



SILENTA3A

Product & Technical Guide

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GF HAKAN PLASTİK is one of the world's largest plastic piping systems manufacturers. The company develops, produces and markets a comprehensive range of piping systems and components in a variety of materials used worldwide to transport water and gas at the highest quality, service and the right price. GF HAKAN PLASTİK operates in three core segments of piping systems; Building Technology, Utility and Agriculture. Its certified products are used in more than 70 countries in 5 continents worldwide.

With more than 10.000 products, GF HAKAN PLASTİK manages a land and maritime transport operation seamlessly and is able to meet the needs of its clients fully wherever they may be in the world.

■ HISTORY

HAKAN PLASTİK was founded in 1965 by the Karadeniz family. Since its foundation, Hakan Plastik has continuously expanded its presence in the manufacturing and sales of plastic piping systems with a focus on innovation.

In 2002, the company invested in a state of art modern facility in Çerkezköy Industrial Zone (ÇOSB), one of the three largest industrial zones in Turkey. To increase its production capacity, HAKAN PLASTİK opened up its second facility in Şanlıurfa. Both facilities totally cover an area of 170.000 m².

In 2013, the leading plastic pipe manufacturer of Europe and the Middle East, HAKAN PLASTİK and the world's leading manufacturer of piping systems, Swiss-based Company, GEORG FISCHER joined forces under the name of "**GF HAKAN PLASTİK**" to provide a unique platform for further growth worldwide.

GEORG FISCHER, founded in 1802 is headquartered in Switzerland and has 125 companies, 48 of which are production facilities, in 32 countries with a workforce of 13,500 employees. The company generated sales of 3.6 billion Swiss francs in 2012. Georg Fischer operates in three core businesses GF Piping Systems, GF Automotive and GF Machining Solutions.

GF Piping System Division is a global supplier of plastic piping systems for the conveyance of liquids and gases in industry, building technology and utility applications. With over 5,000 employees, GF Piping Systems generated sales of about CHF 1.3 billion in over 100 countries in 2012.

■ ABOUT GF HAKAN PLASTİK

GF HAKAN PLASTİK operates in 2 production facilities equipped with the latest manufacturing technologies in Çerkezköy and Şanlıurfa with a workforce of 730 employees. Its headquarters is in Çerkezköy. The company has 6 regional directorates, offices and warehouses in Turkey.

The company has taken its place among the top 500 Enterprises in Turkey according to the worldwide known, prestigious Fortune 500 ranking and also one of the Top 500 Largest Companies in Turkey according to "Istanbul Chamber of Industry (ISO)."



GF Hakan Plastik Çerkezköy Factory

The system quality of GF HAKAN PLASTİK has been certified by BVQI, ISO 9001 and ISO 14001. As a result of a meticulous quality control approach and continuous research and development, product quality of GF HAKAN PLASTİK is confirmed by its international quality certificates.

The company gives top priority to using the highest standards of technology to manufacture user-friendly products with the highest quality and service.

GENERAL INFORMATION

GF HAKAN PLASTIK SILENTA 3A is a sound-insulating 3-layered sewer pipe system made of Silenta PP which is specially formulated and reinforced for non-pressurized domestic drainage in accordance with System Standards of DIN 4109, DIN 4102.

- Silenta 3A reaches a sound-intensity level of 16 dB at 4lt/s flow rate by the officially recognized Fraunhofer Institute, Germany.
- Silenta 3A has a density of $\sim 1,4 \text{ gr/cm}^3$ * according to DIN 53479.
- Silenta 3A is suitable for hot/cold water and acidic liquid transfers.
- Silenta 3A can be used at above and underground drainage systems, even at areas with high traffic load.
- Silenta 3A Products consist of pipes from 40mm to 200mm with and without socket and fittings with complementing accessories.
- Silenta 3A is GF Hakan Plastik' s globally registered trademark.

BENEFITS

Silenta 3A is a high quality sound insulating multilayer pipe system which is made of mineral reinforced polypropylene.

- Provides excellent sound insulation, creates ideal conditions for buildings and contributes to an increase in the property value along with the quality of life.
- Reduces the vibrations and unfamiliar sounds coming from the plumbing system.
- Flame-retardant, according to **DIN 4102** standard.
- High impact resistance.
- Does not require additional sound insulation systems.
- The coefficient of thermal expansion is only 0.06 mm/m°K.
- Operation and installation temperature climbs down to -20° C.
- Resistant to organic and inorganic acids.
- Suitable for ph value between 2 & 12.
- Alternative to cast iron.

* Density of sound insulation layer.

WORLDWIDE QUALITY ASSURANCE APPROVALS

SYSTEM STANDARDS

DIN 4109 > Sound protection in structural engineering

DIN 4102 > Flame Resistance

EN 476 > General requirements for components

EN 1451-1 > Specifies the requirements for pipes fittings and the systems of polypropylene solid

EN 14366 > Noise from waste water installations

- **DIN EN 12056** >

Gravity drainage systems inside buildings;
 Part 1: General and performance requirements
 Part 2: Sanitary pipework, layout and calculation
 Part 3: Roof drainage, layout and calculation
 Part 4: Sewerage lifting plants, layout and calculation
 Part 5: Installation and testing, instructions for operation, maintenance

- **DIN 1986-100** >

Drainage systems;
 Part 100: Additional requirements for DIN EN 752 and DIN EN 12056
 DIN 1986-3:
 Drainage systems;
 Part 3: Regulations on operation and maintenance
 DIN 1986-4:
 Drainage systems;
 Part 4: Areas of use of sewer pipes and fittings made of various materials
 DIN 1986-30:
 Drainage systems;
 Part 30: Service
 Waste water, drainage and discharging systems

APPROVALS & CERTIFICATES



GERMANY - FRAUNHOFER INSTITUT
 [P-BA 186 / 09 P-BA187 / 09]



RUSSIA
 GOST-R [0303657]
 GOST-R HYGIENE
 [13.07.05 / 2737974]



UKRAINE
 UKR SEPRO [10964]



TURKEY
 YILDIZ TECHNICAL UNIV.
 [23.02.06/210]



TURKEY
 TURKISH STANDARDS
 INSTITUTE
 [59/14.02.76]



GERMANY
 HOCH]



SCANDINAVIAN COUNTRIES
 SWEDCERT

WORLDWIDE QUALITY ASSURANCE APPROVALS

FIELDS OF APPLICATION

TECHNICAL PROPERTIES

SOUND INSULATION PERFORMANCE

MARKING

ASSEMBLY

PACKAGING - STORAGE TRANSPORT

TECHNICAL DRAWINGS & DIMENSIONS

FIELDS OF APPLICATION

Silenta noise-insulating products are used wherever sound protection and high impact resistance is required. Silence plays a big role in areas such as;

DRAINAGE SYSTEMS

- Working Areas

Office buildings, conference rooms, etc.

- Studying Areas

Schools, colleges, libraries, community centers, tutoring centers, etc.

- Sleeping Areas

Hospitals, houses, residences, hotels, apartments, etc.

- Commercial Kitchens

Restaurants, Industrial kitchens

- Under Ground Drainage Systems

All underground drain systems btw. the building and the main pipe line

VENTILATION SYSTEMS

Office buildings, conference rooms, schools, colleges, libraries, community centers, tutoring centers, hospitals, houses, residences, hotels, apartments, etc.

CENTRALISED VACUUM CLEANING SYSTEMS

Sustainable / green buildings.

EXHAUST GAS SYSTEMS

Waste gas transport at industrial areas.

CHEMICAL TRANSFER SYSTEMS

Industrial areas (short and long term usage)

Silenta pipes and fittings are not suitable for:

Waste water containing petrol or benzene transfers.

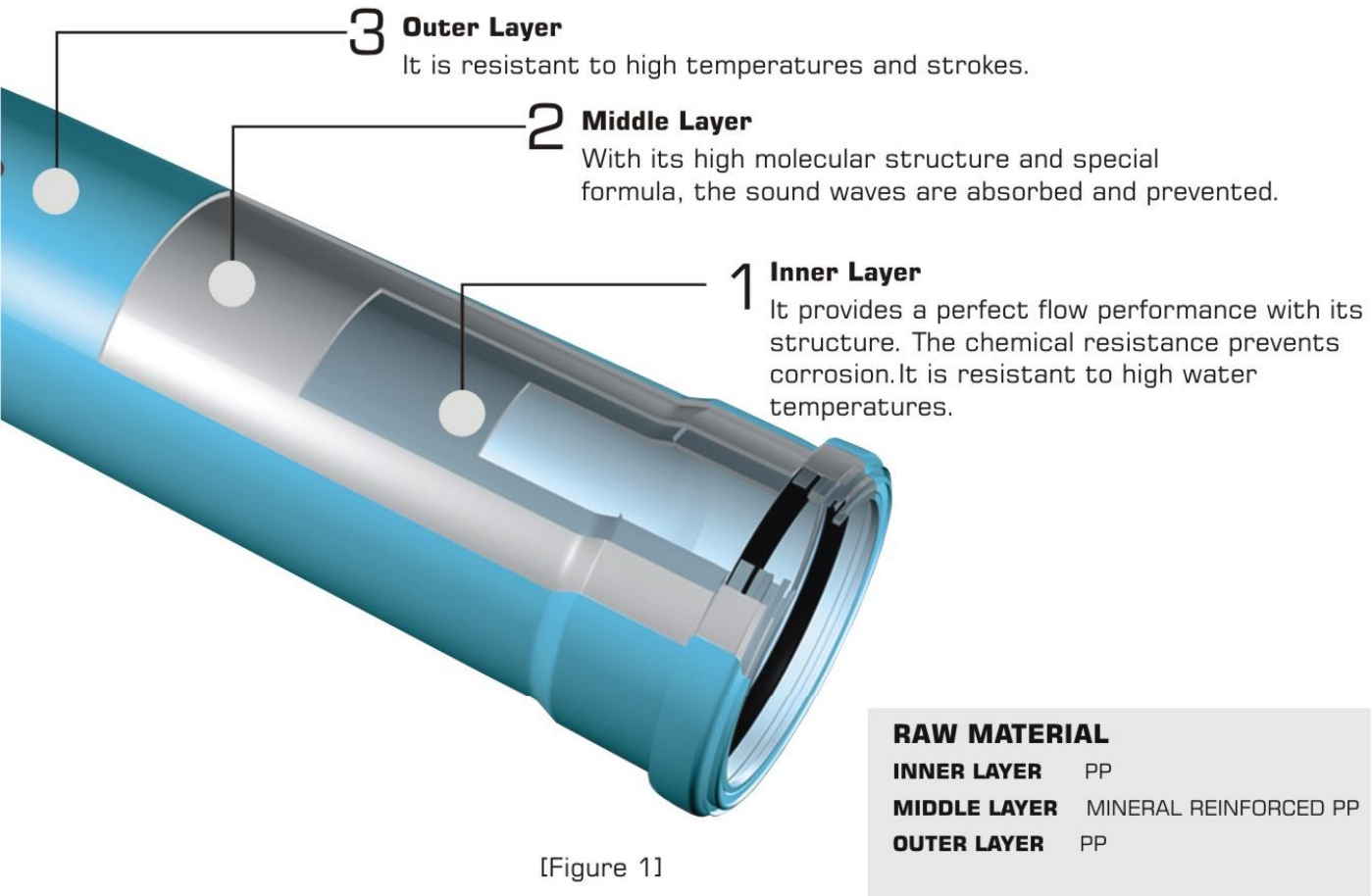
Installations at temperatures below -20 °C.

ALTERNATIVE TO CAST IRON (CI)

	Silenta 3A	Cast Iron
Chemical Resistance	High-Used for ph value between 2&12	Low
Corrosion	Corrosion Free	Corrosion Gradually
Incrustation Loss	Smooth Bore No Incrustation Loss	Losses 25% to 50% of its inner dia
Vibration	Low Reflection of Vibrations	Reflection of Vibrations
Installation	Easy because of less weight	CI weigh 3 times more
Noise Levels	In given conditions Silenta produces 16 dB	CI produces 40 dB
Clamping	Normal commercial clamps	Heavy clamps required
Durability	50 years	Unknown
Wall Thickness	High e.g. 100mm pipe - Wall thickness 3.4mm	Unknown
Coefficient of Thermal Expansion	0,06 mm/m°K	0,105 mm/m°K
Tensile Strength	13 N/mm ²	150-260N/mm ²
Fire Resistance	DIN 4102	NA
Water Absorbtion	No Absorbtion	%20
Maintenance	No maintenance required	Expensive

DESIGN

Silenta 3A features a three-layer wall construction. The multi-layer structure increases pipe rigidity. Technically desirable characteristics are optimized in a targeted way.



