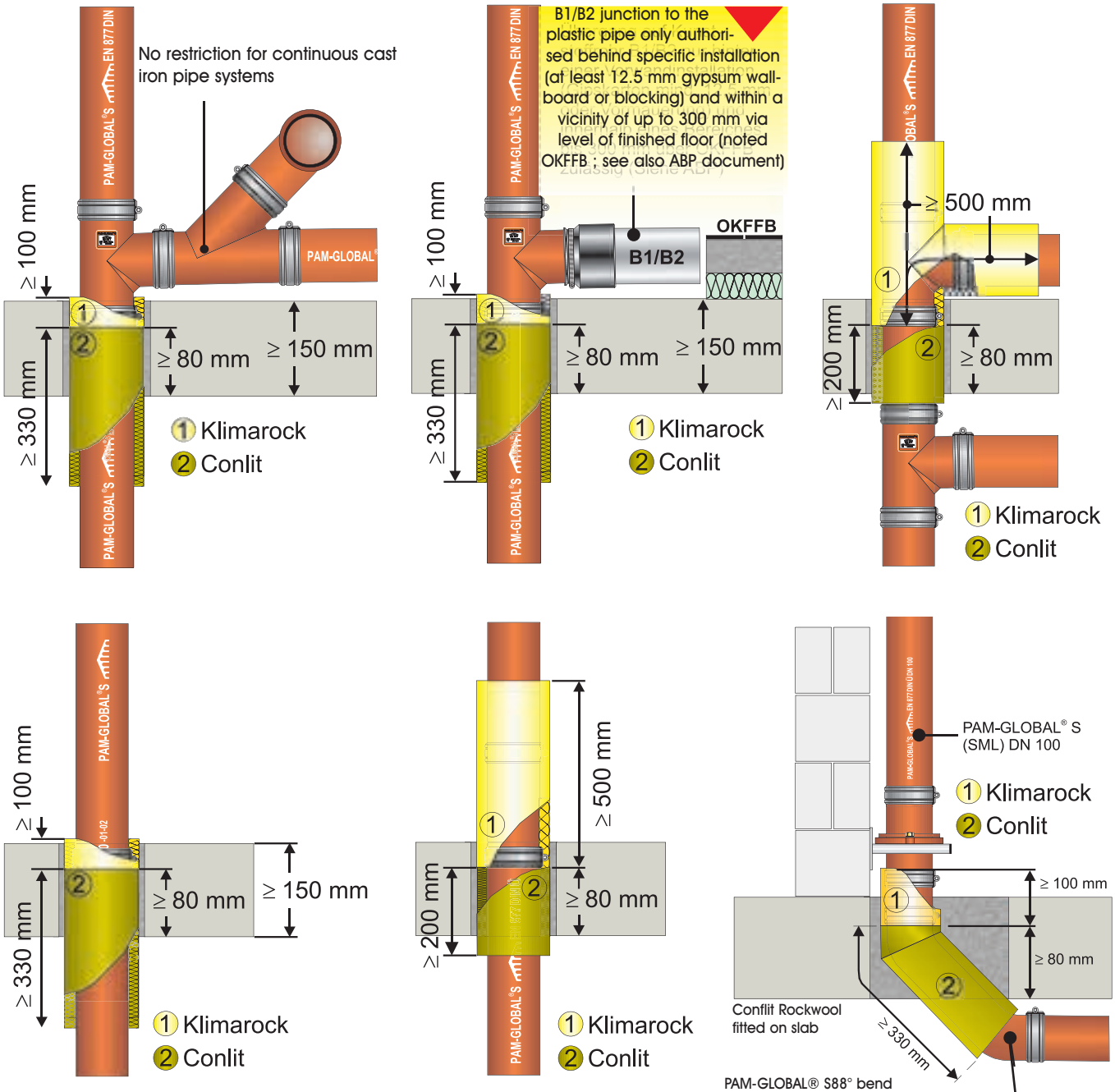
PAM-GLOBAL® pipe systems with PAM-GLOBAL® RAPID couplings meet the requirement of paragraph 3.3.1.

MLAR Section 4.1

Example of tested downpipes penetrating slabs solutions with PAM-GLOBAL® S-system DN 40 to DN 100
ABP-3725/4130-MPA BS

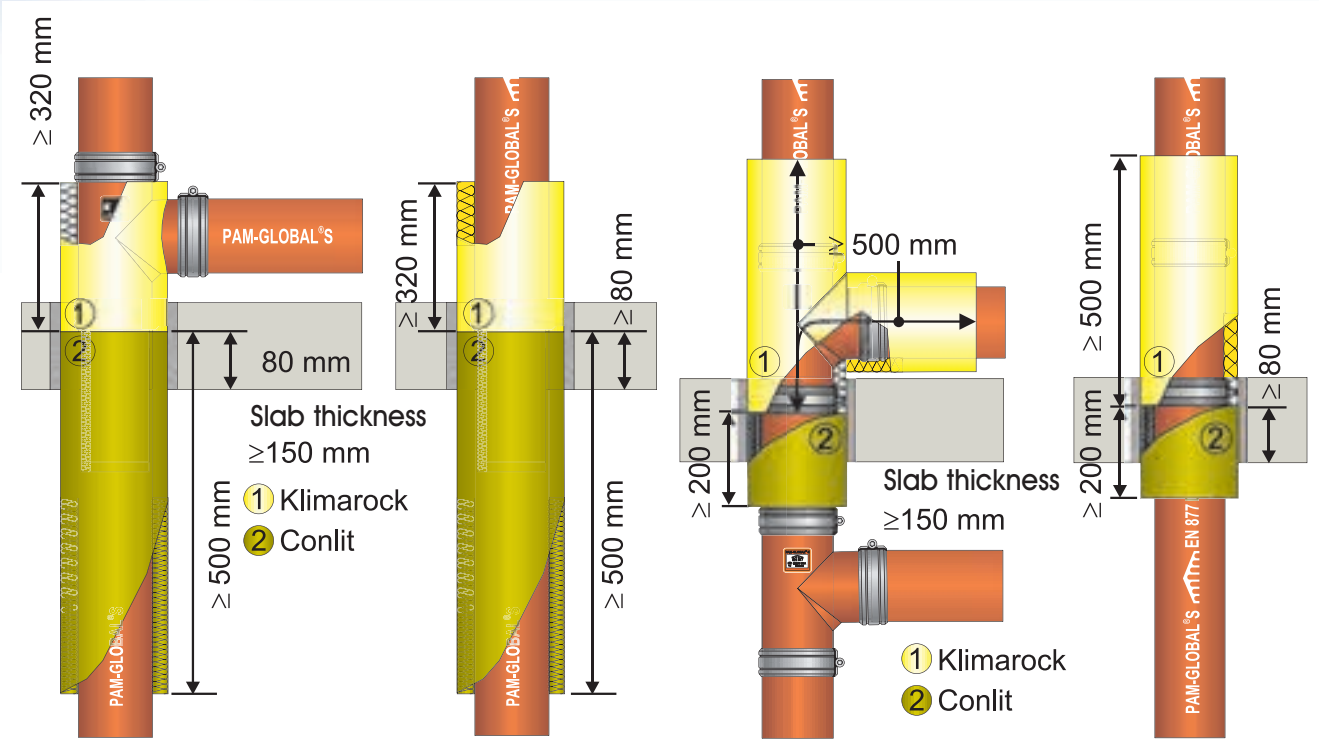
For the installation of PAM-GLOBAL® pipes, the application of MLAR section 4 means :

- Restricting penetration openings to the technically required amount.
- Sealing remaining openings with non-combustible materials, e.g. cement mortar, concrete or rock wool. If rock wool is used, it must have, in accordance with MLAR, a melting point ≥ 1000°C and a relative density of at least 90 kg/m3. If only cement is used, the seal forms a structural sound bridge.
- Casings, for heat, cold or sound insulation, in the vicinity of the wall and surface ducts, which meet requirements in terms of their fire resistance time, must also be produced with rock wool of the abovementioned quality in accordance with MLAR.



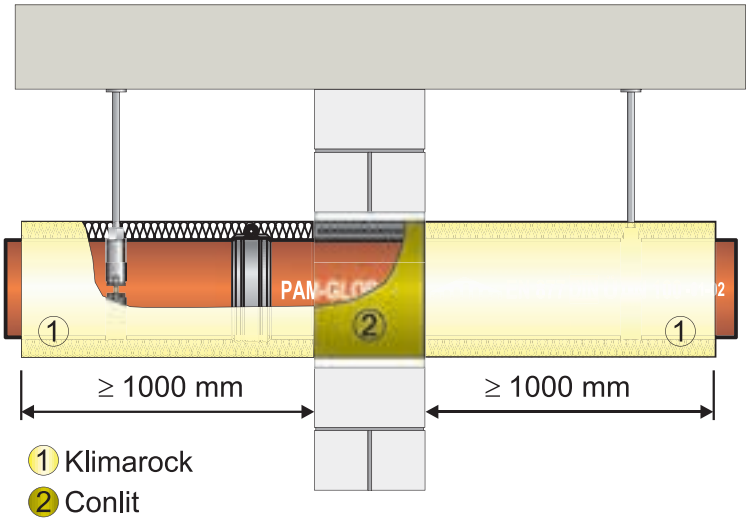
MLAR Section 4.1

Example of tested downpipes penetrating slabs solutions with PAM-GLOBAL® S-system DN 125 to DN 150
ABP-3725/4130-MPA BS



MLAR Section 4.1

Beispiel für geprüfte Lösungen Wanddurchführungen beim PAM-GLOBAL® S-System DN 40 bis DN 150
ABP-3725/4130-MPA BS



Tested fire proofing solutions from the
German rock wool manufacturer
MINERALWOLL GMBH & CO. OHG
Rockwool Straße 37-41
45966 Gladbeck
Telephone: 0 20 43/40 8-0
Fax: 0 20 43/40 8-44 4
E-mail: service.technik@rockwool.de
Website: www.rockwool.de

COMMENT : For the definition of individual pipes for simplified installation, please consult our brochure "**PAM-GLOBAL® S** Safe waste water installations with cast iron pipe systems"

Noise insulation

Cast Iron: The silent solution

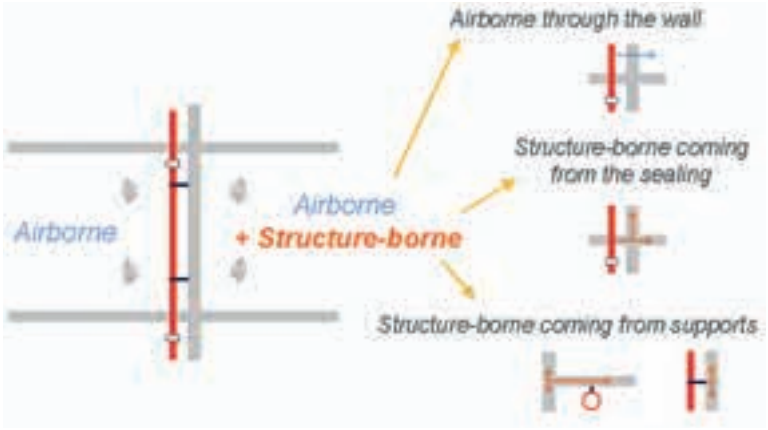
The evacuation of waste, soil and rain waters naturally generate structure-borne and airborne sounds between adjacent rooms. The reduction of draining sounds is the result of 3 factors:

From the building design with considered choices of:

downpipe localisation taking into account the sensitive rooms
efficient materials

During installation:

employing skilful teams in order to reach the essential performances of products



Saint-Gobain CANALISATION offers technical solutions, which conforms to the highest European Requirements, both on structure-borne and airborne sounds.

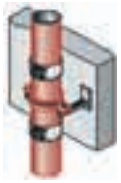
Airborne sounds:

PAM-SMU® cast iron systems conform to the highest requirement of the French document "ESA - Examples of Acoustic Solutions - Acoustic Regulation 2000" - ESA 4 type - LnA < 48 dB(A). This enables the maximum cost reduction of insulation materials within the installed casings.
In the same test conditions (according to prEN 14366, DN 100, flow rate of 4l/s), cast iron is 5 dB (A) quieter than a plastic material promoted as very efficient in terms of sound deadening qualities. For information, a noise which increases by 3 dB (A), approximately doubles the intensity.

Structure-borne sounds:

In order to reduce structure-borne noises, PAM-SMU® cast iron systems are based on a combinaison of:

- couplings with EPDM (or nitrite) gaskets with special profiles avoiding contacts between plain ends
- collars without or with acoustic insulation if necessary
- stack support pipes with elastomer device (see exploded view page 49)



Saint-Gobain CANALISATION solutions for DN 100 which conform to French requirements - 30 dB (A) or 35 dB (A) - on structure-borne sounds, taking into account standards on installation and praticality on sites

Table indicates the nature of collar to be used (see page 86), "802" type or With Acoustic Insulation - noted "WAI"

Requirements		35 dB (A)		30 dB (A)	
Flow rate		2.0 l/s	4.0 l/s	2.0 l/s	4.0 l/s
Wall density	220 kg/m	802	WAI	WAI	WAI
	250 kg/m	802	802	802	WAI
	280 kg/m	802	802	802	WAI

On site and in the height of one floor, 3 possibilities could be used:

- up to 2 collars
- 1 collar and 1 stack support pipe on a console (fixed to wall) or supported by the slab
- 1 collar and 1 seal with neoprene tape (tests were made with Resiliant from Wattelez) around the pipe (see next figure).

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German Example

Sound measurement values for the installation of PAM-GLOBAL® S pipes in a shaft installation in dry partitioning with sandwich-type plaster board cladding.

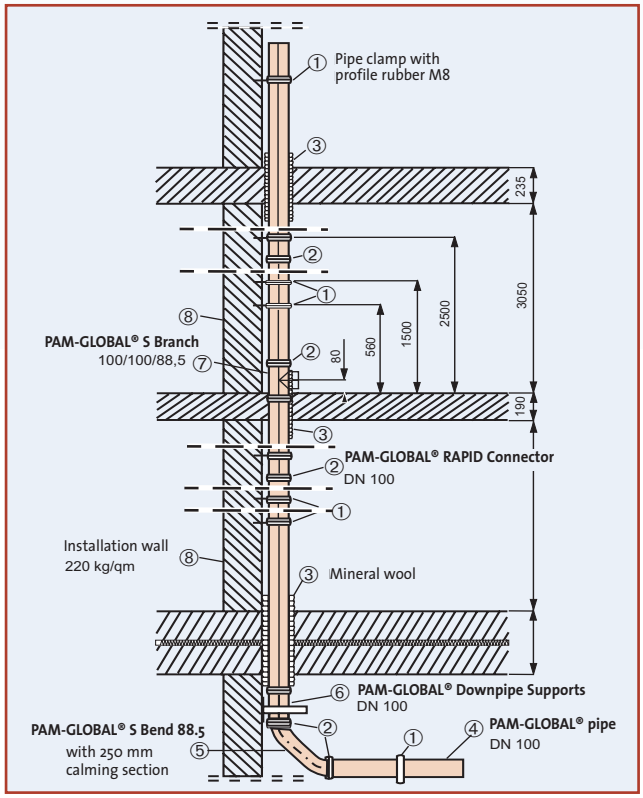
Table 1:

Sound pressure level LAF 10 (noise level corrected and related to Ao = 10 m^2) in dB(A) caused by **draining-water noise** (stationary introduction into the loft [DG]) at different volume rates, measured in the measuring rooms of the installation test stand behind the **installation wall**.

Section of the tested PAM-GLOBAL® pipe installation

PAM-GLOBAL® S with shaft cladding in dry partitioning 2 x 12.5 mm GK	Noise pressure level LAF 10 in dB(A)			
Test room:	ground floor back		Basement back*	
Test flow rate	2 l/s	4 l/s	2 l/s	4 l/s
Waste-water noise	20	27	17	23

Test results from Fraunhofer Institute for Buildings Physics in Stuttgart/Germany



PAM-GLOBAL® SE clamp for securing pipes <20 dB(A) - see page 80

Stricter rules limiting the permissible sound level in water supply and draining systems to max. 30 dB(A) requires the achievement of lower sound levels. The PAM-GLOBAL® S System offers the suitable basis for reducing the sound level. With conventional two-part pipe clamps with rubber lining, the achieved sound-proofing value depends primarily on the tightening torque of the screws. Differences of more than 10 dB(A) can arise with conventional pipe clamps – The tighter, the louder!
Consequently, the best solution utilizes an independent damper not influenced by the clamp torque. The SE pipe clamp features a hinge mechanism and has only one fixing screw. An M8/M10 threaded connection is used for mounting on walls and ceilings.
If correctly installed PAM-GLOBAL® pipelines with the new PAM-GLOBAL® SE clamps can reduce the draining-water induced noises to less than 20 dB(A) at 4 l/s flow rate. This provides the necessary certainty that the specifications of the standard can be properly observed.

RAPID-SE for low external noise values <20 dB(A) DN 100

Comparative measurements carried out by the Fraunhofer Institute for Building Physics in Stuttgart with conventional Pipe Clamps and PAM-GLOBAL® SE Clamps

The noise pressure level for PAM-GLOBAL® S Pipes for different assemblies in the test rooms of the test stand **ground floor** front/back and **basement** front/back with stationary water introduction in DG. Holes through ceilings are packed with mineral wool, while bends at the base of the stack are designed as 88° calming bends.
Flow rate 4 l/s (see Fig.1, page 19).

Test rooms	Sound pressure level LAF 10 [dB(A)]			
	Front		Back	
	Ground floor	Basement	Ground floor	Basement
1. Design: Pipe clamps 5-E-128/8	54	51	25	29
2. Design: PAM-GLOBAL® RAPID-SE Sound de-coupling clamp	55	50	15	**15**

Test results from Fraunhofer Institute for Buildings Physics in Stuttgart/Germany

German Example

Requirements as defined by DIN 4109 and VDI (Verein Deutscher Ingenieure, Germany) Guideline 4100

Drainage installations must be planned in accordance with DIN 4109. This standard defines the requirements expected of sound control with the aim of protecting people in residential rooms from unreasonable nuisance caused by sound transmission. DIN 4109 specifies the requirements that are expected regarding the maximum noise level for third-party rooms that require noise proofing. They include living rooms, bedrooms, workrooms and classrooms. Such requirements do not apply to rooms in the home. As a result of the introduction by the building authorities DIN 4109 has assumed significance under public law. However, it only represents a minimum requirement. The VDI Guidelines 4100 defines 3 sound-proofing levels (SSt). With these 3 quality levels it is possible to cover all sound-proofing requirements and to stipulate them between all those involved in the building work and the home users on the basis of private law.

Noise source	Type of rooms requiring sound-proofing	
	Living rooms and bedrooms	Classrooms and workrooms
	Characteristic sound pressure level dB(A)	
Water installations (water supply and draining systems, total)	≤ 30 [a, b]	≤ 35 [a]

a) Individual brief peaks arising when fittings and devices are actuated (opening, closing, change-over, interrupting, etc.) do not currently have to be taken into account.

b) Contractual preconditions for the fulfilment of the permissible installation sound pressure level:
- The execution documents must take sound-proofing requirements into account, i.e. the necessary sound-proofing certificates for the given components must exist.
- Furthermore, a responsible building site management must be appointed and consulted prior to closing or cladding any installation.

Other details are regulated by ZVSHK Guidance Note (available from: Zentralverband Sanitär Heizung, Klima (ZVSHK), Rathausallee 6, D-53757 Sankt Augustin).

To avoid subsequent disputes it is urgently recommended that the required noise-proofing level (SSt) is contractually stipulated. DIN 4109-10 (currently a draft standard) is being revised to include, in addition to "Standard Noise Control" of 30 dB(A), also "Increased Noise Control" of 27 dB(A) and "Comfort Noise Control" of 24 dB(A). In future these sound levels are to form the contractual basis for agreements concluded under private law.

Noise-technical studies

On account of their high weight per unit area and material properties, PAM-GLOBAL® cast iron pipes absorb almost all air-borne sound waves. Moreover, the rubber profile of the original PAM-GLOBAL® coupling prevent direct contact of the pipe end surfaces, thereby preventing solid-borne sound transmission. In conjunction with wall-mounted installations (e.g. with sandwich- type plaster board cladding) PAM-GLOBAL® drainpipe systems achieve sound values which are well below the maximum sound level of 30 dB(A) for third-party rooms (basement/back [UG]).

The sound behaviour of PAM-GLOBAL® Domestic Draining Systems was established on the basis of model installations and comparative measurements in the course of several studies (Fraunhofer Institute for Building Physics).

Tests were conducted, among others, on wall-mounted installations with a shaft installation in dry partitioning with sandwich-type plaster board cladding. More recently comparative measurements were carried out with sound-decoupled PAM-GLOBAL® SE clamps.

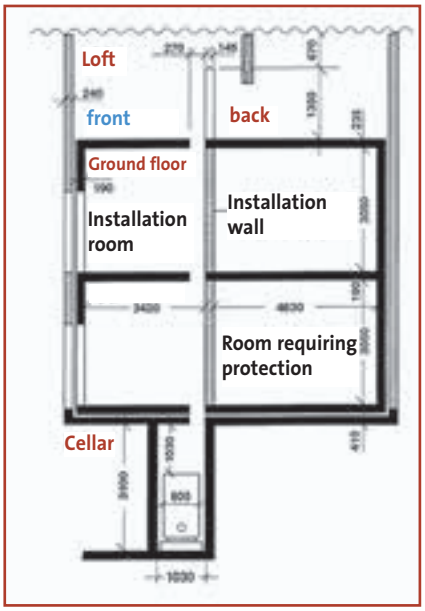


Fig. 1: Installation test stand of the IBP Fraunhofer Institute, Stuttgart, Germany

PAM-GLOBAL® S
PAM-SMU® S
PAM-ENSIGN® S

Safety

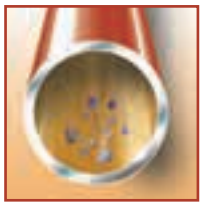
Benefits of PAM GLOBAL® S

New lining of the pipe interior for optimised properties HPS 2000

Best possible corrosion protection of fittings due to KTL cataphoresis coating (inside and outside).

Strictly coordinated fitting systems in the very highest quality.

High durability well beyond the requirements specified in EN 877.

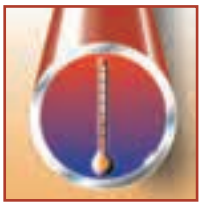


High abrasion resistance with a smooth surface for excellent flow properties.

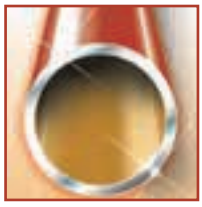
Robust, dimensionally stable and shock-proof.

Sound insulation, progressive sound abatement acc. to DIN 4109 (and VDI 4100).

Preventative fire protection, PAM GLOBAL® pipes and fittings are non-combustible in keeping with DIN 4102.



Insensitive to heat and cold, negligible thermal expansion (0.0105 mm/m °C), equalling approx. that of concrete so that bedding in concrete will not give rise to any problems.



Primer coated in the works, permanent adhesion and attractive appearance due to special external finishing coats by the works (e.g. with bridge structures).

100% recyclable to eliminate all waste disposal problems.

Resources are not wasted as 95 % of the material used to produce PAM GLOBAL® S pipes consists of scrap iron.

Cast iron for buildings is standard to the European regulations

- Its qualities perfectly conform with the provisions of the European Directive" Products for Buildings" – Directive n°89/106/CEE- The European Communities publication n°.L40 – February 11,1989.
- Saint-Gobain CANALISATION products are completely in conformity with the European standard “EN 877 cast iron pipes and fittings intended for the evacuation of water from buildings ”. This is certified by worldwide recognized control organisations.

Evolution of the conditions of use

The operating conditions of the building networks constantly change. This explains why

The development of technologies generates more and more constraints on the wastewater evacuation systems. From now on, the performances required from these pipe systems must take account of many extremely severe and poorly controlled conditions of use.

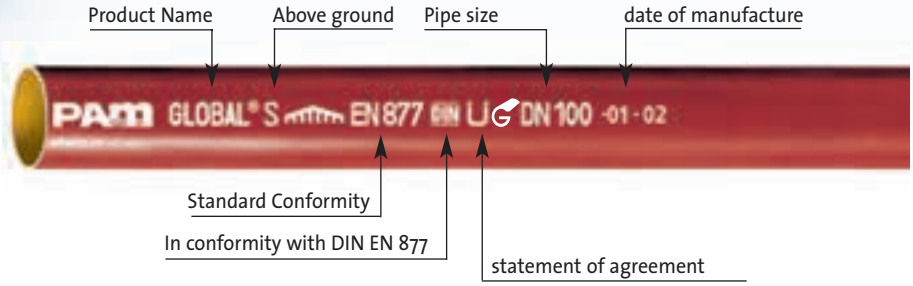
Saint-Gobain CANALISATION offers products with a much greater performance than those stipulated in EN 877

The attacks have especially a chemical nature and can be caused by high temperatures, higher concentrations or the combination of the two.

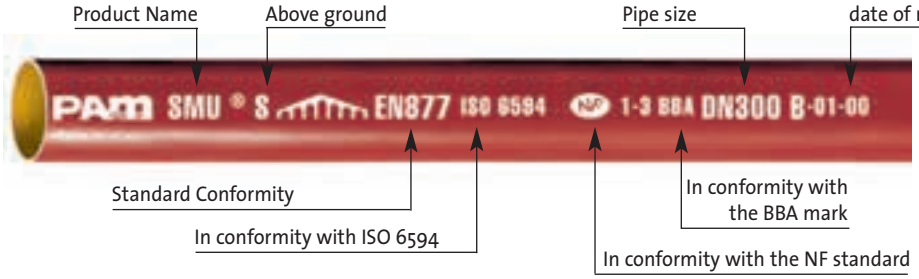
A series of tests were conducted in order to establish the resistance of cast iron systems product to waste water.
The resistance to temperature cycling is measured by a test carried out at 95 °C, on cycles.

PAM-GLOBAL® S
PAM-SMU® S
PAM-ENSIGN® S

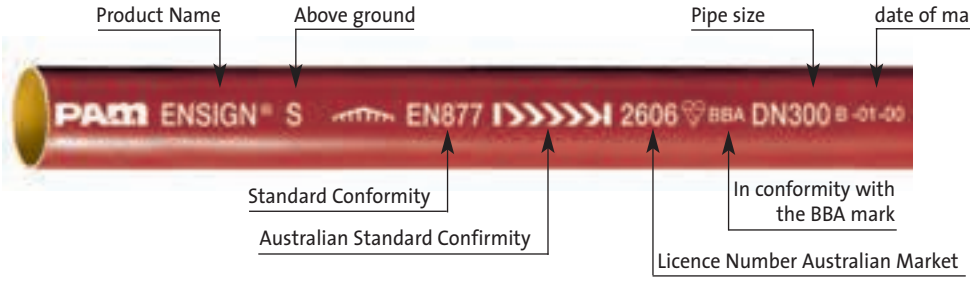
PAM-GLOBAL ® S, above ground



PAM-SMU® S, above ground



PAM ENSIGN® S, above ground



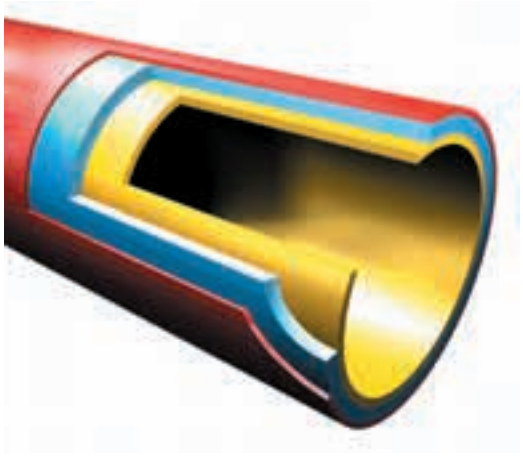
PAM-GLOBAL® S
PAM-SMU® S
PAM-ENSIGN® S

Areas of use:

- **above ground drainage for:**
  soil, waste and rain water

Resistance to variable temperature:

- RESISTANCE TO VARIABLE TEMPERATURE:
  for occasional use to 80 °C with peaks at 95 °C (as stipulated within EN 877).



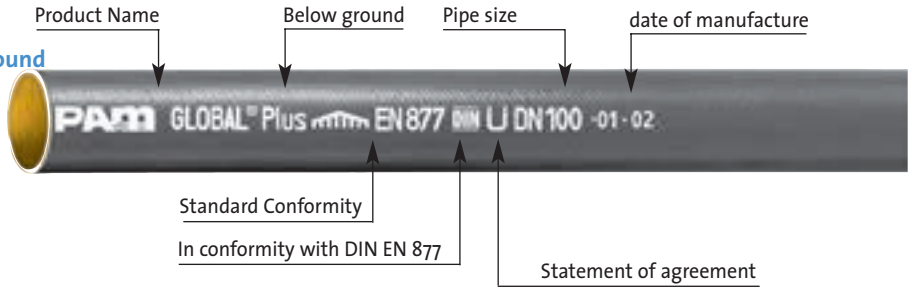
Range of diameters *:

- PAM-GLOBAL® S:
  DN 40 to 600 mm

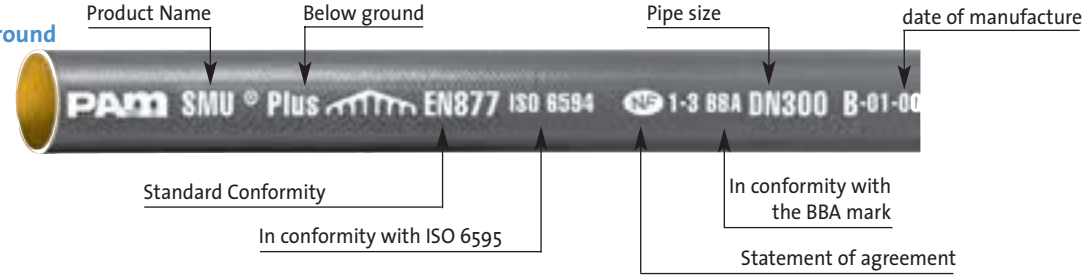
* For cast iron, DN = internal nominal diameter of draining.

PAM-GLOBAL® Plus
PAM-SMU® Plus
PAM-ENSIGN® Plus

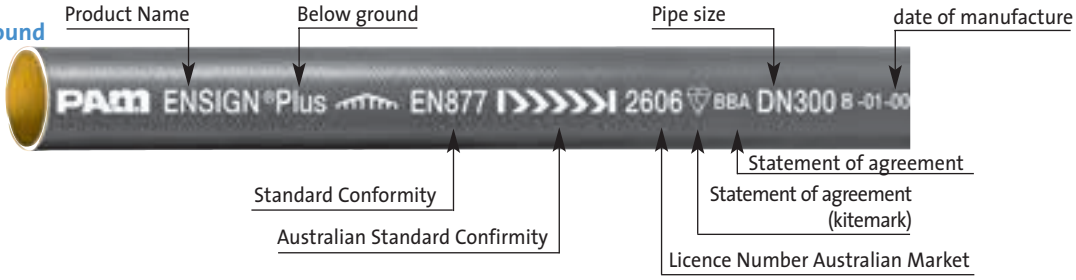
PAM-GLOBAL® Plus, above and below ground



PAM-SMU® Plus, above and below ground



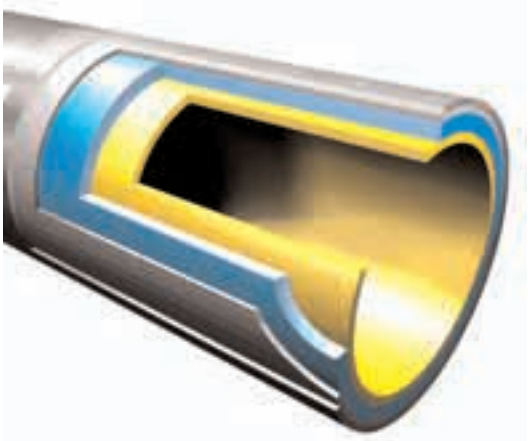
PAM-ENSIGN® Plus, above and below ground



PAM-GLOBAL® Plus
PAM-SMU® Plus
PAM-ENSIGN® Plus

Areas of use:

- Above and below ground drainage systems for soil, rain water, greasy waste, industrial waste water, aggressive effluents (i.e. large kitchens, hospitals, clinics, laboratories, industrial use...)
- System incorporated into concrete slabs, and basement areas



- Buried system for connection to the main sewer

Aggressive chemical and extreme temperatures:

- designed for the drainage of aggressive waste and industrial uses (see attached areas of use) the PAM-GLOBAL® Plus range will withstand temperatures of up to 80 °C with peaks at 95 °C (as stipulated in EN 877)

Range of diameters*:

- PAM-GLOBAL® Plus
  DN 40 to 600 mm

The PAM-GLOBAL® S and PAM-GLOBAL® Plus ranges of Saint-Gobain CANALISATION are not only compatible amongst themselves but also with the old ranges on condition that using adaptation components in the case of rehabilitation.

PAM-GLOBAL® S
PAM-SMU® S
PAM-ENSIGN® S

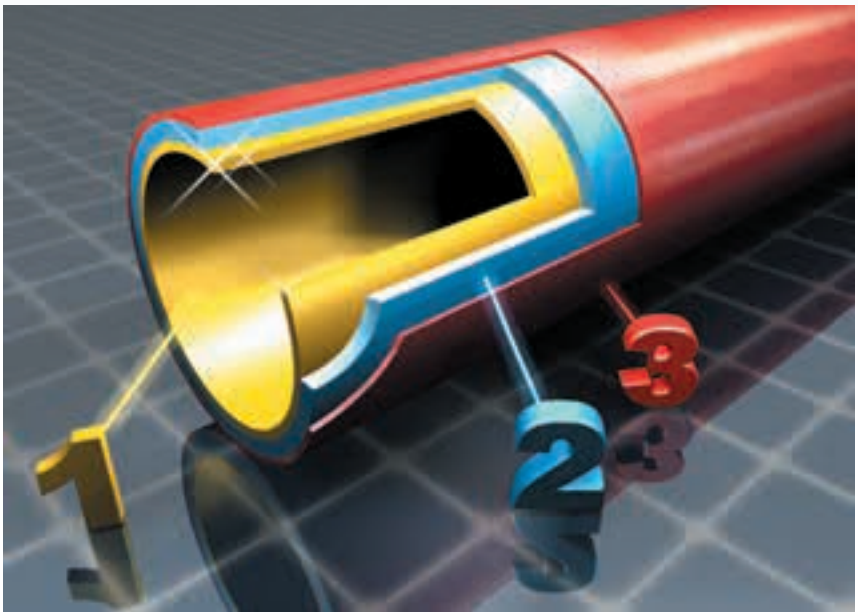
Range of diameters - DN 40 to 600

Pipes

1 New epoxy-resin inner coat with optimised properties (130 µm)

2 Cast iron
De Lavaud process

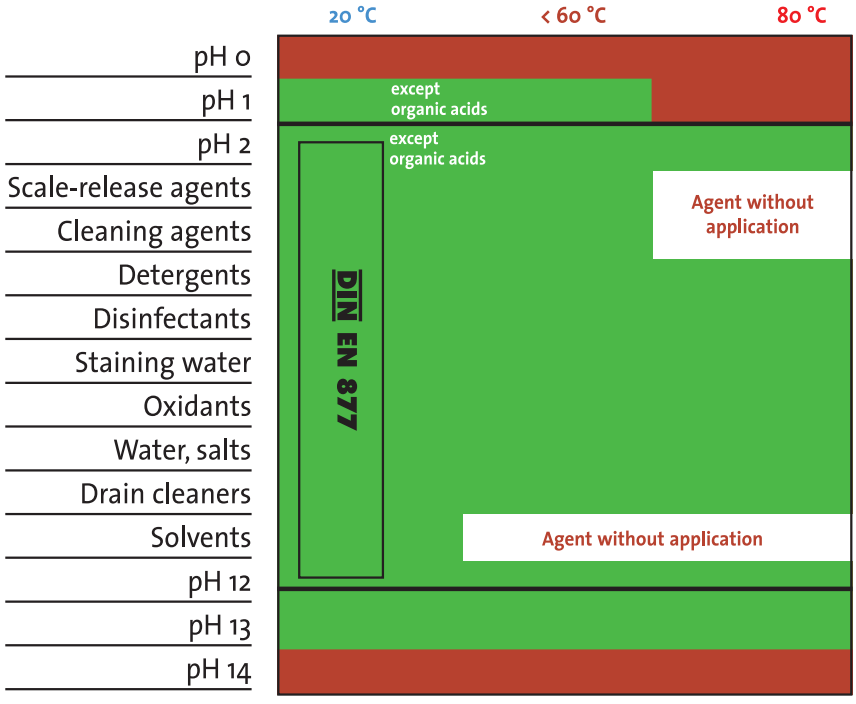
3 Outer coat
(acrylic primer 40 µm)



The interior surfaces of PAM-GLOBAL® S pipes are optimally protected against chemical and mechanical influences as a result of a newly refined coating process on a modified epoxy-resin basis. Moreover, the new extremely smooth surface has improved the flow properties and prevents the formation of incrustations and deposits.
The inner coating of the cast pipes and fittings has been co-ordinated in an ideal manner so that no differences can arise in the durability values of PAM-GLOBAL® S drainpipes.

