01.08.2022

Sound Insulated Piping Systems - SuperMUTE

kalde®

First Choice

K-SUPERMUTE-TK-ENG-18.07.2022 v.02

Kalde is the “First Choice” all around the world.

Certificates

Fraunhofer IBP

Institution for testing, supervision and certification, officially recognized by the building supervisory authority. Approvals of new building materials, components and types of construction

Director
Prof. Dr. Philip Leistner
Prof. Dr. Klaus Peter Sedlbauer

Test Report P-BA 176/2021e

Determination of the Acoustic Performance of a Wastewater Installation System in the Laboratory according to DIN EN 14366

Client: Kalde Klima A.Ş.
Adnan kahveci mah. Büyükdere cad. [illegible]
Beylikdüzü/İSTANBUL
Turkey

Test object: Wastewater system "K[illegible]" (manufacturer: Walraven): Structure-borne ng of Bismat SL loose clamps and Bismat SX socket
The wastewater sy[illegible] an adjustable wall plate with dowels and thread rods.
110), and acou[illegible]ely two clamps were installed. At the upper wall area one
(manufactu[illegible]ounted. At the lower wall area one double clamp consisting of
Content: Resul[illegible]0) and fixing clamp (SX, DN 100) was installed (figure 5). To prevent
[illegible]oose clamp (SL) was mounted with 15 mm space between the locking
[illegible]wo 7.5 mm spacers on each side).
[illegible]allation system was mounted by a technician under the authority of Fraunhofer IBP.

[illegible]st facility P12, mass per unit area of the installation wall: 220 kg/m², mass per unit area of the [illegible]40 kg/m². Installation rooms: sub-basement (KG), basement (UG) front, ground floor (EG) front [illegible]op floor (DG), measuring rooms: UG front, UG rear (details in Annex P and DIN EN 14366: 2020-02)

The measurements were performed according to DIN EN 14366:2020-02; noise excitation by steady water flow with 0.5 l/s, 1.0 l/s, 2.0 l/s and 4.0 l/s. Additional evaluation for comparison with requirements following German standards DIN 4109:2018-01 and VDI 4100:2012-10 (details in Annexes A, F and V).

Result:

Test specimen: Wastewater system "Kalde SuperMUTE" (manufacturer: Kalde Klima A.Ş.). The wastewater system consisted of straight plastic pipes and fittings (OD 110), and acoustic pipe clamps with elastic inlay "Bismat 1000" (manufacturer: Walraven).		Flow rate [l/s] 0.5	1.0	2.0	4.0
Airborne sound pressure level $L_{a,A}$ [dB(A)] **according to DIN EN 14366** for the basement test-room	UG front	38	43	45	48
Structure-borne sound characteristic level $L_{sc,A}$ [dB(A)] **according to DIN EN 14366** for the basement test-room	UG rear	<10	<10	<10	12
Installation sound level $L_{AFeq,n}$ [dB(A)] **following DIN 4109** in the basement test-room	UG front	38	43	45	48
	UG rear	<10	<10	<10	14
Installation sound level $\overline{L_{AFeq,nT}}$ [dB(A)] **following VDI 4100** in the basement test-room	UG front	36	41	43	46
	UG rear	<10	<10	<10	11

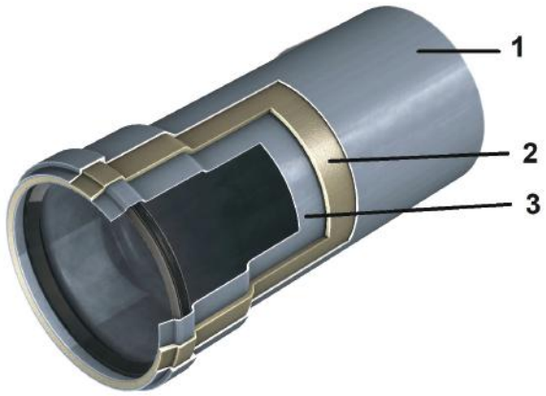
Test date: August 5, 2021

Notes:
- For comparing test results with requirements according to DIN 4109 and VDI 4100 note Annex A.
- The above-mentioned measurement results require careful assembly of the pipe clamps (see test set-up).
- Sound levels below 10 dB(A) are not mentioned in the official test report, since they are subject to an increased measurement uncertainty and moreover are not noticeable in a normal living environment.

Contents

SuperMUTE

Kalde-SuperMUTE (PP/PP-MR/PP) Waste Water Pipe



Pipe Structure

3-layer mineral reinforced polypropylene

1st : PP (polypropylene random copolymer)

2nd : PP-MR (mineral reinforced polypropylene random copolymer)

3rd : PP (polypropylene random copolymer)

Fire Class

B2 s3 d0 (DIN 4102-1) D s3 d0 (TS EN 13501-1)

Sound Transmission

11 dB(A) at 4 l/s according to DIN 4109 – VDI 4100

Connection Method

Gasketed bell and spigot connection

Density

1,5 - 1,7 gr/cm^3

Linear Elongation Coefficient

λ_{FO}: 0,09 mm/mK

Max. Operational Temperature

95°C

Colour

Ral 7040 (grey)

Kalde-SuperMUTE pipes and fittings are according to system standards, **EN 1451-1** (plastic pipe systems - used to discharge cold and hot waste water inside the building - made of polypropylene (pp)), **DIN 4109** (sound insulation in buildings), **VDI4100** (sound insulation between rooms in buildings - residential - assessment and recommendations for improved sound insulation between rooms), and **DIN 4102** (fire behavior of building materials and elements).

