

Specialist Drainage Systems

dB*lue* Acoustic Soil & Waste System

Specification manual
2015

Drainage is ever more called upon to go beyond basic waste water disposal. Vertical living and increased living standards have made acoustic comfort increasingly more important. It requires a solution beyond what has been traditionally available.

This is specialist drainage.

In this Specification Manual you will find the complete dBlue Acoustic Soil & Waste product range. It is the latest addition to the Akatherm range of Specialist Drainage Systems.

The Akatherm dBlue system is made from a state-of-the-art combination of plastic and sound absorbing mineral filler (PP-MD) to maximise absorbance of sound. It offers a unique combination of acoustic performance, weight, resistance and mechanical strength.

In addition to pipes, fittings, connection fittings, transition fittings and traps, you will find all required information on acoustic performance, planning and design, installation, bracketing and relevant standards and approvals.

This manual also comprises substantial technical details of the material properties and chemical resistance of the Akatherm dBlue system. It will assist you with the application, design and installation.

Enjoy Silence with the Akatherm dBlue Acoustic Soil & Waste System.



Applicability

This Specification Manual is applicable for installations with under slab soil & waste systems.

Validity


This Specification Manual is valid from September 2015. With the appearance of this manual previous manuals are no longer valid. The actual technical documentation can be downloaded at www.akatherm.com.


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This Specification Manual is produced with extreme care. All measurements and weights are approximate and errors and changes reserved. Akatherm BV does not accept any liability for damage caused by not or incorrect mentioned data in this manual.

Important information and pictograms

This manual contains pictograms to emphasize important or beneficial information.

 Important information to take into account

 Consult the Akatherm dBlue Sales Office

 Benefit

Disclaimer

Follow all applicable national and international assembly, installation, accident prevention and safety regulations. Furthermore follow the information in this Specification Manual during the installation of drainage systems.

Also follow the applicable laws, standards, guidelines, regulations and instructions for environmental protection, professional associations and the local utility companies.

Applications not covered in this Specification Manual (special applications) require consultation with our technical department. For specific advice consult the Akatherm dBlue Sales Office.

The planning and installation instructions are directly related to the respective Akatherm dBlue products. The reference to standards or regulations is on a general level. Be aware of the current status of guidelines, standards and regulations. Other standards, regulations and guidelines regarding the planning, installation and operation of drainage or building systems need to be taken into account also and are not part of this Specification Manual.

Safety and operating instructions

- Read the safety and operating instructions completely for your own safety and the safety of others before the start of installation
- Store these instructions and keep them available
- If the safety instructions or installation instructions are unclear, please contact the Akatherm dBlue Sales Office

General precautions

- Keep your work area clean and free of obstructing objects
- Provide adequate lighting of your work area
- Keep unauthorized persons away of tools and the work area, especially at renovations in inhabited areas
- Use only Akatherm dBlue system components. The use of non-system components can lead to leakage or other problems

During assembly

- Always read and follow the operating instructions of the used tool
- Improper use of tools can cause severe cuts, bruising or dismemberment
- Improper use of tools can damage components and cause leaks
- Pipe cutters have a sharp blade. Store and handle without risk of injury
- Note the safety distance between your hand and cutting tool when cutting the pipes
- Never grab the cutting zone of the tool or moving parts during the cutting process

Preface	1
Information and safety recommendations	2
Table of contents	3
System information	
1.1 Intended use	5
1.2 Applications	5
1.3 Triple-layer pipe	6
1.4 Uniform fittings	6
1.5 Acoustic brackets	6
1.6 Sound insulation	7
1.7 Packaging, transport and storage	7
1.8 Marking	8
1.9 Recycling	8
Approvals, standards and quality	
2.1 Approvals	9
2.2 Standards	9
2.3 Quality management	10
2.4 Warranty	10
2.5 Akatherm and Aliaxis	10
System and material properties	
3.1 Technical specifications	11
3.2 Properties and benefits	12
3.3 Chemical resistance	13
Sound insulation	
4.1 Noise in a soil & waste system	15
4.2 Sound insulation requirements	15
4.3 Sound reduction with Akatherm dBlue	16
4.4 Acoustic testing	17
Planning and design	
5.1 Relevant standards	18
5.2 Ceiling penetrations	18
5.3 Transition from downpipe to collector pipe	19
5.4 Horizontal change of direction	19
5.5 Inspection and maintenance	19
5.6 Transitions to other materials	20
5.7 Bathroom installation	21
5.8 Kitchen installation	21
5.9 Akavent high-rise design	22
5.10 Embedding Akatherm dBlue in concrete	23
5.11 Stormwater drainage and condensation	23
5.12 Professional kitchens	23
5.13 Fire protection	23
Fixing system	
6.1 Bracketing plan in the vertical stack	24
6.2 Bracketing plan in horizontal pipes	25
6.3 Support bracing	25

Installation

7.1	Shortening and chamfering	26
7.2	Jointing pipes and fittings	27
7.3	Fixing system	27
7.4	Transitions to other materials	28
7.5	Akavent	29
7.6	Floor waste gully	30
7.7	Disconnecter trap and 4-way riser	31
7.8	Embedding Akatherm dBlue in concrete	32
7.9	Fire protection	32
7.10	Using pipe remainders without a socket	32
7.11	Additions to an existing system	33
7.12	Testing	33

Product range

8.1	Dimensions	34
8.2	Abbreviations	34

Pipes

Pipe with socket	35
Pipe plain-end	36

Fittings

Sockets	37
Reducers	38
Elbows	39
Branches	40
Socket plug	43
Expansion socket	43

Traps

Floor waste gully	44
Four way riser	44
Adjustable disconnecter trap	45
P-trap	45

Transition fittings

Trap connection bend	46
Trap connection socket	46
Cast iron transition	47

Fixing material

Acoustic brackets	48
-------------------------	----

Tools & accessories

Tools & accessories	49
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1 System information

1.1 Intended use

Akatherm dBlue is an innovative noise-attenuated soil & waste drainage system, designed to be installed in accordance with EN12056. It is suitable for use in multi-occupancy applications as well as hospitals and hotels and other commercial applications, where reduced noise levels are preferred.

Akatherm dBlue is available in nominal diameters DN40 to DN200 with a full range of socketed pipes, a comprehensive range of fittings including brackets, transition adaptors as well as the Akavent high-rise solution for single stack downpipes.

- +** The system has the following features:
- Complete rubber ring joint system with excellent sound-insulation properties
 - Made from a state-of-the-art combination of polypropylene and sound absorbing mineral filler (PP-MD) for air-borne noise reduction
 - A triple layer pipe which is rigid, noise-attenuated with a smooth bore that resists incrustation and blockages
 - Dedicated dBlue brackets with rubber lining dampen vibrations and reduce structure-borne noise
 - Fast and easy installation without special equipment
 - Robust fittings that resist on-site- and transit damage
 - Installation inside the building and embedded in concrete (wrapped connections)
 - Akavent high-rise solution for single stack downpipes
 - Sustainable system which is 100% recyclable



Illustration 1.1

1.2 Applications

Akatherm dBlue is designed to be installed in accordance with EN12056. Akatherm dBlue thereby meets the requirements for use in residential and commercial buildings.

Residential buildings

Its excellent sound insulation properties result in a high noise reduction without insulation and is an ideal and cost effective alternative for insulated PVC in single and multi-occupancy buildings.

Commercial buildings

Akatherm dBlue is an innovative and professional soil & waste drainage system and its many distinct features and high quality make it suited for a wide range of commercial applications like:

- Hotels, spas, luxury resorts
- Multi occupancy buildings
- High-rise buildings
- Multi-storey buildings
- Concert halls, museums and cinemas
- Hospitals
- Office buildings
- Professional kitchens

Akatherm dBlue is designed for noise reduction and allows you to enjoy urban living with increased living standards.

- +** **No acoustic insulation required**
- Akatherm dBlue does not require additional acoustic insulation, offering many significant advantages:
- No insulation material required
 - No insulation installation time
 - Less scheduling of companies
 - Consistent acoustic results during installation lifetime
 - No unverified insulation materials
 - Faster and easier inspection
 - Faster and easier maintenance

Application parameters

The pipes, fittings and seals can be used continuously at 90°C and up to 95°C for brief periods. They are suitable for the drainage of chemically aggressive waste water with a pH value of 2 (acidic) to 12 (basic).

Behaviour in fire corresponds to B2 normal combustibility according to DIN 4102 and E according to EN 13501-1.

Akatherm dBlue is suited for installation down to -10°C.

For installations in applications not listed in this manual or with chemicals not listed in the chemical resistance list of this manual, please contact your local office for further advice.

Where not to use

Although Akatherm dBlue is very versatile, it is not a true chemical drainage system and is not recommended for industrial chemical drainage and laboratory drainage.

The preferred solution for these applications is a homogenous welded PE or PP system using butt-welding and electrofusion technology like Akatherm HDPE. See www.akatherm.com.

1.3 Triple-layer pipe

The triple-layer pipe structure is produced using the latest co-extrusion technology. Each layer has its own function optimised to reduce sound levels, increase mechanical characteristics and improve the drainage flow.

The grey inner layer improves the drainage flow with a low friction smooth surface that is abrasion resistant and resistant to high temperatures. The middle layer is mineral filled and provides the pipe its excellent air borne noise absorption as well as a high pipe stiffness. The outer layer is impact resistant, has increased UV-resistance and allows installation down to -10°C.

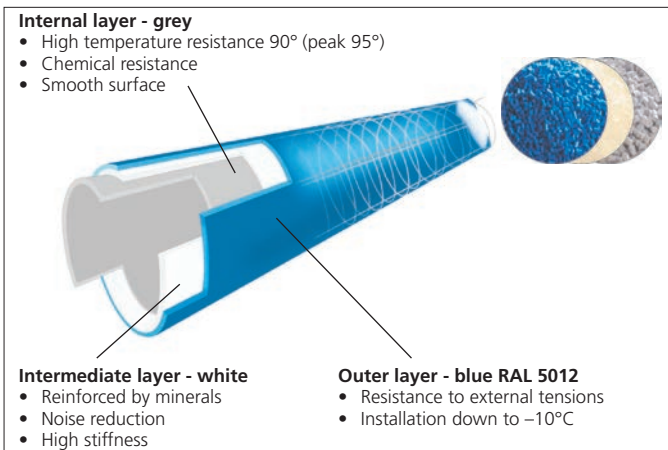


Illustration 1.2

Combined the three layers provide the dBlue system with a pipe suited for a wide range of applications.

One end of each pipe has an integrated socket with rubber ring whilst the other side has a chamfered end which makes the pipe ready to install.

1.4 Uniform fittings

The dBlue fittings have been designed for noise reduction and have many on-site benefits. All fittings are injection moulded (exceptions noted) from PP-MD in a uniform single layer. This provides the fittings with their excellent sound-insulation properties and a constant production quality. The fittings have a mat surface finish and the snap cap rubber ring containment make it a robust fitting.

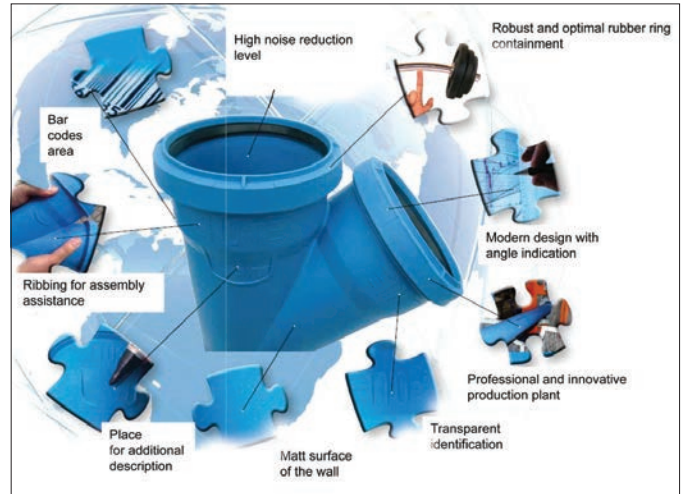


Illustration 1.3

+ Installation and inspection friendly

The snap cap contains an angle indication for correct positioning. The fitting body has a dedicated area where the installer can mark its position during pre-fabrication. The marking on the fitting is large and highly visible during inspection.

1.5 Acoustic brackets

dBlue acoustic brackets support the system and contain a rubber lining to dampen the structure-borne noise vibrations.

The bracket is a single solution for guide and anchor points in the installation. Use the provided spacers to create a guide bracket in open position. Without spacers the quick close mechanism fully tightens the bracket around the pipe to create a fixed point.

The bracket is installed to the building with a M10 connection nut firmly welded to the bracket.



Illustration 1.4

1.6 Sound insulation

Increased living standards and vertical living have shaped modern installation regulations of drainage systems. In modern urban life noise is around us all the time and this requires proven sound reduction results in each building aspect.

European Directive No.2002/49/EC describes category II as noise measured indoors: 'Building acoustics. Protection of rooms inside buildings against noise. Acceptable indoor sound level values'.

For instance the acceptable noise levels for accommodations in residential buildings, boarding schools, children's homes, care buildings, 4 and more star hotels are 35 dB during daytime and 25 dB at night.

Traditional installation systems don't offer enough acoustic performance and additional insulation is labour intensive.

+ Akatherm dBlue has been independently tested and meets the requirements without additional insulation.

1.7 Packaging, transport and storage

Packaging

Pipes up to 500 mm and fittings are packed in cardboard boxes. Where required, supplementary items in the cardboard boxes will be packed in a plastic bag.

Pipes longer than 500 mm are packed on wooden pallets and fastened with straps.

+ For optimal storage each pallet has additional support spacers (combs) installed to avoid shape deviation of the pipes. Two combs are installed for pipe lengths between 1 and 2 m, and three combs for 3 m long pipes.

The pipes are packed socket end next to spigot end for the proper shape retention.

+ All pallets are wrapped with UV resistant white plastic stretch film, shielding the pipes from UV radiation, dirt, dust and (light) rain.

Transport

Pipes and fittings still packed in their original packaging (cardboard box or pallet) must be secured against movement and deflection.

Individual lengths of pipe transported loose should be transported 'side by side': socket end next to spigot end for proper shape retention. The pipes must be firmly supported over the entire length and secured from movement and defect.

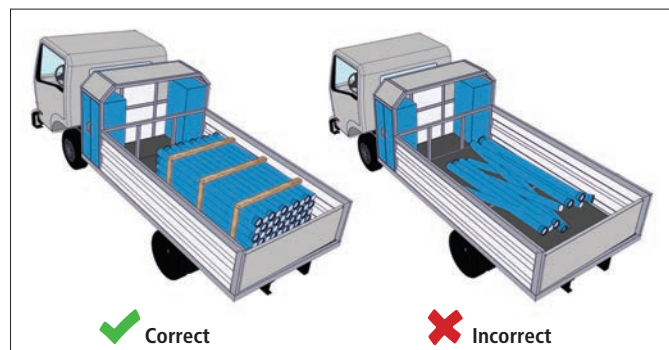


Illustration 1.5

During the transport of pipes and fittings exposure to rain and snow should be limited.

Storage

Pipes should be stored in their original lengths in stacks on a flat and clean area. Ensure that the wooden frames are aligned squarely when stacking. The first level of the stack should always be laying on the wooden blocks of the pallets.

The maximum safe height of the stack shouldn't exceed 2,5 m.

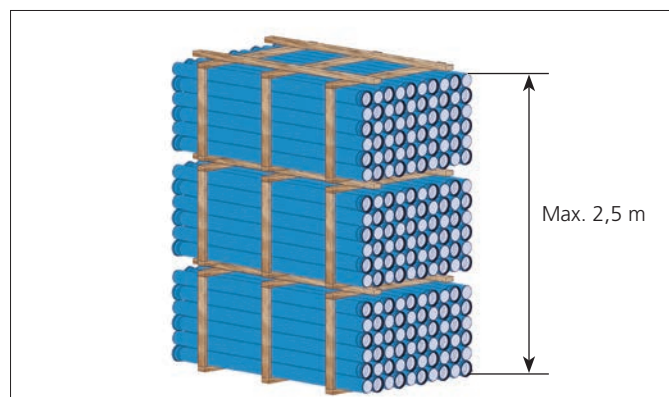


Illustration 1.6

Outside storage of pipe crates is possible when the following guidelines are followed:

- Pipes are protected from direct sunlight (with proper ventilation)
- Storage up to 12 months is possible when the pipes are kept packaged in the original UV resistance stretch foil
- Storage up to 6 months is possible when the pipes are not protected by the original UV resistance stretch film
- Storage temperature should not exceed 60°C

Pipes which have been exposed to UV radiation over a longer period of time can fade in colour. It has no negative effect on the pipe's structure and mechanical resistance.

Store pipes in such a manner that no objects are placed on top of the sockets and spigot ends to ensure that these are not deformed.

Fittings should be kept in their original packaging in a dry covered area and be protected against moisture, dirt, solids and UV radiation.