■ ANTI-SHRINK SYSTEM

“Anti-Shrink System” is a manufacturing process of SILENTA 3A that prevents any kind of deformation in case of ambient temperature or heat variations. If this system is not applied during the manufacturing process, the socket may be subject to shape deformations. SILENTA Anti-Shrink System, avoids problems such as changes in shape, fluid flow obstacles, complicated assembly and leakages.

TECHNICAL PROPERTIES

Silenta 3A has 16dB sound transmission in 4lt/s. Silenta 3A products meet the requirements for DIN-4109, which has been proven by the Fraunhofer Institute (Germany). Silenta continues to be one of the most performant soundproof pipe systems worldwide.

TECHNICAL DATA

SOUND TRANSMISSION	16 dB/4lt in given conditions (DIN 4109)
INCRUSTATION LOSS	Smooth Bore-No incrustation loss
VIBRATION	Low Reflection of Vibrations
INSTALLATION	Easy because of less weight
CLAMPING	Normal Commercial Clamps
DENSITY	~1.4 gr/cm ³ *
COEFFICIENT of THERMAL EXPANSION	0,06 mm/m°K
TENSILE STRENGTH	13 N/mm ²
CHEMICAL RESISTANCE	resistant to organic and inorganic acids suitable for ph value between 2&12
FIRE RESISTANCE	DIN 4102
WATER ABSORPTION	No Absorption
MAINTENANCE	No maintenance required
TYPE	With and without socket
STRUCTURE	3-LAYER (PP-MINERAL REINFORCED PP-PP)
COLOUR	Light blue (halogen and cadmium free)
OPERATION & INSTALLATION TEMPERATURE	-20°C /60°C
TEMPERATURE OF OPERATING MEDIA	min : 0 (lower temperatures for various chemicals) max : 97°C
SERVICE LIFE	50 Years Long-term : 97°C 10 min/day = 3000 h/50 years Short-term : 97°C 30 sec/day = 152 h/50 years Permanent : 60°C 5h/day = 87.600 h/50 years
APPLICATION CLASS	B/D (building / drainage)
MARKING	Manufacturer's Logo, Manufacturer's Trade Name, Manufacturer's Trade Mark, nominal diameter (DN), Angle specification (with elbows and branches), material, standart numbers, Mark of Quality, machine number, date of manufacture, EAN code
CONNECTIONS	Push-fit sockets with factory-inserted lip seals.
RING RIGIDITY	ISO/DIN 9969. The rigidity is at least 4.0 kN/m ² over the entire range of – dimensions da 40 – da 200
E-MODULUS	2400 – 3800 MPa according to ISO 178
IMPACT STRENGTH	EN 1451
PRODUCT QUALITY	Authorised German plastics testing institutes (Fraunhofer, Hoch) and TSE
DIAMETERS	40 Ø, 50 Ø, 75 Ø, 90 Ø, 110 Ø, 125 Ø, 160 Ø, 200 Ø
PIPE LENGTHS	0.15m-6m

* Density of sound insulation layer.

SOUND INSULATION PERFORMANCE

The sound-insulating domestic waste water system SILENTA 3A guarantees quality, peace and living comfort. In practice-oriented measurements carried out by the officially recognized Fraunhofer Institute for Building Physics in Stuttgart, Germany SILENTA 3A reached a sound-intensity level of 16 dB at 4lt/s flow rate.

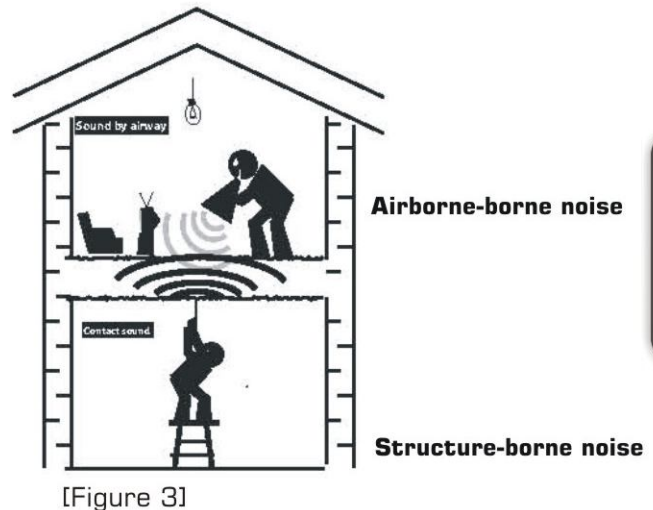
Noise is generated by moving parts or by flowing media. Pipes for waste water evacuation are prone to vibration, particularly where water flows through downpipes or is forced to change direction in correspondence with joints and elbows (noise due to impact or shock). Experience shows that the greatest problems are typically caused by the transmission of structural noise, particularly in the proximity of pipe clamps and brackets or where pipe-work is run through walls or ceilings. In every area of building construction, especially the construction of multi-storey apartment blocks, hospitals and convalescent homes, sound insulation plays an increasingly important role. One of the most significant sources of sound within buildings is the sanitation set-up and the accompanying domestic waste pipe system. An unsuitable sewer pipe system and type of attachment are considerable contributors to disturbing noise. SILENTA, a system-tested, universal sound-insulating domestic waste water system, puts things right.

■ Airborne noise

Airborne noise is present if the noises of a sound source are transferred directly through the air to people. [see figure 3]

■ Structure-borne noise

With structure-borne noise, the sound transfer first occurs through a solid body. This body vibrates and passes the vibrations on to people as airborne noise. [see figure 3]



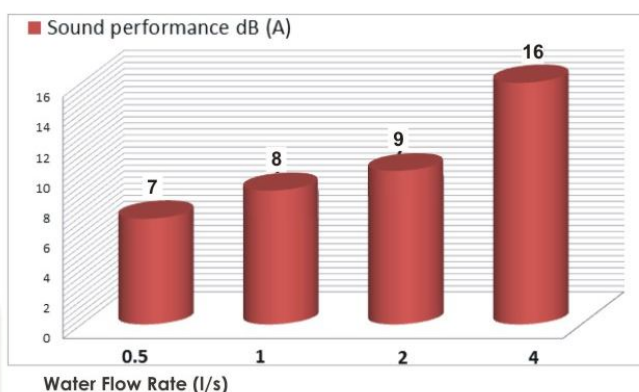
■ Sound reduction with SILENTA

Both structure-borne and airborne noise occurs in sewer pipe systems. The pipe wall of the sewer pipe vibrates due to currents and flow noises. The type and intensity of these pipe vibrations depend on a variety of factors, such as the mass of the pipe, the pipe material and its inner damping. The pipe vibrations are emitted directly from the pipe as airborne noise and are transferred as structure-borne noise via the pipe attachments to the wall fastening panel. When developing a sound-insulating domestic waste water system, both types of sound distribution must be taken into account.

SOUND INSULATION PERFORMANCE

- Structure borne noise is reduced by special rubber clamps and perfect planning.

Air-borne noise is reduced with SILENTA thanks to special materials, sound dampening fillers and increased weight of the pipe system. Targeted mass optimization in sound-sensitive areas of fitting elbows of nominal diameter DN 40 to DN 200 provides further improvement at redirection points.



[Figure 4]

WHY SOUND PROTECTION ?

Sound protective measures in a building pursue the purpose of minimizing noise pollution in rooms. Occupants need to be protected from disturbing air-borne and structure-borne sound. Architectural sound protection measures can be applied to the buildings and the elements of them where people spend longer period of time (offices, flats). Disturbing noise caused by sources within the building directly (structure-borne noise) or indirectly (e.g. noise deriving from building engineering systems) can easily be solved by SILENTA.

The following formula applies to a number x of equal sources with a sound level L: $L_{ges} = L + 10 \log(x)$

X number of equal sources of sound	1	2	3	4	5	6	7	8	9	10	100	1000
10 · log(x) Increase In dB	0	3	5	6	7	8	8	9	10	10	20	30

Example :

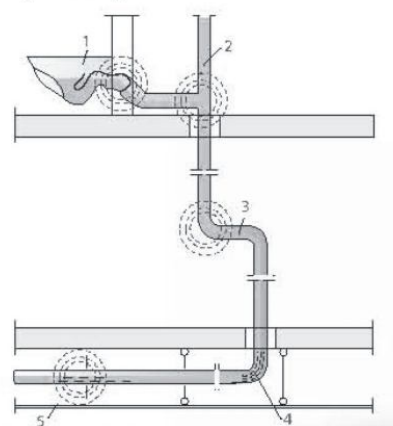
Two sources of sound with equal sound level lead to an increase of the sound level by +3dB.

70 dB + 70 dB amount to 73 dB!

At sound levels of approximately 15-30 dB, as they are usual in building engineering, an increase or reduction by 3 – 5 dB leads to double or half the sound impact.

- The sources of sounds in buildings can be listed as;

- Water shrinks
- The change of direction of the water
- High water velocities
- Crossing points
- Narrowing the formation of cavitation
- Flushing the toilets
- Unloading
- Incorrect planning



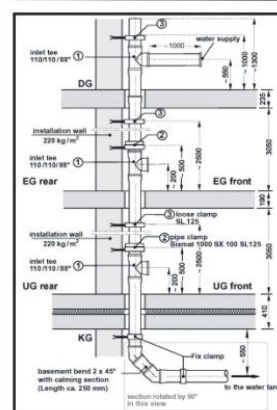
[Figure 5]

Due to critical drainage conditions, the pipe system experiences local vibrations at redirections. This can have a negative effect on sound-related properties.

To minimize this effect and counteract negative influences, targeted mass optimization was carried out in sound-critical areas of elbows with a nominal diameter of DN 40 to DN 200. This stabilizes the sound behaviour, reduces noise and thus achieves even better noise damping in the impact area.

Flow rate [l/s]	0.5	1.0	2.0	4.0
Installation sound level $L_{dB(A)}$ measured in the basement test-room UG front *)	46	48	49	52
Installation sound level $L_{dB(A)}$ measured in the basement test-room UG rear *)	9	10	12	13
Airborne sound pressure level $L_{p,dB(A)}$ *)	46	48	49	52
Structure-borne sound characteristic level $L_{w,dB(A)}$ *)	7	8	9	16

GF Hakan Plastik measurements of August 19, 2009. Sound pressure levels measured in the installation test facility. Test object was the waste water system "HAKAN SILENTA 3A Noise-Insulated DIN 4102" (manufacturer Hakan). The waste water system consisted of straight plastic pipes and fittings, nominal width OD 110 and pipe clamps "Bismat 1000 SX 100 SL125" (manufacturer BIS Walraven).



Sample Test Layout

CHEMICAL RESISTANCE

GF HAKAN SILENTA products resist corrosion by acids and inorganic reduces with **pH 2-12** values.

The table in this document summarises the data given in a number of polypropylene chemical resistance tables at present in use in various countries, derived from both practical experience and test results.

Source: ISO/TR 10358

The table contains an evaluation of the chemical resistance to a number of fluids judged to be either aggressive or not towards polypropylene. This evaluation is based on values obtained by immersion of polypropylene test specimens in the fluid concerned at 20, 60 and 100°C and atmospheric pressure, followed in certain cases by the tensile characteristics.

DEFINITIONS, SYMBOLS and ABBREVIATIONS

The criteria of classifications, definitions, symbols and abbreviations adopted in this document are as follows:

S = Satisfactory

The chemical resistance of polypropylene exposed to the action of a fluid is classified as "satisfactory" when the results of test are acknowledged to be "satisfactory" by the majority of the countries participating in the evaluation.

L = Limited

The chemical resistance of polypropylene exposed to the action of fluid is classified as "**limited**" when the results of tests are acknowledged to be "**limited**" by the majority of the countries participating in the evaluation.

Also classified as "limited" are the resistances to the action of chemical fluids for which judgements "**S**" and "**NS**" or "**L**" are pronounced to an equal extent.

NS = Not satisfactory

The chemical resistance of polypropylene exposed to the action of a fluid classified as "not satisfactory" when the results of test are acknowledged to be "not satisfactory" by the majority of the countries participating in the evaluation.

Also classified as "not satisfactory" are materials for which judgement "**L**" and "**NS**" are pronounced to an equal extent.

Sat.sol Saturated aqueous solution, prepared at 20C

Sol Aqueous solution at a concentration higher than 10 % but not saturated

Dil.sol Dilute aqueous solution at a concentration equal to or lower than 10 %

Work.sol Aqueous solution having the usual concentration for industrial use

Solution concentrations reported in the text are expressed as a percentage by mass. The aqueous solutions of sparingly soluble chemicals are considered, as far as chemical action towards polypropylene in concerned, as saturated solutions.

In general, common chemical names are used in this document.

The table is made as a first guideline for user of polypropylene. If a chemical compound is not to be found or if there is an uncertainty on the chemical resistance in an application, please contact GF Hakan Plastik for advise and proposal on testing.