Pipe Dimensions

Nominal Size	Nominal Outer Dia.	Outer Diameter (mm)		Wall Thickness (mm)	
DN / OD	DN	Dem, min	Dem, maks	S, min	S, max
58	58	58	58,3	4,0	4,4
78	78	78	78,3	4,5	4,9
110	110	110	110,3	5,3	5,8
125	125	125	125,4	5,3	5,8
160	160	160	160,5	5,3	5,8
200	200	200	200,6	6,2	7,1

Sound Insulation Values

Silence Values of the "Kalde SuperMUTE Pipes PP/PP-MR/PP 110X5.3" Waste Water System				
Water flow rate (l/s)	0,5	1,0	2,0	4,0
Installation sound level measured in the lower floor test room according to DIN 4109. L_{in} (dB(A))	<10	<10	<10	14
Installation sound level measured in the lower floor test room according to VDI 4100. L_{in} (dB(A))	<10	<10	<10	11

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Acoustics

Sound is defined as the mechanical vibrations in gas (lightning), liquid and solid (bell, pipe wall, glass, wall, ceiling) materials perceived by the eardrum.

The human ear can hear sounds with a frequency between 20 Hz (very low tone) and about 20000 Hz (very high tone).

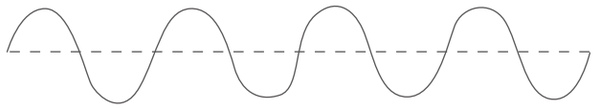
Sounds with a frequency higher than 20000 Hz are defined as ultra sound.

The sound and noise in the environment can have different effects on a person depending on the mood and activities of that person; it can affect work performance and concentration, interrupt rest and sleep and even cause health problems in case of continued exposure.

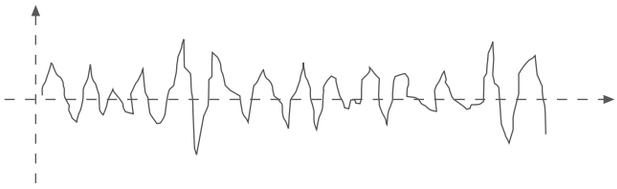
The noise in buildings might be caused by the outer environment, traffic, industry, people, in-house technical installations, elevators, audio systems, kitchen appliances, hot water, clean water and waste water installations.

Various Sounds;

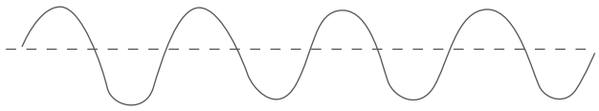
a) Rhythmic Sound



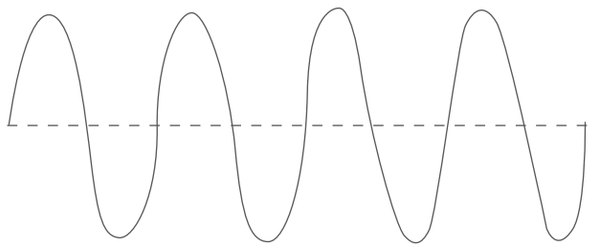
b) Noisy Sound



c) Low Amplitude Sound



d) High Amplitude Sound



a) Howling Sound

b) Water Sound

c) Pounding Sound

d) Walking Sound

a) Howling Sound: Travels through air at a speed of 340 m/s.

b) Water Sound: Occurs in water and similar liquids.

c) Pounding Sound: Travels in solid materials at a speed of 5000 m/s in steel, 4000 m/s in concrete, 500 m/s in foam, etc.

d) Walking sound: It is a special form of contact sound. It occurs when one walks on the floor. It is transmitted partly as contact sound and partly as humming sound.