System information dBlue Acoustic Soil & Waste System

1.8 Marking

dBlue pipes and fittings are marked with:

- Manufacturer's mark or brand
- Material type
- Nominal diameter
- Area of application
- Conformity of dimensions
- Resistance to low temperatures
- Fire resistance class
- Approvals information
- Information on recycling
- Production year and month

- Production day (pipe only)
- Wall thickness (pipe only)
- Time, shift number and production line number (pipe only)

- EAN barcode (fittings only)
- Angle indication (fittings only)

1.9 Recycling

dBlue pipes and fittings are 100% recyclable.

Left over dBlue materials should be recycled as following:

- Remainder pipe : residual waste
- Remainder fittings : residual waste
- Lubrication : residual waste
- Cleaning cloths : residual waste

- Wooden crating : recycled wood
- Plastic spacers : residual waste

- Carton boxes : recycled paper



Illustration 1.7

2 Approvals, standards and quality

2.1 Approvals

Akatherm dBlue has been approved the following certification agencies:

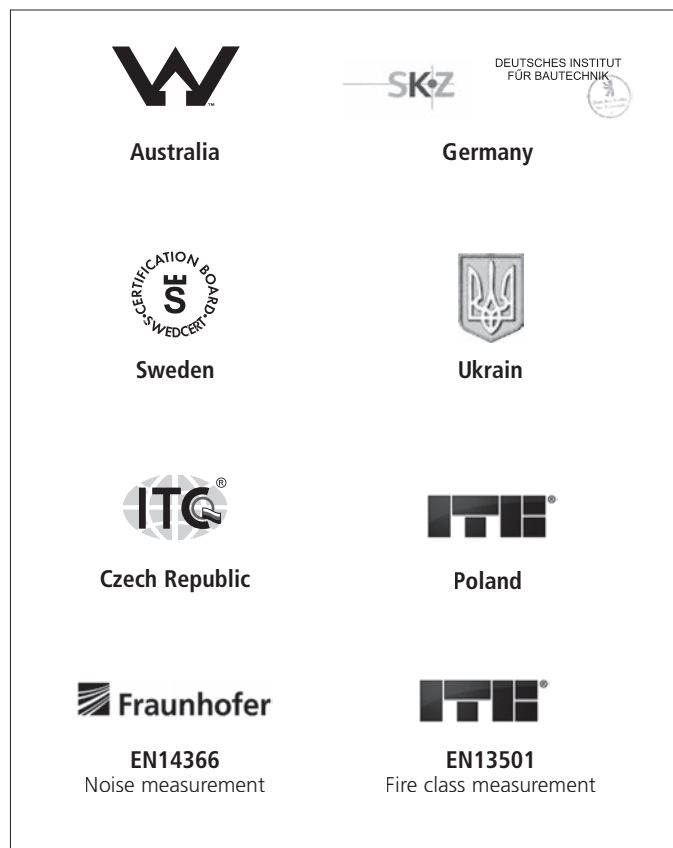


Illustration 2.1

2.2 Standards

Akatherm dBlue is a professional acoustic soil & waste drainage system and meets a number of quality and safety standards.

EN 1451

Plastic piping systems for soil and waste discharge (low and high temperature) within the building structure. Polypropylene (PP). Specifications for pipes, fittings and the system.

EN 1411

Plastic piping and ducting systems. Thermoplastic pipes. Determination of resistance to external blows by the staircase method.

EN 14366

Laboratory measurement of noise from waste water installations.

EN 13501

Fire classification of construction products and building elements.

DIN 4102

Fire behaviour of building materials and building components.

EN 1055

Plastic piping systems. Thermoplastic piping systems for soil and waste discharge inside buildings. Test method for resistance to elevated temperature cycling.

EN 1054

Plastic piping systems. Thermoplastic piping systems for soil and waste discharge. Test method for airtightness of joints.

EN 681

Elastomeric seals. Material requirements for pipe joint seals used in water and drainage applications.

2.3 Quality management

Akatherm dBlue is developed and manufactured within an ISO 9001 Quality Assurance system. It emphasises on quality care and continuous improvements for customer satisfaction.

Furthermore Akatherm has integrated the ISO 14001 environmental management system to control and improve our overall environmental performance.



Illustration 2.2

2.4 Warranty

Akatherm guarantees the proper functioning of your drainage system by combining training upfront, technical support during construction and (if required) inspection afterwards.

All the Akatherm products have a warranty of 10 years, details are available on request.

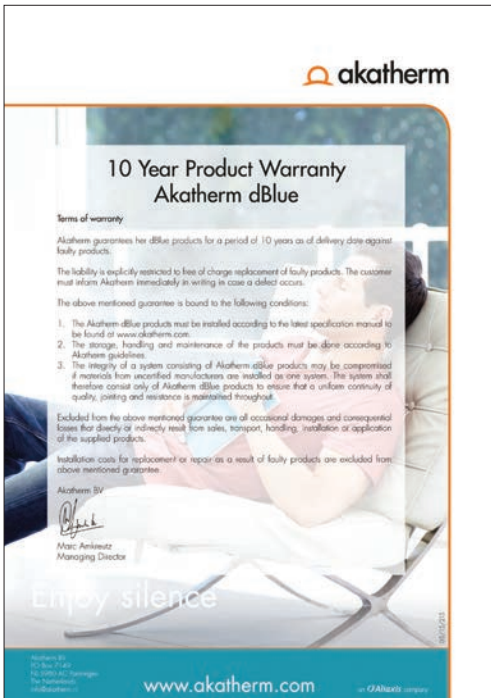


Illustration 2.3

2.5 Akatherm and Aliaxis

Akatherm is a part of Aliaxis, which is the leading producer of plastic pipe systems in the world. The Aliaxis group has over 16.000 employees and comprises of more than 100 companies with subsidiaries in 40 countries. All companies operate under their own brand and are specialized in specific solutions for building, industrial and utility applications.

Akatherm is the brand within Aliaxis focusing on specialist drainage systems in the commercial and industrial building sector. Akatherm has a global network with professional local Aliaxis support offices offering promotional, sales, supply, training and on-site support services.

3 System and material properties

The Akatherm dBlue system is made from a state-of-the-art combination of plastic and sound absorbing mineral filler (PP-MD). The material formula is developed by the Aliaxis R&D laboratory and offers a unique combination of acoustic performance, weight, resistance and mechanical strength. The triple-layer pipe structure is produced using latest co-extrusion technology. Each layer has its own function optimised to reduce sound levels, increase mechanical characteristics and improve the drainage flow.

3.1 Technical specifications

Property	Value
Material	PP-MD mineral-reinforced (pipes and fittings)
Size range	DN40 to DN200
Wall thickness	DN40-50 : 1,8 mm, DN75 : 2,3 mm, DN200 : 6,2 mm DN90 : 2,8 mm, DN110 : 3,4 mm DN125 : 3,9 mm, DN160 : 4,9 mm
Area of application	Drainage pipes in buildings and above ground installation
Chemical resistance	Polypropylene basis No waste water containing benzene Seals made of SBR
Application	Waste water with pH value 2 - 12 Waste water temperature up to 90°C (continuous load) and 95°C for brief periods
Density	Mineral filled layer: 1,4 g/cm ³
Coefficient of thermal expansion	0,10 mm/mK
Coefficient of thermal conductivity	0,25 W/mK
Ring stiffness	> 4 kN/m ²
Colour	Internal layer: light grey (RAL7040) Middle layer: cream white (natural without any dye) External layer: blue (RAL5012)
Structure	Triple-layer pipe Uniform fitting
Connection	Rubber ring joint socket with factory-installed lip sealing ring
Fire behaviour	B2 (normally inflammable) DIN 4102-1 E (normally inflammable) EN 13501-1
Standards and approvals	System tested according to EN1451. Refer to the chapter about approvals, standards and quality.
Sound insulation	0,5 l/s 13 dB 1,0 l/s 11 dB 2,0 l/s 15 dB 4,0 l/s 19 dB All tests were carried out in the accredited Institute for Building Physics Fraunhofer in Germany.
Independent monitoring	Süddeutsches Kunststoffzentrum (SKZ), Germany

Table 3.1

3.2 Properties and benefits

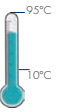
Material advantages



High noise reduction without insulation



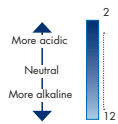
Installation possible at temperatures down to -10°C



High resistance to waste water temperatures up to 90°C (peak 95°C)



Triple layer pipe is rigid, noise-attenuated with a smooth bore that resists incrustation and blockages



High chemical resistance ranging from pH2 to pH12



Sustainable system
100% recyclable
ISO 14001 certified company

Table 3.2

System advantages



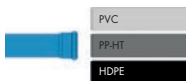
dBlue acoustic brackets with rubber lining reduce acoustic vibrations to a minimum



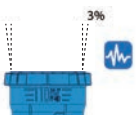
Fast installation of rubber ring joints without additional tools



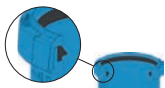
No vent stack required in multi-storey buildings using the Akavent single stack system



Transitions to PVC, PP-HT and HDPE possible without additional transition fittings required



Rubber ring joint increases flexibility of the pipe system during ground movement or earthquake



Snap cap technology with tight rubber ring containment and installation angle indication

Table 3.3

3.3 Chemical resistance

The current state of knowledge about chemical resistance of plastics is based on long-lasting laboratory tests and practical experience. The following evaluation can be an initial indicator of the possibilities of Akatherm dBlue application for fluid transportation including transport at elevated temperatures. dBlue pipes and fittings and rubber gaskets are meant for transporting waste water ranging from acids (pH 2) to alkalis (pH 12) present in households. In case of industrial waste water, its chemical composition and concentration should be analyzed. The table covers a set of chemicals and determination of Akatherm dBlue chemical resistance. The following evaluation criteria were adopted:

Used symbols:

+	Resistant: in general Akatherm dBlue is a suitable material for this application
/	Limited resistance: further research necessary
-	No resistance
Empty field	No data available

Abbreviations:

Sat. sol	Saturated aqueous solution: prepared at 20°C
Sol	Aqueous solution at a concentration higher than 10% but not saturated

Component	Concentration	Temperature		
		20°C	60°C	100°C
Acetic acid	Up to 40%	+	+	
Acetic acid	50%	+	+	/
Acetic acid, glacial	>96%	+	/	-
Acetic anhydride	100%	+		
Acetone	100%	+	+	
Acrylonitrile	100%	+		
Allyl alcohol	100%	+	+	
Ammonia, aqueous	Sat. sol	+	+	
Ammonia, dry gas	100%	+		
Ammonia, liquid	100%	+		
Ammonium acetate	Sat. sol	+	+	
Ammonium chloride	Sat. sol	+	+	
Ammonium nitrate	Sat. sol	+	+	+
Ammonium sulphate	Sat. sol	+	+	+
Aniline	100%	+	+	
Beer		+	+	
Benzene	100%	/	-	-
Benzoic acid	Sat. sol	+	+	
Borax	Sol	+	+	
Boric acid	Sat. sol	+		
Bromine, liquid	100%	-	-	-
Butane, gas	100%	+		
Butanol	100%	+	/	/
Butyl acetate	100%	/	-	-
Calcium carbonate	Sat. sol	+	+	+
Calcium nitrate	Sat. sol	+	+	
Carbon dioxide, dry gas		+	+	
Chlorine, dry gas	100%	-	-	-
Chlorine, liquid	100%	-	-	-
Chloroform	100%	/	-	-
Chlorosulphonic acid	100%	-	-	-
Chromic acid	Up to 40%	+	/	-
Citric acid	Sat. sol	+	+	+
Copper (II) chloride	Sat. sol	+	+	
Cyclohexanone	100%	/	-	-

System and material properties
dBlue Acoustic Soil & Waste System

Component	Concentration	Temperature		
		20°C	60°C	100°C
Dextrin	Sol	+	+	
Dichloroethylene (A and B)	100%	/		
Dichloromethane	100%	/	-	
Ethanolamine	100%	+		
Ethyl alcohol	Up to 95%	+	+	+
Ethyl ether	100%	+	/	
Ethylene glycol	100%	+	+	+
Formaldehyde	40%	+		
Formic acid	10%	+	+	/
Gasoline, petrol (aliphatic hydrocarbons)		-	-	-
Glycerine	100%	+	+	+
Glycolic acid	30%	+		
Hexane	100%	+	/	
Hydrochloric acid	Up to 20%	+	+	+
Hydrochloric acid	30%	+	/	/
Hydrogen peroxide	Up to 30%	+	/	
Hydrogen sulphide, dry gas	100%	+	+	
Lactic acid	Up to 90%	+	+	
Magnesium chloride	Sat. sol	+	+	
Magnesium sulphate	Sat. sol	+	+	
Milk		+	+	+
Monochloroacetic acid	>85%	+	+	
Nitric acid	Up to 30%	+	-	-
Nitric acid	From 40 to 50%	/	-	-
Oleic acid	100%	+	/	
Oleum (sulphuric acid with 60% of +o3)		+	/	
Oxalic acid	Sat. sol	+	/	-
Oxygen, gas		+		
Phenol	90%	+		
Potassium bromate	Up to 10%	+	+	
Potassium chlorate	Sat. sol	+	+	
Potassium chromate	Sat. sol	+	+	
Potassium cyanide	Sol	+		
Potassium dichromate	Sat. sol	+	+	+
Potassium ferricyanide	Sat. sol	+	+	
Potassium hydroxide	Up to 50%	+	+	+
Potassium nitrate	Sat. sol	+	+	
Potassium permanganate	(2 N) 30%	+		
Propane, gas	100%	+		
Pyridine	100%	/		
Seawater		+	+	+
Sodium chlorate	Sat. sol	+	+	
Sodium hydroxide	From 10 to 60%	+	+	+
Sodium hypochlorite	From 10 to 15%	+		
Sodium sulphite	40%	+	+	+
Sulphuric acid	Up to 10%	+	+	+
Sulphuric dioxide, dry or wet	100%	+	+	
Tartaric acid	Sat. sol	+	+	
Tin (IV) chloride	Sol	+	+	
Tin (II) chloride	Sat. sol	+	+	
Toluene	100%	/	-	-
Trichloroethylene	100%	-	-	-
Urea	Sat. sol	+	+	
Vinegar		+	+	
Wines		+	+	
Xylene	100%	-	-	-

Table 3.4

4 Sound insulation

4.1 Noise in a soil & waste system

Noise is all around us all the time. In modern urbanised life there are few places left to enjoy the comfort of silence. In many building constructions like multi-storey apartment blocks, hospitals or luxurious spas, the sound of the sanitary and drainage systems have become a significant source of noise. Modern standards require the noise to stay within acceptable limits for everyday use.

Every object in motion makes noise transmitting its vibrations to the surrounding air as pressure waves. There are two types of noise in soil & waste systems:

Air-borne noise

This is sound that travels through the air from its source. The source causes the air to vibrate. Air-borne noise can pass through structures and is reduced by using absorbent materials.

Structure-borne noise

This is sound that first occurs through a solid structure generated from a vibrating source or impact event. The vibrations pass through the structure and reach the human ear as air-borne noise at different locations within the building. The building structure acts as an acoustic bridge. Structure-borne noise is reduced by using soft material to acoustically uncouple the vibrating source or impact event.

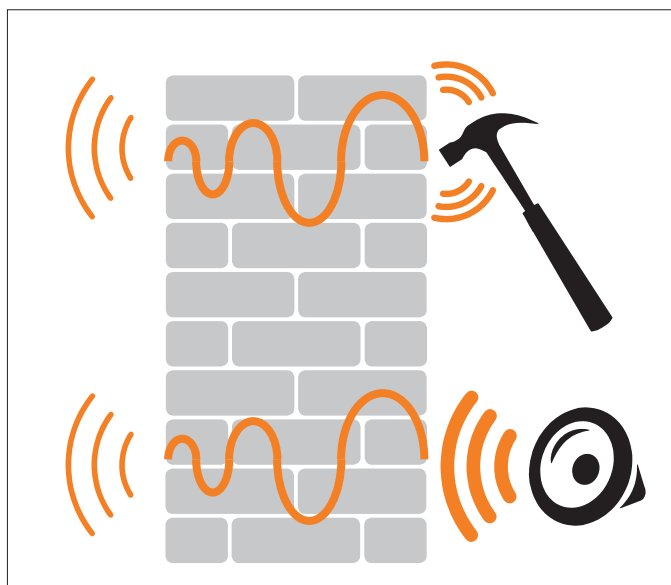


Illustration 4.1

4.2 Sound insulation requirements

The acceptable noise level that a human being can be exposed to while performing everyday activities and relaxing is described as 'the threshold noise level value'. According to the valid regulations, there are two categories of noise tests:

Category I: Noise measured outdoors, for instance a neighbouring area and open spaces. According to European Directive No.2002/49/EC (generally speaking) the acceptable noise in a built-up area during daytime is 60 dB and 50 dB at night (between 10.00 pm and 6.00 am).

Category II: Noise measured indoors. 'Building acoustics. Protection of rooms inside buildings against noise. Acceptable indoor sound level values'.

Table 4.1 presents several examples of the acceptable sound level in rooms designed for everyday stay.