The coating of PAM-GLOBAL® S pipes and fittings by far exceed the requirements stipulated in DIN EN 877.

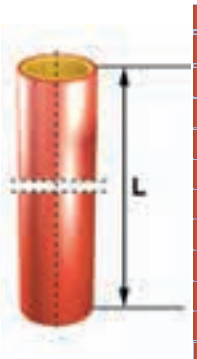
The most important resistance properties of the inner lining of PAM-GLOBAL® S pipes and fittings for domestic applications in intermittent use. PAM-GLOBAL® S Plus is available for commercial applications and to drain off particularly aggressive waste water (after referring to the Technical Consultant Service).



Pipes

Socketless pipe (L= 3 m)

Pipe marking (example for a pipe of DN 100)



L= 3000 mm			
DN	DE*	Product code	Weight
40	48	see Pam-SMU® S	9.40
50	58	156361	13.00
70	78	156454	17.70
75	83	156550	18.30
100	110	156561	25.20
125	135	156734	35.40
150	160	156825	42.20
200	210	156949	69.30
250	274	157048	99.80
300	326	157113	129.70
400	429	157171	177.70
500	532	157187	244.90
600	635	157203	321.90

* External Diameter

Socketless pipe (L= 3 m)

Pipe marking (example for a pipe of DN 300)

L= 3000 mm			
DN	DE*	SMU reference	Weight
40	48	156342	8.90
50	58	156360	12.50
70	78	see Pam-GLOBAL® S	
75	83	156452	18.30
100	110	156560	24.30
125	135	156733	34.30
150	160	156824	40.90
200	210	156948	67.40
250	274	157047	97.30
300	326	157112	126.80

* External Diameter

Socketless pipe (L= 3 m)

Pipe marking (example for a pipe of DN 300)

L= 3000 mm			
DN	DE*	Product code	Weight
50	58	156363	13.00
70	78	156455	19.00
75	83	see Pam-SMU® S	
100	110	156563	25.50
125	135	156736	35.50
150	160	156827	43.00
200	210	156951	69.30
250	274	157049	99.80
300	326	157114	129.70

* External Diameter

Protection of the pipe cut ends

In countries or areas where aggressive flushing waters could be used (e. g. sea water for toilet,...), after cutting of pipes, it is recommendable to protect the sections by applying a layer from ENDOKOTE-Protection kit, reference 170897 made of 85 gr syringe (a resin and a hardnerbased), red color. Number of the DN 100 pipe cut ends that enable to cover with a kit : 20.

Weights are in kg

PAM-GLOBAL® S
PAM-SMU® S
PAM-ENSIGN® S

Identification marking

PAM-GLOBAL® S

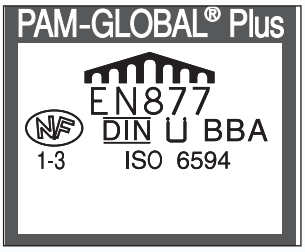
EN 877 =
In conformity with Standards

NF/BBA =
In conformity with labels

PAM-GLOBAL® Plus

EN 877 =
In conformity with Standards

NF/BBA =
In conformity with labels



PAM-SMU® S

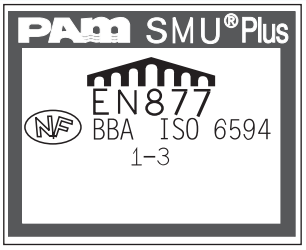
EN 877 =
In conformity with Standards

NF/BBA =
In conformity with labels

PAM-SMU® Plus

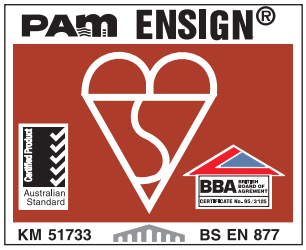
EN 877 =
In conformity with Standards

NF/BBA =
In conformity with labels



PAM-ENSIGN® S

EN 877 =
In conformity with Standards



Shot blasting

1. Raw fitting 2. Shot blasted fitting 3. Cataphoresis coated fitting

Range of diameters - DN 40 to 600

Coating of PAM-SMU® S fittings

Bath of fitting

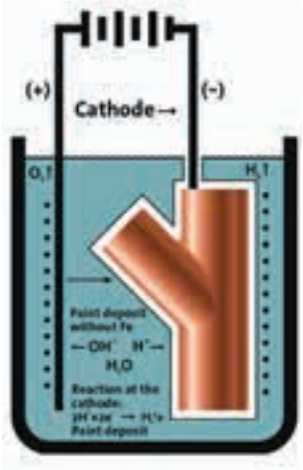
Preparation of primary components

Internal - external:

- Epoxy-film deposited by cataphoresis and thermo-reticulated, brown-red colour

Technology:

- Cataphoresis is a coating process which deposits a film of regular thickness on metallic objects made conductive (see attached diagram).
  This technique which is generalised in the motor industry was for the first time used for the castings by SAINT-GOBAIN CANALISATION.



Reliability

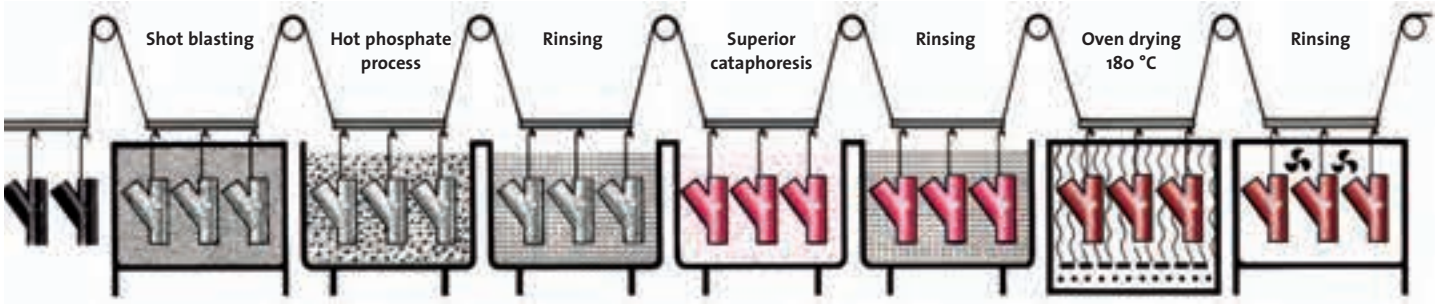
- Castings are subjeted to a specific surface preparation by extra-fine shot blasting, an immersion in baths of degreasing and a cooling. The coating is composed of a pigment and an epoxy bonding in solution in water, which uniformly settles on all surfaces of the fittings. The adherence of the deposited film is exceptional and its impact resistance excellent.

Performance:

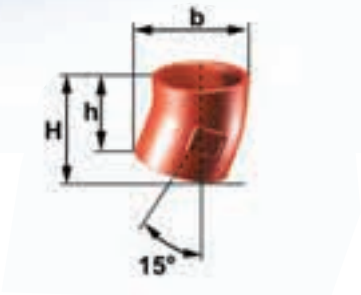
- Resistance to exposure to salt spray above 1 500 hours.
  (see diagram page 24)

An environmental process

Cataphoresis is a non-polluting process based on a water solution and a paint bonding pigment. Liquids that form part of the treatment process are re-collected and recycled.

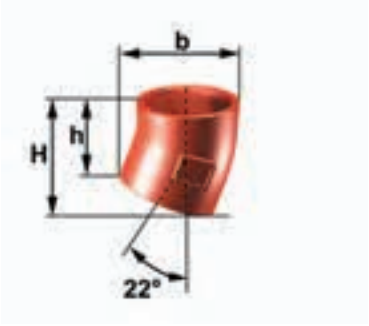


15° bends



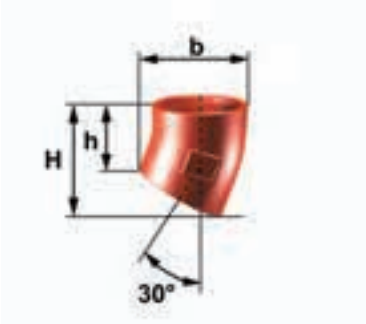
DN	Product code	b	H	h	Weight
50	155752	66	80	66	0.40
70	155781	88	98	78	0.60
75	176702	93	99	78	0.68
100	155816	121	112	83	1.00
125	155870	148	134	99	1.70
150	155903	173	148	108	2.50
200	155932	227	184	129	4.60

22° bends



DN	Product code	b	H	h	Weight
50	156388	70	88	66	0.45
75	156480	97	105	74	0.80
100	156598	126	125	84	1.30
125	156761	152	143	92	1.85
150	156855	179	162	102	2.60
200	156974	233	200	122	4.40
250	157071	300	240	138	9.50
300	157136	356	279	157	15.30

30° bends

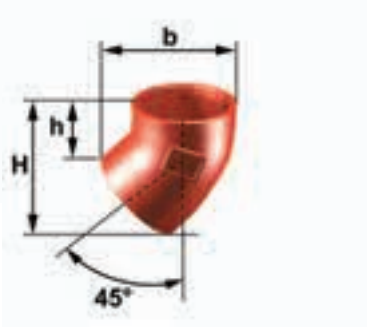


DN	Product code	b	H	h	Weight
50	155753	76	97	69	0.50
70	155782	97	112	73	0.70
75	176703	102	114	72.5	0.79
100	155817	132	136	81	1.30
125	155871	160	164	96	2.00
150	155904	189	188	108	3.00
200	155933	243	229	124	5.40
250	155948	309	270	133	9.70
300	155960	367	322	159	15.50

All dimensions are in mm and nominal weights in kg

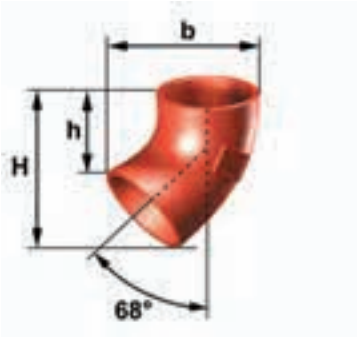
Bends

45° bends



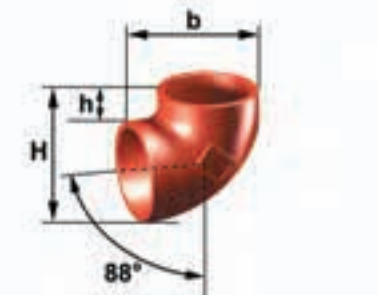
DN	Product code	b	H	h	Weight
40	156348	72	94	60	0.35
50	156384	84	106	65	0.55
70	155780	108	129	74	0.90
75	156476	112	132	73	0.85
100	156593	142	158	80	1.57
125	156756	171	184	89	2.12
150	156850	199	210	97	3.19
200	156970	256	262	113	5.25
250	157069	324	319	125	10.00
300	157134	387	380	149	18.82
400	157175	540	573	270	34.34
500	157190	678	730	350	64.00
600	175540	788	821	370	93.00

68° bends



DN	Product code	b	H	h	Weight
50	156382	104	123	70	0.75
70	155779	123	139	67	1.10
75	156474	131	149	72	1.05
100	156591	159	176	74	1.80
125	156754	188	205	80	3.00
150	156847	219	237	89	4.10
200	156968	277	295	99	7.78
250	157067	343	358	104	14.65
300	157132	406	423	121	20.00

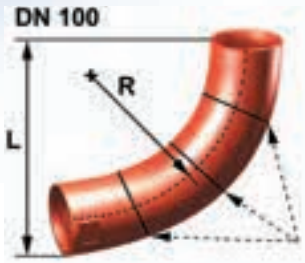
88° bends

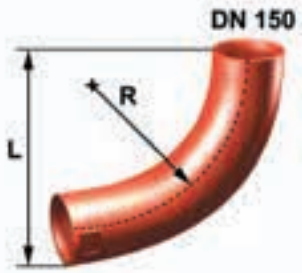


DN	Product code	b	H	h	Weight
40	156346	90	91	43	0.50
50	156379	104	107	49	0.80
70	155778	130	132	54	1.40
75	156471	138	140	57	1.20
100	156588	166	169	59	2.22
125	156752	194	197	62	2.85
150	156844	227	230	70	4.34
200	156966	267	291	81	8.10
250	157065	360	363	89	13.50
300	157130	427	431	105	27.67

All dimensions are in mm and nominal weights in kg

88° large radius bends





DN	Product code	L	R	Weight
100	156606	324	230	4.95
150	156860	349	210	8.00

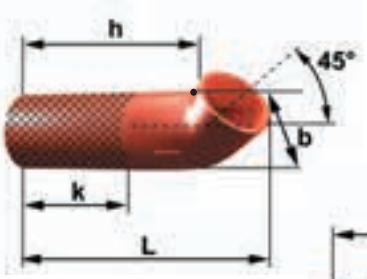
The DN 100 large radius bend has references marks to be stamp out in 22° parts.

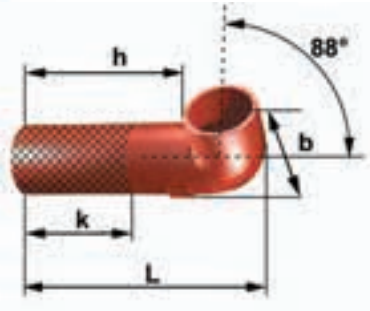
Bend radius of a 88° bend is lower than 4 assembled 22° bends than the one of a lay radius one. Then, we advice you to use of large radius bends in order to optimise hydraulic working and avoid deposit or blocking of the pipeworks.

S bends offset 65, 75, 130, 150, 200 mm

DN	Product code	L	b	E	Weight
50	156386	185	133	75	1.09
	156390	210	208	150	1.51
75	156478	200	158	75	1.51
	156482	230	233	150	2.32
100	155812	205	175	65	2.30
	156596	215	185	75	2.47
	156602	270	240	130	3.65
	156604	250	260	150	3.32
	155822	340	310	200	4.15
125	156759	236	210	75	3.67
	156764	270	285	150	4.80
150	156853	255	235	75	5.05
	156858	300	310	150	6.66
200	156972	295	285	75	8.30
	156976	350	360	150	10.77

45° and 88° bends long tail



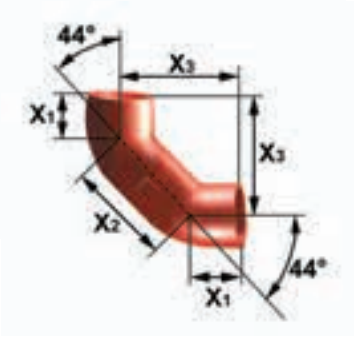


DN	Angle	Product code	L	b	h	k	Weight
70	45°	155786	319	108	264	190	2.60
70	88°	155785	292	130	214	160	2.80
100	45°	155824	338	143	260	180	3.50
100	88°	155823	305	165	195	140	3.75

All dimensions are in mm and nominal weights in kg – k= maximum zone of possible cut

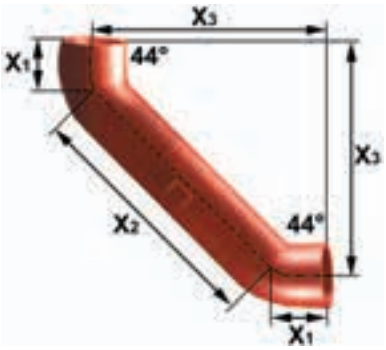
Bends

88° double bend formed by two 44° bends



DN	Product code	x1	x2	x3	Weight
50	155754	50	100	121	1.20
70	155783	60	120	145	1.80
100	155819	70	140	169	2.80
125	155872	80	160	193	4.37
150	155905	90	180	217	6.33

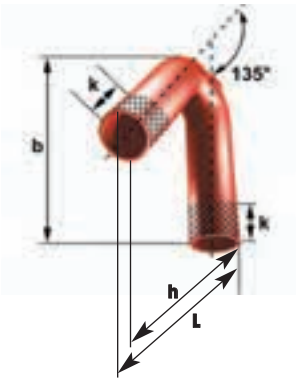
88° bend



DN	Product code	x1	x2	x3	Weight
70	155784	60	301	273	3.20
100	155820	70	312	291	4.80
125	155873	80	322	308	6.80
150	155906	90	334	326	9.60

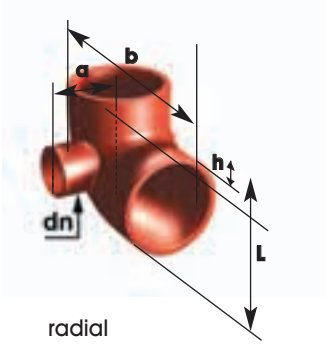
135° bend

88° double bend with a 250 mm calming section for transfer from downpipes to offset pipes.



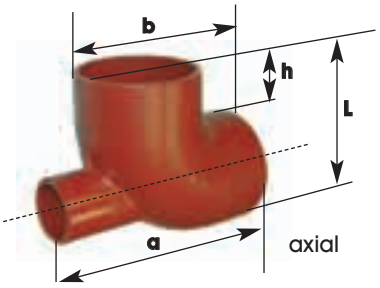
DN	Product code	L	b	h	k	Weight
100	155818	272	236	100	4.50	

88° bends with ventilation



radial

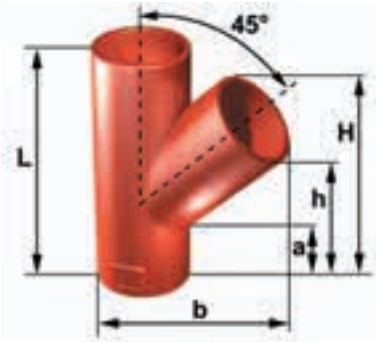
DN	dn	Ventilation	Product code	L	b	h	a	Weight
100	50	radial	157581	169	166	59	95	2.15
100	50	axial	156585	169	166	59	200	2.15



axial

All dimensions are in mm and nominal weights in kg – k= maximum zone of possible cut

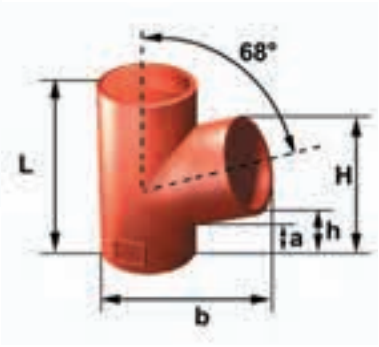
45° single branches



DN	dn	Product code	L	b	H	h	a	Weight
40	40	156356	160	121	143	109	33	0.75
50	40	156392	160	126	143	109	38	1.05
	50	156435	185	144	165	124	36	1.15
70	50	155789	190	124	166	125	35	1.60
	70	155806	215	179	195	140	35	2.30
75	50	156490	180	156	161	120	43	1.80
	75	156544	215	179	198	140	40	2.35
100	50	156618	200	191	172	131	47	2.45
	70	155831	235	213	208	153	48	3.50
	75	156625	220	204	199	140	44	3.05
	100	156701	275	238	253	175	45	3.95
125	50	156769	205	218	170	130	44	3.24
	70	155879	240	236	208	153	49	4.30
	75	156771	240	237	215	156	51	4.00
	100	156775	280	261	254	177	47	5.15
	125	156813	320	284	296	201	49	5.80
150	70	155910	245	259	208	154	52	5.60
	75	176733	255	265	220	161	54	5.10
	100	156879	295	287	262	185	54	6.10
	125	156883	325	307	298	202	52	7.30
	150	156931	355	323	333	219	53	8.70
200	70	155934	255	302	212	157	62	8.10
	100	156982	305	330	266	188	63	8.80
	125	156984	335	350	300	204	62	10.00
	150	156989	375	373	343	230	63	11.10
	200	157030	455	418	428	280	68	15.80
250	100	157073	330	398	276	198	72	13.60
	125	157074	370	420	318	223	75	15.65
	150	157075	405	440	358	245	75	17.25
	200	157078	480	486	440	291	75	24.30
	250	157106	580	537	530	335	70	32.80
300	100	157138	350	445	287	208	88	19.30
	125	157139	360	464	316	221	80	20.00
	150	157140	415	487	359	246	81	23.20
	200	157141	485	547	454	305	81	28.40
	250	157142	580	588	540	347	80	37.20
	300	157169	660	634	661	431	115	50.60
400	300	157178	660	728	620	389	86	55.30
	400	157185	835	820	795	492	101	82.50
500	300	157193	720	861	680	448	114	86.00
600	300	157205	225	965	683	452	115	100.00

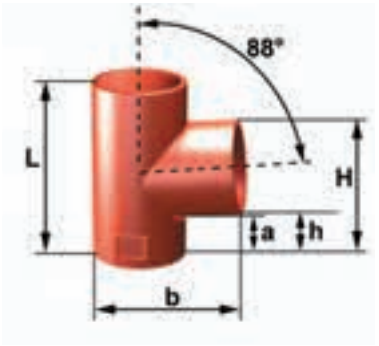
All dimensions are in mm and nominal weights in kg

68° single branches



DN	dn	Product code	L	b	H	h	a	Weight
50	50	156433	145	118	117	65	37	1.10
70	50	155788	145	133	115	62	36	1.30
	70	155805	170	146	143	71	40	1.70
75	50	156488	155	140	122	69	42	1.40
	75	156542	180	158	149	72	37	2.35
100	50	156616	155	168	123	69	43	1.80
	70	155830	180	180	150	79	43	2.40
	75	156623	185	186	155	79	44	2.40
	100	156699	220	195	189	87	50	2.95
125	100	156773	225	222	190	88	50	3.80
	125	156811	225	235	220	95	50	4.45
150	100	156877	235	243	194	92	55	4.90
	125	156881	265	262	226	101	56	6.50
	150	156929	295	276	256	108	55	6.65
200	150	156987	310	329	263	114	62	10.20
	200	157027	365	352	321	126	63	13.20
250	200	157076	390	420	328	132	68	18.48
	250	157104	460	452	408	154	77	20.10
300	300	157167	545	544	480	178	80	34.50

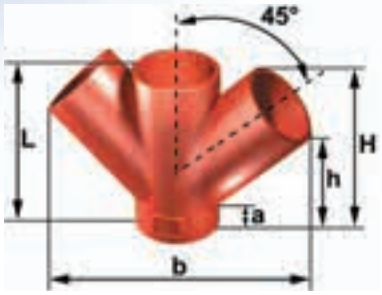
88° single branches



DN	dn	Product code	L	b	H	h	a	Weight
50	50	156431	145	110	111	53	31	1.10
70	50	155787	160	132	117	59	43	1.40
	70	155804	180	135	139	61	38	1.70
75	50	156486	160	132	117	59	42	1.50
	75	156538	180	138	140	57	37	1.95
100	50	156613	170	161	127	69	45	2.25
	70	155829	190	166	145	67	45	2.40
	75	156620	190	166	145	62	40	2.55
	100	156695	220	172	174	64	41	2.90
125	50	156768	180	188	131	73	51	2.80
	70	155878	200	194	150	72	48	3.40
	100	155880	235	199	184	74	48	4.00
	125	156809	260	205	209	74	48	4.50
150	50	156870	200	221	134	76	51	3.90
	70	155909	215	221	159	81	53	4.80
	75	156872	220	221	161	78	55	4.95
	100	156874	245	227	190	80	52	4.90
	125	155913	275	232	220	85	56	5.70
	150	156925	300	237	243	83	55	6.50
200	100	156980	270	282	206	96	64	9.80
	200	157024	365	388	296	86	67	11.10
250	250	157102	455	366	375	101	77	18.50
300	300	157165	530	433	437	111	87	34.00

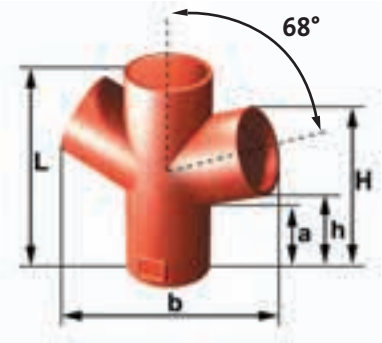
All dimensions are in mm and nominal weights in kg

45° double branches



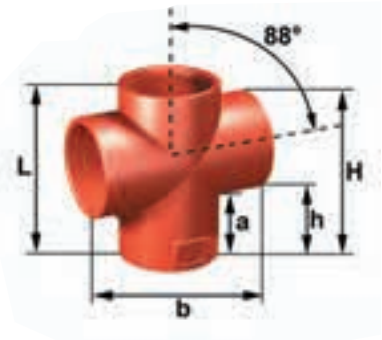
DN	dn	Product code	L	b	H	h	a	Weight
100	100	156709	260	346	243	165	46	4.50
125	125	156817	305	421	285	190	45	7.30
150	150	156936	355	488	334	277	55	11.70

68° double branches



DN	dn	Product code	L	b	H	h	a	Weight
50	50	156437	145	117	118	64	35	1.30
75	50	156484	155	140	122	69	42	1.60
	75	156546	180	158	149	72	36	2.20
100	75	156609	185	186	155	79	44	3.00
	100	156707	220	195	189	87	50	3.90
125	100	156766	225	222	190	88	50	4.40
	125	156815	255	235	220	95	51	5.95
150	125	156867	265	262	226	101	56	5.80
	150	156934	295	276	256	108	57	8.10
200	150	156978	310	328	263	114	62	10.35
	200	157032	365	352	321	126	65	14.00

88° double branches

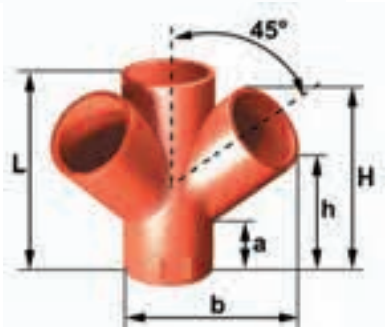


DN	dn	Product code	L	b	H	h	a	Weight
100	50	155825	170	212	127	69	45	2.20
	70	155826	190	222	145	67	44	2.70
	100	156704	230	243	179	69	49	3.20
125	100	155874	235	263	184	74	48	5.00
150	100	155907	245	294	190	80	52	7.10

All dimensions are in mm and nominal weights in kg

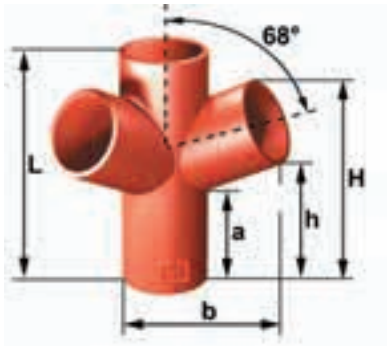
Branches

45° corner branches



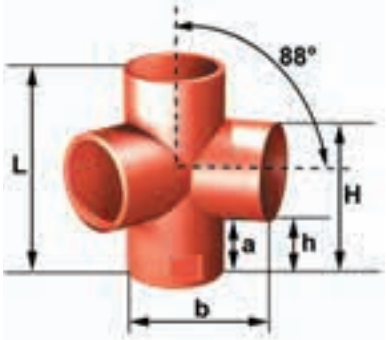
DN	dn	Product code	L	b	H	h	a	Weight
100	100	156716	260	227	242	166	46	5.20

68° corner branches



DN	dn	Product code	L	b	H	h	a	Weight
75	75	156548	180	158	149	72	36	2.30
100	100	156714	220	195	189	87	50	3.60

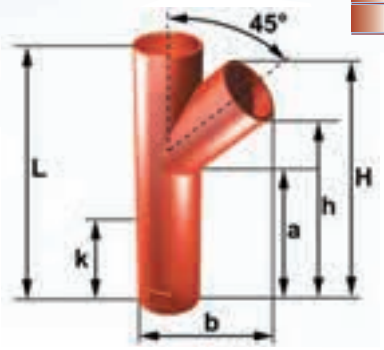
88° corner branches



DN	dn	Product code	L	b	H	h	a	Weight
100	70	155839	190	166	145	67	44	2.70
	100	156712	230	177	179	69	44	3.40
125	70	155888	200	194	150	72	49	5.00
	100	155889	235	199	184	74	48	5.00
150	100	155919	245	227	190	80	52	7.10

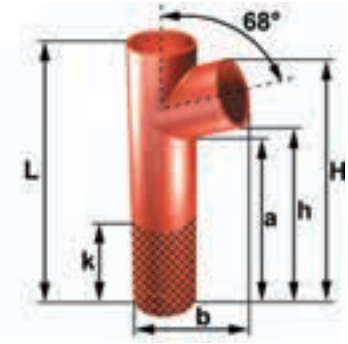
All dimensions are in mm and nominal weights in kg

45° single branches long tail



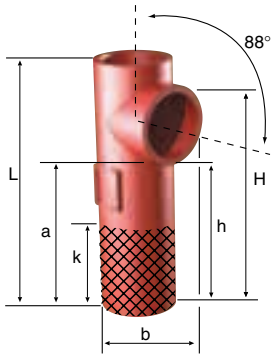
DN	dn	Product code	L	b	H	h	a	k	Weight
100	100	156723	430	238	346	424	241	170	5.50
150	150	156938	705	323	571	486	403	350	18.48
200	200	157036	770	423	600	749	383	320	28.00

68° single branch long tail



DN	dn	Product code	L	b	H	h	a	k	Weight
100	100	156721	460	195	328	430	290	250	5.20

88° single branch long tail

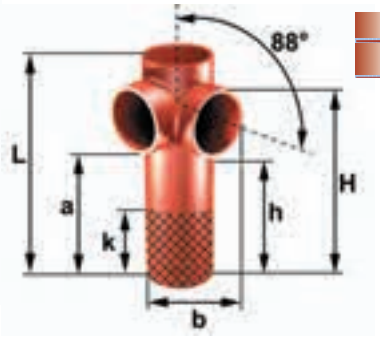


DN	dn	Product code	L	b	H	h	a	k	Weight
100	100	156720	430	177	379	269	244	210	4.80

All dimensions are in mm and nominal weights in kg – k= maximum zone of possible cut

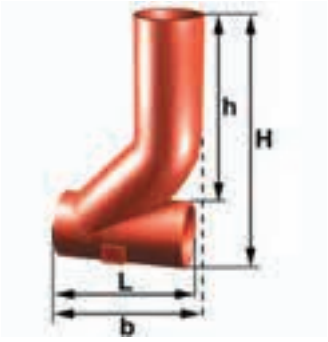
Branches/Reducers

88° corner branch long tail



DN	dn	Product code	L	b	H	h	a	k	Weight
100	100	156725	430	177	379	269	244	210	5.33

45° single branch/ For connecting downpipe



DN	dn	Product code	L	b	h	a	Weight
100	100	156726	260	282	450	340	6.30

See page 118 for installation.

The 45° single branch for connecting downpipe is also used to go trough vertical wall, dividing wall.

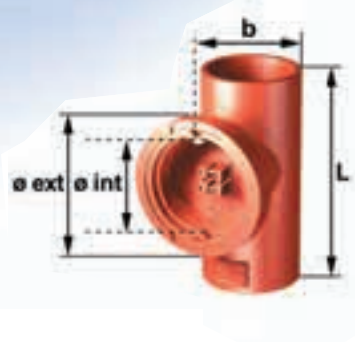
Pipes tapered/Reducers

DN	dn	Product code	L	h	Weight
50	40	156354	75	40	0.30
70	50	155763	75	42	0.50
75	50	156424	80	47	0.70
100	50	156426	80	45	1.00
	70	155801	85	45	0.90
	75	156526	90	45	1.10
125	50	156428	85	50	1.50
	70	155802	90	50	1.50
	75	156528	95	52	1.30
	100	156684	95	50	1.60
150	50	156430	95	55	1.90
	70	155803	100	55	2.10
	75	156530	100	57	1.70
	100	156686	105	60	2.30
	125	156805	110	60	1.95
200	75	156532	115	72	3.35
	100	156688	115	70	3.65
	125	156807	120	70	3.45
	150	156919	125	65	3.85
250	75	156534	125	82	5.95
	100	156690	125	82	5.70
	150	156921	135	82	5.90
	200	157020	145	80	6.10
300	75	156536	140	97	9.90
	100	156692	140	95	9.10
	150	156923	150	97	9.70
	200	157022	160	95	9.70
	250	157100	170	95	10.10
400	300	157163	200	100	19.70

All dimensions are in mm and nominal weights in kg – k= maximum zone of possible cut

PAM-GLOBAL® S
PAM-SMU® S

Short pipes with access door



DN	Product code	L	b	Ø int	Ø ext	Weight
50	156414	160	102	75	108	1.90
70	155799	205	132	101	134	3.00
75	156513	205	132	101	134	3.00
100	156659	250	157	128	160	4.50
125	156794	280	192	154	189	6.50
150	156905	320	222	181	224	10.40
200	157015	360	270	181	224	12.75
250	157098	380	333	181	225	17.60
300	157161	400	385	181	227	26.30

The PAM-GLOBAL® S short pipe with access door combines reliability with simplicity and handling security:

- **Comfort and security:**
  Possible elimination of accidental water pressure of the network before opening =(1-2)
- **Respect of the current and elimination of turbulance:**
  Internal contour of elastomer couplings = (3-4)
- **Convenience:**
  Simplicity for opening and closing the cast iron cover with standard tool and a “fontainier” key = (5)


1


2

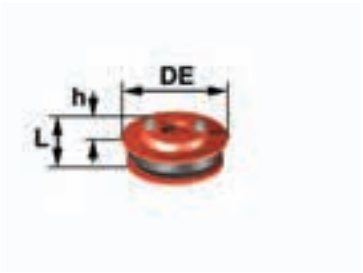

3


4


5

Short pipe with access door is also available for the SMU®Plus ranges
See page 122 for information on resistance when accidental pressure

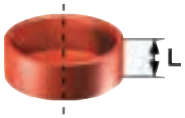
Expansion plugs



DN	DE	Product code	L	h	Weight
50	64	156374	48	15	0.25
70	85	156468	63	11	0.50
75	90	156464	63	11	0.55
100	118	156579	81	26	1.00
125	143	156747	82	29	1.50
150	168	156839	88	35	2.25
200	218	156961	100	37	4.20
250	284	157060	93	40	6.20
300	336	157125	100	44	9.00

Expansion plugs with bleeding valve are available on request for the 125/150/200 and 300 DN (for water tightness tests). See page 122 for information on resistance when accidental pressure

PAM-GLOBAL® S Blank Ends



DN	Product code	L	Weight
50	156376	30	0.25
70	155776	35	0.40
75	156466	35	0.45
100	156581	40	0.80
125	156749	45	1.20
150	156841	50	1.70
200	156963	60	3.20
250	157062	70	5.90
300	157127	80	9.40

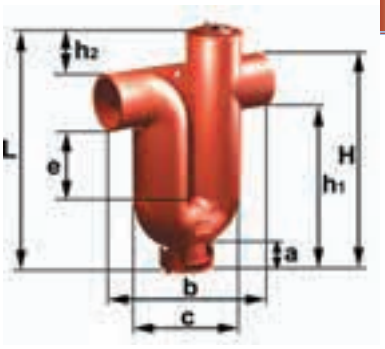
All diminsions are in mm and nominal weights in kg

Traps For Gravity Drainage System

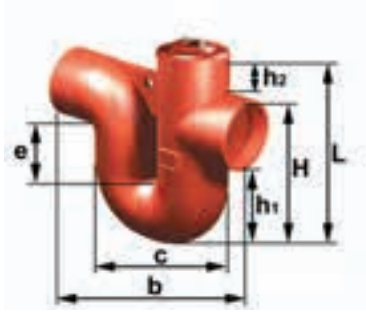
DN	Product code	L	b	h1	h2	a	c	e	H	Access(*)	Weight
50	156420	240	190	143	39	33	112	60	201	EP 50	2.90
70	156521	280	264	150	52	43	162	60	230	TS 50	5.48
75	156519	282	264	150	52	13	162	60	230	TS 50	5.85
100	156668	381	325	216	55	15	216	100	326	TS 50	9.50
125	156801	435	390	238	63	12	266	100	372	TS 75	13.10
150	156912	482	470	257	65	8	340	100	417	TS 125	21.80

DN	Product code	L	b	h1	h2	c	e	H	Weight
200	157018	590	600	300	80	415	100	510	26.60

(*) Bottom access of cleaning: – EP by expansion plug
– TS by tight sheet



Syphon PAM-GLOBAL® S: DN 50 to 150



Syphon PAM-GLOBAL® S: DN 200

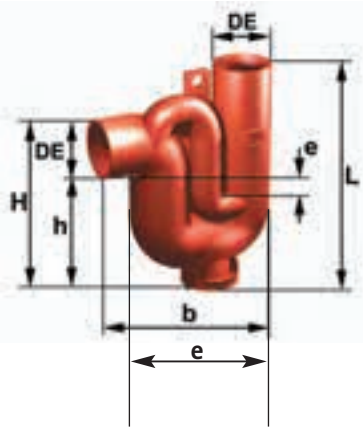
To install these components only on the drainage networks of rainwater.
The arrow on this component shows the flow direction.