CHEMICAL RESISTANCE

▪ CHEMICAL RESISTANCE TABLE POLYPROPYLENE

Chemical Resistance of Polypropylene, Not Subjected to Mechanical Stress, to Various Fluids at 20, 60 and 100°C

Chemical or Product	Concentration	Temperature °C		
		20	60	100
Acetic acid	Up to 40 %	S	S	-
Acetic acid	50 %	S	S	L
Acetic acid, glacial	> 96 %	S	L	NS
Acetic anhydride	100 %	S	-	-
Acetone	100 %	S	S	-
Aceptophenone	100 %	S	L	-
Acrylonitrile	100 %	S	-	-
Air		S	S	S
Allyl alcohol	100 %	S	S	-
Almond oil		S	-	-
Alum	Sol	S	S	-
Ammonia, aqueous	Sat.sol	S	S	-
Ammonia, dry gas	100 %	S	-	-
Ammonia, liquid	100 %	S	-	-
Ammonium acetate	Sat. sol	S	S	-
Ammonium chloride	Sat.sol	S	S	-
Ammonium fluoride	Up to 20 %	S	S	-
Ammonium hydrogen carbonate	Sat.sol	S	S	-
Ammonium metaphosphate	Sat.sol	S	S	S
Ammonium nitrate	Sat.sol	S	S	S
Ammonium persulphate	Sat.sol	S	S	-
Ammonium phosphate	Sat.sol	S	-	-
Ammonium sulphate	Sat.sol	S	S	S
Ammonium sulphide	Sat.sol	S	S	-
Amyl acetate	100 %	L	-	-
Amyl alcohol	100 %	S	S	S
Aniline	100 %	S	S	-
Apple juice		S	-	-
Aqua regia	HCl/HNO ₃ =3/1	NS	NS	NS
Barium bromide	Sat.sol	S	S	S
Barium carbonate	Sat.sol	S	S	S
Barium chloride	Sat.sol	S	S	S

CHEMICAL RESISTANCE

■ CHEMICAL RESISTANCE TABLE POLYPROPYLENE

Chemical or Product	Concentration	Temperature °C		
		20	60	100
Barium hydroxide	Sat.sol	S	S	S
Barium sulphide	Sat.sol	S	S	S
Beer		S	S	-
Benzene	100 %	L	NS	NS
Benzoic acid	Sat.sol	S	S	-
Benzyl alcohol	100 %	S	L	-
Borax	Sol	S	S	-
Boric acid	Sat.sol	S	-	-
Boron trifluoride	Sat.sol	S	-	-
Bormine, gas		NS	NS	NS
Bromine, liquid	100 %	NS	NS	NS
Butane, gas	100 %	S	-	-
Butanol	100 %	S	L	L
Butyl acetate	100 %	L	NS	NS
Butyl glycol	100 %	S	-	-
Butyl phenols	Sat.sol	S	-	-
Butyl phthalate	100 %	S	L	L
Calcium carbonate	Sat.sol	S	S	S
Calcium chlorate	Sat.sol	S	S	-
Calcium chloride	Sat.sol	S	S	S
Calcium hydroxide	Sat.sol	S	S	S
Calcium hypochlorite	Sol	S	-	-
Calcium nitrate	Sat.sol	S	S	-
Camphor oil		NS	NS	NS
Carbon dioxide, dry gas		S	S	-
Carbon dioxide, wet gas		S	S	-
Carbon disulphide	100 %	S	NS	NS
Carbon monoxide, gas		S	S	-
Carbon tetrachloride	100 %	NS	NS	NS
Castor oil	100 %	S	S	-
Caustic soda	Up to 50 %	S	L	L
Chlorine, aqueous	Sat.sol	S	L	-
Chlorine, dry gas	100 %	NS	NS	NS
Chlorine, liquid	100 %	NS	NS	NS
Chloroacetic acid	Sol	S	-	-

CHEMICAL RESISTANCE

■ CHEMICAL RESISTANCE TABLE POLYPROPYLENE

Chemical or Product	Concentration	Temperature °C		
		20	60	100
Chloroethanol	100 %	S	-	-
Chloroform	100 %	L	NS	NS
Chlorosulphonic acid	100 %	NS	NS	NS
Chrome alum	Sol	S	S	-
Chromic acid	Up to 40 %	S	L	NS
Citric acid	Sat.sol	S	S	S
Coconut oil		S	-	-
Copper (II) chloride	Sat.sol	S	S	-
Copper (II) nitrate	Sat.sol	S	S	S
Copper (II)	Sat.sol	S	S	-
Corn oil		S	L	-
Cottonseed oil		S	S	-
Cresol	Greater than 90 %	S	-	-
Cyclohexane	100 %	S	-	-
Cyclohexanol	100 %	S	L	-
Cyclohexanone	100 %	L	NS	NS
Decalin (decahydronaphthalene)	100 %	NS	NS	NS
Dextrin	Sol	S	S	-
Dextrose	Sol	S	S	S
Dibutyl phthalate	100 %	S	L	NS
Dichloroacetic acid	100 %	L	-	-
Dichloroethylene (A and B)	100 %	L	-	-
Diethanolamine	100 %	S	-	-
Diethyl ether	100 %	S	L	-
Diethylene glycol	100 %	S	S	-
Diglycolic acid	Sat.sol	S	-	-
Diisooctyl	100 %	S	L	-
Dimethyl amine, gas		S	-	-
Dimethyl formamide	100 %	S	S	-
Diocyl phthalate	100 %	L	L	-
Dioxane	100 %	L	L	-
Distilled water	100 %	S	S	S
Ethanolamine	100 %	S	-	-
Ethyl acetate	100 %	L	NS	NS

CHEMICAL RESISTANCE

▪ CHEMICAL RESISTANCE TABLE POLYPROPYLENE

Chemical or Product	Concentration	Temperature °C		
		20	60	100
Ethyl alcohol	Up to 95 %	S	S	S
Ethyl chloride, gas		NS	NS	NS
Ethylene chloride (mono and di)		L	L	-
Ethyl ether	100 %	S	L	-
Ethylene glycol	100 %	S	S	S
Ferric chloride	Sat.sol	S	S	S
Formaldehyde	40 %	S	-	-
Formic acid	10 %	S	S	L
Formic acid	85 %	S	NS	NS
Formic acid, anhydrous	100 %	S	L	L
Fructose	Sol	S	S	S
Fruit juice		S	S	S
Gasoline, petrol (aliphatic hydrocarbons)		NS	NS	NS
Gelatine		S	S	-
Glucose	20 %	S	S	S
Glycerine	100 %	S	S	S
Glycolic acid	30 %	S	-	-
Heptane	100 %	L	NS	NS
Hexane	100 %	S	L	-
Hydrobromic acid	Up to 48 %	S	L	NS
Hydrochloric acid	Up to 20 %	S	S	S
Hydrochloric acid	30 %	S	L	L
Hydrochloric acid	From 35 to 36 %	S	-	-
Hydrofluoric acid	Dil.sol	S	-	-
Hydrofluoric acid	40 %	S	-	-
Hydrogen	100 %	S	-	-
Hydrogen chloride, dry gas	100 %	S	S	-
Hydrogen peroxide	Up to 10 %	S	-	-
Hydrogen peroxide	Up to 30 %	S	L	-
Hydrogen sulphide, dry gas	100 %	S	S	-
Iodine, in alcohol		S	-	-
Isoctane	100 %	L	NS	NS

CHEMICAL RESISTANCE

■ CHEMICAL RESISTANCE TABLE POLYPROPYLENE

Chemical or Product	Concentration	Temperature °C		
		20	60	100
Isopropyl alcohol	100 %	S	S	S
Isopropyl ether	100 %	L	-	-
Lactic acid	Up to 90 %	S	S	-
Lanoline		S	L	-
Linseed oil		S	S	S
Magnesium carbonate	Sat.sol	S	S	S
Magnesium chloride	Sat.sol	S	S	-
Magnesium hydroxide	Sat.sol	S	S	-
Magnesium sulphate	Sat.sol	S	S	-
Maleic acid	Sat.sol	S	S	-
Mercury (II) chloride	Sat.sol	S	S	-
Mercury (II) cyanide	Sat.sol	S	S	-
Mercury (I) nitrate	Sol	S	S	-
Mercury	100 %	S	S	-
Methyl acetate	100 %	S	S	-
Methyl alcohol	5 %	S	L	L
Methyl amine	Up to 32 %	S	-	-
Methyl bromide	100 %	NS	NS	NS
Methyl ethyl ketone	100 %	S	-	-
Methylene chloride	100 %	L	NS	NS
Milk		S	S	S
Monochloroacetic acid	>85 %	S	S	-
Naphtha		S	NS	NS
Nickel chloride	Sat.sol	S	S	-
Nickel nitrate	Sat.sol	S	S	-
Nickel sulphate	Sat.sol	S	S	-
Nitric acid	Up to 30 %	S	NS	NS
Nitric acid	From 40 to 50 %	L	NS	NS
Nitric acid, fujming (with nitrogen dioxide)		NS	NS	NS
Nitrobenzene	100%	S	L	-
Oleic acid	100 %	S	L	-
Oleum (sulphuric acid with 60 % of SO ₃)		S	L	-

CHEMICAL RESISTANCE

■ CHEMICAL RESISTANCE TABLE POLYPROPYLENE

Chemical or Product	Concentration	Temperature °C		
		20	60	100
Olive oil		S	S	L
Oxalic acid	Sat.sol	S	L	NS
Oxygen, gas		S	-	-
Paraffin oil (FL65)		S	L	NS
Peanut oil		S	S	-
Peppermint oil		S	-	-
Perchloric acid	(2 N) 20 %	S	-	-
Petroleum ether (ligroine)		L	L	-
Phenol	5 %	S	S	-
Phenol	90 %	S	-	-
Phosphine, gas		S	S	-
Phosphoric acid	Up to 85 %	S	S	S
Phosphorus oxychloride	100 %	L	-	-
Picric acid	Sat.sol	S	-	-
Potassium bicarbonate	Sat.sol	S	S	S
Potassium borate	Sat.sol	S	S	-
Potassium bromate	Up to 10 %	S	S	-
Potassium bromide	Sat.sol	S	S	-
Potassium carbonate	Sat.sol	S	S	-
Potassium chlorate	Sat.sol	S	S	-
Potassium chlorite	Sat.sol	S	S	-
Potassium chromate	Sat.sol	S	S	-
Potassium cyanide	Sol	S	-	-
Potassium dichromate	Sat.sol	S	S	S
Potassium ferricyanide	Sat.sol	S	S	-
Potassium fluoride	Sat.sol	S	S	-
Potassium hydroxide	Up to 50 %	S	S	S
Potassium iodide	Sat.sol	S	-	-
Potassium nitrate	Sat.sol	S	S	-
Potassium perchlorate	10 %	S	S	-
Potassium permanganate	(2 N) 30 %	S	-	-
Potassium persulphate	Sat.sol	S	S	-
Potassium sulphate	Sat.sol	S	S	-
Propane, gas	100 %	S	-	-
Propionic acid	>50 %	S	-	-

CHEMICAL RESISTANCE

■ CHEMICAL RESISTANCE TABLE POLYPROPYLENE

Chemical or Product	Concentration	Temperature °C		
		20	60	100
Pyridine	100 %	L	-	-
Seawater		S	S	S
Silicon oil		S	S	S
Silver nitrate	Sat.sol	S	S	L
Sodium acetate	Sat.sol	S	S	S
Sodium benzoate	35 %	S	L	-
Sodium bicarbonate	Sat.sol	S	S	S
Sodium carbonate	Up to 50 %	S	S	L
Sodium chlorate	Sat.sol	S	S	-
Sodium chloride	Sat.sol	S	S	-
Sodium chlorite	2 %	S	L	NS
Sodium chlorite	20 %	S	L	NS
Sodium dichromate	Sat.sol	S	S	S
Sodium hydrogen carbonate	Sat.sol	S	S	S
Sodium hydrogen sulphate	Sat.sol	S	S	-
Sodium hydrogen sulphite	Sat.sol	S	-	-
Sodium hydroxide	1 %	S	S	S
Sodium hydroxide	From 10 to 60 %	S	S	S
Sodium hypochlorite	5 %	S	S	-
Sodium hypochlorite	10 % - 15 %	S	-	-
Sodium hypochlorite	20 %	S	L	-
Sodium metaphosphate	Sol	S	-	-
Sodium nitrate	Sat.sol	S	S	-
Sodium perborate	Sat.sol	S	S	-
Sodium phosphate (neutral)		S	S	S
Sodium silicate	Sol	S	S	-
Sodium sulphate	Sat.sol	S	S	-
Sodium sulphide	Sat.sol	S	-	-
Sodium sulphite	40 %	S	S	S
Sodium thiosulphate (hypo)	Sat.sol	S	-	-
Soybean oil		S	L	-
Succinic acid	Sat.sol	S	S	-
Sulphuric acid	Up to 10 %	S	S	S
Sulphuric dioxide, dry or wet	100 %	S	S	-