Kind of room	Acceptable average noise level	
	day	night
Rooms designed for mental activities that require intense concentration	30 dB	-
Rooms in 3-star or below 3-star hotels	40 dB	30 dB
Accommodation in residential buildings, boarding schools, children's homes, old people's homes, 4 and more star hotels	35 dB	25 dB
Rooms in Intensive Medical Care Units	25 dB	25 dB
Patient's rooms in hospitals and sanatoriums except rooms in Intensive Care Units	30 dB	25 dB
Kitchens and sanitary rooms in flats	40 dB	40 dB

Table 4.1

4.3 Sound reduction with Akatherm dBlue

Noise in a soil & waste system is caused by waste water flowing inside a drainage pipe system. The waste water is turbulent and causes noise as well as vibrations in the pipe structure.

The vibrations are emitted directly from the pipe surface as air-borne noise and as structure-borne noise to the wall through the fixing system. Akatherm dBlue has been designed to reduce both air-borne and structure-borne noise.

How Akatherm dBlue reduces air-borne noise

Air-borne is reduced using absorbent materials. The plastic PP-MD used for Akatherm dBlue is a special formula adding sound-dampening mineral fillers with increased weight to maximise the absorbance of air-borne sound waves. The triple layer pipe and rubber ring joints further reduce acoustic vibration in the system.

How Akatherm dBlue reduces structure-borne noise

Structure-borne noise is reduced by using soft material to acoustically uncouple the vibrating source or impact event. The dBlue acoustic bracket has a special rubber lining designed to best uncouple any vibrations from the pipe system.

The combination of all these features is what makes Akatherm dBlue a system that takes reduction of soil & waste noise to the next level.

Non-system specific installation practice will also benefit a lower noise level, like to install the pipe systems to the heaviest wall and to properly insulate a pipe section passing through building slabs and other structural barriers.

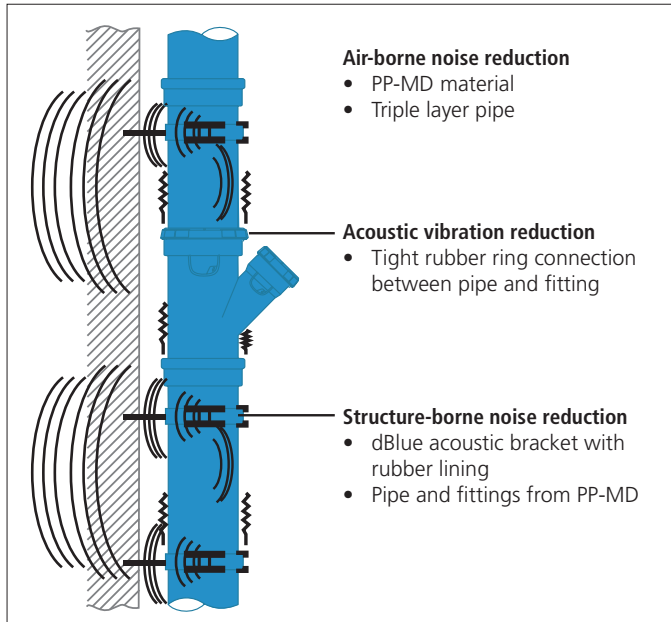


Illustration 4.2

4.4 Acoustic testing

Test and measurements of noise emitted by the Akatherm dBlue system were conducted according to the European standard EN 14366 'Laboratory measurement of noise from waste water installations'.

Illustration 4.3 presents noise measurement and its methodology inside the dBlue system. The test stand, diameters and types of components used are described in the standard. Water introduced into the system on the TF(f) floor and received on the C floor was the tested medium. Acoustic tests are conducted in rooms MR(b) and MR(f) and the least favourable boundary conditions are assumed in the comparative analysis with other soil & waste systems or other sources of noise. The boundary conditions are as follows:

- measured flow in the soil and waste system $Q = 0,5/1/2/4$ l/s
- pipe diameter DN = 110 mm (most frequent diameter)
- measurement taken on the lowest floor, in room MR(b) – room marked red in the diagram: safety standards determine and require the lowest noise levels at this point (room neighbouring the soil stack)
- partition wall – weight: 220 kg/m²

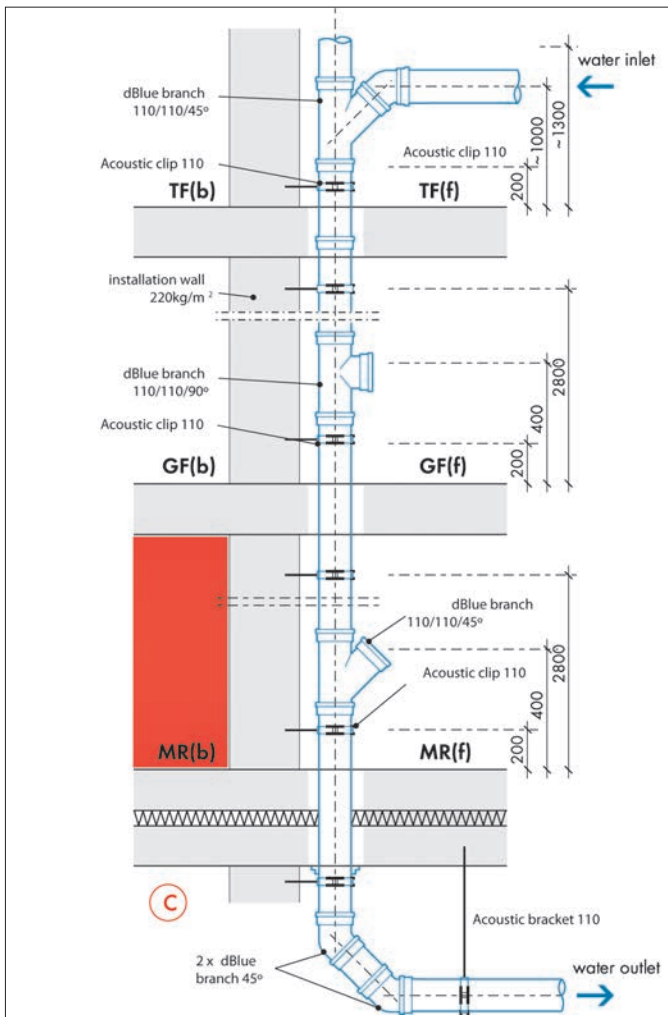


Illustration 4.3

The Akatherm dBlue system is certified at a noise transmission level of 19 dB at a water flow of 4 l/s using dBlue acoustic brackets with rubber lining. All tests were carried out in the accredited Institute for Building Physics Fraunhofer in Germany. Results are available in test report P-BA 74-3/2010e.

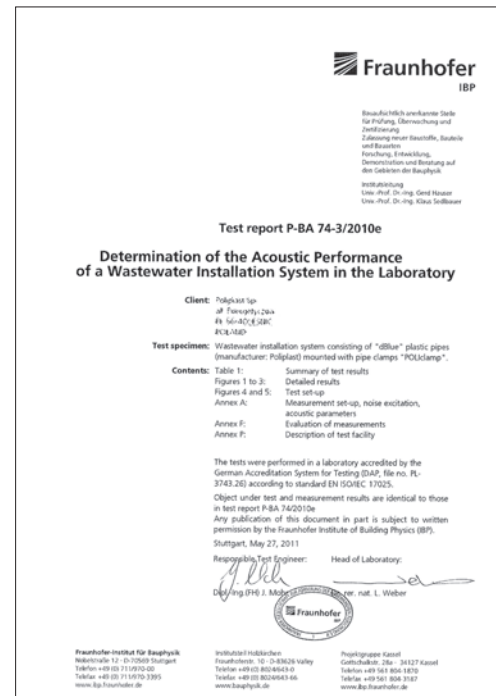


Illustration 4.4

5 Planning and design

5.1 Relevant standards

Akatherm dBlue is designed for drainage systems inside the building. The planning and design shall comply to:

- EN12056 Gravity drainage systems inside buildings
- EN1451 Plastic piping systems for soil & waste discharge (low and high temperature) within the building structure. Polypropylene (PP). Specifications for pipes, fittings and the system.

Additionally planning, design, installation and commissioning shall comply to the guidelines as specified in this manual.

Approvals

Akatherm dBlue is certified in conformity with EN1451 in many countries like Germany and Sweden.



Illustration 5.1

The certifications include all pipe and fittings from size DN40 to DN200.

For a full overview of countries and certifications, please check the chapter about approvals, standards and quality.

Fire rating

Akatherm dBlue has fire behaviour class B2 (normally inflammable) according to DIN 4102-1 and class E (normally inflammable) according to EN 13501-1. When Akatherm dBlue passes through fire-rated building elements it is mandatory to install fire protection collars that will not reduce the fire-rating of these building elements.

5.2 Ceiling penetrations

Each duct in a construction barrier must be constructed with a sleeve made of material that ensures acoustic insulation and prevents against moisture. Proper acoustic insulation will prevent an acoustic bridge through contact noise.

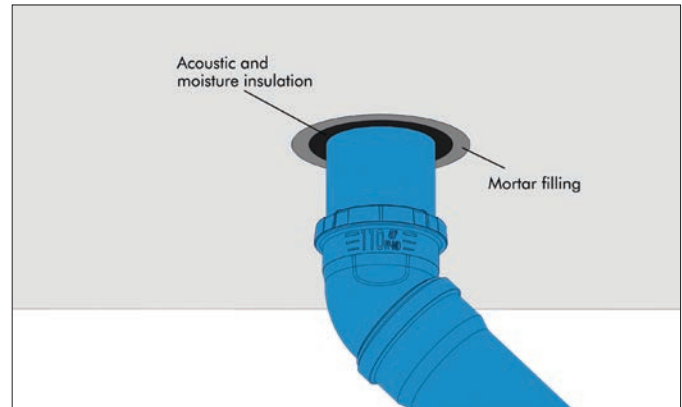


Illustration 5.2

Appropriate protective measures need to be taken when the pipe system can come into contact with hot floor coverings like mastic asphalt.

! Fire-protection may be required when the pipe system passes through fire-rated building elements.

5.3 Transition from downpipe to collector pipe

At the bottom of the vertical stack the waste water will be at its highest volume and speed. At this point the transition to horizontal must be designed using 2 x 45° fittings with a 250 mm dBlue pipe in between. This will prevent unwanted pressure spikes by allowing air to move freely in the pipe system. Furthermore a gradual transition will decrease the noise level.

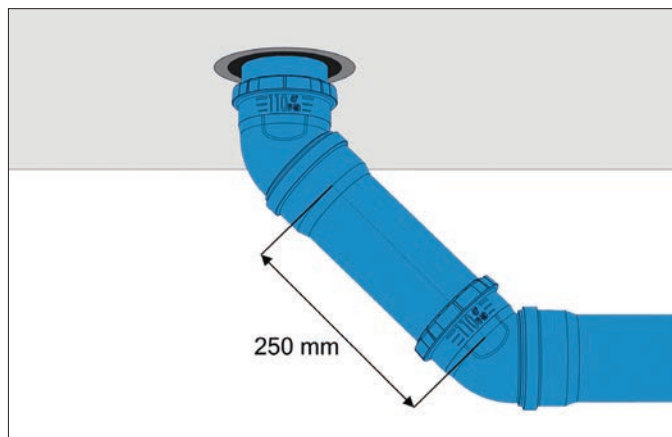


Illustration 5.3

dBlue acoustic brackets should be installed behind each socket to maximise fixation at the bottom of the stack and absorbing vibrational energy (= noise). To minimise the distance from the collector pipe to the ceiling, the top elbow can be embedded in the ceiling.

5.4 Horizontal change of direction

Ensure gradual horizontal transitions are made using two 45° elbows (or swept bend) to decrease noise levels compared to the use of a 90° elbow.

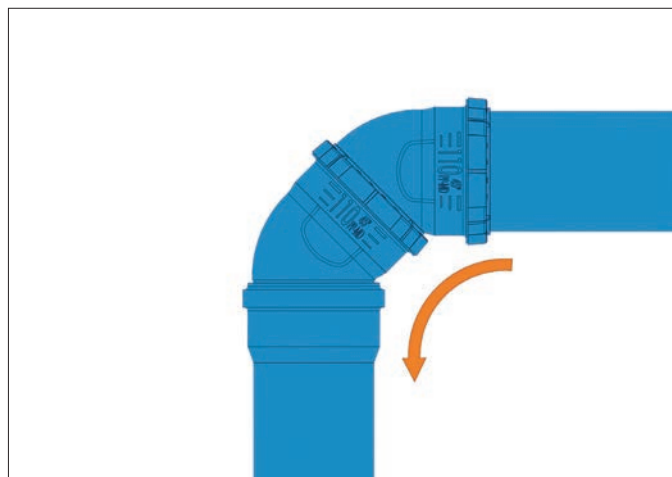


Illustration 5.4

5.5 Inspection and maintenance

Use the dBlue inspection piece for shaft inspection. Install according to EN12056 specifications.

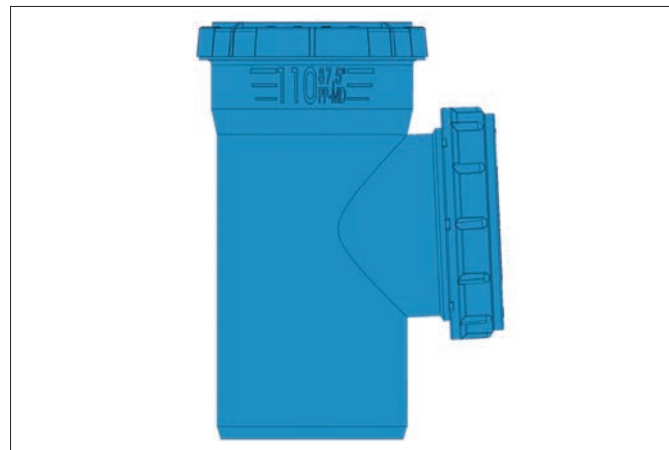


Illustration 5.5

Place the inspection piece according to the standard joint procedure and tighten the screw cap with rubber seal after installation.

Horizontal pipe inspection

A long horizontal pipe section can be cleaned at the start when the change of direction is installed using a combination of an equal branch, an elbow and an end cap.

Remove the end cap to inspect the horizontal drainage pipe. Clean if required.

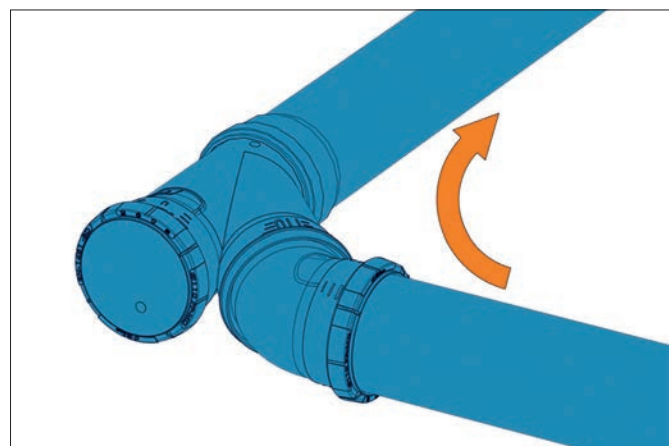


Illustration 5.6

The above illustration shows a 90° bend using a 45° equal branch and 45° degree elbow. Akatherm dBlue has branches and elbows in many angles allowing almost all direction changes.

! The dBlue end cap is pressure tested whilst inserted in fittings and can withstand regular drainage pressure spikes.

! Do not use sharp tools for shaft inspection and cleaning.

Planning and design dBlue Acoustic Soil & Waste System

5.6 Transitions to other materials

5.6.1 PVC system

PVC systems according to BS 4514 have different pipe sizes from Akatherm dBlue below DN110. Refer to table 5.1 below for PVC and dBlue pipe sizes.

PVC (BS)		Akatherm dBlue	
DN	OD (mm)	DN	OD (mm)
32	36	40	40
40	43	40	40
50	56	50	50
65	69	75	75
80	82	90	90
100	110	110	110
-		125	125
150	160	160	160

Table 5.1

Connections to and from PVC systems with non-compatible diameters are possible using adaptor fittings.

For pipe sizes d110 mm and 160 mm no adaptor fitting is required since both systems have identical outer diameters. The PVC pipe can simply be inserted into the dBlue socket using lubricant.

5.6.2 Plumbing fixture drainage fittings

Connections from plumbing fixture drainage fittings are typically with other materials. Connections to Akatherm dBlue are possible using adaptor fittings with rubber nipple, available from the Akatherm dBlue range. The pipe from the plumbing fixture is inserted into the rubber nipple. The fitting can be connected inserted into a dBlue socket using lubricant.