Traps DN ≥ 250: installation with 88° PAM-GLOBAL® S bends

DN	L	b
250	900	725
300	1070	860

Possibility of putting a short pipe with access door for the DN 250 and 300

Anti-Syphon Traps



DN	DE	Product code	b	L	c	h	e	H	Weight
40	48	156352	145	215	139	152	80	200	2.10
50	58	156422	165	230	144	155	80	189	2.40
75	83	156522	240	300	192	213	80	272	4.75
100	110	179013	316	382	255	214	80	374	9.20
150	160	156916	412	531	372	324	80	484	24.80

Conditions of use

The Anti-Syphon Trap works by preventing the siphoning effect of a heavy discharge trough the system. It does this trough the internal partition within the trap allowing the air to by-pass the water, thus breaking the vacuum created by the discharging water.

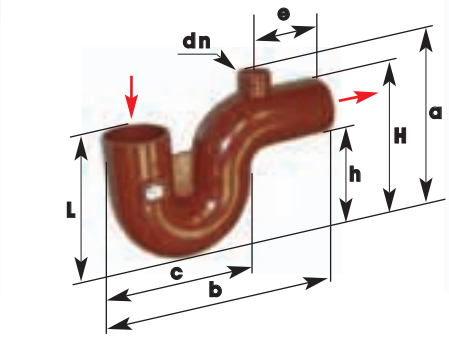
The Anti-Syphon device ensures the retention of a water seal within the body of the trap to prevent odours travelling backwards trough the system.

To ensure proper operation of the anti-syphon trap, at least one appliance in the system above the trap should not have any syphon device and there should be no other trap between the anti-syphon trap and the downpipe.

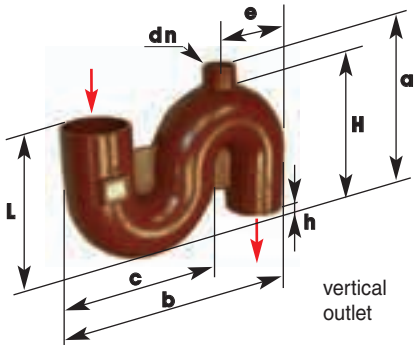
All dimensions are in mm and nominal weights in kg

Traps with ventilation

DN	dn	Outlet	Product code	L	b	c	h	H	a	e	Weight
100	50	horizontal	156670	239	423	262	165	275	306	139	6.7
100	50	vertical	156672	239	415	262	36	275	306	131	8.0



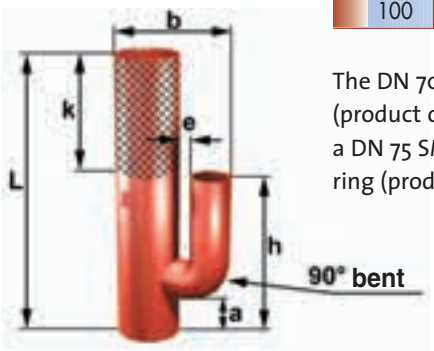
horizontal outlet



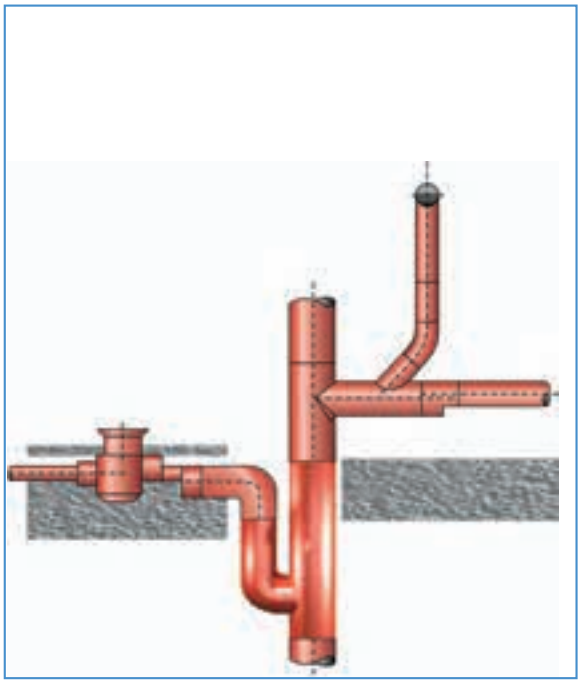
vertical outlet

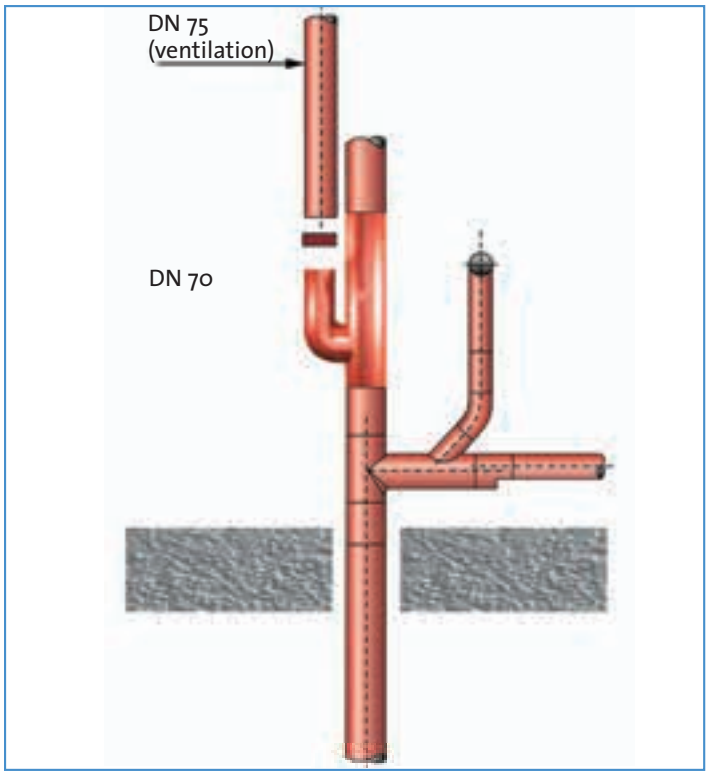
Parallel Branch

DN	dn	Product code	L	b	a	h	e	k	Weight
100	70	155832	400	215	55	275	31	125	5.43



The DN 70 branch can receive a DN 40 or 50 outlet by using an EPDM plug (product code 156492). When this branch is used like ventilation, it is possible to connect a DN 75 SMU Rapid2® coupling (product code 157368), which is provide with a stepping ring (product code 156494).

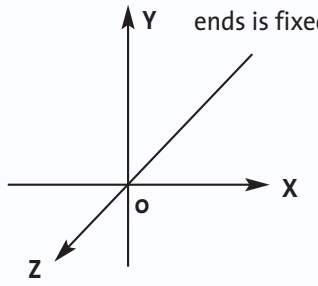




All dimensions are in mm and nominal weights in kg – k=maximum zone of possible cut

Compensators of movement

Conditions of use: Fittings intended to absorb the relative movement between two componets of pipework; each one of its ends is fixed at 2 different elements of structure.



L is the dimension of the compensator in neutral position.
The maximum authorised movements following the three axis are noted:

X axial movement

Y vertical radial movement

Z horizontal radial movement

Every reference is composed of:

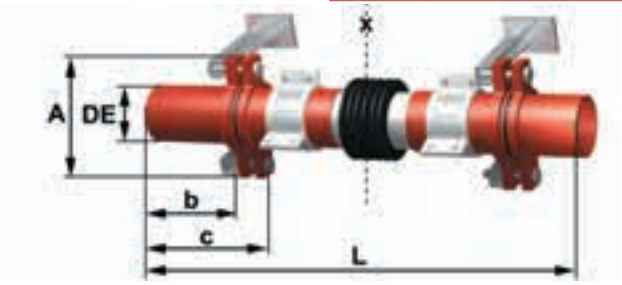
- one movement absorber
- two bi-directional stack support pipes

Acceptable pressure for the DN 75 to 200:

- negative pressures up to - 0.9 bar
- positive pressures up to 3 bar (accidental and internal hydrostatic pressure)

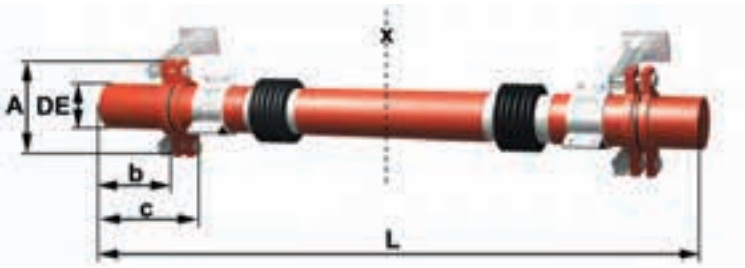
Compensators of movement for small range of movement

DN	DE	Product code	L	b	c	A	socket extension			Weight
							X	Y	Z	
75	83	155050	895	81	139	174	± 30	± 30	± 30	18.40
100	110	172638	897	80	140	201	± 30	± 30	± 30	20.80
125	135	155067	897	80	140	227	± 30	± 30	± 30	26.00
150	160	155072	909	78	142	254	± 30	± 30	± 30	29.30
200	210	155077	932	78	142	306	± 30	± 30	± 30	40.40



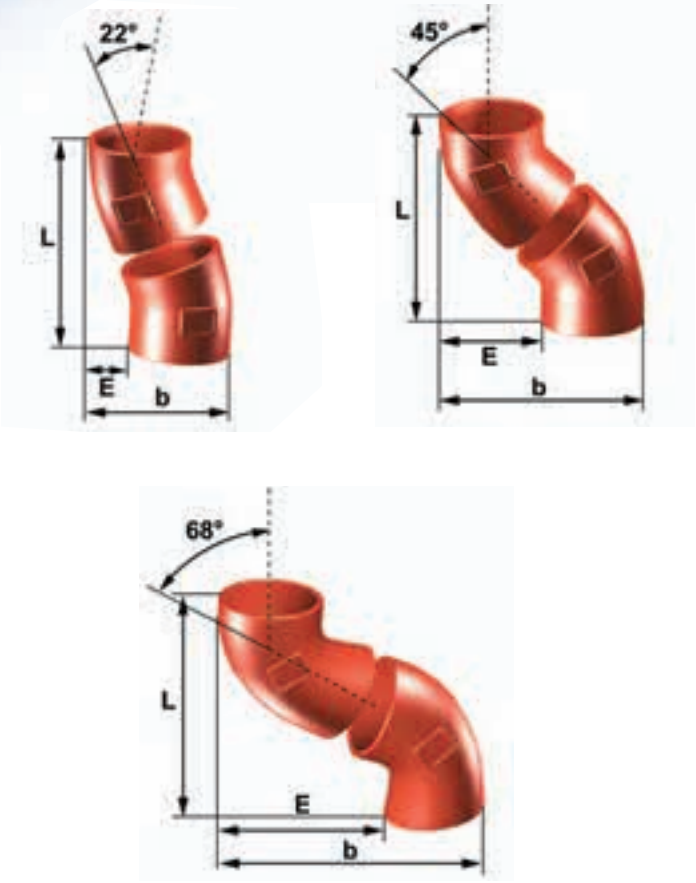
Compensators of movement for big range of movement

DN	DE	Product code	L	b	c	A	socket extension			Weight
							X	Y	Z	
75	83	155051	1794	81	139	174	± 60	± 130	± 130	25.60
100	110	155063	1796	80	140	201	± 60	± 130	± 130	27.50
125	135	155068	1796	80	140	227	± 60	± 130	± 130	33.00
150	160	155073	1802	78	142	254	± 60	± 130	± 130	39.80
200	210	155078	1824	78	142	306	± 60	± 130	± 130	55.60



All dimensions are in mm and nominal weights in kg – k=maximum zone of possible cut

Connectings of 22°/45°/68° PAM-GLOBAL® S bends

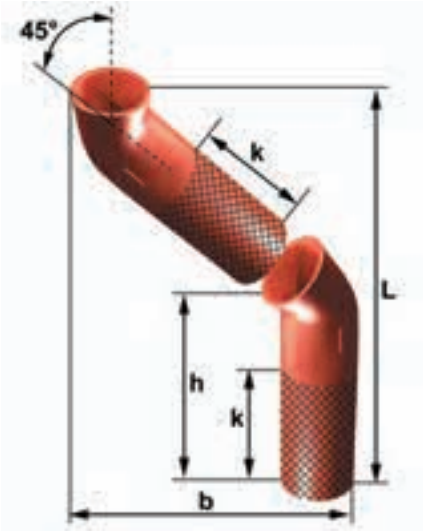


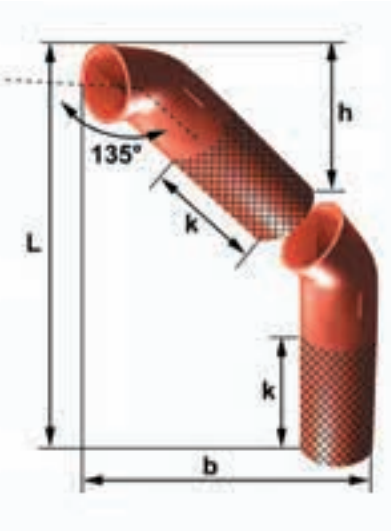
DN	Angle	L	b	E
50	22°	156	84	26
75		182	113	30
100		212	144	34
125		239	171	36
150		268	200	40
200		325	258	48
250		382	328	58
300		439	388	62
50	45°	173	131	73
75		206	170	87
100		243	213	103
125		276	251	116
150		310	290	130
200		378	368	158
250		446	460	186
300		532	541	215
50	68°	194	191	133
75		222	235	152
100		251	277	167
125		287	331	196
150		327	383	223
200		395	484	274
250		464	590	316
300		545	696	370

Connectings of 45° PAM-GLOBAL® S bends long tail

DN	h	L		b		k
	maxi	maxi	mini	maxi	mini	
100	260	549	242	339	212	180

DN	h	L		b		k
	maxi	maxi	mini	maxi	mini	
100	338	534	227	354	227	180

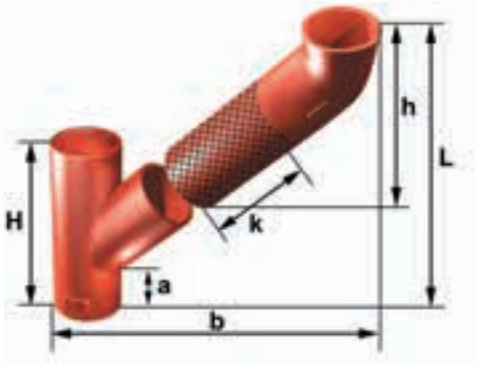




All dimensions are in mm and nominal weights in kg – k=maximum zone of possible cut

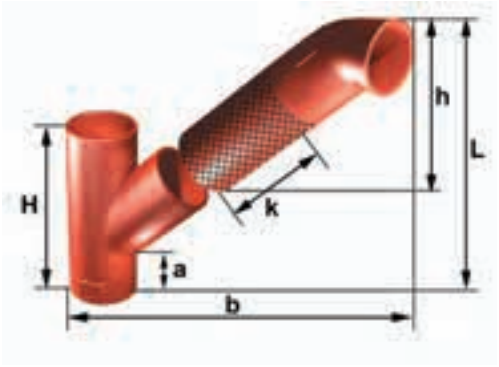
Typical Assemblies

Connecting of a 45° branch and a 45° bend long tail (with vertical outlet)



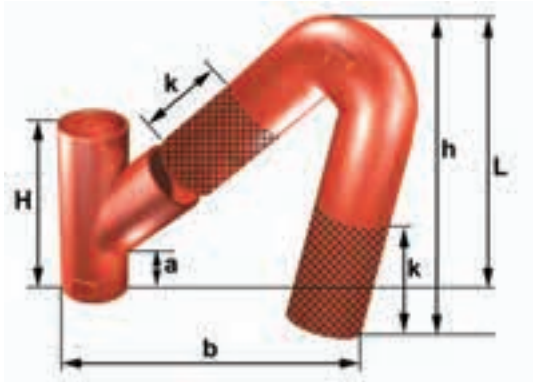
DN	h maxi	a	L maxi	L mini	b maxi	b mini	H	k
100	285	40	467	340	435	307	275	180

Connecting of a 45° branch and a 45° bend long tail (with horizontal outlet)



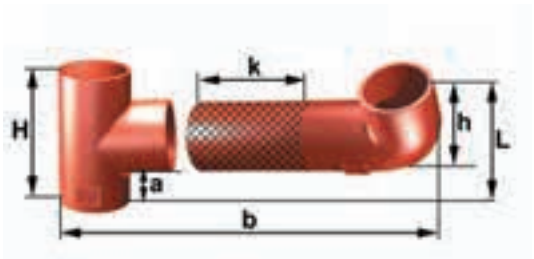
DN	h maxi	a	L maxi	L mini	b maxi	b mini	H	k
100	270	40	450	322	449	321	275	180

Connecting of a 45° branch and a 135° bend



DN	h maxi	a	L maxi	L mini	b maxi	b mini	H	k
100	272	45	478	407	476	407	275	100

Connecting of a 88° branch and a 88° bend



DN	h	a	L maxi	L mini	b maxi	b mini	H	k
100	165	40	237	232	479	259	220	140

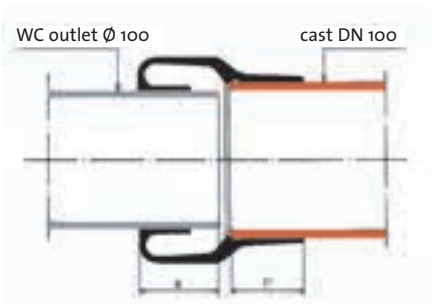
All dimensions are in mm and nominal weights in kg – k=maximum zone of possible cut

WC Connectors

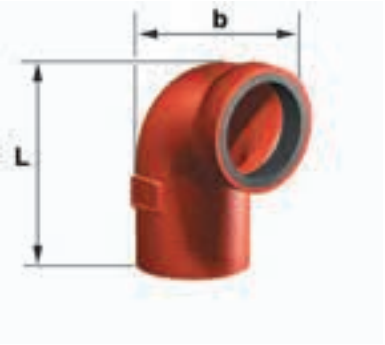
WC connectors for a ceramic DN 100

DN	Product code	L	a	P	Weight
100	156654	90	53 maxi	41.5	0.34

N.B.: This product does not require stainless steel collar



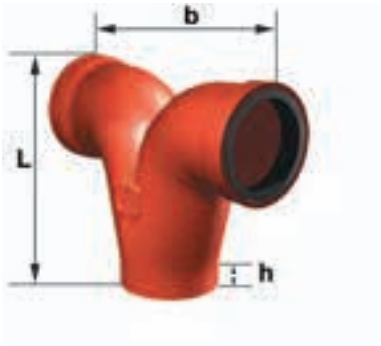
WC connectors*



DN	Product code	L	b	Ø socket extension	Weight
75	176725	207	147	92	1.93
100	155852	217	139	133	2.85

* Product delivered with his rubber

90° single WC connectors*



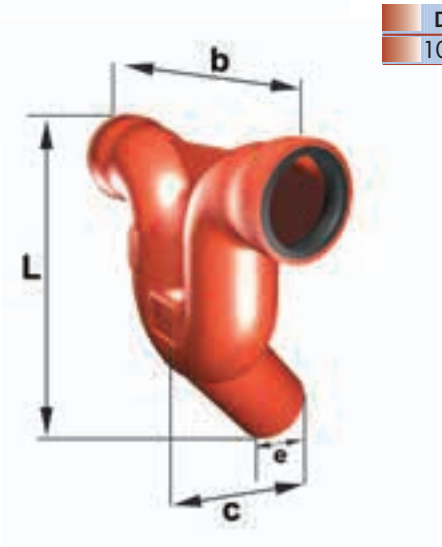
DN	Product code	L	b	h	Ø socket extension	Weight
100	155853	292	250	50	133	5.00

* Product delivered with his rubber

All dimensions are in mm and nominal weights in kg

WC connectors for a ceramic DN 100

90° double bend WC connector*



DN	Product code	L	c	b	e	Ø socket extension	Weight
100	155854	361	231	280	78	133	5.00

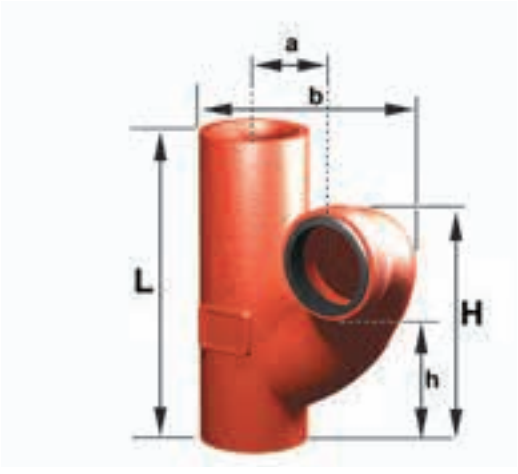
* Product delivered with his rubber

Simple and horizontal WC connectors*

DN	Inlet	Product code	L	H	b	a	h	Ø socket extension	Weight
100	R	155850	320	337	252	130	204	133	4.80
100	L	155849	320	337	252	130	204	133	4.80

* Product delivered with his rubber

Left inlet - L



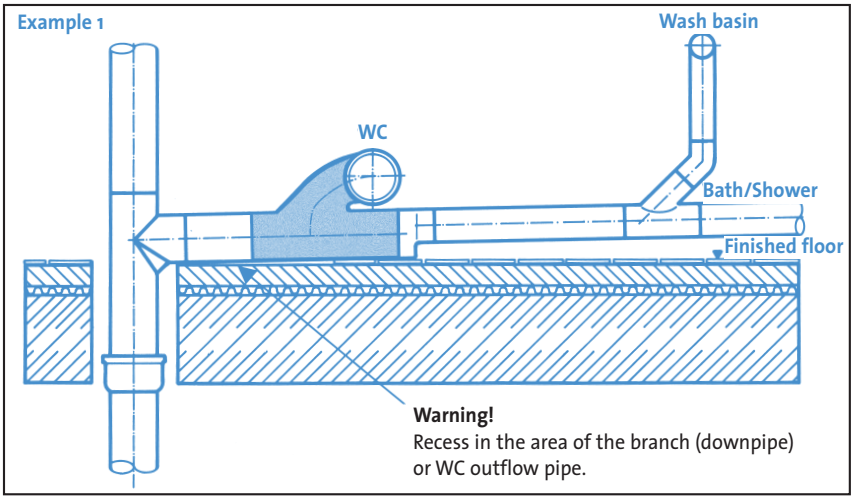
Right inlet - R

All dimensions are in mm and nominal weights in kg

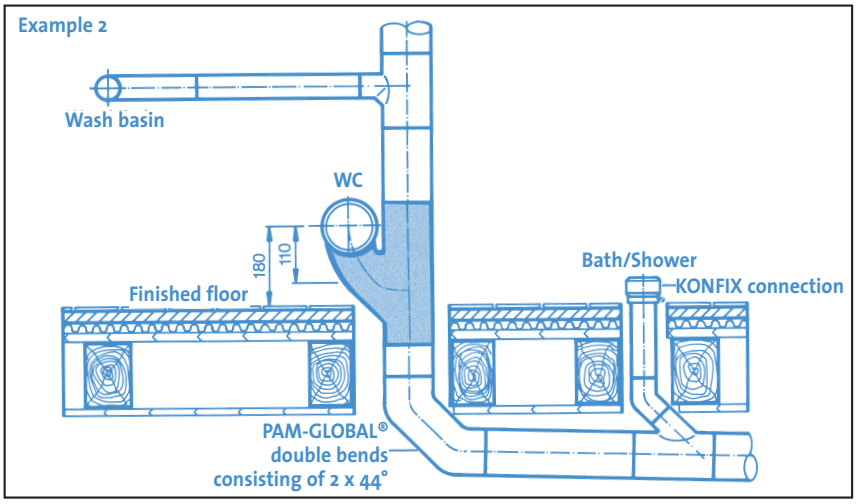
Installation examples

PAM-GLOBAL® WC Branch for the renovation of old buildings
This special branch for the connection of a floor WC bowl with a subsequently laid PAM-GLOBAL® Pipe on a finished floor (e.g. for the modernisation of old buildings).

With this WC branch it is possible to lay the collecting connection pipe on the existing floor. The upper covering must be recessed in the area of the branch (downpipe) and the WC branch. The connecting height of a floor WC bowl with horizontal outflow pipe is usually around 180 mm from the middle of the WC outflow pipe to the top edge (OK) of the finished floor. A normal commercial plastic WC connecting piece of 110 mm external diameter is required to link the WC junction to the PAM-GLOBAL® connecting socket.



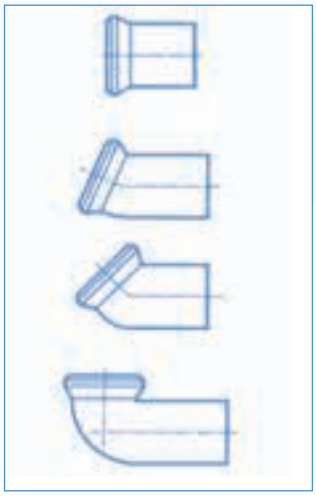
Example 1:
Installing the branch in a collecting connection line to link a floor WC bowl to a horizontal outflow pipe.



Example 2:
Installing a branch in a downpipe to link a floor WC bowl to a horizontal outflow pipe.
Only surface-mounted or bowl-supported flushing cisterns or flushing valves can be used.

* Laying Guidelines for Waste-Water Downpipes acc. to DIN 1986, Part 1; 6.2.3.
"Floor bends of 87° to 90° are permissible for downpipes which do not pass through more than three floors, or which are not longer than 10 m, and which leads into horizontal lines."
For sound-technical reasons, however, we recommend the use of a double bend consisting of 2 x 44°.

Installation instructions for WC connections



Plastic WC connecting sections, 110 mm diam., are supplied among others by Abu-Plast, Geberit, Ideal-Standard, Schwab and Franz Viegener II.

General: To connect WC connecting lines to downpipes we recommend the PAM-GLOBAL® Branch 88° with 45° inflow angle as this offers the best outflow conditions.

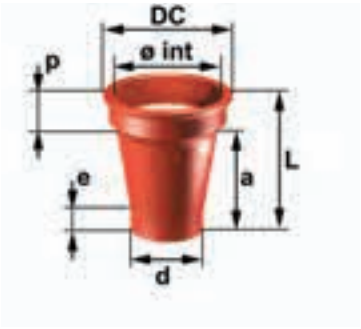
WC connecting lines must be conducted into the downpipe in such a manner that the height difference between the water level of the WC trap and the base of the connecting pipe is at least 100 mm at the point of entry into the downpipe. This rule must also be observed for wall WC bowls with a horizontal outflow pipe.

See DIN 1986, Part 1, Section 6.2.7.2 to 6.2.8

Nowadays, state-of-the-art **floor WC bowls** are only supplied with a vertical or horizontal outflow pipe. A plastic WC connection piece, 110 mm diam., and featuring lip seals or compression joints, is used to link the WC connection to a cast-iron pipe. (Bends 22°, 45° and 90° as well as straight connection sections). The plastic connecting pipe is connected to the cast-iron pipe

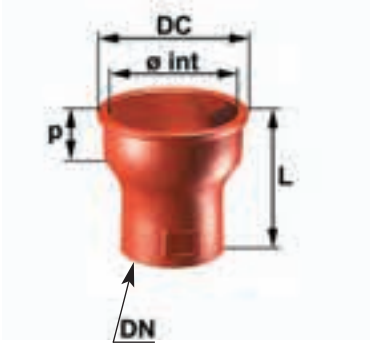
- For socket-free pipes with the KONFIX connector DN 100.
- For GA sockets with the Rollfix connector.
- For cast-iron WC connections with a special socket over an inserted sealing ring.

Concentric connectors Cast iron/Cast iron



d	Product code	Ø int	L	DC	p	a	e	Weight
62	156447	87	160	102	40	106	35	0.95
58	156524	102	205	118	60	135	70	1.60
75	156553	101	160	116	40	105	35	1.80
84	156680	125	160	140	40	105	35	1.60
103	156682	128	160	143	40	105	35	1.85
111	156803	155	180	171	40	125	35	2.55
135	156917	182	180	198	40	125	35	3.40
118	156940	182	180	180	40	125	35	3.60
173	156942	210	260	230	50	190	40	6.50
146	157038	236	260	256	50	195	40	6.60
200	157040	236	260	256	50	195	40	7.30

Traditional joint connectors

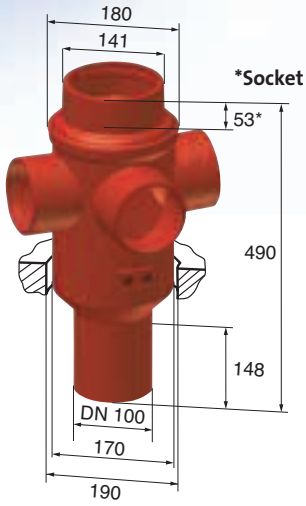


DN*	Product code	L	DC	Ø int	p	Weight
100	156650	155	176	160	80	2.65
125	156789	155	205	187	80	3.80
150	156902	155	232	214	80	4.80
200	157011	145	284	258	70	5.80
300	157158	145	394	366	70	11.40

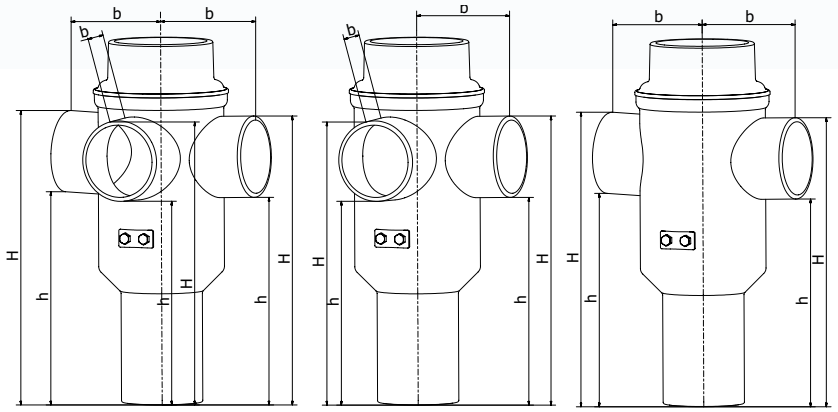
* For external diameters, see page 25

All dimensions are in mm and nominal weights in kg

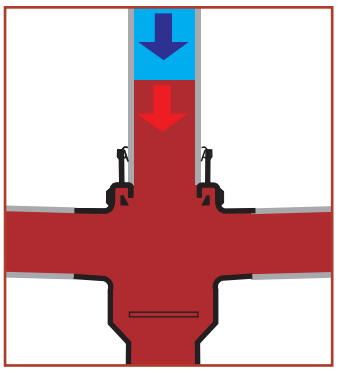
Branches with single downpipe (2 to 3 inlets)



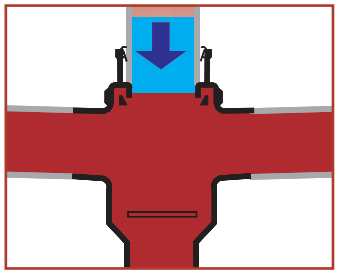
DN	Product code	Lateral adjustments	H	h	b	Weight
100	177237	3 consecutive DN at 90°	392	282	140	11
	177236	2 DN at 90°				10.4
	177235	2 DN at 180°				10.8



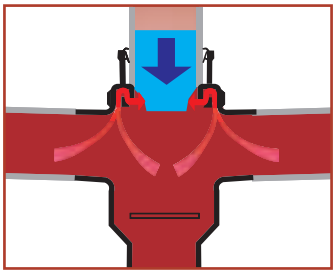
177237 **177236** **177235**



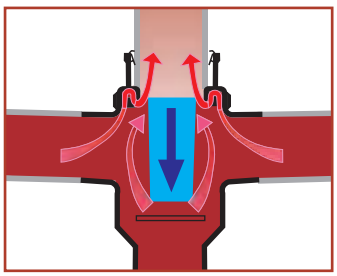
1. The wastewater drops down the soil pipe. It generates a liquid "piston" which pushes back the air over the front portion of the soil pipe, creating a pressure drop in the air on the upstream side.



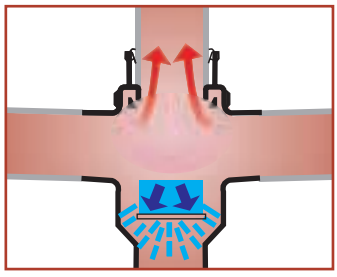
2. This "piston" reaches the height of the single soil pipe chute.



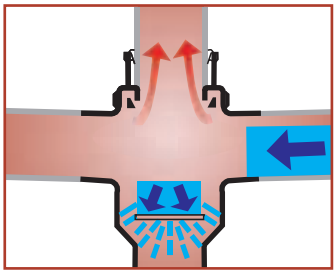
3. The "piston" is channelled and small in diameter. This causes air to rise up along the piston.



4. The air then enters the patented device of the single soil pipe chute. This system prevents desiphoning of the installations in the facilities on higher levels and does not interfere with those on the same floor.



5. The water "piston" strikes the rubber deflector and breaks up.



6. A new flush takes place and the cycle starts again.

The branch with single downpipe (CEBTP licence) is installed without secondary ventilation and serves simultaneously 2 WC by storey and all the other sanitary appliances of 2 flats.

It is particularly adapted to:

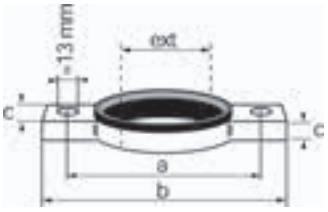
- the cramped Service shafts
- hotel rooms, student flats, old people's homes and all other buildings comprising semi-detached sanitary blocks.

• see also page 118

All dimensions are in mm and nominal weights in kg

Stack support pipes

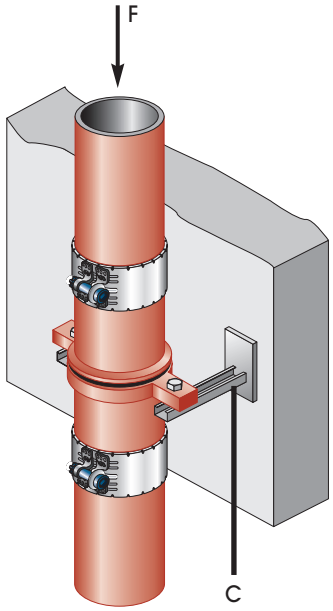
DN	Product code	L	a	b	c	d	e	Ø ext	Weight
50	156413	220	150	195	30	17	8	108	2.10
70	177742	200	170	215	30	19	8	128	2.00
75	156512	220	175	218	30	19	8	133	3.00
100	156657	220	214	259	32	20	8	162	4.50
125	156793	220	228	275	32	20	8	187	5.50
150	156904	220	255	300	32	22	8	222	7.20
200	157014	220	310	362	36	22	8	278	10.00
250	157097	300	394	444	40	25	8	354	18.50
300	157160	300	448	498	40	30	8	406	30.75



Method of assembly
Support: mounting of the stack support pipe on bracket

It is executed with the mounting of the pipework on line

1) Put the support bracket (A) on the flange pipe (T). The elastomer side in the contact with the surface of the flange
2) Fix the bracket to the wall using cantalever arms (C)
3) Fix the support bracket (A) to the bracket

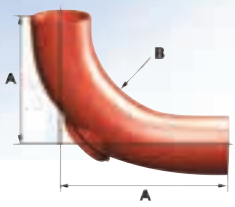


Look out!
Compared to the direction of the pressure (F), the flange pipe (T) must be located upstream the support bracket (A).

The stack support pipe is only used when pipes are not sealed in the slab. In this case, we find it every 15 meters.
See page 90 for cantalever arms.