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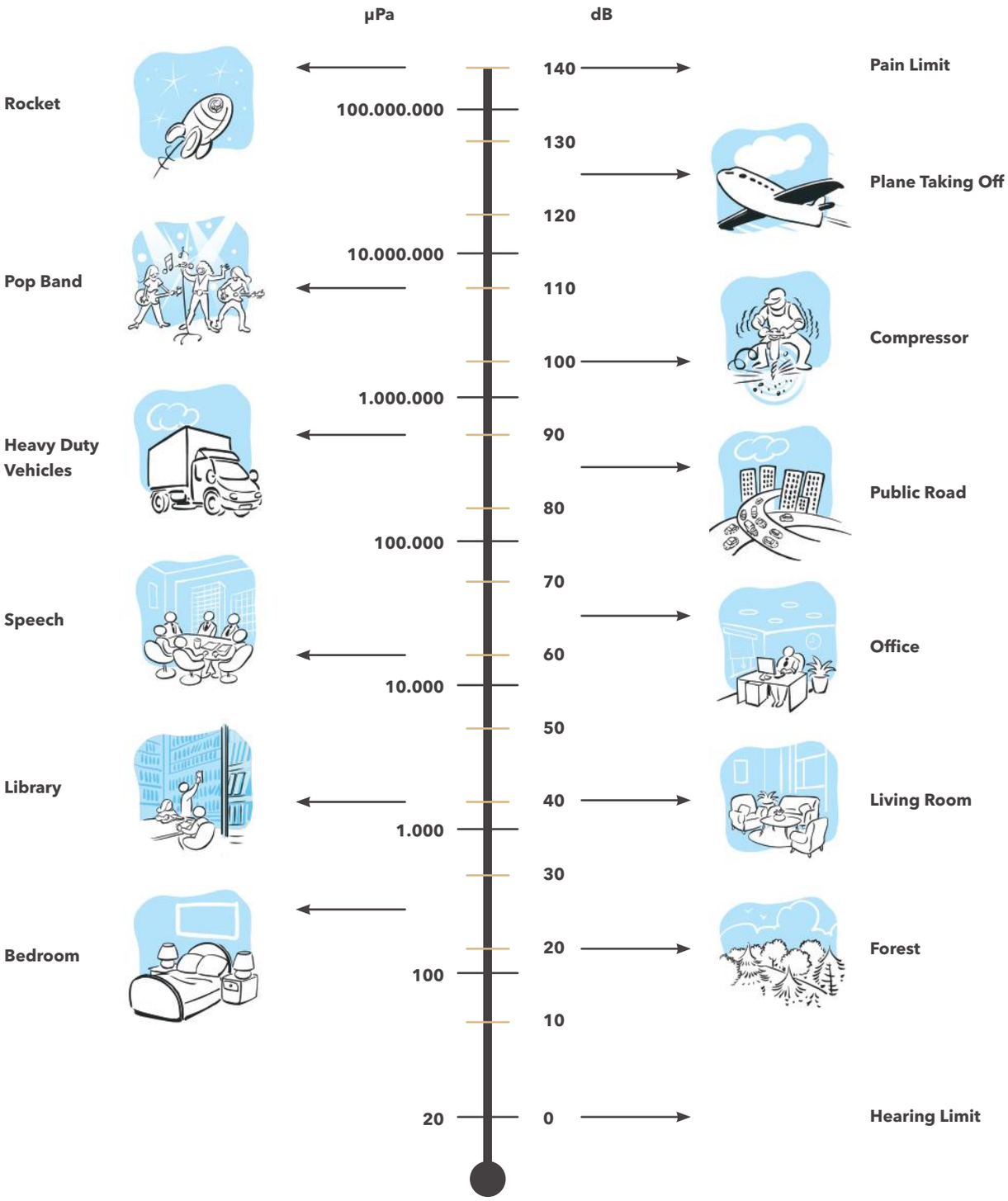
- **Tone** is defined as audible humming sounds comprising of continuous vibrations with a single frequency.
- **Harmonic sound** is multiple tones waving together harmonically.
- **Sound** is multiple non harmonic tones.
- **Noise** is a disturbing mixture of tones, harmonic sounds and sound.

Sound Pressure Unit;



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Sound travels as waves and creates a sound pressure.

Sound pressure (p) is transformation into humming of the sound waves created in gases or water as variable pressures.

Sound pressure (1 µbar = 1/1.000.000 bar). The human ear can hear sounds between 2/10.000 µbar = $2 \cdot 10^{-4}$ µbar (lower hearing limit) and 200 µbar = 2 10^{2} µbar

(pain limit). A logarithmic scale is used for measuring the sound pressure and the sound pressure level is expressed in LP decibel (dB).

The reference sound pressure level is 20 micropascals (µbar).

The hearing limit pressure is 0.0002 µbar 0 dB while the pain limit pressure is 200 µbar 120 dB (at f = 1000 Hz). (sound pressure unit)

An increase of 10 dB in the sound pressure level means that the sound has doubled.

The addition of another sound source at the same level increases the sound pressure level **3 dB only.**

For instance: two machines producing 50 dB of sound each cause a sound pressure level as follows: **50 dB + 50 dB = 53 dB.**

Sound Pressure Levels of Various Sounds, Sound Pressure Level in L db (A)	Sound
10	Audible sound, ticking of a watch
15 - 20	Considered silence, silence of a forest at night
25 - 30	Whisper (in a reading room)
40	Quiet conversation, quiet chat
50 - 60	Normal chat among people
60 - 65	Vacuum cleaner, shopping center noise, noisy office
70 - 75	Average street noise
80	Loud shouting, scream, sound level in a metro station
80 - 90	Truck passing by at a distance of 1 meter
90 - 100	Chainsaw, train passing by at a short distance
100 - 110	Lightning, motorcycle without muffler
110 - 120	Plane Engine at 3 meters
120 - 130	Jet Engine

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Noise Management in Waste Water Installation

Taking measures to prevent outside noise from entering into the buildings where people live is equally important with taking measures against the noises to occur in the building. Due to the importance of this matter, various standards were introduced.

Particularly DIN 4109 (GERMANY) and ÖNORM 8115 (AUSTRIA) standards require that specific measures are taken in various buildings against all sorts of noise to ensure acoustical comfort of people.

The maximum values for the installation noise provided for in DIN 4109 are given in the table below and the noise level for the clean and waste water installations was determined as 35dB max.

Noise Source	**The maximum sound pressure levels allowed in the buildings requiring sound insulation as per DIN 4109/VDI 4100 (db)**		
	Stages of Noise		
	Stage 1 Standard Buildings	**Stage 2 Qualified Buildings**	**Stage 3 Luxurious Buildings**
Water installation Clean Water and Waste Water installations together	35 [1) 2)]	30 [1) 2)]	25 [1) 2)]
Other technical installations	30 [1) 2)]	30 [1) 2)]	25 [1) 2)]

1- Individual loud sounds with short duration during opening, closing, adjusting taps and faucets are not taken into account.

2- Unnoticed continuous sounds from ventilation system are allowed up to 5dB of extra.

Waste water installation is an integral part of buildings and the noise from such installations is inevitable.

The noise level can be decreased considerably with various measures to be taken.