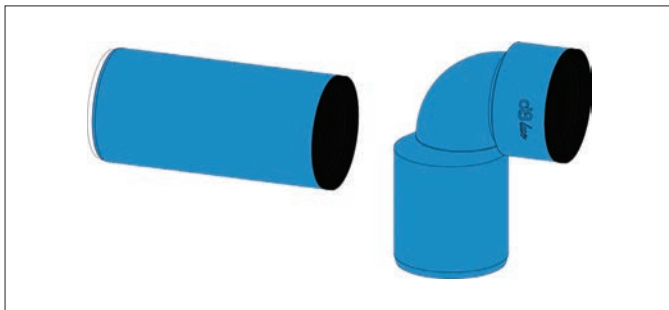


Illustration 5.7

Akatherm dBlue has a straight connection socket and a connection bend. Refer to the table below for the possible transitions available both straight and as a bend.

From size	to dBlue	Rubber nipple/spigot
DN	DN	OD (mm)
32	40	31,8/40
32	50	31,8/50
40	40	38,1/40
40	50	38,1/50

Table 5.2

5.6.3 Cast Iron system

Cast Iron systems are manufactured with different pipe sizes from Akatherm dBlue. Connections from cast iron systems with non-compatible diameters are possible using cast iron adaptor fittings with rubber ring from the Akatherm dBlue range.

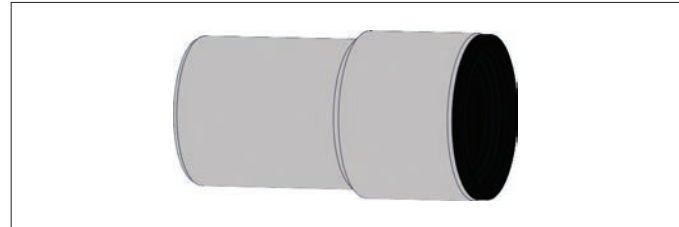


Illustration 5.8

Akatherm dBlue has a straight connection fitting to transition from cast iron to dBlue. Refer to the table below for the possible transitions.

From size	to dBlue	Rubber nipple/spigot
DN	DN	OD (mm)
50	50	58/50
75	75	78/75

Table 5.3

5.6.4 Other materials

For connections from and to other drainage pipe materials it is advised to use flexible rubber sleeve adaptors with stainless steel worm-gear clamps.



Illustration 5.9

The rubber sleeve adaptor should have the same temperature and chemical resistance as the Akatherm dBlue system.

Check the rubber sleeve manufactures guidelines for correct installation and material specifications.

5.7 Bathroom installation

Illustration 5.10 shows an example of a bathroom installation using the Akatherm dBlue system. All direction changes are done using 45° angled fittings to optimise noise reduction. The floor waste gully connects bathroom fixtures like showers, baths and washbasins (all that are not WC) using a single 75 mm trap inside the floor gully.

+ Cleaning*
The 75 mm trap is removable via the top and is accessed via the grid in the floor above. The floor gully thereby avoids the need for scheduled maintenance via the concealed ceiling like a typical PVC installation.

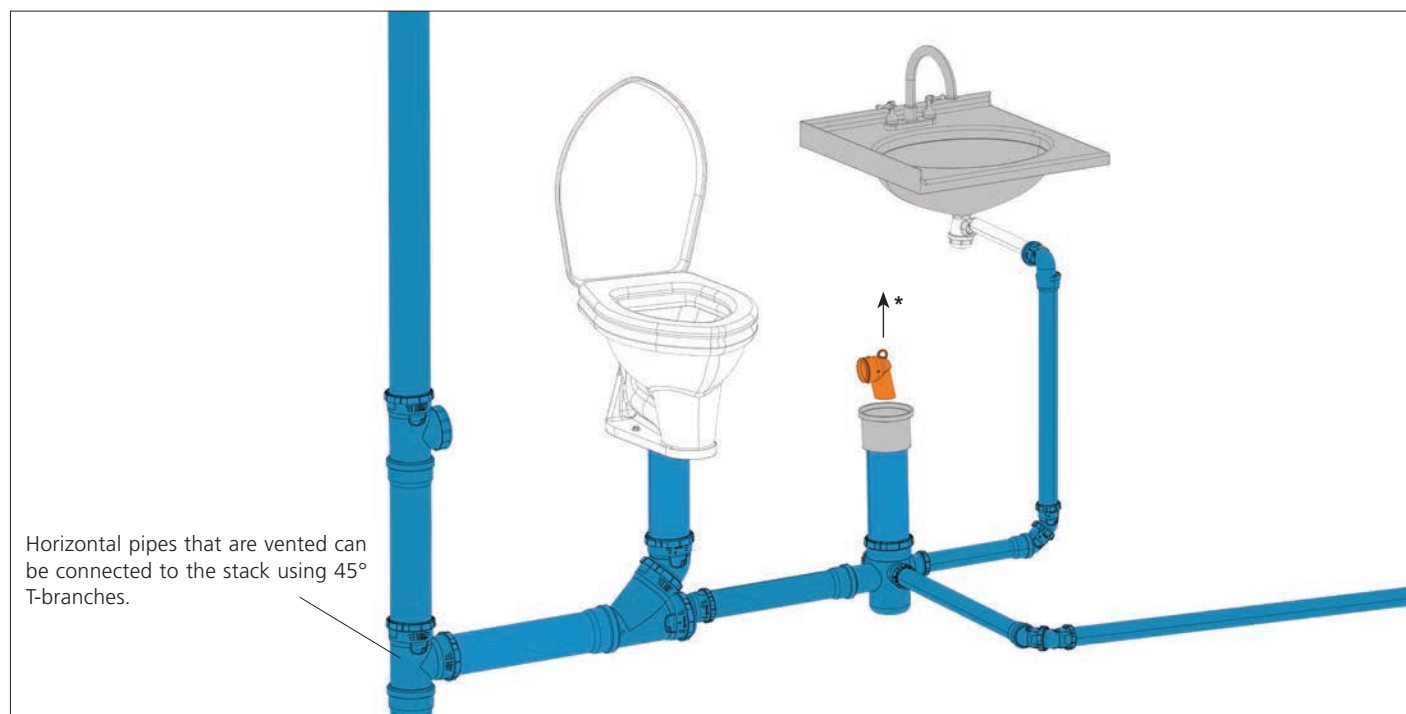


Illustration 5.10

5.8 Kitchen installation

Illustration 5.11 shows an example of a kitchen installation using the Akatherm dBlue system. All direction changes are done using 45° angled fittings to optimise noise reduction. The floor waste gully connects all kitchen fixtures like dishwashers, washing machines and washing basins using a single 75 mm trap inside the floor gully.

+ Cleaning*
The 75 mm trap is removable via the top and is accessed via the grid in the floor above. The floor gully thereby avoids the need for scheduled maintenance via the concealed ceiling like a typical PVC installation.

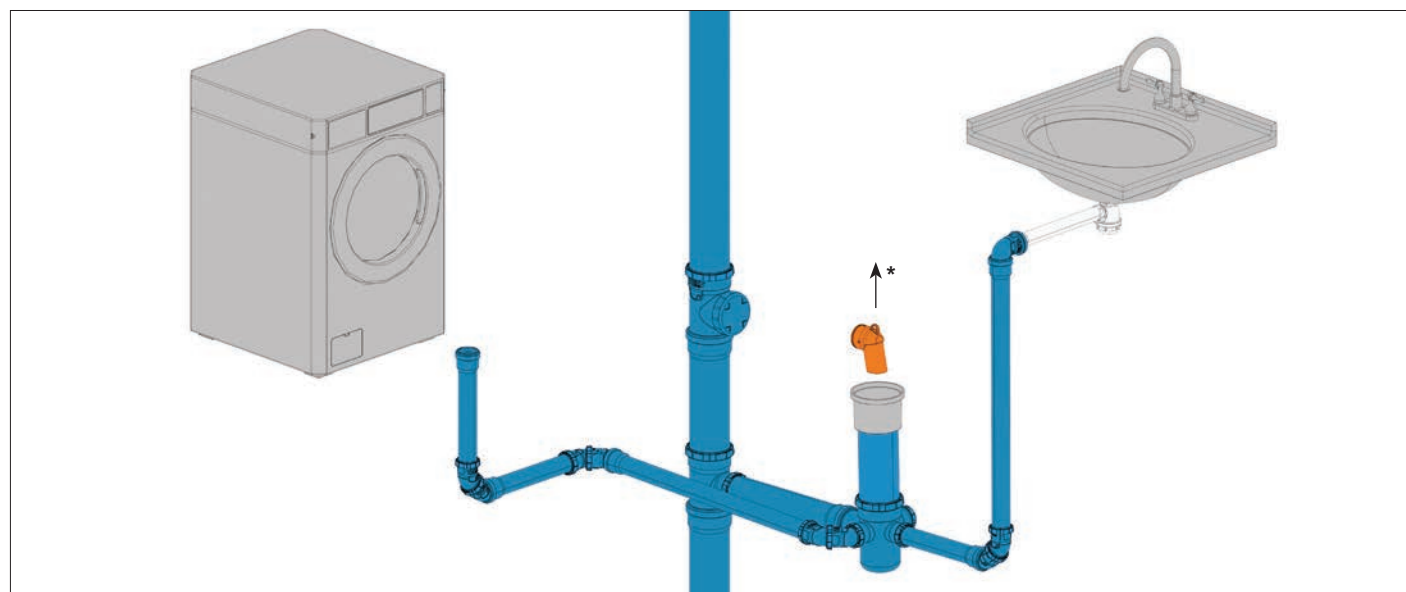


Illustration 5.11

5.9 Akavent high-rise design

5.9.1 Working principle

The Akavent aerator eliminates the requirement of a vent stack by keeping the air pressure in a single stack system within acceptable limits.

- + Eliminating the vent stack creates more usable room in the building and extra space for other installations. Furthermore the Akavent aerator increases the overall flow capacity of the stack, has less installation costs and allows multiple connection per floor.

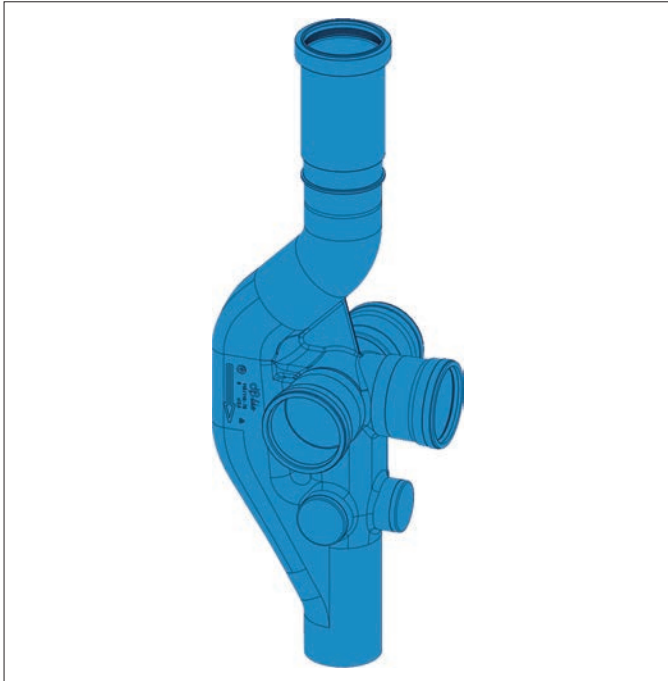


Illustration 5.12

The air pressure inside a single stack system is kept within acceptable limits by preventing the formation of hydraulic plugs. The fitting prevents hydraulic plugs by breaking the fall on each floor and reducing the speed of the soil & waste flow. Its unique shape smoothly converges the flow of each floor whilst maintaining free movement of air within the downpipe.

The Akavent aerator for Akatherm dBlue is available in DN110 mm and DN160 mm.

5.9.2 Relevant standard

The Akavent system should be designed according to EN12056 and further local regulations.

The Akavent system design information includes (but is not limited to):

- Do not reduce in size
- Maximum 5 x DN100 combined vents
- Use relief lines when offsetting the stack

This manual covers basic design information. Detailed design and calculation information is available in separate documentation.

5.9.3 Akavent system design

System elements

The Akavent system is installed without an additional vent pipe. The system consist of the following elements:

- Akavent aerator on every floor
- Akavent wrapped in sound-insulating material
- Downpipe of dBlue pipe and fittings
- A vent pipe into the atmosphere without reduction in diameter
- A vent pipe at the ground floor transition to the collector pipe

Maximum distance between Akavents

The maximum vertical distance between two Akavents is 5 m. A double offset using 4 x 45° elbows must be used when this distance is exceeded.

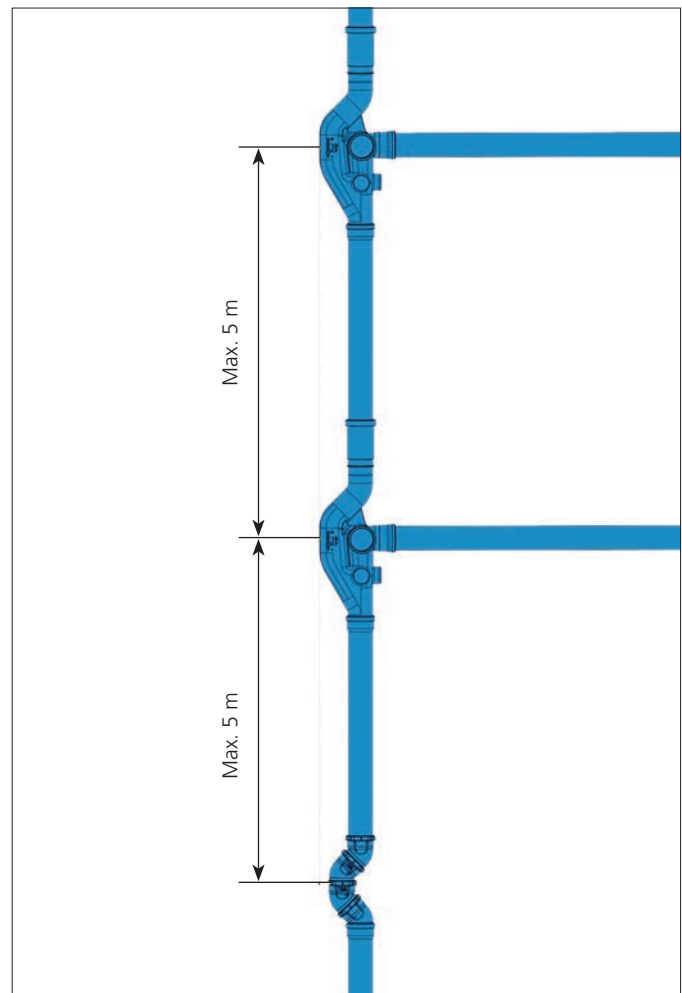


Illustration 5.13

Connecting to the Akavent

The Akavent will be available on site with all project specific connections pre-installed. Specify configuration when ordering.

The expansion socket at the top is used to insert the pipe coming from the higher floor. The bottom of the Akavent will insert into the socket of the dBlue pipe or fitting continuing down.

Floor connections can be installed into laterally placed push-fit sockets DN110 and DN75. The Akavent has three sockets available per diameter.

! Opposite lateral connections of the same diameter are not permitted.

Further important points of attention during installation can be found in the installation chapter of this manual.

Check the relevant standard for maximum length of floor drainage pipe work allowed to connect before an additional vent solution is required.

Further design instructions are available in separate documentation and include:

- Deflection of the downpipe
- First floor vent design
- Venting the Akavent downpipe into atmosphere
- Zone division of multiple downpipes

5.10 Embedding Akatherm dBlue in concrete

The Akatherm dBlue system is suited to be embedded in concrete. Certain precautions need to be taken during design and installation.

Expansion and contraction compensation

Because Akatherm dBlue and hardened concrete do not adhere, the pipe system embedded in concrete can move freely when expanding under influence of temperature changes. All fittings installed in the pipe system act as an anchor point and are subjected to the expansion force. Make sure to allow for enough expansion joints when designing the pipe system.

Pressure and heat during pouring

When the concrete is poured and is still liquid, the outer pressure can exceed the ring stiffness of the system. Furthermore quick drying concrete will undergo an exothermic reaction (a chemical reaction that is accompanied by the release of heat). The temperatures generated by the exothermic reactions can damage the system materials. Adequate protection must be provided to the Akatherm dBlue system.

To compensate for the outer pressure or the heat, the pipe system can be filled with water and closed making it an incompressible closed system.

Acoustic design

Direct contact between the Akatherm dBlue pipe system and the concrete can cause structural-borne noise. We advise to uncouple the pipe system using a wrapping sleeve made of material that ensures acoustic insulation and prevent against moisture.

! Precisely follow the installation instructions for embedding Akatherm dBlue in concrete.

5.11 Stormwater drainage and condensation

When using Akatherm dBlue for stormwater drainage, the relatively cold rainwater can cause dew condensation on the outside pipe surface within the building.

Condensation occurs when the water vapour carried in the air is deposited on a 'colder' surface. Air at a given temperature can contain only a certain amount of water vapour. If the air temperature drops when in contact with the colder pipe system, the excess amount of water vapour will then condense.