All dimensions are in mm and nominal weights in kg

Bends – Short & Long Radius Door Back



DN	Product code	A	Weight
88° Bend – Short Radius Door Back – EF005			
70	156472	90	1.80
100	156589	110	3.30
150	156845	145	6.10

DN	Product code	A	B	Weight
88° Bend – Long Radius Door Back – EF05L				
100	156607	269	180	1.80

Branches – Single equal & Unequal

See BS EN 12056-2: 2000 for applications.

DN	Product code	A	B	C	Weight
88° Single Branch – Radius Curve – EF06R					
70x70	156539	210	80	130	2.20
100x50	156611	204	90	120	2.40
100x70	156612	221	90	142	2.70
100x100	156696	270	102	150	3.50
150x100	156869	300	117	202	7.60
150x150	156926	400	140	260	12.50
200x150	156985	428	157	283	13.00
200x200	157025	478	182	293	21.00

Branches – Single equal & Unequal

See BS EN 12056-2: 2000 for applications.

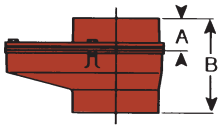
DN	Product code	A	B	C	Weight
88° Branch with Access – Radius Curve – EF07R					
70x70	156540	210	80	130	2.50
100X50	156614	204	90	120	2.40
100x70	156621	221	90	142	3.50
100x100	156697	270	102	150	4.30
150x100	156875	300	117	202	10.40
150x150	156927	400	140	260	13.90

Branches – Double

See BS EN 12056-2: 2000 for applications.

DN	Product code	A	B	C	Weight
88° Double Branch – Radius Curve – EF010R					
100x100	157643	270	102	150	4.20
150x100	156862	300	115	200	10.90

Multi Manifold



DN	Product code	A	B	C	D	E	Weight
Manifold Connector – EF094							
100	175626	43	125	200	142	62	3.20
150	175629	70	165	290	184	81	6.10

For installation, see also pages 82 and 83.

Traps

DN	Product code	A	B	Weight
Traps – Plain – EF034				
100	156666	255	160	1.80

DN	Product code	A	B	Weight
Traps – Plain with Access Bottom – EF037				
50	156419	160	115	2.00
70	156518	200	138	2.70
100	156667	255	175	5.20
150	156911	350	240	12.10

All dimensions are in mm and nominal weights in kg

PAM-GLOBAL® Plus
PAM-SMU® Plus
PAM-ENSIGN® Plus

Areas of use:

- **Above and below ground drainage systems:**
  for soil, rain water, greasy waste, industrial waste water, aggressive effluents (i.e. large kitchens, hospitals, clinics, laboratories, industrial use...)
- **System incorporated into concrete slabs and basement areas**
- **Buried system tor connection to the main sewer**

SMU® Plus for laboratories

Aggressive chemical and extreme temperatures:

designed for the drainage of aggressive waste and industrial uses (see attached areas of use) the PAM-GLOBAL® Plus range will withstand temperatures of up to 80 °C with speaks at 95 °C as stipulated in EN 877).

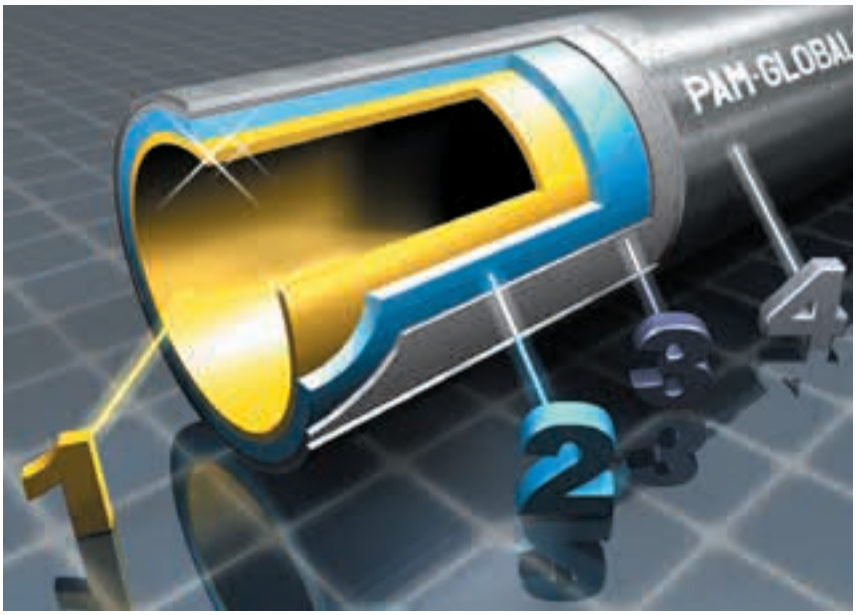
PAM-GLOBAL® Plus network
– Louis Pasteur Hospital

PAM-GLOBAL® Plus
for concrete slabs

PAM-GLOBAL® Plus
PAM-SMU® Plus
PAM-ENSIGN® Plus

Range of diameters – DN 40 to 600

Pipes



1 **Internal coating:**
2 layers of two-part ochre colour epoxy, giving a total average dry thickness of 250 microns.

2 **Cast Iron De Lavaud Process**

3 **External coating:**
Initial flame applied anti-corrosive zinc coating at 130 gr/m², then painted using anthracite grey acrylic primer, with an average dry coating thickness of 40 microns

4

Fittings

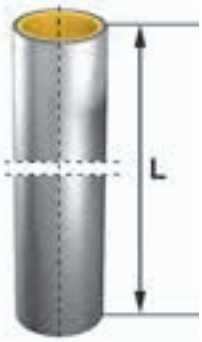
Internally and externally coated in fluidised bed with a polymerised epoxy powder, with an average dry fitting thickness of 300 microns. The epoxy layer produces a non-porous coating giving excellent adhesion and uniform thickness. The non-porosity of the coating may be verified by means of an electric brush.

Epoxy powder coating of the fittings

Oven epoxy coating polymerisation

Socketless pipe (L= 3m)

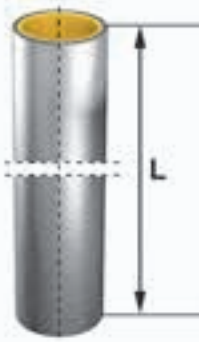
PAM-GLOBAL® Plus,
above and below ground



L = 3000 mm			
DN	DE*	Product code	Weight
50	58	155302	13.30
70	78	155321	18.00
100	110	155348	25.50
125	135	155391	35.80
150	160	155413	42.70
200	210	155447	69.80
250	274	155475	99.80
300	326	155492	129.70
400	429	155508	176.40
500	532	155511	247.00
600	635	175630	324.40

* External diameter

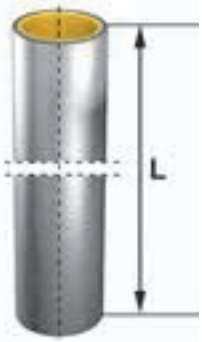
PAM-SMU® Plus,
above and below ground



L = 3000 mm			
DN	DE*	Product code	Weight
40	48	155296	9.00
50	58	155301	12.70
75	83	155320	18.50
100	110	155347	24.70
125	135	155390	34.80
150	160	155412	41.50
200	210	155446	68.20
250	274	155474	98.30
300	326	155491	128.10

* External diameter

PAM-ENSIGN® Plus,
above and below ground



L = 3000 mm			
DN	DE*	Product code	Weight
100	110	155349	25.50
150	160	155414	42.70
200	210	155448	69.30
250	274	155476	99.80
300	326	155493	129.70

* External diameter

Protection of the pipe cut ends

After any cutting of pipes, it is imperative to protect the sections by applying a layer from ENDOKOTE-Protection kit, reference 157666 made of a 83 gr syringe (a resin and a hardnerbased), dark grey colour. Number of the DN 100 pipe cut ends that enable to cover with a kit: 20.

All dimensions are in mm and nominal weights in kg

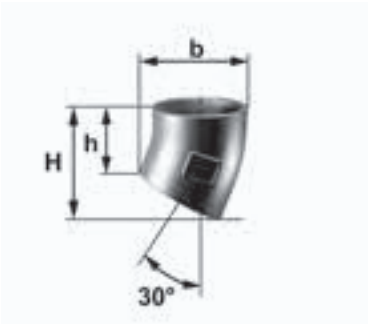
15° bends

DN	Product code	b	H	h	Weight
50	155202	66	89	66	0.40
70	155220	88	98	78	0.60
100	155237	121	112	83	1.00
125	155262	148	134	99	1.70
150	155278	227	148	108	2.50

22° bends

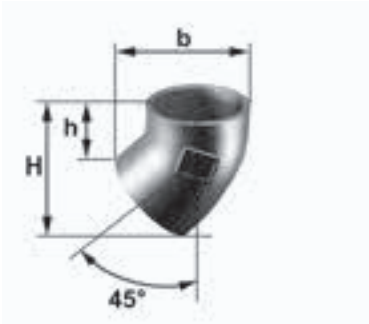
DN	Product code	b	H	h	Weight
50	155308	70	88	66	0.46
75	155327	97	105	74	0.82
100	155358	126	125	84	1.33
125	155396	152	143	92	1.90
150	155421	179	162	102	2.67
200	155455	233	200	122	4.53
250	155482	300	240	138	9.78
300	155499	356	279	159	15.75

30° bends



DN	Product code	b	H	h	Weight
50	155203	76	97	69	0.50
70	155221	97	112	73	0.70
100	155238	132	136	81	1.30
125	155263	160	164	96	2.00
150	155279	189	188	108	3.00

45° bends

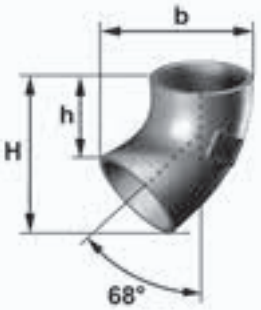


DN	Product code	b	H	h	Weight
50	155306	84	106	65	0.36
70	155219	108	129	74	0.90
75	155325	112	132	73	0.56
100	155356	142	158	80	0.87
125	155395	171	184	89	1.61
150	155420	199	210	97	2.18
200	155453	256	262	113	3.28
250	155481	324	319	125	5.40
300	155498	387	380	149	10.29
400	155509	540	573	270	18.82

All dimensions are in mm and nominal weights in kg

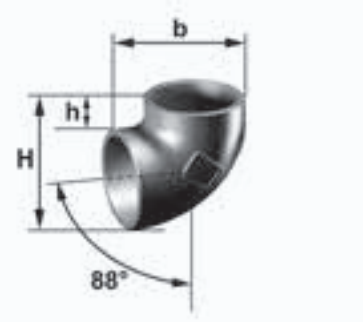
Bends

68° bends



DN	Product code	b	H	h	Weight
50	155305	104	123	70	0.77
70	155218	123	139	67	1.10
75	155324	131	149	72	1.08
100	155355	159	176	74	1.85
125	155394	188	205	80	3.08
150	155419	219	237	89	4.22
200	155452	277	295	99	8.01
250	155480	343	358	104	15.08
300	155497	406	423	121	20.59

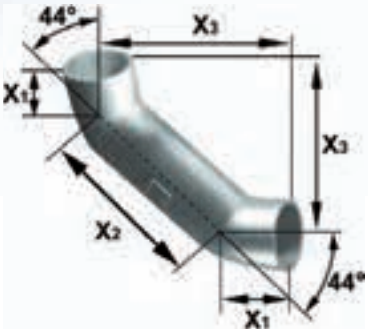
88° bends



DN	Product code	b	H	h	Weight
50	155304	104	107	49	0.82
70	155217	130	132	54	1.20
75	155323	138	140	57	1.44
100	155353	166	169	59	2.28
125	155393	194	197	62	2.93
150	155418	227	230	70	4.43
200	155451	267	291	81	8.34
250	155479	360	363	89	13.90
300	155496	427	431	105	28.49

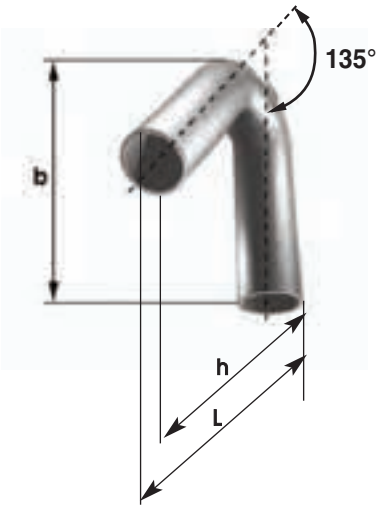
All dimensions are in mm and nominal weights in kg

88° Double bend



DN	Product code	x1	x2	x3	Weight
100	155359	70	140	169	2.80

135° bend



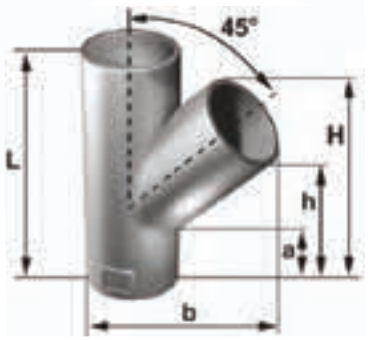
DN	Product code	b	H	h	Weight
100	155239	272	314	236	4.63

S bend offset 150 mm

DN	Product code	L	b	E	Weight
100	155361	250	260	150	3.42

All dimensions are in mm and nominal weights in kg

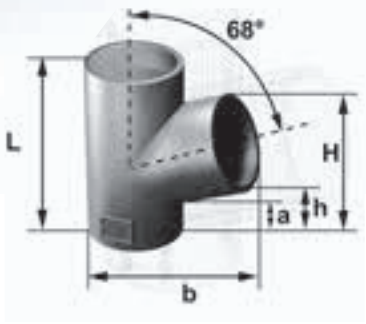
45° single branches



DN	dn	Product code	L	b	H	h	a	Weight
50	50	155316	185	144	165	124	36	1.18
70	50	155223	190	124	166	125	35	1.60
	70	155229	215	179	195	140	35	2.30
75	50	155331	180	156	161	120	43	1.85
	75	155344	215	179	198	140	40	2.42
100	50	155365	200	191	172	131	47	2.52
	70	155247	235	213	208	159	48	3.30
	75	155368	220	204	199	140	44	3.14
	100	155380	275	238	253	175	45	4.06
125	50	155398	205	218	170	130	44	3.33
	70	155265	240	236	208	153	49	4.30
	100	155400	280	261	254	177	47	5.30
	125	155409	320	284	296	201	49	5.97
150	70	155280	245	259	208	154	52	5.60
	100	155430	295	287	262	185	54	6.28
	125	155432	325	307	298	202	52	7.51
	150	155442	355	323	333	219	53	8.95
200	70	155290	255	302	212	157	62	8.10
	100	155459	305	330	266	188	63	9.06
	125	155292	335	350	300	204	62	10.29
	150	155461	375	373	343	230	63	11.43
	200	155470	455	418	428	280	68	16.26
250	200	155483	480	486	440	291	75	25.02
	250	155490	580	537	530	335	70	33.77
300	250	155500	580	588	540	347	80	38.30
	300	155507	660	634	661	431	115	52.10
400	300	155510	660	728	620	389	86	56.94

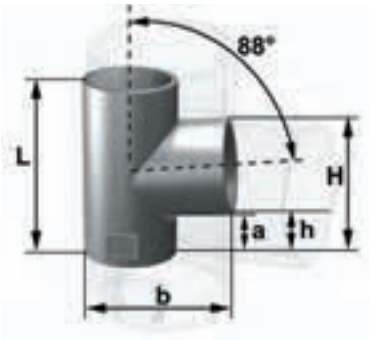
All dimensions are in mm and nominal weights in kg

68° single branches



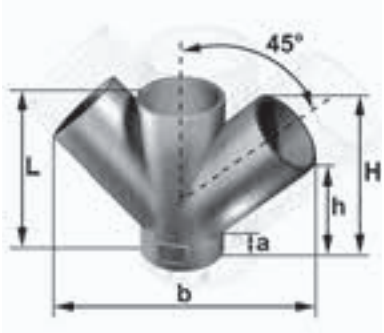
DN	dn	Product code	L	b	H	h	a	Weight
50	50	155315	145	188	118	65	37	1.13
75	50	155330	155	140	122	69	42	1.44
	75	155343	180	158	149	72	37	2.42
100	50	155364	155	168	123	69	43	1.85
	75	155367	185	186	155	79	44	2.47
	100	155379	220	195	189	87	50	3.03
125	100	155399	225	222	190	88	50	3.91
	125	155408	255	235	220	95	50	4.58
150	100	155429	235	243	194	92	55	5.04
	125	155431	265	262	226	101	56	6.69
	150	155441	295	276	256	108	55	6.84
200	150	155460	310	329	263	114	62	10.50
	200	155469	365	352	321	126	63	13.59
250	250	155489	460	452	408	154	77	20.69
300	300	155506	545	544	480	178	80	35.52

88° single branches



DN	dn	Product code	L	b	H	h	a	Weight
50	50	155314	145	110	111	53	31	1.13
70	50	155222	160	132	117	59	43	1.40
	70	155228	180	135	139	61	38	1.70
75	50	155329	160	132	117	59	42	1.54
	75	155342	180	138	140	57	37	2.00
100	50	155363	170	161	127	69	45	2.31
	70	155246	190	110	141	63	42	2.40
	75	176746	190	166	145	62	40	2.60
	100	155378	220	172	174	64	41	3.03
125	125	155407	260	205	209	74	48	4.58
150	50	185472	200	221	134	76	51	3.90
	100	155428	245	227	190	80	52	4.90
	150	155440	300	237	243	83	55	6.84
200	100	155457	270	282	206	96	66	8.80
	200	155468	365	288	296	86	67	7.41
250	250	155488	455	366	375	101	77	10.50
300	300	155505	530	433	437	111	87	13.59

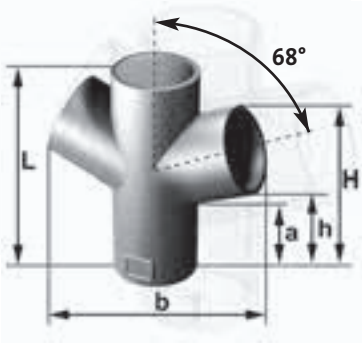
45° double branches



DN	dn	Product code	L	b	H	h	a	Weight
100	100	155384	260	346	243	165	46	4.63
125	125	155411	305	421	285	190	45	7.51
150	150	155445	355	488	334	277	55	12.04

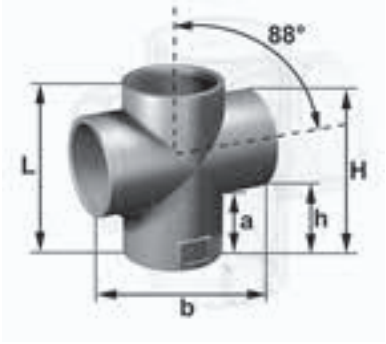
All dimensions are in mm and nominal weights in kg

68° double branches



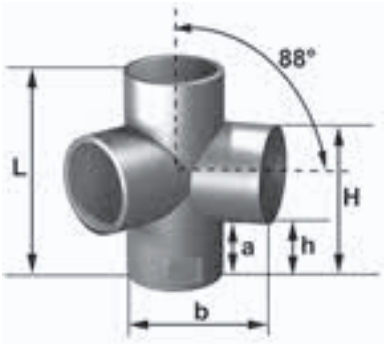
DN	dn	Product code	L	b	H	h	a	Weight
50	50	155317	145	117	118	64	35	1.33
75	50	155328	155	140	122	69	42	1.64
	75	155345	180	158	149	72	36	2.26
100	75	155362	185	186	155	79	44	3.08
	100	155383	220	195	189	87	50	4.01
125	100	155397	225	222	190	88	50	4.53
	125	155410	255	235	220	95	51	6.12
150	125	155426	265	262	226	101	56	5.97
	150	155444	295	276	256	108	55	8.34
200	150	155456	310	329	263	114	62	10.65
	200	155472	365	352	321	126	63	14.41

88° double branches



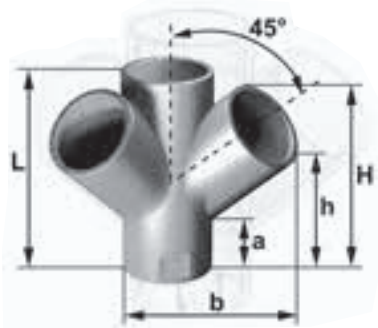
DN	dn	Product code	L	b	H	h	a	Weight
100	100	155382	230	243	179	69	49	3.29

88° corner branches



DN	dn	Product code	L	b	H	h	a	Weight
100	100	155385	230	177	179	69	44	3.4

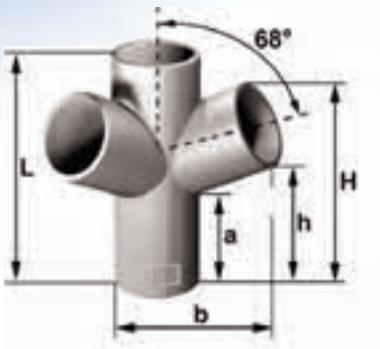
45° right angle double branches



DN	dn	Product code	L	b	H	h	a	Weight
100	100	155387	260	227	242	166	46	5.35

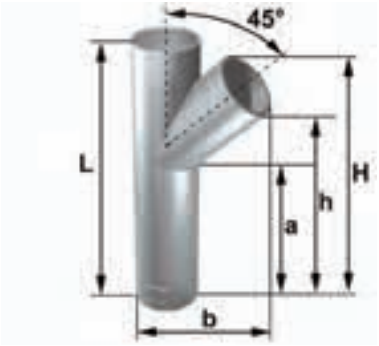
All dimensions are in mm and nominal weights in kg

68° right angle double branches



DN	dn	Product code	L	b	H	h	a	Weight
75	75	155346	180	158	149	72	36	2.37
100	100	155386	220	195	189	87	50	3.71

45° single branches long tail

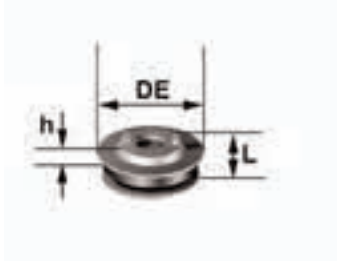


DN	dn	Product code	L	b	H	h	a	Weight
100	100	155381	430	238	346	424	241	5.71
150	150	155443	705	323	571	684	403	19.03
200	200	155471	770	423	600	749	383	28.83

68° single branches long tail

DN	dn	Product code	L	b	H	h	a	Weight
100	100	155388	460	195	328	430	290	5.35

Expansion plugs



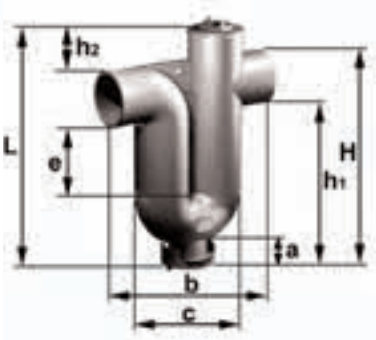
DN	DE	Product code	L	h	Weight
50	64	155303	48	15	0.26
75	90	155322	63	20	0.57
100	118	155351	81	30	1.03
125	143	155392	82	30	1.54
150	168	155417	88	30	2.32
200	218	155450	100	40	4.32
250	284	155478	100	40	6.38
300	336	155495	100	40	9.27

Expansion plugs with bleeding valve are available on request for the 100/150/200 and 300 DN (for water tightness test)
See page 110 for information on resistance when accidental pressure

All dimensions are in mm and nominal weights in kg

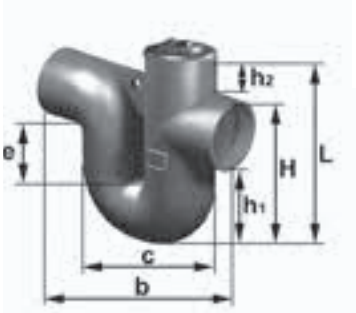
Traps for aggressive effluents

DN	Product code	L	b	h1	h2	a	c	e	H	Access(*)	Weight
50	155311	240	190	143	39	33	112	60	201	EP 50	2.99
70	155335	293	264	150	52	13	162	60	230	TS 50	5.00
75	155334	282	264	110	52	13	162	60	230	TS 50	6.02
100	155372	381	325	216	55	15	216	100	326	TS 50	9.78
125	155404	435	390	238	63	12	266	100	372	TS 75	13.49
150	155436	482	470	257	65	8	340	100	417	TS 125	22.40



(*) Bottom access of cleaning: – EP by expansion plug
– TS by tight sheet

Syphon SMU® Plus: DN 50 to 150

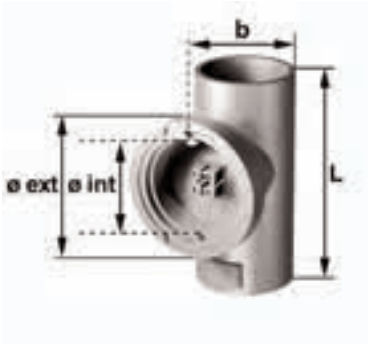


DN	Product code	L	b	h1	h2	c	e	H	Weight
200	155464	590	600	300	80	415	100	510	28.30

Syphon SMU® Plus: DN 200

To install these components only on the drainage networks of rainwater.
The arrow on this component shows the flow direction.

Short pipes with access door



DN	Product code	L	b	Ø int	Ø ext	Weight
50	155310	160	102	75	108	2.01
75	155332	205	132	101	134	3.09
100	155370	250	157	128	160	4.63
125	155403	280	192	154	189	6.69
150	155435	320	222	181	224	10.71
200	155463	360	270	181	224	13.13
250	155486	380	333	181	225	18.12
300	155503	400	385	181	227	27.08

See page 38 for information on opening and closing.
See page 122 for information on resistance when accidental pressure.

All dimensions are in mm and nominal weights in kg

Pipes tapered/Reducers

DN	dn	Product code	L	h	Weight
40	50	155299	75	40	0.30
70	50	155208	75	42	0.50
75	50	155312	80	47	0.72
100	50	155313	80	45	1.03
	70	155225	85	45	0.90
	75	155337	90	45	1.13
125	50	155210	85	50	1.54
	70	155226	90	50	1.50
	75	155338	95	52	1.33
	100	155374	95	50	1.64
150	50	155211	95	55	1.95
	70	155227	100	55	2.10
	75	155339	100	57	1.75
	100	155375	105	60	2.36
	125	155405	110	60	2.00
200	75	155340	115	72	3.45
	100	155376	115	70	3.75
	125	155406	120	70	3.55
	150	155439	125	65	3.96
250	75	155341	125	82	6.12
	100	155377	125	82	5.86
	150	155437	135	82	6.07
	200	155465	145	80	6.28
300	100	155373	140	97	9.37
	150	155438	150	95	9.98
	200	155466	160	95	9.98
	250	155487	170	95	10.40
400	300	155504	200	100	20.28

DN 500 and 600: do not hesitate to contact us

All dimensions are in mm and nominal weights in kg

PAM-GLOBAL®
PAM-SMU®
PAM-ENSIGN®

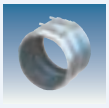
The precisely matched joints not only guarantee absolute tightness, but also facilitate assembly and optimal assembly time.

PAM-GLOBAL® S
PAM-SMU®
PAM-ENSIGN® S

Which joint for which purpose ?

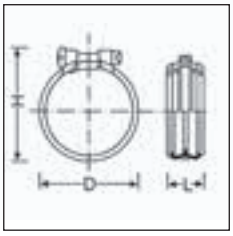
Application Range	PAM-GLOBAL® RAPID-S coupling	PAM-GLOBAL® RAPID-INOX coupling	PAM-GLOBAL® REKORD grip collar	PAM-GLOBAL® UNIVERSAL grip collar	PAM-GLOBAL ® CV coupling	PAM-GLOBAL ® CE coupling	PAM-GLOBAL® CV grip collar	SMU-S coupling - INOX
								
Domestic waste water and rain water within buildings **PAM-GLOBAL® S Pipes** **PAM-SMU® S Pipes** **PAM-GLOBAL ENSIGN® S**	✓		✓ 1)	✓ 1)	✓		✓ 1)	✓
Waste water containing petrol and oil within buildings **PAM-GLOBAL® S Pipes** **PAM-SMU® S Pipes** **PAM-GLOBAL ENSIGN® S**	✓ 6)				✓ 6)			✓ 6)
PAM-GLOBAL® S Pipes **PAM-SMU® S Pipes** **PAM-GLOBAL ENSIGN® S** **embedded in concrete**	✓		✓ 2)	✓ 2)	✓		✓	✓
Pressure lines of lifting gear up to DN 100 **PAM-GLOBAL® S Pipes** **PAM-SMU® S Pipes** **PAM-GLOBAL ENSIGN® S**	✓ 1)		✓ 1)	✓ 1)				
Within buildings **PAM-GLOBAL® Plus Pipes** **PAM-GLOBAL ENSIGN® Plus Pipes** **PAM-SMU® Plus**	✓	✓	✓	✓	✓	✓	✓	
Below ground **PAM-GLOBAL® Plus Pipes** **PAM-GLOBAL ENSIGN® Plus Pipes** **PAM-SMU® Plus Pipes**		✓				✓		✓
Embedded in concrete **PAM-GLOBAL® Plus Pipes** **PAM-GLOBAL ENSIGN® Plus Pipes** **PAM-SMU® Plus Pipes**	✓		✓	✓	✓		✓	✓
EPAMS HDE-System **PAM-GLOBAL® S Pipes** **PAM-SMU® S Pipes** **PAM-GLOBAL ENSIGN® S**	✓		✓ 5)	✓ 5)	✓		✓ 5)	

1) See Installation instructions pages 78-79
2) With complicated structures consisting of several fittings
3) See Installation instructions page 80
4) Not for burying in the ground or embedding in concrete

SMU-S AUTOGRIP coupling - INOX	SMU RAPID® 2 coupling	Stainless steel SMU RAPID® 2 coupling	SMU RAPID® grip collar	PAM-ENSIGN® coupling	Stainless steel collar ISO 6594 (below ground)	PAM-ENSIGN® coupling (below ground)	PAM-GLOBAL® KONFIX	PAM-GLOBAL® KONFIX-MULTI	PAM-GLOBAL® MULTIQUICK
									
✓	✓		✓ 3)	✓			✓ 4)	✓	✓
✓ 6)		✓ 6)		✓ 6)					
✓ 2)	✓		✓ 2)	✓					
✓ 1)			✓ 3)						
	✓	✓	✓			✓	✓ 5)	✓	✓
✓		✓			✓	✓			
✓	✓		✓			✓			
✓ 5)	✓		✓						

5) Please refer to the EPAMS HDE technical specification
6) With NBR seal collar

PAM-GLOBAL® RAPID-S couplings



DN	Product code W2 - S	Product code W5 Inox All S-steel	D Largest dimension after installation	H≈ Largest dimension after installation	L≈ Largest dimension after installation	Tightening torque [Nm]	Weight
40	157586	157587	53	64	41	block clamp	0.07
50	157589	157591	70	80	40		0.10
70	155794	155795	90	100	40		0.12
75	157594	157596	90	100	40		0.13
100	157598	157600	125	135	46		0.18
125	157602	157604	147	162	55		0.30
150	157606	157608	172	187	55		0.35
200	157610	157612	223	240	70		0.65
250	-	183457	295	306	95		0.70
300	-	183458	348	359	95		0.90

Note : a specific system exists for DN 70 - DN 75 connection, see page 70

PAM-GLOBAL RAPID S technical specifications

DN 40 to DN 200
Strap made of ferritic stainless steel. Material group W2 = material 1.4510/ 1.4511 (AISI 430 Ti/-)
Clamps: stainless steel 1.4510/ 1.4511 or 1.4301 (AISI 430 Ti/-/304)
One screw coupling. Galvanized screw, washer and square nut, yellow chromatised.

PAM-GLOBAL RAPID - INOX technical specifications

DN 40 to DN 300
Identification feature:
W5 identification on the strap.
Strap made of austenitic stainless steel. Material group W5 = material 1.4571 (AISI 316 Ti
Clamps : stainless steel material 1.4571 (AISI 316 Ti)
One screw coupling. Stainless steel A4 screw and square nut.

For pipelines that are exposed to the weather, e.g. for bridge building or open multi-storey car parks. Likewise, without additional corrosion protection, ideal for burying in the ground.

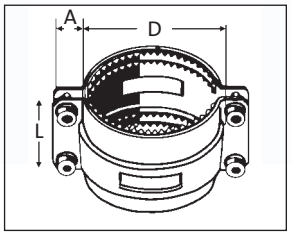
Special shape for the couplings DN 250 and DN 300

These products are sold EPDM gasket included. Also available with NBR gasket when exposed to waste waters liable to contain oil or hydrocarbons.

See page 78 for installation instructions

All dimensions are in mm and nominal weights in kg

PAM-GLOBAL® REKORD grip collars



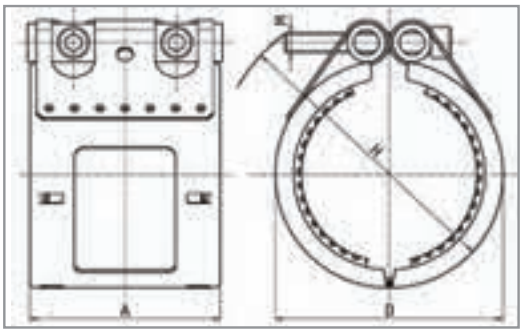
DN	Product code	A Largest dimension [mm]	D≈ [mm]	L*) Tightening torque [mm]	Md [Nm]	Pressure [bar]	Hexagon socket screw	Weight
40	155743	21	65	62	12-15	to 10	M8	0.40
50	155761	21	75	69	12-15	to 10	M8	0.55
70	155796	21	95	69	12-15	to 10	M8	0.65
100	155835	25	135	87	25-30	to 10	M10	1.25
125	155885	25	160	95	30-35	to 5	M10	1.50
150	155916	25	185	95	30-35	to 5	M10	1.75
200	155939	30	235	111	60-65	to 3	M12	2.80

Securing ring with friction-locked longitudinal adhesion for PAM-GLOBAL® pipelines with PAM-GLOBAL® RAPID couplings at internal pressure loads of up to 10 bar (DN 40-100);
Material: electrogalvanized steel.
PAM-GLOBAL® REKORD grip collars consisting of 2 clamp halves with hardened claw inserts, 2 hexagon socket screws with fine thread and fixed guiding and threaded plates.
Application: Pump pressure lines of lifting installations; rain-water and waste-water pipelines in areas subject to backpressure.

PAM-GLOBAL® UNIVERSAL grip collars

DN	Product code	A	D≈	H≈	Pressure [bar]	Hexagon socket screw	Weight
50	177227	77	85	105	10	M8	0.40
75	177228	77	105	125	10	M8	0.50
100	177229	97	130	150	10	M10	0.90
125	177230	97	165	195	10	M10	1.10
150	177231	97	185	215	5	M10	1.20
200	177232	113	240	270	5	M12	2.00
250	180874	140	295	325	3	M10	2.60
300	180875	140	345	385	3	M10	2.90

Note : For this claw there is no tightening torque to apply as assembly is complete when locking parts are parallel and in contact, see pictures page 79.



Case :
1.4510/11

Closure parts and screws :
Surface-treated steel

Strap :
1.4571

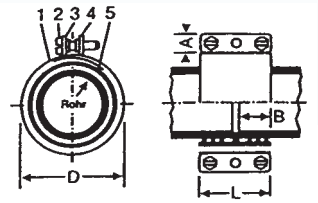
See pages 78 and 79 for installation instructions

All dimensions are in mm and nominal weights in kg

PAM-GLOBAL® CV-CE Standard couplings

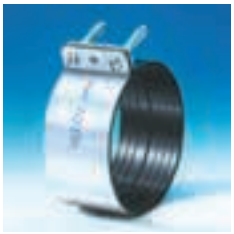
PAM-GLOBAL® couplings from DN 50 to 300. EPDM gasket included or as a special design for up to DN 300 with NBR gasket for waste water containing oil or hydrocarbons. From DN 200 onwards in two parts

DN	Product code CV	Product code CE	A	B	D≈	L	Md Tightening torque [Nm]	Weight
50	157590	157588	14	22.5	56	48	4-6	0.10
70	155791	155793	14	22.5	85	48	4-6	0.12
75	157595	157592	14	22.5	85	48	4-6	0.15
100	157599	157597	18	25.5	115	54	10-12	0.20
125	157603	157601	18	31	140	65	10-12	0.30
150	157607	157605	18	31	170	65	10-12	0.35
200	157611	157609	18	37	220	78	15-20	0.70
250	157614	157613	18	37	286	78	15-20	0.85
300	157617	157616	18	37	338	78	15-20	0.90



1 Clamping sleeve
2 For CV: slotted hexagon screws
DN 50 and 70: M6, SW10
DN 100 to 300: M8, SW10
For CE: Hexagon screws
DN 50 and 70; M6, SW10
DN 100 to 300; M8, SW13
3 Guide plate
4 Threaded plate
5 Sealing gasket

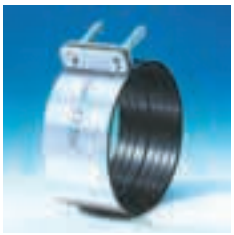
PAM-GLOBAL® CV standard couplings



Strap made of austenitic stainless steel. Material 1.4510/ 1.4511 (AISI 430 Ti/)
Screw and closure parts: galvanized steel

CV coupling

PAM-GLOBAL® CE standard couplings

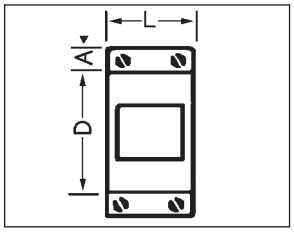


Identification feature:
W4 identification on the strap.