CHEMICAL RESISTANCE

■ CHEMICAL RESISTANCE TABLE POLYPROPYLENE

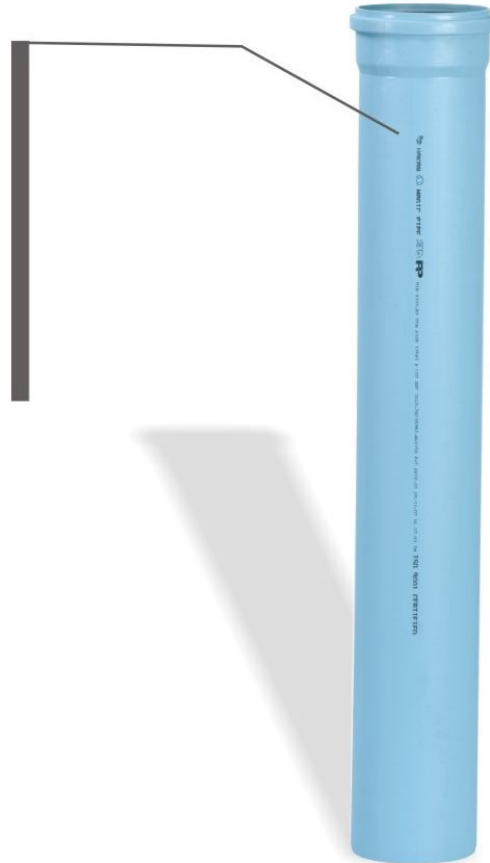
Chemical or Product	Concentration	Temperature °C		
		20	60	100
Sulphur acid	From 10 to 30 %	S	S	-
Sulphuric acid	50 %	S	L	L
Sulphuric acid	96 %	S	L	NS
Sulphuric acid	98 %	L	NS	NS
Sulphurous acid	Up to 30 %	S	-	-
Tartaric acid	Sat.sol	S	S	-
Tetrahydrofuran	100 %	L	NS	NS
Tetralin	100 %	NS	NS	NS
Thiophene	100 %	S	L	-
Tin (IV) chloride	Sol	S	S	-
Tin (II) chloride	Sat.sol	S	S	-
Toluene	100 %	L	NS	NS
Trichloroacetic acid	Up to 50 %	S	S	-
Trichloroethylene	100 %	NS	NS	NS
Triethanolamine	Sol	S	-	-
Turpentine		NS	NS	NS
Urea	Sat.sol	S	S	-
Vinegar		S	S	-
Water brackish, mineral, potable		S	S	S
Whiskey		S	S	-
Wines		S	S	-
Xylene	100 %	NS	NS	NS
Yeast	Sol	S	S	S
Zinc chloride	Sat.sol	S	S	-
Zinc sulphate	Sat.sol	S	S	-

This data is based on multiple sources. You are required to carry out the appropriate tests to ensure the suitability and safety of the products for the envisaged use in accordance with all applicable regulations.

MARKING

Pipes and fittings are marked with the following:

- Manufacturer's Logo
- Manufacturer's Trade Name
- Manufacturer's Trademark
- Nominal diameter (DN)
- Angle specification (with elbows and branches)
- Material
- Standard numbers
- Mark of quality
- Machine Number
- Date of manufacture
- EAN Code



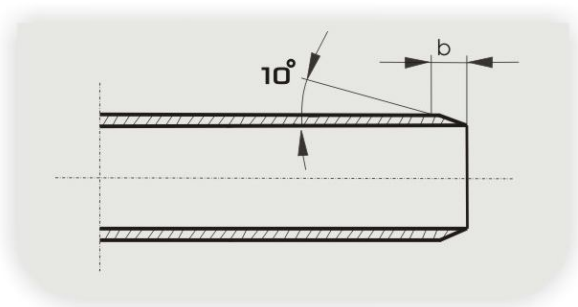
[Figure 6]

ASSEMBLY

▪ **SHORTENING AND CHAMFERING THE PIPES**

1. Cut the pipe at a 90° angle from the axis with a pipe cutter, a fine-toothed saw or any other parting-off tool. [see figure 8-9]
2. For connections to push-fit socket pipe systems, chamfer the pipe ends with a chamfering tool or a coarse file at an angle under approx. 10° according to the following table: [see also figure 7]

DN / OD	50	75	90	110	125	160	200
b ca mm.	4	4	5	6	6	7	8



[Figure 7]

3. De-burr the outside edges with a knife or a scraper. [see figure 10]



[Figure 8]



[Figure 9]



[Figure 10]

ASSEMBLY

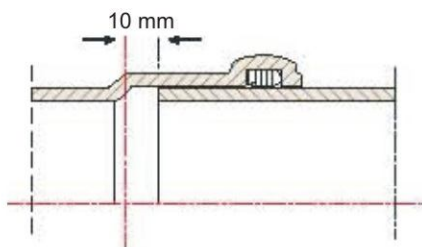
▪ CONNECTING THE PIPES WITH THE FITTINGS

1. Clean the ends of both the pipe and the fitting to be connected.
2. Apply a thin layer of lubricant to the ends of the pipe and the fitting.
Do not use grease or soft soap.
3. Insert the pipe completely into the fitting until it stops.
4. Mark inserted pipe end in this position at the sleeve edge with a pencil, felt pen etc.
5. Vertically laid pipework: for each additional storey, retract the push-fit connection in the socket by 10 mm. (see figure 11)
6. Horizontally laid pipework: after every 4 m of laid pipe length, retract the push-fit connections between the fittings, they can remain fully inserted.
7. It is not necessary to make changes in length to push-fit connections between fittings, they can remain fully inserted.

Where pipes are vertically arranged, the individual lengths must be fastened with brackets under the socket immediately after installation to avoid sinking. (see figure 15).

Length expansion coefficient:

- **SILENTA 3A** 0,06 mm/m°K



[Figure 11]

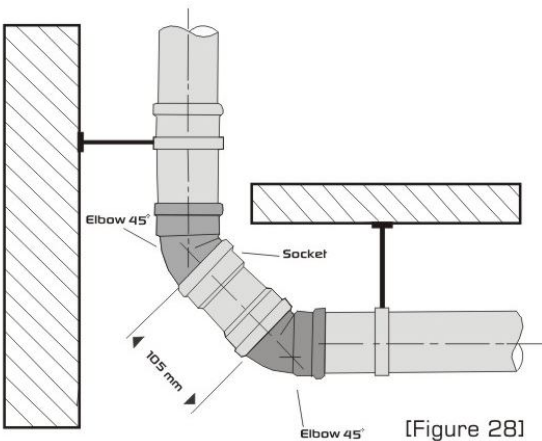
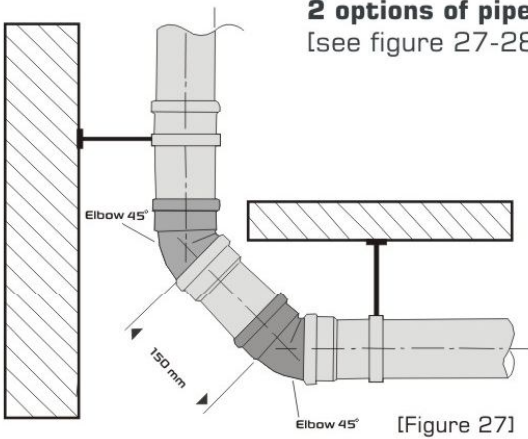
ASSEMBLY

■ **PIPE LAYING**

Pipe arrangement has a significant impact on noise reduction as well as the development of sound. Appropriate measures must be taken to reduce flow and impact sounds in areas of directional change.

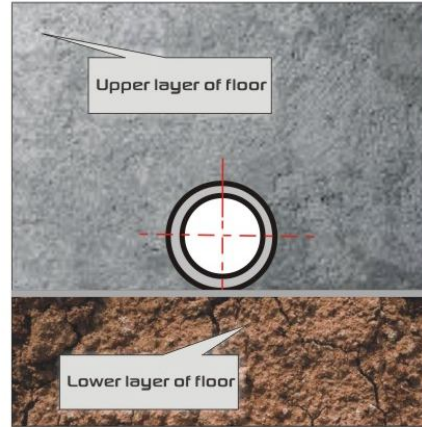
Example: In the case of bending of vertical down-pipes in the intermediate ceiling area. For any 90-degree change of direction where the down pipe enters the horizontal main, a steadying section consisting of two 45° bends and a 250 mm long pipe must be used for hydraulic and acoustic reasons. 87.5° bends must not be fitted in the transition area leading from a vertical to a horizontal arrangement.

2 options of pipelaying:
 [see figure 27-28]



■ **INSTALLING PIPES IN CONCRETE AND BRICKWORK**

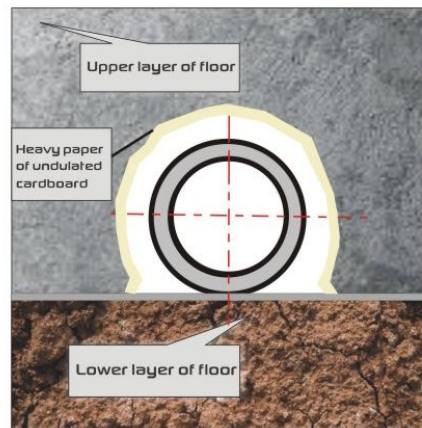
SILENTA pipes and fittings can be set directly into concrete. [See figure 29]



[Figure 29]

The change in pipe length must be taken into account.

In case of high temperature liquid transfers, it is advised to cover the pipes with undulated cardboard in a way to allow expansion. [see figure 30]



[Figure 30]

In order to prevent the concrete mixture from seeping into the socket gap, it should be sealed with adhesive tape. Open piping components must be closed. The piping must be installed in such a manner that it is prevented from moving during the cementing process.

No acoustic bridge for structure-borne sound should be allowed to develop between the piping and the plaster support. In order to prevent this, the pipe can be covered with sound insulation material.

ASSEMBLY

FLOOR TRAP

- This highly functional product completes the existing GF Hakan Plastik low-noise soil and waste system. With GF Hakan Plastik, noise inside buildings can be reduced to an absolute minimum.
- GF Hakan Plastik Floor Trap has unique features such as an air tight baffle construction.
- GF Hakan Plastik Floor Trap can be directly applied in a soil and waste system design.
- Important aspects in the designing process were knockout prevention, absorbs/correct installation mistakes, durability and resistance to 'cruel' installation circumstances.

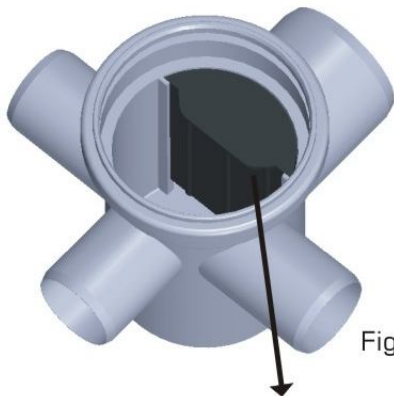


Figure 30-1

Inner separator specification

- Provides a proper water flow and avoids reflux.
- Prevents expansion of bad odors from the installation to the building.
- Avoids wastes to drop into the installation and so prevents clogging.



Figure 30-2

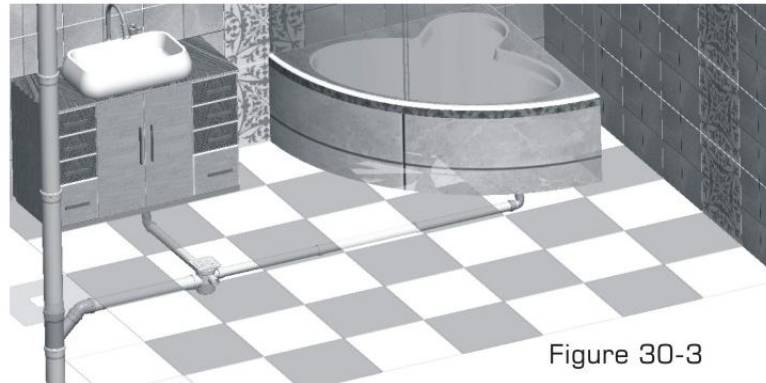


Figure 30-3

Connections and relation between DN

	Number	DN (mm)
Inlets	3	58
Outlet	1	78
Top Inlet	1	110

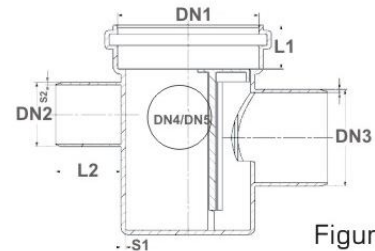


Figure 30-4

Installation

- Before installation all the input and output channels of the floor trap should be checked.
- The channels of the floor trap should be opened by using a metal tool.
- Make sure that the surface where the floor trap will be installed is flat.
- In order to prevent the entrance of solid waste into the installation, a filter must be assembled onto the 110mm output of the floor trap.
- In case not all the inlets are to be used, assembly PP blind cap. These blind caps are easy to mount to the inlets of the floor trap and secure a leakage-free sealing of unused inlet connections.