The temperature of the air at which air is saturated with water vapour is called the 'dew point'. Condensation occurs when pipework has a temperature under the dew point of the surrounding air. Condensation depends on a number of factors:

- Room temperature
- Relative humidity of the air
- Temperature of the pipe surface

Akatherm dBlue has a relatively good thermal coefficient and no condensation will occur during short periods of rain. To know exactly when and how to insulate, a h-x (Mollier) diagram and a detailed calculation has to be used.

When insulating the pipe system, use diffusion-proof closed cell insulation material. Open cell insulation has to have an impermeable outer layer.

The entire pipe network must be insulated and an insulated pipe system must always be a closed circuit. Always ensure to:

- Close all openings, cuts and transitions with sealing material
- Encasing the bracket fully and seal the transition

5.12 Professional kitchens

Greece will accumulate easier in longer pipe systems which can lead to serious blockage of the pipe system. Animal and vegetable-based oil and grease discharged by commercial kitchens are separated from the waste water by grease separators. Akatherm dBlue is very well suited to connect the discharge fixtures to the grease separator.

The use of trace heating and additional insulation may be required to reduce heat loss. The trace heating element should not exceed 45°C.

5.13 Fire protection

Akatherm dBlue has fire behaviour class B2 (normally inflammable) according to DIN 4102-1 and class E (normally inflammable) according to EN 13501-1. When Akatherm dBlue passes through fire-rated building elements it is mandatory to install fire protection collars that will not reduce the fire-rating of these building elements.

We advise to follow the manufacturer's guidelines with respect to design, installation, commissioning and maintenance of the used fire protection collars. Contact the responsible authority for compliance with applicable regulations.

! During design, installation and commissioning of the fire protection collars the applicable on-site, local and national regulations must be observed.

6 Fixing system

Akatherm dBlue is a complete system including dBlue acoustic brackets for optimal sound dampening. The dBlue fixing system includes:

- Bracketing plan in the vertical stack
- Horizontal bracketing plan
- Correct use of guide and anchor point brackets
- Correct tension free installation of each bracket
- Correct installation of each dBlue joint
- Support bracing

Using dBlue acoustic brackets and following the guidelines in this manual will ensure that the Akatherm dBlue soil & waste system will be supported correctly over time and under influence of temperature changes while achieving the desired sound reduction level.

! To achieve the optimal and validated noise reduction levels use only the dBlue acoustic brackets and install them according to this manual.

All dBlue brackets have a M10 nut for connection to the wall and ceiling.

Guide and anchor point bracket

The Akatherm dBlue fixing plan requires the use of guide and anchor point brackets. The dBlue acoustic bracket is designed to function as guide bracket in open position by using two spacers at the bracket closing point. Without the spacers the bracket fully closes and can be used as an anchor point bracket.

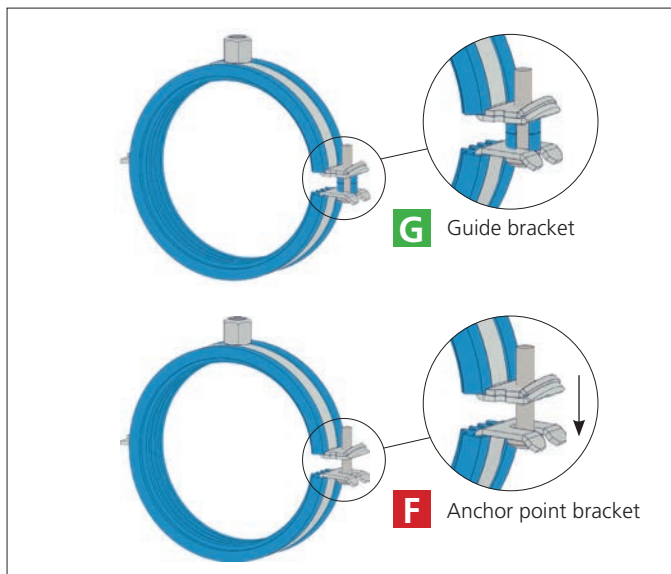


Illustration 6.1

Thermal expansion and contraction

Akatherm dBlue is a rubber ring joint system that takes up thermal expansion and contraction of the pipe system in each joint. This is only possible when following the dBlue joint installation instruction and pulling back the pipe 10 mm after full insertion in the socket. The 10 mm additional room in the joint is sufficient to take up at least 30°C difference between installation and operational temperature.

! Pipes longer than 500 mm have to be pulled back 10 mm after full insertion in the socket to allow thermal expansion of the pipe system.

6.1 Bracketing plan in the vertical stack

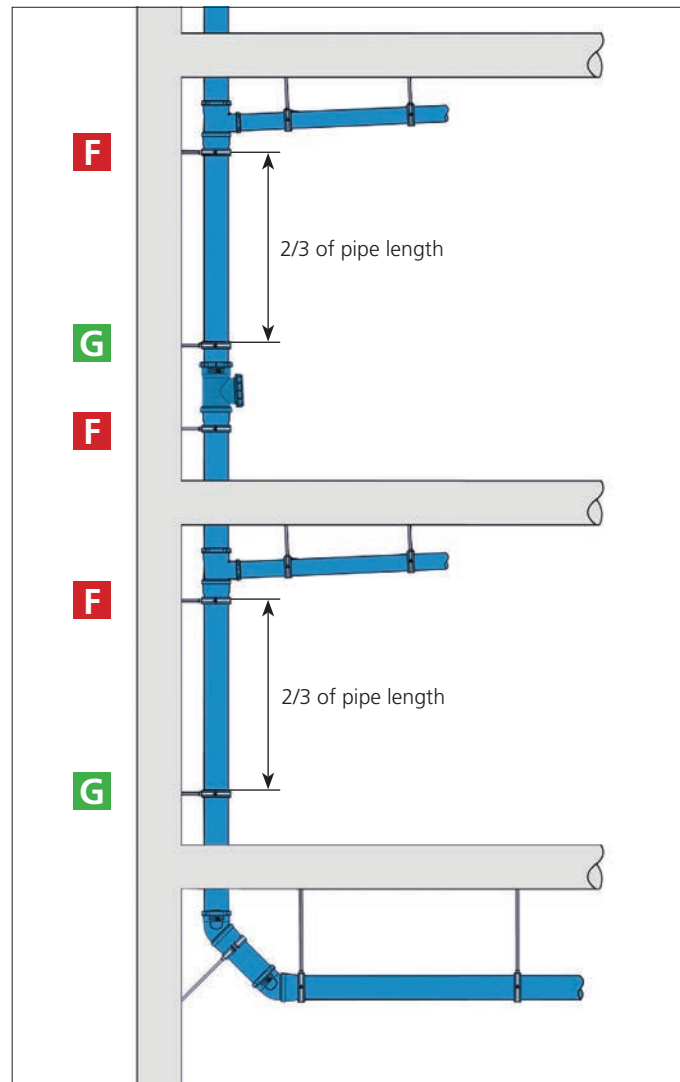


Illustration 6.2

F Anchor point bracket (closed without spacers)

G Guide bracket (open with 2 spacers)

One fitting per floor level

- Fixed point bracket directly below each socket
- Guide bracket at $\frac{2}{3}$ of the pipe length

More than one fitting per floor level

- Secure each socket with an anchor point bracket
- Place a guide bracket when the pipe length between the anchor point brackets is more than 20x the pipe diameter

Install an anchor point bracket behind each socket at the bottom of the stack where the downpipe transitions to the collector pipe.

The anchor point bracket fixes the socket in which the thermal expansion can be accommodated. The guide bracket keeps the pipe in a straight line to the next socket.

! Expansion forces will be transmitted to the brackets. Make sure to follow instructions in this manual on support bracing in order to keep all brackets in their original place of installation.

6.2 Bracketing plan in horizontal pipes

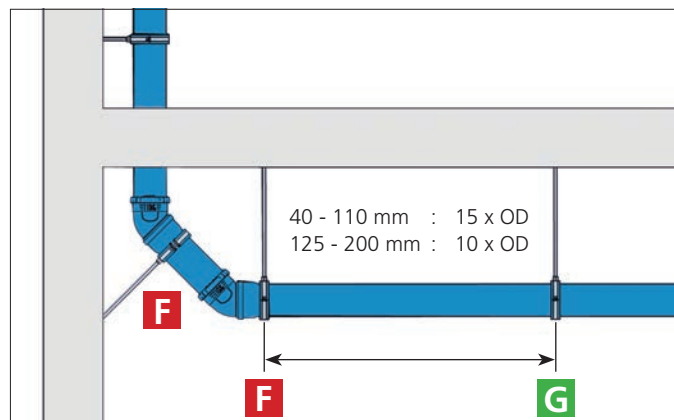


Illustration 6.3

- F** Anchor point bracket (closed without spacers)
- G** Guide bracket (open with 2 spacers)

Anchor point brackets

- Always place an anchor point bracket directly behind each socket.

Guide brackets

Horizontal pipe lengths between the anchor points must be supported by guide brackets at regular intervals:

- 40 - 110 mm : 15 x pipe diameter
- 125 - 200 mm : 10 x pipe diameter

When the pipe system layout does not allow specified guide brackets intervals, decrease interval length until possible.

The anchor point bracket fixes the socket in which the thermal expansion can be accommodated. The guide brackets support the pipe to avoid sagging.

! Expansion forces will be transmitted to the brackets. Make sure to follow instructions on support bracing in order to keep all bracket in their original place of installation.

6.3 Support bracing

The support bracing used for the dBlue fixing system should be designed to withstand:

- The fully filled weight of the pipe system (W)
- The transmitted expansion forces (E) over the full support length (L)

Pipe system weight

The weight of the pipe system (W) is according to the table below.

Pipe diameter	Empty weight	100% filled weight
DN	(kg/m)	W (kg/m)
40	0,26	1,30
50	0,34	2,03
75	0,65	4,54
90	0,94	6,53
110	1,41	9,94
125	1,82	12,61
160	2,94	20,66
200	4,63	32,27

Table 6.1

Transmitted expansion forces

Akatherm dBlue takes up thermal expansion and contraction of the pipe system in each joint. The friction between the rubber ring and the pipe is the resistance force (E) that will be fully transmitted to the threaded rod with length L.

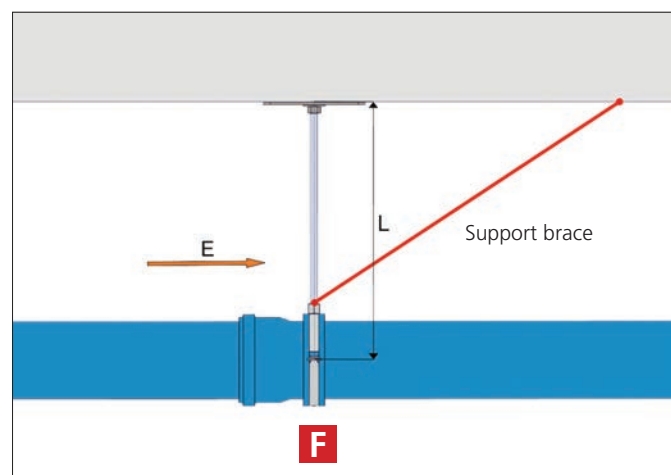


Illustration 6.4

The table below shows the socket resistance force E.

Pipe diameter	Force E	
DN	(N)	(kg)
40	200	20
50	200	20
75	250	25
90	300	30
110	400	40
125	600	60
160	800	80
200	1000	100

Table 6.2

Because the thermal expansion is compensated in the sockets it is very important to install the pipes correctly into the sockets.

! Pipes longer than 500 mm have to be pulled back 10 mm after full insertion in the socket to allow thermal expansion of the pipe system.

The 10 mm additional room in the joint is sufficient to take up at least 30°C difference between installation and operational temperature.

Thermal expansion over 30°C will put additional force on the bracing system and will possibly require stronger bracing.

☎ Contact your local dBlue distributor for advice when the difference between installation and continuous operational temperature exceeds 30°C.

Installation dBlue Acoustic Soil & Waste System

7 Installation

7.1 Shortening and chamfering

dBlue pipes and fittings have factory made sockets and chamfered spigot ends. Pipe is available in several standard pipe lengths. Fittings are not designed to be shortened.

Measure pipe length from end of socket

dBlue pipes are made with sockets that are not part of the true pipe length. Ensure measurements are made from the end of the socket, which will prevent pipes becoming too short.

Cut pipe square

Cut the pipe square using pipe cutters or a fine toothed hand saw for the best results. Fix the pipe before cutting. A mitre box can be used to assist in obtaining a square angle.

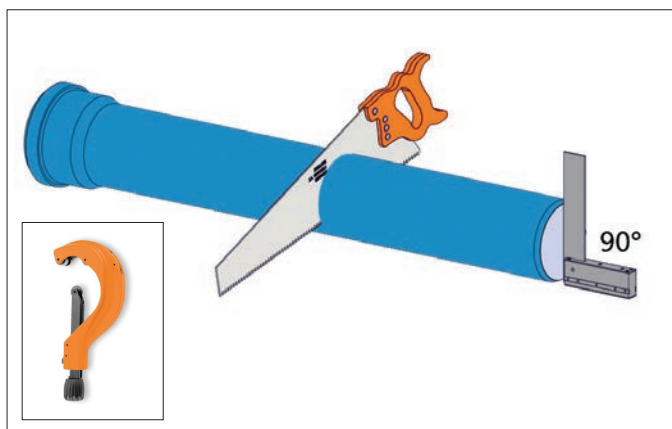


Illustration 7.1

! Do not use high speed electrical cutting tools which will cause heavy burrs and will possibly melt the plastic.

Debur and chamfer pipe

Proper deburring and chamfering of the pipe is required to allow the pipe to be inserted past the rubber ring in the socket.

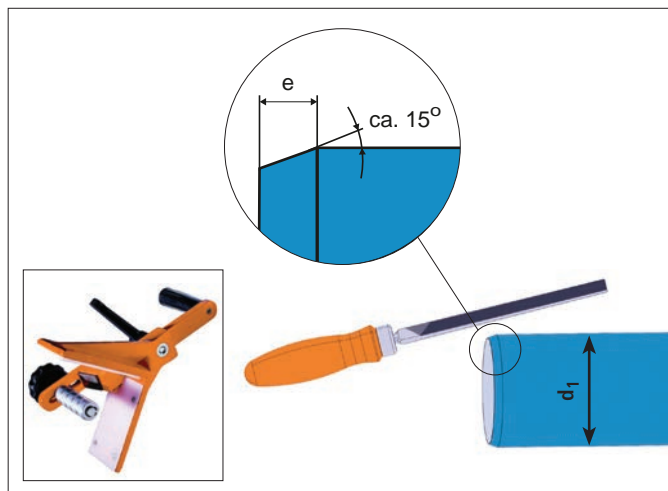


Illustration 7.2

The chamfer angle is always 15°. We recommend the use of a purpose designed chamfering tool for best results. A fine file could also be used but has lesser precision. Remove any leftover burrs using a standard deburring tool.

The chamfer length *e* differs per diameter according to the table below. Uncut pipes have chamfer already.

d_1	Chamfer length <i>e</i> (mm)
40	3,0
50	3,5
75	3,5
90	4,5
110	4,5
125	5,0
160	6,0
200	11,0

Table 7.1

Take care when chamfering at low temperatures. Akatherm dBlue is able to be installed at temperatures as low as -10°C without becoming brittle.

! Without deburring and chamfering, the pipe spigot end can damage the rubber ring or even separate it from the socket, both resulting in leakage. Burrs along the edge will prevent lubrication to be distributed uniformly over the pipe.

7.2 Jointing pipes and fittings

When making joints the socket of the pipe or fitting added should be in downstream direction for best flow results.

Clean

Clean the spigot and the socket, including rubber ring, from any dust and dirt.

Lubricate

Always apply plenty of dBlue lubricant at the spigot end and the rubber ring.

Insert fully

Each joint must initially be made by fully inserting the spigot end into the entire depth of the socket until it stops (1).

Mark spigot end

Clearly mark the spigot end at the inserted depth with a permanent pencil or pen. Mark the fitting on a clearly visible side. This will allow visual inspection of each joint after installation (2).

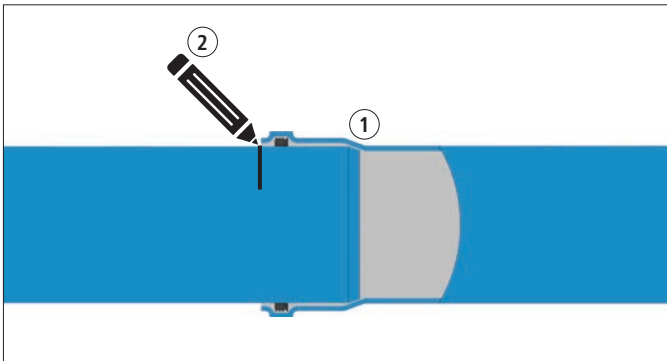


Illustration 7.3

Pull back 10 mm

Pipe that is 500 mm or longer has to be pulled back 10 mm to allow for thermal expansion. Shorter pipes and fittings can remain fully inserted in the socket (3).