Main Factors Causing Noise:

- The type of the building materials used (heavy or light).
- The quality of labor in the building and installation applications.
- The type of materials used in the waste water installation.
- The connections of the waste water installation with the main structure.
- The operating conditions and the manner of use by the user.

The noise sources in the waste water installation are the hardware such as the bathtub, shower, closet, washbasin, etc. and the noise if formed by the water from these sources flowing through the pipes and fittings (elbow, t-piece, etc.).

Furthermore, if the connection of the installation with the main structure was made without sound insulation, these noises are transmitted to the main structure via the fittings.

As it is known, solid materials transmit sound better than air and water.

Sources of Noise in the Waste Water Installation and the Installation Systems Transmitting Noise (Figure 3)

Sanitary installation

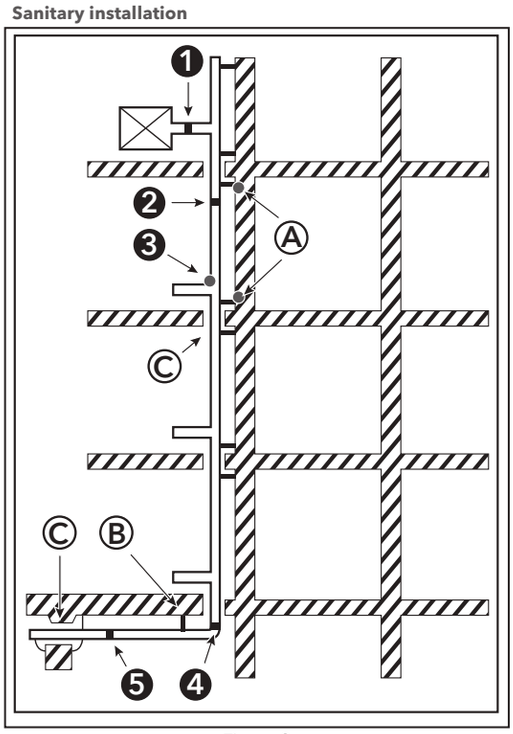


Figure 3

Transmission of noise to the neighboring locations

A Fixation of the vertical pipes to the walls

B Fixation of the horizontal pipes to the ceilings

C Passage of the pipes through flooring and walls

Noise sources

1 Sanitary installation (closet, bath, tub...)

2 Noises from the flows in the vertical pipes

3 Locations such as elbows, corners, etc. where the continuity is spoilt

4 Noises caused by change of direction

5 Noises from the flows in the horizontal pipes

Locations of Noise in the Waste Water Installations (Figure 4)

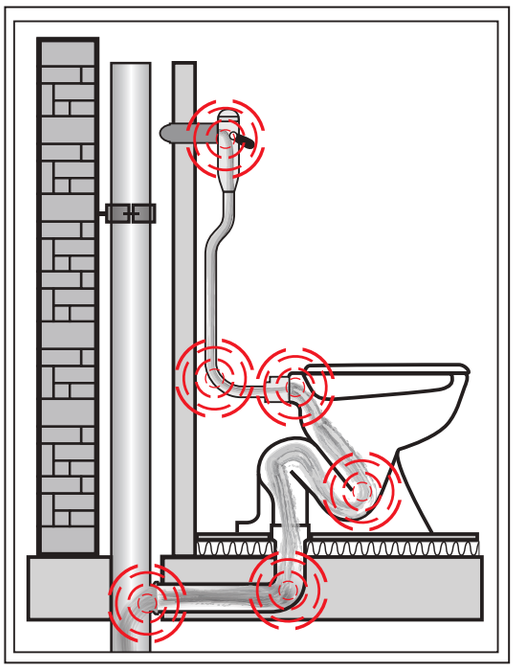


Figure 4

The water from the upper floors cause air sound directly on the walls of the pipes depending on the amount and speed of the water while flowing downwards from the vertical columns. Also, the mass effect sound is transmitted to the neighboring locations via the fittings, walls and flooring. The fittings such as the elbows, t-pieces, etc. which change the direction of flow cause the existing sound to increase. This also applies to horizontal pipe systems and the sound is transmitted to the neighboring locations in the same manner.

In order to prevent the air sound from being dispersed, either high density pipes and fittings should be used or sound insulation materials should be used for the installation.

Since the use of heavy materials lead to detailing and installing challenges, use of lightweight and sound absorbing materials should be preferred.

Kalde-SuperMUTE Pipes and Fittings are the First Choice Thanks to Their Low Weight and Sound Absorbing Features.

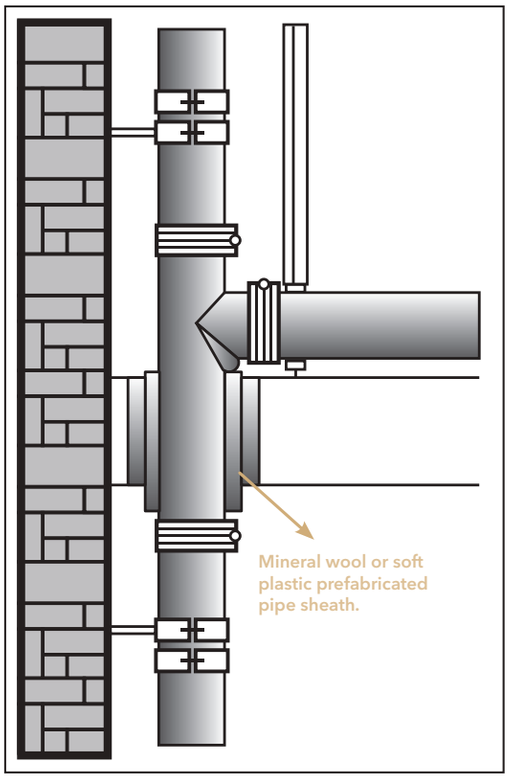


Figure 5

In order to prevent transmission of sound caused by the mass effect, a flexible material which has sound absorbing and pressure resisting features and stops direct contact should be placed between the materials contacting each other.

