GEBERIT

PLANNING AND INSTALLATION GUIDE

GEBERIT DRAINAGE SYSTEMS

VALID FROM JANUARY 2023

KNOW HOW INSTALLED

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CHAPTER ONE

GEBERIT DRAINAGE SYSTEMS

1.1 OVERVIEW OF DRAINAGE SYSTEMS

Geberit offers the following drainage systems for building drainage:

- Geberit HDPE
- Geberit Silent-db20

Geberit HDPE offers a full range for all types of drainage, from building drainage to trade effluent.

Geberit Silent-db20 is designed for buildings with sound insulation requirements thanks to its excellent sound insulation properties.

1.2 APPLICATION RANGE

The following table indicates the areas for which the Geberit HDPE and Geberit Silent-db20 can be used.

Geberit Silent-db20 is suitable for use in buildings with sound insulation requirements.

Application range	**Geberit HDPE**	**Geberit Silent-db20**
Building drainage		
Branch discharge pipes, visible	✓	✓
Branch discharge pipes, uninsulated and embedded in concrete	✓	✕
Branch discharge pipes with structure-borne sound insulation and embedded in concrete	✕	✓
Stacks	✓	✓
Ventilation pipes	✓	✓
Collector pipes	✓	✓
Pump pressure pipes	✓ 1)	✓ 1)
Conventional roof drainage	✓	✓
Geberit Pluvia	✓	✕
Other drainage areas		
Buried pipes	✓	✕
Bridge drainage	✓	✕
Trade effluent	✓ 2)	✕

✓ Suitable

✕ Not suitable

1) Without a mechanical load up to 150 kPa (1.5 bar) at a maximum temperature of 30 °C, 10 a, d32–160 (DN 30–150)

2) The robustness against aggressive and chemical drains from industrial and laboratory installations can be found in the chemical resistance list. The list is available in the download area of the Geberit website.

1.3 PROPERTIES

The following tables gives a comparative overview of the most important characteristics of the Geberit HDPE and Geberit Silent-db20.

Characteristic		Geberit HDPE	Geberit Silent-db20
Density		• 955 kg/m³	• 1,700 kg/m³
Thermal expansion		• Thermal expansion coefficient α = 0.17 mm/(m•K) • Rule of thumb: 1 cm/m of pipe at ΔT = 50 K	
Thermal accrual		• Maximal 1 cm/m (DIN standard 3 cm/m) • The pipes are stored in a hot water bath once manufactured. This technique reduces the thermal accrual of the pipes.	
Thermal conductivity		• Thermal conductivity coefficient λ = 0.43 (W/m•K)	
Hot water resistance		• Permanently up to 80 °C in the drain area, unpressurised state • Permanently above 80 °C only after consultation with Geberit • Briefly up to 100 °C for a duration of maximum 1 min: – without mechanical, chemical or static load – a maximum of 400 short-term loads per year – all connections are non-positive – short-term loads up to 100 °C affect the service life of the material. The pipe must be returned to normal temperature after the short-term load.	• Permanently up to 60 °C in the drain area, unpressurised state • Briefly up to 100 °C for a duration of maximum 1 min: – without mechanical, chemical or static load – a maximum of 400 short-term loads per year – all connections are non-positive – short-term loads up to 100 °C affect the service life of the material. The pipe must be returned to normal temperature after the short-term load.
Resistance to cold		• High elasticity, which means the frozen pipes filled with water remain undamaged after thawing.	
Fire behaviour		• Normally inflammable: – building material class B2 in accordance with DIN 4102-1:1998-05 – building material class E in accordance with EN 13501-1:2018	
Material abrasion		• High resistance to abrasion • Additional safety due to the thickness of the wall Solid waste is consistently incorporated into drainage systems. Resistance to abrasion is therefore of great importance in connection, collection and underground pipes.	
Flexibility/impact resistance		• High flexibility • Virtually unbreakable at room temperature and normal processing temperatures	
Electrical conductivity		• Not electrically conductive	
UV resistance		• UV-resistant through the addition of approx. 2% carbon	
Airborne sound propagation		• The airborne sound must be encapsulated by a Geberit Isol Flex sound insulation mat or structural provisions.	• Very good airborne sound insulation values of the material HDPE-S2 • Constructionally implemented airborne sound insulation: – thick pipe wall – sound insulation ribs on the fittings

Characteristic		Geberit HDPE	Geberit Silent-db20
Transmission of structure-borne sound		• Low transmission of structure-borne sound due to the modulus of elasticity of the materials HDPE and HDPE-S2 • In addition, structure-borne sound can be further reduced by consistent separation from the building structure using pipe brackets with insulation inserts as well as insulating sleeves	
Resistance to pressure[1)]		Pump pressure pipes d32–160 (DN 30–150): • For domestic waste water: without a mechanical load up to 150 kPa (1.5 bar) at a maximum temperature of 30 °C, 10 a • For non-domestic waste water: subject to approval by Geberit • All connections must be non-positive	
		Valley rainwater pipes for non-pressure drainage d32–160 (DN 30–150): • In the case of backpressure, brief (24 h, 15 °C) maximum static load of 300 kPA (3 bar) • In addition to expansion sockets, which absorb thermally caused changes in length, all other connections must be non-positive (butt welding or electrofusion couplings).	
Chemical resistance		• Very good chemical resistance to domestic waste water and trade effluent	• Very good chemical resistance to domestic waste water (chemically contaminated waste water from school laboratories, doctors' surgeries, hospitals, etc. on request)
Tightness of connections		• Absolute tightness of the welding joints • The weld seam of the butt-welding construction is internal and round so there is no risk of deposits	
Material of the seals		• EPDM	

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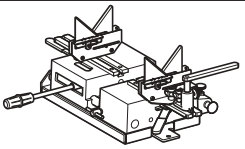
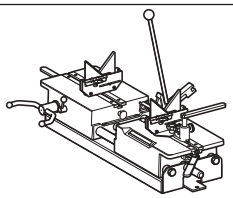
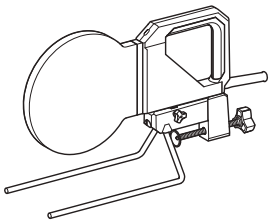
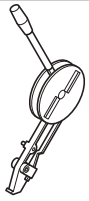
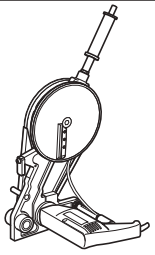
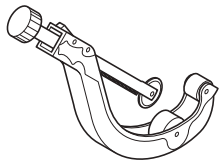
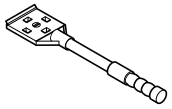
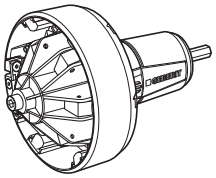
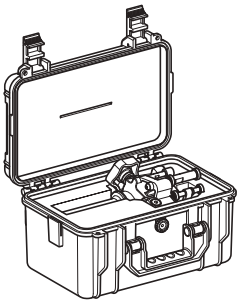
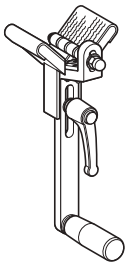
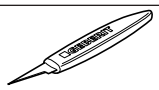
1) Applies to the entire drainage system including couplings, connections and access pipes.

1.4 PROCESSING TOOLS

A diverse assortment of processing tools is available for working with Geberit drainage systems. The assortment includes:

- butt-welding tools
- electrofusion welding tools
- pipe working tools

Tool group	Tool		d [mm]
Butt-welding tools	Geberit Media welding machine		40–160
	Geberit Universal welding machine		40–315
	Geberit welding plate		32–315
	Geberit hand-operated plane		40–160
	Geberit electric plane		40–315

Tool group	Tool		d [mm]
Pipe working tools	Geberit pipe cutter for plastic pipes		32–315
	Geberit handheld pipe scraper		32–315
	Geberit pipe scraper (for use with cordless drill drivers)		56–110
	Geberit handheld pipe scraper (in a case)		63–160
	Geberit chamfering tool		32–160
	Geberit deburring knife		32–315

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CHAPTER TWO

GEBERIT PE

2.1 SYSTEM DESCRIPTION

2.1.1 Overview of Geberit HDPE

Geberit HDPE can be used for all types of drainage. It is especially suited for use in building drainage, industrial and laboratory drainage as well as bridge drainage.

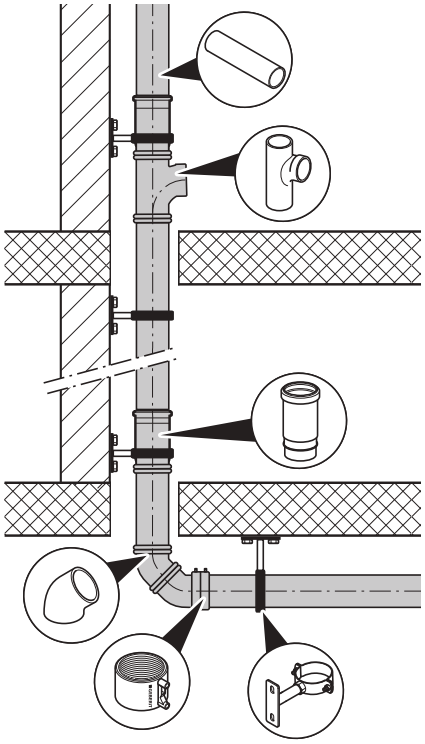
Geberit HDPE pipes and fittings are manufactured using polyethylene 80 and are characterised by their low weight, resistance to breakage, impact and abrasion as well as by their high temperature resistance.

Thanks to its flexibility, Geberit HDPE gives building owners and plumbers the option of making the planning and implementation of the pipe laying versatile and taking advantage of the waste water prefabrication.

2.1.2 System components

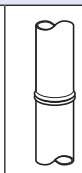
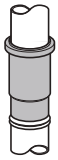
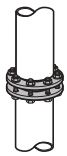
Geberit HDPE includes the following system components:

- system pipes d32–315 mm
- fittings
- connections
- waste fittings and traps
- adapters for other systems
- accessories



2.1.3 Connections

The following connection options are available for connecting Geberit HDPE pipes and fittings. The connections differ in the connection technology and the pipe dimensions for which they can be used.

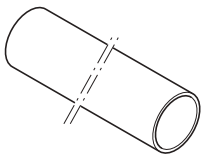
Connection		Non-positive		Positive
		Removable	Permanent	Removable
Butt welding, d32–315 mm (DN 30–300)		–	✓	–
Electrofusion coupling, d40–160 mm (DN 40–150)		–	✓	–
Electrofusion coupling with integrated thermal fuse, d200–315 mm (DN 200–300)		–	✓	–
Expansion socket, d32–315 mm (DN 30–300)		–	–	✓
Ring seal socket, d32–160 mm (DN 30–150)		–	–	✓
Flange, d50–315 mm (DN 50–300)		✓	–	–
Screw connection without flange bushing, d32–110 mm (DN 30–100)		–	–	✓
Screw connection with flange bushing, d32–110 mm (DN 30–100)		✓	–	–

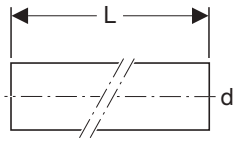
✓ Applies

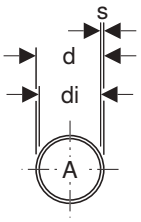
– Does not apply

2.1.4 Technical data

Pipe data for Geberit HDPE pipe



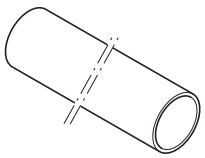


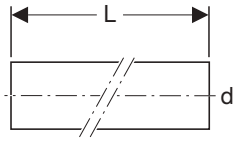


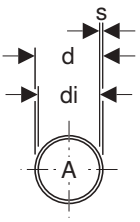
DN	d [mm]	di [mm]	L [m]	A [cm²]	s [mm]	Pipe line S[1)]	Weight m [kg/m]	
							Empty	With water
30	32	26	5	5.3	3	12.5	0.24	0.77
40	40	34	5	9	3	12.5	0.33	1.23
50	50	44	5	15.2	3	12.5	0.46	1.98
56	56	50	5	19.6	3	12.5	0.48	2.44
60	63	57	5	25.4	3	12.5	0.61	3.15
70	75	69	5	37.3	3	12.5	0.73	4.46
90	90	83	5	54.1	3.5	12.5	0.96	6.37
100	110	101.4	5	80.7	4.3	12.5	1.49	9.56
125	125	115.2	5	104.5	4.9	12.5	1.90	12.35
150	160	147.6	5	171.1	6.2	12.5	3.00	20.11
200	200	187.6	5	276.4	6.2	16	3.60	31.20
250	250	234.4	5	431.5	7.8	16	5.67	48.77
300	315	295.4	5	685.3	9.8	16	8.97	77.47

1) In accordance with BS EN 1519-1:2019-05-02

Pipe data for Geberit HDPE pipe PN4







DN	d [mm]	di [mm]	L [m]	A [cm²]	s [mm]	Pipe line S[1)]	Weight m [kg/m]	
							Empty	With water
200	200	184.6	5	268.4	7.7	12.5	4.44	31.24
250	250	230.6	5	418.2	9.7	12.5	6.99	48.79
300	315	290.6	5	663.8	12.2	12.5	11.08	77.38

1) In accordance with BS EN 1519-1:2019-05-02

Determination of the chemical resistance

Geberit HDPE can be used without hesitation from a pH value of 0 to 14. It is important to note that the chemical resistance of the seal rings (EPDM) differs from that of Geberit HDPE.

Various processes, such as absorption of the liquid (swelling), extraction of soluble material components (shrinkage) or chemical reactions (hydrolysis, oxidation etc.) may arise as a result of the flow substances coming into contact with the pipe wall material that may cause property changes to the pipes and pipe sections.

Geberit has prepared an extensive list for the chemical resistance of Geberit HDPE. The list is available to download from the Geberit website.

The chemical resistance to flow substances or conditions that are not included on the list can be requested from Geberit. The following information is required for this:

- flow substances (composition, chemical designation)
- proportion (concentration)
- temperature in °C
- information on exposure time, frequency and flow rate
- other flow substances

The form for the resistance request is available to download from the Geberit website.

2.2 SYSTEM PLANNING AND PROCESSING

2.2.1 Fastening pipes

The pipe brackets carry the pipe. Pipe fastenings differ in the manner in which the thermally caused change in length is controlled. There is a fundamental difference between the “sliding installation” and “rigid installation” fastening types.

Thermal expansion of pipes

Pipes expand differently due to thermal effects depending on the material. This thermal expansion is designated as a thermally caused change in length Δl.

The following have an influence on the thermally caused change in length Δl:

- material
- building conditions
- operating conditions

Taking account of changes in length Δl

The thermally caused change in length must be taken into account during the planning of the piping system. The following measures ensure the absorption of the change in length:

- planning for expansion space
- installing expansion compensators
- positioning of anchor points and sliding points

Taking account of these measures is also a prerequisite for the safe absorption of the bending and torsional stresses that occur during the operation of a piping system.

Overview of fastening types

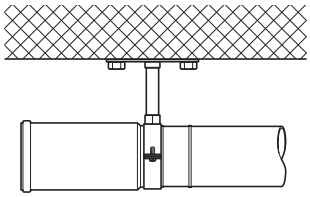
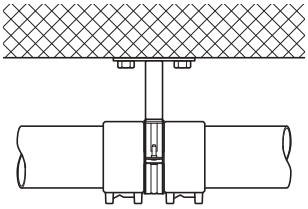
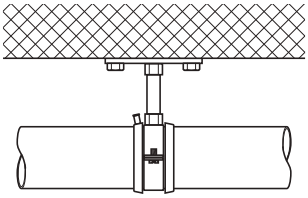
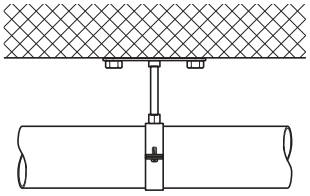
Pipe brackets differ in the manner in which the thermally induced change in length is controlled. A distinction is made between:

- sliding installation
- rigid installation

Expansion elements absorb the thermally caused change in length in a sliding installation. Expansion sockets or deflection legs are used as expansion elements. The forces generated by the thermally caused change in length are transferred to the building in a rigid installation.

The following table gives an overview of the possible fastenings for anchor and sliding points in a sliding and rigid installation with Geberit HDPE. The fastening types are suitable for horizontal and vertical installation.

Geberit recommends using an expansion socket in a sliding installation.

<table>
<tr><th></th><th colspan="2">Sliding installation</th><th>Rigid installation</th></tr>
<tr><th></th><th>With expansion socket</th><th>With deflection leg</th><th></th></tr>
<tr><td>Anchor point</td><td rowspan="2">With pipe bracket on an expansion socket
  </td><td>Variant 1: with pipe bracket and 2 electrofusion couplings
  </td><td rowspan="2"></td></tr>
<tr><td>Variant 2: with pipe bracket on electrofusion tape
  </td></tr>
<tr><td>Sliding point</td><td colspan="3">With pipe bracket
  </td></tr>
</table>

Sliding installation

Design with expansion sockets

The Geberit HDPE expansion socket absorbs the thermally caused change in length of the pipe in the design with expansion sockets. The following rules must be observed in this case:

- The expansion socket is assigned a maximum pipe length of 6 metres.
- Anchor and sliding points must be designed properly.
- In the case of stacks, an expansion socket must be fitted on each floor.
- Each expansion socket must be designed as an anchor point.

Anchor and sliding points must be designed as follows so that the change in length is directed towards and absorbed by the expansion socket:

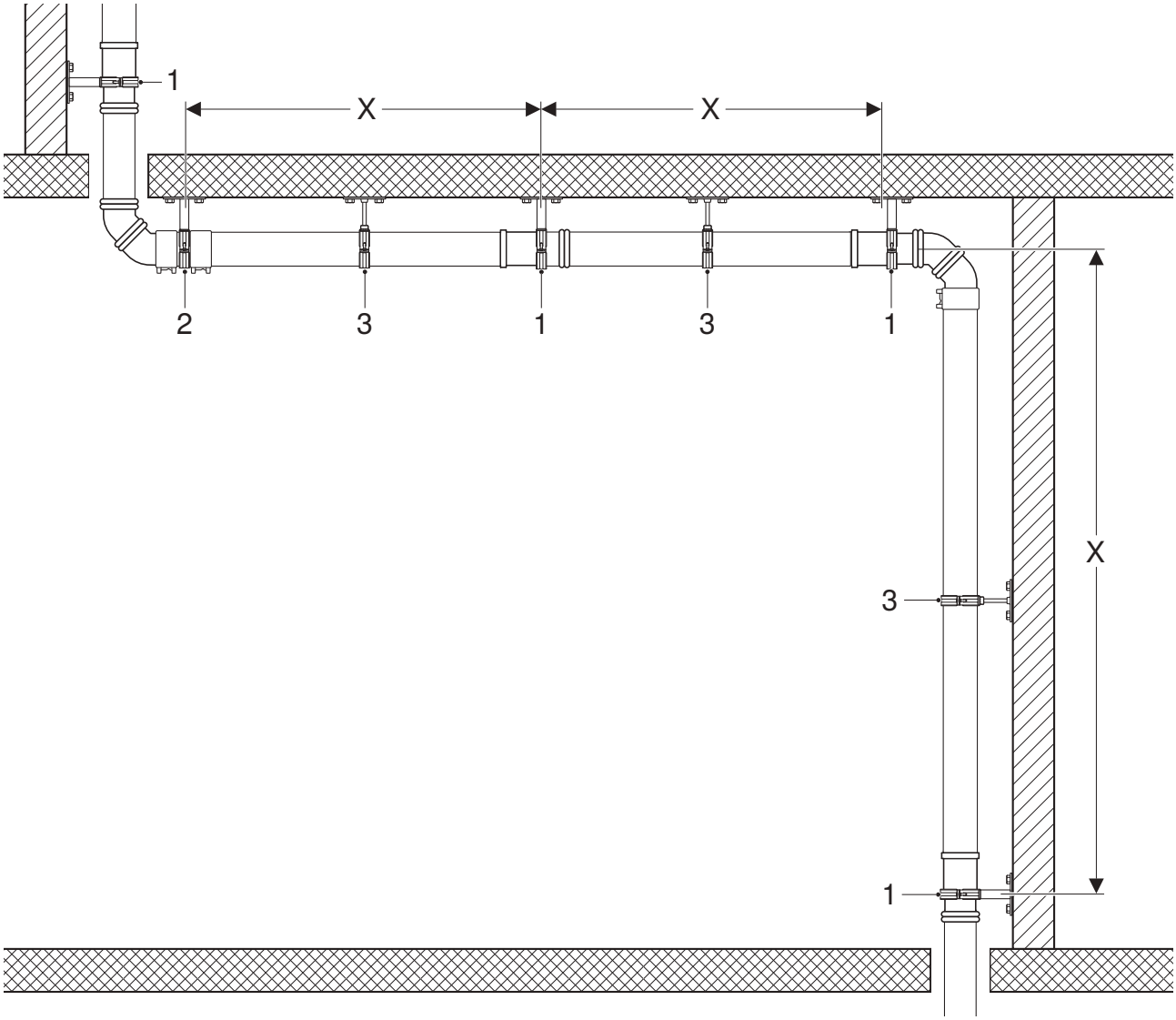


Figure 1: Design of the sliding installation with Geberit HDPE expansion sockets

1 Expansion socket with pipe bracket as an anchor point
2 Pipe bracket with 2 Geberit electrofusion couplings as an anchor point
3 Pipe bracket as a sliding point
X Max. distance of 6 m between the expansion sockets

Forces on the Geberit HDPE expansion socket during installation and operation

The following forces are generated on the Geberit HDPE expansion socket during installation and operation:

- installation force
- sliding resistance

The installation force is the force that has to be exerted when inserting the chamfered pipe end. The sliding resistance is the force at which the Geberit HDPE expansion socket needs to be maintained so that it can absorb the change in length.

Table 1: Forces during installation and operation of the Geberit HDPE expansion socket

d [mm]	Installation force [N]	Sliding resistance during operation [N]
32	100	70
40	140	80
50	190	90
56	200	100
63	230	140
75	250	150
90	300	200
110	350	300
120	430	350
160	600	400
200	1200	1000
250	1800	1500
315	2600	2200

Insertion depth of Geberit HDPE expansion sockets

The insertion depth of the Geberit HDPE expansion socket is dependent on the installation temperature. The following example shows the difference between the insertion depths at 0 °C and 20 °C based on the Geberit HDPE expansion socket d110.

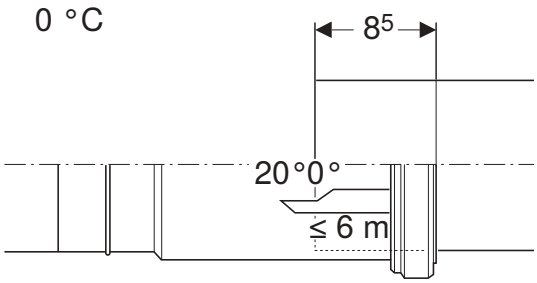


Figure 2: Insertion depth of 8.5 cm for d110 and an installation temperature of 0 °C

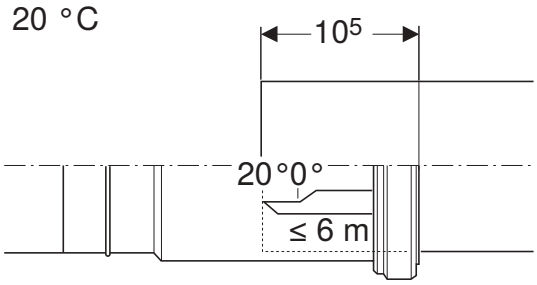


Figure 3: Insertion depth of 10.5 cm for d110 and an installation temperature of 20 °C

Table 2: Insertion depth in cm depending on the dimension of the Geberit HDPE expansion socket and the installation temperature

d [mm]	Installation temperature						
	-10 °C	0 °C	10 °C	20 °C	30 °C	40 °C	50 °C
32	3.5	4.0	5.0	5.5	6.0	6.5	7.0
40–56	6.5	7.5	8.5	9.5	11.0	12.0	13.0
63–90	7.0	8.0	9.5	10.5	11.5	12.5	13.5
110	7.5	8.5	9.5	10.5	12.0	13.0	14.0
125–160	8.0	9.0	10.0	11.0	12.0	13.5	14.5
200–315	17.0	18.0	19.0	20.5	21.5	22.5	23.5

Anchor point with a Geberit HDPE expansion socket

Anchor points are designed with suitable pipe brackets and a sufficiently strong pipe bracket fastening on the Geberit HDPE expansion socket.

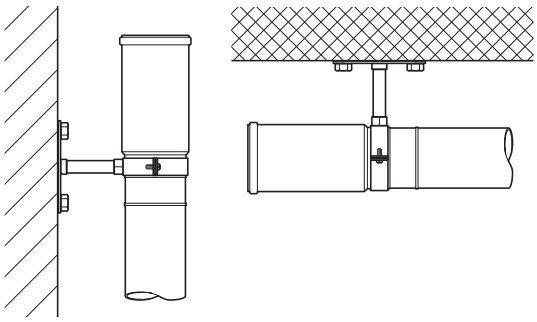


Figure 4: Vertical and horizontal anchor-point fastening with pipe bracket on the Geberit HDPE expansion socket

Thickness of the pipe fixation for anchor points

Geberit offers a suitable fastening system with pipe brackets, threaded pipes and base plates in various thread sizes. The required thickness of the pipe fixation must be selected depending on the ceiling or wall distance.

Table 3: Required thickness of the pipe fixation when fastening horizontally to ceilings and walls

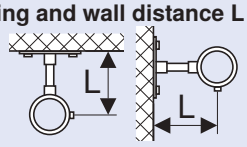
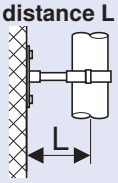
DN	d [mm]	Ceiling and wall distance L [cm] 					
		10	20	30	40	50	60
40	40	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
50	50	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
56	56	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
60	63	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
70	75	1/2"	1/2"	1/2"	1/2"	1/2"	3/4"
90	90	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"
100	110	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"
125	125	1/2"	1/2"	3/4"	3/4"	1"	1"
150	160	–	3/4"	1"	1"	1"	1 1/4"
200	200	–	1"	1"	1 1/4"	1 1/4"	1 1/4"
250	250	–	1"	1 1/4"	1 1/4"	1 1/2"	2"
300	315	–	1"	2"	2"	2"	2"

Table 4: Required thickness of the pipe fixation when fastening vertically to walls

DN	d [mm]	Wall distance L [cm] 					
		10	20	30	40	50	60
40	40	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
50	50	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
56	56	1/2"	1/2"	1/2"	1/2"	1/2"	3/4"
60	63	1/2"	1/2"	1/2"	1/2"	1/2"	3/4"
70	75	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"
90	90	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"
100	110	1/2"	1/2"	3/4"	3/4"	1"	1"
125	125	1/2"	3/4"	3/4"	1"	1"	1"
150	160	–	3/4"	1"	1"	1 1/4"	1 1/4"
200	200	–	1"	1 1/4"	1 1/4"	1 1/2"	1 1/2"
250	250	–	1 1/4"	1 1/4"	1 1/2"	2"	2"
300	315	–	1 1/4"	1 1/2"	2"	2"	–

Pipe bracket spacing when fastening horizontally to ceilings and walls, without support shells

The following pipe bracket spacing RA is applied for pipe fixation without support shells:

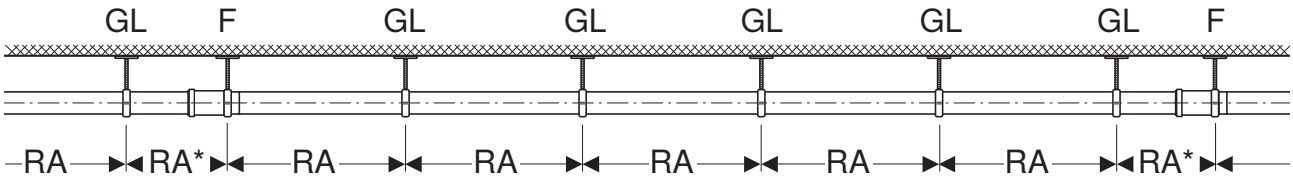


Figure 5: Pipe bracket spacing RA when fastening to ceilings and horizontally to walls, without support shells

GL Sliding point
F Anchor point
RA Pipe bracket spacing
RA* Distance to the expansion socket (not relevant for the design with a deflection leg)

DN	d [mm]	RA [m]	RA* [m]	Weight force FG[1)] [N]
30	32	0.8	0.4	6
40	40	0.8	0.4	11
50	50	0.8	0.4	16
56	56	0.8	0.4	20
60	63	0.8	0.4	25
70	75	0.8	0.4	36
90	90	0.9	0.5	58
100	110	1.1	0.6	106
125	125	1.3	0.7	149
150	160	1.6	0.8	323
200	200	2.0	1.0	626
250	250	2.0	1.0	1195
300	315	2.0	1.0	2424

1) Weight force per pipe bracket, pipe filled with water (10 °C)

Pipe bracket spacing when fastening horizontally to ceilings and walls, with support shells

The following pipe bracket spacing RA is applied for pipe fixation with support shells:

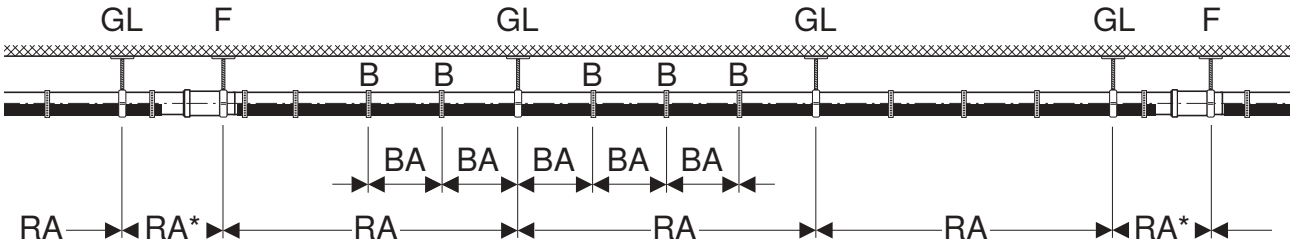


Figure 6: Pipe bracket spacing RA when fastening to ceilings and walls, with support shells

GL Sliding point
F Anchor point
B Support shell fastening
BA Spacing of fastening strips
RA Pipe bracket spacing
RA* Distance to the expansion socket (not relevant for the design with a deflection leg)

DN	d [mm]	RA [m]	RA* [m]	BA [m]	Weight force FG[1)] [N]
30	32	1.0	0.5	0.5	8
40	40	1.0	0.5	0.5	13
50	50	1.0	0.5	0.5	20
56	56	1.0	0.5	0.5	25
60	63	1.0	0.5	0.5	32
70	75	1.2	0.6	0.5	45
90	90	1.4	0.7	0.5	86
100	110	1.7	0.9	0.5	158
125	125	1.9	1.0	0.5	233
150	160	2.4	1.2	0.5	485
200	200	3.0	1.5	0.5	939
250	250	3.0	1.5	0.5	1826
300	315	3.0	1.5	0.5	3695

1) Weight force per pipe bracket, pipe filled with water (10 °C)

Pipe bracket spacing for vertical wall fastening

The following pipe bracket spacing RA is applied for pipe fixation fastened vertically to walls:

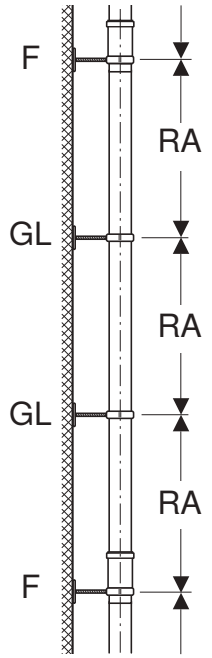


Figure 7: Pipe bracket spacing RA for vertical wall fastening

GL Sliding point
F Anchor point
RA Pipe bracket spacing

DN	d [mm]	RA [m]
30	32	1.0
40	40	1.0
50	50	1.0
56	56	1.0
60	63	1.0
70	75	1.2
90	90	1.4
100	110	1.7
125	125	1.9
150	160	2.4
200	200	3.0
250	250	3.0
300	315	3.0

Design with deflection leg

The deflection leg absorbs the thermally caused change in length of the pipe in the design with deflection leg. The deflection leg must be calculated for each pipe section that branches out or changes direction.