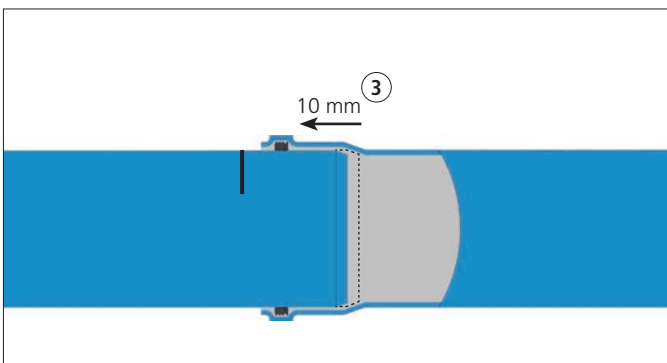


Illustration 7.4

! The dBlue system uses each socket to compensate for thermal expansion of the pipe system under influence of temperature changes.

Pulling back the spigot end 10 mm from the socket creates enough room to allow for 3 m pipe to expand and contract.

7.3 Fixing system

This chapter will describe the correct installation of the dBlue acoustic bracket. The Akatherm dBlue bracketing plan requires the use of guide and anchor point brackets.

+ dBlue uses a single bracket type. The bracket is used as a guide bracket when installed with the supplied spacers and as an anchor point bracket without spacers.

Guide bracket installation

The dBlue acoustic bracket is designed to function as guide bracket in open position by using two spacers at the bracket closing point.

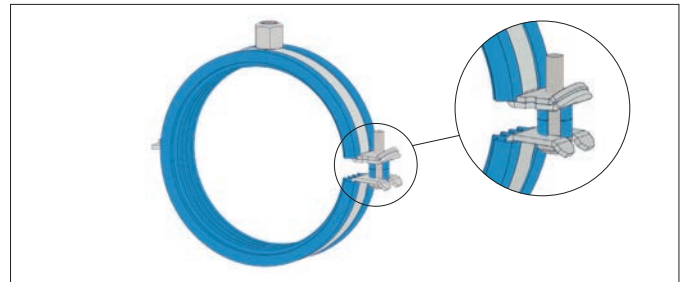


Illustration 7.5

The spacers are not pre-installed and should be placed around the screw between the bracket 'ears'. With the spacers installed the bracket can be closed without creating an anchor point.

Anchor point bracket installation

The dBlue acoustic bracket is designed to function as an anchor point bracket when in fully closed position (without spacers).

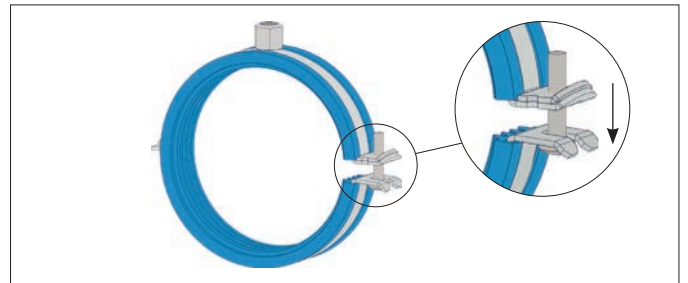


Illustration 7.6

Bracket connection to the wall and ceiling

All dBlue brackets have a M10 nut for further connection to the wall and ceiling. The suspension should be level and tension free.

Akatherm dBlue is a complete system including dBlue acoustic brackets for optimal sound dampening. The Akatherm dBlue fixing system includes:

- Bracketing plan in the vertical stack
- Horizontal bracketing plan
- Correct use of guide and anchor point brackets
- Correct tension free installation of each bracket
- Correct installation of each dBlue joint
- Support bracing

! Follow the design guidelines for the vertical and horizontal bracketing plan, support bracing and correct installation of each dBlue joint as described elsewhere in this manual.

7.4 Transitions to other materials

7.4.1 PVC system

PVC systems have different pipe sizes from Akatherm dBlue below DN110. Connections from PVC systems with non-compatible diameters are possible using PVC adaptor fittings.

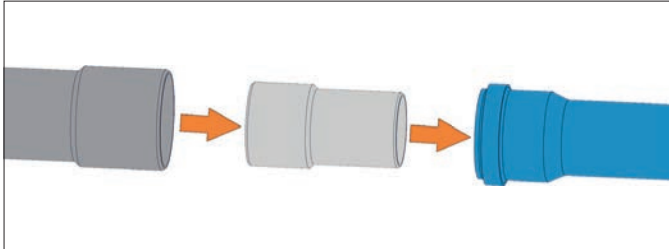


Illustration 7.7

Install the PVC adaptor fittings according to following instructions:

Clean

Clean the PVC adaptor, the PVC socket as well as the rubber ring inside of the dBlue socket from any dust and dirt.

Connect PVC side first

Apply primer and solvent cement on the correct part of the adaptor fitting and insert into the female socket of the PVC system.

Connect dBlue socket next

Apply lubricant to the other side of the PVC adaptor and insert into the dBlue socket. Where required install the additional reducer first.

! The transition adaptor needs to be pushed in firmly all the way to ensure uninterrupted flow.

For pipe sizes DN110 and DN160 no adaptor fitting is required since both systems have identical outer diameters. Refer to the table below for the possible transitions.

7.4.2 Plumbing fixture drainage fittings

Connections from plumbing fixture drainage fittings are typically with other materials. Connections to Akatherm dBlue are possible using adaptor fittings with rubber nipple, available from the Akatherm dBlue range. The other pipe from the plumbing fixture is inserted into the rubber nipple. The fitting can be inserted into a dBlue socket using lubricant.

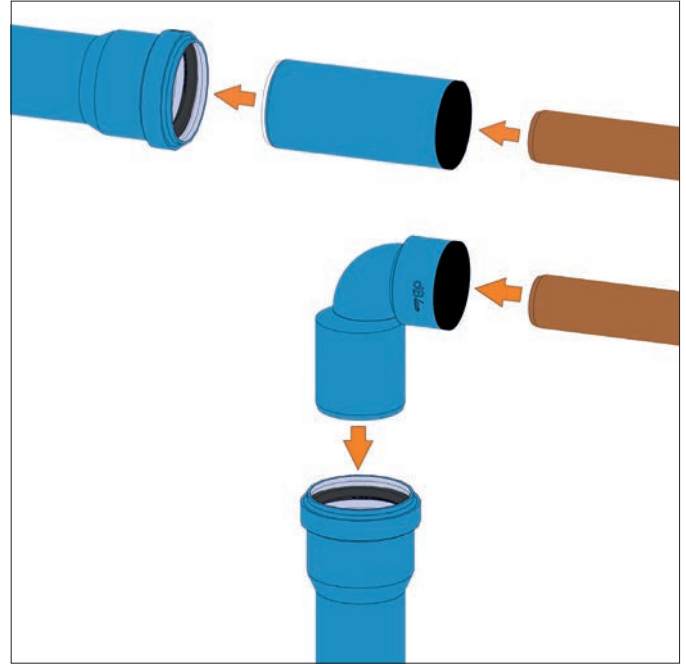


Illustration 7.8

Refer to the table below for the possible transitions available both straight and as a bend.

From size DN	to dBlue DN	Rubber nipple/spigot OD (mm)
32	40	31,8/40
32	50	31,8/50
40	40	38,1/40
40	50	38,1/50

Table 7.2

Install the adaptor fittings according to following instructions:

Clean and deburr

Clean the rubber nipple and ensure the plumbing fixture drainage pipe is free from burrs. Use the chamfer to create a chamfer for better insertion.

Insert the plumbing fixture drainage pipe

Apply lubricant to the inside of the rubber nipple and outside of the pipe. Fully insert the drainage pipe until it stops. Connect the dBlue spigot side as a regular dBlue fitting.

! When adjusting the inserted pipe ensure the rubber nipple stays fully inserted into the socket. Use lubricant to allow good pipe movement.

7.4.3 Cast Iron system

Cast Iron systems are manufactured with different pipe sizes from Akatherm dBlue. Connections from cast iron systems with non-compatible diameters are possible using cast iron adaptor fittings from the Akatherm dBlue range.

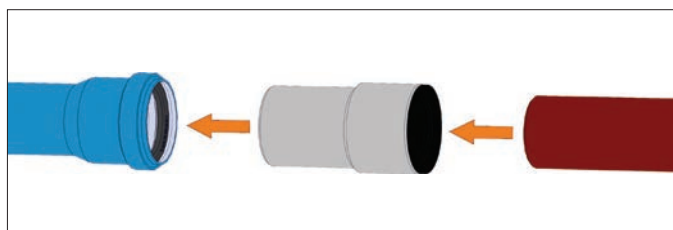


Illustration 7.9

Install the cast iron adaptor fittings according to following instructions:

Clean and debur

Clean the cast iron adaptor, the cast iron spigot socket as well as the rubber ring inside of the dBlue socket from any dust and dirt. Ensure the cast iron spigot is free from burrs.

Connect cast iron

Apply lubricant to the inside of the rubber nipple and outside of the cast pipe. Fully insert the drainage pipe until it stops. Connect the dBlue spigot side as a regular dBlue fitting.

! The transition adaptor needs to be pushed in firmly all the way to ensure uninterrupted flow. When adjusting the inserted pipe ensure the rubber nipple stays fully inserted into the socket. Use lubricant to allow good pipe movement.

Refer to the table below for the possible transitions.

From cast iron	to dBlue	Cast iron adaptor
DN	DN	OD (mm)
50	50	58/50
75	75	78/75

Table 7.3

7.4.4 Cast iron and other materials

For connections from other drainage pipe materials we advise the use of flexible rubber sleeve adaptors with stainless steel worm-gear clamps.



Illustration 7.10

The rubber sleeve adaptor should have the same temperature and chemical resistance as the Akatherm dBlue system. Check the rubber sleeve manufacturers guidelines for correct installation and material specifications.

7.5 Akavent

The Akavent aerator will be delivered with an expansion socket welded to the top and the required 110 mm and 75 mm plug-in sockets for lateral floor connections. Install the Akavent according to the following steps:

Clean and chamfer

Clean all rubber ring sockets from dust and dirt. Chamfer and debur the bottom spigot end according to instructions of dBlue pipes.

Install Akavent in the downpipe

The expansion socket at the top of the Akavent has a factory made anchor point construction where a dBlue acoustic anchor point bracket can be placed.

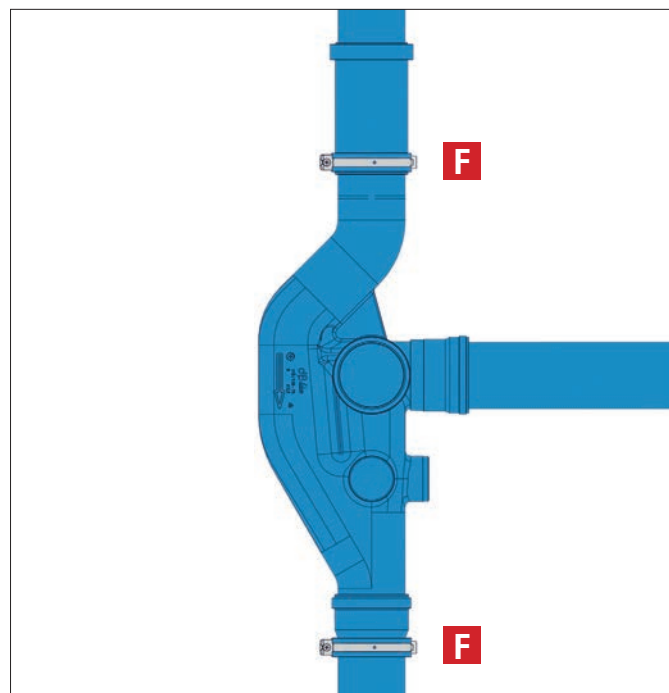


Illustration 7.11

The pipe socket at the bottom of the Akavent must also contain an anchor point bracket as per the vertical bracketing plan.

Install lateral floor connections

Connect the floor connections to the Akavent according to standard instructions. Place anchor point and guide brackets on the horizontal pipe system according to the horizontal bracketing plan.

Optionally insulate Akavent

The Akavent is bracketed with dBlue acoustic brackets which dampen structure-borne noise. When airborne noise is critical at the position of the Akavent, fully wrap the Akavent in sound insulation material.

Installation

dBlue Acoustic Soil & Waste System

7.6 Floor waste gully

The dBlue floor waste gully is equipped with:

- 3x closed 50 mm socketed side inlets
- 1x open 110 mm socketed top inlet
- 1x open 75 mm socketed side outlet
- Trap with 75 mm water height

! The snap caps and rubber rings of the 50 mm side inlets must be installed after drilling open the required inlets.

Install the floor gully according to the following steps:

Open the required inlets

Drill a hole through the gully body for the required inlets using a 45 mm hole saw. Temporarily remove the trap from the floor gully preventing damage.

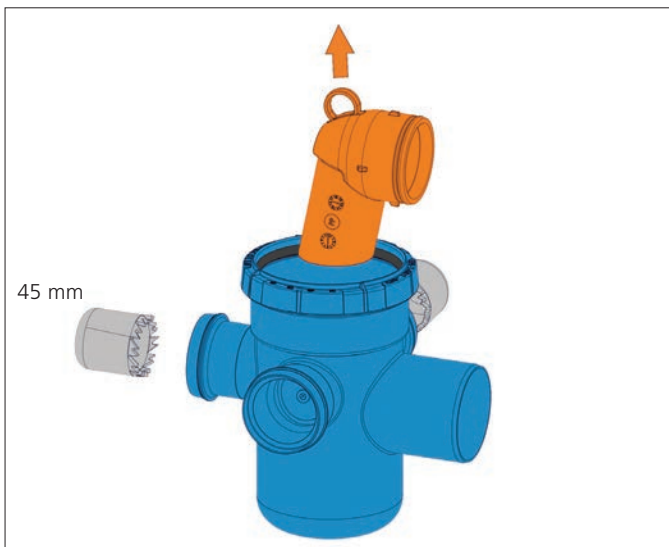


Illustration 7.12

Insert rubber seals and install snap caps

Insert the rubber seals and install the snap caps to the 50 mm inlets. Any 50 mm inlet that has not been utilized can have their seal and cap installed for potential future use. Re-insert the trap.

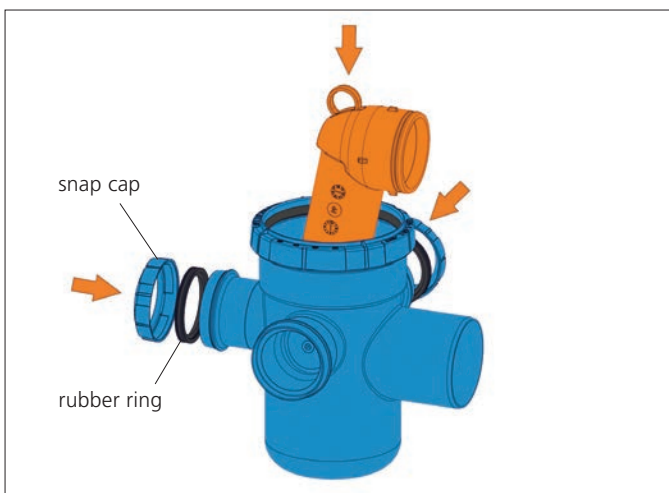


Illustration 7.13

Place floor waste gully beneath slab

Insert the top inlet over the 110 mm pipe coming through the slab penetration.

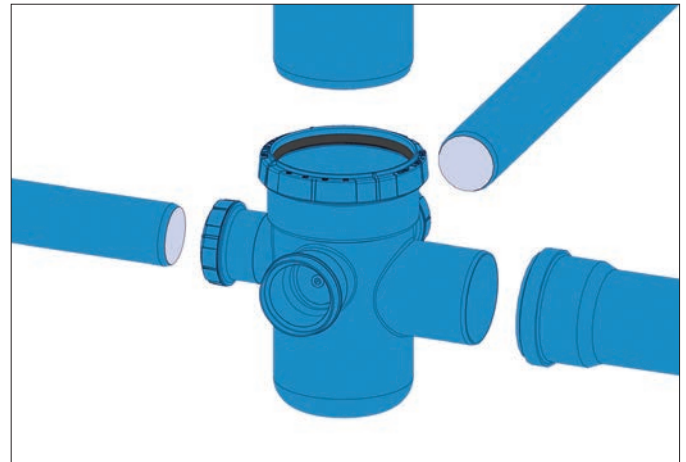


Illustration 7.14

Fixate the floor gully to the slab

Secure the floor gully to the ceiling using anchor point brackets on the 75 mm outlet and opposite 50 mm inlet.