Figure 30-5

Some Application Areas

- Commercial kitchens, bathroom & toilets, car parks, healthcare facilities, shopping centres, high rise apartments.

ASSEMBLY

▪ **INSTALLATION OF VENTILATION ELBOW**

For the ventilation and the elimination of odors, reduction of moisture and humidity, ventilation fans are used. A correct assembly of ventilation systems is important for successful results.

Allow a 2-3 foot straight run out of the fan before the first elbow. This allows airflow momentum to build before passing through the first elbow. An installation that has a 90° elbow immediately after the fan exhaust port will cause air to flow back into the fan. This will reduce fan performance and increase noise. [see figure 31-32]

ELBOWS



CORRECT

[Figure 31]



INCORRECT

[Figure 32]

Use a long radius angle to ensure optimum airflow and minimum airflow noise. The shortest smooth, inner surface duct with the least number of elbows will provide optimum fan performance. [see figure 33-34]

LONG RADIUS ANGLE



TYPICAL

[Figure 33]



PREFERRED

[Figure 34]

ASSEMBLY

FASTENING WITH CLAMPS

TYPES OF CLAMPS FOR SILENTA 3A

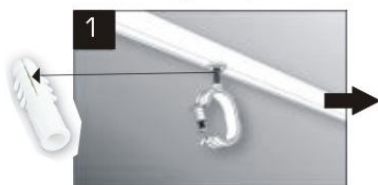
- By using EPDM insulated pipe clamps, it is possible to reduce noise and prevent the abrasions on surface which are caused by the vibrations generated by the fluids flow.[see page 42]

APPLICATION AREAS & FEATURES

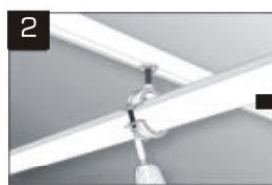
- CLAMP WITH SCREW

- It is used as pipe fixing element on horizontal and vertical surfaces.
- It is fixed with nylon plug [see figure A]
- Its screw with cruciform slot provides more easy and practical mounting.[see figure B]
- Drop of screws is prevented by washer on it.
- It is coated with 8- 12 zinc against corrosion.
- With its EPDM insulating rubber it absorbs vibration and accommodates to thermal movements.

Assembly Sequence



[Figure A]



[Figure B]



[Figure C]



- CLAMP WITH NUT

- It is used as pipe fixing element on horizontal and vertical surfaces.
- It is fixed with steel anchor
- Its screw with cruciform slot provides more easy and practical mounting.
- Drop of screws is prevented by washer on it.
- It is coated with 8- 12 zinc against corrosion.
- With its EPDM insulating rubber it absorbs vibration and accommodates to thermal movements.

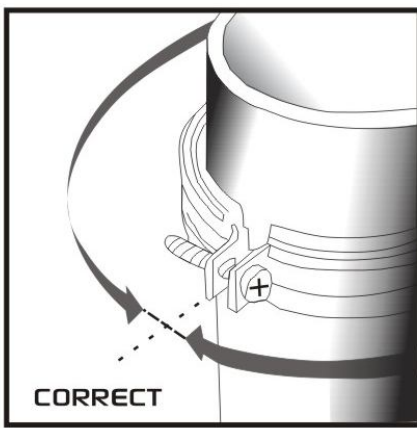


ASSEMBLY

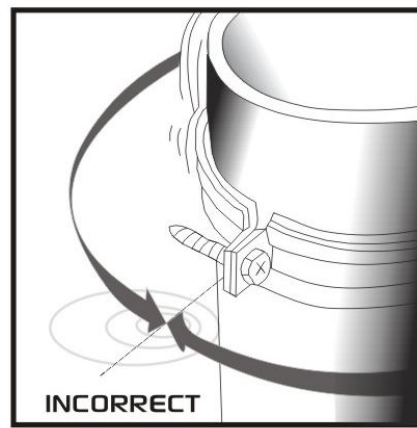
▪ **FASTENING WITH CLAMPS**

- When mounting a pipe system with a sound insulating steel bracket with rubber insert on the wall, make sure to observe the correct distances when tightening the screws.

- The fixed bracket must not be fully tightened in order to observe the span tolerances and to avoid increased structure-borne noise (see figure 12-13).



[Figure 12]

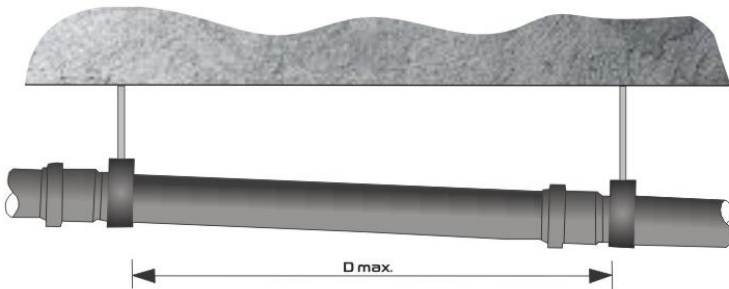


[Figure 13]

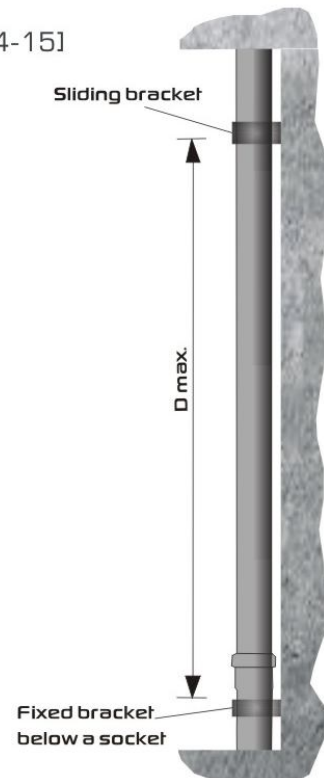
- The clamps should be mounted near the points where noise can be generated. For example in proximity of reductions and bends. It is recommended to use vibration-damping rubber-clad steel clips. [see figure 16]

- On principle, 2 brackets are fitted for each storey. [see figure 14-15]

- One fixed and one sliding bracket must be fitted on each storey. [see figure 14-15]



[Figure 14]



[Figure 15]

ASSEMBLY

- The fixed bracket must be positioned below a socket in the lower third of the storey. The bracket has to be tightened to the required extent.
- The sliding bracket must be fitted on the plain pipe in the upper third of the storey as it is intended to allow linear expansion of the pipe due to the changes in the temperature, but prevent lateral yielding.
- Make sure that the sliding bracket only slightly touches the pipe to avoid unnecessary transmission of structure-borne sound into the room that needs to be protected many steel brackets for plastic pipe dimensions DN/OD 110 have a span range from 108 to 114 mm. A fully tightened bracket would press the rubber insert too heavily. Consequentially, this strong pressing would give rise to avoidable structure-borne noise transmissions and eventually, the plumbing noise level L_{in} would increase.
- The insertion of spacers between the locking clips can also ensure the expert quality laying of the pipe.

Maximum distance between the brackets:

Nominal outer diameter DN/OD mm	Bracket distance	
	Horizontal pie routing* Dmax. m (max. 15 x da)	Vertical pipe routing* D max. m
40	0,6	1,50
50	0,75	1,50
75	1,10	2,00
90	1,35	2,00
110	1,65	2,00
125	1,85	2,00
160	2,40	2,00
200	3,00	2,00
250	3,00	2,00

In horizontal pipelines the distance between the clamps should be approximately $10 \times D_n$ (ex: $D_n = 110\text{mm}$ Clamp distance: $10 \times 110\text{mm} = 1.100\text{mm}$)

In vertical pipelines the distance between the clamps should not exceed 1-1,5 meters.

ASSEMBLY

▪ FIRE PROTECTION

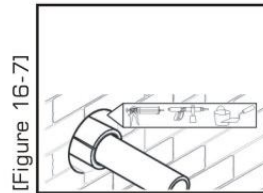
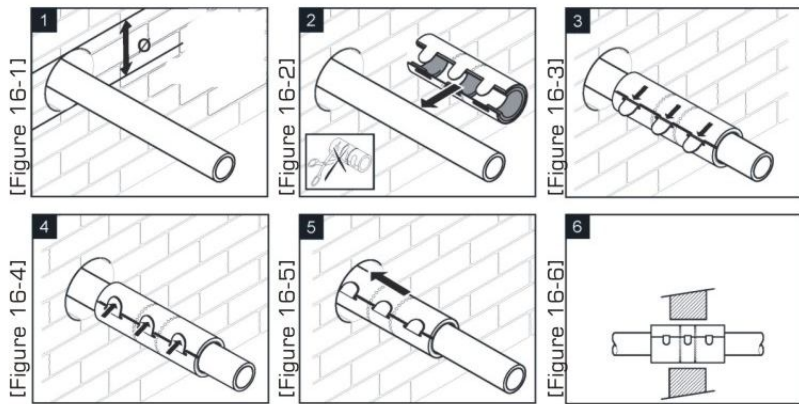
During the assembly of SILENTA pipes it is recommended to use one of the below fire retarding products in wall and floor transitions in order to ensure a good fire protection. In case of fire, these items prevent the propagation of flames between the floors and the adjacent doors. Their assembly is fast and easy and does not require the use of any extra equipment.

Installation

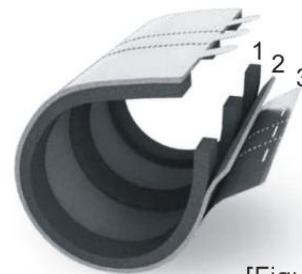
Fire, Smoke and Noise Barrier



[Figure 16]



The composition



[Figure 17]

- 1-Foam Tape**
- 2-Fire-Resistant Layer**
- 3-Stainless Steel Sleeve**

Features & Benefits

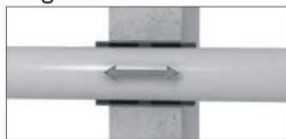
- Is easily and simply installed.
- Is suitable for apertures through floors, ceilings, solid walls and stud walls.
- Is maintenance-free and unaffected by moisture or any other building chemicals in common use.
- Does not affect the duct or any other construction components guaranteed to remain operational for decades.
- Permits shrinkage and expansion or sideways movement of the ducting
- Does not contain any asbestos or other dangerous substances
- Does not emit any toxic fumes or develop any smoke worth mentioning in the event of fire
- Limits operational noise transmission between pipe and wall or ceiling

[Figure 18]



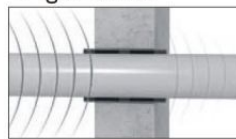
Smoke protection

[Figure 19]



Free expansion-contraction

[Figure 20]



The transmission of noise reduction

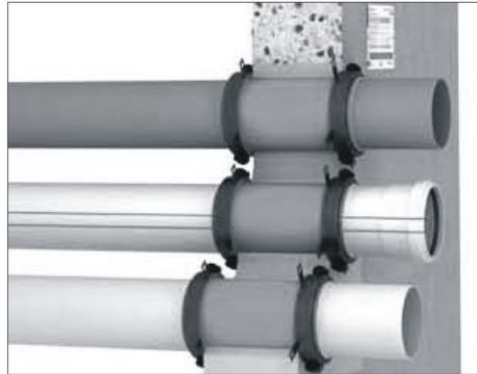
ASSEMBLY

▪ FIRE PROTECTION

Fire Retarding Cuff



[Figure 21]



[Figure 22]

Features & Benefits

- If installed properly, stuck on both side of the wall, the cuffs will not allow smoke or flames to pass from a room to another.
- The cuffs can be used with any plastic pipeline applications that require fire protection on walls and ceilings according to DIN 4102-11 and EN1363-3.
- Thanks to their small size they can be installed directly under the ceiling.
- For fire protection the installation must be done on both sides of the wall.
- Suitable to use in wet rooms.
- It can be used with waste water pipes for up to 200mm diameter.

Fire Protection Stripe



[Figure 23]



[Figure 24]



[Figure 25]

Features & Benefits

- The nature of its work is based on the coverage of the surface of the pipes then the protective shield will protect it from heat and flame.
- It can be used with Plastic pipes and pipe applications that require fire protection on the walls and ceilings according to DIN 4102-11 and EN1363-3.
- It can be applied on any material without the need of any extra tools or can be installed with glued tape.
- One roll is sufficient for many applications.