Anchor and sliding points must be designed as follows so that the change in length is directed towards and absorbed by the deflection leg:

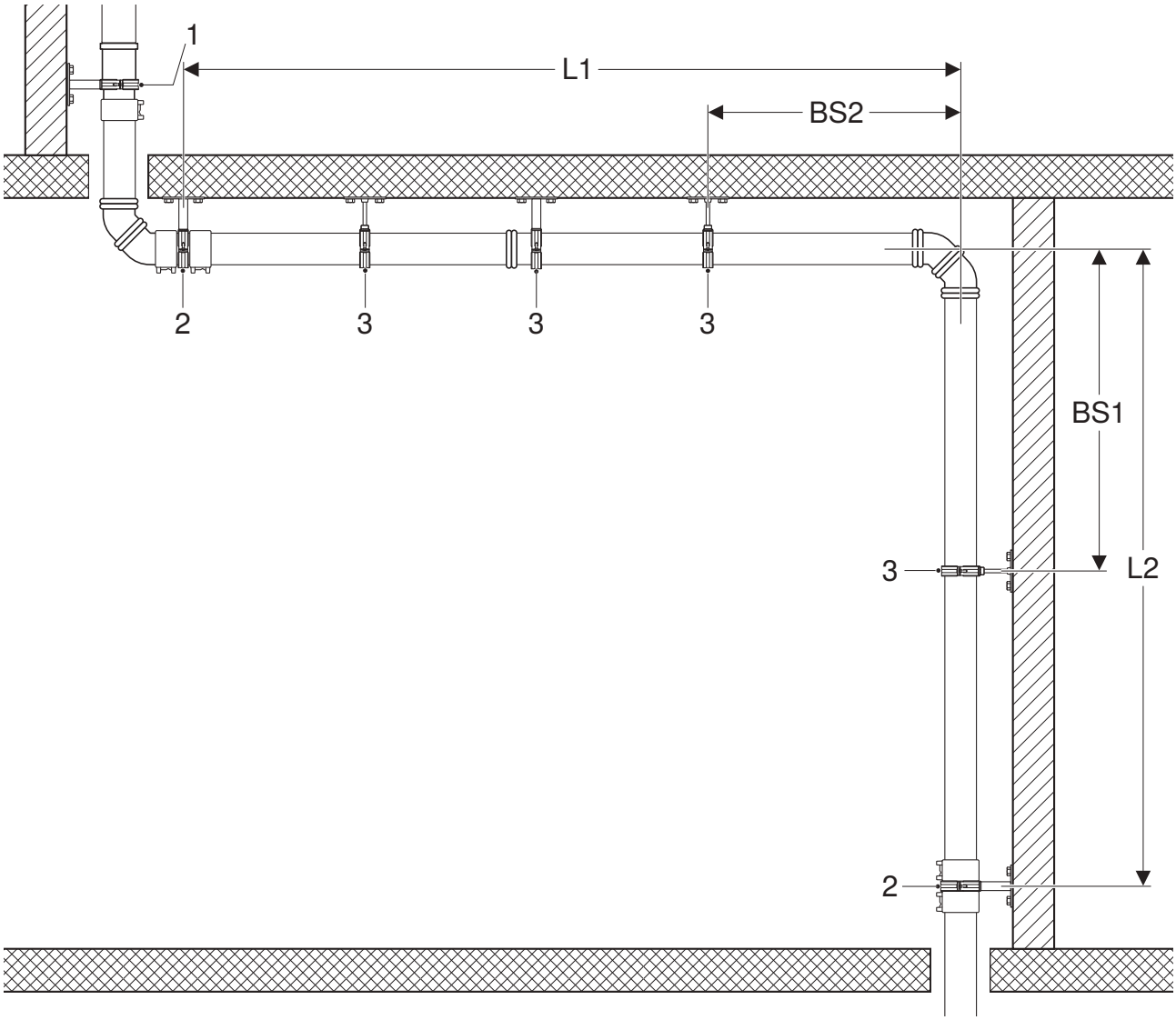


Figure 8: Design of the sliding installation with deflection leg

1 Expansion socket with pipe bracket as an anchor point
2 Pipe bracket with 2 Geberit electrofusion couplings as an anchor point
3 Pipe bracket as a sliding point
BS Deflection leg length
L Pipe length

Calculation of the deflection leg length

The thermal expansion of pipes depends on the material, among other things. Expansion caused by material-dependent parameters must be considered when calculating the deflection leg length. The following table lists the parameters for Geberit HDPE.

Table 5: Material-dependent Geberit HDPE parameters for calculating the deflection leg length

System pipe	Geberit HDPE
Material	HDPE
Thermal expansion coefficient α [mm / (m • K)]	0.17
Material constant k	10

The calculation of the deflection leg length comprises the following steps:

- calculation of the change in length Δl
- calculation of the deflection leg length BS

calculation of the change in length Δl

The change in length Δl is calculated with the following formula:

$$\Delta l = L \cdot \alpha \cdot \Delta T$$

Δl Change in length [mm]
L Pipe length [m]
ΔT Temperature differential (operating temperature – ambient temperature during installation) [K]
α Thermal expansion coefficient [mm/(m • K)]

Given:

- Material: Geberit HDPE
- L = 4 m
- α = 0.17 mm/(m • K)
- ΔT = 60 K (operating temperature 80 °C – ambient temperature during installation 20 °C)

Required:

- Change in length Δl [mm]

Solution:

$$\Delta l = L \cdot \alpha \cdot \Delta T \left[\frac{m \cdot mm \cdot K}{m \cdot K} = mm \right]$$

Δl = 4 m • 0.17 mm/(m•K) • 60 K

Δl = 40.8 mm

The change in length ΔI can also be calculated in a simplified manner from the following tables.

Table 6: Change in length **ΔI** in mm for Geberit HDPE system pipes

L [m]	Temperature differential ΔT [K]									
	10	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
1	1.7	3.4	5.1	6.8	8.5	10.2	11.9	13.6	15.3	17.0
2	3.4	6.8	10.2	13.6	17.0	20.4	23.8	27.2	30.6	34.0
3	5.1	10.2	15.3	20.4	25.5	30.6	35.7	40.8	45.9	51.0
4	6.8	13.6	20.4	27.2	34.0	40.8	47.6	54.4	61.2	68.0
5	8.5	17.0	25.5	34.0	42.5	51.0	59.5	68.0	76.5	85.0
6	10.2	20.4	30.6	40.8	51.0	61.2	71.4	81.6	91.8	102.0
7	11.9	23.8	35.7	47.6	59.5	71.4	93.3	95.2	107.1	119.0
8	13.6	27.2	40.8	54.4	68.0	81.6	95.2	108.8	122.4	136.0
9	15.3	30.6	45.9	61.2	76.5	91.8	107.1	122.4	137.7	153.0
10	17.0	34.0	51.0	68.0	85.0	102.0	119.0	136.0	153.0	170.0
20	34.0	68.0	102.0	136.0	170.0	204.0	238.0	272.0	306.0	340.0
30	51.0	102.0	153.0	204.0	255.0	306.0	357.0	408.0	459.0	510.0
40	68.0	136.0	204.0	272.0	340.0	408.0	476.0	544.0	612.0	680.0
50	85.0	170.0	255.0	340.0	425.0	510.0	595.0	680.0	765.0	850.0

Calculation of the deflection leg length BS

The deflection leg length BS to be calculated is defined as follows for a change in direction and for branch discharge pipes:

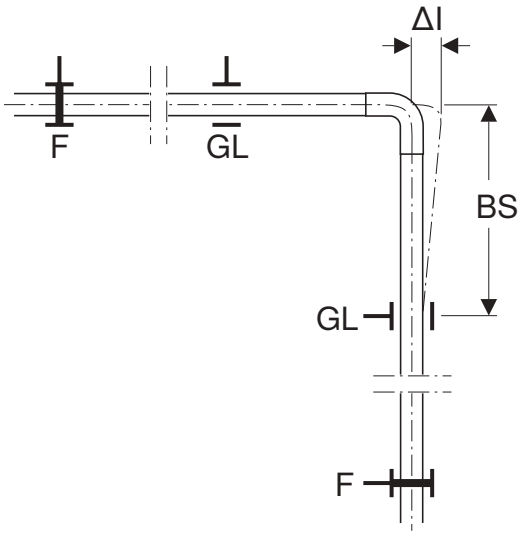


Figure 9: Deflection leg length for a change in direction

F Anchor point
GL Sliding point
BS Deflection leg length
ΔI Change in length

The deflection leg length is calculated with the following formula:

$$BS = \frac{k \cdot \sqrt{d \cdot \Delta l}}{1000}$$

BS	Deflection leg length [m]
d	Outer pipe diameter [mm]
Δl	Change in length [mm]
k	Material constant

Given:

- Material: HDPE
- k = 10
- d = 110 mm
- Δl = 40.8 mm

Required:

- BS [m]

Solution:

$$BS = \frac{k \cdot \sqrt{d \cdot \Delta l}}{1000} \left[\frac{\sqrt{mm \cdot mm}}{\frac{mm}{m}} = m \right]$$

$$BS = \frac{10 \cdot \sqrt{110\ mm \cdot 40.8\ mm}}{1000\ mm/m}$$

$$BS = 0.67\ m$$

The deflection leg length BS can also be calculated in a simplified manner from the following graphics.

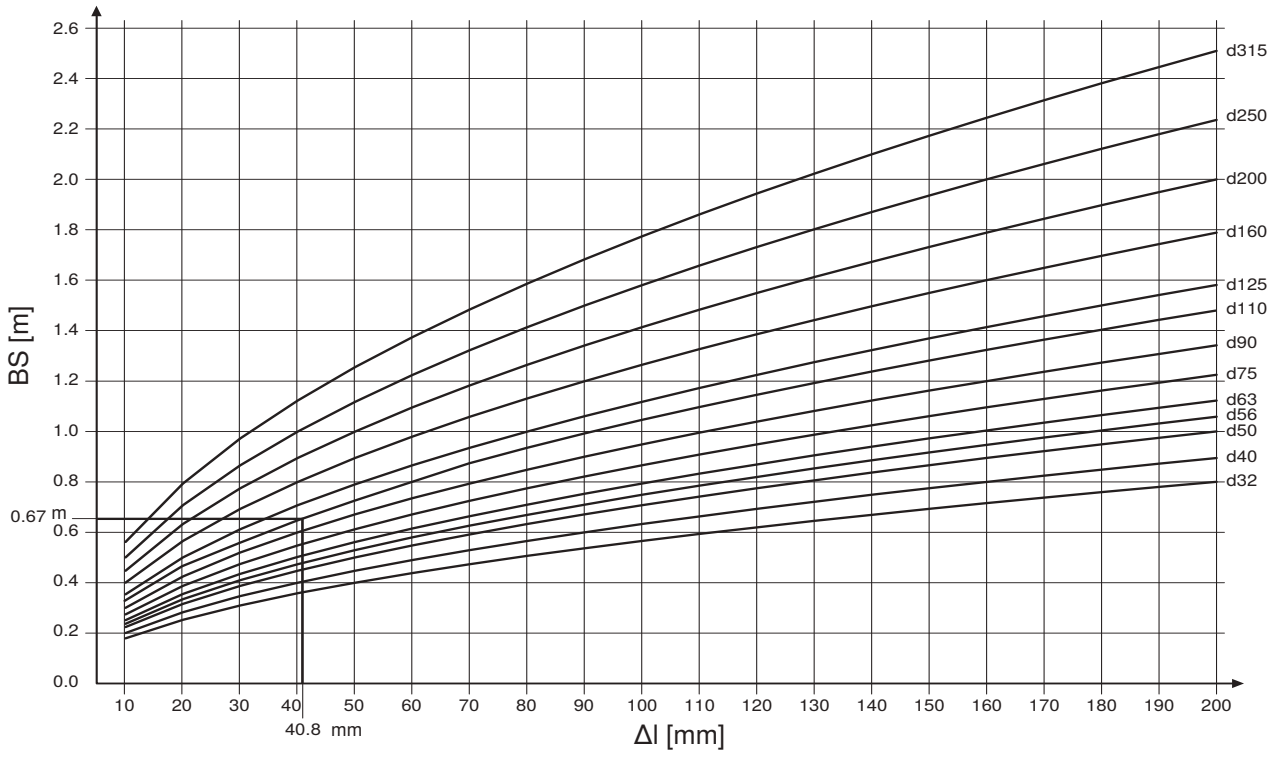


Figure 10: Deflection leg length BS for Geberit HDPE pipes

Anchor point with Geberit electrofusion tape

Anchor points are designed with suitable pipe brackets and a sufficiently strong pipe bracket fastening on the Geberit electrofusion tape (d50–315).

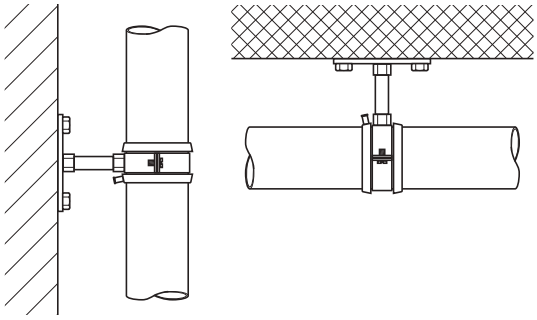


Figure 11: Vertical and horizontal anchor-point fastening on Geberit electrofusion tape

Anchor point with Geberit electrofusion couplings

Anchor points are designed with suitable pipe brackets and a sufficiently strong pipe bracket fastening on the pipe with 2 Geberit electrofusion couplings (d40–160).

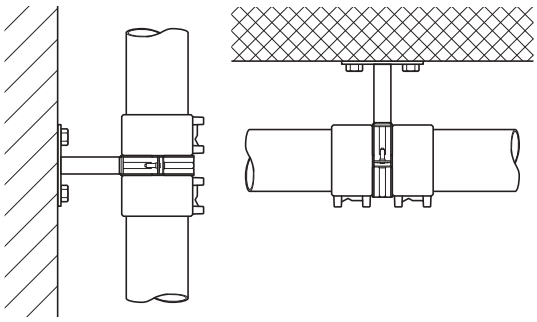


Figure 12: Vertical and horizontal anchor-point fastening with a pipe bracket on the pipe with 2 Geberit electrofusion couplings

Thickness of the pipe fixation for anchor points

Geberit recommends consulting a specialist in fastening technology for pipe fixation for anchor points in a rigid installation.

The required thickness of the threaded rods/threaded pipes must be selected depending on the ceiling or wall distance.

The required thicknesses of the pipe fixation below are calculated on the basis of the expansion forces on anchor points in a rigid installation when heated to a temperature of between approx. +20 °C and +90 °C.

Table 7: Required thickness of the pipe fixation when fastening to ceilings

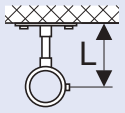
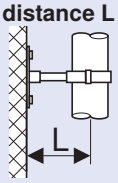
DN	d [mm]	Ceiling and wall distance L [cm] 					
		10	20	30	40	50	60
40	40	3/4"	1 1/4"	1 1/4"	1 1/2"	2"	2"
50	50	1"	1 1/4"	1 1/2"	2"	2"	2"
56	56	1"	1 1/4"	1 1/2"	2"	2"	–
60	63	1"	1 1/2"	2"	2"	–	–
70	75	1"	1 1/2"	2"	2"	–	–
90	90	1 1/4"	2"	–	–	–	–
100	110	1 1/2"	–	–	–	–	–
125	125	2"	–	–	–	–	–
150	160	–	–	–	–	–	–

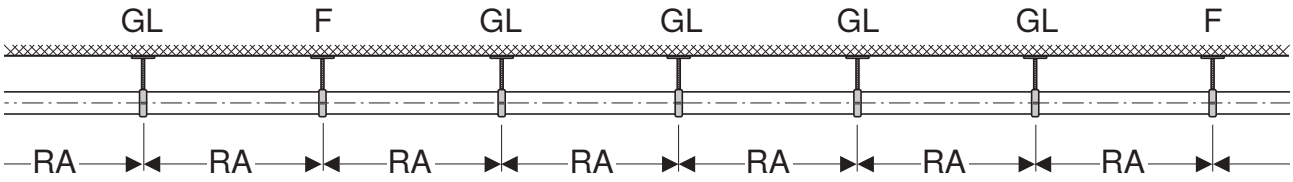
Table 8: Required thickness of the pipe fixation when fastening vertically to walls

DN	d [mm]	Wall distance L [cm] 					
		10	20	30	40	50	60
40	40	1/2"	3/4"	1"	1"	1"	1 1/4"
50	50	1/2"	3/4"	1"	1"	1 1/4"	1 1/4"
56	56	1/2"	1"	1"	1 1/4"	1 1/4"	1 1/2"
60	63	3/4"	1"	1"	1 1/4"	1 1/4"	1 1/2"
70	75	3/4"	1"	1 1/4"	1 1/4"	1 1/2"	1 1/2"
90	90	1"	1 1/4"	1 1/4"	1 1/2"	2"	2"
100	110	1"	1 1/4"	2"	2"	2"	–
125	125	1 1/4"	1 1/2"	2"	–	–	–
150	160	–	–	–	–	–	–

Commercially available products can be used to create the anchor points.

Pipe bracket spacing when fastening horizontally to ceilings and walls, without support shells

The following pipe bracket spacing is applied for pipe fixation without support shells with a deflection leg as an expansion compensator:



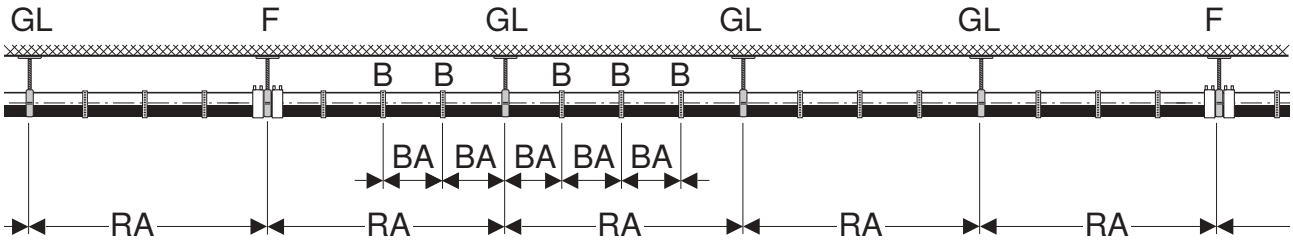
GL Sliding point
F Anchor point
RA Pipe bracket spacing

DN	d [mm]	RA [m]	Weight force FG[1)] [N]
30	32	0.8	6
40	40	0.8	11
50	50	0.8	16
56	56	0.8	20
60	63	0.8	25
70	75	0.8	36
90	90	0.9	58
100	110	1.1	106
125	125	1.3	149
150	160	1.6	323
200	200	2.0	626
250	250	2.0	1195
300	315	2.0	2424

1) Weight force per pipe bracket, pipe filled with water (10 °C)

Pipe bracket spacing when fastening horizontally to ceilings and walls, with support shells

The following pipe bracket spacing is applied for horizontal pipe fixation with support shells with a deflection leg as an expansion compensator:



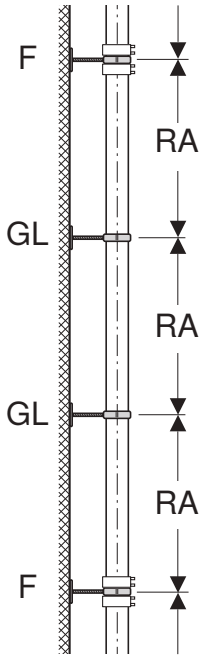
GL Sliding point
F Anchor point
B Support shell fastening
BA Spacing of fastening strips
RA Pipe bracket spacing

DN	d [mm]	RA [m]	BA [m]	Weight force FG[1] [N]
30	32	1.0	0.5	8
40	40	1.0	0.5	13
50	50	1.0	0.5	20
56	56	1.0	0.5	25
60	63	1.0	0.5	32
70	75	1.2	0.5	45
90	90	1.4	0.5	86
100	110	1.7	0.5	158
125	125	1.9	0.5	233
150	160	2.4	0.5	485
200	200	3.0	0.5	939
250	250	3.0	0.5	1826
300	315	3.0	0.5	3695

1) Weight force per pipe bracket, pipe filled with water (10 °C)

Pipe bracket spacing for vertical wall fastening

The following pipe bracket spacing is applied for vertical pipe fixation with a deflection leg as an expansion compensator:



GL Sliding point
F Anchor point
RA Pipe bracket spacing

DN	d [mm]	RA [m]
30	32	1.0
40	40	1.0
50	50	1.0
56	56	1.0
60	63	1.0
70	75	1.2
90	90	1.4
100	110	1.7
125	125	1.9
150	160	2.4
200	200	3.0
250	250	3.0
300	315	3.0

Rigid installation

Conventional rigid installation design

The forces generated by the thermally induced change in length are transferred to the building through anchor points in a conventional rigid installation. The following rules must be observed in this case:

- An anchor point must be created immediately before each branch fitting as well as each outlet from the branch fitting.
- An anchor point must be created immediately before and after each reducer.

Anchor and sliding points must be designed as follows so that the change in length can be transferred to the building through the rigid installation:

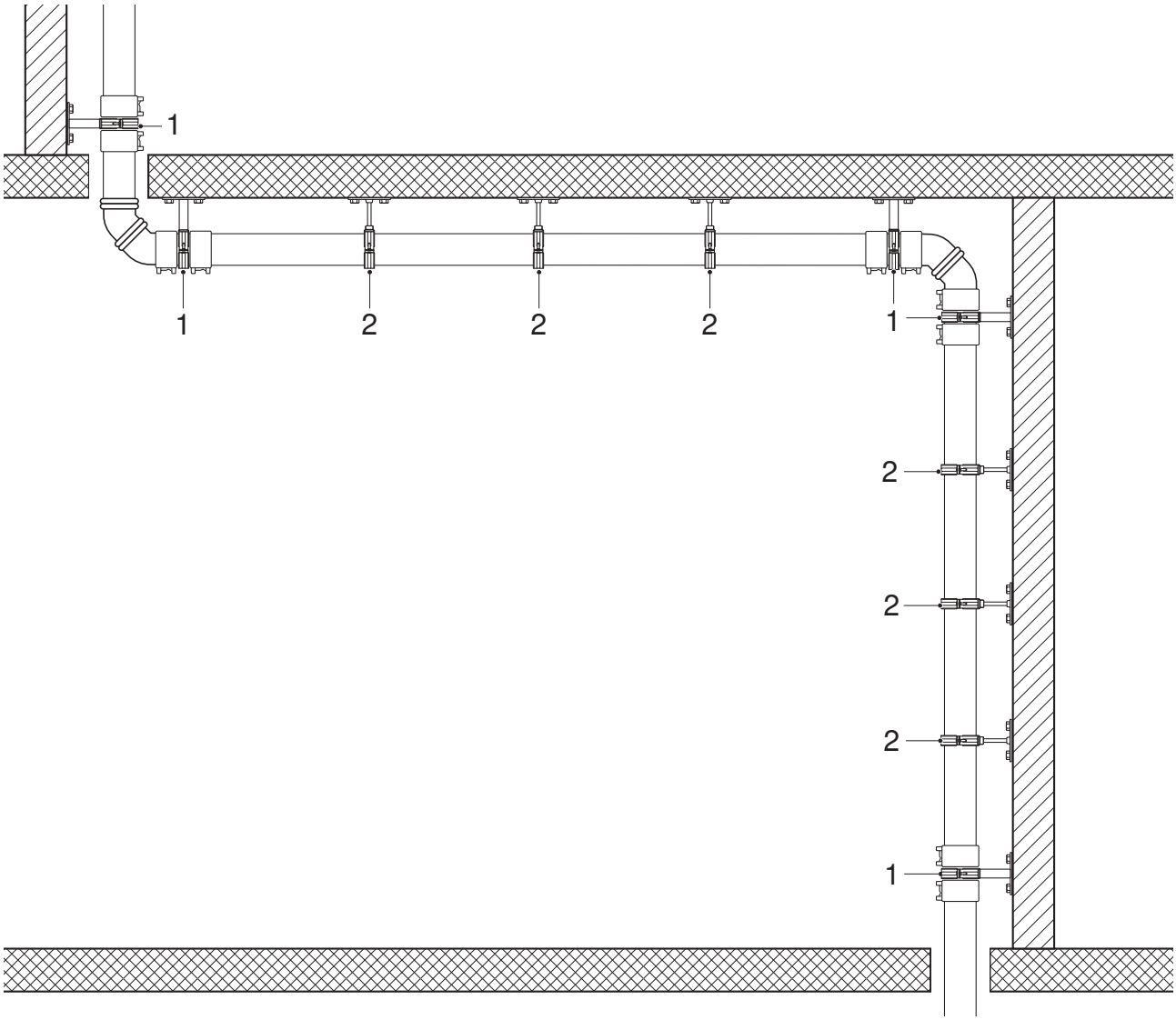


Figure 13: Design of the conventional rigid installation

1 Pipe bracket with 2 Geberit electrofusion couplings as an anchor point
2 Pipe bracket as a sliding point

Anchor point with Geberit electrofusion tape

Anchor points are designed with suitable pipe brackets and a sufficiently strong pipe bracket fastening on the Geberit electrofusion tape (d50–315).

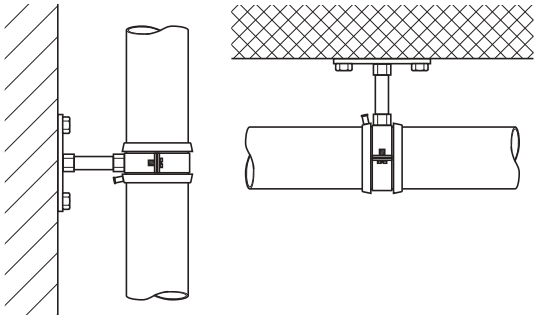


Figure 14: Vertical and horizontal anchor-point fastening on Geberit electrofusion tape

Anchor point with Geberit electrofusion couplings

Anchor points are designed with suitable pipe brackets and a sufficiently strong pipe bracket fastening on the pipe with 2 Geberit electrofusion couplings (d40–160).

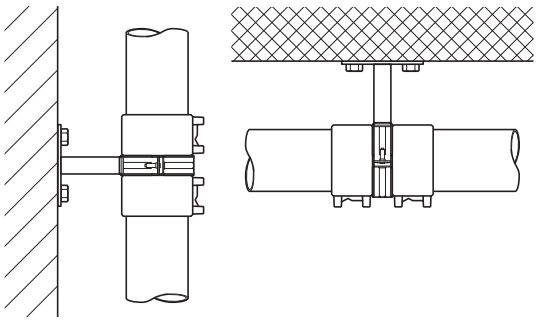


Figure 15: Vertical and horizontal anchor-point fastening with a pipe bracket on the pipe with 2 Geberit electrofusion couplings

Thickness of the pipe fixation for anchor points in a rigid installation

Geberit recommends consulting a specialist in fastening technology for pipe fixation for anchor points in a rigid installation.

The required thickness of the threaded rods/threaded pipes must be selected depending on the ceiling or wall distance.

The required thicknesses of the pipe fixation below are calculated on the basis of the expansion forces on anchor points in a rigid installation when heated to a temperature of between approx. +20 °C and +90 °C.

Table 9: Required thickness of the pipe fixation when fastening to ceilings

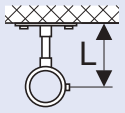
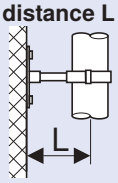
DN	d [mm]	Ceiling and wall distance L [cm] 					
		10	20	30	40	50	60
40	40	3/4"	1 1/4"	1 1/4"	1 1/2"	2"	2"
50	50	1"	1 1/4"	1 1/2"	2"	2"	2"
56	56	1"	1 1/4"	1 1/2"	2"	2"	–
60	63	1"	1 1/2"	2"	2"	–	–
70	75	1"	1 1/2"	2"	2"	–	–
90	90	1 1/4"	2"	–	–	–	–
100	110	1 1/2"	–	–	–	–	–
125	125	2"	–	–	–	–	–
150	160	–	–	–	–	–	–

Table 10: Required thickness of the pipe fixation when fastening vertically to walls

DN	d [mm]	Wall distance L [cm] 					
		10	20	30	40	50	60
40	40	1/2"	3/4"	1"	1"	1"	1 1/4"
50	50	1/2"	3/4"	1"	1"	1 1/4"	1 1/4"
56	56	1/2"	1"	1"	1 1/4"	1 1/4"	1 1/2"
60	63	3/4"	1"	1"	1 1/4"	1 1/4"	1 1/2"
70	75	3/4"	1"	1 1/4"	1 1/4"	1 1/2"	1 1/2"
90	90	1"	1 1/4"	1 1/4"	1 1/2"	2"	2"
100	110	1"	1 1/4"	2"	2"	2"	–
125	125	1 1/4"	1 1/2"	2"	–	–	–
150	160	–	–	–	–	–	–

Commercially available products can be used to create the anchor points.

Pipe bracket spacing in a rigid installation, without a support shell

The following pipe bracket spacing RA is applied in a rigid installation without support shells:

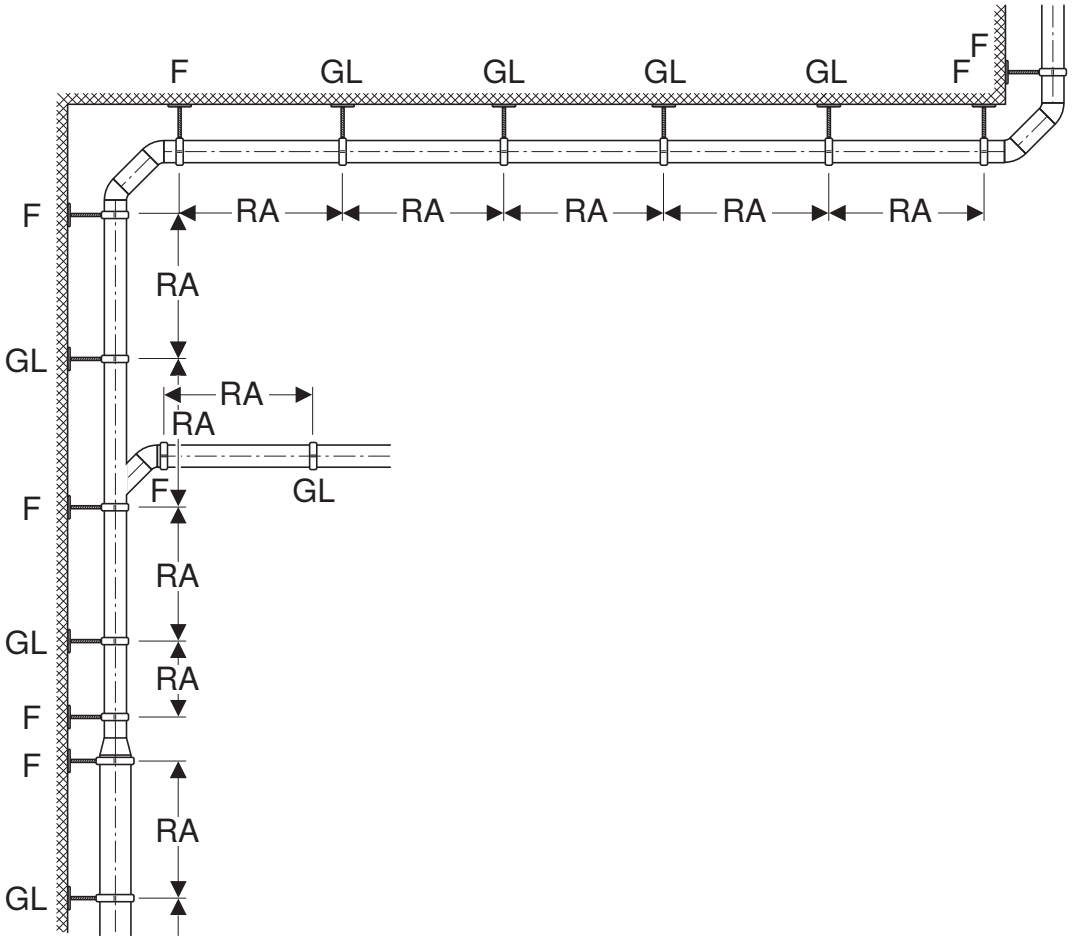


Figure 16: Pipe bracket spacing RA in a rigid installation without support shells

GL Sliding point
F Anchor point
RA Pipe bracket spacing

DN	d [mm]	RA [m]
30	32	0.8
40	40	0.8
50	50	0.8
56	56	0.8
60	63	0.8
70	75	0.8
90	90	0.9
100	110	1.1
125	125	1.3
150	160	1.6
200	200	2.0
250	250	2.0
300	315	2.0

Sliding bracket fastening

Sliding points are created with pipe brackets on the pipe and a sufficiently strong pipe bracket fastening. The design of sliding points is the same for all fastening types.

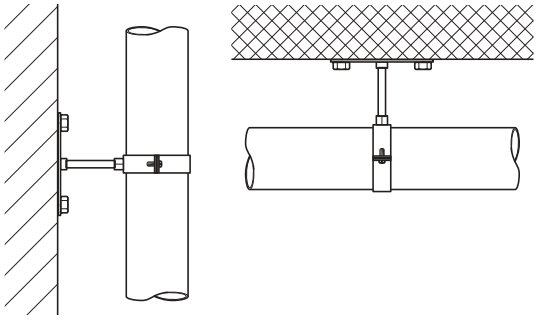


Figure 17: Vertical and horizontal fastening of sliding points with a pipe bracket on the pipe

Thickness of the pipe fixation for sliding points

Geberit offers a suitable fastening system with pipe brackets, threaded rods, threaded pipes as well as base plates with threaded rods in different thicknesses. The required thickness of the threaded rods for the fastening must be selected depending on the ceiling or wall distance.