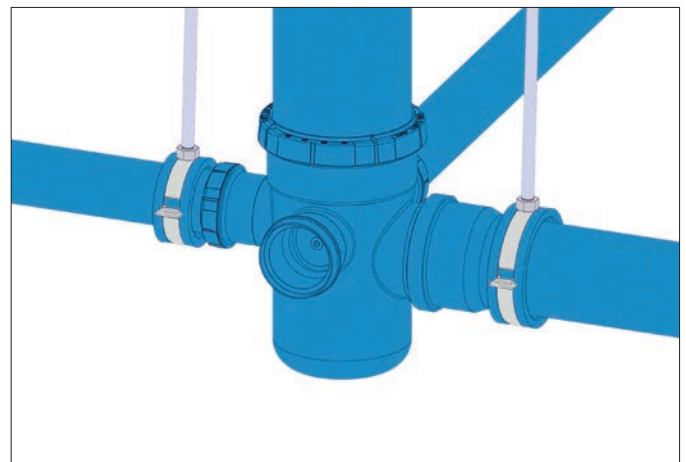


Illustration 7.15

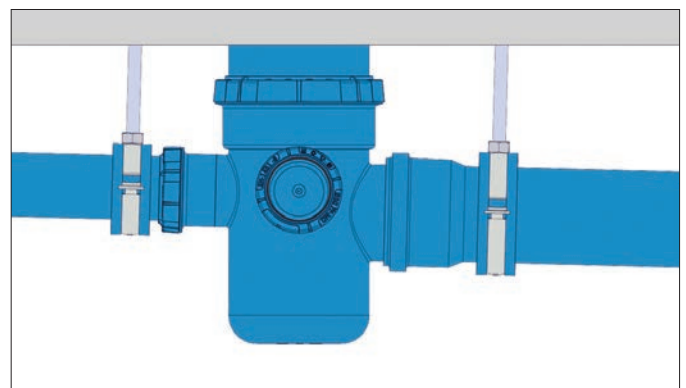


Illustration 7.16

7.7 Disconnecter trap and 4-way riser

The 4-way riser and disconnecter trap combine into a flexible fitting with multiple side connections and a 110 mm connection and trap. The dBlue 4-way riser is equipped with:

- 4x closed 50 mm socket side inlets
- 1x open 110 mm socket top inlet
- 1x open 110 mm spigot bottom end

! The snap caps and rubber rings of the 50 mm side inlets must be installed after drilling open the required inlets.

Install the 4-way riser and disconnecter trap according to the following steps:

Open the required inlets

Drill a hole through the gully body for the required inlets using a 45 mm hole saw.

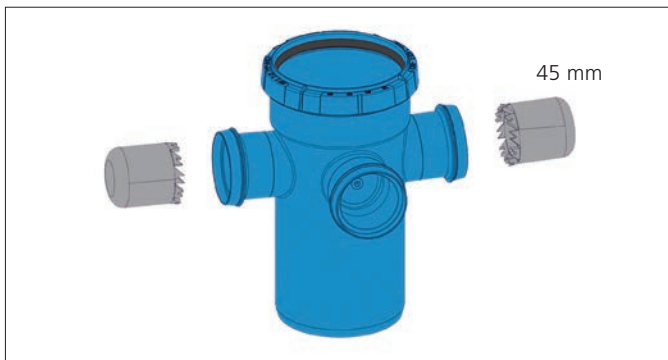


Illustration 7.17

Insert rubber seals and install snap caps

Insert the rubber seals and install the snap caps to the 50 mm inlets. Any 50 mm inlet that has not been utilized can have their seal and cap installed for potential future use.

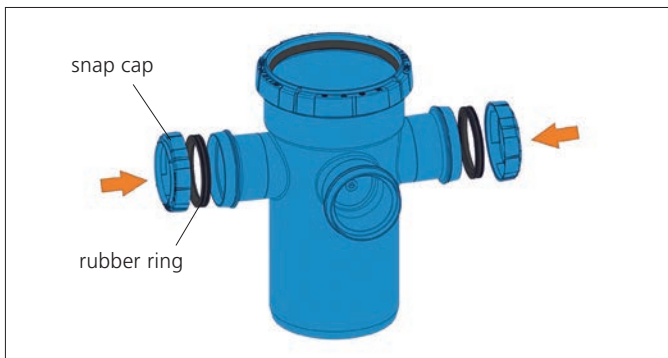


Illustration 7.18

Place 4-way riser and disconnecter trap beneath slab

Insert the top inlet over the 110 mm pipe coming through the slab penetration.

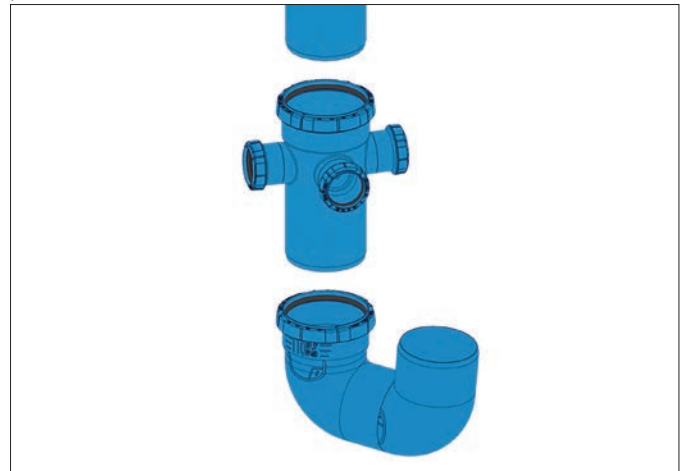


Illustration 7.19

Fixate the disconnecter trap to the slab

Secure the disconnecter trap to the slab using an anchor point bracket.

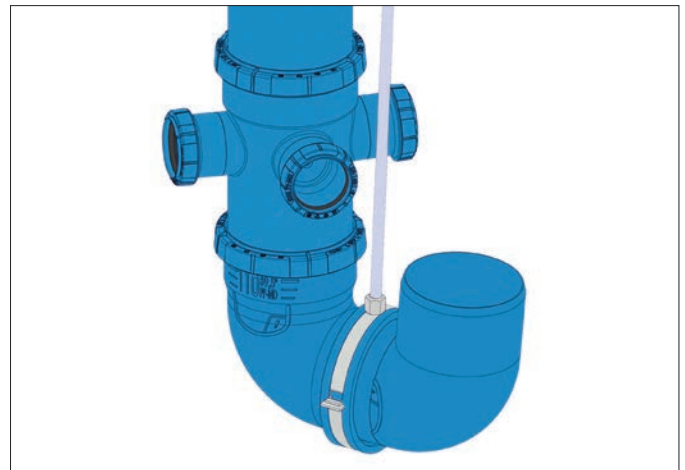


Illustration 7.20

Install side inlets and discharge pipe

Continue installation with the 50 mm side inlets. Place a 87,5° elbow to continue with the discharge pipe system.

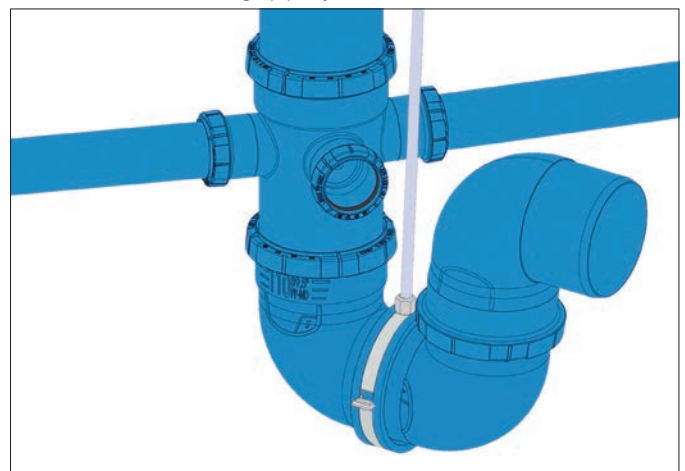


Illustration 7.21

7.8 Embedding Akatherm dBlue in concrete

The Akatherm dBlue system is suited to be embedded in concrete. However certain precautions need to be taken during design and installation.

Follow the instructions in the planning and design chapter on:

- Expansion and contraction compensation
- Pressure and heat during pouring
- Acoustic design

When installing Akatherm dBlue in concrete always:

- Seal each joint with a wrapping sleeve before pouring, this will prevent concrete from entering
- Close open pipe sections before pouring
- Secure the pipe system against movement
- Avoid walking on the pipe system
- Avoid placing weight and steel reinforcements directly on pipe system

! Use extra care when installing dBlue in concrete because it is difficult to reach after installation.

7.9 Fire protection

Akatherm dBlue has fire behaviour class B2 (normally inflammable) according to DIN 4102-1 and class E (normally inflammable) according to EN 13501-1. When dBlue passes through fire-rated building elements, it is mandatory to install fire protection collars that will not reduce the fire-rating of these building elements.

! Fire collars can be installed casted within the concrete slab or retro-fitted after the slab and pipe are installed.

Fire collars must be installed around the pipe only, not around the socket.

We advise to follow the manufacturer's guidelines with respect to design, installation, commissioning and maintenance of the used fire protection collars. Contact the responsible authority for compliance with applicable regulations.

! During design, installation and commissioning of the fire protection collars the applicable on-site, local and national regulations must be observed.

7.10 Using pipe remainders without a socket

Pipe without socket can be used in combination with a double socket. Make sure to follow the debur, chamfer and joint procedure.

Install an anchor point bracket in the middle of each double socket, which will ensure no movement of the fitting.

Allow for sufficient expansion room.

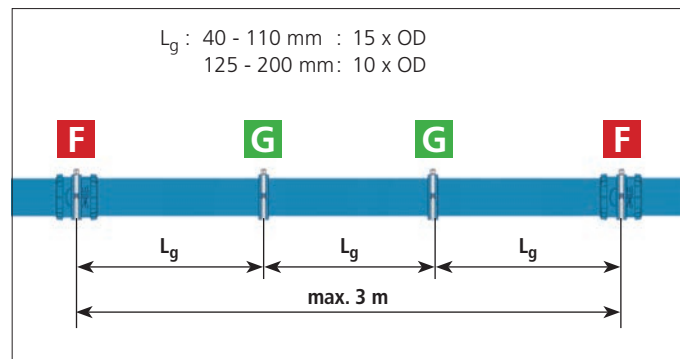


Illustration 7.22

7.11 Additions to an existing system

Modifications and additions to existing systems is possible using sleeve couplers. The sleeve coupler has no centre stop and slides over a pipe completely. Install an additional fitting according to the following steps:

Remove pipe section

Cut out a sufficiently long section of pipe from the pipeline so the additional fitting has room to be inserted. Length of section to cut out according to illustration 7.23 dimension L_t :

$$L_t = \text{fitting length} + 2 \times \text{pipe outer diameter}$$

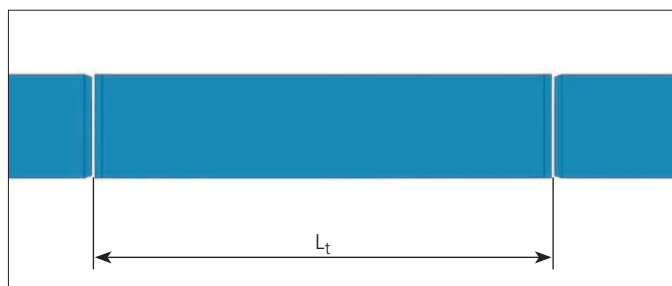


Illustration 7.23

Chamfer and deburr pipe ends

Chamfer and deburr the two pipe ends in the existing pipe system.

Install fitting

Assemble the fitting at the required position using lubricant.

Shorten pipe exactly to size

Measure the remaining gap between fitting and pipe according to dimension L_c in illustration 7.24. Cut the pipe to the required length, chamfer and deburr both ends.

Mount sleeve couplers

Slide one sleeve coupler completely over the cut out pipe section and one sleeve coupler completely over the remaining pipe end using plenty of lubricant.

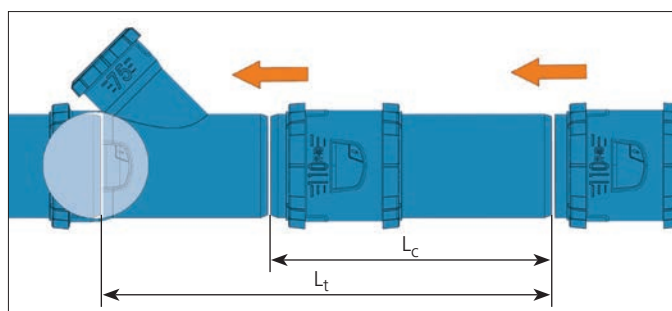


Illustration 7.24

Complete installation

Insert the pipe section and slide the sleeve couplers into their correct place, halfway over both pipes.

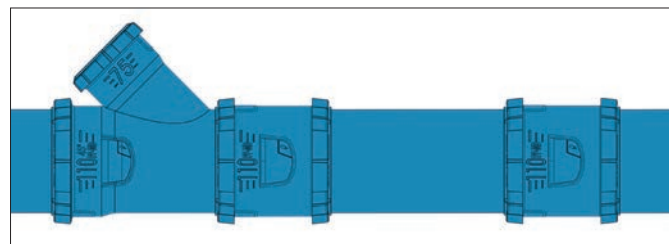


Illustration 7.25

Use plenty dBlue lubricant so the sleeve couplers slide properly.

7.12 Testing

The testing of gravity drainage systems is regulated via the EN12056-5: Gravity drainage systems inside building - Part 5: "Installation and testing, instructions for operation, maintenance and use". Chapter 11 concerning testing leaves the testing mostly to local practice. An Akatherm dBlue installation can be tested on leak tightness using a static head of water or air pressure.

The part of a drainage system which is principally at highest risk, is that situated below the level of the lowest sanitary appliance. This part can be tested by inserting a plug in the lower end of the pipework. The system should then be filled with water up to the flood level of the lowest appliance but to a static head not exceeding 5.0 m. Use 0.5 Bar when testing with pressurised air.

Gravity drainage systems designed in accordance with the EN12056 will have pressure spikes within the boundary of +/- 300 mBar, which is the equivalent of a head of water of 3.0 m. Residential and commercial floor to floor distances are maximally 3 to 4 m. The maximum floor distance is directly related to the maximum water head in a system since the system will eventually overflow out of an appliance, thereby limiting the head.

When the Akatherm dBlue system is tested using a maximum static head of 5 m, both the maximum pressure spikes and maximum head of water in actual operation will be simulated with some added reserve.

8 Product range

8.1 Dimensions

The dimensions of the pipe and fittings in the product tables are all in mm unless stated differently. The standard wall thickness of the fittings is not included in the tables, but can be found in the table below.

Diameter d_1	Wall thickness e
40	1,8
50	1,8
75	2,3
90	2,8
110	3,4
125	3,9
160	4,9
200	6,2

Table 8.1

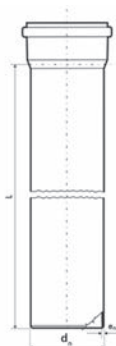
8.2 Abbreviations

Abbreviation	
DN_1	Nominal dimension
d_n / d_1	External dimension fitting/pipe
Z_1	Length until insertion point
α°	Angle of fitting
L	Total length fitting
l_1	Partial length of fitting

Table 8.2

Pipe with socket

PP-MD



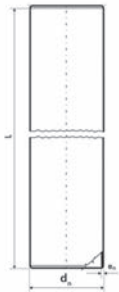
d_n	L	Article code	e
40	150	PPA-040-018-015-D	1,8
40	250	PPA-040-018-025-D	1,8
40	500	PPA-040-018-050-D	1,8
40	1000	PPA-040-018-100-A	1,8
40	1500	PPA-040-018-150-A	1,8
40	2000	PPA-040-018-200-A	1,8
40	3000	PPA-040-018-300-A	1,8
50	150	PPA-050-018-015-D	1,8
50	250	PPA-050-018-025-D	1,8
50	500	PPA-050-018-050-D	1,8
50	1000	PPA-050-018-100-A	1,8
50	1500	PPA-050-018-150-A	1,8
50	2000	PPA-050-018-200-A	1,8
50	3000	PPA-050-018-300-A	1,8
75	150	PPA-075-023-015-D	2,3
75	250	PPA-075-023-025-D	2,3
75	500	PPA-075-023-050-D	2,3
75	1000	PPA-075-023-100-A	2,3
75	1500	PPA-075-023-150-A	2,3
75	2000	PPA-075-023-200-A	2,3
75	3000	PPA-075-023-300-A	2,3
90	150	PPA-090-028-015-D	2,8
90	250	PPA-090-028-025-D	2,8
90	500	PPA-090-028-050-D	2,8
90	1000	PPA-090-028-100-A	2,8
90	1500	PPA-090-028-150-A	2,8
90	2000	PPA-090-028-200-A	2,8
90	3000	PPA-090-028-300-A	2,8
110	150	PPA-110-034-015-D	3,4
110	250	PPA-110-034-025-D	3,4
110	500	PPA-110-034-050-D	3,4
110	1000	PPA-110-034-100-A	3,4
110	1500	PPA-110-034-150-A	3,4
110	2000	PPA-110-034-200-A	3,4
110	3000	PPA-110-034-300-A	3,4
125	150	PPA-125-039-015-D	3,9
125	250	PPA-125-039-025-D	3,9
125	500	PPA-125-039-050-D	3,9
125	1000	PPA-125-039-100-A	3,9
125	1500	PPA-125-039-150-A	3,9
125	2000	PPA-125-039-200-A	3,9
125	3000	PPA-125-039-300-A	3,9
160	150	PPA-160-049-015-D	4,9
160	250	PPA-160-049-025-D	4,9
160	500	PPA-160-049-050-A	4,9
160	1000	PPA-160-049-100-A	4,9
160	1500	PPA-160-049-150-A	4,9
160	2000	PPA-160-049-200-A	4,9
160	3000	PPA-160-049-300-A	4,9

Product range dBlue Acoustic Soil & Waste System

Pipe plain-end PP-MD



d_n	L	Article code	e
200	3000	PPA-200-062-300-A	6,2



dBlue Acoustic Soil & Waste System
Product range
Double socket

With center stop

PP-MD


DN ₁	Article code	L
40	VMD-040-000-00D	95
50	VMD-050-000-00D	100
75	VMD-075-000-00D	104
90	VMD-090-000-00D	111
110	VMD-110-000-00D	116
125	VMD-125-000-00D	120
160	VMD-160-000-00D	140
200	VMD-200-000-00D	217

Used for connecting pipe without socket.