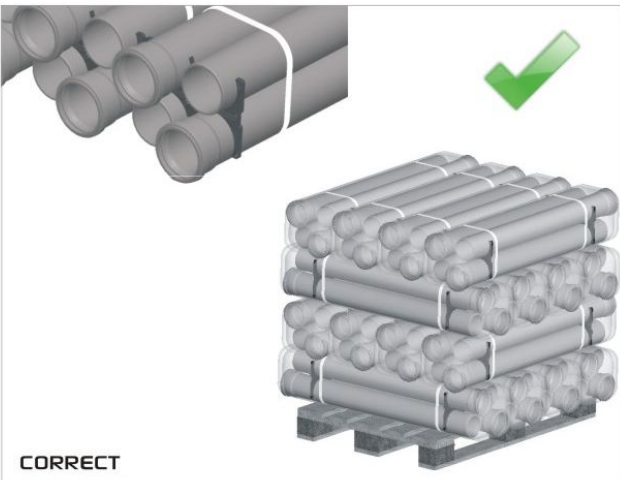
[Figure 26]

PACKAGING - STORAGE - TRANSPORT

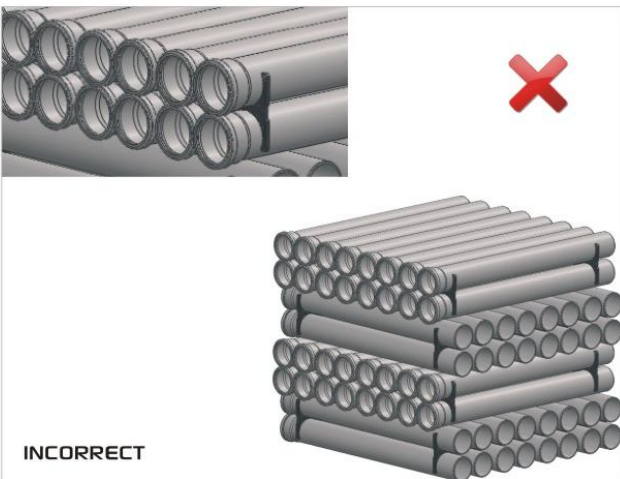
■ **PACKAGING**

SILENTA pipes and fittings are packed ready for transport in a customer friendly way. The packing guarantees optimal security, efficient storage and easy handling.

Pipes with sockets are placed in a way that the socketed parts will not overlap and rest on top of each other.



[Figure 35]



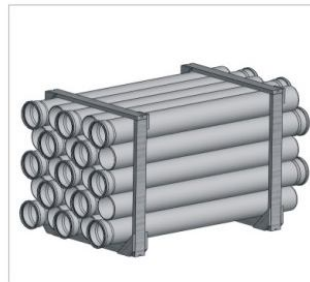
[Figure 36]

Pipes are packed with plastic clamps to hold the pipes together and are covered with plastic film to keep the products away from dust and dirt.



[Figure 37]

SILENTA pipes are provided with wooden frames or pallets depending on the customers' needs.



[Figure 38]



[Figure 39]

Short lengths of 150, 250 and 500 mm as well as fittings are packed in cartons.



[Figure 40]

All Silenta products are identified by a barcode stickers. The barcode system prevents confusions or errors while manipulating, stocking and loading the products.

[Figure 40-11]

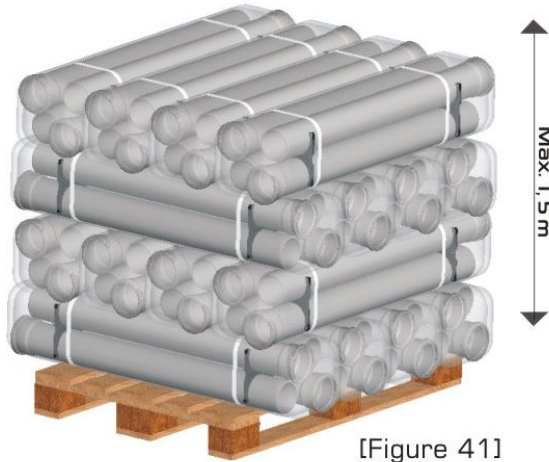


During storage and transport of products, the barcode informations should be checked.

PACKAGING - STORAGE - TRANSPORT

STORAGE

The manner of storage must not cause permanent sagging or damage to the pipes. If well stored, no lasting deformations or damage to pipes and fittings will occur. The stack should never be higher than 1.5 m. Pipe stacks must be secured against rolling apart.



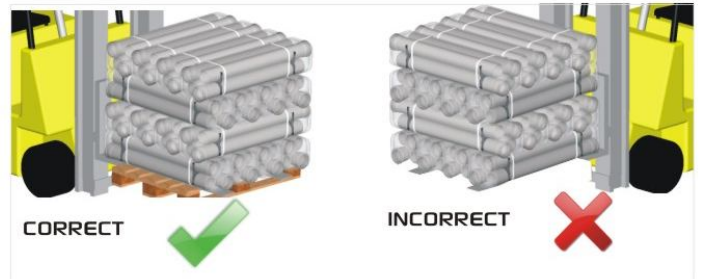
[Figure 41]

Carton-packed pipes and fitting must be protected from moisture.



[Figure 42]

Factory bundled pipes can be stacked with wooden frames. To avoid any damage on socket parts of the pipes that are placed at the bottom of the stack for long time, suitable material such as pallets, etc. must be placed on the ground. This ensures that the pipes and the socket parts do not come into contact with the ground. It also provides ease and excellence while moving the pipes from the floor through forklifts, etc.



[Figure 43]



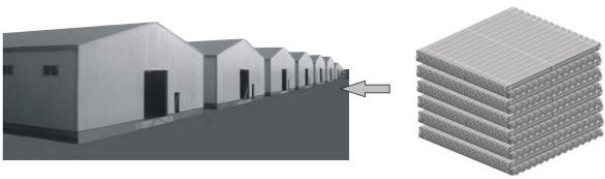
[Figure 44]

PACKAGING - STORAGE - TRANSPORT

▪ **OUTDOOR EXPOSURE**

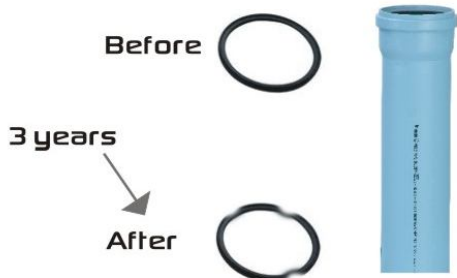
SILENTA 3A pipe systems are designed to withstand outdoor storage for max. 2 years.

Longer outdoor storage periods and intense insolation might lead to discoloration which, however, is only an optical defect and in no way influences the quality of the pipe system. When laying pipes outside buildings (e. g., rain water downpipes) they must be protected from mechanical impact.



[Figure 45]

The sealing material is designed to withstand outdoor storage for three years, after this time the seals must be replaced. This is only applied to seals which are directly exposed to weathering when inserted (spigot end sleeves), their service life equals that of seals installed inside a building.



[Figure 46]

▪ **LOADING, UNLOADING AND TRANSPORTING**

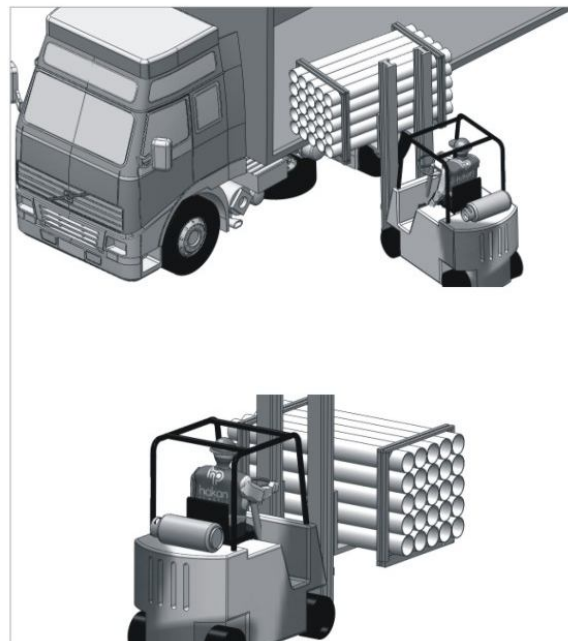
Products are to be carried out with appropriate care. Pay attention not to damage the pipes. Avoid sudden and abrupt stresses on pipes and fittings, especially with temperatures in the frost range.

Do not drop pipes or slide them over the ground. The loading and downloading of the pipes, packed as a block, should be done using forklifts equipped with flat prongs or extensions.



[Figure 47]

It is recommended to avoid contact between metal straps, hooks or chains. Furthermore, make sure that the pipes are not pulled over sharp edges (e.g. Tailgate).

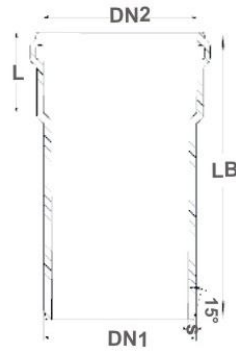


[Figure 48]

SILENTA3A

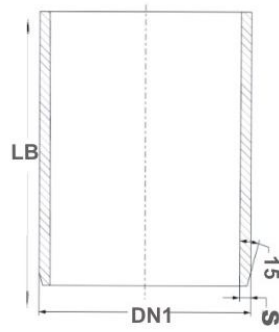
TECHNICAL DRAWINGS & DIMENSIONS

■ SILENTA 3A WITH SINGLE SOCKET PIPE



CODES	DIAMETER (mm)	LB (mm)	DN1 (mm)	DN2 (mm)	S (Thick) (mm)	L (mm)	PACKING (PCS)
4604004000321	40	500	40	41	2	55	150
4604004000421	40	1000	40	41	2	55	10
4604004000521	40	2000	40	41	2	55	10
4604004000621	40	3000	40	41	2	55	10
4604005000121	50	150	50	51	2	46	200
4604005000221	50	250	50	51	2	46	150
4604005000321	50	500	50	51	2	46	90
4604005000421	50	1000	50	51	2	46	10
4604005000521	50	2000	50	51	2	46	10
4604005000621	50	3000	50	51	2	46	10
4604005000721	50	6000	50	51	2	46	10
4604007501021	75	150	75	76	2,6	48	100
4604007501121	75	250	75	76	2,6	48	70
4604007501221	75	500	75	76	2,6	48	40
4604007501321	75	1000	75	76	2,6	48	10
4604007501421	75	2000	75	76	2,6	48	10
4604007501521	75	3000	75	76	2,6	48	10
4604007501621	75	6000	75	76	2,6	48	1
4604009006021	90	150	90	91	3	59	1
4604009006121	90	250	90	91	3	59	1
4604009006221	90	500	90	91	3	59	1
4604009006321	90	1000	90	91	3	59	5
4604009006421	90	2000	90	91	3	59	5
4604009006521	90	3000	90	91	3	59	5
4604011002021	110	150	110	111	3,4	57,5	45
4604011002121	110	250	110	111	3,4	57,5	35
4604011002221	110	500	110	111	3,4	57,5	20
4604011002321	110	1000	110	111	3,4	57,5	4
4604011002421	110	2000	110	111	3,4	57,5	4
4604011002521	110	3000	110	111	3,4	57,5	4
4604011002621	110	6000	110	111	3,4	57,5	1
4604012503021	125	150	125	126	3,4	60,5	40
4604012503121	125	250	125	126	3,4	60,5	20
4604012503221	125	500	125	126	3,4	60,5	16
4604012503321	125	1000	125	126	3,4	60,5	4
4604012503421	125	2000	125	126	3,4	60,5	4
4604012503521	125	3000	125	126	3,4	60,5	4
4604012503621	125	6000	125	126	3,4	60,5	4
4604016004021	160	150	160	161	4	75	24
4604016004121	160	250	160	161	4	75	14
4604016004221	160	500	160	161	4	75	8
4604016004321	160	1000	160	161	4	75	4
4604016004421	160	2000	160	161	4	75	4
4604016004521	160	3000	160	161	4	75	4
4604016004621	160	6000	160	161	4	75	1
4604020006621	200	150	200	201	6,2	87	4
4604020006721	200	250	200	201	6,2	87	4
4604020006821	200	500	200	201	6,2	87	4
4604020006921	200	1000	200	201	6,2	87	4
4604020007021	200	2000	200	201	6,2	87	4
4604020007121	200	3000	200	201	6,2	87	4
4604020007221	200	6000	200	201	6,2	87	1