Table 11: Required thickness of the pipe fixation when fastening horizontally to ceilings and walls

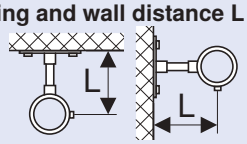
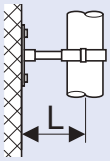
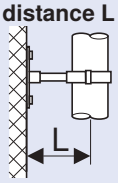
DN	d [mm]	Ceiling and wall distance L [cm] 					
		10	20	30	40	50	60
30	32	M10	M10	M10	M10	M10	1/2"
40	40	M10	M10	M10	M10	M10	1/2"
50	50	M10	M10	M10	M10	M10	1/2"
56	56	M10	M10	M10	M10	M10	1/2"
60	63	M10	M10	M10	M10	M10	1/2"
70	75	M10	M10	M10	M10	M10	1/2"
90	90	M10	M10	M10	M10	M10	1/2"
100	110	M10	M10	M10	M10	1/2"	1/2"
125	125	M10	M10	M10	1/2"	1/2"	1/2"
150	160	–	M10	1/2"	1/2"	1/2"	1/2"
200	200	–	1"	1"	1"	1"	1"
250	250	–	1"	1"	1"	1"	1"
300	315	–	1"	1"	1"	1"	1"

Table 12: Required thickness of the pipe fixation when fastening vertically to walls

DN	d [mm]	Wall distance L [cm] 					
		10	20	30	40	50	60
30	32	M10	M10	M10	1/2"	1/2"	1/2"
40	40	M10	M10	M10	1/2"	1/2"	1/2"
50	50	M10	M10	M10	1/2"	1/2"	1/2"
56	56	M10	M10	M10	1/2"	1/2"	1/2"

DN	d [mm]	Wall distance L [cm] 					
		10	**20**	**30**	**40**	**50**	**60**
60	63	M10	M10	M10	1/2"	1/2"	1/2"
70	75	M10	M10	M10	1/2"	1/2"	1/2"
90	90	M10	M10	M10	1/2"	1/2"	1/2"
100	110	M10	M10	1/2"	1/2"	1/2"	1/2"
125	135	M10	1/2"	1/2"	1/2"	1/2"	1/2"
150	160	–	1/2"	1/2"	1/2"	1/2"	1/2"
200	200	–	1"	1"	1"	1"	1"
250	250	–	1"	1"	1"	1"	1"
300	315	–	1"	1"	1"	1"	1"

2.2.2 Building connection

EN 12056 requires that the load on a discharge pipe due to various settlements of the building must be avoided by suitable measures. Geberit HDPE absorbs various settlements due to the flexibility of the material. In addition, an insulation must be attached that is thicker than the expected settlement.

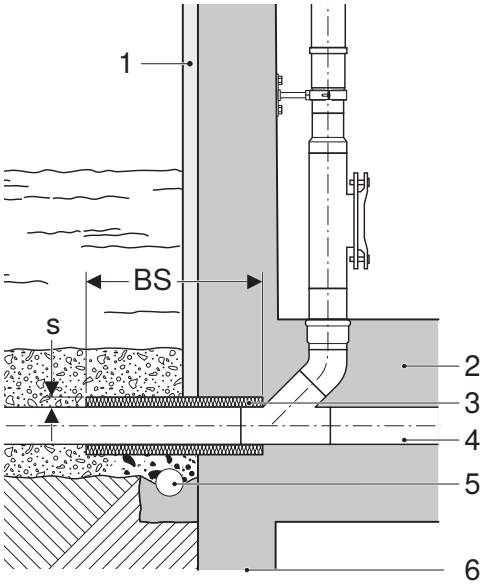


Figure 18: Pipe feed-through with building connection

1 Filter plate
2 Foundation slab
3 Insulation against settlements
4 Geberit HDPE pipe
5 Subsoil drain
6 Settlement
BS Deflection leg
s Insulation thickness
ΔS Expected building settlement

The deflection leg length BS is dependent on the expected building settlement ΔS and the diameter of the pipe d and is calculated with the following formula:

$$BS = 10 \cdot \sqrt{\Delta S \cdot d}$$

Sealing the building connection with a Geberit puddle flange

EN 12056 requires that buried discharge pipes that are passed through the outer wall are designed to be permanently waterproof and airtight.

A seal like this can be created with the Geberit puddle flange.

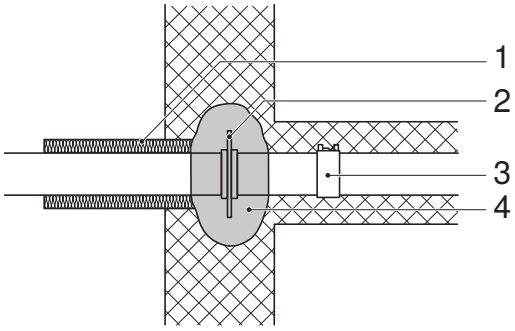


Figure 19: Sealing the building connection with a Geberit puddle flange

1 Insulation against settlements
2 Geberit puddle flange for discharge pipes
3 Electrofusion coupling as an anchor point
4 Concrete covering on all sides at least 8 cm

2.2.3 Duct connection

Settlements are always expected with duct connections. For this reason, the duct connection must be designed to be flexible through the use of a duct lining or a specially prefabricated duct connection. 4 examples of duct connections are shown below.

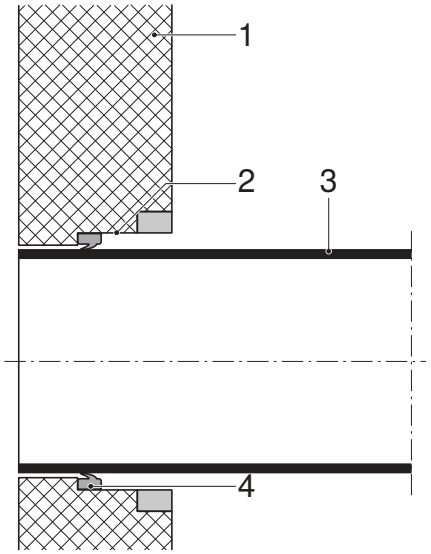


Figure 20: Connection with a prefabricated duct connection

1 Concrete duct, prefabricated
2 Recess for seal (steel ring with a defined outer diameter set in the formwork)
3 Geberit HDPE pipe
4 Seal made of EPDM

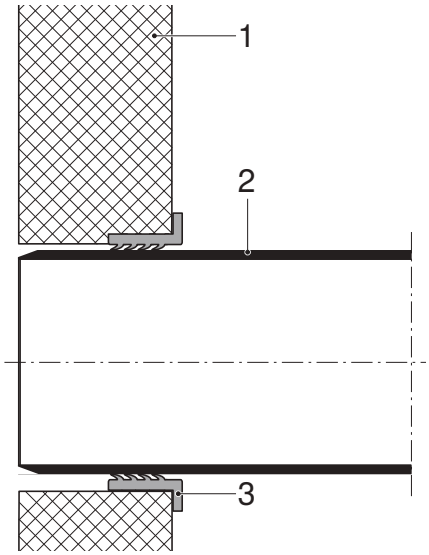


Figure 21: Connection with sealing of connection

1 Concrete duct with corresponding core hole
2 Geberit HDPE pipe, chamfered, treated with lubricant
3 Multi-lip sealing collar with stopper set in the core hole from outside

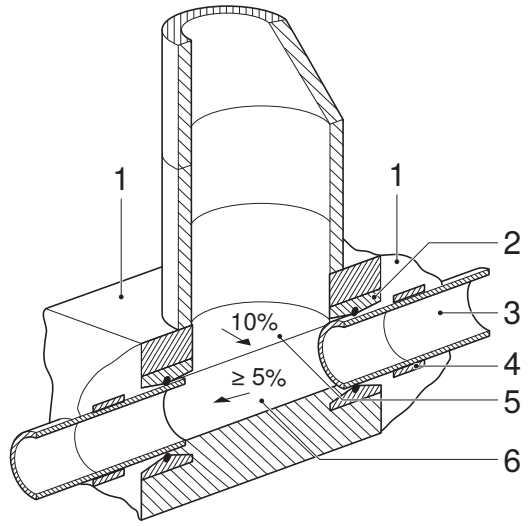


Figure 22: Open duct guide

1 Concrete
2 Duct lining
3 Geberit HDPE pipe
4 Anchor point may be necessary
5 Footing

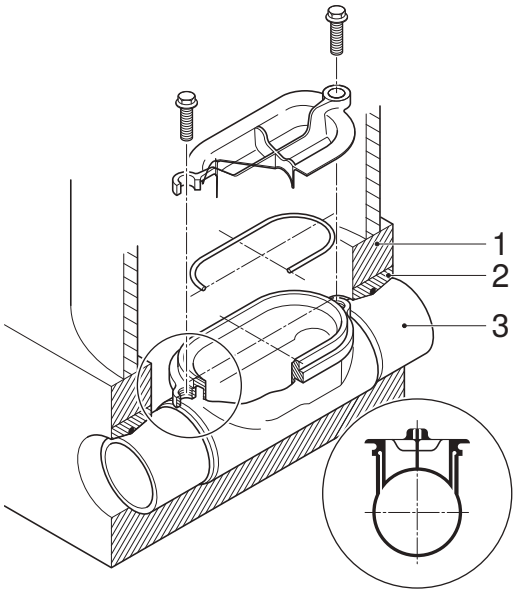


Figure 23: Access pipe with oval cover

1 Concrete
2 Duct lining
3 Access pipe

2.2.4 Installation in concrete

The solid welding and compact embedding of Geberit HDPE pipes in concrete prevents the thermally caused change in length of the pipe. The thermal expansion or shrinkage is absorbed by the elasticity of the HDPE in the material.

The forces that occur during a prevented change in length are considerable with large pipe diameters. The fittings must withstand these forces by themselves, since the pipe does not have any adhesion with the concrete.

The following rules must be observed when embedding Geberit HDPE pipes in concrete:

- Pipes and fittings must be installed so that they are kept in position while they are being embedded in concrete, e.g. by being fastened to the formwork with insertion pipe brackets.
- Pipes and fittings must be connected using (Geberit electrofusion couplings or butt welding).
- Pipes and fittings must be compactly embedded in concrete.
- Only bends with an angle of 45°–90° may be used in horizontal pipes that are longer than 4 metres.

Branch fittings 88.5° embedded in concrete

Equal branch fitting 88.5°

Equal branch fittings 88.5° act as anchor points through the compact embedding in concrete. The branch fitting compactly embedded in concrete prevents the branch discharge pipe shearing off.

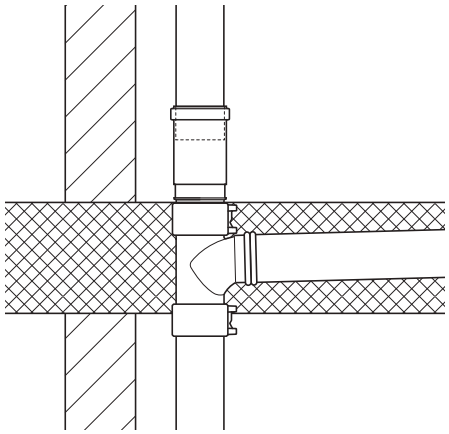


Figure 24: Equal branch fitting 88.5°, embedded in concrete

Reduced branch fitting 88.5°

Reduced branch fittings can absorb less force and must be protected with an anchor point at a maximum distance of 40 cm. The branch fitting compactly embedded in concrete and the anchor point prevent the branch discharge pipe shearing off.

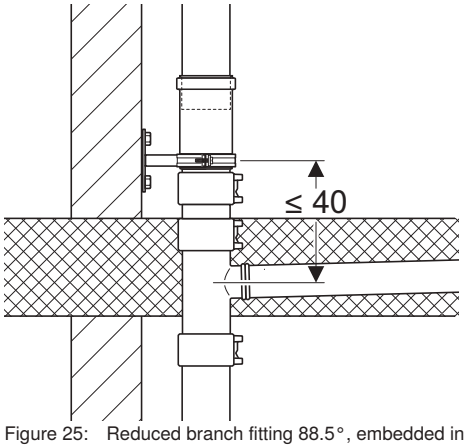


Figure 25: Reduced branch fitting 88.5°, embedded in concrete

Uninsulated branch fittings 45°, embedded in concrete

Equal branch fitting 45°

Equal branch fittings 45° act as anchor points through the compact embedding in concrete. The branch fitting compactly embedded in concrete prevents the branch discharge pipe shearing off.

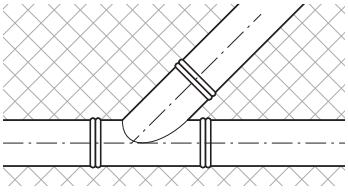


Figure 26: Equal branch fitting 45°, uninsulated

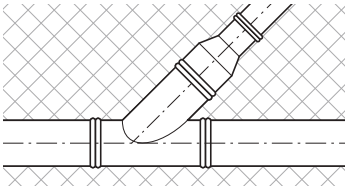


Figure 27: Equal branch fitting 45°, uninsulated, with connecting reducer

Reduced branch fitting 45°

Reduced branch fittings 45° must be fixed in different ways depending on the pipe length. The pipe length is defined from the axis centre of the branch fitting to the next anchor point. Bends greater than 45° and equal branch fittings are regarded as anchor points.

Reduced branch fitting 45° for a pipe length ≤ 4 m

Reduced branch fittings 45° are connected by means of butt welding with a pipe length up to 4 m. The butt welding is used as a fixing. The branch fitting compactly embedded in concrete and the butt welding prevent the branch discharge pipe shearing off.

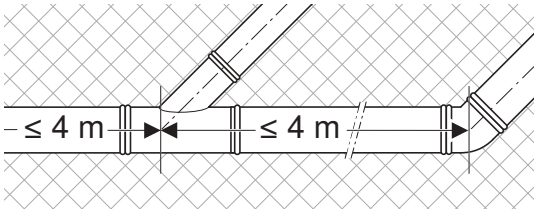


Figure 28: Reduced branch fitting 45°, pipe length up to 4 m

Reduced branch fitting 45° for a pipe length greater than 4 m

Reduced branch fittings 45° must be secured with an electrofusion coupling or flange bushing with a pipe length greater than 4 m. The branch fitting then acts as an anchor point through the compact embedding in concrete. The branch fitting compactly embedded in concrete and the securing thereof with the electrofusion coupling or flange bushing prevent the branch discharge pipe shearing off.

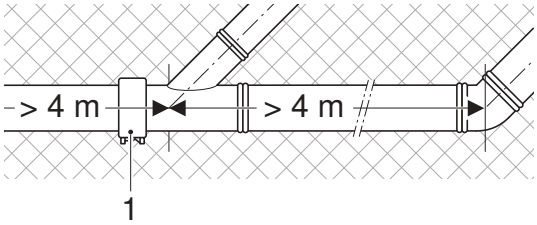


Figure 29: Reduced branch fitting 45°, pipe length greater than 4 m

1 Electrofusion coupling

Insulated branch fittings 45°, embedded in concrete

Equal branch fitting 45°

Geberit recommends embedding insulated equal branch fittings 45° in concrete. The fitting and the insulation prevent the branch discharge pipe from shearing off. The branch fitting functions as an anchor point in this installation method.

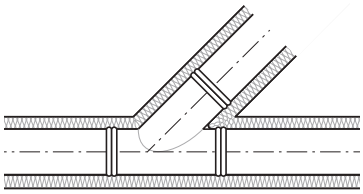


Figure 30: Equal branch fitting 45°, insulated

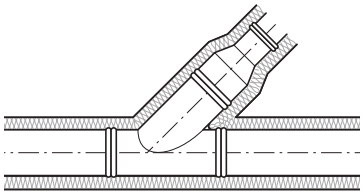


Figure 31: Equal branch fitting 45°, insulated with connecting reducer

Reduced branch fitting 45° for a pipe length ≤ 4 m

The branch fitting compactly embedded in concrete and the insulation prevent the branch discharge pipe shearing off.

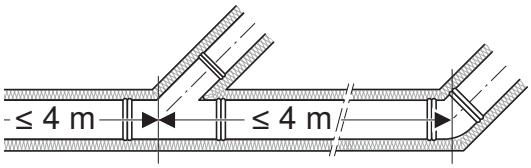


Figure 32: Reduced branch fitting 45°, pipe length ≤ 4 m

The planning of branch discharge pipes is carried out according to EN 12056 or SN 592000. The maximum length of non-ventilated branch discharge pipes must not exceed 4 metres. For this reason, the branch discharge pipes embedded in concrete are almost exclusively ≤ 4 metres. When planning according to this rule, reduced branch fittings do not need to be additionally secured.

Geberit still recommends using equal branch fittings anyway since they can absorb more force.

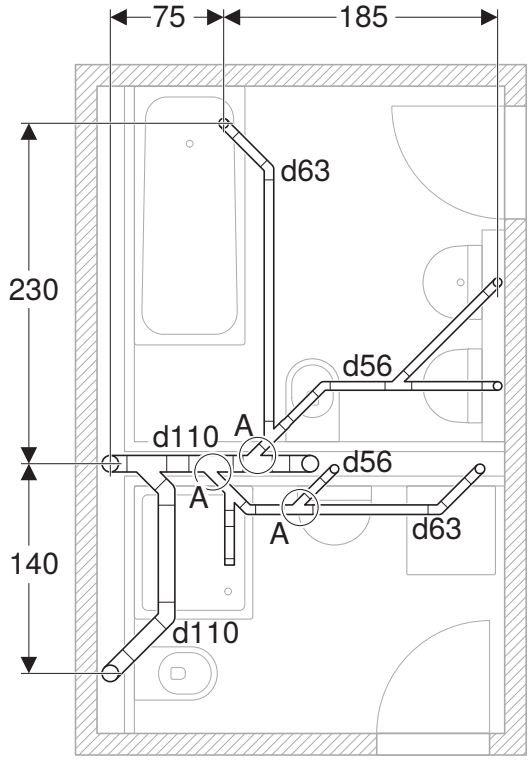


Figure 33: Design detail with reduced branch fittings 45° and pipe embedded in concrete ≤ 4 metres

A Reduced branch fittings

Reduced branch fitting 45° for a pipe length greater than 4 m

In the case of a pipe length greater than 4 m, reduced branch fittings 45° must additionally be secured with either insulation thicker than 17 mm or an anchor point. The branch fitting compactly embedded in concrete and the additional insulation or securing with an anchor point prevent the branch discharge pipe shearing off.

The pipe length is measured to the next anchor point. Anchor points are bends ≥ 45° and equal branch fittings.

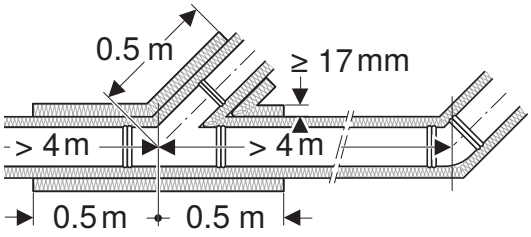


Figure 34: Reduced branch fitting 45°, pipe length greater than 4 m, with additional insulation

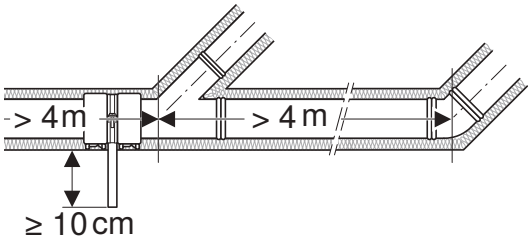


Figure 35: Reduced branch fitting 45°, pipe length greater than 4 m with anchor point

Anchor point for insulated pipes embedded in concrete

The anchor point is created with 1 pipe bracket and 2 electrofusion couplings. The pipe bracket is screwed with the threaded pipe that protrudes into the concrete at least 10 cm over the insulation. The insulation in the area of the threaded pipe must be bonded so that it is leakproof.

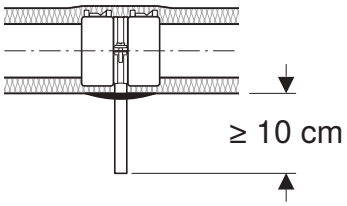


Figure 36: Anchor point for insulated Geberit discharge pipes embedded in concrete

Straight ceiling feed-throughs as an anchor point

Uninsulated straight ceiling feed-through

The anchor point is created with an electrofusion coupling or flange bushing in uninsulated straight ceiling feed-throughs.

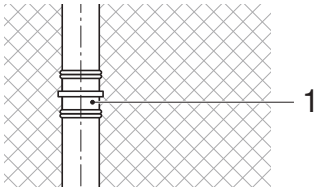


Figure 37: Anchor point with a flange bushing in uninsulated straight ceiling feed-throughs embedded in concrete

1 Flange bushing

Insulated straight ceiling feed-through

The anchor point is created with 1 pipe bracket and 2 electrofusion couplings in insulated straight ceiling feed-throughs. A 1/2" threaded pipe is screwed onto the pipe bracket that protrudes into the concrete at least 10 cm over the insulation. The insulation in the area of the threaded pipe must be bonded so that it is leakproof.

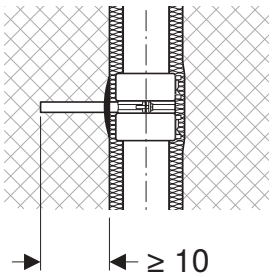


Figure 38: Anchor point in insulated straight ceiling feed-throughs embedded in concrete

2.2.5 Installation in the ground

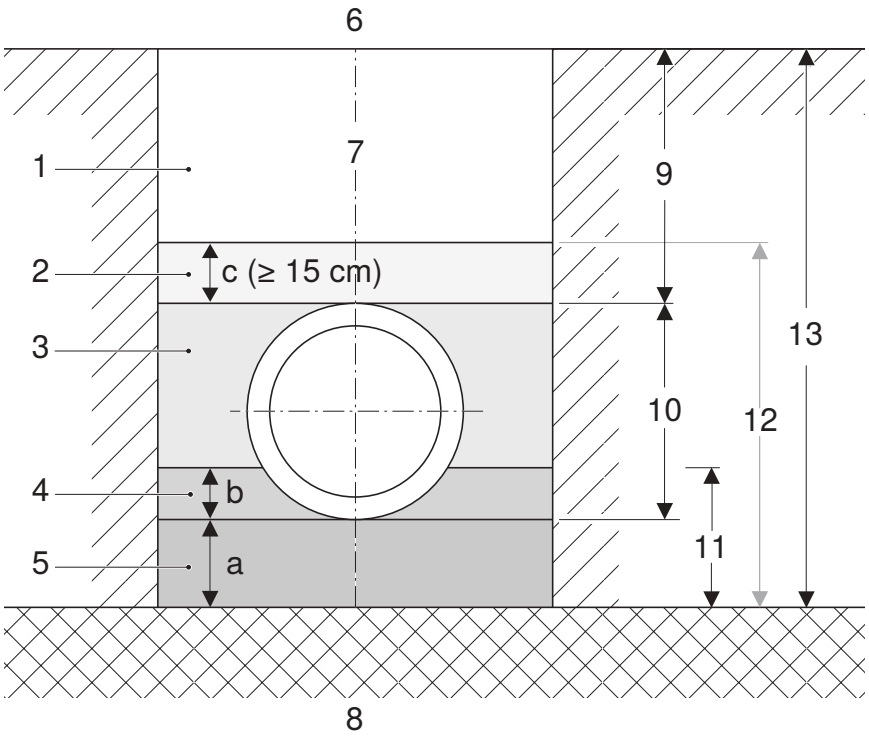
Normative requirements

When Geberit HDPE pipes and fittings are installed in the ground, the requirements of the following standards must be taken into account:

- EN 1610:2015
- EN 12056
- EN 752:2017

Structure of the embedment

The perfect design of the embedment is decisive for the bearing capacity of the Geberit HDPE pipes and fittings in the ground. The embedment is the backfilling in the area of the Geberit HDPE pipe and consists of the bedding, side filling and covering zone.



1 Main filling
2 Covering zone
3 Side filling
4 Upper bedding layer
5 Lower bedding layer
6 Surface
7 Trench walls
8 Trench bottom
9 Overburden height
10 Outer pipe diameter
11 Bedding
12 Embedment
13 Digging depth

Design of the embedment

Basic rules

The following rules must be observed when designing the embedment:

- The embedment must be designed according to the planning requirements and the static calculation.
- The bearing capacity, stability or the position of the embedment must not be changed by:
  - removal of the sheeting,
  - influence of ground water,
  - other neighbouring earthwork.
- The position of the pipe must not change until backfilling of 30 cm over the top of the pipe has been achieved.
- No cavities must form underneath the pipe.

The building materials for the embedment must fulfil the following requirements:

- no negative influence on the Geberit HDPE pipe
- free of frozen material
- free of components that are greater than:
  - 22 mm for DN ≤ 200
  - 40 mm for DN > 200

Bedding

The bedding consists of the lower and upper bedding layer. The width of the bedding must correspond to the trench width. In the case of pipes under dams, the width of the bedding must be four times the outer diameter unless otherwise specified.

EN 1610:2015 distinguishes between 3 bedding types:

- bedding type 1: for all embedments
- bedding type 2: for embedments in even, relatively loose fine-grained soil
- bedding type 3: for embedments in relatively fine-grained soil

Bedding type 1 consists of an upper and lower bedding layer.

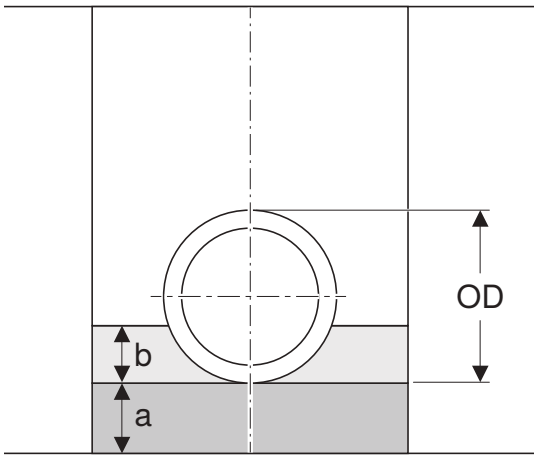


Figure 39: Bedding type 1

a	Lower bedding layer
b	Upper bedding layer
OD	Outer pipe diameter

The following rules must be observed when creating bedding type 1:

- Unless otherwise specified, the lower bedding layer must have at least the following height:
  - 100 mm under normal ground conditions
  - 150 mm with rocky ground or compact ground
- The Geberit HDPE pipe must fit closely along its entire length.
- The height of the upper bedding layer must correspond to the static calculation.

Bedding types 2 and 3 consist of only one upper bedding layer.

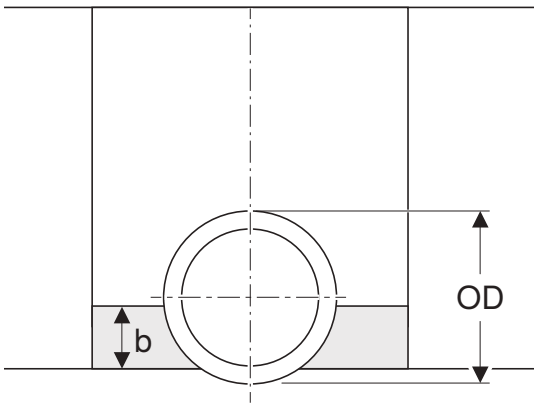


Figure 40: Bedding type 2

b Upper bedding layer
OD Outer pipe diameter

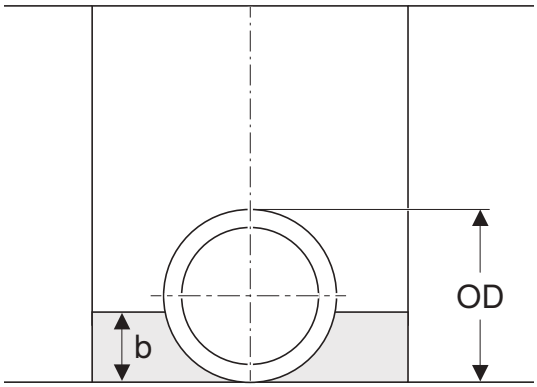


Figure 41: Bedding type 3

b Upper bedding layer
OD Outer pipe diameter

The following rules must be observed when creating bedding types 2 and 3:

- The Geberit HDPE pipe can be laid directly on the trench bottom.
- The Geberit HDPE pipe must fit closely along its entire length.

Special bedding designs

In the case of a trench bottom with a low-load bearing capacity for the bedding (e.g. peat, fluidised sand), special designs are necessary, for example:

- replacement of the soil by other building materials
- support of the pipe with piles etc.

These designs may only be used if their suitability has been proven by a static calculation.

Main filling

The main filling must be executed according to the planning requirements.

Compression

The following rules must be observed when compressing the embedment:

- The degree of compression must correspond to the static calculation.
- The cover directly over the pipe must be compressed by hand if necessary.
- Mechanical compression should only be done after there is a minimum cover thickness of 30 cm over the top of the pipe.

Static calculation

A static calculation of buried Geberit HDPE pipes and fittings is not required with burial depths of 0.8 to 6 m without ground water influence and without imposed loads. The specifications laid out in EN 1610:2015 must be observed when installing the drainage system.

In the case of imposed loads or other influencing variables, the general requirements for the static calculation of buried pipes according to EN 1295-1:2017 must be taken into account. The specifications resulting from the static calculation must be observed during installation.

2.2.6 Low pressure applications

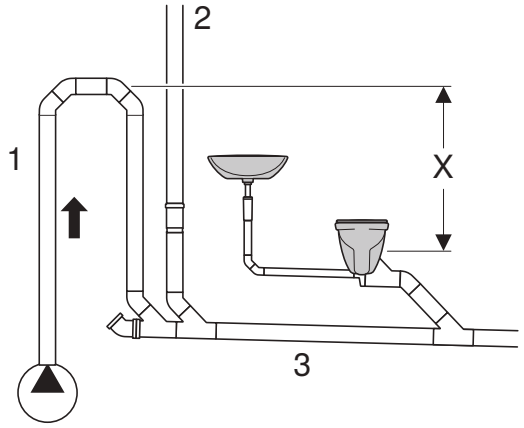
Pump pressure pipes

Geberit HDPE can be used for pump pressure pipes in the pipe dimensions d32–160 if the following conditions are fulfilled:

- Maximum internal pressure of 1.5 bar at a maximum temperature of 30 °C, 10 years of operation, without any mechanical or chemical load.
- All connections must be non-positive with butt welding, electrofusion welding or flange connections.

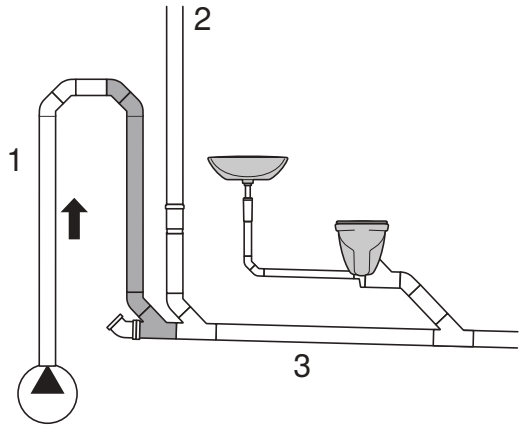
The following rules must be observed when designing pump pressure pipes with Geberit HDPE:

- The level of the pump pressure pipe through a pipe loop must be higher than the lowest sanitary appliance.



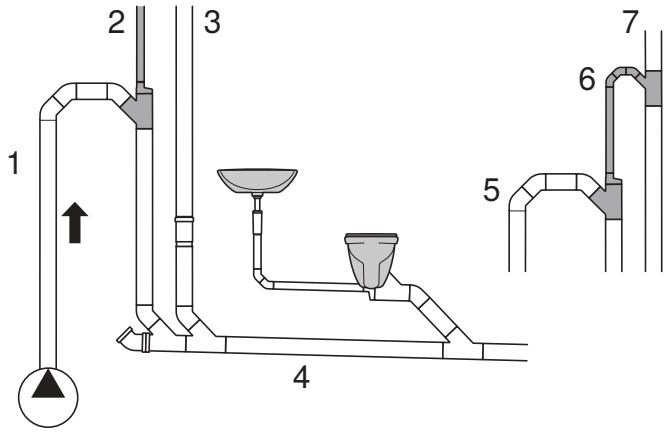
1 Pump pressure pipe
2 Vertical duct
3 Collector pipe
X Difference in height between the pipe loop and lowest sanitary appliance

- The vertical section of the pipe loop must be extended when a flow rate is less than 5 l/s.



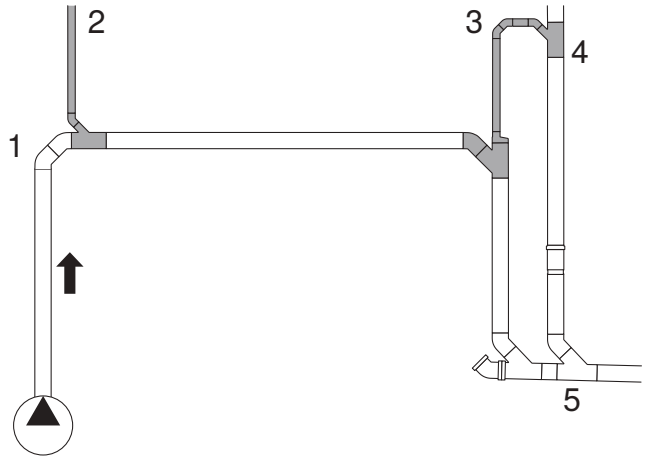
1 Pump pressure pipe
2 Vertical duct
3 Collector pipe

- The stack must be ventilated with a ventilating pipe with an internal diameter of at least 50 mm when a flow rate is higher than 5 l/s.



1 Pump pressure pipe v > 5 l/s
2 Ventilation
3 Vertical duct
4 Collector pipe
5 Pump pressure pipe
6 Lateral ventilation
7 Vertical duct

- Pipe loops with long horizontal sections must be ventilated. The following rules must be observed when designing the ventilation:
  - The internal diameter of the ventilating pipe must be at least 57 mm or 2 dimensions smaller than the discharge pipe.
  - The ventilating pipe must be higher than the delivery height of the pump.
  - The ventilating pipe must be routed over the roof.