Strap and closure parts made of austenitic stainless steel. Material group W4 = material 1.4301 (304)
Screw: stainless steel A 2 class.

CE coupling
(All stainless steel)

PAM-GLOBAL® CV grip collars



DN	Product code	A	D	L	Md Tightening torque [Nm]	Weight
50	155760	23	74	71	10-12	0.43
70	155792	23	94	71	10-12	0.52
100	155834	23	124	87	18-20	1.10
125	155884	23	149	98	18-20	1.35
150	155915	23	174	98	18-20	1.60
200	155938	23	224	110	25-30	2.25
250	155953	27	294	138	55-60	5.20
300	155966	27	346	138	55-60	6.30

The inexpensive securing clamps for all CV and CE securings above 0.5 bar internal pressure.

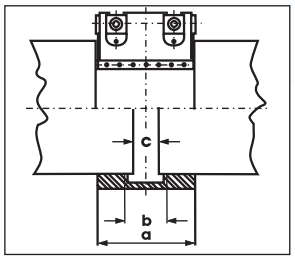
Securing clamp with friction-locked longitudinal adhesion for PAM-GLOBAL® pipelines with CV or CE couplings, DN 50 to 300, at internal pressure loads of up to 3 bar.
Material: steel 37/2, electrogalvanized.

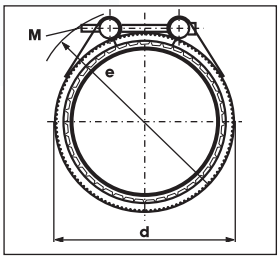
See page 79 for installation instructions

All dimensions are in mm and nominal weights in kg

PAM-SMU®-S couplings -INOX

DN	Product code	a	b	c	fb d	fb e	M	Weight
100	177190	98	40	25	137	154	8	1.90
125	177221	113	50	35	166	194	10	2.50
150	156887	112	50	35	186	210	10	2.70
200	156994	138	74	35	238	266	12	3.30
250	157082	138	74	35	299	327	12	3.80
300	157146	138	74	35	355	382	12	4.10
400	157181	139	74	35	458	485	12	5.90
500	157197	140	74	35	555	570	12	8,00
600	157207	140	74	35	666	690	12	9.10



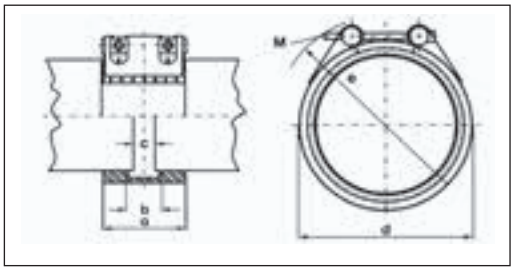


Case: 1.4571 = AISI 316
Closure bolts: 1.4401
Screw: 1.4404

Two-lip EPDM sealing system

PAM-SMU®-S AUTOGRIP couplings -INOX

DN	Product code	Pressure	a	b	c	≈ d	≈ e	M	Weight
50	177222	10	77	29	17	79	109	8	0.80
70	177226	10	98	40	25	100	125	10	1.50
75	177223	10	98	40	25	105	130	10	1.60
100	156630	10	98	40	25	133	154	10	1.90
125	177224	10	115	50	35	166	197	12	2.50
150	156886	10	115	50	35	186	211	12	3.00
200	156993	10	140	74	35	240	270	16	3.40
250	157081	10	140	74	35	299	330	16	4.20
300	157145	10	140	74	35	455	470	16	4.50
400	157180	10	142	74	35	480	520	16	7.90
500	157196	6	142	74	35	560	576	16	8.80
600	177225	4	142	74	35	665	635	16	9.90

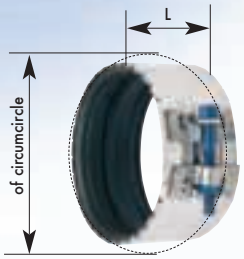


Case: 1.4571
Closure bolts: 1.4401
Screws: 1.4404
Claw ring: 1.4310

Two-lip sealing system
made of EPDM or NBR.

All dimensions are in mm and nominal weights in kg

PAM-SMU RAPID® 2 couplings



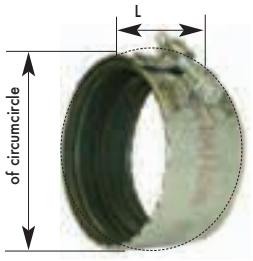
DN 50 to 200


DN 40 : the shape of this component is different for DN 40

DN	Product Codes EPDM	L	Ø of circumcircle	Weight
40*	157631	41	90	0.07
50	157635	51	104	0.14
75	157638	51	126	0.16
100	157641	58	160	0.22
125	157645	58	182	0.25
150	157648	58	206	0.28
200	157650	83	272	0.42

*The shape of this component is different for DN 40

All stainless steel PAM-SMU RAPID® 2 couplings



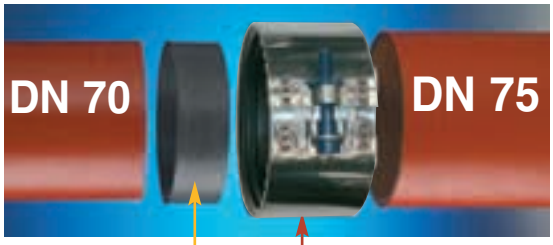
DN 50 to 200


DN 250 and 300

DN	Product code EPDM**	L	Ø of circumcircle	Weight
40*	157632	41	90	0.07
50	157636	51	104	0.14
75	156639	51	126	0.16
100	156642	58	160	0.22
125	156646	58	182	0.25
150	156649	58	206	0.28
200	157651	83	272	0.42
250	183904	95	350	0.94
300	183905	95	410	1.08

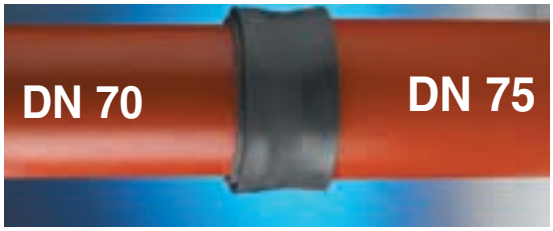
*The shape of this component is different for DN 40.
** Please consult us for NBR gasket for waste waters liable to contain hydrocarbons or oil

PAM-SMU RAPID®2 DN 70/75 connection



Product code : 156494 157638
1. Stepping ring SMU Rapid®2

2. Fit the rubber gasket to DN 70 pipe end first



3. Fit the SMU Rapid®2 rubber gasket to both pipe ends

4. Apply SMU Rapid®2 tightening strap, pull tightly and screw.

NOTE: SMU® couplings must be fitted without any lubricant.

All dimensions are in mm and nominal weights in kg

PAM-SMU RAPID® grip collars*

DN	Product code	L	Ø Drawn Diameter	Weight	Screw**	Tightening torque [Nm]
40	156351	73	130	0.29	13	10
50	156406	73	120	0.32	13	10
75	156503	73	146	0.39	13	10
100	156643	87	185	1.00	17	20
125	156784	98	210	1.11	17	20
150	156896	98	230	1.23	17	30
200	157007	122	310	2.25	17	30

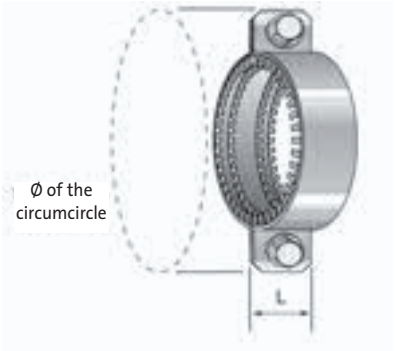
*Product to be used to face of accidental water pressure of the network
** Dimension of internal hexagonal hole or size of allen key required

PAM-SMU UNIVERSAL grip collars*

DN	Product code	A	D	H	Pressure	Hexagon** Socket screw	Weight
250	180874	140	295	325	3	10	2.60
300	180875	140	345	385	3	10	2.90

*Product to be used to face of accidental water pressure of the network
** Dimension of internal hexagonal hole or size of allen key required

Grip collars for expansion plugs*



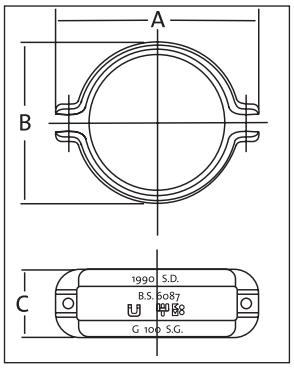
DN	Product code	L	Ø Drawn Diameter	Weight	Screw**	Tightening torque [Nm]
50	156407	73	120	0.26	13	20
75	156504	73	146	0.39	13	20
100	156644	87	185	0.42	17	20
125	156785	98	210	0.70	17	20
150	156897	98	230	0.90	17	20
200	157008	122	310	1.00	17	20
250	157092	122	360	1.80	19	30
300	157155	122	420	2.10	19	30

*Product to be used to face of accidental water pressure of the network
** Dimension of internal hexagonal hole or size of allen key required

See page 80 for installation instructions

All dimensions are in mm and nominal weights in kg

Ductile iron couplings with built-in electrical continuity



DN	Product code	A	B	C	Weight
Two-piece Ductile Iron Coupling					
50	156398	113	79	58	0.60
70	156493	129	103	58	0.60
100	156634	170	137	58	0.80
125	156777	188	158	58	0.90
150*	156888	217	183	80	1.70
200*	156998	278	243	82	3.50
250*	175552	343	308	82	4.40
300*	175510	395	360	82	5.40

*150-300mm incorporates 4 socket bolts.

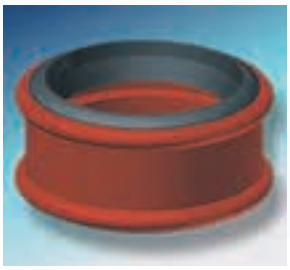
Patent No. 2 305 481

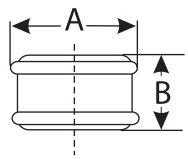
NBR gaskets will be considered on request, on a quotational basis.

See page 80 for installation instructions

All dimensions are in mm and nominal weights in kg

ENSIGN® – Push Fit Joints (PFJ)

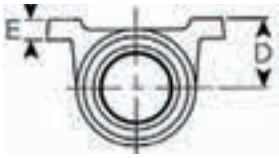


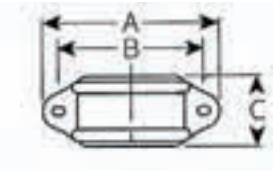


DN	Product code	A	B	Weight
Joint – Plain no ears				
50	Consult us	99	73	0.90
70	Consult us	120	73	1.20
100	Consult us	152	73	1.80
150	Consult us	205	95	2.80

Registered Design
No. 2 083 167

DN	Product code	A	B	C	D	E	Weight
Joint – with fixing ears							
50	Consult us	146	114	73	62	20	1.40
70	Consult us	178	146	73	71	20	1.90
100	Consult us	213	181	73	90	20	2.60
150	Consult us	273	235	95	115	20	3.60





See page 81 for installation instructions

All dimensions are in mm and nominal weights in kg

PAM-GLOBAL® RAPID-INOX couplings (below ground)

See page 66

PAM-GLOBAL® CE couplings (below ground)

See page 68

SMU-S and SMU-S AUTOGRIP couplings (below ground)

See page 69

Stainless steel SMU RAPID® 2 couplings (below ground)

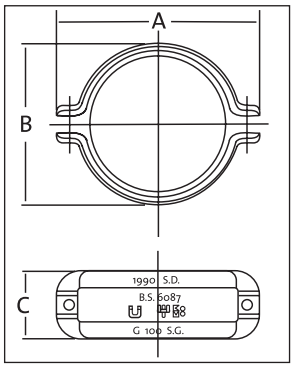
See page 70

Stainless steel collars – ISO 6594 (below ground)

DN	Product code*	L	Ø Drawn Diameter	Weight
100	155120	92	150	0.31
125	155123	108	175	0.47
150	155125	108	195	0.54
200	155132	139	270	1.23
250	155138	139	330	1.65
300	155139	139	381	1.87

Use: when installation of PAM-SMU® Plus pipes below ground

Two-piece ductile iron couplings (Grey – ED001 - below ground)

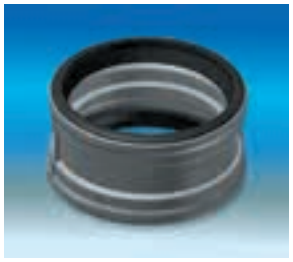


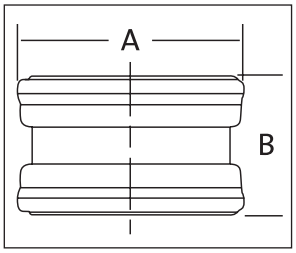
DN	Product code	A	B	C	Weight
100	155369	170	137	58	0.80
150*	155433	217	183	80	1.70
200*	155462	278	243	82	3.50
250*	175591	343	308	82	4.40
300*	175592	395	360	82	5.40

*150-300 mm incorporates 4 socket bolts.
See page 80 for installation instructions

NBR gaskets will be considered on request, on a quotational basis.

Push fit sockets (Grey - ED004 - below ground)



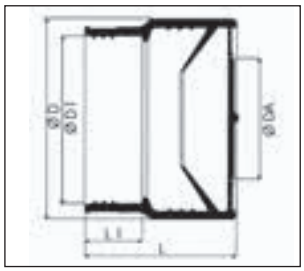


DN	Product code	A	B	Weight
100	175622	140	90	1.20
150	175623	195	95	2.20

On these two pages, all dimensions are in mm and nominal weights in kg

PAM-GLOBAL® KONFIX – For transition connections

DN	Product code	D1	D	Ø Da Connecting pipe mm	L1	L	Insert depth mm	Weight
50	155759	57	72	40-56	20	58	35	0.11
70	155790	77	92	56-75	22	66.5	40	0.16
100	155833	108	126	102-110	27.5	89.5	57	0.30
125	155883	132	151	125	35.5	108.5	65	0.65

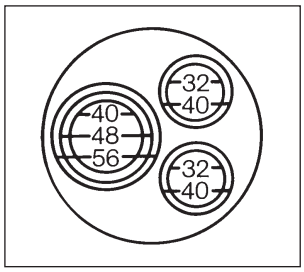


The new PAM-GLOBAL® KONFIX transition connectors DN 50-125. Transitions from connecting pipelines or drain connections made of foreign materials – be they steel or plastic – to PAM-GLOBAL® pipelines are made easier and more secure. KONFIX connections only have one cut-out in the lid, now on the inside, and with an additional connecting lip. Material: EPDM. Spiral-thread clamp made of chrome steel. Material No. 1.4016.

See page 84 for installation

PAM-GLOBAL® KONFIX-MULTI – For transition connections

DN	Product code	D1	D	Ø Da Connecting pipe mm	L1	L	Insert depth mm	Weight
100	176811	108	134	32-56	35.5	90.5	40	0.30

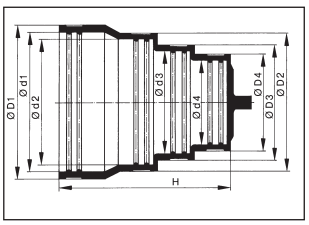


KONFIX-MULTI connector for the connection of up to 3 individual connecting pipes, 32-56 mm diameter, made of foreign materials to PAM-GLOBAL® pipes, DM 100, material: EPDM. Spiral-thread clamp made of chrome steel. Material No. 1.4016.

See page 84 for installation

PAM-GLOBAL® MULTIQUICK – For transition connections

DN	Product	ØD1	ØD2	ØD3	ØD4	Ød1	Ød2	Ød3	Ød4	H	Weight
100 x 70	176812	117	111	101	81	108	104	94	74	107	0.15



The MULTIQUICK connector DN 100 x 70 to connect foreign materials with an outside diameter of 72-110 mm to PAM-GLOBAL® DN 100 GA or LNA with a maximum outside diameter of 115 mm. Material: EPDM. Spiral-thread clamp made of chrome steel. Material No. 1.4016.

See page 84 for installation

All dimensions are in mm and nominal weights in kg

Connectors

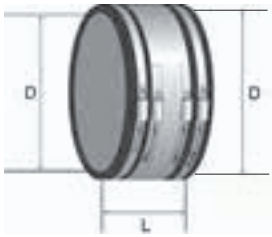
Stepping rings for jointing to other pipe material

Use with a PAM-SMU® RAPID

DN	Product code	id*	Weight
50	156399	50	0.02
75	156495	63	0.06
75	156494	77	0.03
100	156555	91	0.10
100	156635	100	0.05
125	156778	125	0.06
200	157000	200	0.15
250	157085	250	0.45

*external diameter of the other materials

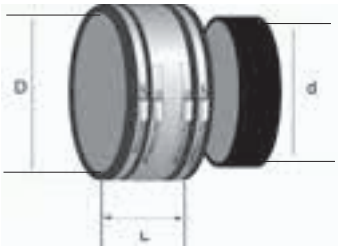
Flexible couplings



DN	Product code	D mini*	D maxi*	L	Weight
75	155001	75	90	100	0.40
100	155002	100	115	100	0.70
100	TXB10NP01	110	121	120	0.70
125	TXB12NL0G	130	150	120	1.00
150	TXB15NM0J	150	175	120	1.00
200	TXB20NL0K	200	225	150	1.50

*mini/maxi external diameters of pipes to be connected

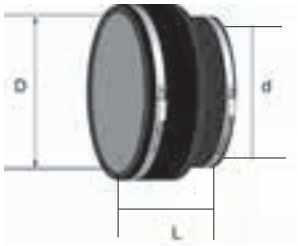
Flexible coupling and stepping ring



DN	Product code	D mini*	D maxi*	d mini*	d maxi*	L	Weight
200	TXB20NN0K	200	225	192	201	150	1.90

*mini/maxi external diameters of pipes to be connected

Flexible and stepping couplings



DN	Product code	D mini*	D maxi*	d mini*	d maxi*	L	Weight
150	155003	155	170	130	145	120	0.80
200	155004	170	193	210	235	150	1.50

*mini/maxi external diameters of pipes to be connected

EPDM plugs: possible pipe traps

Universal plugs 1 or 2 inlets

DN 50

DN 75

DN 100

Universal plug 3 inlets

DN 100

DN	Product code	1st aperture Ø in mm	2nd aperture Ø in mm	3rd aperture Ø in mm	Weight
	with stainless steel collar				
50	156394	32 or 40			0.10
75	156492	32 or 40 or 42 or 50			0.18
100	156628	32 or 40	32		0.29

		without stainless steel collar			Weight
100	156629	32 or 40 or 42	32 or 40 or 40 or 50	32 or 40 or 42 or 50 or 54	0.36

All dimensions are in mm and nominal weights in kg

PAM-GLOBAL® S
PAM-SMU® S

Installation instructions

PAM-GLOBAL® RAPID coupling

1. Push the supplied complete connector on to the pipe end right up to the middle spacing ring of the seal

2. Push the next pipe end from the other end into the connector

3. Firmly tighten the hexagon socket screw with a socket spanner, hand ratchet or impact screwdriver, if possible to the point where the two clamping jaws come together

PAM-GLOBAL® REKORD grip collar

The two clamp halves must encircle the pipe ends uniformly. Consequently, first screw the two clamp halves loosely together. Ensure that the claw tips of the securing clamp are not seated on the plate sheath of the sealing clamp. Tighten the screws crosswise alternatively so that the closing parts are pulled together in parallel, if possible with the same spacing. Ensure that the sealing areas (pointed ends, pipes and formed parts) are perfectly clean (remove paint runs).

Warning!
Ensure that the tightening torques (see table) are observed with all four screws, even if the closing parts are already in contact with each other at a low tightening torque. Use a dynometric key for final tightening.

DN	MD (Nm) Tightening torque	Pressure in bar
40	12-15	to 10
50	12-15	to 10
70	12-15	to 10
100	25-30	to 10
125	30-35	to 5
150	30-35	to 5
200	60-65	to 3

PAM-GLOBAL® UNIVERSAL grip collar

The PAM-GLOBAL® UNIVERSAL grip collar must enclose the cast iron pipe symmetrically.

For this reason:

- Screw the clamp loosely together and take care that the safety clamp tips do not catch on the coupling clamp sleeve (1-2-3).
- Tighten the screws in alternation in a crosswise direction with an Allen key so that the locking parts are parallel and assembled at the most equal distance possible (4-5).
- Assembly is complete when gap is nul (6).

PAM-GLOBAL® CV and CE couplings

The connector consists of two parts: the clamping sleeve made of stainless steel and an elastic sealing collar made of EPDM – a grade of rubber that is resistant to ageing and boiling water Installing is simple, fast and safe.
Tools: Screwdriver, socket spanner, ratchet or electric impact screwdriver

1. Push the supplied complete connector on to the pipe end right up to the middle spacing ring of the seal

2. Turn over the open half of the sealing collar

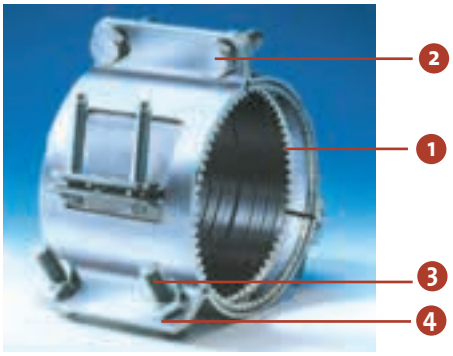
3. Install the next pipe or formed part flush with the spacing ring and fold back the turned over half of the collar

4. Place the clamping sleeve around the collar

5. Alternatively tighten the two clamping screws uniformly and hand tight. The guiding and threaded plates of the clamp must come together parallel to avoid any deformations

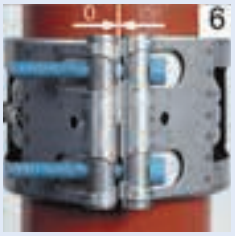
PAM-GLOBAL® CV grip collar

The claw segments must encircle the pipe ends uniformly. Consequently, first screw the two clamp segments loosely together. Ensure that the claw tips of the securing clamp are not seated on the plate sheath of the sealing clamp. Tighten the screws crosswise alternatively so that the closing parts are pulled together in parallel, if possible with the same spacing. The tightening torque is 25-30 Nm. Ensure that the supplied washers are placed under the clamping heads and nuts.



1	Outer sheath made of St 3K40 with hardened claw inserts	DN 50-70 Segments: 2 x 180°	DN 100-200 Segments: 3 x 120°	DN 250-300 Segments: 3 x 120°
2	Hexagon screws	4 pcs M8	6 pcs M10	6 pcs M12
3	Hexagon nuts	4 pcs M8	6 pcs M10	6 pcs M12
4	Washers	8 pcs	12 pcs	12 pcs
	Screw tightening torque Md	10-12 Nm	DN 100-150 18-20 Nm DN 200 25-30 Nm	55-60 Nm

All parts are electrogalvanized



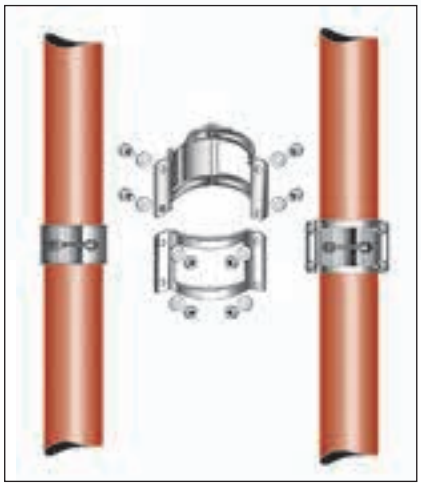
PAM-SMU® S
PAM-ENSIGN® S

Installation instructions

PAM-SMU RAPID Grip collar

Grip Gollar is placed on the SMU® RAPID couplings or the expansion plug

- to cover the PAM-SMU® RAPID couplings or the expansion plug with the grip collar
- to position the last segment and insert hexagon bolt
- to grip gradually while clamping



Mounting on the SMU® RAPID couplings

PAM-ENSIGN Ductile iron Coupling

Couplings are supplied **pre-assembled**. In certain applications, it can be beneficial to apply a small amount of lubricant (i.e. ENSIGN EC Lube or similar) on the lip of the rubber gasket to ease its positioning.

1. Slacken bolts on coupling to fullest extent, removing the bolt(s) from one side to ease asembly and remove rubber gasket.
2. Place the rubber gasket over the end of the pipe or fitting, ensuring the central register is abutted against the spigot edge.
3. Push the second pipe or fitting into the gasket again ensuring that the spigot is abbutted against the central register.
4. Loosely assemble the coupling around around the gasket.
5. Check alignment of assembly before tightening the bolts. Coupling bolts on all sizes are M8 and require special allen socket adaptor EF 100.

PFJ coupling

1. Apply a small amount of lubricant (ie ENSIGN EC Lube or similar) on the lip of the rubber gaskets, both ends, to ease insertion of pipe/fittings.

2. Push joint over the end of pipe/fitting, ensuring the central register is abutted against the spigot edge evently. If the joint ist eared, fix to wall using anti-corrosion coach screws or similar.

3. Push the second pipe or fitting into the gasket again ensuring that the spigot is abutted against the central register.

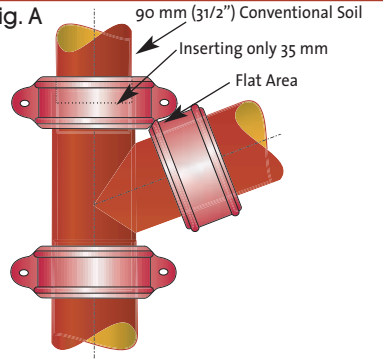
Joints eared/plain can be fitted to most fittings within the ENSIGN 50, 70, 100 and 150 mm diameter ranges

Three joints used on branches can be very close fitting, in some cases they virtually touch. To accommodate this, the plain joint is designed with a flat area which should be lined up with the adjoining socket, to give maximum clearance (see fig. A).

Generally when plain sockets are used, ensure flat area is positioned at the rear of the pipe (nearest the wall) away from view.

Existing Systems
If breaking into an existing ENSIGN system, a slip joint should be ordered which is designed with a reduced central register. The joint is made by slipping the whole socket onto the pipe, positioning the new fitting then sliding the socket into the desired position (in similar fashion to the ENSIGN coupling example on).

Fig. A



Connection to Conventional Soil
Ensign can connect directly to 90 mm (3 fi") conventional soil by inserting a traditional gasket into the PFJ coupling, replacing one of the standard gaskets. (Contact Marketing Department) Lubricate the spigot of the 90 mm pipe, and push coupling over the pipe insert-ing 35 mm only (see fig. A). Ensure the 90 mm pipe is securely fixed to prevent slipping into new pipework.

Note: Bolts should be tightened until a suitable resistance is achieved (min 20 Nm)

PAM-ENSIGN® S Tools

A ENSIGN EC Lube (1 litre bottle)

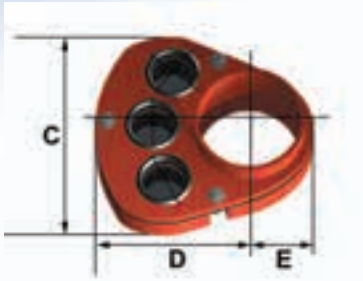
B fi" Square-drive
Ratched Spanner (use with C and E)
For use with nuts on fixing brackets and on acess door fittings and also with new two-piece coupling.

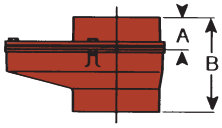
C 13 mm A/F fi" Square-drive
Deep Socket (use with ratchet B)
For use with nuts on fixing brackets and on acess door fittings

D 13 mm A/F 'T' Box Spanner
For use with nuts on fixing brackets and on acess door fittings

E Allen Socket Adaptor (use with racket B)
For use with nuts on fixing brackets and on acess door fittings

Multi Manifold





Replacement Plugs can be supplied on request

DN	Product code	A	B	C	D	E	Weight
Manifold Connector – EF094							
100	175626	43	125	200	142	62	3.20
150	175629	70	165	290	184	81	6.10

3 Rubber Plugs to accommodate 38/32 mm dia. waste.
Suitable for push-fit connection to plastic/copper waste.

150 mm diameter to be introduced later in 2001. (Contact Marketing Department for availability)

The Multi-waste manifold simplifies waste plumbing by grouping all associated pipework from various sources such as sinks, basins, bidets, urinals and showers to one internal point above the finished floor level.

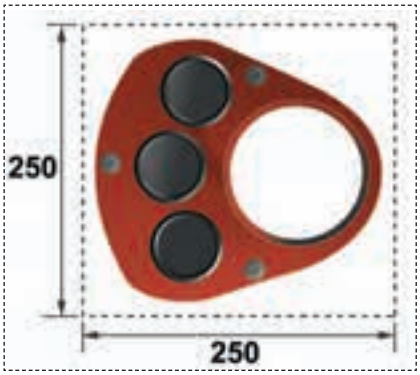
The manifold will permit the connection of three 32/38 mm copper/plastic waste inlets to any new or existing 100 mm diameter, PAM-ENSIGN®S pipe stack.

The manifold main body is connected to the stack using standard coupling EC002. To achieve a 32 mm waste connection, remove the inner rubber ring, 38 mm utilising the outer ring (for waste pipe maximum lengths see BS EN 12056-2).

Pipework connecting discharge appliances to SVP manifold, should be designed not to cause self siphonage.

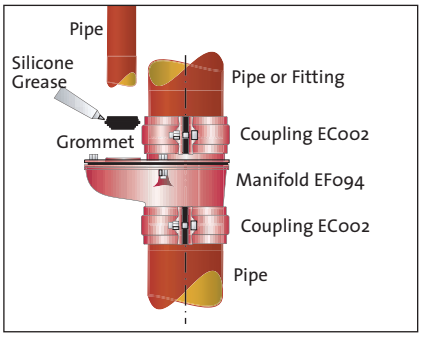
150 mm diameter to be introduced later in 2001. (Contact Marketing Department for availability).

Minimum space required to fit manifold into a hole precaste in concrete slab



Fixing instructions

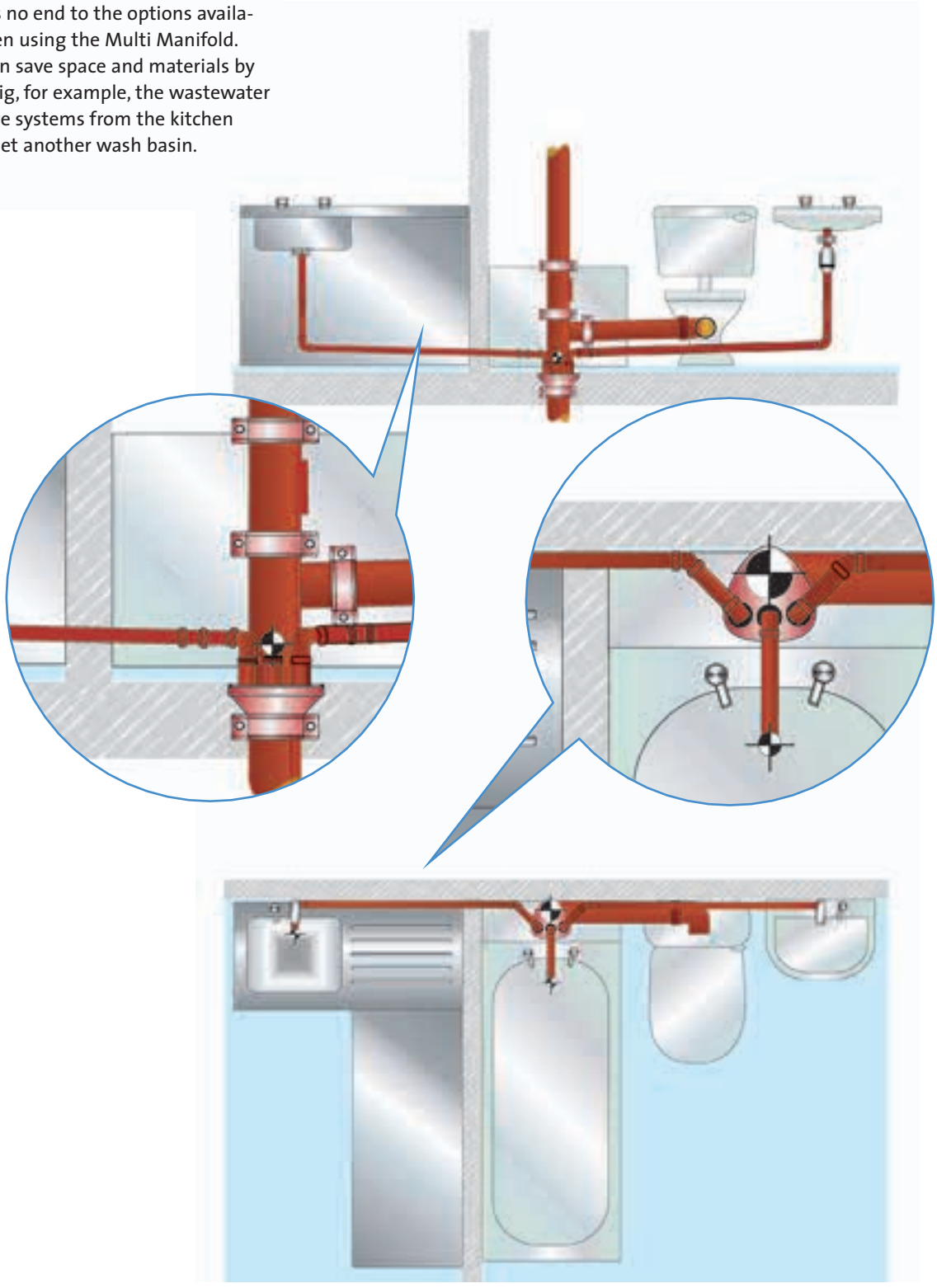
- 1. Remove grommets, piece the appropriate groove for 32 mm or 38 mm waste connections and tear out centre disc where required.
- 2. Apply an appropriate silicon grease (not provided) to the outside of the grommet and re-fit into manifold ensuring that the retaining grooves of the grommet is located correctly in the casing.
- 3. Lubricate pipe ends and insert into grommets with a rotational movement. Pipe ends may be chamfered for ease of insertion.



All dimensions are in mm and nominal weights in kg

Typical Manifold Application

There is no end to the options available when using the Multi Manifold. They can save space and materials by combinig, for example, the wastewater drainage systems from the kitchen and toilet another wash basin.



PAM-GLOBAL® S
PAM-SMU® S
PAM-ENSIGN® S

Installation instructions

PAM-GLOBAL® KONFIX and KONFIX-MULTI

KONFIX connectors are used to connect pipes or drain connections made of foreign material (steel or plastic) to PAM-GLOBAL® pipes. The DN 100 and DN 125 connectors are also used for the connection of plastic roof gutter down-pipes.

1. Push the KONFIX collar with a loose clamping tape onto the PAM-GLOBAL® pipe until the stop point is reached. Then secure to the pipe with the clamping tape.

2. Cut the prescored head side of the KONFIX with a knife and remove the lid.
WARNING: Do not cut too deep so as not to damage the sealing lip!

3. Mark the insert depth on the connecting pipe. Apply a lubricant and push in. Finished!

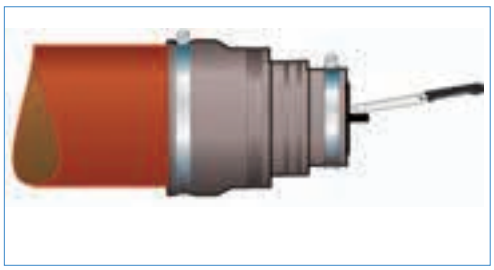
4. The steel pipe adaptor illustrated here only serves as an example. The KONFIX connector can be used to connect all drain pipes made of all materials to the PAM-GLOBAL® pipe.