Sound Absorbing Sheath and Flexible Material Reinforced Clamps Preventing the Mass Sound from Being Transmitted to the Main Structure. (Figure 5)

The flexible material mentioned here is not rubber, it is mineral fibre materials such as glass wool, rock wool, etc. and polyethylene or rubber based foam materials. The materials in this category are usually referred to as flex materials.

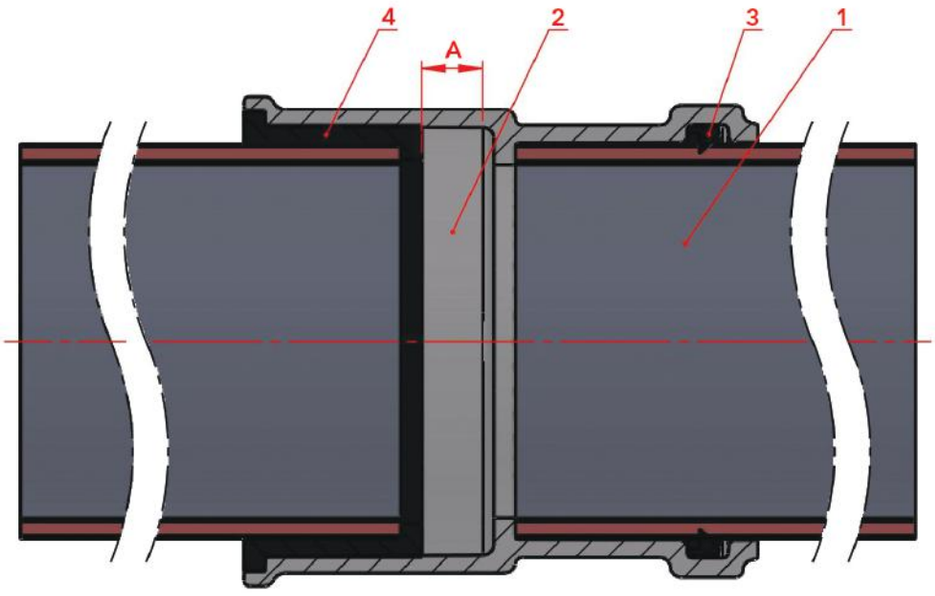
The flex materials with low dynamic hardness don't transmit sound but absorb it. On the other hand, rubber has a very high dynamic hardness and it transmits sound.

Compensator Coupling

Compensator sleeve is a type of fitting which connects the pipes without sockets and the fittings (elbow, t-piece, etc.) used in waste water installations. Leaving a gap as much as the distance A (A>10 mm.) between the pipe and the fitting, it absorbs the dimensional changes to occur in the waste water installation due to thermal expansions thanks to a special compensator gasket.

In the traditional installations, this gap was formed by retracting the pipe but this is not a safe method.

Kalde-SuperMUTE compensator sleeve makes this possible and the waste water installation safe thanks to the special compensator gasket.



1 Kalde-SuperMUTE PP-FO pipe **2** Compensator Sleeve **3** Gasket **4** Compensator gasket

Installation Instructions for Kalde-SuperMUTE Pipe

The following instructions should be followed during installation with the compensator sleeve.

- Clean the pipe end and the sleeve end.
- Insert the compensator gasket to the end of the cleaned pipe and make sure that the pipe end fits snugly into the bead at the end of the compensator gasket.
- Lubricate or apply liquid soap on the outer surface of the compensator gasket and the slot where the fittings will fit.
- Join the pipe and the compensator sleeve. Make sure that the outer bead of the compensator sleeve fits snugly into the slot in the sleeve.

Connecting the Pipes

Kalde-SuperMUTE pipes should be installed taking into account the expansion of the pipes.

- For the horizontal pipes, the distance between the pipe clamps should be 10 times the average pipe diameter.
- For the vertical pipes, the distance between the pipe clamps should be about 1.5 meters. The maximum distance shouldn't exceed 2 meters. **(Figure 6)**
- The connection of vertical pipe lines for floors higher than 2.5 meters should be made with a wall-mounted clamp and a free clamp. **(Figure 7)**
- The wall-mounted clamps should be placed directly on the fitting at the lower ends of the pipes without sockets. **(Figure 8)**