1 Pump pressure pipe
2 Ventilation
3 Lateral ventilation
4 Vertical drain duct
5 Collector pipe

2.2.7 Adapter for Geberit Silent-db20 and third party materials

All not non-positive connections to third party materials must be secured with anchor points to prevent them being pulled out.

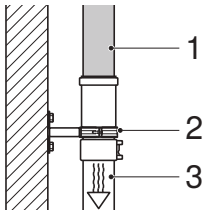


Figure 42: Adapter with expansion socket

1 Geberit HDPE
2 Anchor point with expansion socket
3 Geberit Silent-db20

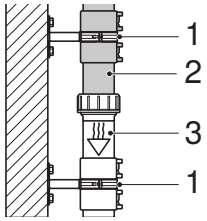


Figure 43: Adapter with screw connection

1 Anchor point with 2 electrofusion couplings
2 Geberit HDPE
3 Geberit Silent-db20

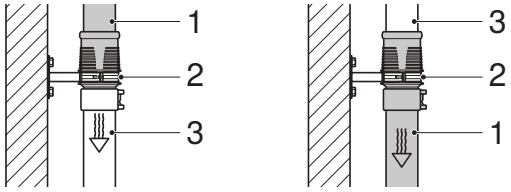


Figure 44: Adapter with Geberit Silent-db20 expansion socket

1 Geberit HDPE with expansion socket
2 Anchor point on Geberit Silent-db20 expansion socket
3 Geberit Silent-db20

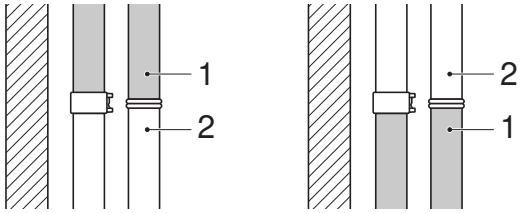


Figure 45: Adapter with Geberit electrofusion coupling or butt welding

1 Geberit HDPE
2 Geberit Silent-db20

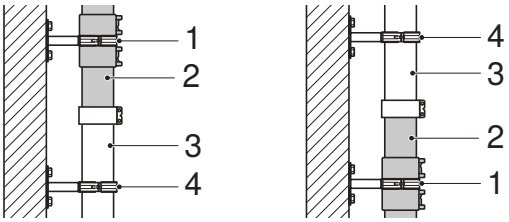


Figure 46: Adapter with Geberit clamping connector, Geberit HDPE always with support ring

1 Anchor point with 2 electrofusion couplings
2 Geberit HDPE
3 Geberit Silent-db20 / cast iron / steel / Astolan / fibre cement
4 Anchor point

CHAPTER THREE

GEBERIT SOVENT

3.1 SYSTEM DESCRIPTION

3.1.1 Overview of Geberit Sovent

Geberit HDPE Sovent is a flow-optimised inlet fitting made of high-density polyethylene, which enables an economical and space-saving configuration of stacks in tall buildings.

The special design of the fitting and patented Geberit SuperTube technology produces a continuous column of air in the stack. The discharge rate of the stack increases as a result of the continuous column of air, meaning that there is no longer any need to install a ventilation pipe running in parallel and the stack dimensions can be smaller in many applications.

A continuous column of air facilitates pressure compensation and increases the discharge rate.

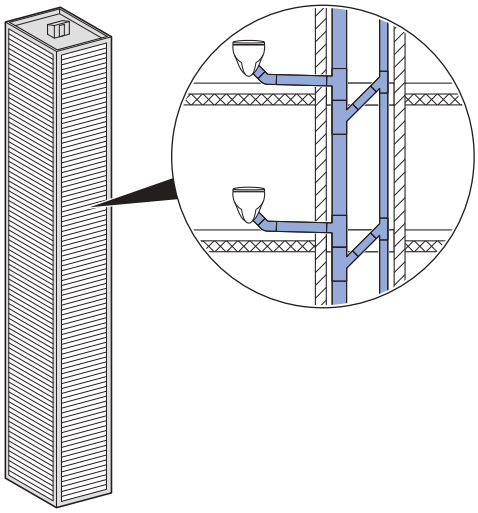


Figure 47: Conventional drainage of high-rise buildings with an additional ventilation pipe (secondary ventilation)

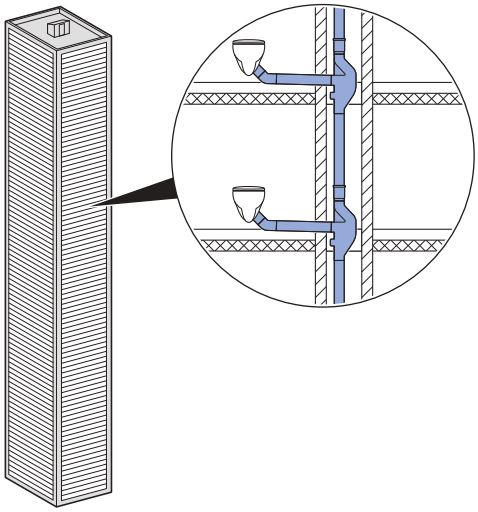


Figure 48: Drainage of high-rise buildings with Geberit HDPE Sovent

The Geberit HDPE Sovent fittings are available in the dimensions of d110 and d160.

The Geberit HDPE Sovent fitting d110 is equipped with the Geberit SuperTube technology. For changes in pipe direction in the dimension d110, the bends Geberit BottomTurn bend and Geberit BackFlip bend are additionally available, which are also equipped with the Geberit SuperTube technology. In combination with the two bends, fitting d110 forms the Geberit SuperTube system.

3.1.2 Structure of Geberit SuperTube

Geberit SuperTube comprises of:

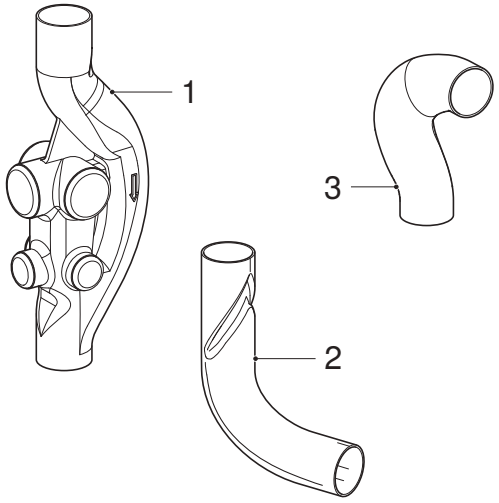


Figure 49: Structure of Geberit SuperTube

1 Geberit HDPE Sovent fitting d110
2 Geberit HDPE BottomTurn bend d110
3 Geberit HDPE BackFlip bend d110

Geberit SuperTube is an optimised flow guidance system developed by Geberit, which ensures a continuous column of air in the stack and significantly increases the discharge rate of the fittings.

Geberit HDPE Sovent fitting d110

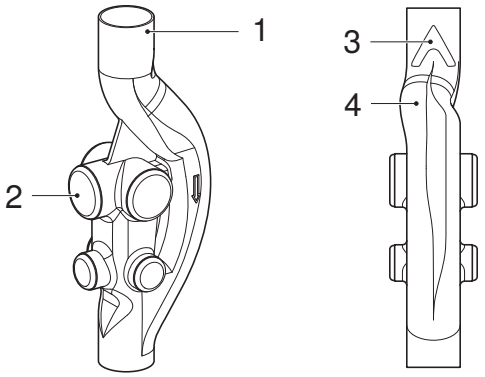


Figure 50: Structure of the Geberit HDPE Sovent fitting d110

1 Stack connection
2 Branch pipe connection, 6-way, sealed at the factory
3 Flow divider
4 Swirl zone

Geberit HDPE BottomTurn Bend d110

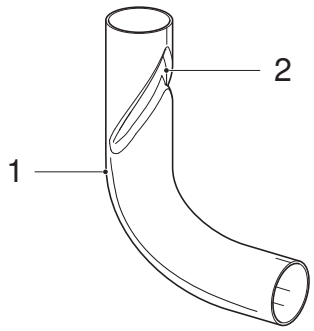


Figure 51: Structure of the Geberit HDPE BottomTurn bend d110

1 Guide channel
2 Flow divider

Geberit HDPE BackFlip Bend d110

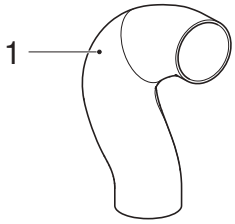


Figure 52: Structure of the Geberit HDPE BackFlip bend d110

1 Swirl zone

3.1.3 Structure of the Geberit HDPE Sovent fitting d160

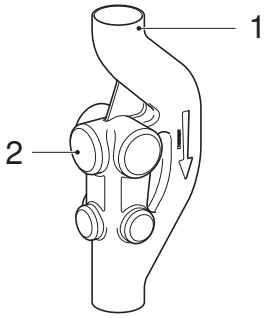


Figure 53: Structure of the Geberit HDPE Sovent fitting d160

1 Stack connection
2 Floor pipe connection, 6-way, sealed at the factory

3.1.4 Application range

Geberit HDPE Sovent is used for an economical and space-saving configuration of stacks in buildings with more than 5 floors (high-rise buildings).

Geberit HDPE BottomTurn bend and Geberit HDPE BackFlip bend can be used only in conjunction with the Geberit HDPE Sovent fitting d110 and the drainage systems Geberit HDPE or Geberit Silent-db20.

3.1.5 Function

Geberit HDPE Sovent fittings

Hydraulic pressure compensation in a stack system is an extremely complex matter. Each stack concept is characterised by individual properties. The capacity of the stack and ventilation system is dependent on the flow capacity of the appliances, their simultaneous drainage pattern, the branch fitting inlet configuration and the drainage concept of the building. Overpressure and negative pressure in a drainage system must be limited in order to ensure the water seal in the trap.

Very high negative pressure values can arise in conventional main ventilation pipes. The negative pressure arises due to unfavourable flow behaviour between the stack and the branch discharge pipe. This unfavourable flow behaviour leads to a hydraulic blockage in the stack that prevents the air from circulating.

The Geberit HDPE Sovent fittings prevent a hydraulic blockage from forming in the stack. Because of the fact that the stack flow is guided around the point of connection, the incoming waste water has time to switch to the vertical direction so that it flows in a parallel direction when it meets the waste water in the stack flow. This minimises the collision turbulences of the two waste water flows and therefore reduces the pressure fluctuations in the system. Guiding the stack flow around the point of connection also causes the flow velocity to decrease which limits the kinetic pressure. In addition, the partition wall in the Geberit HDPE Sovent fittings prevents foam, dirt particles or splash water from getting into the branch discharge pipe.

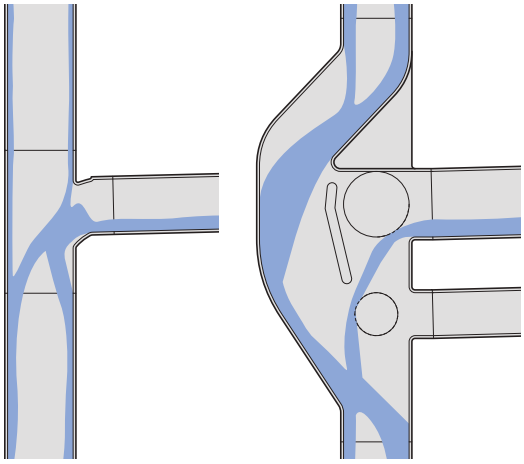


Figure 54: How the Geberit HDPE Sovent fittings function in comparison to conventional main ventilation pipes

Geberit SuperTube technology

Geberit HDPE Sovent fittings and bends with Geberit SuperTube technology also stand out due to their patented, flow-optimised design.

The flow-optimised design in the Geberit HDPE Sovent fitting d110 is comprised of a flow divider and a swirl zone. The flow divider adjusts the flow of the water and supports functional stability in the system. The swirl zone creates a rotating movement that allows the water to flow along the pipe wall, which produces a continuous column of air. This effect increases the discharge rate of the fitting by more than 30 % (from 8.7 l/s to 12 l/s).

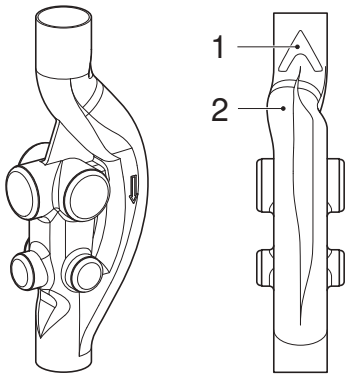


Figure 55: Geberit SuperTube technology components on the Geberit HDPE Sovent fitting d110

1 Flow divider
2 Swirl zone

Direction change in horizontal pipe sections

With a direction change in a horizontal pipe section, the annular flow (vertical pipe section) changes to a layered flow (horizontal pipe section) in the bend. Critical overpressure in the drainage system is mainly caused by direction changes in the horizontal pipe sections. The geometry of the bend used has a major influence on how much overpressure develops in the pipe.

If the baffle is designed with a bend 90°, an abrupt direction change causes water to accumulate in the bend and is severely slowed down. Turbulence arises and the flowing water swings up sideways after the direction change. In such a situation, the water needs extra space in the pipe and displaces some of the air flowing in the pipe. The displaced air can then cause critical overpressure in the pipe which can expel the trap.

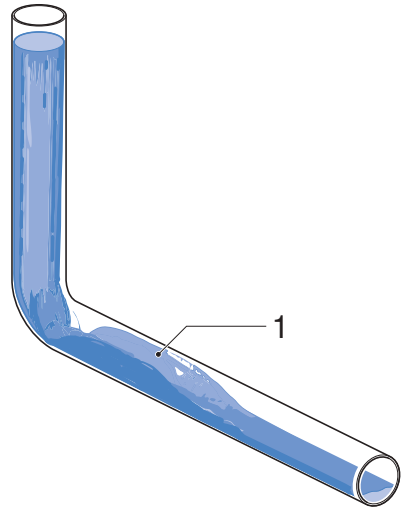


Figure 56: Flow behaviour in a bend 90°

1 Waste water splashes up the sides of the pipe after a direction change

For this reason, standards recommend the use of two bends 45° instead of one bend 90°. 2 bends 45° mean the change in direction is less abrupt and therefore reduce the backup of water.

Direction change in vertical pipe sections

In contrast to the direction change from vertical to horizontal pipe sections, a direction change from horizontal to vertical pipe sections can cause critical negative pressure.

The reason for this negative pressure is that the change in direction of the waste water flow from a horizontal to a vertical pipe section can cause a hydraulic blockage in the bend that obstructs the flow of air. This causes negative pressure in the vertical pipe section (stack) which reduces the performance of the drainage system.

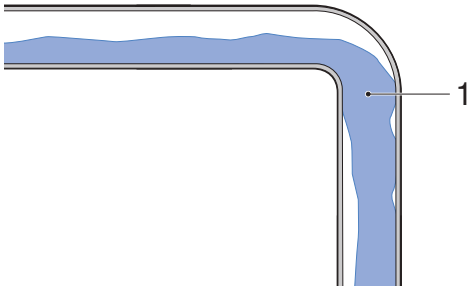


Figure 57: Hydraulic blockage when the direction is changed from horizontal to vertical

1 Hydraulic blockage

Geberit PE BottomTurn bend

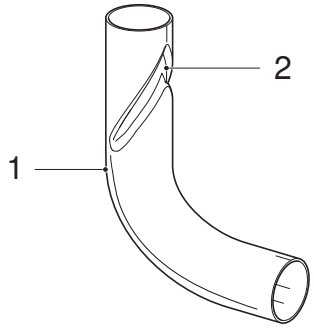


Figure 58: Components of the Geberit SuperTube technology for the Geberit HDPE BottomTurn bend

1 Guide channel
2 Flow divider

With its flow-optimised geometry, the Geberit HDPE BottomTurn bend ensures that the air column is not interrupted in the stack. By optimising the transition from an annular flow to a layered flow, critical overpressure in the drainage system is avoided. The flow divider guides the waste water to the outside of the bend, where the guide channel directs the flow into the horizontal pipe without the waste water splashing up the sides of the pipe. This minimises the energy loss in the baffle and makes optimum use of the pulse from the stack.

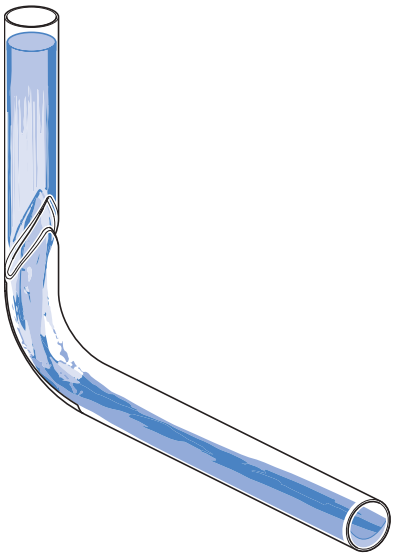


Figure 59: Flow behaviour in the Geberit HDPE BottomTurn bend

Geberit PE BackFlip bend

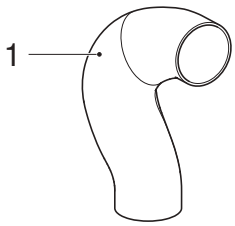


Figure 60: Components of the Geberit SuperTube technology for the Geberit HDPE BackFlip bend

1 Swirl zone

The Geberit HDPE BackFlip bend transfers the layered flow into an annular flow without creating a hydraulic blockage. This prevents critical negative pressure in the drainage system.

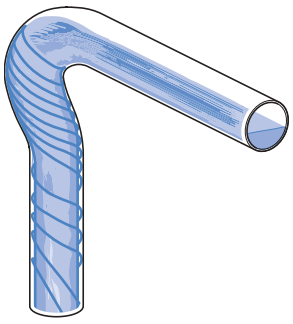


Figure 61: Flow behaviour in the Geberit HDPE BackFlip bend

3.1.6 The load bearing capacity of Geberit HDPE Sovent in comparison to conventional stack versions

Stacks with Geberit HDPE Sovent have a higher load bearing capacity than conventional stacks with main or secondary ventilation with the same dimensions. The following table shows the maximum load of Geberit HDPE Sovent in DU compared to conventional stack versions.

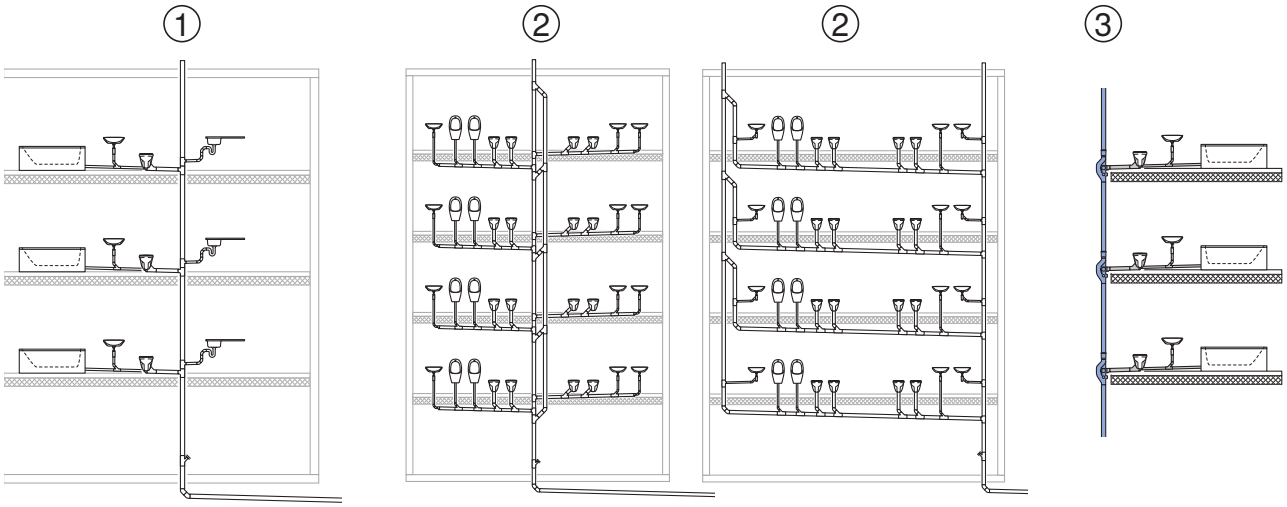
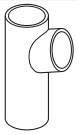
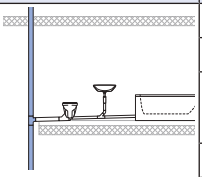
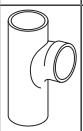
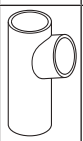
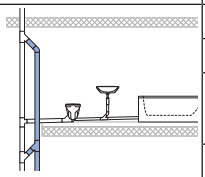
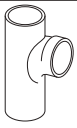
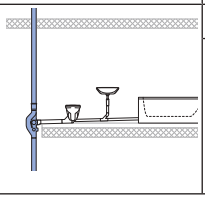


Table 13: The load bearing capacity of Geberit HDPE Sovent in comparison to conventional stack versions in accordance with BS EN 12056-2:2000-09-15

No.	Symbol	Drainage system	Schematic	Dimension d	Dimension d of the secondary ventilation	Maximum load in DU (K = 0.5)	Maximum load in l/s
1		Main ventilation system with branch fitting 88.5°		110	–	64	4.0
				125	–	135	5.8
				160	–	361	9.5
1		Main ventilation system with branch fitting 88.5°, swept-entry		110	–	108	5.2
				125	–	231	7.6
				160	–	615	12.4
2		Secondary ventilation system, direct or indirect, with branch fitting 88.5°		110	50	125	5.6
				125	75	231	7.6
				160	90	615	12.4
2		Secondary ventilation system, direct or indirect, with branch fitting 88.5°, swept-entry		110	50	213	7.3
				125	75	400	10.0
				160	90	1340	18.3
3		Geberit HDPE Sovent		110	–	576	12.0
				160	–	1156	17.0

3.2 STANDARDS AND TESTS

3.2.1 Standards

The Geberit HDPE Sovent fitting is a special fitting based on the requirements of both the Swiss standard SN 592000:2012 and the Australian standard AS/NZS 3500.2:2018.

All of the pipes and connections attached to a stack with Geberit HDPE Sovent fittings are subject to the regulations of the respective locally applicable standards. The drainage system must therefore be installed in accordance with these regulations. For the stack itself and for the transition of the stack into the collector pipe, Geberit specifies technical parameters which must be adhered to.

3.2.2 Tests

Geberit HDPE Sovent has been tested by national test institutes alongside conventional drainage systems in accordance with BS EN 12056-2:2000-09-15. Performance and function of the Geberit HDPE Sovent are documented in the following test reports.

The hydraulic performance and function of fittings with the Geberit SuperTube technology has been confirmed by a test report issued by TÜV Rheinland LGA Products. TÜV Rheinland LGA Products is an independent, internationally recognised test organisation with headquarters in Nuremberg, Germany.

Test reports for Geberit SuperTube

Country	Institute	Test report no.
Germany	TÜV Rheinland LGA Products	SuperTube technology test report 60201117-001
United Kingdom	BBA	SuperTube technology test report S164466

Test reports for Geberit HDPE Sovent fitting d160

Country	Institute	Test report no.
Germany	TÜV Rheinland LGA Products	Test report 7311212-01
United Kingdom	BBA	Test report S1/47721

3.2.3 Approvals

Table 14: Approvals for Geberit HDPE Sovent and Geberit SuperTube

Country	Institute	Approval no.
France	CSTB	Avis Technique 14.1/16-2201_V2
United Kingdom	BBA	Agrément Certificate 19/5706
Australia	Watermark	GM-WM-040011-I02-R03
South Africa	Aenor	001/006952

3.3 SYSTEM PLANNING AND PROCESSING

3.3.1 Planning rules in accordance with Geberit and BS EN 12056-2:2000

Basic rules

When planning discharge pipes with Geberit HDPE Sovent fittings, the following points need to be taken into account in addition to the generally applicable rules for planning discharge pipes:

- Geberit HDPE Sovent fittings should be installed where conventional branch fittings are found in conventional stacks.
- Every stack planned with Geberit HDPE Sovent fittings must be individually ventilated through the roof, without reducing the pipe cross-section.
- The respective planning rules for Geberit HDPE Sovent must be observed for the transition of the stack into a horizontal collector pipe or for the design of a stack offset.

Overview of the pipe sections and rules

Geberit SuperTube pipe sections and rules

The following graphic provides an overview of the pipe sections of a discharge pipe with Geberit SuperTube and the rules which must observed for these pipe sections.

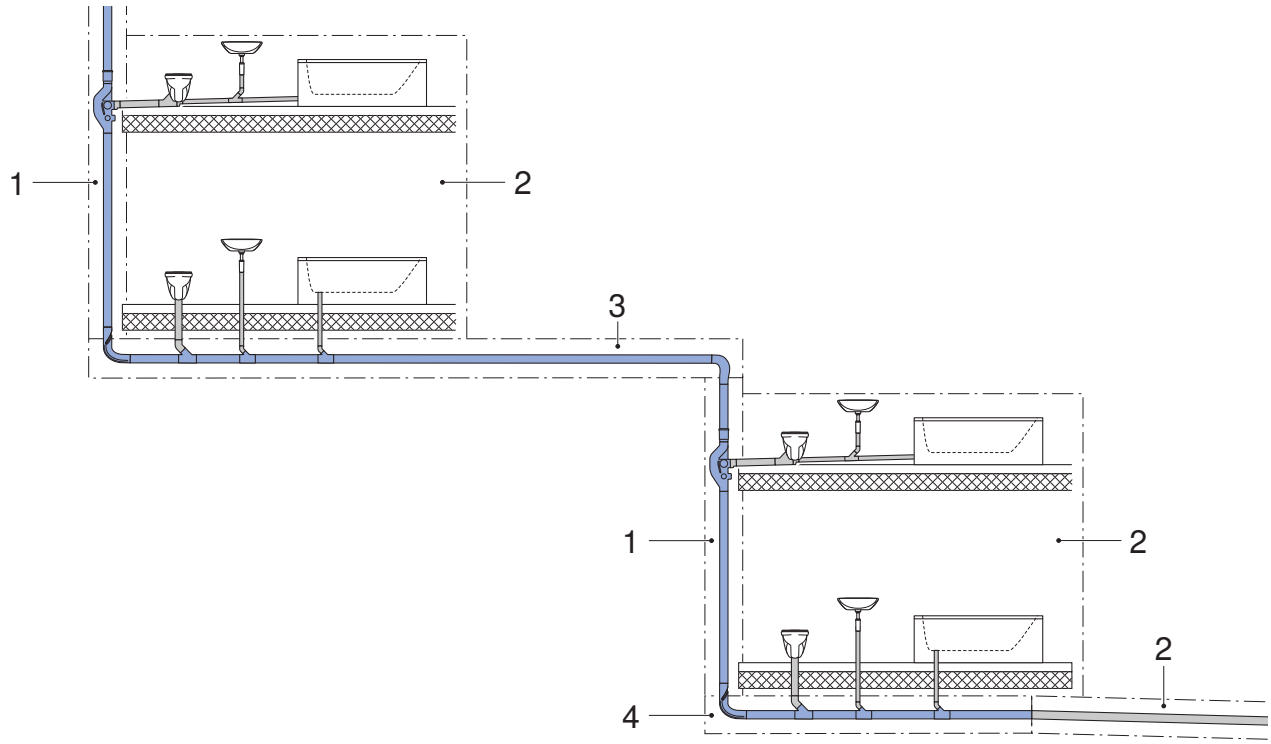


Figure 62: Discharge pipe with Geberit SuperTube: pipe sections and rules

1 Stack: planning in accordance with the rules for Geberit HDPE Sovent fittings
2 Branch discharge pipes, collector pipe: planning in accordance with local standard or BS EN 12056-2:2000-09-15
3 Stack offset: planning in accordance with the rules for Geberit SuperTube
4 Transition to the collector pipe: planning in accordance with the rules for Geberit SuperTube

Geberit HDPE Sovent d160 pipe sections and rules

The following graphic provides an overview of the pipe sections of a discharge pipe with Geberit HDPE Sovent d160 and the rules which must observed for these pipe sections.

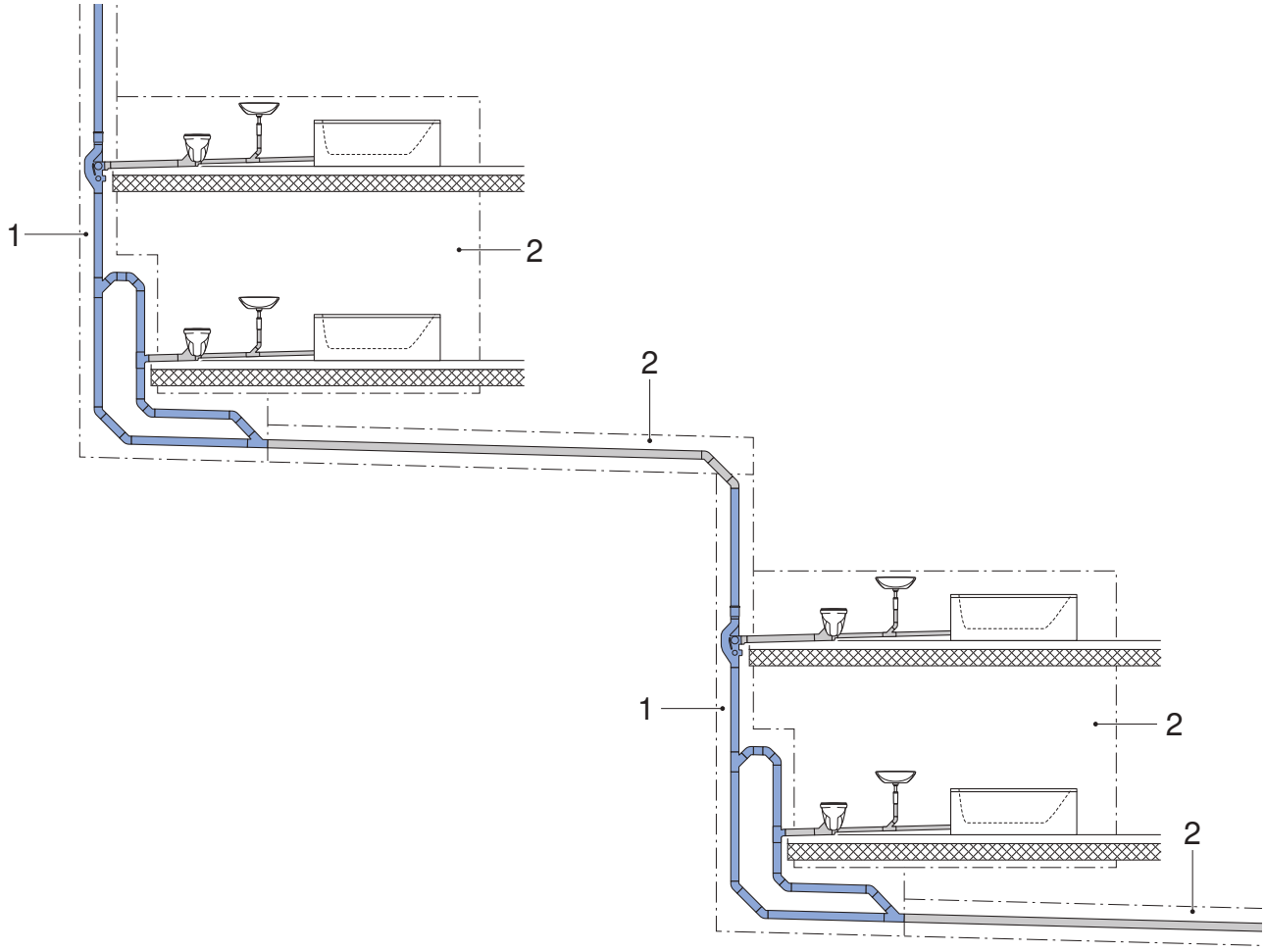


Figure 63: Discharge pipe with Geberit HDPE Sovent d160: pipe sections and rules

1 Stack with transitions to the stack offset and collector pipe: planning in accordance with the rules for Geberit HDPE Sovent fittings

2 Branch discharge pipes, stack offset, collector pipe: planning in accordance with local standard or BS EN 12056-2:2000-09-15

Stack

Load on a stack with Geberit HDPE Sovent fittings

One of the first steps in the planning of a Geberit HDPE Sovent stack is to determine the amount of waste water. All DUs of the appliances must be taken into account for this purpose and included in the configuration of the stack with Geberit HDPE Sovent.

A maximum flow rate of 12 l/s is permitted for stacks with Geberit HDPE Sovent fittings d110 and 17 l/s for stacks with Geberit HDPE Sovent fittings d160. The stack with the stack vent must be implemented completely with d110 or d160.