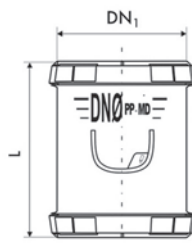

Sleeve socket

Without center stop

PP-MD


DN ₁	Article code	L
40	VMP-040-000-00D	95
50	VMP-050-000-00D	97
75	VMP-075-000-00D	104
90	VMP-090-000-00D	111
110	VMP-110-000-00D	116
125	VMP-125-000-00D	120
160	VMP-160-000-00D	140
200	VMP-200-000-00D	217

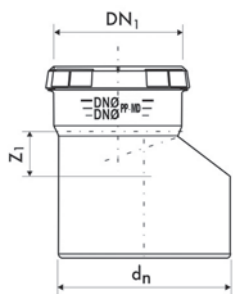
Used for adding fittings to an existing pipe system, floor crossings or repairs.



Product range dBlue Acoustic Soil & Waste System

Reducer eccentric

PP-MD

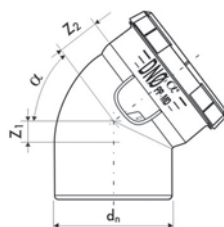


d_n/DN_1	Article code	Z_1
50/40	VRD-050-040-00D	25
75/40	VRD-075-040-00D	25
75/50	VRD-075-050-00D	25
90/40	VRD-090-040-00D	40
90/50	VRD-090-050-00D	35
90/75	VRD-090-075-00D	24
110/50	VRD-110-050-00D	25
110/75	VRD-110-075-00D	25
110/90	VRD-110-090-00D	30
125/110	VRD-125-110-00D	30
160/110	VRD-160-110-00D	35
160/125	VRD-160-125-00D	35
200/160	VRD-200-160-00D	34

Elbow

15°, 30°, 45°, 67°, 87,5°

PP-MD

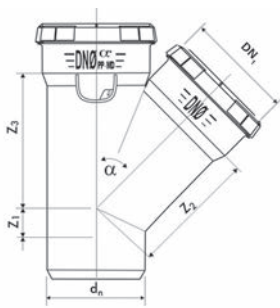


α°	d_n	Article code	Z_1	Z_2
15	40	VKL-040-000-15D	4	12
15	50	VKL-050-000-15D	4	13
15	75	VKL-075-000-15D	12	16
15	90	VKL-090-000-15D	15	15
15	110	VKL-110-000-15D	14	18
30	40	VKL-040-000-30D	7	10
30	50	VKL-050-000-30D	8	12
30	75	VKL-075-000-30D	14	15
30	90	VKL-090-000-30D	20	19
30	110	VKL-110-000-30D	20	22
45	40	VKL-040-000-45D	12	18
45	50	VKL-050-000-45D	12	20
45	75	VKL-075-000-45D	20	28
45	90	VKL-090-000-45D	26	32
45	110	VKL-110-000-45D	25	35
45	125	VKL-125-000-45D	35	45
45	160	VKL-160-000-45D	38	60
45	200	VKL-200-000-45D	46	64
67	40	VKL-040-000-67D	16	20
67	50	VKL-050-000-67D	26	23
67	75	VKL-075-000-67D	30	31
67	90	VKL-090-000-67D	39	40
67	110	VKL-110-000-67D	45	44
87,5	40	VKL-040-000-90D	29	30
87,5	50	VKL-050-000-90D	33	35
87,5	75	VKL-075-000-90D	41	49
87,5	90	VKL-090-000-90D	54	59
87,5	110	VKL-110-000-90D	61	75
87,5	110	VKL-110-LRB-90D *	25	35
87,5	125	VKL-125-000-90D	75	78
87,5	160	VKL-160-000-90D	99	98
87,5	200	VKL-200-000-90D	105	122

* fabricated swept bend

Product range dBlue Acoustic Soil & Waste System

Branch **PP-MD**
 45°, 67°, 87,5°



α°	d_n/DN_1	Article code	Z_1	Z_2	Z_3
45	40/40	VTR-040-040-45D	15	54	54
45	50/40	VTR-050-040-45D	13	61	58
45	50/50	VTR-050-050-45D	17	67	67
45	75/40	VTR-075-040-45D	3	78	71
45	75/50	VTR-075-050-45D	1	83	81
45	75/75	VTR-075-075-45D	23	96	97
45	90/40	VTR-090-040-45D	12	88	83
45	90/50	VTR-090-050-45D	2	94	89
45	90/75	VTR-090-075-45D	16	106	106
45	90/90	VTR-090-090-45D	24	116	116
45	110/40	VTR-110-040-45D	19	100	90
45	110/50	VTR-110-050-45D	13	108	100
45	110/75	VTR-110-075-45D	4	120	118
45	110/90	VTR-110-090-45D	12	129	128
45	110/110	VTR-110-110-45D	29	140	140
45	125/110	VTR-125-110-45AD *	23	162	162
45	125/125	VTR-125-125-45D	30	162	162
45	160/110	VTR-160-110-45D	5	184	190
45	160/160	VTR-160-160-45D	45	208	208
45	200/200	VTR-200-200-45D	46	244	244
67	40/40	VTR-040-040-67D	15	36	36
67	50/40	VTR-050-040-67D	13	44	41
67	50/50	VTR-050-050-67D	17	45	45
67	75/40	VTR-075-040-67D	8	58	48
67	75/50	VTR-075-050-67D	38	60	53
67	75/75	VTR-075-075-67D	38	65	65
67	90/40	VTR-090-040-67D	7	65	53
67	90/50	VTR-090-050-67D	10	68	59
67	90/90	VTR-090-090-67D	37	78	78
67	110/50	VTR-110-050-67D	12	77	63
67	110/75	VTR-110-075-67AD *	20	87	80
67	110/110	VTR-110-110-67D	45	94	94
87,5	40/40	VTR-040-040-90D	30	29	29
87,5	50/40	VTR-050-040-90D	29	34	29
87,5	50/50	VTR-050-050-90D	33	34	35
87,5	75/40	VTR-075-040-90D	26	47	32
87,5	75/50	VTR-075-050-90D	32	47	36
87,5	75/75	VTR-075-075-90D	47	50	50
87,5	90/50	VTR-090-050-90D	40	58	53
87,5	90/75	VTR-090-075-90AD *	27	55	40
87,5	90/90	VTR-090-090-90D	53	58	58
87,5	110/40	VTR-110-040-90D	27	63	36
87,5	110/50	VTR-110-050-90D	31	65	42
87,5	110/75	VTR-110-075-90D	44	66	55
87,5	110/90	VTR-110-090-90D	50	69	63
87,5	110/110	VTR-110-110-90D	62	70	70
87,5	125/110	VTR-125-110-90AD *	60	80	75
87,5	125/125	VTR-125-125-90D	74	80	80
87,5	160/110	VTR-160-110-90AD *	55	100	85
87,5	160/160	VTR-160-160-90D	108	101	101
87,5	200/200	VTR-200-200-90D	107	116	116

* assembled

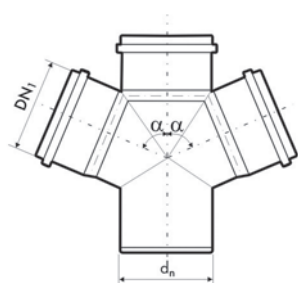
Double branch
45°, 67°, 87,5°

PP-MD



α°	d_n/DN_1	Article code
45	110 x 50	VCR-110-050-045
45	110 x 110	VCR-110-110-045
67	90 x 90	VCRZ-090-090-067*
67	110 x 50	VCRZ-110-050-067*
67	110 x 110	VCRZ-110-110-067*
87,5	110 x 110	VCRZ-110-110-090*

* fabricated



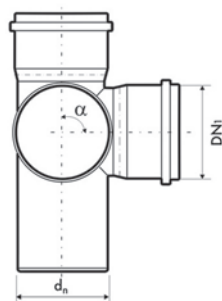
Double corner branch
87,5°

PP-MD



α°	d_n/DN_1	Article code
87,5	110/110	VCNZ-110-110-090*

* fabricated



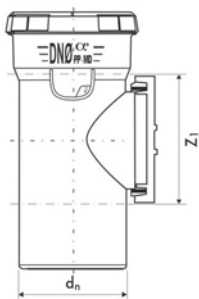
Product range dBlue Acoustic Soil & Waste System

Clean out branch **PP-MD**
90°



d_n	Article code	Z_1
50	VCZ-050-000-OOD	69
75	VCZ-075-000-OOD	90
90	VCZ-090-000-OOD	109
110	VCZ-110-000-OOD	131
125	VCZ-125-000-OOD	154
160	VCZ-160-000-OOD	209
200	VCZ-200-000-OAD *	223

* assembled



Akavent aerator **PE**



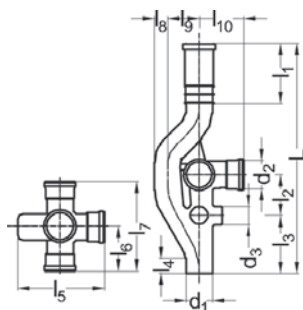
d_1	Article code	L	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}
110	VVEN-110-110-75D	956	256	170	240	60	344	159	318	55	130	159
160	VVEN-160-110-75D	1010	265	170	250	60	404	179	358	80	140	184

The Akavent is available with 6 possible horizontal inlets. The connections need to be welded on the Akavent. Specify configuration when ordering.

3 x d_2 : 110 mm
3 x d_3 : 75 mm

Opposite connections are not permitted.

Use plug-in sockets for the horizontal connections and expansion sockets for the vertical connection on top.



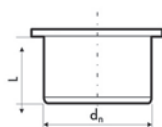
d_1	Article code	Description
75	VVEN-KIE-075-00D	dBlue Plug-in socket (75 mm)
110	VVEN-KIE-110-00D	dBlue Plug-in socket (110 mm)
110	VVEN-WLO-110-00D	dBlue Expansion socket (110 mm)
160	VVEN-WLO-160-00D	dBlue Expansion socket (160 mm)

Socket plug

PP-MD



d_n	Article code	L
40	VKK-040-000-00D	32
50	VKK-050-000-00D	32
75	VKK-075-000-00D	33
90	VKK-090-000-00D	36
110	VKK-110-000-00D	37
125	VKK-125-000-00D	38
160	VKK-160-000-00D	40
200	VKK-200-000-00D	90

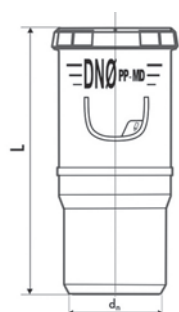


Expansion socket

PP-MD



d_n	Article code	L
75	VDK-075-000-00D	179
90	VDK-090-000-00D	193
110	VDK-110-000-00D	201



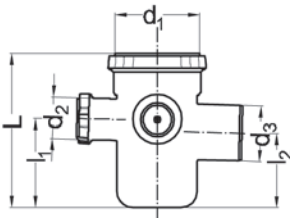
Product range dBlue Acoustic Soil & Waste System

Floor waste gully **PP-MD**



$d_1/d_2/d_3$	Article code	L	l_1	l_2
110/50/75	VWP-110-050-75D	215	123	101

3 x 50 mm side inlets (factory closed)
 1 x 110 mm top inlet
 1 x 75 mm side outlet

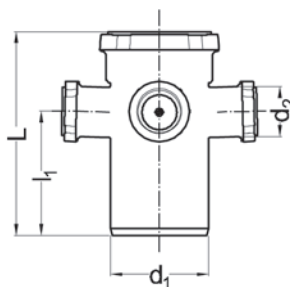


Four way riser **PP-MD**



d_1/d_2	Article code	L	L_1
110/50	VKO-110-050-00D	239	147

4 x 50 mm side inlets (factory closed)
 1 x 110 mm top inlet
 1 x 110 mm bottom outlet



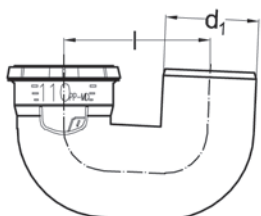
Adjustable disconnecter trap

PP-MD



d_1	Article code	l
50	VSF-050-000-00D*	100
75	VSF-075-000-00D*	133
90	VSF-090-000-00D*	160
110	VSF-110-000-00D*	180

* fabricated

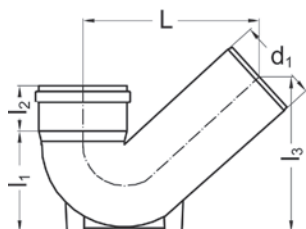


P-trap

PP



d_1	Article code	L	l_1	l_2	l_3
110	VSFP-110-000-00D	235	134	61	206

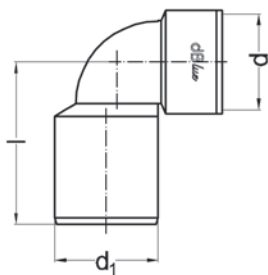


Product range dBlue Acoustic Soil & Waste System

Trap connection bend



d_1/d	Article code	I
40/32	VKL-SYF-040-32D	80
40/40	VKL-SYF-040-40D	80
50/32	VKL-SYF-050-32D	80
50/40	VKL-SYF-050-40D	80

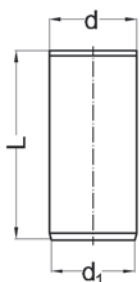


Trap connection socket

PP-MD



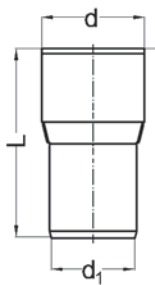
d_1/d	Article code	L
40/32	VRD-SYF-040-32D	100
40/40	VRD-SYF-040-40D	100



Cast iron transition



d_1/d	Article code	L
50/58	TRA-050-000-000	120
75/78	TRA-075-000-000	125
110/110	TRA-110-000-000	140



Product range dBlue Acoustic Soil & Waste System

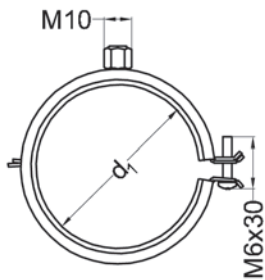
Bracket with rubber lining (metal)

Metal with rubber inlay



dn₁	Article code
40	POB-STL-040-000
50	POB-STL-050-000
75	POB-STL-075-000
90	POB-STL-090-000
110	POB-STL-110-000
125	POB-STL-125-000
160	POB-STL-160-000
200	POB-STL-200-000

dBlue uses a single bracket type. The bracket is used as a guide bracket when installed with the 2 supplied spacers and as an anchor point bracket without spacers.



Acoustic bracket (plastic)

Plastic with rubber inlay



d₁	Article code	R
40	POB-040-000-000	M6
50	POB-050-000-000	M6
75	POB-075-000-000	M6
90	POB-090-000-000	M6
110	POB-110-M08-000	M8
125	POB-125-000-000	M10
160	POB-160-000-000	M10
200	POB-200-000-000	M10

dBlue lubrication



	Article code
250 ml	PAS-250-000-000

Pipe cutters



d	Article code
40 - 75	NAR-OBC-006-076
50 - 125	NAR-OBC-050-140
90 - 160	NAR-OBC-100-160

Chamfer tool



d	Article code
40 - 160	NAR-FAZ-040-160

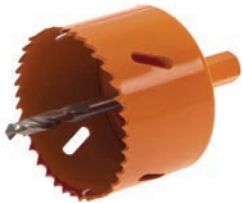
Product range dBlue Acoustic Soil & Waste System

Deburr tool



d	Article code
40-200	NAR-OKR-040-200

Hole saw for floor gully and four way riser



d	Article code
45 mm	NAR-KOR-045 -000

Rubber ring

SBR



d	Article code
40	USZ-KAN-040-BL
50	USZ-KAN-050-BL
75	USZ-KAN-075-BL
90	USZ-KAN-090-BL
110	USZ-KAN-110-BL
125	USZ-KAN-125-BL
160	USZ-KAN-160-BL
200	USZ-KAN-200-BL

A series of 18 horizontal grey bars stacked vertically, providing a space for handwritten notes.

Blank lined area for notes.

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