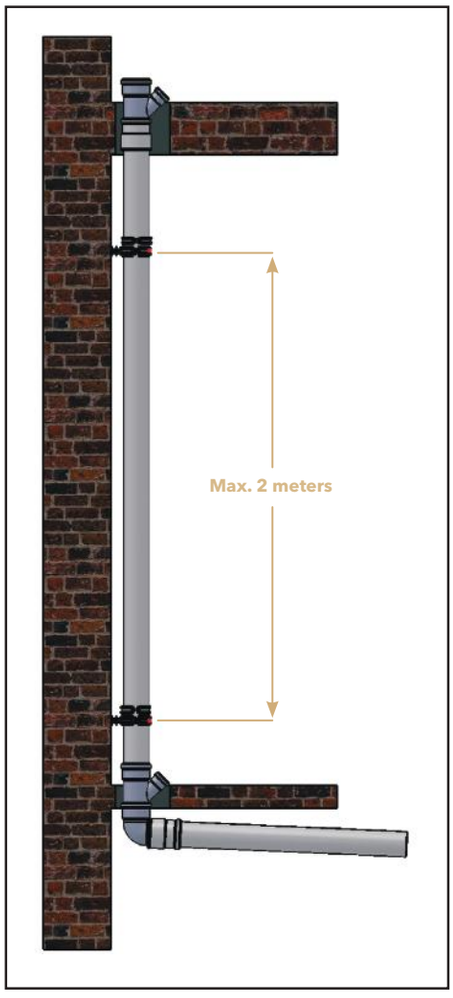


Figure 6

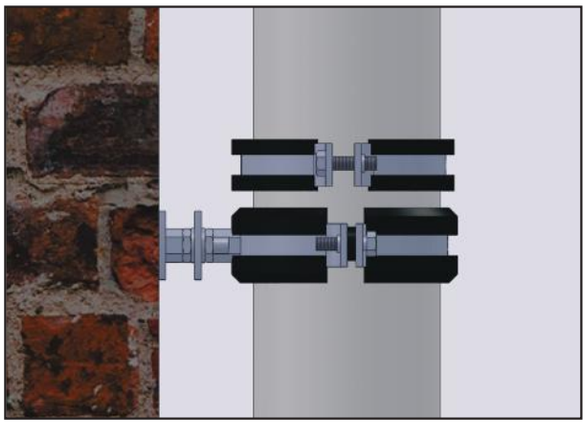


Figure 7

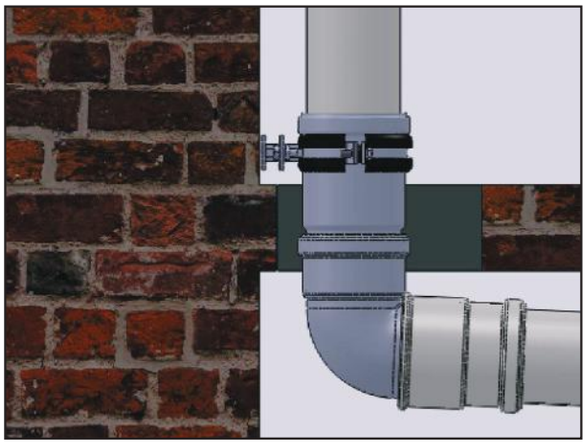


Figure 8

Installing and Storing

Matters to Take into Account While Installing Kalde-SuperMUTE PP Waste Water Pipes

1- Kalde-SuperMUTE waste water pipes should be protected against impacts such as striking, hitting, etc. Since the fragility of the pipes increases where the temperature is near 0 °C, this becomes more important.

2- Insulation should be made to prevent heat and humidity transmission at the floor and ceiling passages.

3- Works causing scratches, cuts or marks on Kalde-SuperMUTE pipes and fittings should be avoided. For the pipes installed vertically, once the pipes are joined with fittings, they should immediately be fixed with clamps.

4- During the installation, a small amount of liquid soap or grease should be applied on the gaskets to join Kalde-SuperMUTE pipes and fittings easily.

5- Kalde-SuperMUTE pipes and fittings shouldn't be joined without gaskets.

6- Kalde-SuperMUTE pipes which will be covered with screed should be tested with one of the methods below before the screed is poured. **AS 2032**

Water Test

The pipe line to be tested should be filled with water at a level not less than 1 meter below the ground.

The mechanism should be tested from the top but the height of this top point shouldn't exceed 5 meters from the bottom level.

In order for the test to be completed successfully, the water level should be retained for at least 15 minutes.

All joining points should be checked against leaks and any defects should be repaired and then the test should be repeated.

Air Test

Air is applied to the pipe line slowly until a pressure of 0.5 bars is achieved.

This pressure should be maintained for at least 3 minutes. There should be no visible leaks at the end of 3 minutes.

Then the air supply system should be turned off; if the air pressure in the pipe doesn't fall below 0.35 bars in 60 seconds, the pipe line is considered fit.

If the pressure can't be maintained within the mentioned limits, the pipe line should be filled with air again and any leaks should be checked by pouring the solution of soap and water on the joints. Any leaks should be repaired and the test should be repeated.

Matters to Take into Account While Transporting, Unloading and Storing Kalde-SuperMUTE Pipes

1) The products shouldn't be dropped during transportation. The pipes should be transported to the destination in piles.

2) The products shouldn't be thrown from the vehicle during the unloading process. They should be placed on a flat surface in piles. Measures should be taken to prevent the products from falling down the vehicle.

3) The products should be piled properly and pallets should be placed under the products if required. The pipes should be piled with the sockets facing outwards without contacting each other.

Furhermore, attention should be paid to ensure that the height of the piles of pipes don't exceed 1.5 meters.