TECHNICAL DRAWINGS & DIMENSIONS

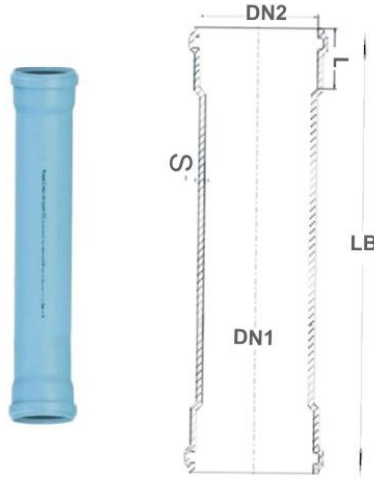


■ SILENTA 3A WITHOUT SOCKET PIPE

CODES	DIAMETER (mm)	LB (mm)	DN1 (mm)	S (Thick) (mm)	PACKING (PCS)
4604005003121	50	150	50	2	100
4604005003221	50	250	50	2	100
4604005003021	50	3000	50	2	10
4604007503021	75	3000	75	2,6	10
4604009005021	90	150	90	5	*
4604009005121	90	250	90	5	*
4604009005221	90	500	90	5	*
4604009005321	90	1000	90	5	10
4604009005421	90	2000	90	5	*
4604009005521	90	3000	90	5	*
4604009005621	90	6000	90	5	*
4604011003121	110	2100	110	3,4	4
4604011003021	110	3000	100	3,4	4
4604011003221	110	3350	110	3,4	4
4604016003021	160	3000	160	4	4
4604020005021	200	150	200	4,5	1
4604020005121	200	250	200	4,5	1
4604020005221	200	500	200	4,5	8
4604020005321	200	1000	200	4,5	1
4604020005421	200	2000	200	4,5	1
4604020005521	200	3000	200	4,5	1
4604020006021	200	4000	200	4,5	1
4604020006121	200	5000	200	4,5	1
4604020006221	200	6000	200	4,5	1

TECHNICAL DRAWINGS & DIMENSIONS

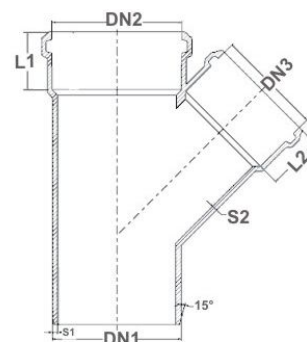
■ SILENTA 3A DOUBLE SOCKET PIPE



CODES	DIAMETER (mm)	LB (mm)	DN1 (mm)	DN2 (mm)	S (Thick) (mm)	L (mm)	PACKING (PCS)
4604005020121	50	1000	50	51	2	46	10
4604005020221	50	1500	50	51	2	46	10
4604005020321	50	2000	50	51	2	46	10
4604007520121	75	1000	75	76	2,6	48	10
4604007520221	75	1500	75	76	2,6	48	10
4604007520321	75	2000	75	76	2,6	48	10
4604009020321	90	2000	90	91	3	59	10
4604011020121	110	500	110	111	3,4	57,5	20
4604011020221	110	1000	110	111	3,4	57,5	4
4604011020321	110	1500	110	111	3,4	57,5	4
4604011020421	110	2000	110	111	3,4	57,5	4

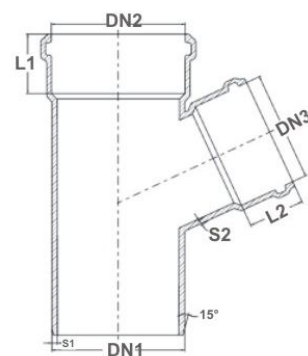
TECHNICAL DRAWINGS & DIMENSIONS

■ SILENTA 3A SINGLE BRANCH (45°)



CODES	DIAMETER (mm)	DN1 (mm)	DN2 (mm)	DN3 (mm)	S1 (Thick) (mm)	S2 (Thick) (mm)	L1 (mm)	L2 (mm)	PACKING (PCS)
4704203200121	32x32	32	33	33	1,8	1,6	40	40	250
4704204000121	40x40	40	41	41	2	1,6	50	50	250
4704205000121	50x50	50	51	51	2	2	46	46	150
4704207500221	75x50	75	76	51	2,6	2	48	46	75
4704207500321	75x75	75	76	76	2,6	2,6	48	48	60
4704209000321	90x90	90	91	91	5	5	55	55	*
4704211000421	110x50	110	111	51	3,4	2	57,5	46	40
4704211000521	110x75	110	111	76	3,4	2,6	57,5	48	30
4704211000621	110x110	110	111	111	3,4	3,4	57,5	57,5	20
4704212500721	125x50	125	126	51	3,4	2	60,5	46	30
4704212500821	125x75	125	126	76	3,4	2,6	60,5	48	25
4704212500921	125x110	125	126	111	3,4	3,4	60,5	57,5	20
4704212501021	125x125	125	126	126	3,4	3,4	60,5	60,5	16
4704216001121	160x110	160	161	111	4	3,4	75	57,5	10
4704216001221	160x125	160	161	126	4	3,4	75	60,5	10
4704216001321	160x160	169	161	161	4	4	75	75	8
4704220001421	200x110	200	201	111	4,5	3,4	86,5	57,5	4
4704220001521	200x125	200	201	126	4,5	3,4	86,5	60,5	4
4704220001621	200x160	200	201	161	4,5	4	86,5	75	4
4704220001721	200x200	200	201	201	4,5	4,5	86,5	86,5	4

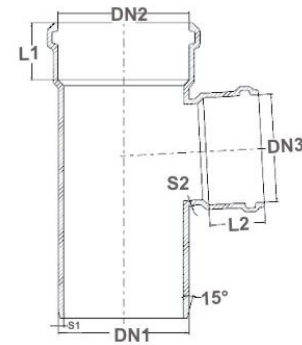
■ SILENTA 3A SINGLE BRANCH (67°)



CODES	DIAMETER (mm)	DN1 (mm)	DN2 (mm)	DN3 (mm)	S1(Thick) (mm)	S2(Thick) (mm)	L1 (mm)	L2 (mm)	PACKING (PCS)
4704211000721	110x110	110	111	111	3,4	3,4	57,5	57,5	25

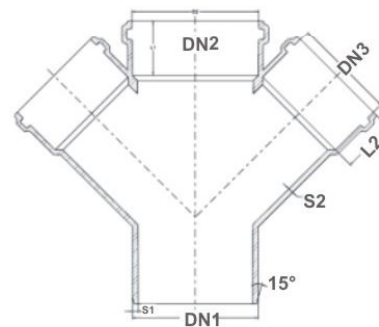
TECHNICAL DRAWINGS & DIMENSIONS

▪ SILENTA 3A SINGLE BRANCH (87°)



CODES	DIAMETER (mm)	DN1 (mm)	DN2 (mm)	DN3 (mm)	S1 (Thick) (mm)	S2 (Thick) (mm)	L1 (mm)	L2 (mm)	PACKING (PCS)
4704205001821	50x50	50	51	51	2	2	46	46	150
4704207501921	75x50	75	76	51	2,6	2	48	46	100
4704207502021	75x75	75	76	76	2,6	2,6	48	48	80
4704207502021	90x90	90	91	91	5	5	55	55	*
4704211002121	110x50	110	111	51	3,4	2	57,5	46	50
4704211002221	110x75	110	111	76	3,4	2,6	57,5	48	30
4704211002321	110x110	110	111	111	3,4	3,4	57,5	57,5	30
4704212502421	125x50	125	126	51	3,4	2	60,5	46	20
4704212502521	125x75	125	126	76	3,4	2,6	60,5	48	20
4704212503822	125x110	125	126	111	3,4	3,4	60,5	57,5	20
4704212503921	125x125	125	126	126	3,4	3,4	60,5	60,5	20
4704216002721	160x110	160	161	126	4	3,5	65	57,5	10
4704216004022	160x125	160	161	126	4	3,4	75	60,5	10
4704220002821	200x110	200	201	111	4	3,4	86,5	57,5	5

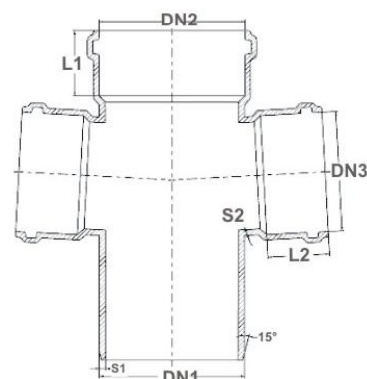
▪ SILENTA 3A DOUBLE BRANCH (45°)



CODES	DIAMETER (mm)	DN1 (mm)	DN2 (mm)	DN3 (mm)	S1(Thick) (mm)	S2(Thick) (mm)	L1 (mm)	L2 (mm)	PACKING (PCS)
4704205003021	50x50	50	51	51	2	2	46	46	100
4704207503121	75x50	75	76	51	2,6	2	48	46	80
4704207503521	75x75	75	76	76	2,6	2,6	48	48	80
4704211003221	110x50	110	111	51	3,4	2	57,5	46	40
4704211003321	110x75	110	111	76	3,4	2,6	57,5	48	20
4704211003421	110x110	110	111	111	3,4	3,4	57,5	57,5	16
4704212503521	125x110	125	126	111	3,4	3,4	60,5	57,5	10
4704212505021	125x125	125	126	126	3,4	3,4	60,5	60,5	10
4704216003621	160x110	160	161	111	4	3,4	75	57,5	8
4704220003721	200x110	200	201	111	4,5	3,4	86,5	57,5	4

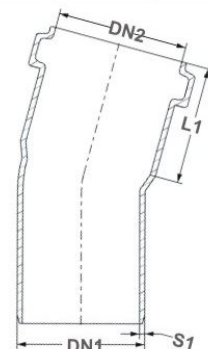
TECHNICAL DRAWINGS & DIMENSIONS

■ SILENTA 3A DOUBLE BRANCH (87°)



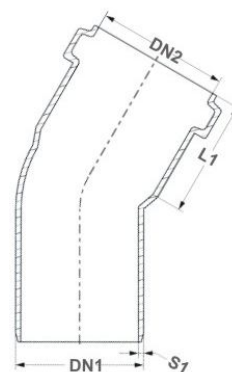
CODES	DIAMETER (mm)	DN1 (mm)	DN2 (mm)	DN3 (mm)	S1 (Thick) (mm)	S2(Thick) (mm)	L1 (mm)	L2 (mm)	PACKING (PCS)
4704211002521	110x110x110	110	111	111	3,4	3,4	57,5	57,5	20
4704209002521	90x90x90	90	91	91	5	4,5	55	55	*

■ SILENTA 3A ELBOW (15°)



CODES	DIAMETER (mm)	DN1 (mm)	DN2 (mm)	S1(Thick) (mm)	L1 (mm)	PACKING (PCS)
4704103200121	32	32	33	1,8	38	500
4704104000121	40	40	41	1,8	48	500
4704105000121	50	50	51	2	46	300
4704107500621	75	75	76	2,6	48	150
4704109001121	90	90	91	5	55	*
4704111001121	110	110	111	3,4	57,5	60
4704116001121	160	160	161	5,3	70	*

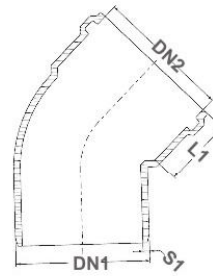
■ SILENTA 3A ELBOW (30°)



CODES	DIAMETER (mm)	DN1 (mm)	DN2 (mm)	S1(Thick) (mm)	L1 (mm)	PACKING (PCS)
4704103200221	32	32	33	1,8	38	500
4704104000221	40	40	41	1,8	48	500
4704105000221	50	50	51	2	46	350
4704107500721	75	75	76	2,6	48	150
4704109001221	90	90	91	5	55	*
4704111001221	110	110	111	3,4	57,5	60
4704116001221	160	160	161	5,3	70	*

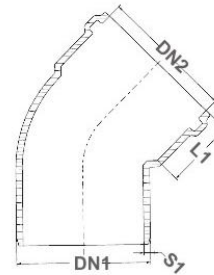
TECHNICAL DRAWINGS & DIMENSIONS

▪ SILENTA 3A ELBOW (45°)



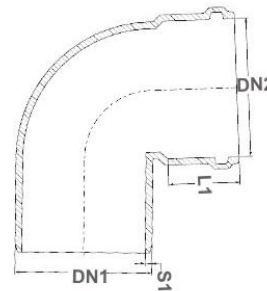
CODES	DIAMETER (mm)	DN1 (mm)	DN2 (mm)	S1 (Thick) (mm)	L1 (mm)	PACKING (PCS)
4704103200321	32	32	33	1,8	45	500
4704104000321	40	40	41	1,8	50	500
4704105000321	50	50	51	2	46	300
4704107500921	75	75	76	2,6	48	150
4704109001321	90	90	91	5	55	*
4704111001321	110	110	111	3,4	57,5	50
4704112501621	125	125	126	3,4	60,5	40
4704116001821	160	160	161	4	75	20
4704120002021	200	200	201	4,5	86,5	10