Table 15: Maximum waste water discharge rate of stacks with Geberit HDPE Sovent

Product	Maximum waste water discharge rate	Maximum load in DU (K = 0.5)	Pipe dimension with stack vent through the roof
Geberit HDPE Sovent fitting d110	12 l/s	576	ø 110 mm / DN 100
Geberit HDPE Sovent fitting d160	17 l/s	1156	ø 160 mm / DN 150

If the waste water discharge rate of stack d110 is greater than 12 l/s, one of the following measures must be planned:

- use additional stacks and distribute the connections accordingly (A, B)
- use a stack d160 (C, maximum 17 l/s)

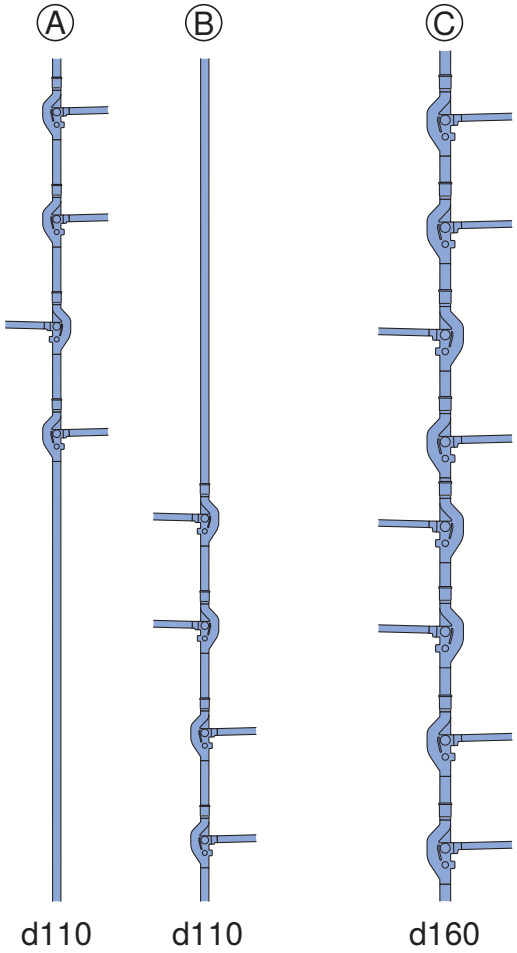


Figure 64: Structure of stacks with Geberit HDPE Sovent with a waste water discharge rate greater than 12 l/s

Installing Geberit HDPE Sovent fittings in the stack

A Geberit HDPE Sovent fitting must be installed at every floor connected to the stack.

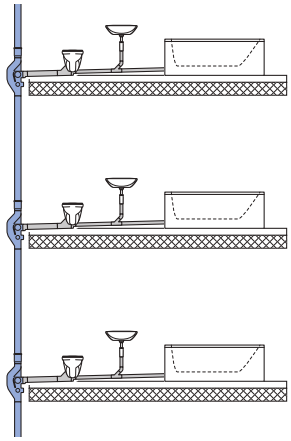


Figure 65: Installing one Geberit HDPE Sovent fitting per floor connection

Combinations of connections diagonally opposite one another must be avoided.

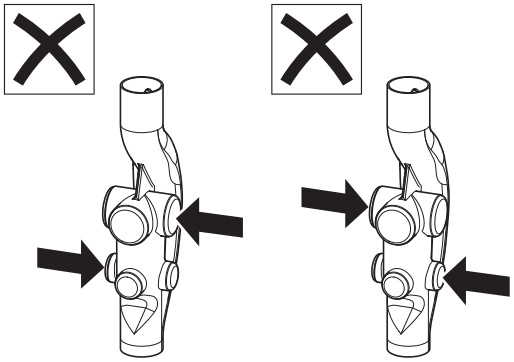


Figure 66: To be avoided: connections diagonally opposite one another

When complying with the following prerequisites, a single, small stack can also be connected to the stack via a branch discharge pipe.

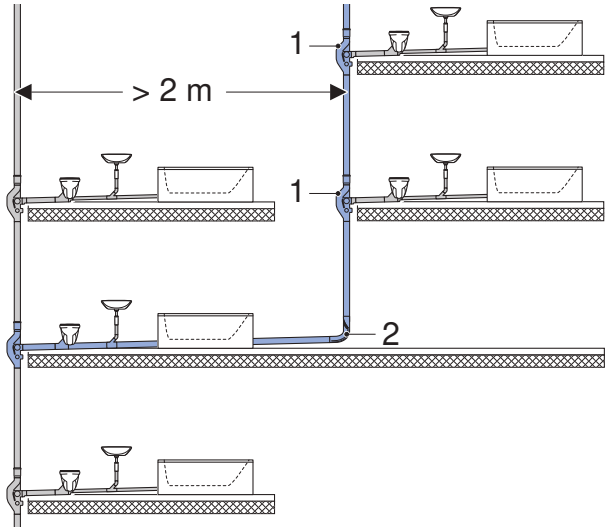


Figure 67: Additional connection of a small stack via a branch discharge pipe

The following prerequisites apply:

- Only one additional stack can be connected to the main stack.
- Only Geberit HDPE Sovent fittings with dimension 110 mm (1) can be used.
- The direction change must be performed using a Geberit SuperTube BottomTurn fitting (2).

- The sum of discharge units must not exceed 15 DU.
- This small stack must also be ventilated through the roof.
- The horizontal length of the branch discharge pipe must be at least 2 m.

Mixed installation

Only Geberit HDPE Sovent fittings of the same dimension may be installed in a stack. All branch discharge pipes must be connected to the stack through Geberit HDPE Sovent fittings.

The following are not permitted:

- mixed installations of Geberit HDPE Sovent fittings d110 and d160 in the same stack
- mixed installations of Geberit HDPE Sovent fittings with Geberit corner branch fittings or swept-entry corner branch fittings in the same stack

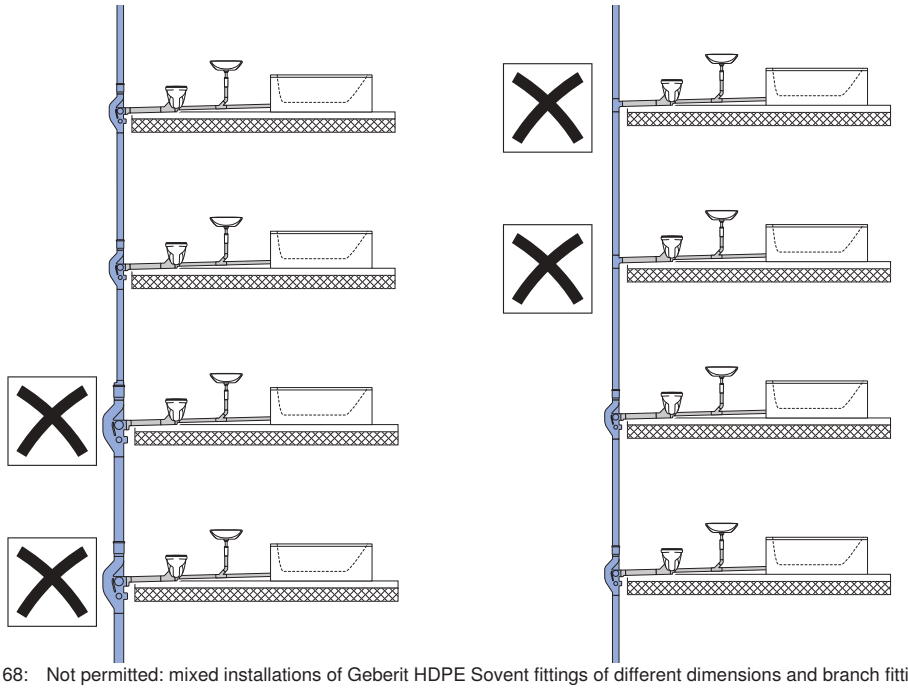


Figure 68: Not permitted: mixed installations of Geberit HDPE Sovent fittings of different dimensions and branch fittings in a stack

Additional stack connectors

Normally, all water-filled pipes are connected to the Geberit HDPE Sovent fitting. An exception to this is condensation pipes. Condensation pipes can be connected to the stack between 2 Geberit HDPE Sovent fittings when the following condition is met:

- the branch discharge pipe has a maximum dimension of d63

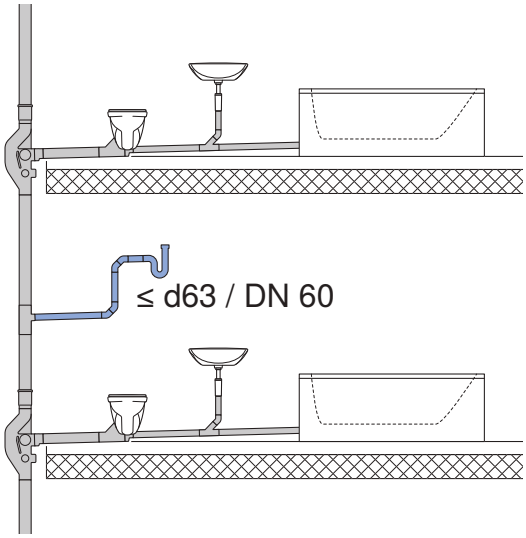


Figure 69: Connection of a condensation pipe ≤ d63 to the stack between 2 Geberit HDPE Sovent fittings

Admitting and venting air in stacks

Each stack with Geberit HDPE Sovent fittings must be individually ventilated through the roof.

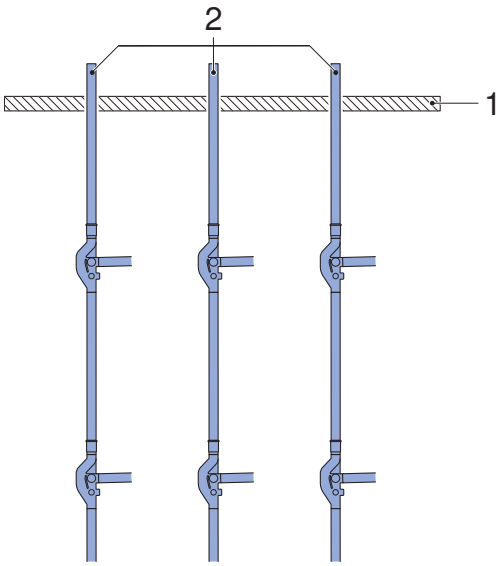


Figure 70: Individual ventilation of stacks with Geberit HDPE Sovent fittings

1 Building roof
2 Ventilation pipe

Air admittance valves must not be used for stacks with Geberit HDPE Sovent fittings as they can have a negative impact on the discharge capacity of the stack.

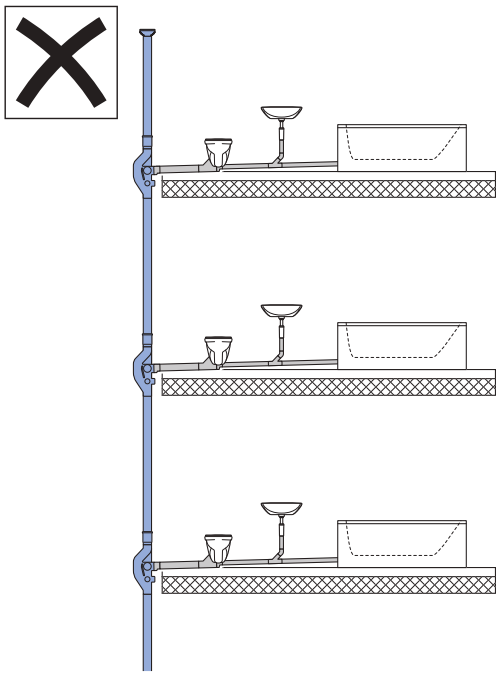


Figure 71: Not permitted: air admittance valves in stacks with Geberit HDPE Sovent fittings

Geberit HDPE Sovent uses the flow-optimised geometry to prevent inadmissible overpressures and negative pressures which impair the correct function of the drainage system. Additional pressure compensation by installing so-called de-aerator valves is not necessary.

Collective ventilation pipes

If combined ventilation is planned for several stacks, a collective ventilation pipe must be configured in accordance with the applicable local standards and regulations. If the corresponding information is missing, a collective ventilation pipe can be set up in accordance with the following rules:

Collective ventilation pipe with Geberit HDPE Sovent d110

- Stacks must be connected to the collective ventilation pipe with branch fittings 45°.
- The change in direction must be executed with bends 45°.
- The dimension of the collective ventilation pipe must be increased in accordance with the following diagram for each additional stack connector. The expansion must be executed upstream of the branch fitting.

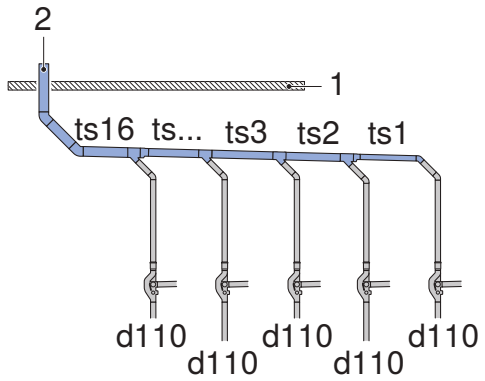


Figure 72: Collective ventilation of stacks with Geberit HDPE Sovent fittings

1 Building roof
2 Collective ventilation pipe
ts1 Dimension of stack section 1
ts2 Dimension of stack section 2
ts3. Dimension of stack section 3...16
..1
6

Table 16: Dimensioning of the collective ventilation pipe

Product	Stack section	Dimension
Geberit HDPE Sovent fitting d110	ts1	ø 110 mm / DN 100
	ts2	ø 160 mm / DN 150
	ts3	
	ts4	ø 200 mm / DN 200
	ts5	
	ts6	ø 250 mm / DN 250
	ts7	
	ts8	
	ts9	
	ts10	ø 315 mm / DN 300
	ts11	
	ts12	
	ts13	
	ts14	
	ts15	
	ts16	

Collective ventilation pipe with Geberit HDPE Sovent d160

- A maximum of 3 stacks can be combined.
- The dimension of the collective ventilation pipe must be increased for each additional stack connector in accordance with the following diagram.

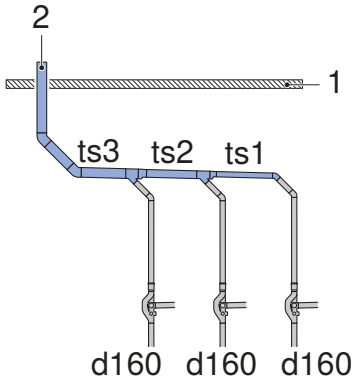


Figure 73: Collective ventilation of stacks with Geberit HDPE Sovent fittings

1 Building roof
2 Collective ventilation pipe
ts1 Dimension of stack section 1
ts2 Dimension of stack section 2
ts3 Dimension of stack section 3

Table 17: Dimensioning of collective ventilation pipes

Product	Stack section	Dimension
Geberit HDPE Sovent fitting d160	ts1	ø 160 mm / DN 150
	ts2	ø 200 mm / DN 200
	ts3	ø 250 mm / DN 250

Branch discharge pipes

Configuration of branch discharge pipes

The branch discharge pipes must be configured in accordance with the applicable local standards and regulations or based on BS EN 12056-2:2000-09-15. These prescribe the diameter as well as the maximum length of the branch discharge pipe.

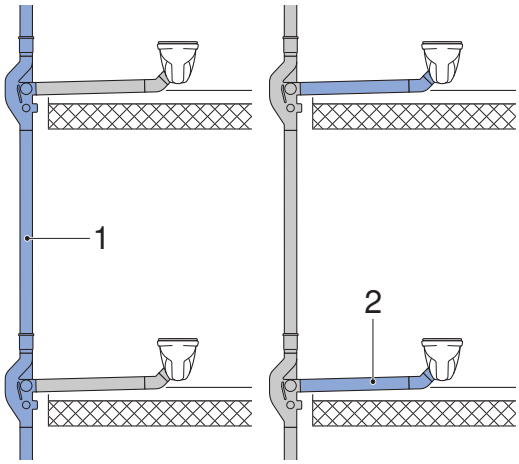


Figure 74: Scope of the branch discharge pipes compared to the stack

1 Stack: planning in accordance with the rules for Geberit HDPE Sovent fittings
2 Branch discharge pipe: planning in accordance with local standards or based on BS EN 12056-2:2000-09-15

Possible structures of branch discharge pipes

Structure of branch discharge pipes connected to the Geberit HDPE Sovent fitting in the same room, above the ceiling:

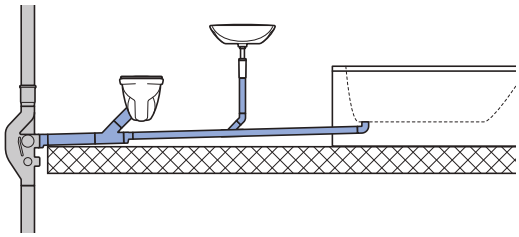


Figure 75: Structure with collector branch discharge pipe

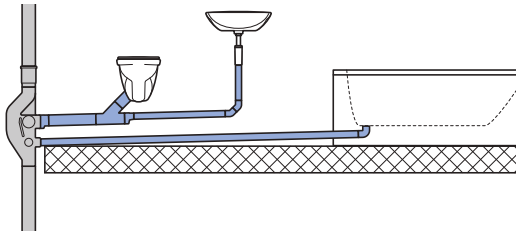


Figure 76: Structure with collector branch discharge pipe and single branch discharge pipe

Structure of branch discharge pipes connected to the Geberit HDPE Sovent fitting in the same room, partly in the ceiling:

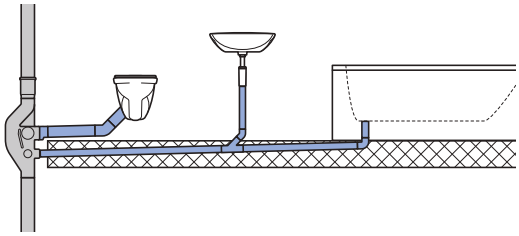


Figure 77: Structure with single branch discharge pipe above the ceiling and collector branch discharge pipe in the ceiling

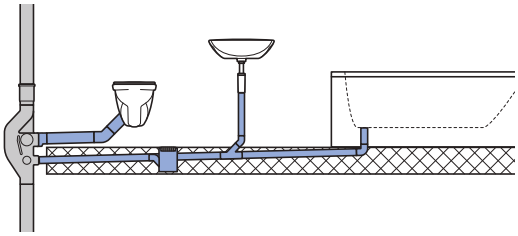


Figure 78: Structure with single branch discharge pipe above the ceiling and collector branch discharge pipe with floor drain in the ceiling

Structure of branch discharge pipes connected to the Geberit HDPE Sovent fitting in the same room, partly in the screed:

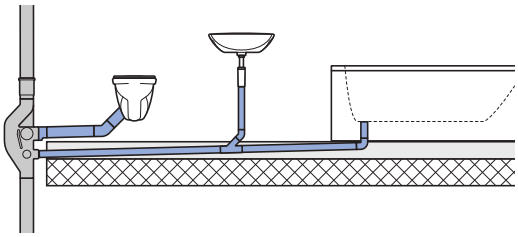


Figure 79: Structure with single branch discharge pipe above the screed and collector branch discharge pipe in the screed

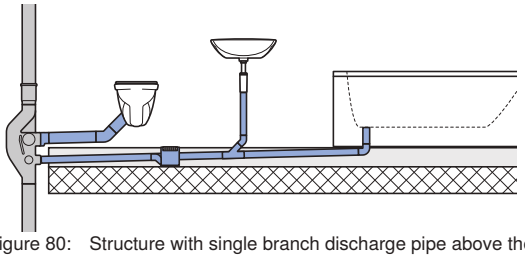


Figure 80: Structure with single branch discharge pipe above the screed and collector branch discharge pipe with floor drain in the screed

Structure of branch discharge pipes connected to the Geberit HDPE Sovent fitting in the ceiling:

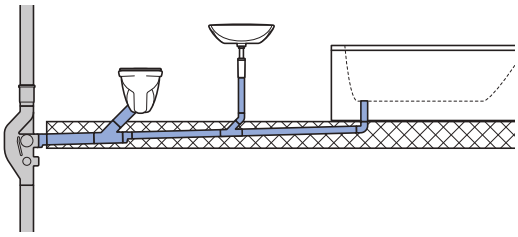


Figure 81: Structure with collector branch discharge pipes in the ceiling

Structure of branch discharge pipes connected to the Geberit HDPE Sovent fitting under the ceiling:

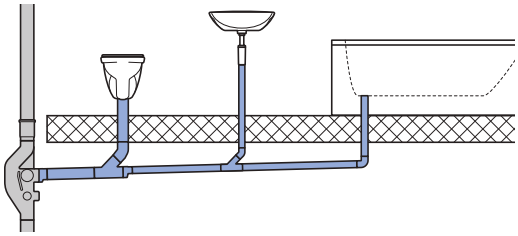


Figure 82: Structure with collector branch discharge pipes under the ceiling

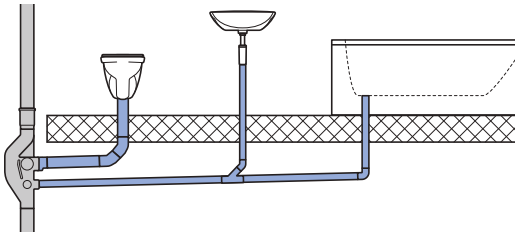


Figure 83: Structure with single branch discharge pipe and collector branch discharge pipe under the ceiling

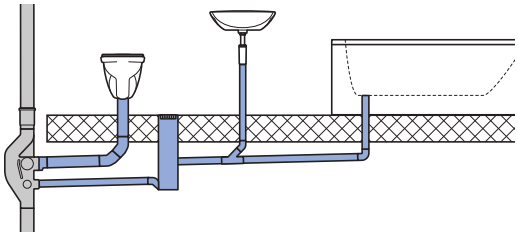


Figure 84: Structure with single branch discharge pipe and collector branch discharge pipe with floor drain under the ceiling

Ventilation of branch discharge pipes

The maximum length of ventilated branch discharge pipes as well as the configuration of the ventilation pipe are laid out in the applicable local standards and regulations and must be followed accordingly.

Branch ventilation pipes can be connected directly to the stack according to the following diagram.

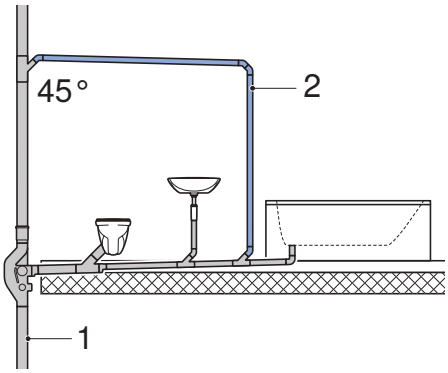


Figure 85: Connection of a branch ventilation pipe to the stack

1 Stack in accordance with rules for Geberit HDPE Sovent fittings
2 Branch discharge and branch ventilation pipes according to local standards or the European standard EN 12056-2:2000

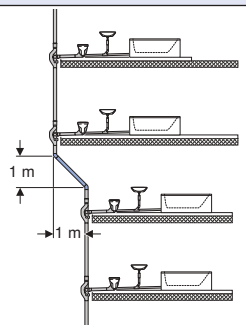
Overview of stack offset

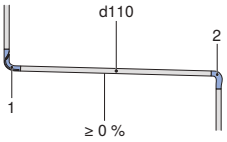
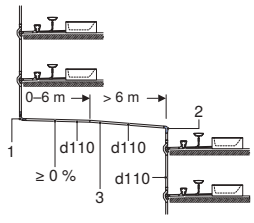
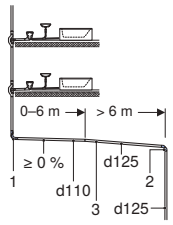
The planning and design of a stack offset in stacks with Geberit HDPE Sovent fittings depend on the following parameters:

- type of fitting/system: Geberit HDPE Sovent d110 or d160 or Geberit SuperTube
- length of stack offset
- branch discharge pipes after the stack offset
- flow rate in the stack

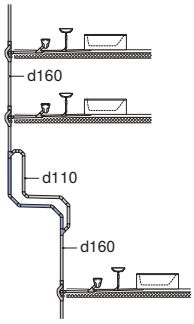
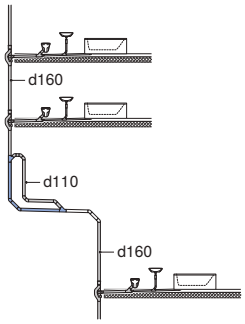
These parameters result in installation situations, for which various planning rules must be observed in terms of the stack offset:

Table 18: Stack offset installation situations in stacks with Geberit HDPE Sovent fittings

Fitting / system	Length of stack offset	Branch discharge pipe	Pipe diameter	Flow rate
Geberit HDPE Sovent d110 or Geberit HDPE Sovent d160	Up to 1 m		d110	≤12 l/s
			d160	≤17 l/s

Fitting / system	Length of stack offset	Branch discharge pipe	Pipe diameter; ≤ 6 m or to the first change in direction	Pipe diameter; > 6 m or from the first change in direction	Flow rate with 50 % filling level	Flow rate with 70 % filling level
Geberit SuperTube	1–6 m		d110 (0 %)	–	≤12 l/s	≤12 l/s
	More than 6 m		d110 (0 %)	d110	According to local standards or BS EN 12056-2:2000-09-15 (depending on the slope)	According to local standards or BS EN 12056-2:2000-09-15 (depending on the slope)
	More than 6 m		d110	d110/125/160[1)]	≤12 l/s	≤12 l/s

1) Depending on filling level and slope

Fitting / system	Length of stack offset	Branch discharge pipe	Pipe diameter	Flow rate
Geberit HDPE Sovent d160	1–2m		d160	According to local standards or BS EN 12056-2:2000-09-15 (depending on the slope)
	More than 2 m		d160	According to local standards or BS EN 12056-2:2000-09-15 (depending on the slope)

The Geberit SuperTube online planning tool is available for planning and calculating a stack offset.

Geberit HDPE Sovent d110 or d160 stack offset up to 1 m

A stack offset of up to 1 m can be installed without requiring any further measures. Bends up to a maximum of 45° must be used for changes in pipe direction.

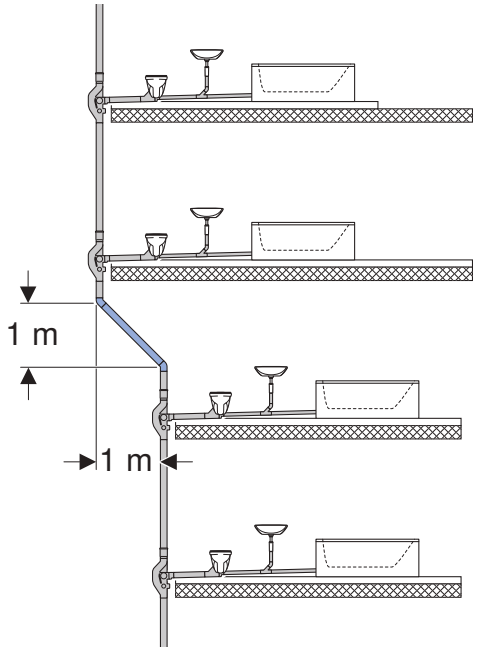


Figure 86: Structure of a stack offset with an offset of up to 1 m

Geberit SuperTube stack offset greater than 1 m

Stack offset 1–6 m

For a flow rate up to 12 l/s (with a ≥ 0 % slope), the stack offset must be structured in accordance with the following diagram. Horizontal changes in pipe direction are not permitted.

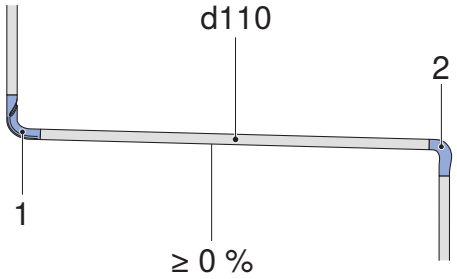


Figure 87: Structure of a stack offset 1–6 m in a stack with Geberit SuperTube

1 Geberit HDPE BottomTurn bend
2 Geberit HDPE BackFlip bend

Stack offset greater than 6 m, with connection downstream of offset

If according to local standard or BS EN 12056-2:2000-09-15 pipe dimension d110 is possible for the offset pipe ≥ 6 m, the offset is executed as follows:

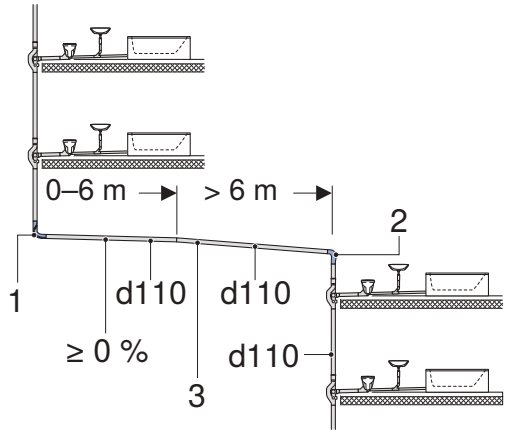


Figure 88: Structure of a stack offset greater than 6 m in a stack with Geberit SuperTube, with branch discharge pipe downstream of stack offset

1 Geberit HDPE BottomTurn bend
2 Geberit HDPE BackFlip bend
3 Slope in accordance with local standard or BS EN 12056-2:2000-09-15

If d110 is not possible for the offset pipe ≥ 6 m, one of the following two measures must be planned:
- Divide stack into 2 stacks with Geberit SuperTube.
- Use a stack with Geberit HDPE Sovent d160 (maximum 17 l/s).

Stack offset greater than 6 m with connection after offset, flow rate greater than 4.4 l/s

At a flow rate greater than 4.4 l/s (with a 3 % slope and 50 % filling level), one of the following measures must be planned:
- Divide stack into two stacks with Geberit SuperTube.
- Use a stack with Geberit HDPE Sovent d160 (maximum 17 l/s).

Stack offset greater than 6 m, without connection downstream of offset

If according to local standard or BS EN 12056-2:2000-09-15 pipe dimension d110 is possible for the offset pipe ≥ 6 m, the offset is executed as follows:

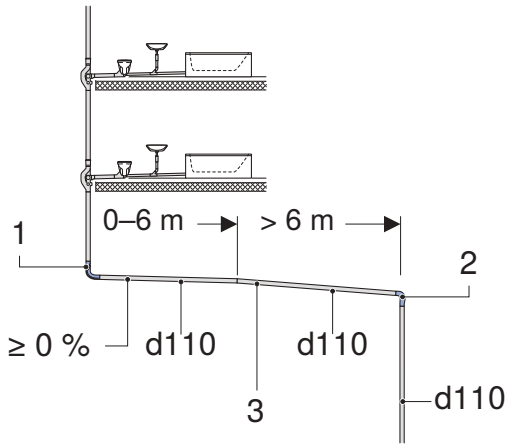


Figure 89: Structure of a stack offset d110 greater than 6 m in a stack with Geberit SuperTube, without branch discharge pipe downstream of stack offset

1 Geberit HDPE BottomTurn bend
2 Geberit HDPE BackFlip bend
3 Slope in accordance with local standard or BS EN 12056-2:2000-09-15

If according to local standard or BS EN 12056-2:2000-09-15 pipe dimension d125 is possible for the offset pipe ≥ 6 m, the offset is executed as follows:

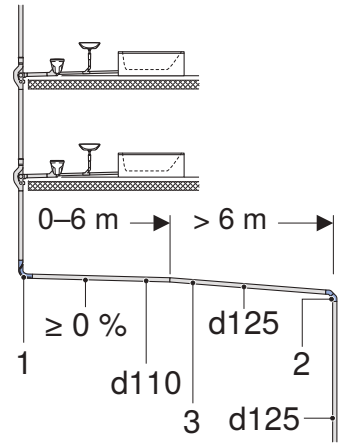


Figure 90: Structure of a stack offset d125 greater than 6 m in a stack with Geberit SuperTube, without branch discharge pipe downstream of stack offset

1 Geberit HDPE BottomTurn bend
2 2 x bend 45° with long leg
3 Slope in accordance with local standard or BS EN 12056-2:2000-09-15

If according to local standard or BS EN 12056-2:2000-09-15 pipe dimension d160 is possible for the offset pipe ≥ 6 m, the offset is executed as follows:

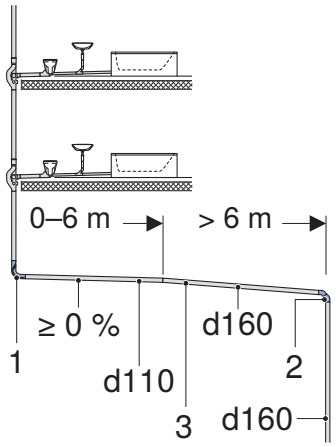


Figure 91: Structure of a stack offset d160 greater than 6 m in a stack with Geberit SuperTube, without branch discharge pipe downstream of stack offset

1 Geberit HDPE BottomTurn bend
2 2 x bend 45° with long leg
3 Slope in accordance with local standard or BS EN 12056-2:2000-09-15

Stack offset greater than 6 m without connection after offset, flow rate 4.4–7.1 l/s

At a flow rate of 4.4–7.1 l/s (with a 3 % slope and 50 % filling level), the stack offset must be structured as follows:

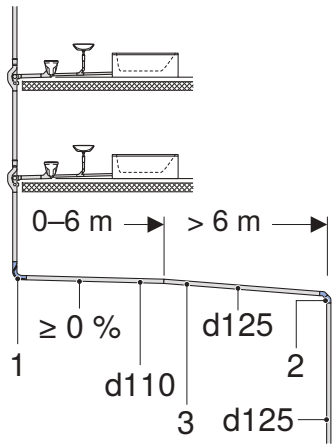


Figure 92: Structure of a stack offset greater than 6 m in a stack with Geberit SuperTube, without branch discharge pipe after stack offset, flow rate 4.4–7.1 l/s (with 3 % slope and 50 % filling level)

1 Geberit HDPE BottomTurn bend
2 2 x 45° bends
3 Slope in accordance with local standard or BS EN 12056-2:2000-09-15

Stack offset greater than 6 m without connection after offset, flow rate greater than 7.1 l/s

At a flow rate greater than 7.1 l/s (with a 3 % slope and 50 % filling level), the stack offset must be structured as follows:

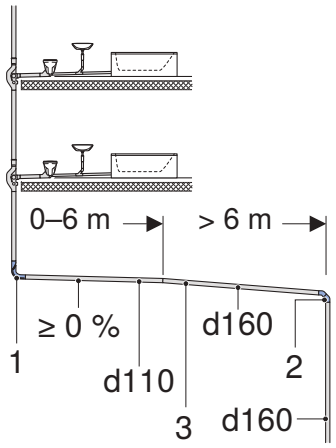


Figure 93: Structure of a stack offset greater than 6 m in a stack with Geberit SuperTube, without branch discharge pipe after stack offset, flow rate greater than 7.1 l/s (with 3 % slope and 50 % filling level)

1 Geberit HDPE BottomTurn bend
2 2 x 45° bends
3 Slope in accordance with local standard or BS EN 12056-2:2000-09-15

Geberit HDPE Sovent d160 stack offset greater than 1 m

Stack offset 1–2 m

A stack offset of 1–2 m must be structured in accordance with the following diagram. A branch ventilation pipe d110 is required to relieve pressure.