PAM-GLOBAL® MULTIQUICK Connector

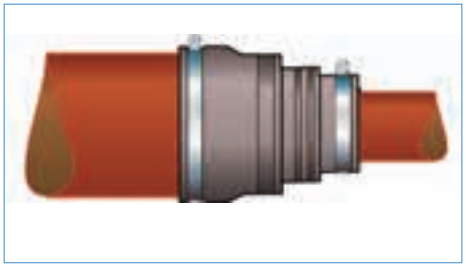
Connecting possibilities:
PAM-GLOBAL® pipes with an outside diameter of 109-112 mm (tolerance range PAM-GLOBAL® pipes DN 100) with shape-stable foreign materials with an outside diameter of 110-72 mm.

PAM-GLOBAL® pipes with an outside diameter of 109-112 mm to LNA and GA pipes with an outside diameter of up to maximum 115 mm. The connection is established with two spiral-thread clamps that are both suitable for larger diameter tolerances

The open end of the MULTIQUICK connection is pushed over the pipe end and the spiral-thread clamp is positioned in the envisaged recess where it is then tightened.



Then use a knife to cut open the closed side and shorten the connection to the corresponding outside diameter of the connecting pipe. The connection is shortened to the required diameter in front of the stepping.
Then push the second spiral-thread clamp over the connecting pipe.



Push the connecting pipe into the MULTIQUICK connection and tighten the spiral-thread clamp in the envisaged position. Ensure that the sealing zone (pointed ends of the pipes and shaped parts) is in a perfectly clean state. Remove paint runs and cement residues. The spiral-thread clamps should only be tightened manually with a screwdriver in order to avoid damage to the MULTIQUICK connection.

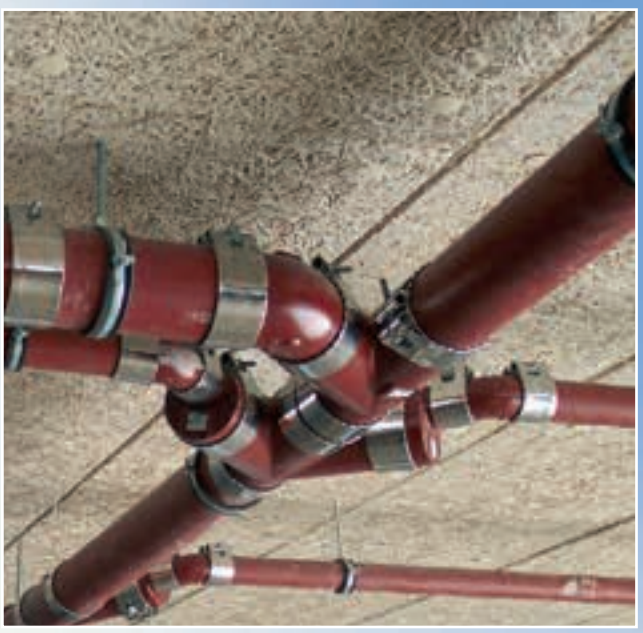
PAM-GLOBAL®
PAM-SMU®
PAM-ENSIGN®

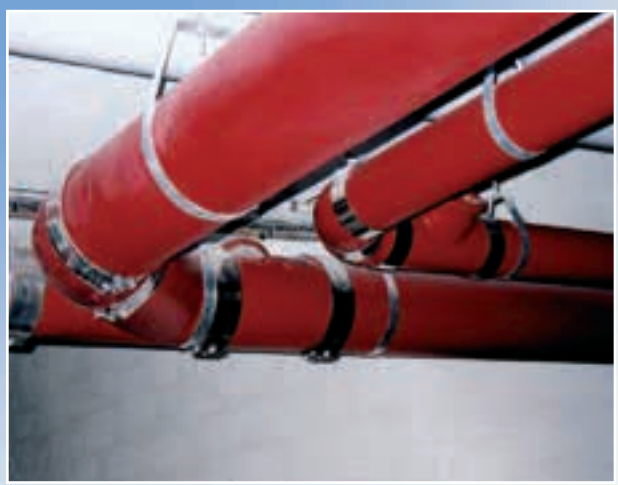
Quality System For Buildings, Industry and Bridges

COMPLETE BRACKETING SYSTEM PROGRAMME – Galvanised Zinc and Stainless Steel

PAM-GLOBAL® has gained a sound reputation in the field of pipelines with its adjustable, corrosion-protected fastening elements in the very highest standard of quality and that are free of all welding. Used not only for buildings but also in industry (laying pipelines) and transport (bridge draining).

The range of standardised, type-coded components covers all forms of pipeline installation on floors, walls or ceilings.

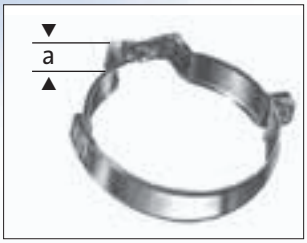




PAM-GLOBAL® S
PAM-SMU® S

STEEL BRACKETS

Downpipe collars "802"



– in galvanised sheet steel
– one lug to facilitate installation

a= distance between pipe generator and wall : 20 mm

DN	Product code	Weight
50	156411	0.08
75	156508	0.10
100	156649	0.14
125	156788	0.16
150	156901	0.19

Suspension hooks "101"

– Aluminium AS 13
– corrosion-free

the said 'corbel'

DN	Product code	Weight
50	156409	0.04
75	156506	0.06
100	156647	0.09
125	156786	0.13
150	156899	0.18
200	157009	0.40
250	157093	0.60
300	157156	0.80

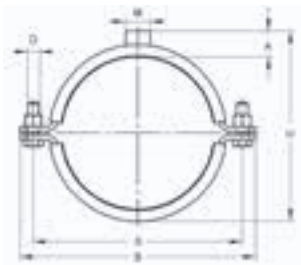
Suspension hooks "401"

– in galvanised sheet steel
– quick fitting with bolt and threaded rod

the said 'pear'

DN	Product code	Weight
50	156410	0.10
75	156507	0.13
100	156648	0.19
125	156787	0.22
150	156900	0.25
200	157010	0.64
250	157094	0.70
300	157157	0.70

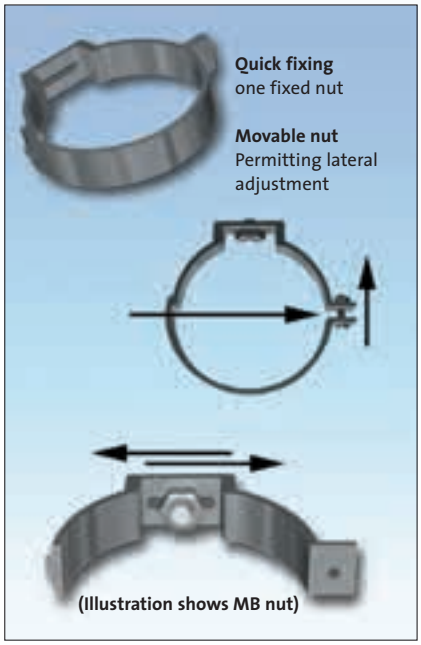
Collar with acoustic insulation



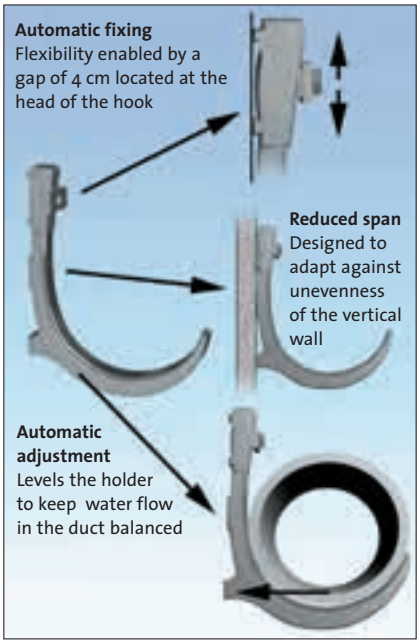
DN	Product code	H	A	B	S	D	Weight	Maximum load	M
50	173628	84-88	24	108	-	-	0.137	160	M6x25
75	173629	113-118	25	136	-	-	0.247	160	M6x30
100	173630	137-141	25	158	-	-	2.290	230	M6x30
125	173641	137-141	29	192	-	-	0.482	230	M6x35
150	173642	193-347	29	219	-	-	0.554	290	M6x45
200	173643	250-256	31	292	262	13	1.162	340	M6x40
250	173644	316-347	31	356	326	13	1.424	340	M6x40
300	173645	362	27	410	376	13	2.930	1200	M6x40

All dimensions are in mm and nominal weights and loads in kg

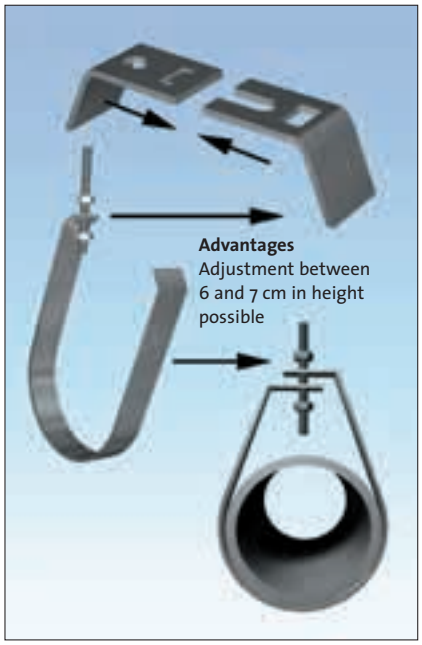
Collar “802”



Hook “101”

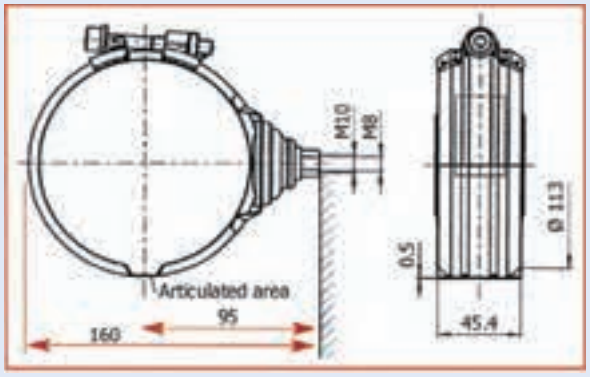


Collar “401”



PAM GLOBAL® SE

Pipe brackets DN 100 with hinged clamp - Product code 156645



Installation is the same as with a conventional pipe clamp by way of a M8 or M10 threaded nipple. The clamp is folded open, the pipe inserted, the locking screw hooked in and finally tightened on the block.
(See also p.18)

Weight : 0.210 kg

PAM GLOBAL® SE
Sound decoupling system

Contrary to conventional pipe clamps where sound is dampened by a rubber insert, the **PAM-GLOBAL® SE** Clamp features a vibration system to decouple the sound. This is achieved with a

Highest sound-proofing values independent of the torque

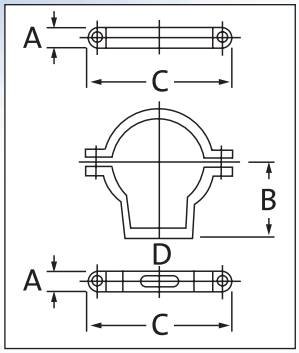
rubber-metal element that has been specifically adapted to the cast material. The effectiveness of sound decoupling is independent of how firm the locking screw has been tightened.

All dimensions are in mm and nominal weights in kg

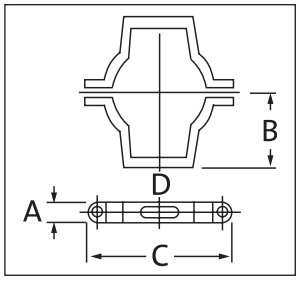
PAM-ENSIGN® S

Above ground applications

Ductile iron brackets



DN	Product code	A	B	C	Weight
Ductile Iron Bracket					
50	156408	27	64	110	0.30
70	156505	27	74	132	0.50
100	156646	27	90	166	0.60
150	156898	30	115	214	0.80
200	177745	35	150	266	1.60



Elongated slot at fixing point (D) to ease fixing

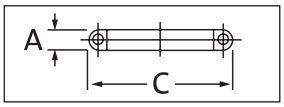
DN	Product code	A	B	C	Weight
Ductile Iron Bracket					
100	177744	27	90	166	0.80

Elongated slot at fixing point (D) to ease fixing

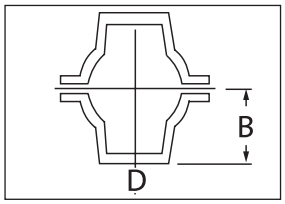
PAM-ENSIGN® Plus

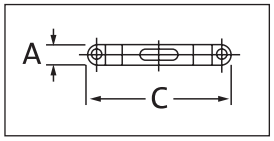
Below ground applications

Ductile iron bracket (Grey – ED048)



DN	Product code	A	B	C	Weight
100	175593	27	90	166	0.60
150	175594	30	115	214	0.80
200	177743	35	150	266	1.60





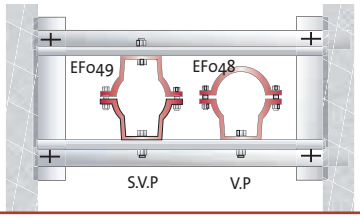
All dimensions are in mm and nominal weights in kg

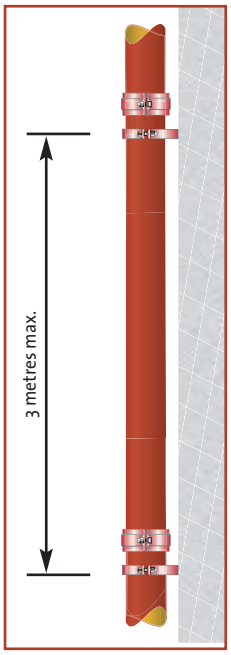
Pipe Support Brackets

The unique, all-purpose, lightweight, ductile iron bracket incorporates an elongated slot at the fixing point. This allows both vertical and lateral adjustment without dismantling the pipe system.

Additional brackets may be required where fittings are installed within the vertical stack at the discretion of the designer.

Typical support arrangement for vertical pipework





Support for vertical pipework

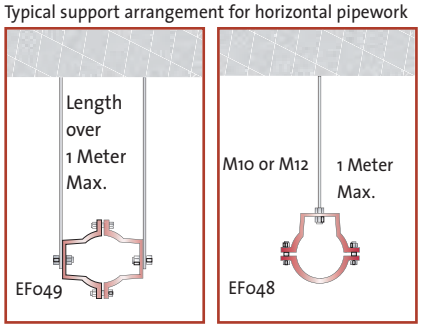
For vertical waste or rainwater stacks, it is recommended that a load-bearing bracket be fitted to each floor level, to carry the weight of the pipe and its contents. This is of particular importance on multi-storey applications.
These brackets should be tightened as the stack is built up, so that each floor heights is self-supporting and undue pressure is not imposed upon the base of the stack.
Where rainwater and soil stacks are located at standard distance from wall or column (see table below), one bracket per length of pipe will be adequate within 600 mm of the joint.

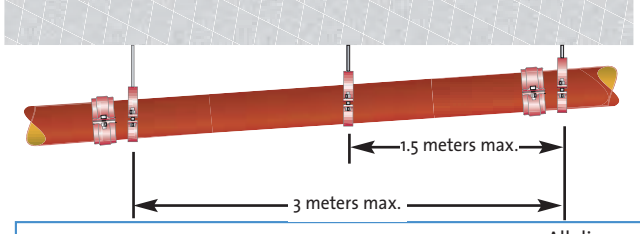
Ensign Pipe Diameters	Stand distances from back of pipe wall face
50, 70	32 mm
100, 150, 200	38 mm

Support for low gradient pipework

The distance between pipe suppports should not exceed 3 metres, as advised in BS EN 12056 Code of Practice for Sanitary Pipework.
However, it is recommended that suspended ENSIGN pipework should have two bracket supports per 3 metre length.
Positioning of brackets as follows:
1 bracket maximum of 300 mm from joint, 2nd bracket positioned approx. centre of 3 m length pipe, or as further guidance, 1.5m approx. from first bracket (see diagram).
BBA standard guidelines depict maximum spacing of brackets not to exceed 2 metres (refer to the Agreement Certificate), with further brackets necessary adjacent to any fittings which are installed.

Typical support arrangement for horizontal pipework





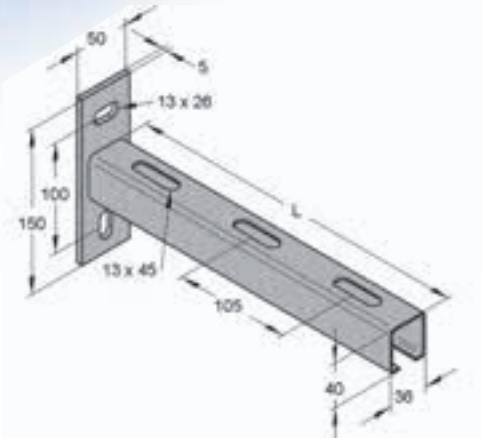
Bracket diameter	50	70	100	125	150	200	250	300
Threated rods (Recommended)	M10	M10	M10	M12	M12	M12	M16	M16

*Max. recommended length of threaded rod is 1 metre for single drop EF048, two drops recommended over 1 metre EF049 type bracket. Lateral movement brace may be required for horizontal pipework at 6 m spacing.

All dimensions are in mm

PAM-GLOBAL® S
PAM-SMU® S
PAM-ENSIGN® S

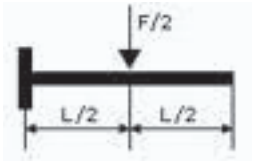
Cantalever Arm 36/40/2 - DN 50 to 150- galvanised steel



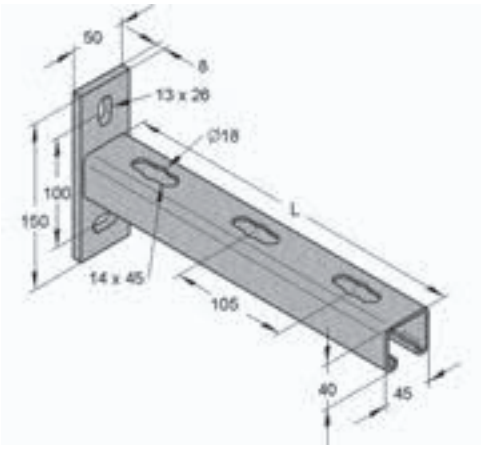
DN	Product Codes	L	F*	Weight
50	173646	210	260	0.60
75	173646	210	260	0.60
100	173647	315	260	0.85
125	173647	315	260	0.85
150	173647	315	260	0.85

(*) F : maximum load for 2 arms,
when applied at mid-lenght of the arm (L/2)

On each arm :



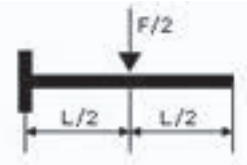
Cantalever Arm 45/40/3 - DN 200 to 300- galvanised steel



DN	Product Codes	L	F*	Weight
200	173648	315	680	1.40
215	173649	525	680	2.10
300	173649	525	680	2.10

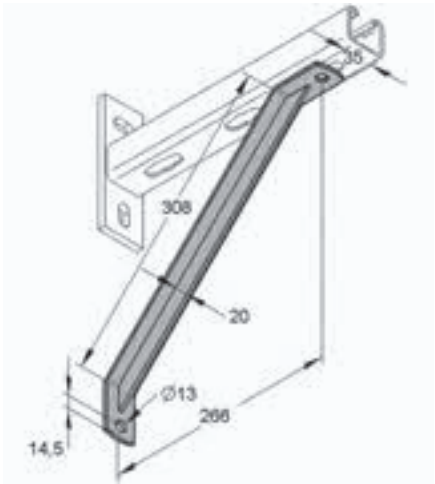
(*) F : maximum load for 2 arms,
when applied at mid-lenght of the arm (L/2)

On each arm :



Cantalever Arm 45/40/3 - galvanised steel

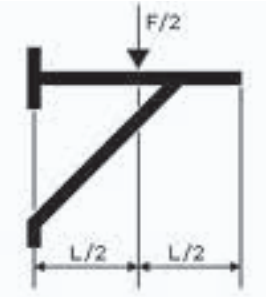
Warning : to be used only with the 525 mm length Cantalever Arm which should be fixed upside down as shown on the figure just below. When bolt, the angle with the Arm is 45°.



Product Codes	F*	Weight
173650	800	0.70

(*) F : maximum load for 2 arms,
when applied at mid-lenght of the arm (L/2)

On each arm :



All dimensions are in mm and nominal weights and loads in kg

SAINT-GOBAIN
CANALISATION

EPAMS®

Syphonic Cast Iron Rainwater Drainage System

EPAMS®

Syphonic Cast Iron Rainwater Drainage System

EPAMS® HDE High-Capacity Roof Drainage System Description

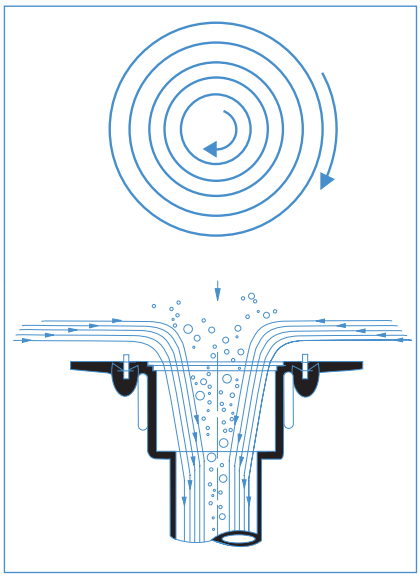
The EPAMS HDE high-capacity pressure-flow roof drainage system was developed approximately 30 years ago in Scandinavia. It is mainly used for draining roofs with large surface areas, such as factories, storage facilities, shopping centres, as well as buildings used for sport, leisure, transportation and administration. The EPAMS HDE system is a technically mature development in roof drainage. It complies with the new VDI 3806 directive.
Meanwhile, pressure-flow roof drainage systems, laid within the PAM-GLOBAL® S pipe system, are being used by thousands in Germany.

The EPAMS HDE roof drainage system has been taken into account by Part 1 since 1988 and Part 2 since 1995.
In traditional rain drainage systems, after the rain falls to the roof, it flows to the roof outlet or gutter via partially-filled drainage pipes.

Inside buildings, the maximum fill factor in rain water pipes is 0.7 (h/d = 0.7) according to EN 12056. This fill factor means that traditional rain drainage systems must have adequate pipe ventilation. I.e., a DN 100 drainage pipe burdened with 50 l/min requires approximately 35 times that volume of air for an open channel (according to EN 12056).

Traditional flat roof outlets form water eddies and cones of air. The undesired air infeed is affected by the Coriolis force (eddy forming) and also depends on the atmospheric pressure, gravity and the Earth's rotation.

The air in the middle of the outlet is sucked in through the eddies. This lowers the outlet's capacity level.



Conventional System

In contrast to open channel drainage (according to EN 12056), pressure-flow roof drainage pipes systematically operate at the designed rain yield factor. When the pipe system has reached maximum capacity, the geodetic pressure head between the roof outlet and the transition pipe is used in open channel drainage in order to overcome flow loss. This is why smaller dimensions are required than in open channel drainage systems.

The pipes can be laid without gradients under the roof construction due to the typical operating conditions of these systems.

There is no need for a wide-spread branched pipe network.

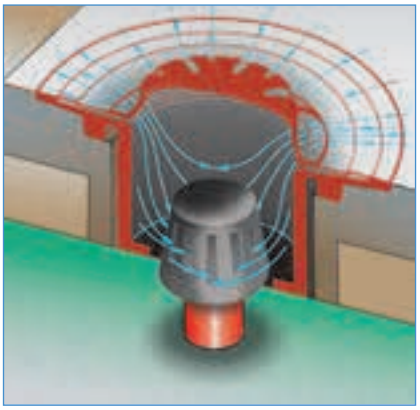
As a rule, our EPAMS HDE High-Capacity Roof Drainage System, with all of its benefits and advantages, offers extremely economical solutions.

However, the pipes can only reach maximum capacity using specially designed roof or channel outlets, which prevent air infeed into the pipe when the calculated volume of rainwater has been reached.

With the EPAMS system, an air screen is placed in the body of the outlet, which is sealed at the top. This prevents air from flowing (air cone build-up) into the pipes when the calculated rain volume has been reached.

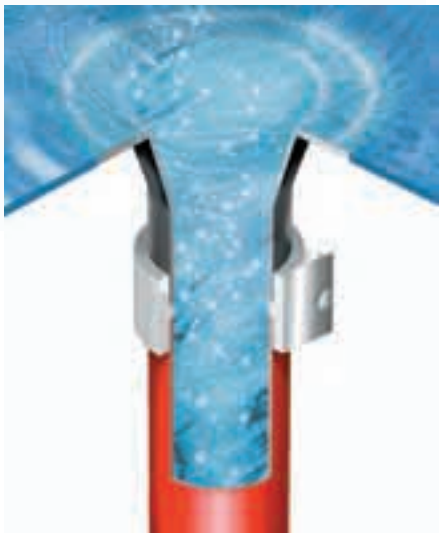
The applicable regulation for the calculation of pipe sections for rainwater drainage is EN 12056. However, the pressure-flow method as a possibility for roof drainage is merely mentioned here. Further details on the design and construction of such drainage systems are not provided. This is why the VDI Gesellschaft Technische Gebäudeausrüstung compiled the VDI 3806 directive, which has universal validity. This directive sets out guidelines for planning, calculation and construction, while the corresponding system components of individual manufacturers have fundamental distinctions with regards to assembly and mounting directives.

The function of the air screen in the PAM-GLOBAL® EPAMS HDE outlet



For further information, please see our brochures and internet sites.

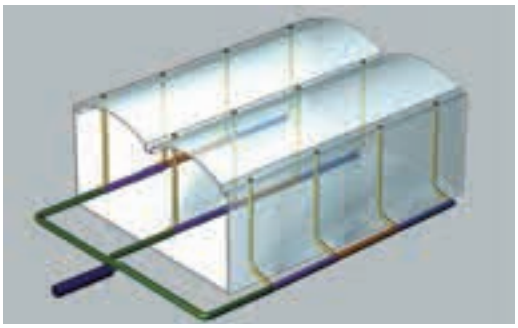
The Science



Example:
Conventional System

In conventional systems

The presence of air in the pipe (approximately 35 litres of air to 1 litre of water in a 100mm diameter pipe) is the fundamental principle of all gravity drainage. The inlet of water in the roof outlet produces a vortex of air (i.e. whirlwind effect). Due to regulations for installation and flow rate calculations the above and below ground (collectors) pipe systems for large roofs areas are often numerous and this can impose both technical and economic constraints.

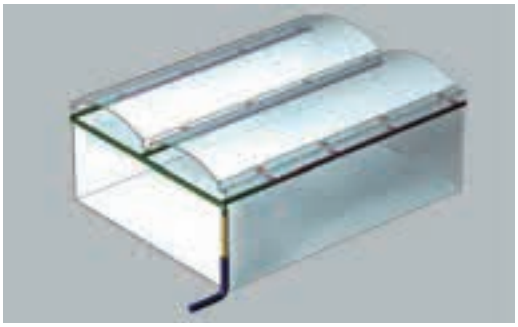


Example:
EPAMS System

In an EPAMS cast iron syphonic rainwater drainage system

During its design and installation the EPAMS system applies the Bernoulli theory which governs the variations in water pressure during its flow between two points within the system (high and low). By virtue of the dynamics of the rainwater flow the mechanical energy produced is absorbed within the system.

Air is prevented from entering the system by means of a special roof outlet that is equipped with an anti-vortex mechanism thus creating a negative pressure and consequent suction effect allowing the pipes to run completely full.



Therefore at an equivalent flow rate and for an identical roof surface area, the diameters and number of downpipes are reduced and horizontal pipes no longer need to be installed with a gradient to facilitate flow.

EPAMS®

With the EPAMS system our technical experts design, dimension and create rainwater systems that work under negative pressure and use the pipe's "full" capacity in the flow rate calculations. SAINT-GOBAIN PAM employ an advanced computer programme, developed and successfully used for more than 10 years in Germany where around 3 million square metres of roof space have been equipped cast iron with syphonic rainwater drainage.

A detailed study

In collaboration with the consultant an EPAMS technical study is compiled by SAINT-GOBAIN PAM for each project containing the following information:

- Surface area, isometrics of the building
- Nature of support structure
- Roofing material envisaged
- Maximum rainfall intensity

These important elements enable SAINT-GOBAIN PAM to then determine

- The number of roof outlets
- The diamter of the EPAMS pipe system
- The positive and negative pressures within the EPAMS system

The EPAMS computer programme accurately calculates the requirements, giving the optimum EPAMS solution. Upon completion the EPAMS technical study is forwarded to the consultant and the installer.

Installation Control

SAINT-GOBAIN PAM uses an external control body to verify the conformitiy of the installation to the recommendations and instructions established in the EPAMS technical study.

Syphonic Cast Iron Rainwater Drainage System

The EPAMS HDE Flat Roof Outlet Program SAINT-GOBAIN CANALISATION complies with EN 1253
The EPAMS system has in France a Technical Assessment 14+5/01-656 with an Addendum *01 Add

EPAMS outlets to be welded

EPAMS outlets to be welded

- Stainless steel body, including M10 bolts
- Aluminium grating

Application field:
This roof outlet is especially designed to be welded (or brazed) in gutters or in metal roof valleys

DN	Product code	DE mm	Weight kg	Capacity l/s	Surface Drainage m²
50	171283	58	5.4	13	260
75	171284	83	5.7	23	460
100	171285	110	6.4	26	520
125	172850	135	8.3	26*	520

* The advantage of the DN 125 outlet is in the « gutters » application where the water cover height can exceed the 55 mm figure (see French Technical Assessment 14+5/01-656 – Assessment § 2.21)
This outlet is the basis for the three next outlets, on which are grafted various elements depending on the application field

See page 97 for main dimensions

EPAMS outlets with flange

EPAMS outlets with flange

- Stainless steel body, including M10 bolts
- Aluminium grating
- Aluminium flange

Application field:
This roof outlet can be used for roofs containing extra-thick metal gutters or valleys as well as for roofs waterproofed by synthetic or bituminous membranes

DN	Product code	DE mm	Weight kg	Capacity l/s	Surface Drainage m²
50	171288	58	6.2	13	260
75	171289	83	6.5	23	460
100	171290	110	7.2	26	520
125	172871	135	9.1	26*	520

* The advantage of the DN 125 outlet is in the « gutters » application

EPAMS outlets with steel plate

EPAMS outlets with steel plate

- Stainless steel body, including M10 bolts
- Aluminium grating
- Stainless steel plate - 500 x 500 mm²

Application field:
This roof outlet is used on all the roofs mentioned in the field of application of the French Technical Assessment 14+5/01-656, except for those with waterproofing by synthetic membrane

DN	Product code	DE mm	Weight kg	Capacity l/s	Surface Drainage m²
50	171081	58	6.4	13	260
75	171267	83	6.7	23	460
100	171305	110	7.4	26	520
125	172874	135	9.3	26*	520

* The advantage of the DN 125 outlet is in the « gutters » application

EPAMS outlets for flexible PVC membranes

EPAMS outlets for flexible PVC membranes

- Stainless steel body, including M10 bolts
- Aluminium grating
- Laminate-steel PVC plate - 500 x 500 mm²

Application field:

This roof outlet is used on non-accessible roofs and/or with equipment zones, and waterproofed by synthetic membranes according to the SARNAFIL Technical Assessment. Waterproofing is provided by a weld between the various PVC elements to seal it in a traditional way. The membrane may be visible or may be given heavy mineral protection. For this latter case, it is possible to use fine gravel but in
this case the roof outlet is to be fitted with an elevating kit for the DAV-GG (see page 97)

DN	Product code	DE mm	Weight kg	Capacity l/s	Surface Drainage m²
50	171286	58	6.8	13	260
75	171287	83	7.1	23	460
100	171263	110	7.7	26	520
125	Consult us	135	9.6	26*	520

* The advantage of the DN 125 outlet is in the « gutters » application

EPAMS Anti-Vortex Device

EPAMS Anti-Vortex Device

- Aluminium

To suit all outlets 50, 75 100 and 125 DN

Product code : 171293

EPAMS Elevating Kits for Anti-Vortex Device

EPAMS Elevating Kits for Anti-Vortex Device

- 1 Aluminium Anti-Vortex Device
- 1 Grating cap
- 3 Yokes
- 3 Fixing nuts

For roof with waterproofing protection by fine gravel or by flags on isolating layer by fine gravel

Two heights of elevation: 90 and 250 mm

Product code : 90 mm kit - 171291
250 mm kit - 171292

EPAMS Bolt Kit

EPAMS Bolt Kit

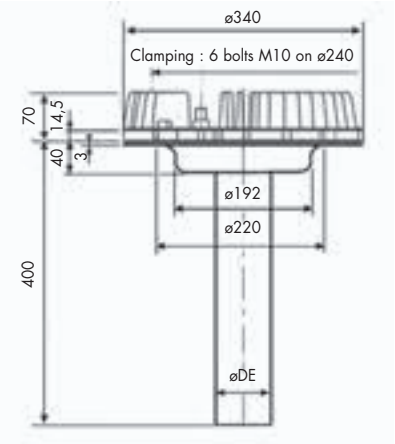
- 3 nut caps
- 6 nuts

To suit all outlets 50, 75 100 and 125 DN

Product code : 171295

Syphonic roof outlets

Main dimensions of Body part



EPAMS-HDE **Syphonic Cast Iron Rainwater Drainage System**

Cast iron
EPAMS HDE flat-roof
outlets

Cast iron EPAMS HDE flat-roof outlets

available in one or two component models
HDE-50-GG (ASE)
HDE-70-GG (ASE)

Capacity:
1.0* l/s to 6 l/s (DN 50)
4.0 l/s to 12 l/s (DN 70)

EPAMS HDE flat-roof outlet
UNO DN 70

EPAMS HDE flat-roof outlet UNO DN 70

HDE flat-roof outlet UNO DN 70
one component, made from stainless steel A2 material 1.4301, with clamp flange

Capacity:
1.0* l/s to 15 l/s (DN 70)

*Connection pipe DN 40

Polyurethane
EPAMS HDE flat-roof outlets

Polyurethane EPAMS HDE flat-roof outlets

HR polyurethane foam, insulated, available as one or two component models with foamed-in connection foil, stainless steel outlet supports.
HDE-50-PUR (ASE)
HDE-70-PUR (ASE)

Capacity:
1.0* l/s to 6 l/s (DN 50)
4.0 l/s to 10 l/s (DN 70)

PP EPAMS HDE flat-roof
outlet

PP EPAMS HDE flat-roof outlet

Polypropylene, insulated, available as one and two component models with aluminium flange ring, metal-reinforced outlet supports, with galvanized securing clamp.
EPAMS HDE-70-PP (ASE)

Capacity:
1.0* l/s to 12 l/s

PAM-GLOBAL® HDE gutter outlets

HDE gutter outlets DN 50, special production DN 70

Rounded design, aluminium, copper and stainless steel A4, material 1.4571, stainless steel outlets also available with connector flanges.
All run-offs with leaf traps and reinforced outlet supports.

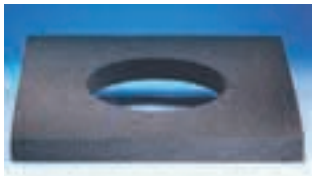
Capacity:
1.0* l/s to 4.0 l/s (DN 50)
4.0* l/s to 8.0 l/s (DN 70)

*Connection pipe DN 40

All information about the standard designs and system components of the EPAMS HDE flat-roof outlet range is available in the brochure "High-Capacity Roof Drainage System". More detailed information on the technical data for PAM-GLOBAL® S pipes, fittings and connection technology can be found in this brochure and also in the PAM-GLOBAL® S service directory.

Insulating compensation rings
40 mm thick to compensate insulating thickness in excess of 60 mm.

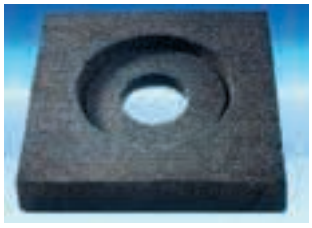
40 mm thick: 0.8 kg
60 mm thick: 1.3 kg



Insulating body
for thermal insulation of the outlet; can be used as direct encasing.
1.3 kg

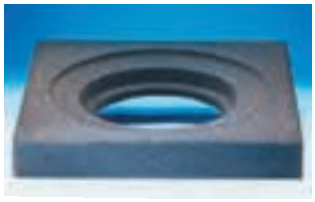
Insulating body for the underside of the outlet
for thermal insulation of the underside of the EPAMS HDE cast outlet, DN 50/70.