▪ SILENTA 3A ELBOW (67,5°)



CODES	DIAMETER (mm)	DN1 (mm)	DN2 (mm)	S1(Thick) (mm)	L1 (mm)	PACKING (PCS)
4704105000421	50	50	51	2	46	300
4704107500821	75	75	76	2,6	48	150
4704111001421	110	110	111	3,4	57,5	50

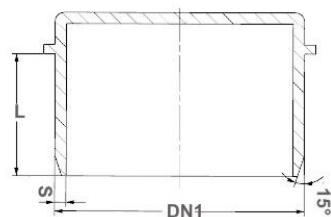
▪ SILENTA 3A ELBOW (87°)



CODES	DIAMETER (mm)	DN1 (mm)	DN2 (mm)	S1 (Thick) (mm)	L1 (mm)	PACKING (PCS)
4704103200421	32	32	33	1,8	40	500
4704104000521	40	40	41	1,8	50	450
4704105000521	50	50	51	2	46	300
4704107501021	75	75	76	2,6	48	100
4704109001421	90	90	91	5	55	*
4704111001521	110	110	111	3,4	57,5	40
4704112501721	125	125	126	3,4	60,5	30
4704116001921	160	160	161	4	75	15
4704116001921	200	200	201	4,5	86,5	6

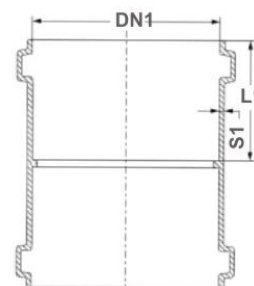
TECHNICAL DRAWINGS & DIMENSIONS

▪ SILENTA 3A BLIND CAP



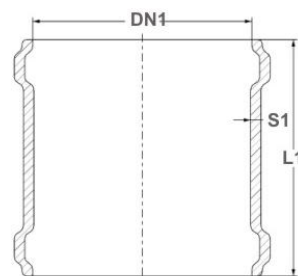
CODES	DIAMETER (mm)	DN1 (mm)	S1 (Thick) (mm)	L1 (mm)	PACKING (PCS)
4704905000421	50	50	2	46	1000
4704907500121	75	75	2,6	48	500
4704909000121	90	90	5	52	*
4704911000221	110	110	3,4	57,5	200
4704912508121	125	125	3,4	60,5	100
4704916000321	160	160	4	75	60

▪ SILENTA 3A SOCKET



CODES	DIAMETER (mm)	DN1 (mm)	S1 (Thick) (mm)	L1 (mm)	PACKING (PCS)
4704504000121	40	41	1,8	91,6	600
4704505000121	50	51	2	105	400
4704507500221	75	76	2,6	110	200
4704509000321	90	91	5	115	*
4704511000321	110	111	3,4	120	80
4704512506121	125	126	3,4	130	40
4704516000421	160	161	4	145	30
4704520000521	200	201	4,5	205	12

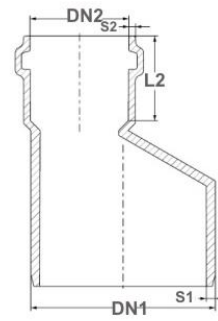
▪ SILENTA 3A SLEEVE SOCKET



CODES	DIAMETER (mm)	DN1 (mm)	S1 (Thick) (mm)	L1 (mm)	PACKING (PCS)
4704505000221	50	51	2	105	400
4704507500321	75	76	2,6	110	200
4704511000421	110	111	3,4	120	80
4704512506122	125	126	3,4	130	40
4704516000621	160	161	4	145	30
4704520000721	200	201	4,5	205	12

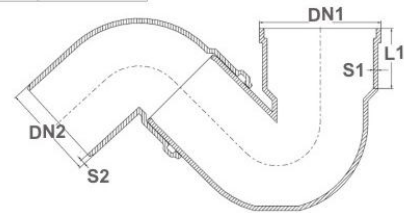
TECHNICAL DRAWINGS & DIMENSIONS

■ SILENTA 3A REDUCTION



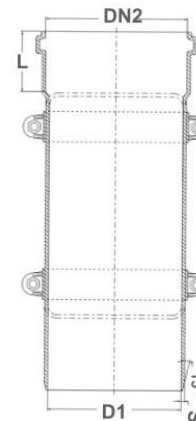
CODES	DIAMETER (mm)	DN1 (mm)	DN2 (mm)	S1(Thick) (mm)	S2(Thick) (mm)	L2 (mm)	PACKING (PCS)
4704405000121	50x40	50	41	2	1,8	48	500
4704407500121	75x50	75	51	2,6	2	46	200
4704411000221	110x50	110	51	3,4	2	46	100
4704411000321	110x75	110	76	3,4	2,6	48	100
4704411000421	110x90	110	91	5	5,3	60,5	*
4704412500421	125x110	125	111	3,4	3,4	57,5	50
4704416000521	160x110	160	111	4	3,4	57,5	40
4704416000721	160x125	160	126	4	3,4	60,5	50
4704420000621	200x110	200	111	4,5	3,4	57,5	20
47044200008621	200x125	200	126	4,5	3,4	60,5	20
47044200008721	200x160	200	161	4,5	4	75	20

■ SILENTA 3A "S" SIPHON 45°- 87°



CODES	DIAMETER (mm)	DN1 (mm)	DN2 (mm)	S1 (Thick) (mm)	S2 (Thick) (mm)	L1 (mm)	PACKING (PCS)
4704607500121	75x45°	97	75	2,7	2,5	49	50
4704611000121	110x45°	140	110	3,4	3,4	70	20
4704607500221	75x87°	97	75	2,7	2,5	49	50
4704611000221	110x87°	140	110	3,4	3,4	70	20

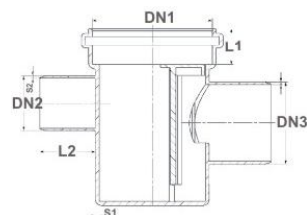
■ SILENTA 3A CLEAN OUT



CODES	DIAMETER (mm)	DN1 (mm)	DN2 (mm)	S1 (Thick) (mm)	L1 (mm)	PACKING (PCS)
4501307800522	75	75	76	2,6	48	80
4704309000421	90	90	91	5	55	*
4501311000121	110	110	111	3,4	57,5	30
4501313500221	125	125	126	3,4	60,5	20
4501316000321	160	160	161	4	75	8

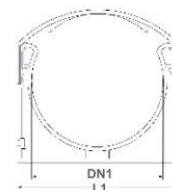
TECHNICAL DRAWINGS & DIMENSIONS

▪ SILENTA 3A FLOOR TRAP



CODES	DIAMETER (mm)	DN1 (mm)	DN2 (mm)	DN3 (mm)	S1 (Thick) (mm)	S2 (Thick) (mm)	L1 (mm)	L2 (mm)	PACKING (PCS)
4701911002022	110x75x50x50	111	50	75	3,4	2	57,3	51,3	12

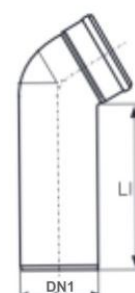
▪ SILENTA 3A CLAMP



CODES	DIAMETER (mm)	DN1 (mm)	L1 (mm)	PACKING (PCS)
4701905001022	50	59	65	100
4701907501122	75	78	85	100
4701911001222	110	111	135	100
4701912501322	125	126	155	100
4701916001422	160	161	185	50

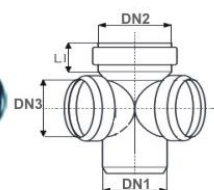
▪ SILENTA 3A LONG ELBOW (45°)

CODES	DIAMETER (mm)	DN1 (mm)	S1(Thick) (mm)	L1 (mm)	PACKING (PCS)
4704111004521	110	110	5,3	250	*



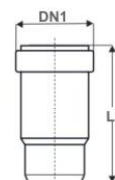
▪ SILENTA 3A DOUBLE CORNER BRANCH (87°)

CODES	DIAMETER (mm)	DN1 (mm)	DN2 (mm)	DN3 (mm)	S1(Thick) (mm)	L1 (mm)	PACKING (PCS)
4704211003021	110x110x110	110	111	111	5,3	57,5	*



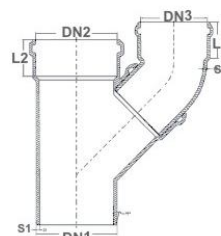
▪ SILENTA 3A LONG SOCKET

CODES	DIAMETER (mm)	DN1 (mm)	S1(Thick) (mm)	L1 (mm)	PACKING (PCS)
4704911002221	110	110	5,3	196	*



▪ SILENTA 3A SINGLE PARALLEL BRANCH

CODES	DIAMETER (mm)	DN1 (mm)	DN2 (mm)	DN3 (mm)	S1(Thick) (mm)	S2(Thick) (mm)	L1 (mm)	L2 (mm)	PACKING (PCS)
4704211010122	110x110	110	111	111	5,3	5,3	57,5	57,5	*



TECHNICAL DRAWINGS & DIMENSIONS

■ FIRE, SMOKE AND NOISE BARRIER



CODES	DIAMETER (mm)	PACKING (PCS)
4704905020282	50	*
4704907520282	75	*
4704909020282	90	*
4704911020282	110	*
4704912520282	125	*
4704916020282	160	*

■ SAFETY CLAMP (LIPPER)



CODES	DIAMETER (mm)	PACKING (PCS)
4704905020382	50	*
4704907520382	75	*
4704909020382	90	*
4704911020382	110	*
4704912520382	125	*
4704916020382	160	*

■ FIRE RETARDING CUFF



CODES	DIAMETER (mm)	PACKING (PCS)
4704905020182	50	*
4704907520182	75	*
4704909020182	90	*
4704911020182	110	*
4704912520182	125	*
4704916020182	160	*

■ SAFETY CLAMP (FLAT)



CODES	DIAMETER (mm)	PACKING (PCS)
4704905020482	50	*
4704907520482	75	*
4704909020482	90	*
4704911020482	110	*
4704912520482	125	*
4704916020482	160	*

■ FIRE PROTECTION STRIPE



CODES	PACKING (PCS)
4704900000182	1

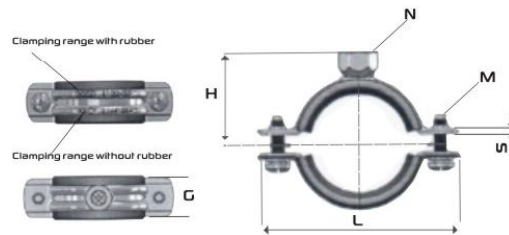
■ CONNECTION CLAMP



CODES	DIAMETER (mm)	PACKING (PCS)
4704905020582	50	*
4704907520582	75	*
4704909020582	90	*
4704911020582	110	*
4704912520582	125	*
4704916020582	160	*

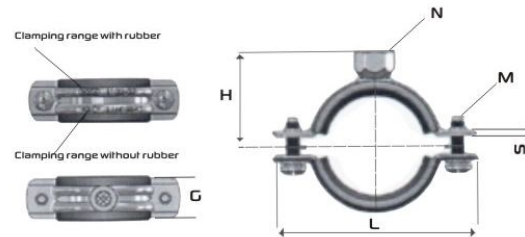
TECHNICAL DRAWINGS & DIMENSIONS

■ SILENTA 3A CLAMP WITH NUT



CODES	SIZE (Inch)	CLAMMING RANGE (mm)	L (mm)	H (mm)	M	SxG Iron Seet	N Suspension Nut
*	1.1/4"	39-46	91,5	39	M5	1.2x20	M8
*	1.1/2"	47-53	99	42,5	M5	1.5x20	M8
*	2.1/2"	74-81	134	60	M6	1.5x25	M10
*	3"	85-92	145	65,5	M6	1.5x25	M10
*	4"	107-117	170	78	M6	1.5x25	M10
*	5"	120-130	184	84,5	M6	2x25	M10
*	6"	156-168	222	103,5	M6	2x25	M10
*	7"	191-203	257	121	M6	2x25	M12

■ SILENTA 3A CLAMP WITH NUT [ORANGE]



CODES	SIZE (Inch)	CLAMMING RANGE (mm)	L (mm)	H (mm)	M	SxG Iron Seet	N Suspension Nut
*	1.1/4"	39-46	91,5	39	M5	1.2x20	M8
*	1.1/2"	47-53	99	42,5	M5	1.5x20	M8
*	2.1/2"	74-81	134	60	M6	1.5x25	M10
*	3"	85-92	145	65,5	M6	1.5x25	M10
*	4"	107-117	170	78	M6	1.5x25	M10
*	5"	120-130	184	84,5	M6	2x25	M10
*	6"	156-168	222	103,5	M6	2x25	M10
*	7"	191-203	257	121	M6	2x25	M12

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