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Kalde-SuperMUTE Waste Water Pipe and Fittings

Kalde-SuperMUTE Tube

Code	Size	S, min.	L	Pcs.
4503-tbm-0k0250	ø58	4	250	
4503-tbm-0k0500	ø58	4	500	
4503-tbm-0k1000	ø58	4	1000	
4503-tbm-0k2000	ø58	4	2000	
4503-tbm-0k3000	ø58	4	3000	
4503-tbm-0l0250	ø78	4,5	250	
4503-tbm-0l0500	ø78	4,5	500	
4503-tbm-0l1000	ø78	4,5	1000	
4503-tbm-0l2000	ø78	4,5	2000	
4503-tbm-0l3000	ø78	4,5	3000	
4503-tbm-0m0250	ø110	5,3	250	
4503-tbm-0m0500	ø110	5,3	500	
4503-tbm-0m1000	ø110	5,3	1000	
4503-tbm-0m2000	ø110	5,3	2000	
4503-tbm-0m3000	ø110	5,3	3000	
4503-tbm-0n0250	ø125	5,3	250	
4503-tbm-0n0500	ø125	5,3	500	
4503-tbm-0n1000	ø125	5,3	1000	
4503-tbm-0n2000	ø125	5,3	2000	
4503-tbm-0n3000	ø125	5,3	3000	
4503-tbm-0p0250	ø160	5,3	250	
4503-tbm-0p0500	ø160	5,3	500	
4503-tbm-0p1000	ø160	5,3	1000	
4503-tbm-0p2000	ø160	5,3	2000	
4503-tbm-0p3000	ø160	5,3	3000	

Kalde-SuperMUTE Tube | Two Side Flat

Code	Size	S, min.	L	Pcs.
4303-tbe-0k3000	ø58	4	3000	
4303-tbe-0l3000	ø78	4,5	3000	
4303-tbe-0m3000	ø110	5,3	3000	
4303-tbe-0n3000	ø125	5,3	3000	
4303-tbe-0p3000	ø160	5,3	3000	

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Kalde-SuperMUTE Elbow 45°

Code	Size	S, min.	d	D	L	Pcs.
4213-elb-0k0045	ø58	4	58	58	52.50	100
4213-elb-0l0045	ø78	4,5	78	78	59.50	50
4213-elb-0m0045	ø110	5,3	110	110	75.50	25
4213-elb-0n0045	ø125	5,3	125	125	83	20
4213-elb-0p0045	ø160	5,3	160	160	77	7
4213-elb-0r0045	ø200	6,2	200	200	97	

Kalde-SuperMUTE Elbow 87°

Code	Size	S, min.	d	D	L	Pcs.
4213-elb-0k0087	ø58	4	58	58	53.50	100
4213-elb-0l0087	ø78	4,5	78	78	61.50	50
4213-elb-0m0087	ø110	5,3	110	110	75.50	25
4213-elb-0n0087	ø125	5,3	125	125	83	20
4213-elb-0p0087	ø160	5,3	160	160	82.50	7
4213-elb-0r0087	ø200	6,2	200	200	101	

Kalde-SuperMUTE Single Branch 45°

Code	Size	S, min.	d	D1	D2	L	Pcs.
4213-sbr-0k0k45	ø58/58	4,5	58	58	58	57	50
4213-sbr-0l0k45	ø78/58	4,5	78	78	58		
4213-sbr-0l0l45	ø78/78	5,3	78	78	78	57	50
4213-sbr-0m0k45	ø110/58	5,3	110	110	58		
4213-sbr-0m0l45	ø110/78	5,3	110	110	78	70.50	30
4213-sbr-0m0m45	ø110/110	5,3	110	110	110	72.50	25
4213-sbr-0n0m45	ø125/110	5,3	125	125	110	72	15
4213-sbr-0n0n45	ø125/125	5,3	125	125	125	72	15
4213-sbr-0p0m45	ø160/110	5,3	160	160	110	77	10
4213-sbr-0p0n45	ø160/125	5,3	160	160	125	76	8
4213-sbr-0p0p45	ø160/160	5,3	160	160	160	77	8
4213-sbr-0r0m45	ø200/110	5,3	200	200	110	95	4
4213-sbr-0r0n45	ø200/125	5,3	200	200	125	95	4
4213-sbr-0r0p45	ø200/160	5,3	200	200	160	97	
4213-sbr-0r0r45	ø200/200	6,2	200	200	200	97	

SuperMUTE

Kalde-SuperMUTE Single Branch 87°

Code	Size	S, min.	d	D1	D2	L	Pcs.
4213-sbr-0k0k87	ø58/58	4	58	58	58		80
4213-sbr-0l0k87	ø78/58	4,5	78	78	58		25
4213-sbr-0l0l87	ø78/78	5,3	78	78	78		
4213-sbr-0m0k87	ø110/58	5,3	110	110	58		20
4213-sbr-0m0l87	ø110/78	5,3	110	110	78		20
4213-sbr-0m0m87	ø110/110	5,3	110	110	110		15
4213-sbr-0n0k87	ø125/58	5,3	125	125	58		
4213-sbr-0n0l87	ø125/78	5,3	125	125	78		
4213-sbr-0n0n87	ø125/125	5,3	125	125	125		
4213-sbr-0p0k87	ø160/58	5,3	160	160	58		
4213-sbr-0p0m87	ø160/110	5,3	160	160	110		
4213-sbr-0p0n87	ø160/125	5,3	160	160	125		
4213-sbr-0r0n87	ø200/125	5,3	200	200	125		
4213-sbr-0r0p87	ø200/160	5,3	200	200	160		