DN 50
DN 70



Insulating ring
for thermal insulation and load distribution of the build-up element.

1.2 kg

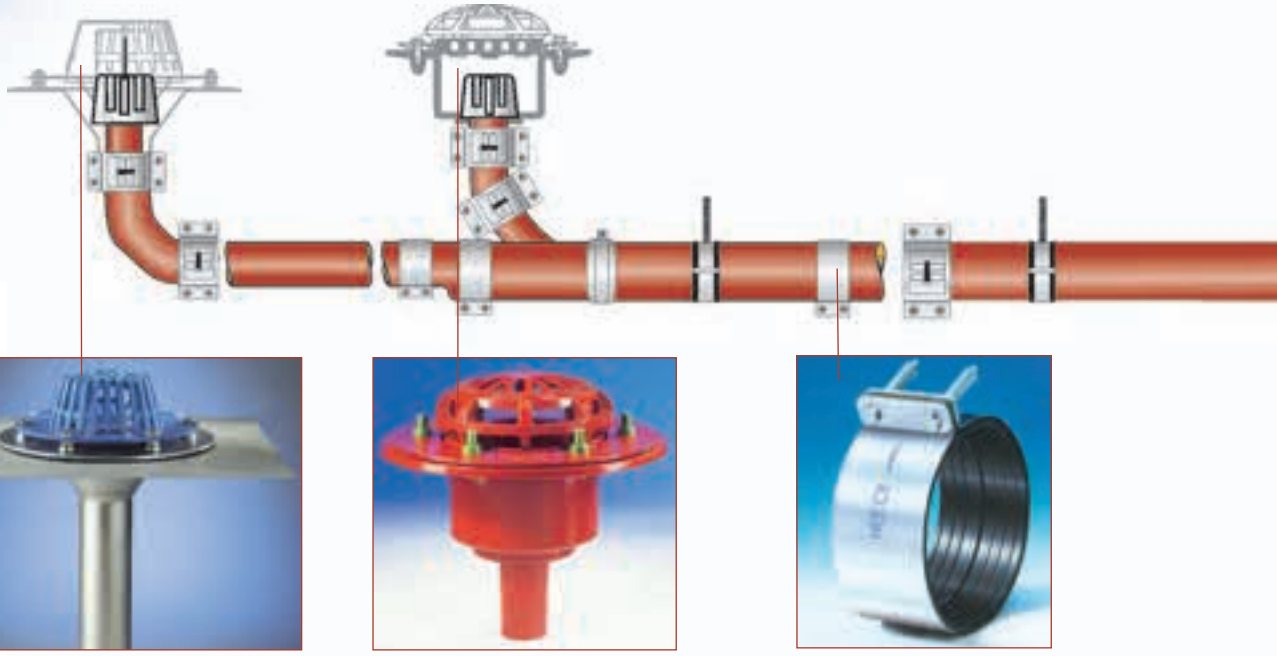


Heating for the EPAMS HDE flat roof outlet UNO DN 70
With self-limiting heating tape;
230 V/50 Hz; heating capacity 10 watt.

EPAMS®

Syphonic Cast Iron Rainwater Drainage System

Typical installation



EPAMS HDE flat-roof outlet UNO

Cast iron EPAMS HDE flat-roof outlets

HES CE coupling

A **complete product range** of PAM-SMU® cast iron pipes and fittings, stainless steel couplings, grip collars, sound absorbing brackets, roof outlets and safety collars.

Peace of mind that cast iron is **non-comubustible**, meeting all fire regulations (flame and fire proof for at least 4 hours). No expensive fire collars required. No fumes in the event of fire.

A very **low accumulation of surface water** on the roof.

The **silent solution** of cast iron whatever the flow rate. No expensive noise insulation required.

Cost saving – fewer pipes and fittings.

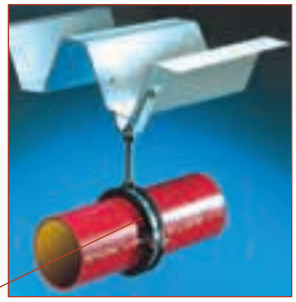
Long life – will last the life time of the building.

No expansion joints or thermal limiters needed, in contrast to HDPE systems

Reduced diameters of pipework – **less cost**.

Independent Endorsement – The Veritas Office has given EPAMS a glowing report after carrying out a series of tests (New Technology Report No. 3907 7th July 1993).

The **mechanical resistance** of the PAM-SMU® components to withstand the positive and negative pressures in the EPAMS system.



Roof fastening devices

PAM-GLOBAL® RAPID-S-coupling

PAM-GLOBAL® REKORD grip collar

RAPID-SE

Easy, rapid jointing can take less than 40 seconds with PAM-SMU® stainless steel couplings. No special welding required unlike HDPE systems.

Optimised horizontal runs and **fewer vertical stacks** allowing even greater architectural freedom.

Fewer brackets compared to HDPE systems.

PAM-GLOBAL® CV grip collar

Stack support pipe

Concrete

German Example

PAM-GLOBAL® lines are planned and laid in conformity with the technical rules and stipulations of:

DIN EN 12 056 and DIN 1986, Part 100, 34, 30 as well as DIN EN 752

DIN EN 12 056 Gravity drainage within buildings

Part 1: Field of application, definitions, general demands and execution requirements.
part 2: Dirty-water installations – Planning and calculation.
Part 3: Roof drainage – Planning and calculation.
Part 4: Drainage installations – Planning and calculation.
Part 5: Installation, maintenance and operating instructions

Drainage fundamentals for buildings and properties in connection with the following parts:

Remaining national standards:

DIN 1986 – Draining systems for buildings and properties
Part 100: Additional provisions relating to DIN EN 12056 (Draft 1/2001)
Part 3: Rules for operation and maintenance
Part 4: Application fields for drainage pipes and shaped parts made of different materials
Part 30: Maintenance

DIN EN 752 – Drainage systems outside buildings
Part 1: General remarks and definitions
Part 2: Demands
Part 3: Planning
Part 4: Hydraulic calculations and environment protection aspects
Part 5: Modernisation
Part 6: Pumping installation
Part 7: Operation and maintenance

Furthermore, the following standards in their given valid versions must be observed:

DIN 1053 – Masonry
Part 1 with provisions relating to recesses and grooves.
DIN EN 1610 – Draining channels and pipes, with guidelines relating to laying pipes underground.
DIN 4102 – Fire protection in building construction.
DIN 4108 – Thermal protection in building construction.
DIN 4109 – Sound insulation in building construction.

Demands and permissible pressure loads for PAM-GLOBAL® couplings

1. Normative requirements DIN EN 12056 and DIN 1986-100

In principle drainage and ventilation systems are designed as pressureless gradient lines. However, this does not exclude the possibility of pressures arising in the lines under specific operating conditions.

The old requirement of DIN 1986, Part 1, Section 4, that pipelines must withstand an internal and external pressure of 0.5 bar no longer exists in EURO EN 12056. DIN EN 12056-1, January 01, Section 5.4.2 Water and Gas Tightness, states in general: Drainage installations must be sufficiently water and gas tight to withstand the arising operating pressures.

Moreover, DIN EN 12056-5, January 01, Section 6.3 Laying Drainage Lines, tates with regard to securing: Pipes without friction-locked longitudinal adhesion must be secured and/or supported in such a manner that the connection cannot come apart during use. The arising reaction forces must be taken into account.

2. DIN EN 877 Product Requirements

The requirements expected of system tightness are specified in the product standards. Standard DIN EN 877 applies to PAM-GLOBAL® Pipes which stipulates the requirements expected of tightness. These requirements are much higher than the former 0.5 bar.

For pipes up to DN 200 inside buildings the test requirements are 5 bar, but this does not automatically infer that all connectors can be used for pressures up to 5 bar. This is due to the fact that the tests are conducted in a clamped state, i.e. strain-relieved.

Consequently the pressure under which the connector can be used with friction-locked longitudinal adhesion is important for the given part or which measures must be applied for strain relief, for instance, securing, claws, abutment, etc.

3. Installation rules and permissible pressure loads for PAM-GLOBAL® couplings

3.1 General remarks

The precondition for secure fastening and friction-locked longitudinal adhesion of the coupling point applied particularly to drainage lines that could be exposed to an internal pressure that is higher than 0.5 bar, for example:

1. Pipes in the backwater zone
2. Rainwater pipes within buildings
3. Dirty-water pipes that are conducted through several basement levels
4. Pressure pipelines of waste-water lifting installations

Operating pressures can particularly arise pipelines that are below the backwater level, e.g. backflow from the culvert network which can cause pipe connections to come apart. Consequently, it is necessary to proceed in the following manner for PAM-GLOBAL® pipelines which are below the backwater level:

Up to 0.5 bar in the backwater zone

- With PAM-GLOBAL® RAPID connectors DN 100-200 – Securing directional changes using PAM-GLOBAL® REKORD claws.
- Claws for DN 250 and 300 are currently being prepared.

Over 0.5 bar in the backwater zone

All PAM-GLOBAL® connectors must be secured with the corresponding PAM-GLOBAL® claws. PAM GLOBAL® couplings for PAM-GLOBAL® pipelines with claws are suitable for the following overpressures. The RAPID connections in the following nominal diameters, secured with REKORD claws, can be subjected to the specified pressures:

- DN 40, 50, 70 and 100 with 10 bar
- DN 125 and 150 with 5 bar
- DN 200 with 3 bar

PAM-GLOBAL® CV and CE connectors in the following nominal diameters, secured with CV claws, can be subjected to the specified pressure:

- DN 50 to 300 with 3 bar

PAM-GLOBAL® GRIP connectors in the following nominal diameters can be subjected to the specified pressure:

- DN 50 - 400 with 10 bar (6)
- DN 500 with 6 bar (3)
- DN 600 with 4 bar (2)

Ensure that the installation instructions for the given connector type are observed.

3.2 Rainwater pipes

DIN EN 12056-3, Section 7.6.4., stipulates in this context:

Indoor rainwater pipes must be able to withstand the pressure that can arise as a result of clogging.

Clogging of rainwater collecting pipes and downpipes, and with it pressure loads at building height, is a new requirement that has not been specified in the past in DIN 1986, Part 1. Reference was made to overpressures in excess of 0.5 bar and internal pressures due to special operating states, but clogging did not form a planned operating state in our opinion.

Today, DIN 1986 T, 100 defines the internal pressure as overload, i.e. backwater in the pipe, for selecting the pressure strength of the pipe. However, backwater up to the top edge of the building will continue to remain the exception in future. Our experience has shown that it is sufficient to secure pipes below the backwater level with claws. Normally downpipes above the backwater level do not have to be secured with claws. The water column in vertical rainwater pipes that are open at the top does not exert a longitudinal force, provided that the pipes are secured against buckling out of the axis direction. Our experience has shown that, with radio towers, it has been perfectly sufficient for the past 15 years to secure the bottom bends and junctions with CV claws. Obviously, this presupposes that the statutory pipe has been laid and secured according to the PAM-GLOBAL® installation instructions and that materials from SAINT-GOBAIN have been used. Please also refer to our new PAM-GLOBAL® GRIP connectors up to 10 bar.

3.3 Pressure pipes of lifting installations

The pressure lines can consist of PAM-GLOBAL® S pipes and shaped parts with PAM-GLOBAL® connectors and REKORD claws up to DN 100. PAM-GLOBAL® GRIP connectors, DN 50-400, can be used as an alternative. The maximum pressure in both cases is 10 bar. The reason for the use of connectors up to 10 bar is the fact that pressure shocks normally arise when the pumps are switched off. These shocks can be a multiple of the pumping head. Float-closing back-pressure flaps with a counterweight, as offered by suppliers of lifting installations, are recommended to reduce the pressure shocks. Moreover, compensators must be installed to prevent the transmission of vibrations of the lifting installation to the pressure lines.

Securings must be in keeping with the installation instructions for PAM-GLOBAL® pipelines. The pipe clamps should be directly mounted on the wall or in the ceiling or, in the event of major spacings, fitted on corresponding rails or consoles. The threaded connection of the pipe clamp must be M16.

PAM-GLOBAL® S
PAM-SMU® S
PAM-ENSIGN® S

Simple installation with the greatest accuracy

PAM-GLOBAL® pipes up to DN 300 are supplied in 3 m lengths and a cut to size by the user. The pipe cutter from Ridgid (see above) or Virax ensure fast, neat and rectangular cut-off.
Angle grinders with cut-off wheel are not advisable for cast iron. If, at all, they should only be used in connection with cutting-off devices which maintains a secure hold of the pipe that is to be cut off and which guarantees a rectangular cut.

Other cut-off devices include electrical belt saws with clamping device or power hacksaws which allow the pipe to be clamped in a console to guarantee a neat cut. It is essential that the cut is always at a right angle to the pipe axis.

Please note: Cutting wheels and saw blades must be regularly exchanged.

PAM-GLOBAL® installation and laying instructions

SAINT GOBAIN CANALISATION has drawn up laying and installation instructions to ensure the correct installation of PAM-GLOBAL® pipes. Care must be taken for due observation of the installation instructions, the instructions for laying PAM-GLOBAL® pipes underground and for ensuring friction-locked longitudinal adhesion with pipelines subject to pressure. Friction-locked longitudinal adhesion must be ensured when water drain pipes are subject to pressures in excess of 0.5 bar, for instance with:

- Pipes in the backwater zone
- Rainwater pipes
- Dirty-water pipes which pass through several basement levels without any additional draining points
- Pressure pipes for waste-water lifting installations

The required friction-locked longitudinal adhesion with PAM-GLOBAL® pipes and shaped parts is achieved with the PAM-GLOBAL® REKORD claw, Universal claw or CV claw.

It is also necessary to observe the installation instructions for WC connections as well as the rules relating to securing PAM-GLOBAL® pipelines.

French Example

DTU 60.2 – NF P 41-220

Cast-iron pipework. Discharge of sewage, rainwater and waste-water.

Important extracts from the Technical Specification

The following extracts clarify certain technical aspects essential to both regulators and users. Comments and references to certain sections of the technical specifications provide any necessary additional information.

3-2 Construction of assemblies

3-21 Assembly by elastomer joints

"Conventional elastomer joints are deemed to include the following:
a) UU ring seal assemblies
b) JC joint assemblies."

Note:
SMU® RAPID joints for non-interlocking pipes and connections - UU -,

(a) consisting of an elastomer joint and stainless steel clamp,

(b) for interlocking pipes and connections – EU – are considered as conventional.

3-22 Assembly by "packed" or "cast" joint

"Assemblies are constructed using mastic, molten lead or cement mortar, after caulking with tarred cord, lead wool.

3-3 Laying pipework

3-323 Embedded or wrapped pipework

"Wrapping or embedding of part of the pipework system, comprising one or more assemblies, can be constructed with elastomer joint assemblies; "packed" or "cast" joints are not permitted.

Note:
SMU® high-speed joints may be embedded or wrapped.

3-324 Floor or wall crossings

"A floor or wall crossing is deemed to include any part of the pipework that is inaccessible over a length of less than 1 metre."
"Assemblies by "packed" or "cast" joints are not permitted in crossings; elastomer joints are admissible."

Note:
The simplicity of implementation of SMU® high-speed joints and joints ensures high performance and reliability of assemblies located in crossings.

3-31 Mechanical stresses

"Over and above 0.2 bar, inspection plugs, inspection T-sections, bungs, etc. should be stopped with a removable device or special parts so that there is no risk of stresses exerted due to bottom effects in the vent of obstruction of the pipework causing detachment of joints. The stop should allow for a certain amount of play."

Note:
Grip clamps and anchor joints also offer solutions that are ideally suited to absorbing exceptional stresses.

PAM-GLOBAL® S
PAM-SMU® S

Technical specifications

NF EN 877

Cast iron pipes and fittings, their joints and accessories for the evacuation of water from buildings – Requirements, test methods and quality assurance

Some main stages

Concerned Ranges:
PAM-GLOBAL® S and PAM-GLOBAL® Plus: DN 40 to 600
Rainwater range: DN 75 to 150

Area of use Scope

This European standard applies to cast iron pipeline components used for the construction of discharge systems for buildings and of drains, normally as gravity systems.
This standard specifies the requirements for the materials, dimensions and tolerances, mechanical properties, appearance, standard fittings for cast iron pipes, fittings and accessories.
It also indicates performance requirements for all components, including joints.

Definitions

Discharge system for buildings: system of pipes, fittings, accessories and joints used to collect and drain waste water and rainwater from a building; it comprises discharge pipes, stack ventilation and rainwater pipes, installed within the limits of a building or attached to the building.

Drain: system of pipes, fittings, accessories and joints installed outside the limits of a building in order to connect the discharge system of this building to a soil and drain or a septic tank.

Soil and drain: system of pipes designed to collect waste water and rainwater from buildings and surface water and to convey them to the point of disposal or treatment.

Dimensions

Pipes:

External diameter (DE)		
DN	Nominal value	Tolerance
100	110	+2 -1
200	210	+2.5 -2.5

Angles of fittings:

Bends:	15°	22°	30°	45°	68°	88°
Branches:				45°	68°	88°

Coatings

Pipes and fittings:

Above and below ground:

Internal fitting:
- resistance to salt spray: 350 h
- chemical resistance: from pH 2 to pH 12
- resistance to temperature cycling: 1500 cycles between 15 °C to 93 °C

Below ground only:

External fitting of pipes:
- the mean mass of zinc per unit area shall be not less than 130 g/m²

NF EN 877 European standard (continuation)

Product marking

The marking shall be checked by visual inspection to ensure the following conformance:

- the manufacturer's name or mark
- the identification of the production site
- the period of manufacture, coded or not
- the reference to this standard
- the DN, or several DN where applicable
- the design angle of fittings
- the identification of the accredited third party, where applicable

Water tightness

Water tightness of joints-performance requirements

Test condition	Hydrostatic test pressure in bar			
	DN 40 to 200		DN 250 to 600	
	internal	external	internal	external
Aligned	0 to 5	0 to 5	0 to 3	0 to 0.5
Deflected*	0 to 5		0 to 3	
Subject to	0 to 1		0 to 1	

Note: 1 bar = 100 kPa = 0.1 MPa

*3° for DN ≤200; 1°45' for DN > 200

In the lack of European harmonisation, the product performances that are in conformity with the present standard must be evaluated in comparison with national regulations in force on the site of the installation, by particularly taking criteria of performance and possible classifications into account.

Noise protection

(See the notes F of the Standard)

Cast iron pipe systems due to their high mass per unit area of their pipe walls as well as the joint design characteristics provide considerable noise reduction benefits when evacuating waste water within buildings. As a rule additional protection is therefore nor required.

Safety in case of fire

(See the notes F of the Standard)

Cast iron products in accordance with the European standard are non-flammable and non-combustible. When exposed to fire they will maintain their functional characteristics and integrity for several hours i.e. their walls will remain impervious to flames and gases and there will be no fracture, collapse or significant deformation. The integrity of connections through walls and ceiling is maintained.

Domestic waste

General

Domestic effluent, sewage (E.U.), waste-water (E.V.) and rainwater (E.P.) are generated by normal occupancy of residential premises and suchlike. According to article 29.2 of the typical Departmental Health and Hygiene Regulations "it is prohibited to introduce any solid, liquid or gaseous matter into public works, directly or via pipework in buildings, likely to be the direct or indirect cause of either risk to personnel operating disposal or treatment works or damage to the said structures or hindrance to their operation. This prohibition relates in particular to the discharge of hydrocarbons, acids, cyanides, sulphides, radioactive products, etc.."

"Effluent deriving from any professional activity conducted inside residential premises of a quality other than that of domestic waste must be treated by special processing procedures."

Design of disposal works

According to article 42-1 of the typical Departmental Health and Hygiene Regulations "there must be no obstacle to the circulation of air between public drains or the waste and domestic water treatment system and the outside atmosphere, via waste and domestic water pipework and downcomers on buildings especially where connection requires the installation of a lifting station".

Resistance properties of PAM-SMU® S internal fittings

Interior fittings in PAM-SMU® S pipes meet the performance requirements laid down in French standard NF EN 877:

- resistance to hot water: 24 h at 95 °C
- resistance to heat cycles: 1500 cycles between 15 °C and 93 °C
- saline mist stability: better than 350 h
- resistance to waste water: 30 days or greater
- resistance to chemical products for $2 \leq pH \leq 12$

Resistance properties of PAM-SMU® S external fittings

External primer fittings on PAM-SMU® S pipes meet the performance requirements laid down in French standard NF EN 877.

Cataphoresis fittings on joints are likely to lose brightness when subjected to prolonged exposure to ultraviolet rays. The characteristics of the fitting remain entirely unimpaired, however.

Aggressive waste

General

Aggressive waste is characterised by its content in: acids, bases, salts, alcohol, solvents, hydrocarbons, detergents, fats, solid matter, and (also) by their temperature.

In general, such waste should, prior to disposal in the public systems, undergo pre-treatment using settling tanks, separators, neutralising tanks, etc.
It is imperative to consult the various regulations governing aggressive waste.

Scope of application of PAM-SMU® Plus range: Aggressive waste (communal kitchens, hospitals, clinics, laboratories, industry, etc.)

1. Overground systems and underfloor voids

The PAM-SMU® Plus range is not designed for the conveyance of "process" fluids but for the discharge of aggressive waste to and from pre-treatment systems.

Prior to installation, it is essential to confirm full compatibility of the waste for disposal with the fittings on the PAM-SMU® Plus range.

2. Systems incorporated in concrete

Pipe sections should not come into contact with metal reinforcing bars.

3. Buried pipework systems

The PAM-SMU® Plus range is specified for (= external diameter 110 mm) and installed :

- **with bends and corner connectors of 68° or less**

Installation of the SMU® Plus range for a buried system is permitted in accordance with the conditions set out in volume 70:

Admissible coverage depth: as determined by our technical and commercial department based on the specific parameters of each site: ND, type of backfill, type of compacting, etc.
Please contact us with regard to this.

Live loads: domestic live loads corresponding to permanent vehicle traffic.

The resistance of PAM-SMU® Plus to aggressive substances

Resistance of the internal fittings

Resistance is appreciated by taking account of the totality of the physico-chemical parameters that characterise an effluent: volume of discharge; nature of the evacuated acids, bases and solvents...; simultaneity of acids or bases, maximum pinpoint temperature, permanent average temperature, alternation of cold and hot discharge, possibility of rinsing of pipework. According to this information, our technical sales department is in a position to give an opinion about the potential use of the range.

Tables of chemical resistance

The following tables enable to check the compatibility of the internal fittings and the gaskets of couplings with effluents characterised by:

- **only one aggressive product**
- **a range of pinpoint temperature, corresponding to a discharge of a few minutes**

In case of doubt or multiple discharge, please consult the technical sales department.

1= internal coatings of fittings and pipes

2= elastomer EPDM gasket

3= Nitril NBR gasket

These tables are only indicative and non exhaustive.
For more information about specific use, do not hesitate to contact our technical sales department.

	pH	20 °C			60 °C			80 °C		
		1	2	3	1	2	3	1	2	3
WATERS										
Salt water NaCl 30 g/l	5,6	■	■	■	■	■	■	■	■	■
Demineralised water	6,6	■	■	■	■	■	■	■	■	■
Waste water	6,9	■	■	■	■	■	■	■	■	■
Oxygenated water 18 v/L	–	■	■	■	■	■	■	■	■	■
DETERGENTS										
Washing-up 5	,8	■	■	■	■	■	■	■	■	■
Bubble bath 5 %	6,9	■	■	□	■	■	□	■	■	□
cleaning product 10 %	7,4	■	■	□	■	■	□	■	■	□
Phosphate free washing	7,7	■	■	□	■	■	□	■	■	□
Dish washing-up 5 %	9,0	■	■	□	■	■	□	■	■	□
Ammoniated efFluent 10 %	9,5	■	■	■	■	■	■	■	■	■
Pure ammoniated effluent	10,0	■	■	■	■	■	■	■	■	■
WC pure drain clearer	11,8	■	■	□	□	□	□	□	□	□
Drain clearer 10 %	–	■	■	□	□	□	□	□	□	□
DISINFECTANT										
Type „SANYTOL" 5 %	3,1	■	■	□	□	□	□	□	□	□
SPOT REMOVING OXIDIZER										
Type „ACE DELICAT" 5 %	4,2	■	■	□	□	□	□	□	□	□
Type „BECKMANN"/5 l	9,3	■	■	□	□	□	□	□	□	□
Type „BLANCO"/5 l	10,3	■	■	□	□	□	□	□	□	□
SALTS										
KCl 3 %	4,2	■	■	□	□	□	□	□	□	□
NaH_2PO_4 3 %	4,2	■	■	□	□	□	□	□	□	□
$(NH_4)_2SO_4$ 6	,7	■	■	□	□	□	□	□	□	□
SOLVENTS										
Ethanol, methanol, glycol	–	■	■	■	□	□	□	□	□	□
Xylene	–	■	■	■	□	□	□	□	□	□
White Spirit	–	■	■	■	□	□	□	□	□	□
Oil, gas oils, oil mineral	–	■	■	■	□	□	□	□	□	□
Oils, lubricating –		■	■	■	□	□	□	□	□	□
Acetone	–	■	■	■	□	□	□	□	□	□
Cyclohexane –		■	■	■	□	□	□	□	□	□
Aceton	–	■	■	■	□	□	□	□	□	□

Technical specifications

1= internal coatings of fittings and pipes

2= elastomer EPDM gasket

3= Nitril NBR gasket

		pH	20 °C			60 °C			80 °C		
			1	2	3	1	2	3	1	2	3
MINERAL ACIDS											
	Hydrochloric HCl 10 %	0,7									
	Hydrochloric HCl 5 %	1,0									
	Sulphuric H_2SO_4 10 %	1,0									
	Sulphuric H_2SO_4 5 %	2,0									
	Phosphoric H_3PO_4 10 %	1,3									
	Phosphoric H_3PO_4 5 %	1,8									
	Phosphoric H_3PO_4 2.5 %	2,0									
	Nitric HNO_3 10 %	2,0									
ORGANIC ACIDS											
	Lactic 10 %	1,1									
	Lactic 1-5 %	2,2									
	Citric 5 %	2,0									
	Vinegar 30 %	2,9									
	Vinegar 10 %	3,2									
BASES											
	Soda NaOH	12,0									
	Soda NaOH 1	3,6									
	Ammoniated NH_3	12,1									
	Potash	13,6									
	Bleach 10 %	12,0									
	Bleach 30 %	12,0									
	Bleach 10 %	12,5									
OTHER											
	Oils, vegetable and animal	–									

resistant
not resistant
without object

PAM-SMU® Plus pipes: resistance of external fittings

Metal fitting with zinc:
Zinc fitting protects the cast iron pipes by galvanic action. Thanks to its specific electrochemical properties, the metallic zinc placed in a corrosive surrounding protects in fact cast iron from any corrosion and prevents the local attacks due to the *wound* of the pipe surface. Zinc constitutes a form of cathodic protection in situ. In long term, zinc changes into a stable layer of complex salts, forming a passive protection coat on the surface of the pipe. On the pipes, zinc fitting represents a layer of adhesive and ductile metal. In contrast to all the organic fittings, zinc endures high levels of impacts.

Anthracite grey acrylic primer, complementary to zinc fitting

Technical characteristics of joints (couplings and collars)

	SMU Rapid® 2	Stainless steel SMU Rapid® 2	PAM-GLOBAL Rapid S	PAM-GLOBAL Rapid Inox	SMU-S	SMU-S AUTOGRIP	Stainless steel collar ISO 6594
Strap/case Material [1]	Austenitic stainless steel DN 40: 1.4510 (430 Ti) DN 50-200: 1.4310 (301)	Austenitic stainless steel DN 40 250 300: 1.4571 (316 Ti) DN 50-200: 1.4310 (301)	Ferritic stainless steel 1.4510/1.4511 (430 Ti/-)	Austenitic stainless steel 1.4571 (316 Ti)	Austenitic stainless steel 1.4301 (304)	Austenitic stainless steel 1.4571 (316Ti)	Austenitic stainless steel 1.4301 (304)
Screw	Allen						Hexagonal screw + screwdriver slot
Wrench dimension (in mm)	DN 40: 4 DN 50-300: 6		DN 40: 4 DN 50-150: 6 DN 200: 8	DN 40: 4 DN 50-150: 6 DN 200: 8 DN 250-300: 6	DN 100: 6 DN 125-150: 8 DN 200-600: 10	DN 50: 6 DN 70-100: 8 DN 125-150: 10 DN 200-600: 14	DN 100-150: 10 DN 200-300: 13
Number	1		1		2	2	DN 100-150: 2 DN 200-300: 4
Material	Steel, grade 8.8 Zn Al plated	Stainless steel class A4 [2]	Steel, grade 8.8 Zn Al plated	Stainless steel class A4 [2]	Stainless steel class A4 [2]	Stainless steel class A4 [2]	Stainless steel class A2 [2]
Tightening torque (in N.m)	DN 40: 2 DN 50-200: 4[3] DN 250: 15 DN300:20		DN 40: 2 DN 50-200: Fully tightened	DN 40: 2 DN 50-300: Fully tightened	DN 100: 15 DN 125: 25 DN 150: 30 DN 200-300: 35 DN 400-600: 40	DN 50: 20 DN 70-100: 30 DN 125: 50 DN 150: 60 DN 200-250: 100 DN 300: 180 DN 500-600: 200	DN 100-150: 10 DN 200-300: 20
Clamp and barrel	Clamps		Clamps		Barrels		Clamps
Material [1]	DN 40: Stainless steel 1.4510/1.4511 or 1.4301 (430 Ti/-/304) DN 50-200: Stainless steel 1.4510 (430 Ti)	DN 40: Stainless steel 1.4510/1.4511 or 1.4301 (430Ti/-/304) DN 50-300: Stainless steel 1.4301/1.4571 (304/316Ti)	Stainless steel 1.4510/1.4511 or 1.4301 (430 Ti/-/304)	Stainless steel 1.4571 (316 Ti)	Stainless steel 1.4301 (304)	Stainless steel 1.4571 (316Ti)	Stainless steel 1.4301 (304)
Number	2	2	2	2	2	2	DN 100-150 : 4 DN 200-300 : 8
Sleeve (gasket)	EPDM	EPDM or Nitrile	EPDM or Nitrile	EPDM or Nitrile	EPDM	EPDM or Nitrile	EPDM
Performances	In compliance with EN 681-1 - December 1996 - type WC						
Maximum deflection [4]	DN 40-200: 3° [5] DN 250-600: 1°45 [5]						DN 100-200: 4° DN 250-300: 2°
Maximum misalignment [4]	Correspond to a shearing load of 10 x DN in Newton, limited to 6 mm, under an internal pressure of 1 bar						-
Hydrostatic test pressure [4]	In compliance with EN 877 DN 40-200: 5 bar - DN 250-300: 3 bar				DN 40-400: 10 bar DN 500: 6 bar - DN 600: 4 bar		DN 100-200: 0.3 bar DN 250-300: 0.2 bar

[1] First grade is according to EN 10027-2, grade in brackets to the closest AISI one considering equivalences between standards
[2] As per EN ISO 3506-1
[3] Standard tightening (see Fig.1 - next page) for reaching EN 877 requirements. For higher requirements on pressure resistance, "edge-to-edge" tightening should be applied (see Fig. 2 - next page)
[4] See EN 877 for more details
[5] When couplings are used with grip collars, or for SMU-S Autogrip couplings, deflection should be applied before tightening of bolts/screws

Note: 1 bar = 100 kPa = 0.1 MPa 1 daN/cm^2 10 m water column

Technical specifications

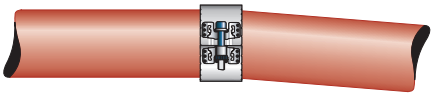
SMU RAPID®2 (including Stainless Steel version)

Fig. 1: Standard tightening

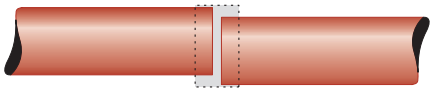
Fig. 2 : Edge-to-edge tightening

Deviation and misalignment (NF EN 877)

Angular deviation



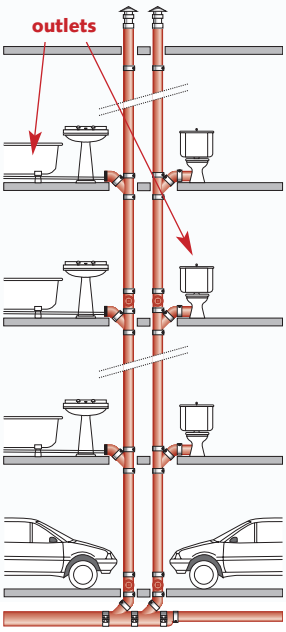
Misalignment under internal pressure



SMU® S and SMU® Plus cast iron pipes are completely unaffected by normal stresses applied and transmitted by building structures. The angular deviations and misalignment accepted by the SMU® S and SMU® Plus pipe systems are an important factor regarding operating safety and hygiene.

Pressure resistance of networks

The instructions to be complied with are supplementary to, and do not replace the relevant requirements applicable in France (standards, DTU specifications, etc.).
The pressure resistance requirements for a drainage network partly depend on the following:
• the height of the water column between a given point of a network and the first outlet located upstream. A distinction is generally drawn between networks carrying waste water and effluent water and those carrying rainwater
• the possibility of accidental water pressure of the network. Such cases are most frequently due to a specific obstruction in a pipe or saturation of the public network.



Drainage networks for waste water and soil water (WW-SW)

Risk of accidental water pressure with a small water column

Waste water or soil water networks generally drain sanitary appliances on each storey. In the event of accidental water pressure, those appliances become outlets.
The pressure must not, therefore, exceed the pressure corresponding to the height of a storey, i.e. a value of about 0.3 bar.
SMU RAPID® 2, SMU-S, SMU-S AUTOGRIP couplings satisfy these operating requirements.

Risk of water pressure with a high water column

In the very rare case where waste water or soil water downpipes pass through a number of floors of a building without any outlets and when there is a risk of accidental water pressure, the installation must comply with the instructions applicable to rainwater (RW) networks.

Drainage networks for rainwater (RW)

Risk of water pressure with a low water column

See the paragraph above on waste water or soil water networks.

Risk of water pressure with a high water column

The accidental water pressure of a network can introduce mechanical loads on some components (bends, plugs, etc.), and those loads must be taken into account considering their values. This is illustrated in the table below.

	DN 50	DN 75	DN 100	DN 125	DN 150	DN 200	DN 250	DN 300	DN 400	DN 500	DN 600
expansion plug	2.1	4.6	8.5	13	18.5	32.2	55.4	78.7	135.5	209.8	301.4
45° bends	3	6.5	12	19.4	26.1	45.5	78.3	111.2	191.6	296.6	426.2
base of sownpipe	2.1	4.6	8.5	13	18.5	32.2	55.4	78.7	135.5	209.8	301.4

Effort of thrust under a 1-metre water column, expressed in kg.F

For example, under a 10-metre water column, an expansion plug of end of DN 200 is subjected to a load of 320 kg and a set of two 45° bends to another of 455 kg.

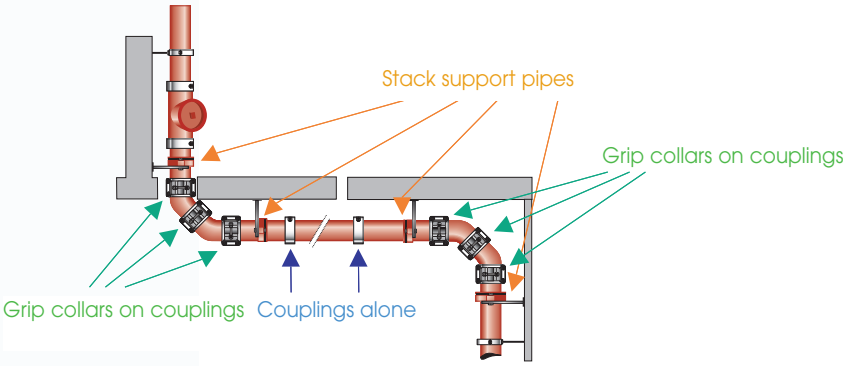
In such conditions, the installation must be capable of continuing to fulfil its purposes:

- leak-tightness
- and mechanical stability, preventing any uncoupling at joints. This phenomenon is due to the loads generated, in particular, at bends (deviations), branches and plugs and which are transmitted via connections all along the pipe.