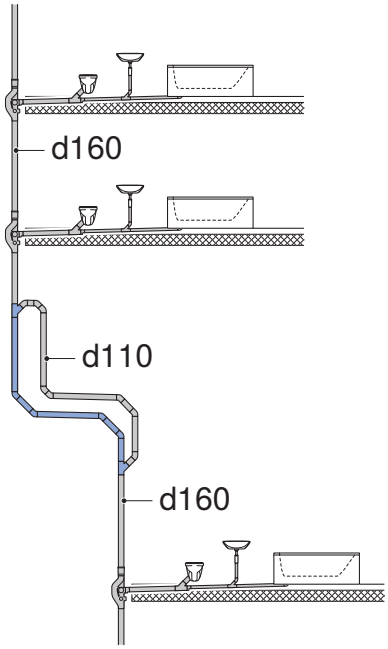


Figure 94: Structure of a stack offset 1–2 m in a stack with Geberit HDPE Sovent d160

Stack offset greater than 2 m

A stack offset greater than 2 m must be structured in accordance with the following diagram. A branch ventilation pipe d110 is required to relieve pressure.

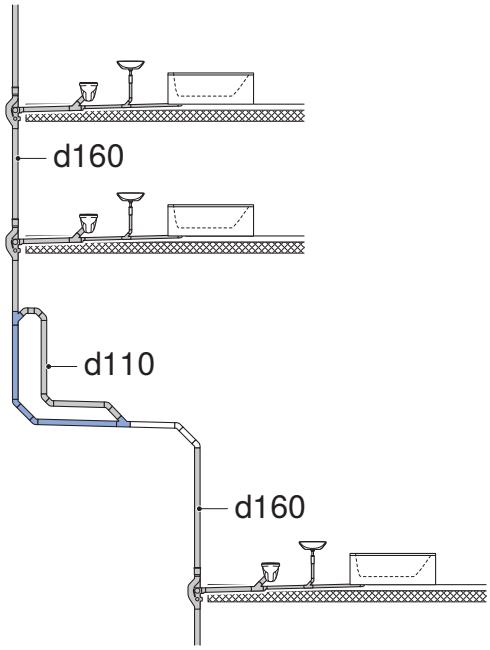


Figure 95: Structure of a stack offset greater than 2 m in a stack with Geberit HDPE Sovent d160

Installation of cleaning openings in the Geberit SuperTube stack offset

If an access pipe is provided in a stack offset, the access pipe can be placed in any position. Depending on the access pipe, the following distances from the ceiling should be taken into account:

Geberit HDPE access pipe 45°

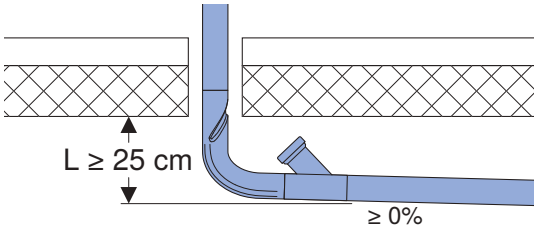


Figure 96: Distance of stack offset from the ceiling when installing a Geberit HDPE access pipe 45°

Geberit HDPE access pipe 90°

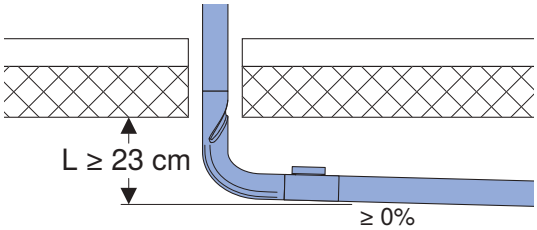


Figure 97: Distance of stack offset from the ceiling when installing a Geberit HDPE access pipe 90°

Zones without connections

Geberit SuperTube zones without connections

After a direction change, the zones without connections must be observed in accordance with the following figures:

Structure without connections into the stack offset:

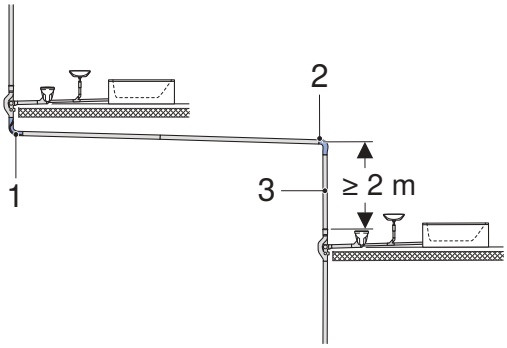


Figure 98: Zone without connections Geberit SuperTube with a stack offset without connections into the stack offset

1 Geberit HDPE BottomTurn bend
2 Geberit HDPE BackFlip bend
3 Zone without connection: upper edge of Geberit HDPE Sovent fitting up to pipe axis

Structure with connections into the stack offset:

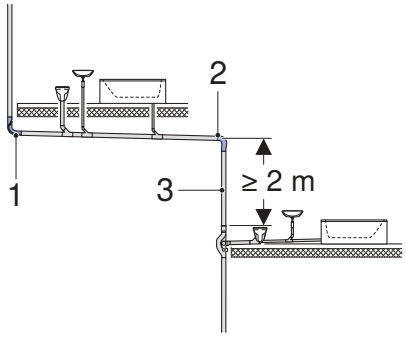


Figure 99: Zone without connections Geberit SuperTube with a stack offset with connections into the stack offset

1 Geberit HDPE BottomTurn bend
2 Geberit HDPE BackFlip bend
3 Zone without connection: upper edge of Geberit HDPE Sovent fitting up to pipe axis

Structure with a collector branch discharge pipe into the stack offset:

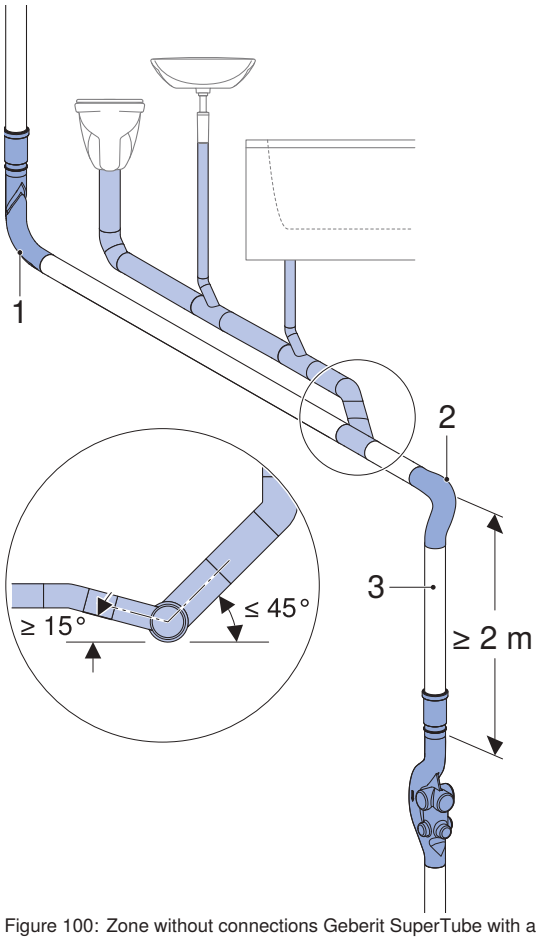


Figure 100: Zone without connections Geberit SuperTube with a stack offset with a collector branch discharge pipe into the stack offset

1 Geberit HDPE BottomTurn bend
2 Geberit HDPE BackFlip bend
3 Zone without connection: upper edge of Geberit HDPE Sovent fitting up to pipe axis

Geberit HDPE Sovent d160 zones without connections

Before and after a direction change, the zones without connections must be observed in accordance with the following diagrams:

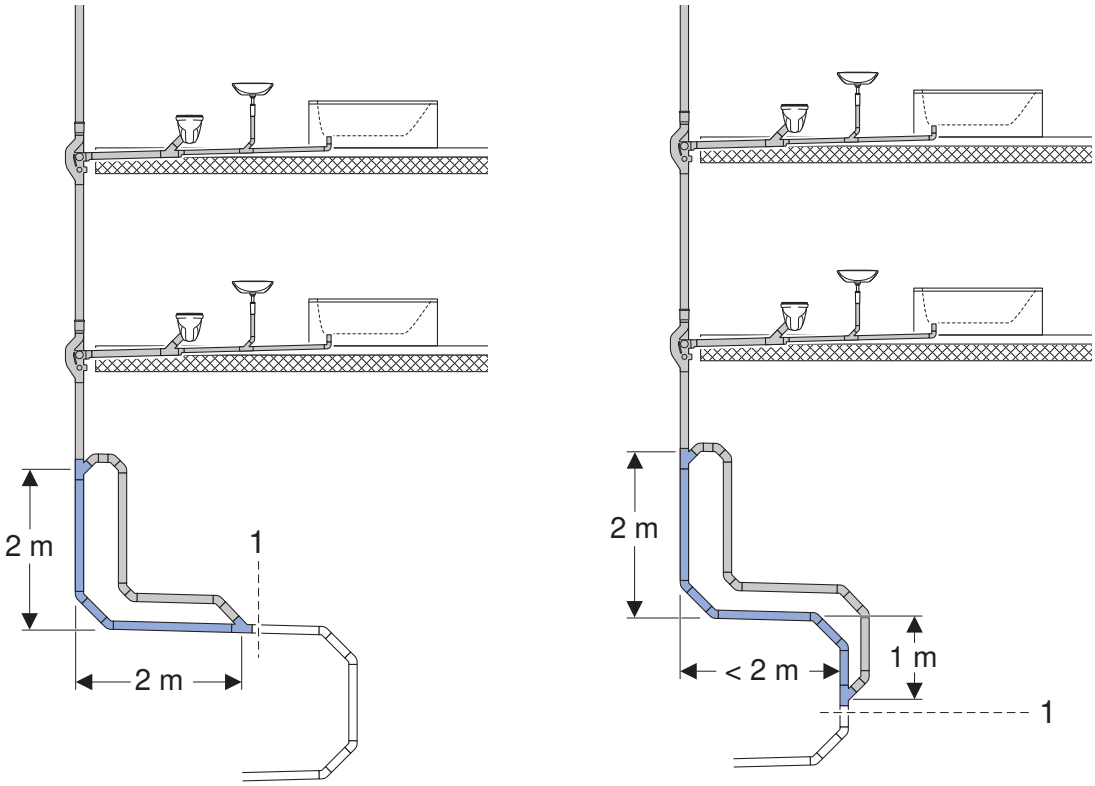


Figure 101: Zone without connections with a stack offset d160

1 Base of the pipe system with Geberit HDPE Sovent fittings

Zones without connections must be installed before the direction change into the underground pipe or the collector pipe if sanitary appliances are connected to the stack in order to prevent backing up. The sanitary appliances must be connected to a branch ventilation pipe d110.

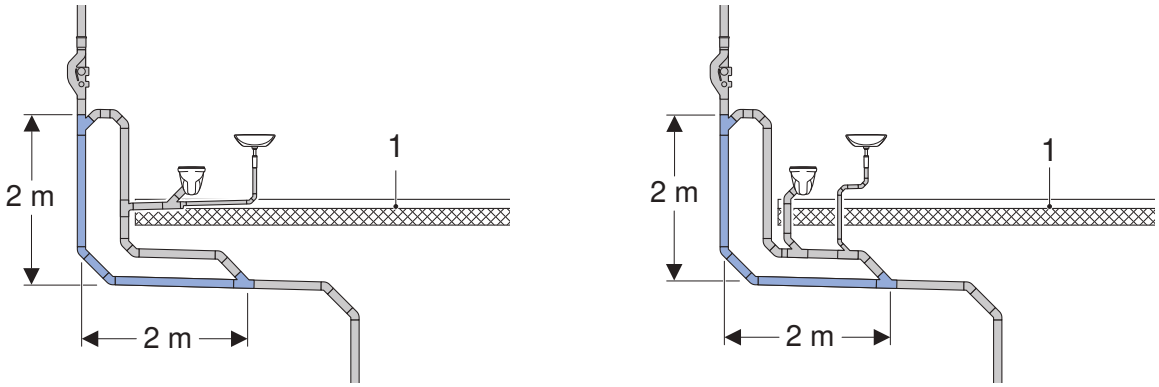


Figure 102: Zone without connections with a stack offset d160 with branch discharge pipes before the direction change into the underground or collector pipe

1 First floor

The subsequent pipe layout is planned in accordance with local standards.

Transition to the collector pipe

Geberit SuperTube transition to the collector pipe

For the transition of a stack with Geberit SuperTube to the collector pipe, 1 Geberit HDPE BottomTurn bend must be installed at the base of the stack. The connecting stack (maximum 6 m) is to be executed up to the system boundary without a direction change.

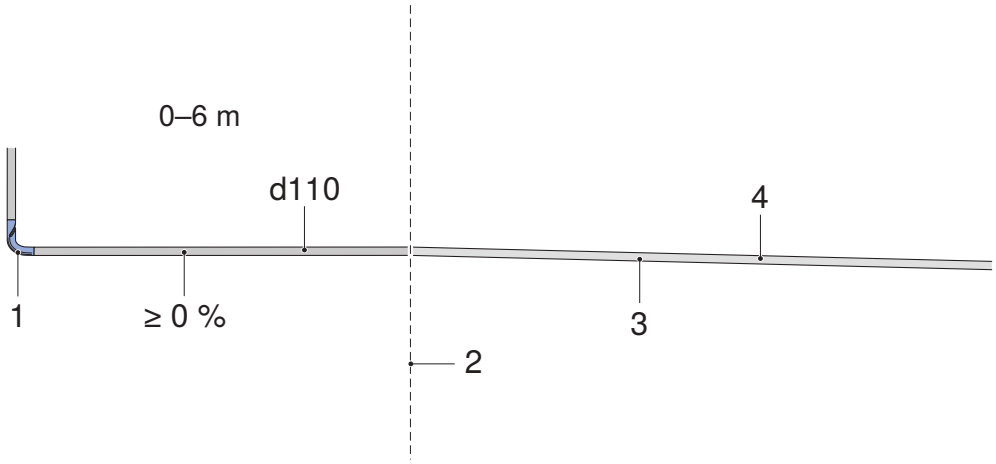


Figure 103: Transition of a stack with Geberit SuperTube to the collector pipe

1 Geberit HDPE BottomTurn bend
2 System boundary
3 Slope in accordance with local standard or in accordance with BS EN 12056-2:2000-09-15
4 Dimensioning in accordance with local standard or in accordance with BS EN 12056-2:2000-09-15

If several stacks with Geberit SuperTube are connected to one collector pipe, 1 Geberit HDPE BottomTurn bend must be installed at the base of each stack. The connecting stack (maximum 6 m) is to be executed up to the system boundary without horizontal direction change.

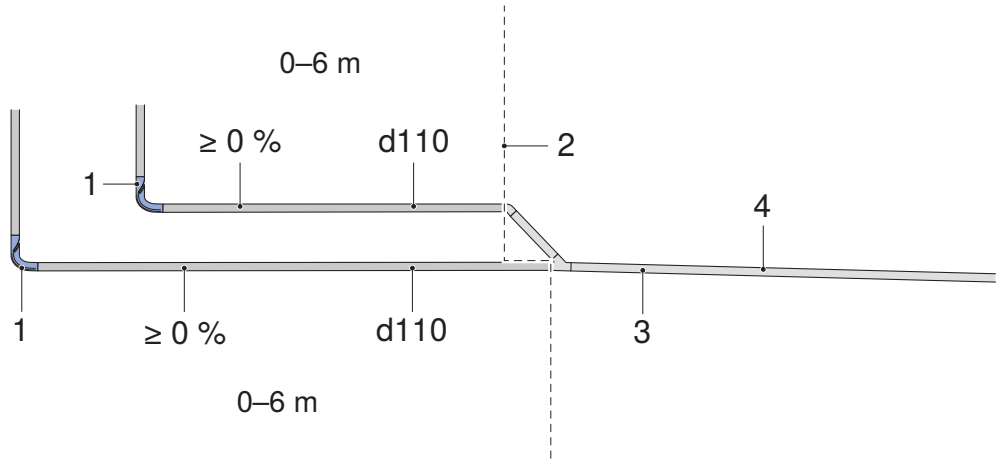


Figure 104: Connection of several stacks with Geberit SuperTube to the collector pipe

1 Geberit HDPE BottomTurn bend
2 System boundary
3 Slope in accordance with local standard or in accordance with BS EN 12056-2:2000-09-15
4 Dimensioning in accordance with local standard or in accordance with BS EN 12056-2:2000-09-15

Transition to the collector pipe Geberit HDPE Sovent d160

For the transition of a stack with Geberit HDPE Sovent fittings d160 to the collector pipe, a branch ventilation pipe d110 must be installed at the base of the stack to reduce any potential overpressure.

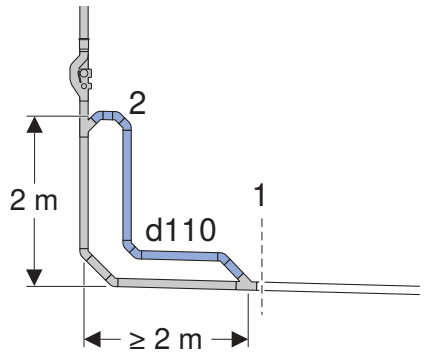


Figure 105: Transition of a stack with Geberit HDPE Sovent fittings d160 to the collector pipe

1 Base of the pipe system with Geberit HDPE Sovent fittings
2 Branch ventilation pipe for pressure relief

3.3.2 Dimensioning

Principles

The maximum admissible flow rate of a stack with Geberit HDPE Sovent fittings is:

- d110 (DN 100): 12 l/s
- d160 (DN 150): 17 l/s

If the flow rate in the stack falls below the maximum admissible flow rate, the stack can be dimensioned with the corresponding pipe diameter. If the flow rate exceeds the flow capacity, a second stack must be planned or the dimensions of stack d110 must be increased in size.

Sample calculations

Stack in residential building with 40 floors

Given:

- residential building with 40 floors
- 2 apartments per floor
- sanitary appliances per apartment:
  - 1 kitchen sink
  - 1 bathtub
  - 2 washbasins at 0.5 DU
  - 1 WC suite 6 l
- discharge value K = 0.5

Required:

- pipe dimension of the stack
- number of stacks

Solution:

1. Calculation of DU discharge units

Number	Sanitary appliance	DU
1 1 2 1	Kitchen sink Bathtub Washbasin at 0.5 DU WC suite 6 l	0.8 0.8 1.0 2.0
	Total per apartment	4.6
	Total per floor	9.2
	Total for residential building	**368**

2. Calculation of the flow rate (waste water discharge rate) in the stack

$$Q_S = K \cdot \sqrt{\sum DU}$$
$$= 0.5 \cdot \sqrt{368}$$
$$= \mathbf{9.59\ l/s}$$

3. Compare Q_S with $Q_{max\ Sovent}$

Q_S (9.59 l/s) is smaller than $Q_{max\ Sovent\ d110}$ (12 l/s).

Result:

The residential building can be drained using **1** stack **d110 mm** (DN 100).

Stack in residential building with 120 floors

Given:

- residential building with 120 floors
- 2 apartments per floor
- sanitary appliances per apartment:
  - 1 kitchen sink
  - 1 bathtub
  - 2 washbasins at 0.5 DU
  - 1 WC suite 6 l
- discharge value K = 0.5

Required:

- pipe dimension of the stack
- number of stacks

Solution:

1. Calculation of DU discharge units

Number	Sanitary appliance	DU
1 1 2 1	Kitchen sink Bathtub Washbasin at 0.5 DU WC suite 6 l	0.8 0.8 1.0 2.0
	Total per apartment	4.6
	Total per floor	9.2
	Total for residential building	**1104.0**

2. Calculation of the flow rate (waste water discharge rate) in the stack

$$Q_S = K \cdot \sqrt{\sum DU}$$
$$= 0.5 \cdot \sqrt{1104}$$
$$= \mathbf{16.6\ l/s}$$

3. Compare Q_S with $Q_{max\ Sovent}$

Q_S (16.6 l/s) is greater than $Q_{max\ Sovent\ d110}$ (12 l/s) and smaller than $Q_{max\ Sovent\ d160}$ (17 l/s).

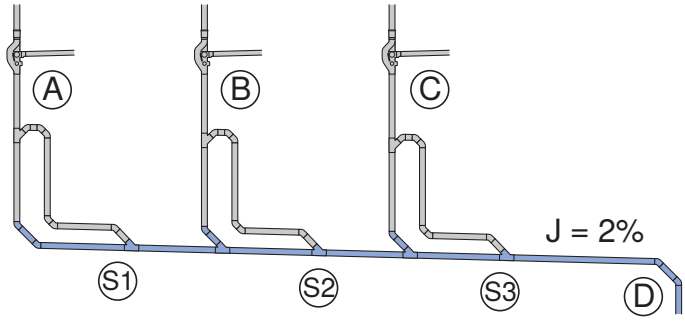
Result:

The residential building must be drained using **2** stacks **d110 mm** (DN 100) or with **1** stack **d160 mm** (DN150).

Underground or collector pipe with several stacks

Given:

- building with 3 stacks d160 mm (DN 150) with Geberit HDPE Sovent fittings d160



A	Stack A
B	Stack B
C	Stack C
D	Collector pipe
S1	Section 1
S2	Section 2
S3	Section 3
J	Slope

- waste water discharge rate per stack:
  - stack A: $\Sigma DU_A = 800$
  - stack B: $\Sigma DU_B = 750$
  - stack C: $\Sigma DU_C = 820$
- filling level of the underground or collector pipe = 50 %
- slope of the underground or the collector pipe = 2 %
- drainage factor K = 0.5

Required:

- pipe dimension of the collector pipe (sections S1–S3)

Solution:

1. Calculation of the waste water discharge rate of sections S1–S3

$S1 = K \cdot \sqrt{\sum DU_A}$

$= 0.5 \cdot \sqrt{800}$ = **14.1 l/s**

$S2 = K \cdot \sqrt{\sum DU_A + \sum DU_B}$

$= 0.5 \cdot \sqrt{1550}$ = **19.7 l/s**

$S3 = K \cdot \sqrt{\sum DU_A + \sum DU_B + \sum DU_C}$

$= 0.5 \cdot \sqrt{2370}$ = **24.4 l/s**

2. Calculation of the pipe dimensions of sections S1–S3

The pipe dimension of sections S1–S3 depends on the filling level and on the slope of the pipe. It is calculated in accordance with BS EN 12056-2:2000-09-15, as shown in the following table:

Table 3: Maximum waste water discharge rate in l/s for underground pipes or collector pipes at a filling level of **50 %** depending on pipe dimension and slope in accordance with BS EN 12056-2:2000-09-15

Slope J										
0.5 % (1 : 200)	**1 % (1 : 100)**	**1.5 % (1 : 66)**	**2 % (1 : 50)**	**2.5 % (1 : 40)**	**3 % (1 : 33)**	**3.5 % (1 : 28)**	**4 % (1 : 25)**	**4.5 % (1 : 22)**	**5 % (1 : 20)**	**Pipe dimension ø [mm] / DN**
1.8	2.5	3.1	3.5	4.0	4.4	4.7	5.0	5.3	5.6	110/100
3.4	4.1	5.0	5.7	6.4	7.1	7.6	8.2	8.7	9.1	125/125
5.3	7.7	9.4	10.9	12.2	13.3	14.4	15.4	16.3	17.2	160/150
10.5	14.2	17.4	20.1	22.5	24.7	26.6	28.5	30.2	31.9	200/200
19.0	26.9	32.9	38.1	42.6	46.7	50.4	53.9	57.2	60.3	250/250
35.1	48.3	59.2	68.4	76.6	83.9	90.7	96.6	102.8	108.4	315/300

Key:

1. Select column with the specified slope: 2 % column
2. Select the next greatest waste water value:
   - Section 1: calculated waste water value = 14.1 l/s
   - Section 1: next greatest waste water value: 20.1 l/s
   - Section 2: calculated waste water value = 19.7 l/s
   - Section 2: next greatest waste water value: 20.1 l/s
   - Section 3: calculated waste water value = 24.4 l/s
   - Section 3: next greatest waste water value: 38.1 l/s
3. Select the pipe dimension corresponding to the next greatest waste water value:
   - Section 1: ø 200 mm (DN 200)
   - Section 2: ø 200 mm (DN 200)
   - Section 3: ø 250 mm (DN 250)

3.3.3 Installation rules

Basic rules

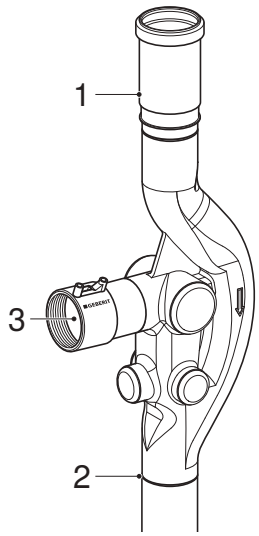
The same rules apply to mounting the Geberit HDPE Sovent fittings as for the mounting of all other Geberit HDPE fittings.

In addition, the following rules must be taken into account for the mounting of the Geberit HDPE Sovent fittings:

- Connection pipes can only be connected using a butt-welding connection.
- Geberit HDPE Sovent fittings may be installed only in the direction of flow. The direction of flow is indicated by an arrow on the fittings.

Prefabrication

For prefabrication, the Geberit HDPE pipes and fittings or Geberit Silent-db20 pipes and fittings can be connected to the Geberit HDPE Sovent fitting with electrofusion couplings or butt welding.

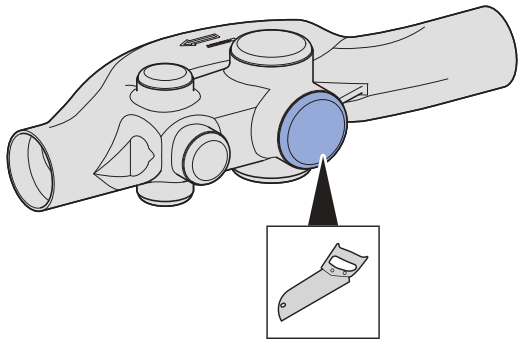


1 Expansion socket: connection with butt welding (electrofusion welding also possible)
2 Pipe for the stack extension: connection with butt welding (electrofusion welding also possible)
3 Branch discharge pipe: connection with electrofusion welding at previously attached connection piece (butt welding also possible)

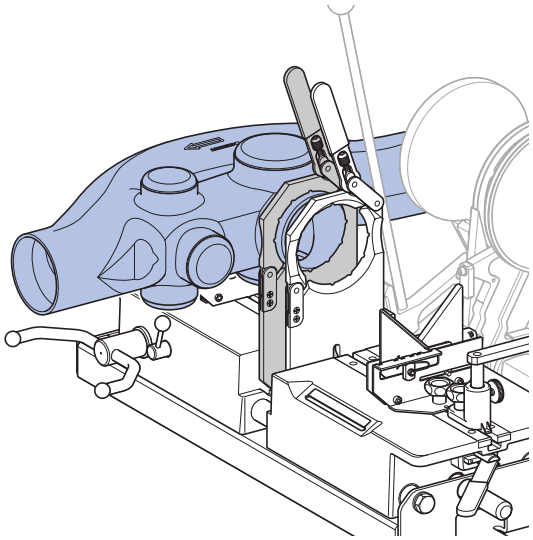
3.3.4 Installation manual

Connecting Geberit HDPE Sovent fitting with pipe section

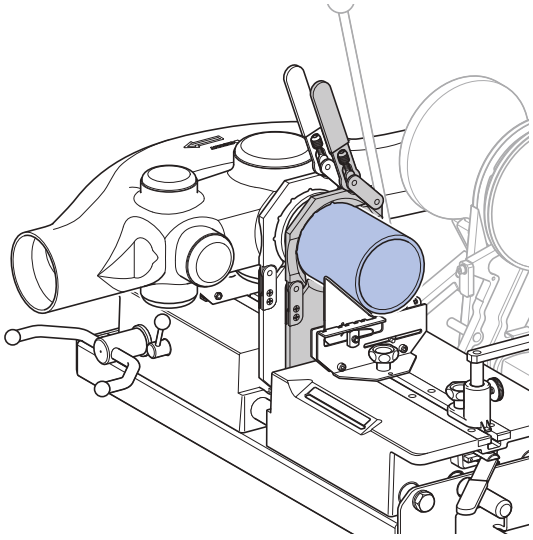
1 Saw open the required lateral connection.



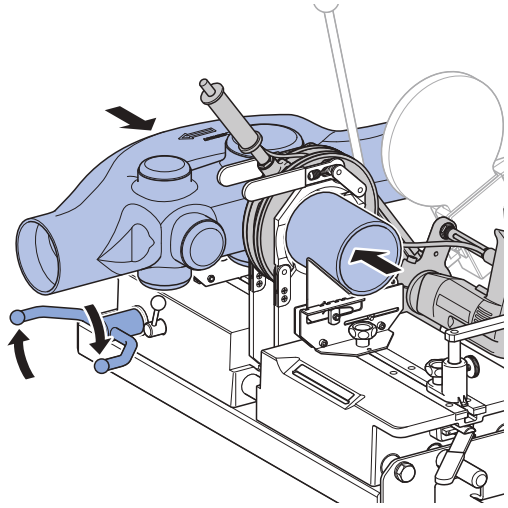
2 Clamp the Geberit HDPE Sovent fitting into the welding machine.



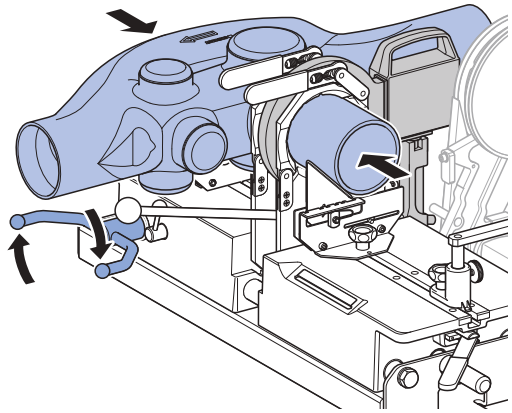
3 Clamp the corresponding pipe section of the branch discharge pipe.



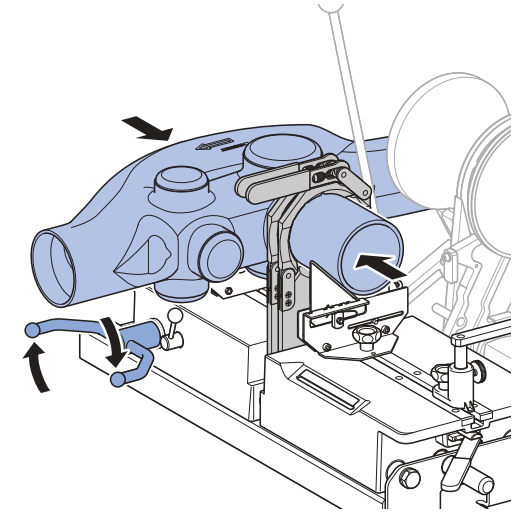
4 Surface plane the opened connection and the pipe section.



5 Heat both clamped parts.



6 Press the parts together and let them cool.



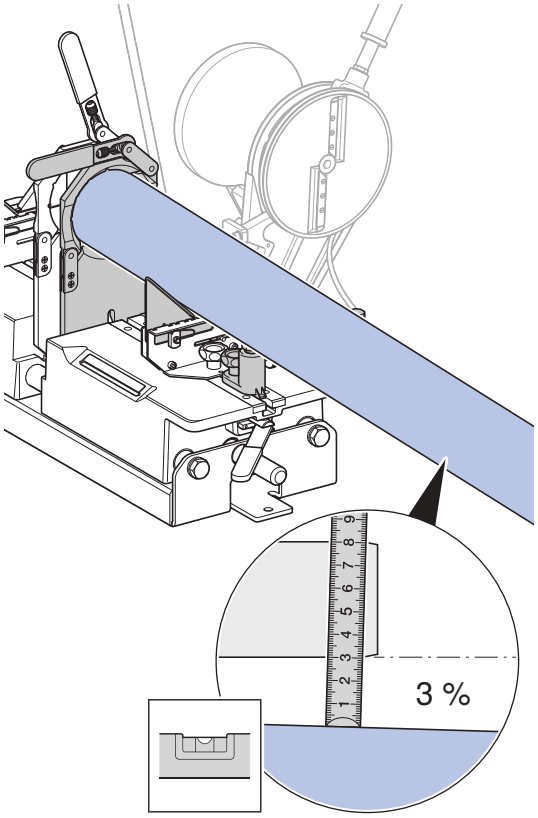
7 Remove fitting from welding machine.