Kalde-SuperMUTE Double Branch 45°

Code	Size	S, min.	d	D1	D2	L	Pcs.
4213-dbr-0k0k45	ø58/58	4	58	58	58		
4213-dbr-0l0k45	ø78/58	4,5	78	78	58		
4213-dbr-0l0l45	ø78/78	5,3	78	78	78		
4213-dbr-0m0k45	ø110/58	5,3	110	110	58		
4213-dbr-0m0l45	ø110/78	5,3	110	110	78		
4213-dbr-0m0m45	ø110/110	5,3	110	110	110		
4213-dbr-0n0k45	ø125/58	5,3	125	125	58		
4213-dbr-0n0l45	ø125/78	5,3	125	125	78		
4213-dbr-0n0m45	ø125/110	5,3	125	125	110	71	25
4213-dbr-0n0n45	ø125/125	5,3	125	125	125		
4213-dbr-0p0k45	ø160/58	5,3	160	160	58		
4213-dbr-0p0l45	ø160/78	5,3	160	160	78		
4213-dbr-0p0m45	ø160/110	5,3	160	160	110		
4213-dbr-0p0n45	ø160/125	5,3	160	160	125		
4213-dbr-0p0p45	ø160/160	5,3	160	160	160		

Kalde-SuperMUTE Double Branch 87°

Code	Size	S, min.	d	D1	D2	L	Pcs.
4213-dbr-0m0m87	ø110/110	5,3	110	110	110		80

SuperMUTE

Kalde-SuperMUTE Reduction

Code	Size	S, min.	d	D	L	Pcs.
4213-rdc-0l0k00	ø78/58	4,5	58	78	54.5	100
4213-rdc-0m0k00	ø110/58	4,5	58	110	57.50	40
4213-rdc-0m0l00	ø110/78	5,3	78	110	68	40
4213-rdc-0n0l00	ø125/78	5,3	78	125		
4213-rdc-0n0m00	ø125/110	5,3	110	125	71	20
4213-rdc-0p0m00	ø160/110	5,3	110	160	70	15
4213-rdc-0p0n00	ø160/125	5,3	125	160	82	15
4213-rdc-0r0m00	ø200/110	6,2	110	200		
4213-rdc-0r0p00	ø200/160	6,2	160	200		

Kalde-SuperMUTE PVC Transition

Code	Size	S, min.	d	D	L	Pcs.
4213-psw-0k0000	ø78/50	5,3	50	78	48.50	50
4213-psw-0l0000	ø78/75	5,3	78	75	47	50

Kalde-SuperMUTE S

Code	Size	S, min.	d	D	l	L	Pcs.
4213-spl-0m0087	ø110/87°	5,3	110	122	107	217	8

Kalde-SuperMUTE Cleaning Part | Square

Kod	Ölçü	S, min.	d	D	L	Adet
4213-clp-0m0000	ø110					

SuperMUTE

Kalde-SuperMUTE Sliding Coupling

Code	Size	S, min.	d	L	Pcs.
4213-soc-0k0000	ø58	4	58	92	100
4213-soc-0l0000	ø78	4,5	78		
4213-soc-0m0000	ø110	5,3	110		
4213-soc-0n0000	ø125	5,3	125	136.50	75
4213-soc-0p0000	ø160	5,3	160	175	25
4213-soc-0r00000	ø200	6,2	200	201	20

Kalde-SuperMUTE Coupling

Code	Size	S, min.	d	l	L	Pcs.
4213-fmf-0k0000	ø58	4	58	44.50	92	100
4213-fmf-0l0000	ø78	4,5	78			
4213-fmf-0m0000	ø110	5,3	110			
4213-fmf-0n0000	ø125	5,3	125	66	136.50	75
4213-fmf-0p0000	ø160	5,3	160	85.5	175	25
4213-fmf-0r00000	ø200	6,2	200	98	201	20

Kalde-SuperMUTE Expanding Coupling

Code	Size	S, min.	L	Pcs.
4213-emf-0k0000	ø58	4		75
4213-emf-0l0000	ø78	4,5		50
4213-emf-0m0000	ø110	5,3		25
4213-emf-0n00000	ø125	5,3		20
4213-emf-0p00000	ø160	5,3		10

Kalde-SuperMUTE Coupling-Long

Code	Size	S, min.	d	D	l	L	Pcs.
4213-lmf-0m0000	ø110	5,3	110	110	71	210	15

SuperMUTE

Kalde-SuperMUTE Stopend

Code	Size	S, min.	d	D	L	Pcs.
4213-ste-0k0000	ø58	4	58	65	61	100
4213-ste-0l0000	ø78	4,5	78	83	69.50	75
4213-ste-0m0000	ø110	5,3	110	123	75	50
4213-ste-0n0000	ø125	5,3	125	139	84	40
4213-ste-0p0000	ø160	5,3	160	171	89	30
4213-ste-0r0000	ø200	6,2	200			

Kalde-SuperMUTE Bracket

Code	Size	Pcs.
4213-bcc-0k0000	ø58	100
4213-bcc-0l0000	ø78	100
4213-bcc-0m0000	ø110	100
4213-bcc-0n00000	ø125	100
4213-bcc-0p00000	ø160	100

Kalde-SuperMUTE Bracket-Acoustic

Code	Size	Pcs.
4213-apc-0l0000	ø58	100
4213-apc-0n0000	ø78	75
4213-apc-0p0000	ø110	25

Kalde-SuperMUTE Joint

Code	Size	Pcs.
4213-rur-0k0000	ø58	100
4213-rur-0l0000	ø78	100
4213-rur-0m0000	ø110	100
4213-rur-0n00000	ø125	100
4213-rur-0p00000	ø160	100
4213-rur-0r00000	ø200	100

Kalde-SuperMUTE Adaptor Joint

Code	Size	Pcs.
4213-aru-0k0000	ø58	100
4213-aru-005850	ø58/50	100
4213-aru-007875	ø78/75	100

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