Technical specifications

The mechanical stability of a network when tilting can be ensured as follows:

- by isolating the section subjected to the loads between two fixed points (referring to the building structure), such as by using stack support pipes,
- by adapting the joints and their accessories (nature of couplings, fitting of grip collars, etc.) between those fixed points.



Note: There are other solutions to withstand the loads. These are based on welded assemblies or masonry components.

Choice of couplings and accessories for each pipe section according to the nominal diameter (DN) and the level of pressure which may be reached (see next table).

Pressure in bar	0	0,5	3	5
DN				
40 to 200	SMU RAPID® 2 coupling 	SMU RAPID® 2 coupling  + SMU RAPID® grip collar 		
250 and 300	SMU RAPID® 2 coupling 	+ SMU RAPID® grip collar 	SMU-S AUTOGRIP coupling 1) 	
400 to 600		SMU-S AUTOGRIP coupling 1) 		

1) SMU-S® AUTOGRIP couplings can be replaced with SMU-S® couplings provided that the deviations (bends, etc.) are supported by welded devices or concrete thrustblocks.

Supplementary accessories

For this type of network, expansion plugs should be equipped with specific grip collars (see page 71).

Please consult our technical sales department for installations with deviations and for cases where hydrostatic pressures may exceed 5 bar.

Specific points of the network

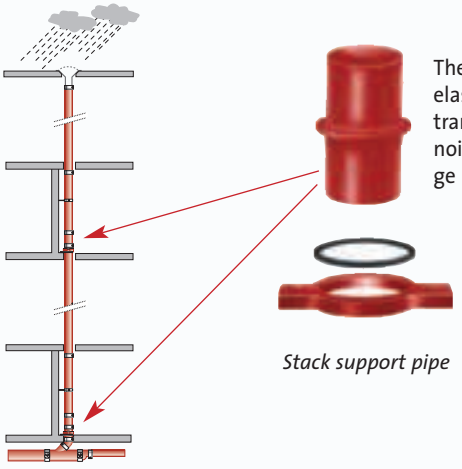
Design for withstanding the loads

Opened hopper

In a downpipe, it is recommended that stack support pipes should be fitted every 15 metres, the first one located at the base of the downpipe, in order to support the weight of the downpipe and mechanically stabilize it.

On cantalever arms

Resting on slab



The support-ring covered with elastomer prevents from the transmission of structure-borne noises coming from the drainage network

Stack support pipe

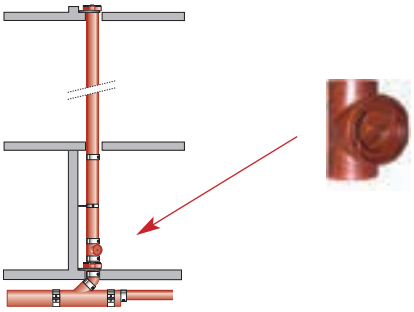
Closed hopper

In this case, no stack support pipes are required.

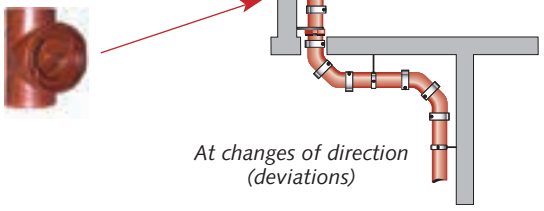
Access of the network (standard NF EN 12056 –1 § 5.6.6)

Access must be ensured so that tests, inspections and maintenance can be performed. Access may be obtained using a short pipe with access door.

On downpipes



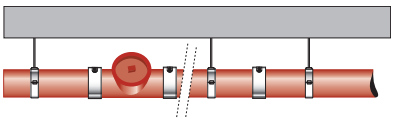
On bottom part



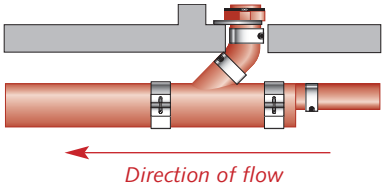
At changes of direction (deviations)

On horizontal collectors

For easier access, the short pipe with access will be installed in a slight sloped position with respect to the pipe generatrix.



Flow and air circulation (standards NF EN 12056-2 & -3)



Direction of flow

The cross section of pipes cannot be reduced in the direction of flow, except in the case of "depressurized" networks or "full pipe" networks such as our EPAMS system.
For this reason, the addition of connections on the network, which leads to higher flow rates or changes in slope may require an increase in cross section. This increase must be made upstream of the coupling, using a pipe tapered/reducer (see page 37).

For horizontal rainwater networks, the pipe tapered/reducer must be fitted to allow air to circulate in the pipe along the upper generatrix which should be in line with the pipe.

Technical specifications

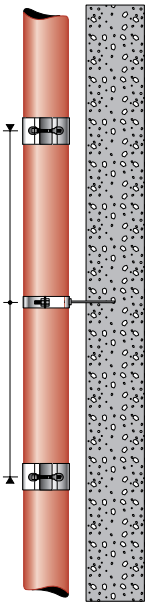
Supporting of pipes (except for EPAMS system)

Requirements of DTU 60.2 NF P 41-220 for SMU ranges

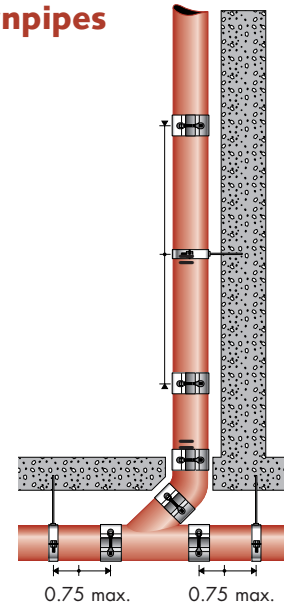
	Number of brackets	
	inside buildings	outside buildings
Vertical network		
For straight product with :		
Length ≥ 2.70 m	1	2
Length ≥ 1 m		1
Length ≤ 1 m	1	
For fitting as :		
Branch	1	1
Change of direction > 45°	1	1
Horizontal network		
Length ≥ 2 m	2	2
Fitting or length < 2 m	1	1

Mountings (openings, sealing) are prohibited in prestressed beams.

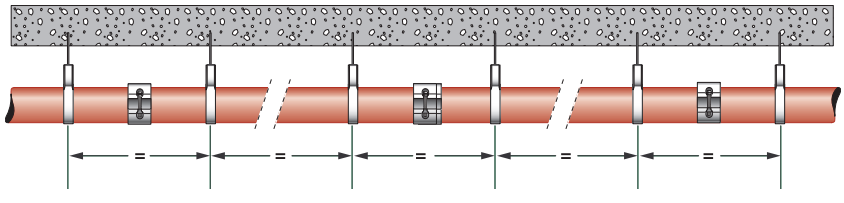
Downpipes



Base of downpipes



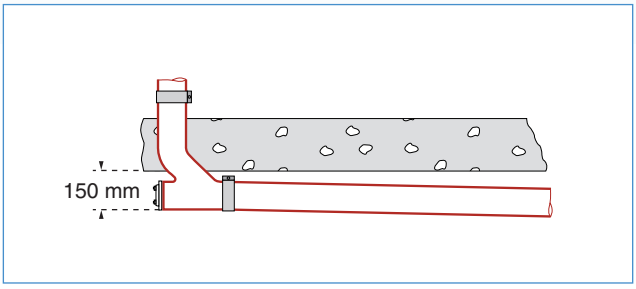
Collectors

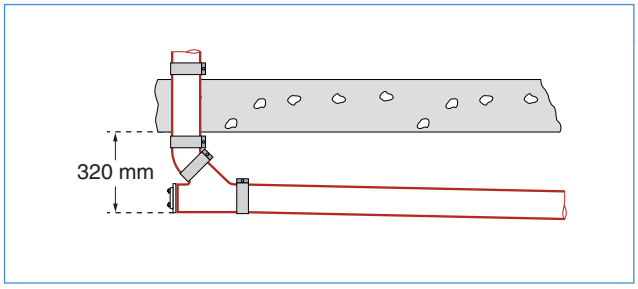


Note: The technical specifications for threaded rods and metal brackets shall be established on the basis of the weights of PAM-SMU® S pipes given page 122.

PAM-SMU® S 45° Single branch/For connecting downpipe

This fitting enables the chute and manifold to be connected minimising the distance between the flow in the manifold and the undersurface of the slab. In the case of long sections of horizontal manifolds, the overall dimensions of the pipework are substantially reduced, maintaining the same run-off gradient coefficient. Maximum slab thickness = 250 mm.





Branch with single downpipe (CEBTP Licence) – Technical Assessment 14/03-777

The process utilising this fitting enables the disposal of waste water from baths in a single fall, except for rainwater, without the need for secondary ventilation as provided for in article 2.202 of Standard NF P 41-201.

Each fitting can serve the following as a maximum on each level: 2 WC, 2 baths and a given number of other standard sanitary appliances.

Proper operation of this fitting has been tested on the basis of the following simultaneity assumptions:

Type of appliance	10 floors	20 floors
WC	2	2
Wash-hand basins	2	3
Bath-tubs	5	8

Other waste discharges:
PAM-GLOBAL® S DN 100 elastomer plugs:

- 2 apertures for pipe taps 32 to 40 mm. Ref. 156628
- 3 apertures for pipe taps: 32 to 54 mm to enable the connection of 2 pipes of 50 mm serving all sanitary appliances other than WCs for 2 apartments. Product cod. 156629

Fitting connections are as follows:
WC : direct WC connection made of elastomer

German Example Securing

Securing PAM-GLOBAL® S lines

Basic rules: The securing devices should be spaced as uniformly as possible. Spacing lengths of 2 m should not be exceeded. Pipes of 2 to 3 m length should be secured at two points. Shorter pipe lengths should be secured once or twice, depending on the diameter (or pipe weight). The securing devices must be uniformly spaced in relation to the connecting points. The distance on either side of each connection should not be longer than 0.75 m.

Horizontal lines must be adequately secured at all points where the direction changes and at all branches. Suspended lines must be secured at particularly firm points every 10 to 15 m so that the line is protected against any displacement. This achieves perfect lateral stability and ensures that other mounted assemblies cannot displace the pipe from the envisaged direction.

Downpipes must likewise be secured at a spacing of no more than 2 m at a floor height of 2.50 mm, i.e. twice per floor, including once in the immediately vicinity of a branch that may be integrated in the line.

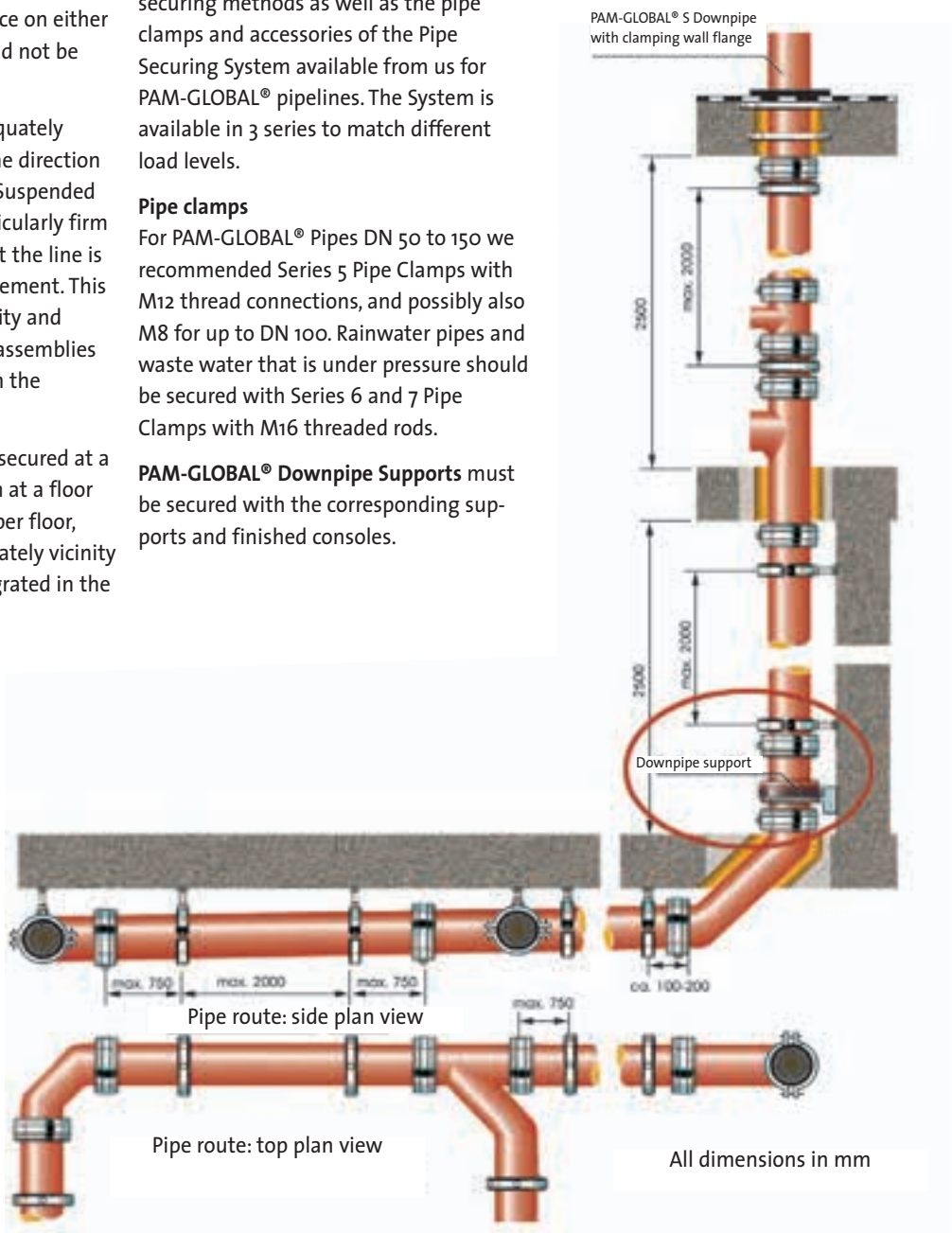
For buildings with up to 5 floors and a pipe diameter of DN 100 the downpipes must be secured by a downpipe support above the cellar ceiling so that it is safeguarded against subsidence. Furthermore, a downpipe support must be incorporated in every further 5th floor.

The pipeline illustrated here indicates the elementary securing rules. The subsequent pages illustrates the principal securing methods as well as the pipe clamps and accessories of the Pipe Securing System available from us for PAM-GLOBAL® pipelines. The System is available in 3 series to match different load levels.

Pipe clamps
For PAM-GLOBAL® Pipes DN 50 to 150 we recommended Series 5 Pipe Clamps with M12 thread connections, and possibly also M8 for up to DN 100. Rainwater pipes and waste water that is under pressure should be secured with Series 6 and 7 Pipe Clamps with M16 threaded rods.

PAM-GLOBAL® Downpipe Supports must be secured with the corresponding supports and finished consoles.

Pressurized PAM-GLOBAL® Pipelines
Waste-water pipes without longitudinal frictional connections that are subject to internal pressure loads must be secured against being pressed apart or pushed out of axial alignment. The required longitudinal frictional connection can be achieved with PAM-GLOBAL® Claws. Please refer to the corresponding pages for application instructions.



Pipe route: side plan view

Pipe route: top plan view

All dimensions in mm

Connections

Old cast iron / Current range in cast iron

Existing networks		New networks		PAM-SMU® ranges
DE	dn	DN	DE	Joining components
64	54	75	83	Stepping ring 156495 + SMU RAPID coupling 157638
77	67	75	83	Stepping ring 156494 + SMU RAPID coupling 157638
91	81	75	83	Flexible fitting 155001
91	81	100	110	Stepping ring 156555 + SMU RAPID coupling 157641
104	94	100	110	Flexible coupling 155002
118	108	100	110	Flexible coupling TXB 10NPOI
145	135	150	135	Flexible coupling 155003
145	135	125	160	Flexible coupling TXB 12NLOG
172	162	150	160	Flexible coupling TXB 15NMOJ
172	162	200	210	Flexible coupling 155004
197	189	200	210	Flexible coupling TXB 20NNOK
226	216	200	210	Flexible coupling TXB 20NLOK

Other materials / Current range in cast iron

Existing networks		Cast iron networks		PAM-SMU® ranges	Cast iron networks	
DE	Material	DN	DE	Joining components	DN	DE
32	PVC/PE	50	58	Universal plug 156394	50	58
		75	83	Universal plug 156492	75	83
		100	110	Universal plug 156628	100	110
40	PVC/PE	50	58	Universal plug 156394	50	58
		75	83	Universal plug 156492	75	83
		100	110	Universal plug 156628	100	110
50	PVC/PE	50	58	Stepping ring 156399 + SMU RAPID coupling 157635	50	58
		75	83	Universal plug 156492	75	83
		100	110	Universal plug 156628	100	110
63	PE	75	83	Stepping ring 156495 + SMU RAPID coupling 157638		
75	PVC/PE	75	83	Stepping ring 156494 + SMU RAPID coupling 157638		
90	PVC/PE	100	110	Stepping ring 156555 + SMU RAPID coupling 157641		
100	PVC	100	110	Stepping ring 156635 + SMU RAPID coupling 157641		
110	PVC/PE	100	110	SMU RAPID coupling 157641		
125	PVC/PE	125	135	Stepping ring 156778 + SMU RAPID coupling 157645		
160	PVC/PE	150	160	SMU RAPID coupling 157648		
200	PVC/PE	200	210	Stepping ring 157000 + SMU RAPID coupling 157650		
250	PVC/PE	250	274	Stepping ring 157085 + SMU RAPID coupling 157087		

For the cast iron materials, the DN correspond to the internal diameter
For the synthetic materials, the DN correspond to the external diameter

Connections

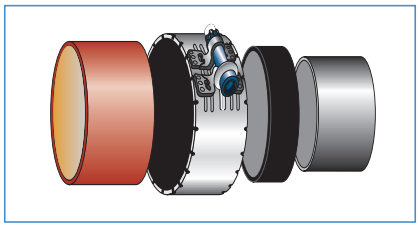
Universal plugs

Elastomer plugs 1 or 2 inlets for the PAM-SMU® S ranges – DN 50, 75 and 100 – are installed with stainless steel collar that is provided.

The 3 inlets plug for the DN 100 PAM-SMU® S ranges does not need stainless steel collar, except in the event of significant misalignment of the inlets. No stainless steel collar 5 provided.

Stepping rings

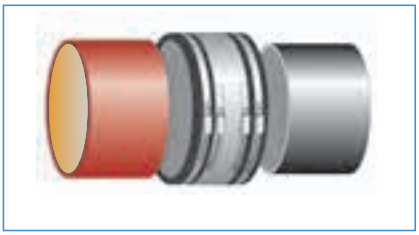
These rings are only used with the PAM-SMU® RAPID 2 couplings. They are installed on the end of PVC, polyethylene and stainless steel pipes or in case of DN 70-75 connection and put their external diameter at the level of SMU® pipes diameters. No lubricant is necessary.
See page 70 for details.



Other adapting components

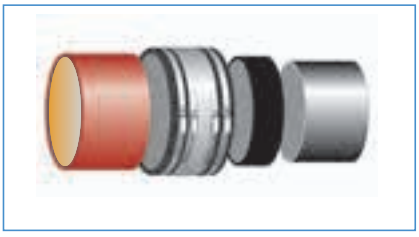
Flexible couplings

References	DN SMU®	Mini external diameter to connect	Maxi external diameter to connect
155001	75	75	90
155002	100	100	115
TXB 10NP01	100	110	121
TXB 12NLOG	125	130	150
TXB 15NMOJ	150	150	175
TXB 20NLOK	200	200	225



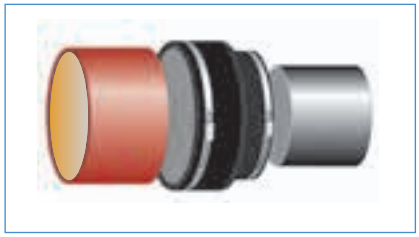
Flexible coupling + stepping ring

References	DN SMU®	Mini external diameter to connect	Maxi external diameter to connect
TXB 20NNOK	200	192	201



Flexible and stepping couplings

References	DN SMU®	Mini external diameter to connect	Maxi external diameter to connect
155003	150	130	145
155004	200	170	193



Nature of stainless steel collars and screws: stainless steel A.I.S.I. 304
Nature of the elastomer: EPDM

Maximal accidental pressure:
flexible coupling: 1.5 bar
fitting: 0.6 bar

For the synthetic materials, the DN correspond to the external diameter

PAM-GLOBAL® S
PAM-SMU® S
PAM-SMU® Plus

Technical specifications

PAM-SMU® S and PAM-SMU® Plus short pipes with access door

The resistance of short pipes with access door to the accidental pressure is:

- 5 bar maximum for the DN 50 to 200
- 3 bar maximum for the DN 250 and 300

PAM-SMU® S and PAM-SMU® Plus expansion plugs

The resistance of the expansion plug to an accidental pressure is 0.2 bar without any additional devices.
If it is necessary, the bolting of this plug is realised by a specific grip collar.

Expansion plug resistance to end thrust bolted like this is:

- 5 bar maximum for the DN 50 to 200
- 3 bar maximum for the DN 250 and 300

Weights of PAM-SMU® S pipes (L=3m) in kg

	DN											
SMU® S	40	50	75	100	125	150	200	250	300	400	500	600
Empty pipe	8.9	12.5	18.2	24.3	34.3	40.9	67.4	97.3	126.8	177.7	244.9	321.9
Full pipe	12.7	18.4	31.5	47.9	71.1	93.9	161.6	244.6	338.9	554.7	833.9	1170.1

Developed surface of PAM-SMU® S pipes (in m²/linear meter of pipe)

SMU® S	50	75	100	125	150	200	250	300	400	500	600
Full pipe	0.18	0.26	0.35	0.42	0.50	0.66	0.86	1.02	1.34	1.67	1.99

Rot repair paint of PAM-SMU® S

- density of the painting in jar: 1.2 kg/l
- superficial and theoretical efficiency: 4.4 m²/l to obtain a film of 100 microns.

References SMU®	weight
156340	0.80
156412	5.00

Finishing paint of PAM-SMU® S

It is recommended to use a painting of “alkyd” or “glycerophtalic” type

Notions of condensation on draining pipework

Condensation appears when the temperature of the evacuation pipes walls any nature is lower than the dewpoint. This happens when molten snow or cold rain runs out in pipes crossing a surrounding with strong hygrometry. The possible regulation of preventive solutions falls within the competence of the engineering and design department, after taking specificity the building site into account.
According to the anticipated results and the requirements as regards fire protection of building, solutions such as: mineral wool, anti-condensation painting or finally, insulating strip can be considered.

Technical specifications

Discharge capability of PAM-GLOBAL® S pipes according to DIN EN 877 and DIN 19522

Filling level 50 % (*h/d*=0.5)

	DN 70		DN 75		DN 100		DN 125		DN 150		DN 200		DN 250		DN 300	
	d_i = 71		d_i = 75		d_i = 103		d_i = 127		d_i = 152		d_i = 200		d_i = 263		d_i = 314	
J	Q	v	Q	v	Q	v	Q	v	Q	v	Q	v	Q	v	Q	v
cm/m	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s
0.5	0.8	0.4	0.9	0.4	2.1	0.5	3.7	0.6	6.0	0.7	12.5	0.8	25.8	1.0	41.3	1.1
0.6	0.9	0.4	1.0	0.4	2.3	0.6	4.1	0.6	6.6	0.7	13.7	0.9	28.3	1.0	45.3	1.2
0.7	0.9	0.5	1.1	0.5	2.5	0.6	4.4	0.7	7.1	0.8	14.8	0.9	30.6	1.1	48.9	1.3
0.8	1.0	0.5	1.1	0.5	2.7	0.6	4.7	0.7	7.6	0.8	15.8	1.0	32.7	1.2	52.3	1.4
0.9	11	0.5	1.2	0.6	2.9	0.7	5.0	0.8	8.1	0.9	16.8	1.1	34.7	1.3	55.5	1.4
1.0	1.1	0.6	1.3	0.6	3.0	0.7	5.3	0.8	8.5	0.9	17.7	1.1	36.6	1.3	58.5	1.5
1.1	1.2	0.6	1.4	0.6	3.2	0.8	5.5	0.9	8.9	1.0	18.6	1.2	38.4	1.4	61.4	1.6
1.2	1.2	0.6	1.4	0.6	3.3	0.8	5.8	0.9	9.4	1.0	19.4	1.2	40.1	1.5	64.2	1.7
1.3	1.3	0.6	1.5	0.7	3.4	0.8	6.0	1.0	9.7	1.1	20.2	1.3	41.8	1.5	66.8	1.7
1.4	1.3	0.7	1.5	0.7	3.6	0.9	6.3	1.0	10.1	1.1	21.0	1.3	43.4	1.6	69.3	1.8
1.5	1.4	0.7	1.6	0.7	3.7	0.9	6.5	1.0	10.5	1.2	21.7	1.4	44.9	1.7	71.8	1.9
1.6	1.4	0.7	1.6	0.7	3.8	0.9	6.7	1.1	10.8	1.2	22.4	1.4	46.4	1.7	74.1	1.9
1.7	1.5	0.7	1.7	0.8	3.9	0.9	6.9	1.1	11.1	1.2	23.1	1.5	47.8	1.8	76.4	2.0
1.8	1.5	0.8	1.7	0.8	4.1	1.0	7.1	1.1	11.5	1.3	23.8	1.5	49.2	1.8	78.7	2.0
1.9	1.5	0.8	1.8	0.8	4.2	1.0	7.3	1.2	11.8	1.3	24.5	1.6	50.6	1.9	80.8	2.1
2.0	1.6	0.8	1.8	0.8	4.3	1.0	7.5	1.2	12.1	1.3	25.1	1.6	51.9	1.9	82.9	2.1
2.5	1.8	0.9	2.0	0.9	4.8	1.2	8.4	1.3	13.5	1.5	28.1	1.8	58.0	2.1	92.8	2.4
3.0	1.9	1.0	2.2	1.0	5.3	1.3	9.2	1.5	14.8	1.6	30.8	2.0	63.6	2.3	101.7	2.6

Filling level 70 % (*h/d*=0.7)

	DN 70		DN 75		DN 100		DN 125		DN 150		DN 200		DN 250		DN 300	
	d_i = 71		d_i = 75		d_i = 103		d_i = 127		d_i = 152		d_i = 200		d_i = 263		d_i = 314	
J	Q	v	Q	v	Q	v	Q	v	Q	v	Q	v	Q	v	Q	v
cm/m	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s
0.5	1.3	0.4	1.5	0.5	3.6	0.6	6.2	0.7	10.1	0.7	20.8	0.9	43.1	1.1	68.9	1.2
0.6	1.4	0.5	1.7	0.5	3.9	0.6	6.8	0.7	11.0	0.8	22.9	1.0	47.2	1.2	75.5	1.3
0.7	1.6	0.5	1.8	0.5	4.2	0.7	7.4	0.8	11.9	0.9	24.7	1.1	51.1	1.3	81.6	1.4
0.8	1.7	0.6	1.9	0.6	4.5	0.7	7.9	0.8	12.7	0.9	26.4	1.1	54.6	1.3	87.3	1.5
0.9	1.8	0.6	2.1	0.6	4.8	0.8	8.4	0.9	13.5	1.0	28.1	1.2	58.0	1.4	92.6	1.6
1.0	1.9	0.6	2.2	0.7	5.1	0.8	8.8	0.9	14.3	1.1	29.6	1.3	61.1	1.5	97.6	1.7
1.1	2.0	0.7	2.3	0.7	5.3	0.9	9.3	1.0	15.0	1.1	31.0	1.3	64.1	1.6	102.4	1.8
1.2	2.0	0.7	2.4	0.7	5.5	0.9	9.7	1.0	15.6	1.2	32.4	1.4	67.0	1.6	107.0	1.8
1.3	2.1	0.7	2.5	0.7	5.8	0.9	10.1	1.1	16.3	1.2	33.8	1.4	69.7	1.7	111.4	1.9
1.4	2.2	0.7	2.6	0.8	6.0	1.0	10.5	1.1	16.9	1.2	35.0	1.5	72.4	1.8	115.6	2.0
1.5	2.3	0.8	2.7	0.8	6.2	1.0	10.9	1.1	17.5	1.3	36.3	1.5	74.9	1.8	119.7	2.1
1.6	2.4	0.8	2.7	0.8	6.4	1.0	11.2	1.2	18.1	1.3	37.5	1.6	77.4	1.9	123.7	2.1
1.7	2.4	0.8	2.8	0.9	6.6	1.1	11.6	1.2	18.6	1.4	38.6	1.6	79.8	2.0	127.5	2.2
1.8	2.5	0.8	2.9	0.9	6.8	1.1	11.9	1.3	19.2	1.4	39.8	1.7	82.1	2.0	131.2	2.3
1.9	2.6	0.9	3.0	0.9	7.0	1.1	12.2	1.3	19.7	1.5	40.9	1.7	84.4	2.1	134.8	2.3
2.0	2.7	0.9	3.1	0.9	7.2	1.2	12.5	1.3	20.2	1.5	41.9	1.8	86.6	2.1	138.3	2.4
2.5	3.0	1.0	3.4	1.0	8.0	1.3	14.0	1.5	22.6	1.7	46.9	2.0	96.9	2.4	154.7	2.7
3.0	3.3	1.1	38	1.1	8.8	1.4	15.4	1.6	24.8	1.8	51.4	2.2	106.1	2.6	169.6	2.9

Filling level 100 % (*h/d*=1.0)

	DN 70		DN 75		DN 100		DN 125		DN 150		DN 200		DN 250		DN 300	
	d_i = 71		d_i = 75		d_i = 103		d_i = 127		d_i = 152		d_i = 200		d_i = 263		d_i = 314	
J	Q	v	Q	v	Q	v	Q	v	Q	v	Q	v	Q	v	Q	v
cm/m	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s
0.5	1.6	0.4	1.8	0.4	4.2	0.5	7.4	0.6	12.0	0.7	24.9	0.8	51.6	1.0	82.6	1.1
0.6	1.7	0.4	2.0	0.4	4.7	0.6	8.2	0.6	13.2	0.7	27.4	0.9	56.6	1.0	90.5	1.2
0.7	1.9	0.5	2.1	0.5	5.0	0.6	8.8	0.7	14.2	0.8	29.6	0.9	61.2	1.1	97.8	1.3
0.8	2.0	0.5	2.3	0.5	5.4	0.6	9.4	0.7	15.2	0.8	31.6	1.0	65.4	1.2	104.6	1.4
0.9	2.1	0.5	2.4	0.6	5.7	0.7	10.0	0.8	16.2	0.9	33.6	1.1	69.4	1.3	111.0	1.4
1.0	2.2	0.6	2.6	0.6	6.0	0.7	10.6	0.8	17.1	0.9	35.4	1.1	73.2	1.3	117.1	1.5
1.1	2.3	0.6	2.7	0.6	6.3	0.8	11.1	0.9	17.9	1.0	37.1	1.2	76.8	1.4	122.8	1.6
1.2	2.4	0.6	2.8	0.6	6.6	0.8	11.6	0.9	18.7	1.0	38.8	1.2	80.3	1.5	128.3	1.7
1.3	2.5	0.6	2.9	0.7	6.9	0.8	12.1	1.0	19.5	1.1	40.4	1.3	83.6	1.5	133.6	1.7
1.4	2.6	0.7	3.1	0.7	7.2	0.9	12.5	1.0	20.2	1.1	41.9	1.3	86.7	1.6	138.7	1.8
1.5	2.7	0.7	3.2	0.7	7.4	0.9	13.0	1.0	20.9	1.2	43.4	1.4	89.8	1.7	143.6	1.9
1.6	2.8	0.7	3.3	0.7	7.7	0.9	13.4	1.1	21.6	1.2	44.9	1.4	92.8	1.7	148.3	1.9
1.7	2.9	0.7	3.4	0.8	7.9	0.9	13.8	1.1	22.3	1.2	46.3	1.5	95.6	1.8	152.9	2.0
1.8	3.0	0.8	3.5	0.8	8.1	1.0	14.2	1.1	22.9	1.3	47.6	1.5	98.4	1.8	157.3	2.0
1.9	3.1	0.8	3.6	0.8	8.3	1.0	14.6	1.2	23.6	1.3	48.9	1.6	101.1	1.9	161.7	2.1
2.0	3.2	0.8	3.7	0.8	8.6	1.0	15.0	1.2	24.2	1.3	50.2	1.6	103.8	1.9	165.9	2.1
2.5	3.5	0.9	4.1	0.9	9.6	1.2	16.8	1.3	27.1	1.5	56.2	1.8	116.1	2.1	185.6	2.4
30	3.9	1.0	4.5	1.0	10.5	1.3	18.4	1.5	29.7	1.6	61.6	2.0	127.2	2.3	203.3	2.6

SAINT GOBAIN Cast Iron Soil and Drain Pipelines Worldwide

Europe

Belgium	Military Hospital, Brussels
Cyprus	New Famagusta Hospital
Denmark	Mariott Hotel, Copenhagen
Finland	Nokia Office Center, Helsinki
France	Stade de France, Paris
Germany	World Exhibition Center, Hannover
Great Britain	Kings Cross House, London
Greece	2004 Olympics Broadcasting Center
Ireland	Dublin Castle Renovation
Iceland	Smardlind Shopping Center
Italy	Mont-Blanc Tunnel, Courmayeur
Luxembourg	General Bank of Luxembourg
Malta	Stock Exchange, Valetta
Netherlands	Tramway Tunnel, The Hague
Norway	Oslo Central Station
Portugal	Expo 1998 Building, Lisboa
Spain	Olympic Village, Barcelona
Sweden	Stockholm Sky City

Eastern Europe

Bosnia	Astra Hotel, Sarajevo
Bulgaria	Sofia Airport Building
Croatia	Research Institute, Pliva
Czech Republic	Four Seasons Hotel, Prague
Estonia	Raddison SAS Hotel, Talin
Hungary	Parliament Building, Budapest
Kazakhstan	Intercontinal Hotel, Almata
Latvia	National Park, Riga
Lithuania	President Residence, Vilnius
Macedonia	Academy of Science and Art, Skopje
Moldavia	Chisinau Airport Building
Poland	Daewo Center, Warshaw
Romania	Sofitel Hotel, Bucharest
Russia	Gazpron Tower, Moscow
Slovenia	Brigde over Triska Bistrica, Ljubljana
Turkmenistan	Justice Ministry, Ashgabat
Ukraine	Reko Hotel, Kiev
Uzbekistan	Cigarettes Factory Building BAT

Africa

Algeria	Finance Ministry, Algiers
Egypt	National Telecom Building, Cairo
Marocco	Hassan II Mosque, Casablanca
Niger	Gawage Hotel, Niamey
Nigeria	New Airport, Lagos
South Africa	Constitutional Court, Johannesburgh
Tchad	Five Star Hotel, N'Djamena
Tunisia	Sheraton Hotel, Hammamet

Middle East

Jordan	Queen Alia Hospital
Kuwait	Meridien Hotel
Lebanon	Möwenpick Hotel
Oman	Hilton Hotel, Salalaah
Qatar	Intercontinental Hotel, Doha
Saudi Arabia	Palace Conference Center, Ryadh
Syria	Damas University
Turkey	Sheraton Hotel, Ankara
United Arab Emirates	Bur Juman Center, Dubai
Pakistan	Karachi Airport Terminal

Asia

China	Jin Mao Tower, Shangai
Hong-Kong	International Finance Center Tower
Indonesia	Jakarta International Airport
Macau	Macau Tower
Philippines	Pacific Plaza Tower
Singapore	Esplanade Theatre
Sri Lanka	Kelanitissa Cycle Power Plant
Taiwan	Der-Shing Baseball Stadium
Vietnam	Hanoi Opera Hilton Hotel

America

Argentina	Newspaper Diario de La Nacion
Brasil	Copacabana Palace Hotel, Rio
Mexico	French Embassy
Paraguay	Hotel Ascencion
Venezuela	Caracas Metro

Australia

2000 Olympic Stadium, Sydney
Eureka Tower, Melbourne

New Zealand

Ascot Integrated Hospital, Auckland

Grand Hotel Mercure, Sao Paulo
Architects: Setin Empreend Imobiliaros Ltda.
▼

▲ Edificio Plaza Centenario, Sao Paulo
Architects: Centenario

Colombo, Commercial Centre, Lisbon, Portugal
Architects: Jose Manuel Quintela da Fonseca

Shanghai Pudong, Airport, China
Architects: ADP-ECADI

Edificio United Building, Sao Paulo
Architects: JHS

Stade de France, Paris, France
Architects: Macari Zublena, Regembal and Constantini
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