Creating a change in slope

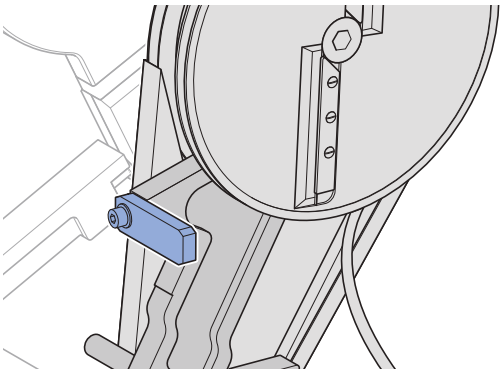
With a stack offset ≥ 6 m or with a transition of a stack with Geberit SuperTube to the collector pipe, the minimum slope must be applied downstream of 6 m of horizontal pipe layout with 0 % slope.

This change in slope can be achieved as follows with a Geberit butt welding machine:

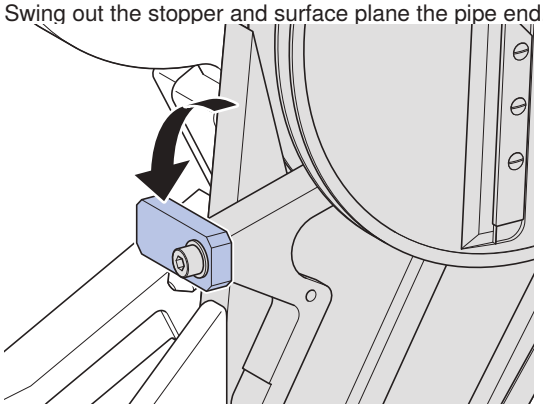
1 Clamp the pipe section for the pipe section with slope in the welding machine and align it to the required minimum slope.

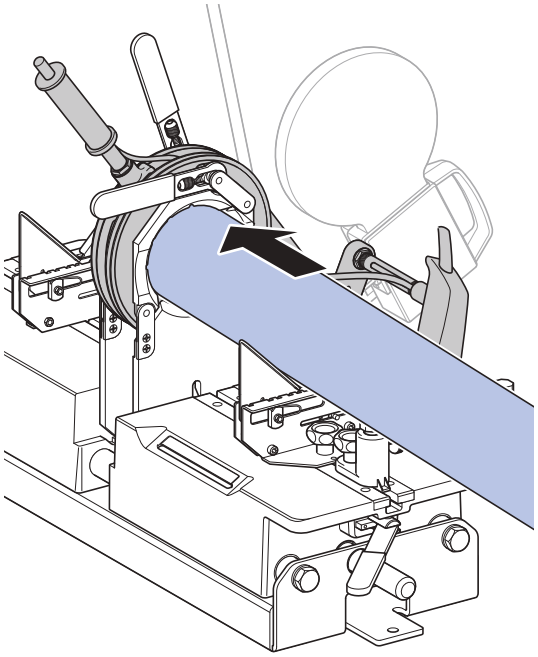


When surface planing on one side, the stopper must be swivelled out so that there is some clearance between the plane and the empty tension device. The tension device and the plane cannot touch each other in this way.

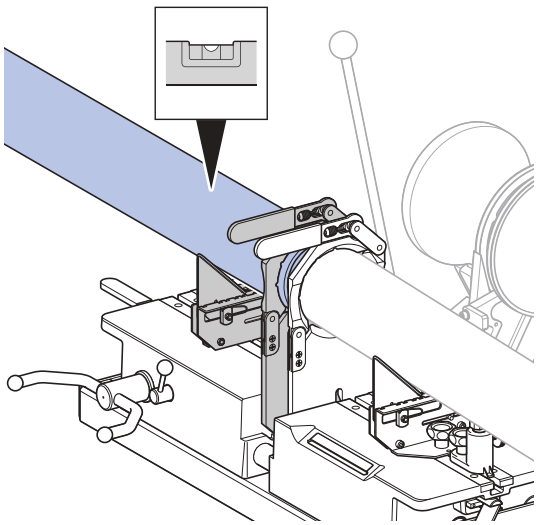


2 Swing out the stopper and surface plane the pipe end.

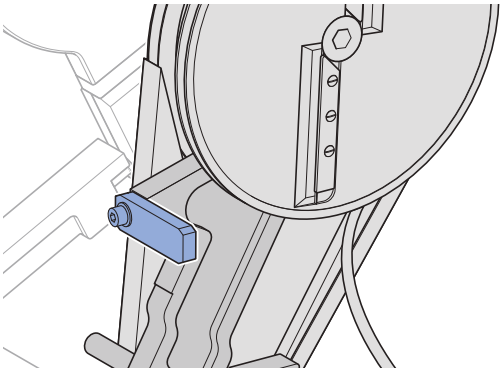




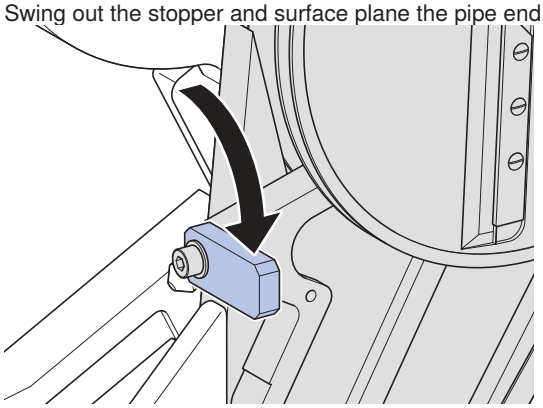
3 Clamp the second pipe section for the horizontal pipe section in the welding machine.

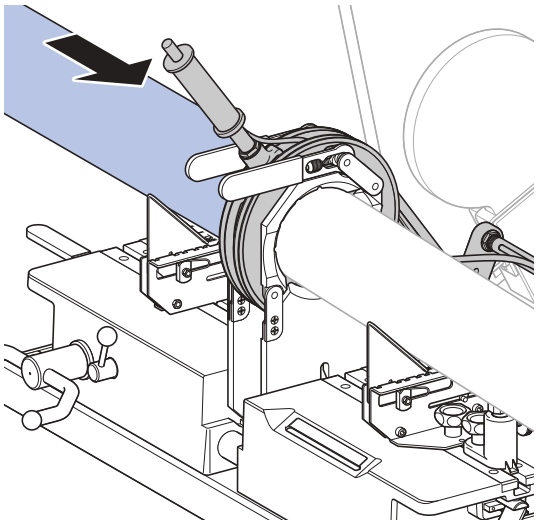


When surface planing on one side, the stopper must be swivelled out so that there is some clearance between the plane and the empty tension device. The tension device and the plane cannot touch each other in this way.

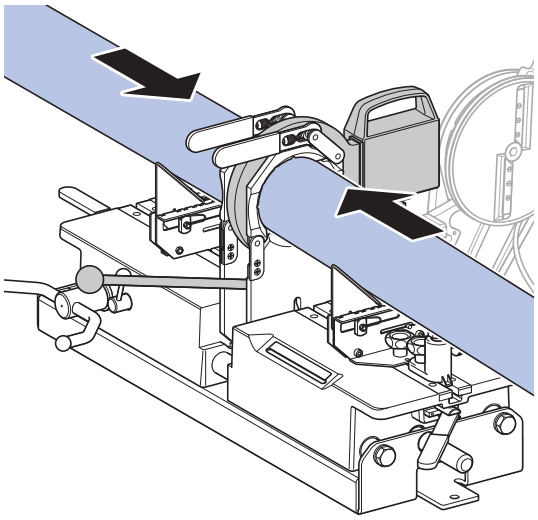


4 Swing out the stopper and surface plane the pipe end.

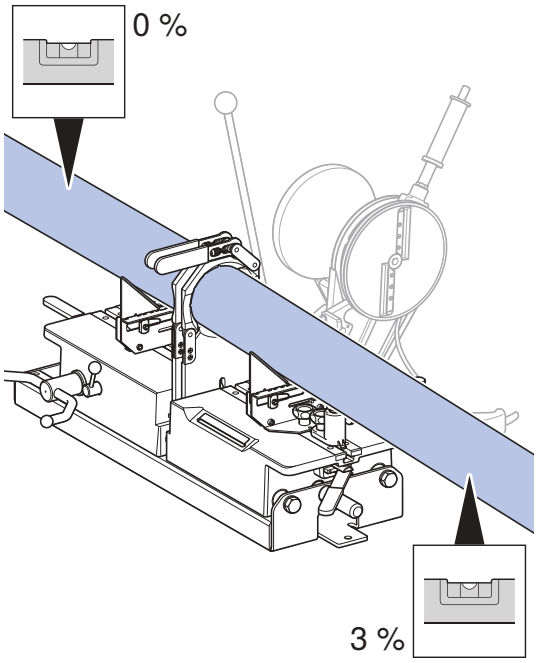




5 Heat both clamped parts and press them together.



6 After the welding joint has cooled down, check the required minimum slope.



CHAPTER FOUR

GEBERIT SILENT-DB20

4.1 SYSTEM DESCRIPTION

4.1.1 Overview of the Geberit Silent-db20

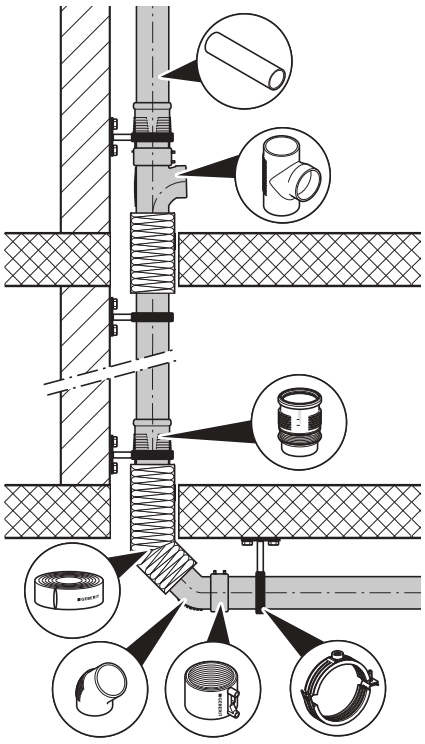
The Geberit Silent-db20 is the only highly sound-insulating drainage system with lengthways non-positive connection options. Geberit Silent-db20 ensures increased standard requirements for sound insulation.

4.1.2 System components

The system components for the Geberit Silent-db20 piping system are characterised by sound-optimised characteristics and fulfil high normative sound insulation requirements.

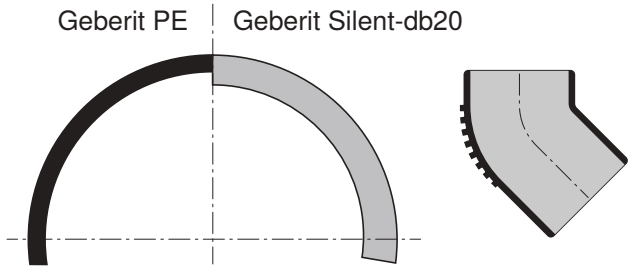
Geberit Silent-db20 includes the following system components:

- system pipes, d56–160 mm
- fittings
- connections
- waste fittings and traps
- transitions for other system pipes
- accessories



Pipes and fittings

The Geberit Silent-db20 pipes and fittings made of mineral-reinforced plastic PE-S2 have much thicker walls than HDPE pipes and fittings. This means that Geberit Silent-db20 pipes and fittings have a high inherent weight that reduces airborne sound propagation.



The Geberit Silent-db20 fittings are characterised by patented sound insulation ribs that reduce the development of noise in the impact zones. The hydraulically optimised geometry of the Geberit Silent-db20 fittings ensures a high discharge capacity, thus facilitating economic dimensioning and a space-saving pipe duct configuration.

The Geberit Silent-db20 Offset fitting can be used for acoustically favourable compensation for a stack offset of up to 10 cm. There is no need for a sliding bracket for pipe fixation, which facilitates the installation and leads to considerably less transmission of structure-borne sound.

System fastenings with a Geberit Silent-db20 pipe bracket

The insulated Geberit Silent-db20 system pipe brackets for wall and ceiling fastening decouple the system acoustically from the building structure. This reduces the transmission of structure-borne sound.

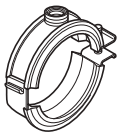


Figure 106: Geberit Silent-db20 pipe bracket, insulated, with threaded socket

Geberit insulation

To avoid the transmission of structure-borne sound, insulation must be used in the area between the building structure and the Geberit piping system. Geberit insulation must always be provided for pipelines embedded in concrete.

Geberit offers the following insulation for structure-borne sound decoupling:

Figure 107: Geberit insulation hose made of HDPE

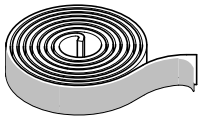


Figure 108: Geberit insulation tape made of PE

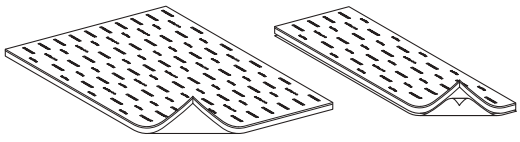
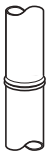


Figure 109: Geberit Isol Flex sound insulation mat and Geberit Isol Flex sound insulation mat precut for pipe (precut to fit pipe diameter)

4.1.3 Connections

The following connection options are available for connecting Geberit Silent-db20 pipes and fittings. The connections differ in the connection technology and the pipe dimensions for which they can be used. The connections fulfil high sound insulation requirements with the exception of the butt welding.

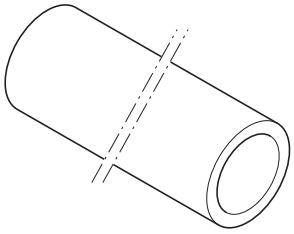
Connection		Non-positive		Positive
		Removable	Permanent	Removable
Butt welding, d56–160 mm (DN 56–150)		–	✓	–
Electrofusion coupling, d56–160 mm (DN 56–150)		–	✓	–
Expansion socket, d75–160 mm (DN 70–150)		–	–	✓

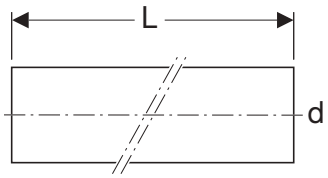
✓ Applies

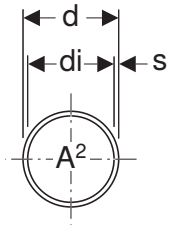
– Does not apply

4.1.4 Technical data

Pipe data







DN	d [mm]	di [mm]	L [m]	A^2 [cm^2]	s [mm]	Weight m [kg/m]	
						Empty	Filled with water
56	56	49.6	3	19.3	3.2	0.90	2.83
60	63	56.6	3	25.1	3.2	1.02	3.53
70	75	67.8	3	36.1	3.6	1.37	4.97
90	90	79	3	49	5.5	2.48	7.38
100	110	98	3	75.4	6	3.33	10.87
150	160	146	3	167.4	7	5.80	22.50

4.2 SYSTEM PLANNING AND PROCESSING

4.2.1 Fastening pipes

The pipe brackets carry the pipe. Pipe fastenings differ in the manner in which the thermally caused change in length is controlled. There is a fundamental difference between the “sliding installation” and “rigid installation” fastening types.

Thermal expansion of pipes

Pipes expand differently due to thermal effects depending on the material. This thermal expansion is designated as a thermally caused change in length Δl.

The following have an influence on the thermally caused change in length Δl:

- material
- building conditions
- operating conditions

Taking account of changes in length Δl

The thermally caused change in length must be taken into account during the planning of the piping system. The following measures ensure the absorption of the change in length:

- planning for expansion space
- installing expansion compensators
- positioning of anchor points and sliding points

Taking account of these measures is also a prerequisite for the safe absorption of the bending and torsional stresses that occur during the operation of a piping system.

Overview of fastening types

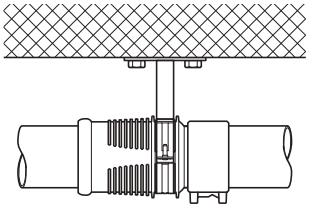
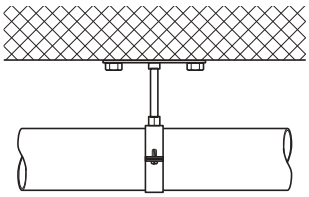
Pipe fixation differs in terms of how the thermally caused change in length is controlled. A distinction is made between:

- sliding installation
- rigid installation

Expansion elements absorb the thermally caused change in length in a sliding installation. Expansion sockets are used as expansion elements. The forces generated by the thermally caused change in length are transferred to the building in a rigid installation. A rigid installation for Geberit Silent-db20 is **not** admissible for sound-proofing reasons.

The following table gives an overview of the possible fastenings for anchor and sliding points in a sliding installation with Geberit Silent-db20 pipes. A sliding installation is suitable for horizontal and vertical installation.

Insulated pipe brackets must always be used for sound-insulating drainage systems in order to avoid the transmission of structure-borne sound.

	Sliding installation	Rigid installation
Anchor point	With pipe bracket on an expansion socket 	×
Sliding point	With pipe bracket 	×

× Not admissible

Sliding installation

Design with expansion sockets

The Geberit Silent-db20 expansion socket absorbs the thermally caused change in length of the pipe in the design with expansion sockets. The following rules must be observed in this case:

- The expansion socket is assigned a maximum pipe length of 6 metres.
- Anchor and sliding points must be designed properly.
- When fastening the anchor points of expansion sockets, a larger pipe dimension must be selected for the pipe bracket than for the pipe diameter used.
- In the case of stacks, an expansion socket must be fitted on each floor.
- Each expansion socket must be designed as an anchor point.

Anchor and sliding points must be designed as follows so that the change in length is directed towards and absorbed by the expansion socket:

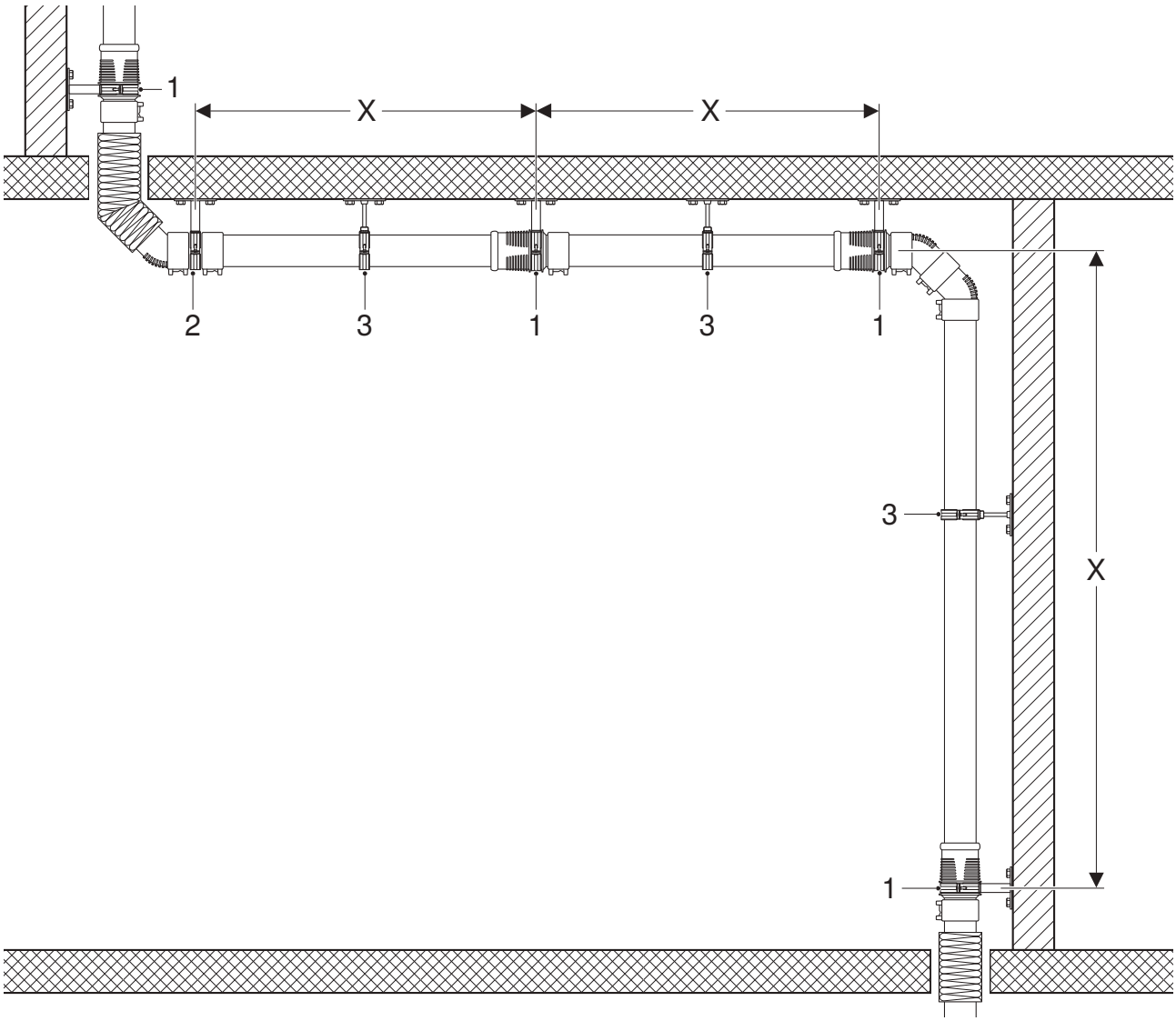


Figure 110: Design of the sliding installation with Geberit Silent-db20 expansion sockets

1 Expansion socket with pipe bracket as an anchor point
2 Pipe bracket with 2 Geberit electrofusion couplings as an anchor point
3 Pipe bracket as a sliding point
X Max. distance of 6 metres between expansion sockets

Insertion depth of the Silent-db20 expansion socket

The insertion depth of the Geberit Silent-db20 expansion socket is dependent on the installation temperature and the dimension of the expansion socket.

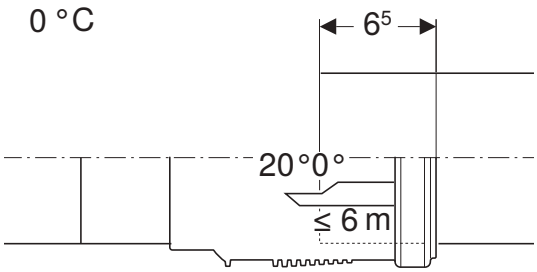


Figure 111: Insertion depth of 6.5 cm for d110 and an installation temperature of 0 °C

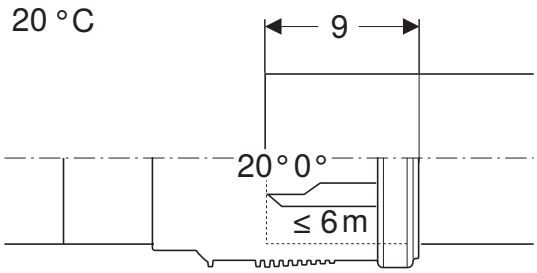


Figure 112: Insertion depth of 9.0 cm for d110 and an installation temperature of 20 °C

Table 19: Insertion depth in cm for the Geberit Silent-db20 expansion socket depending on the dimension of the expansion socket and the installation temperature

DN	d [mm]	Installation temperature						
		-10 °C	0 °C	10 °C	20 °C	30 °C	40 °C	50 °C
70	75	5.3	6.3	7.5	8.8	10.0	11.3	12.5
90	90	5.3	6.3	7.5	8.8	10.0	11.3	12.5
100	110	5.5	6.5	7.7	9.0	10.2	11.5	12.7
150	160	6.3	7.3	8.6	9.8	11.1	12.3	13.6

Anchor point with a Geberit Silent-db20 expansion socket

Anchor points are designed with sound-insulating Geberit Silent-db20 pipe brackets and a sufficiently strong pipe bracket fastening on the Geberit Silent-db20 expansion socket.

When fastening the anchor points of expansion sockets, a larger pipe dimension must be selected for pipe brackets than for the pipe diameter used.

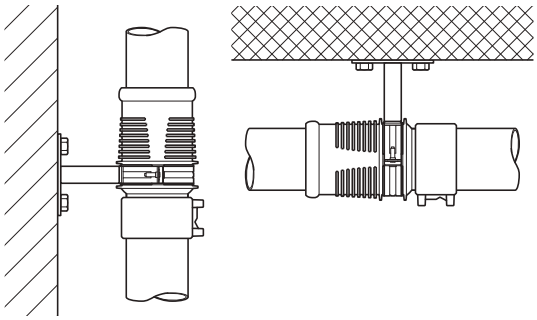
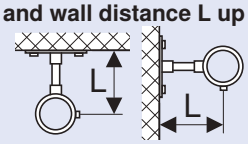


Figure 113: Vertical and horizontal anchor-point fastening with sound-insulating Geberit Silent-db20 pipe bracket on the Geberit Silent-db20 expansion socket

Thickness of the pipe fixation for anchor points

Geberit offers a suitable fastening system with pipe brackets, threaded pipes and base plates in various thread sizes. The required thickness of the pipe fixation must be selected depending on the ceiling or wall distance.

Table 20: Required thickness of the pipe fixation when fastening horizontally to ceilings and walls

DN	d [mm]	Ceiling and wall distance L up to 25 cm 
56	56	1/2"
60	63	1/2"
70	75	1/2"
90	90	1/2"
100	110	1/2"
150	160	1/2" / 1"[1)]

1) 1/2" for anchor point on pipe, 1" for anchor point on expansion socket or double sleeve coupling

The available thicknesses of the threaded pipes are no longer sufficient for anchor points with a ceiling or wall distance of more than 25 cm. Another type of mounting must therefore be selected for anchor-point fastenings with a wall or ceiling distance of more than 25 cm (e.g. support fastening).

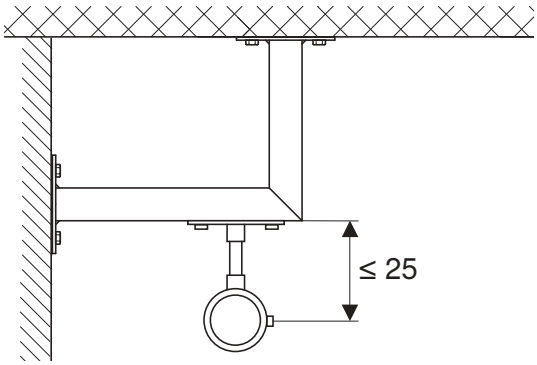
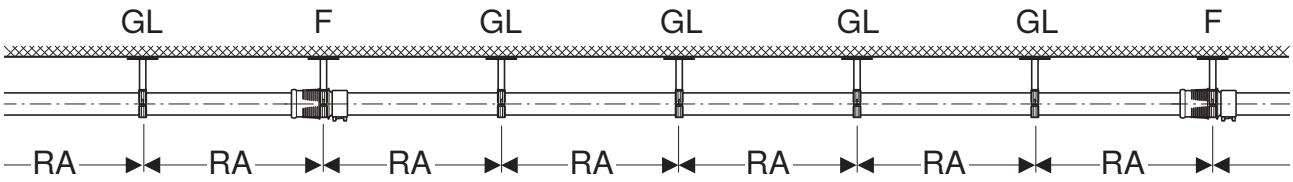


Figure 114: Support fastening for anchor points with a wall or ceiling distance of more than 25 cm

Pipe bracket spacing when fastening horizontally to ceilings and walls, without support shells

The pipe fixation of Geberit Silent-db20 system pipes to ceilings and walls is carried out with Geberit Silent-db20 pipe brackets.

The following pipe bracket spacing RA is applied for pipe fixation without support shells:



GL Sliding point
F Anchor point
RA Pipe bracket spacing

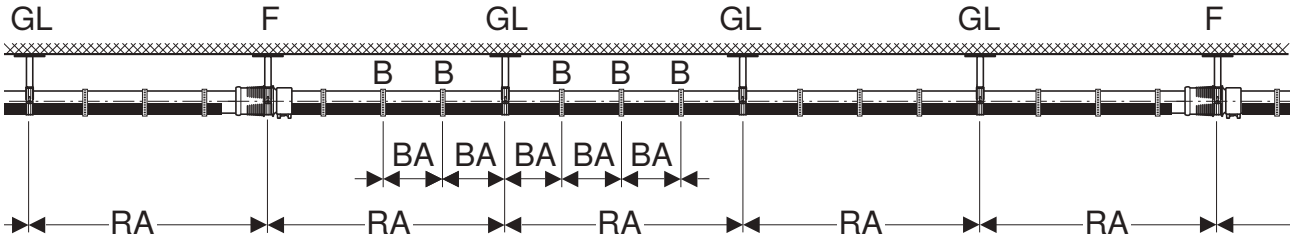
DN	d [mm]	RA[1] (without support shell) [m]	Weight force FG[2] [N]
56	56	0.8	23
60	63	0.8	28
70	75	0.8	40
90	90	0.9	65
100	110	1.1	118
150	160	1.7	374

1) For the sake of simplicity, the pipe bracket spacings without support shells are calculated using 10 x d.
2) Weight force per pipe bracket, pipe filled with water (10 °C)

Pipe bracket spacing when fastening horizontally to ceilings and walls, with support shell

The pipe fixation of Geberit Silent-db20 system pipes to ceilings and walls is carried out with Geberit Silent-db20 pipe brackets with support shell.

The following pipe bracket spacing RA is applied for pipe fixation with a support shell:



GL Sliding point
F Anchor point
B Support shell fastening
BA Spacing of fastening strips: 50 cm
RA Pipe bracket spacing

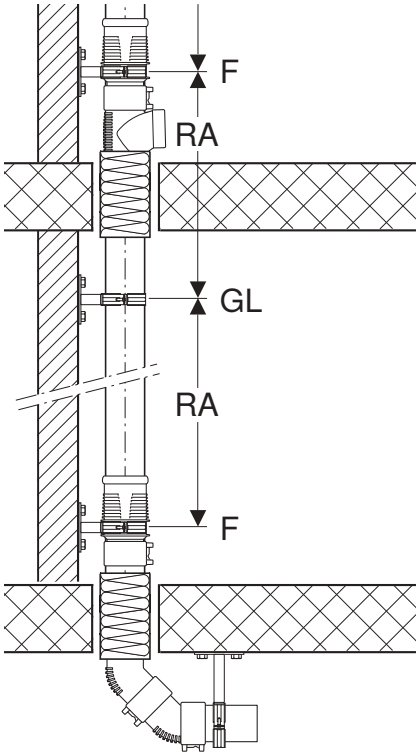
DN	d [mm]	RA[1] (with support shell) [m]	Weight force FG[2] [N]
56	56	1.0	28
60	63	1.0	35
70	75	1.2	59
90	90	1.4	101
100	110	1.7	182
150	160	2.4	528

1) For the sake of simplicity, the pipe bracket spacings with support shells are calculated using 15 x d.
2) Weight force per pipe bracket, pipe filled with water (10 °C)

Pipe bracket spacing for vertical wall fastening

The pipe fixation of Geberit Silent-db20 system pipes to walls is carried out with Geberit Silent-db20 pipe brackets.

The following pipe bracket spacing RA is applied for vertical pipe fixation:



GL Sliding point
F Anchor point
RA Pipe bracket spacing

DN	d [mm]	RA[1] [m]	Weight force FG[2] [N]
56	56	1.5	184
60	63	1.5	205
70	75	1.5	247
90	90	1.5	316
100	110	1.7	421
150	160	2.4	760

1) For the sake of simplicity, the pipe bracket spacings with vertical fastening are calculated using 15 x d.
2) Weight force per pipe bracket, pipe filled with water (10 °C)

Sliding bracket fastening

Sliding points are designed with a sound-absorbing Geberit Silent-db20 pipe bracket on the pipe and a sufficiently strong pipe bracket fastening. The creation of sliding points is the same for all fastening types.

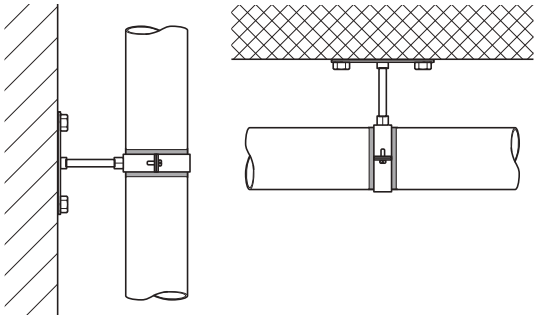
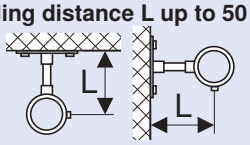


Figure 115: Vertical and horizontal fastening of sliding points with a sound-absorbing Geberit Silent-db20 pipe bracket on the pipe

Thickness of the pipe fixation for sliding points

Geberit offers a suitable fastening system with pipe brackets, threaded pipes and base plates in various thread sizes. The required thickness of the pipe fixation must be selected depending on the ceiling or wall distance.

Table 21: Required thickness of the pipe fixation when fastening horizontally to ceilings and walls

Pipe dimension		Ceiling distance L up to 50 cm 
DN	d [mm]	
56	56	M10
60	63	M10
70	75	M10
90	90	M10
100	110	M10
150	160	1/2"

The available thicknesses of the threaded pipes are no longer sufficient for sliding points in horizontal pipes on walls and ceilings with a distance of more than 50 cm. Another type of mounting must therefore be selected for sliding bracket fastenings in horizontal pipes on walls and ceilings with a distance of more than 50 cm (e.g. support fastening).

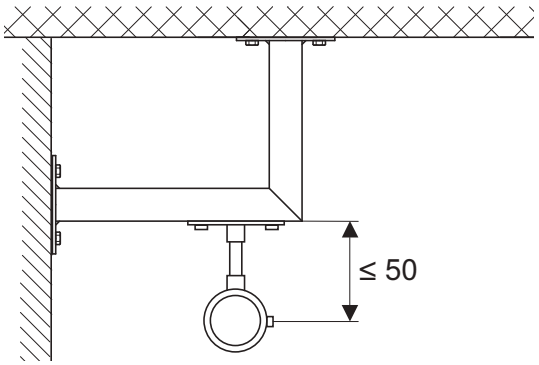


Figure 116: Support fastening for sliding points in horizontal pipes on walls and ceilings with a distance of more than 50 cm

4.2.2 Compensation for offsets in the stack

Geberit Silent-db20 Offset fitting

The Geberit Silent-db20 offset fitting is used to compensate an offset in the stack. The stack is secured with the Geberit Silent-db20 expansion socket.

The feed-throughs must be decoupled from the building structure with a Geberit insulation hose, insulation tape, or GeberitIsol Flex sound insulation mat.

The Geberit Silent-db20 offset fitting can be used in the stack in the following case:

- stack offset max. 10 cm
- pipe length between 2 Geberit Silent-db20 offset fittings is min. 1.5 m and max. 3 m

2 Geberit Silent-db20 offset fittings per offset are required in the stack.

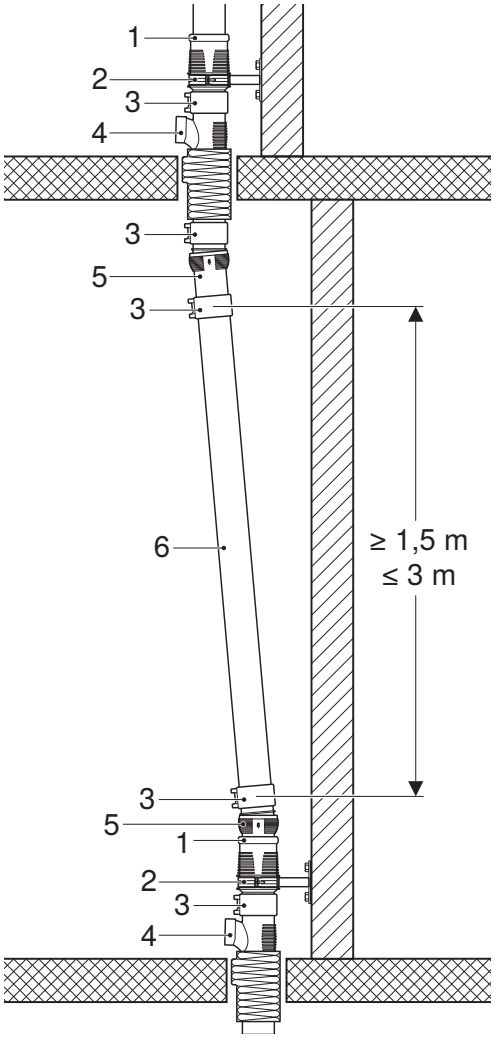


Figure 117: Installation example with the Geberit Silent-db20 Offset fitting

1 Geberit Silent-db20 expansion socket
2 Geberit Silent-db20 system pipe bracket
3 Geberit Silent-db20 electrofusion coupling
4 Geberit Silent-db20 swept entry branch
5 Geberit Silent-db20 offset fitting
6 Geberit Silent-db20 pipe

Fastening the Geberit Silent-db20 expansion socket

When using Geberit Silent-db20 expansion sockets, pipes and fittings must be connected non-positively in the entire pipe section using electrofusion or butt welding.

A combination of Geberit Silent-db20 expansion sockets and Silent-db20 clamping connectors is not admissible.

This requirement does not only apply to the connection to the Geberit Silent-db20 expansion socket, but also to the entire pipe section.

When fastening the anchor points of Geberit Silent-db20 expansion sockets, a larger pipe dimension must be selected for the Geberit Silent-db20 system pipe brackets than for the pipe diameter used.

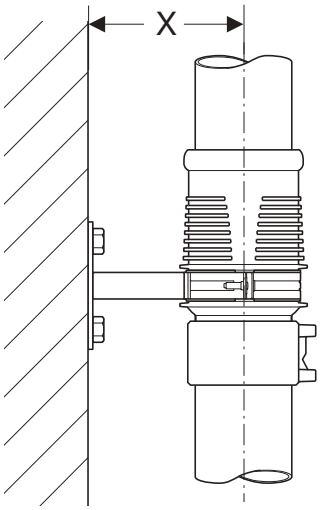
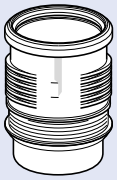


Figure 118: Vertical anchor-point fastening with sound-insulating Geberit Silent-db20 pipe bracket on the Geberit Silent-db20 expansion socket.

Expansion socket 	**Pipe bracket, insulated, with threaded socket** 	
d [mm]	**di [mm]**	**X [cm]**
110	125	≤ 25

4.2.3 Installation in a prewall

Branch discharge pipes

Branch discharge pipe in a prewall installation must be designed with Geberit Silent-db20 and decoupled from the building structure. The connections are established with electrofusion couplings, butt welding or Geberit Silent-db20 clamping connectors.

Branch discharge pipe feed-throughs

In order to prevent the transmission of structure-borne sound, branch discharge pipe feed-throughs through the prewall must be decoupled from the building structure.

The following sound decoupling options are possible for feed-throughs:

- Geberit insulation hose
- Geberit insulation tape
- Geberit Isol Flex sound insulation mat
- Permanently elastic cemented joint

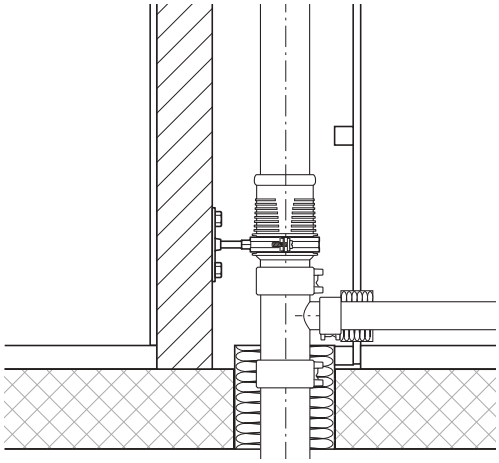


Figure 119: Sound decoupling of feed-throughs in a prewall installation with insulation

Branch discharge pipe built into the wall

Connections on branch discharge pipes built into the wall must be designed to be non-positive with electrofusion couplings or butt welding. In order to prevent the transmission of structure-borne sound, the entire pipe must be decoupled from the building structure.

The following insulation is possible for the sound decoupling of built-in branch discharge pipes:

- Geberit insulation hose
- Geberit insulation tape
- Geberit Isol Flex sound insulation mat

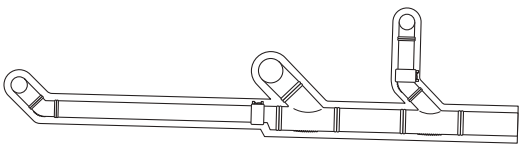


Figure 120: Sound decoupling of branch discharge pipes built into the wall with insulation

Stack with expansion socket

The following rules must be observed for stacks in a prewall installation:

- Expansion sockets must be designed with an insulated Geberit Silent-db20 pipe bracket as an anchor point.
- Pipe routing must be designed with insulated Geberit Silent-db20 pipe brackets as a sliding bracket.
- Floor heights up to a maximum of 6 m must be designed with expansion sockets in combination with electrofusion couplings.
- Feed-throughs must be decoupled from the building structure with a Geberit insulation hose, Geberit insulation tape or a Geberit Isol Flex sound insulation mat.

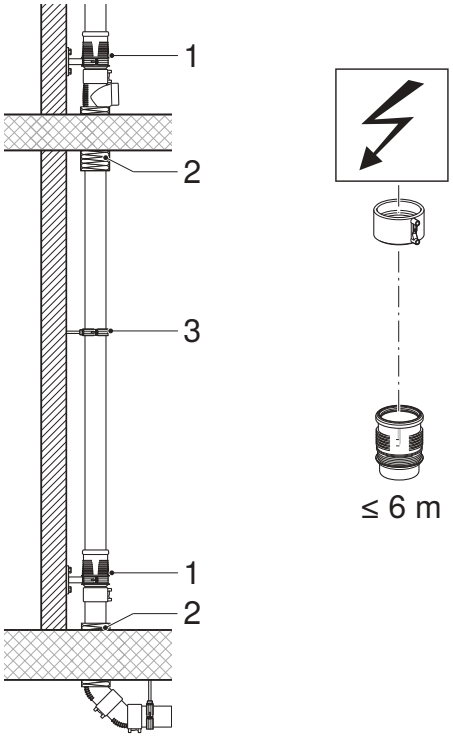


Figure 121: Stack in a prewall installation with expansion socket

1 Expansion element with Geberit Silent-db20 pipe bracket as an anchor point
2 Feed-throughs with suitable insulation
3 Pipe routing with Geberit Silent-db20 pipe bracket as a sliding point

4.2.4 Installation in concrete

The following rules must be observed for Geberit Silent-db20 pipes embedded in concrete:

- Non-positive connections (Geberit electrofusion couplings or butt welding) must be used.
- All pipes must be decoupled from the building structure with a Geberit insulation hose, Geberit insulation tape, or with a Geberit Isol Flex sound insulation mat.
- Geberit Silent-db20 pipes and fittings must be installed so that they remain in position while they are being embedded in concrete, e.g. by being fastened to the formwork (with insertion pipe brackets) or directly to the bottom reinforcement.
- Equal branch fittings must be used in vertical pipes to prevent branch fittings shearing off. Reduced branch fittings must be secured with an anchor point to prevent them shearing off.
- Crossovers with additional inserts, e.g. drinking water pipes or electrical installation pipes, must be avoided.
- Only bends with an angle of 45°–90° may be used in horizontal pipes that are longer than 4 metres.

Geberit recommends establishing vertical branch fittings in the same way. This is a simple way to prevent the branch fitting from shearing off.

Branch fittings 88.5° embedded in concrete

Equal branch fitting 88.5°

Geberit recommends embedding equal branch fittings 88.5°, swept-entry, in concrete. The fitting and the insulation prevent the branch discharge pipe from shearing off. The branch fitting functions as an anchor point in this installation method.

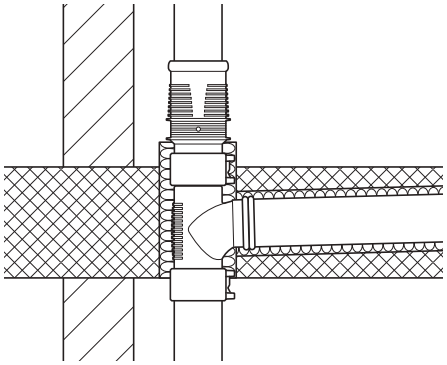


Figure 122: Equal branch fitting 88.5°, swept-entry, embedded in concrete

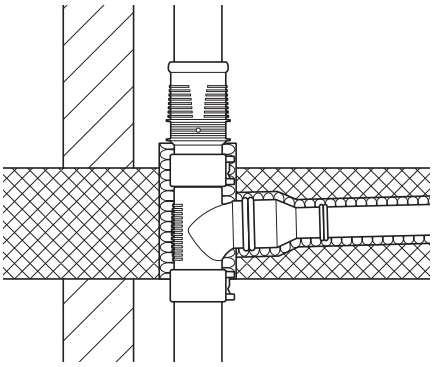


Figure 123: Equal branch fitting 88.5°, swept-entry, embedded in concrete, with reduced branch discharge pipe

Reduced branch fitting 88.5°

Reduced branch fittings can absorb less force. Reduced branch fittings must therefore be protected with an anchor point at a maximum distance of 40 cm. The insulation and the anchor point prevent the branch discharge pipe from shearing off.

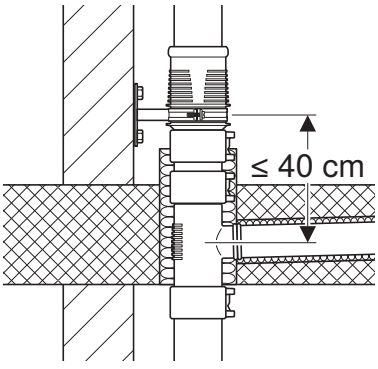


Figure 124: Reduced branch fitting 88.5°, secured with anchor point

Reduced branch fitting 88.5° with WC branch discharge pipe over concrete ceiling

The anchor point cannot always be set at a maximum distance of 40 cm for reduced branch fittings 88.5° with WC branch discharge pipe through the concrete ceiling. For this reason, equal branch fittings, swept-entry, must be embedded in concrete. Geberit recommends using concentric reducers, as these can absorb more force.

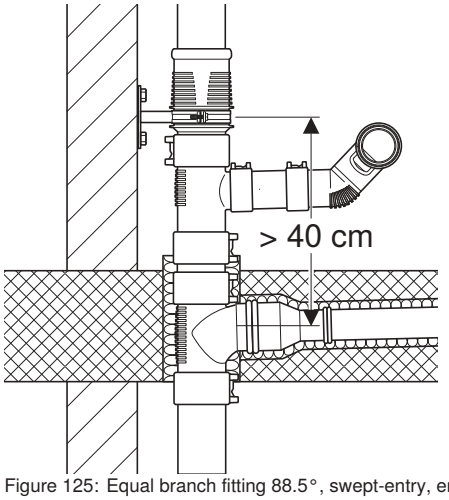


Figure 125: Equal branch fitting 88.5°, swept-entry, embedded in concrete, with reduced branch discharge pipe and a WC branch discharge pipe over the concrete

Branch discharge pipes embedded in concrete

The concrete covering for the branch discharge pipes must be at least 4 cm on all sides in order to be able to observe the sound levels.

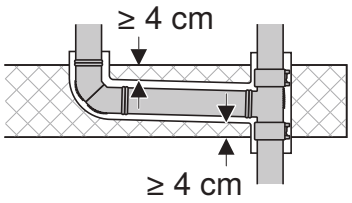


Figure 126: Concrete covering for branch discharge pipes embedded in concrete

Tension resistant connections on branch discharge pipes embedded in concrete must be designed to be non-positive with electrofusion couplings or butt welding. The entire pipe must be decoupled from the building structure with insulation (Geberit insulation hose, Geberit insulation tape or Geberit Isol Flex sound insulation mat).

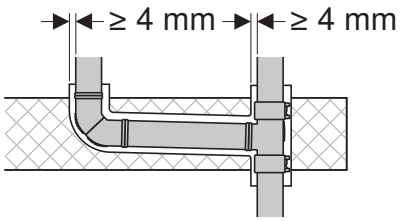


Figure 127: Insulation for decoupling with branch discharge pipes embedded in concrete

Crossovers with additional inserts, e.g. drinking water pipes or electrical installation pipes, must be avoided. They increase the sound levels by 3–10 dB, depending on the constructional situation.

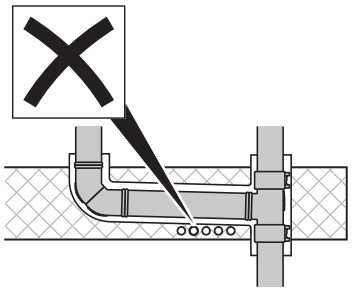


Figure 128: No crossover with water supply lines or electrical installation pipes embedded in concrete

Geberit Silent-db20 pipe and fittings must be installed so that they are kept in position while they are being embedded in concrete, e.g. with insertion pipe brackets.

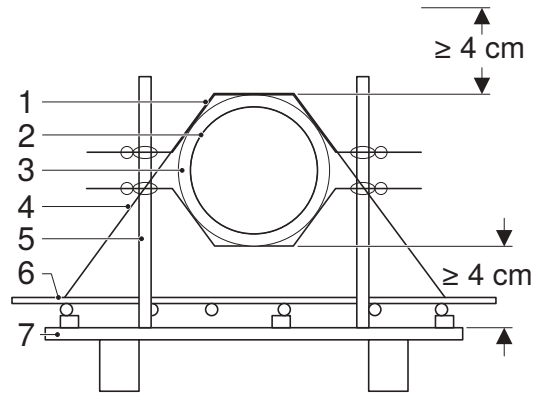


Figure 129: Geberit Silent-db20 embedded in concrete with insertion pipe bracket

1 Pipe bracket clip over insulation
2 Geberit Silent-db20 pipe
3 Geberit insulation hose
4 Prevention against lifting (if the insertion pipe bracket does not adequately prevent against lifting)
5 Insertion pipe bracket
6 Bottom reinforcement
7 Formwork

Branch fittings 45° embedded in concrete

Equal branch fitting 45°

Geberit recommends embedding insulated equal branch fittings 45° in concrete. The fitting and the insulation prevent the branch discharge pipe from shearing off. The branch fitting functions as an anchor point in this installation method.

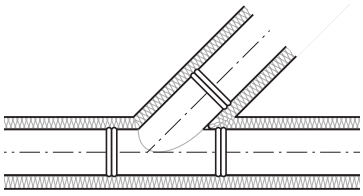


Figure 130: Equal branch fitting 45°, insulated

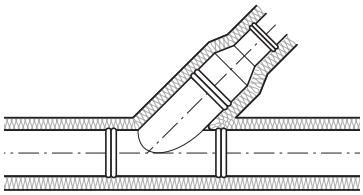


Figure 131: Equal branch fitting 45°, insulated with connecting reducer

Reduced branch fitting 45° for a pipe length ≤ 4 m

The branch fitting compactly embedded in concrete and the insulation prevent the branch discharge pipe shearing off.

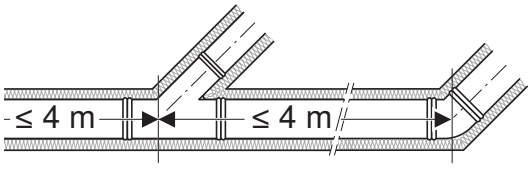


Figure 132: Reduced branch fitting 45°, pipe length ≤ 4 m

The planning of branch discharge pipes is carried out according to EN 12056. The maximum length of non-ventilated branch discharge pipes must not exceed 4 metres. For this reason, the branch discharge pipes embedded in concrete are almost exclusively ≤ 4 metres. When planning according to this rule, reduced branch fittings do not need to be additionally secured.

Geberit still recommends using equal branch fittings anyway since they can absorb more force.

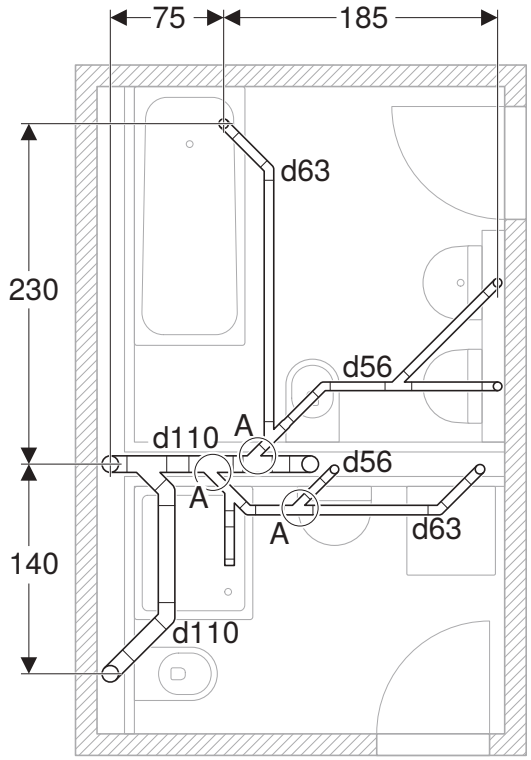


Figure 133: Design detail with reduced branch fittings 45° and pipe embedded in concrete ≤ 4 metres

A Reduced branch fittings

Reduced branch fitting 45° for a pipe length greater than 4 m

In the case of a pipe length greater than 4 m, reduced branch fittings 45° must additionally be secured with either insulation thicker than 17 mm or an anchor point. The branch fitting compactly embedded in concrete and the additional insulation or securing with an anchor point prevent the branch discharge pipe shearing off.

The pipe length is measured to the next anchor point. Anchor points are bends ≥ 45° and equal branch fittings.

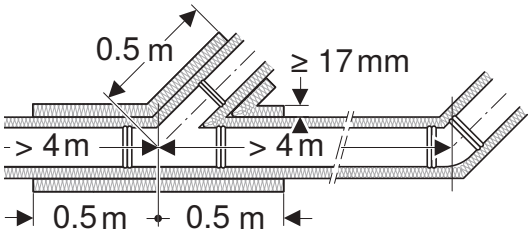


Figure 134: Reduced branch fitting 45°, pipe length greater than 4 m, with additional insulation

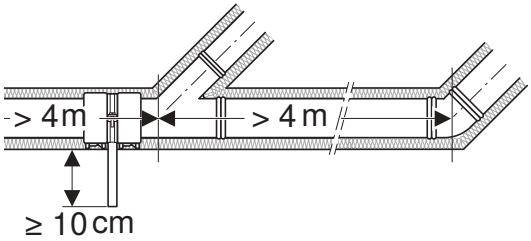


Figure 135: Reduced branch fitting 45°, pipe length greater than 4 m with anchor point

Anchor point for insulated pipes embedded in concrete

The anchor point is created with 1 pipe bracket and 2 electrofusion couplings. The pipe bracket is screwed with the threaded pipe that protrudes into the concrete at least 10 cm over the insulation. The insulation in the area of the threaded pipe must be bonded so that it is leakproof.

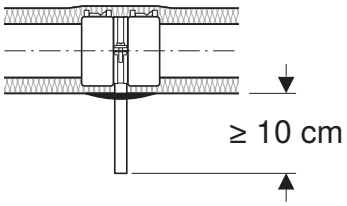


Figure 136: Anchor point for insulated Geberit discharge pipes embedded in concrete

Insulated Geberit HDPE pipes embedded in concrete must feature an anchor point every 5 m.

4.2.5 Design of anticondensation insulation with a Geberit Isol Flex sound insulation mat

The Geberit Isol Flex sound insulation mat can be used as anticondensation insulation under the following conditions:

- rainwater temperature ≥ 0 °C
- room temperature < 25 °C
- moisture < 60 %

When the Geberit Isol Flex sound insulation mat is used as anticondensation insulation, all edges must be taped off using a suitable adhesive tape (taping width ≥ 7 cm) as follows:

- axial edge parallel to the axis of the pipe
- radial edge
- for fittings, all outer edges

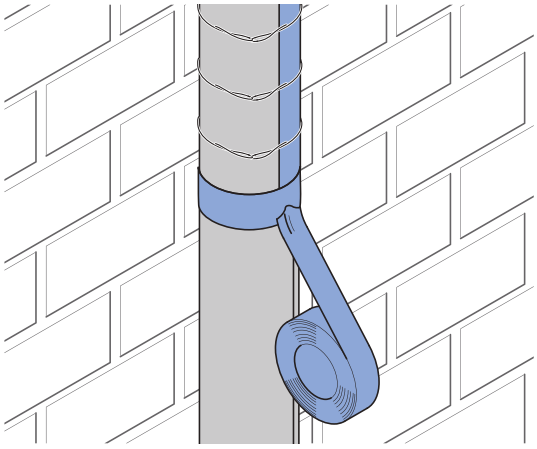


Figure 137: Anticondensation insulation with a Geberit Isol Flex sound insulation mat

4.2.6 Adapter for Geberit PE and third party materials

All not non-positive connections to third party materials must be secured with anchor points to prevent them being pulled out.

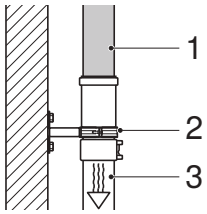


Figure 138: Adapter with expansion socket

1 Geberit Silent-db20
2 Anchor point with Geberit expansion socket
3 Geberit HDPE

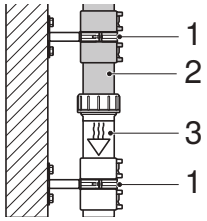


Figure 139: Adapter with screw connection

1 Anchor point with 2 Geberit electrofusion couplings
2 Geberit Silent-db20
3 Geberit HDPE

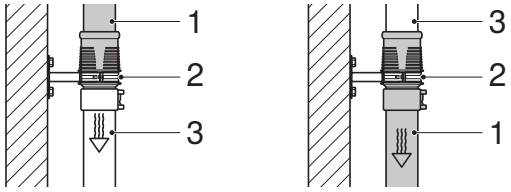


Figure 140: Adapter with Geberit Silent-db20 expansion socket

1 Geberit Silent-db20
2 Anchor point with Geberit Silent-db20 expansion socket
3 Geberit HDPE

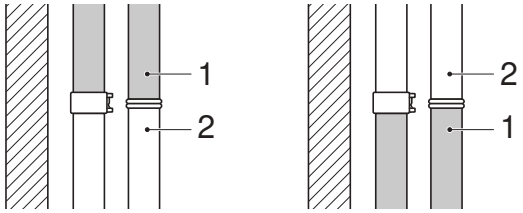


Figure 141: Adapter with Geberit electrofusion coupling or butt welding

1 Geberit Silent-db20
2 Geberit HDPE

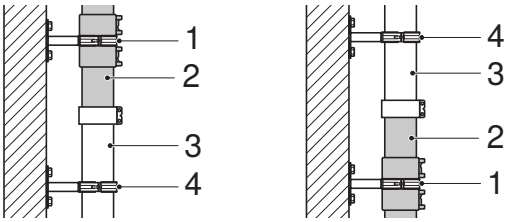


Figure 142: Adapter with Geberit clamping connector, Geberit HDPE always with support ring

1 Anchor point with 2 Geberit electrofusion couplings
2 Geberit Silent-db20
3 Geberit HDPE / cast iron / steel / Astolan / fibre cement
4 Anchor point

CHAPTER FIVE

CROSS-SYSTEM APPLICATIONS

5.1 FIRE PROTECTION

5.1.1 Geberit fire protection sleeve RS90 Plus EN

When pipes made from flammable material are routed through components subject to fire protection requirements, precautions must be taken to prevent the propagation of fire and smoke. The precautions are governed by mandatory country-specific regulation and standards.

The Geberit fire protection sleeve RS90 Plus EN provides 90 minutes of fire resistance for wall and ceiling feed-throughs.

Installation requirements

The following on-site prerequisites must be met to install the Geberit fire protection sleeve RS90 Plus EN:

- Solid walls: at least 10 cm thick, made of masonry, concrete or aerated concrete
- Partition walls: at least 10 cm thick, with a steel substructure and flame-retardant plasterboard panels
- Ceilings: at least 15 cm thick, made of concrete or aerated concrete of fire resistance class EI 90 according to BS EN 13501-2:2016-12

Gap sizes in solid walls or ceilings

Minimum gap sizes apply for the installation of the Geberit fire protection sleeve RS90 Plus EN in solid walls or ceilings.

The following points must be observed:

- Additional insulation, e.g. mineral wool, must be taken into account when determining the gap size.
- The sleeve fastener is taken into account with all dimensions.

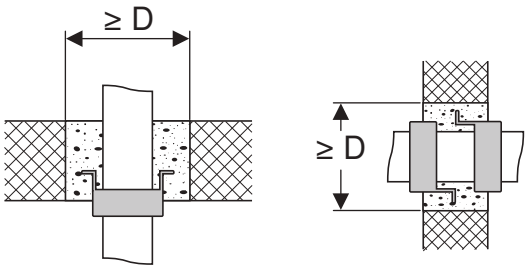


Figure 143: Minimum gap size **D** for the installation of a Geberit fire protection sleeve RS90 Plus EN in solid walls or ceilings

DN	d [mm]	D [cm]
40–56	40–56	12
60/70	63/75	14
90	90	16
110	110	19
125	125/135	21
150	160	25
200	200	31

Distances for pipes routed adjacent to one another

If the Geberit fire protection sleeve RS90 Plus EN is installed on several pipes adjacent to one another, the following distances must be observed. The distances are dependent on whether the fire protection sleeve is installed during or after the mounting of the pipes.

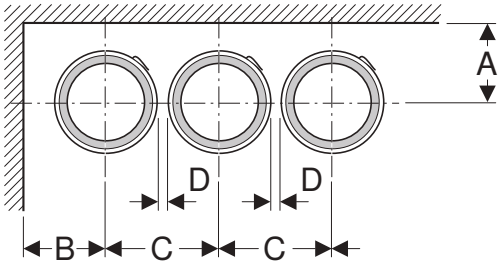


Table 22: Recommended distances for pipes routed adjacent to one another in the wall or ceiling

DN	d [mm]	A [cm]	B [cm]	C [cm]	D [cm]
40	40	4.0	4.0	9.0	A distance of D ≥ 0 cm has been tested and approved.
50/56	50/56	4.5	4.5	9.0	
60/70	63/75	6.0	6.0	11.0	
90	90	7.0	7.0	12.5	
110	110	8.0	8.0	15.0	
125	125	9.5	9.5	19.0	
125	135	9.5	9.5	19.0	
150	160	11.0	11.0	22.0	
200	200	14.0	14.0	28.0	

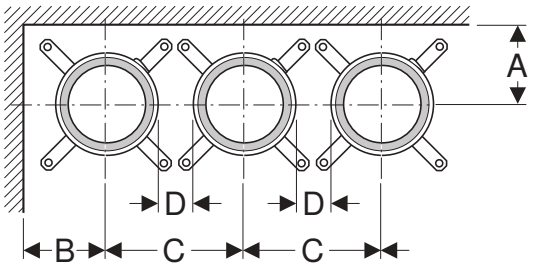


Table 23: Recommended distances for pipes routed adjacent to one another in the wall or ceiling, later installation

DN	d [mm]	A [cm]	B [cm]	C [cm]	D [cm]
40	40	8.0	8.0	15.0	A distance of D ≥ 0 cm has been tested and approved. The fastening brackets can be fitted in an overlapping arrangement for a later installation.
50/56	50/56	8.0	8.0	15.0	
60/70	63/75	9.0	9.0	17.0	
90	90	10.0	10.0	19.0	
110	110	11.0	11.0	21.0	
125	125	12.0	12.0	24.0	
125	135	12.0	12.0	24.0	
150	160	14.0	14.0	28.0	
200	200	17.0	17.0	32.0	

5.2 MOISTURE PROTECTION

5.2.1 Geberit puddle flange

The Geberit puddle flange is used for the water pressure-resistant sealing of pipe feed-throughs with Geberit drainage systems in floors, walls or ceilings embedded in concrete. It can be used and provides protection – for example, from groundwater – up to a water pressure of 8 bar.

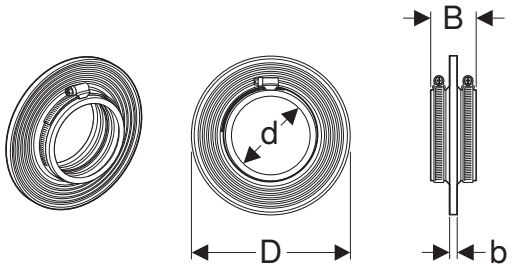
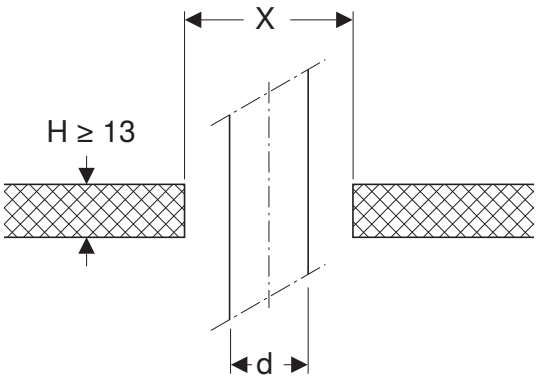


Figure 144: Geberit puddle flange

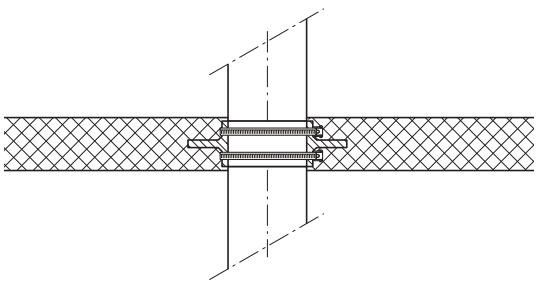
DN	d [mm]	D [cm]	B [cm]	b [cm]
100	110	21	6	1
125	125	22.5	6	1
150	160	26	6	1

The following rules must be observed when installing the Geberit puddle flange:

- The concrete recess (X) must be at least as large as the puddle flange.
- The pipe must be clean and lubricated.
- The concrete recess must be compactly backfilled with concrete after tightening the puddle flange.



d110 = X ≥ 21 cm
d125 = X ≥ 23 cm
d160 = X ≥ 26 cm



5.2.2 Moisture protection for wall and ceiling feed-throughs

Geberit moisture sealing is used wherever pipes are routed through masonry, floors or ceilings and moisture has to be prevented from entering. The moisture sealing can be used up to a moisture pressure of a 1 metre water column (0.1 bar).

The Geberit moisture sealing is available in the following designs:

- with contact foil Resistit® (black) for hot bitumen
- with contact foil Sarnafil® PVC (grey) for thermal welding

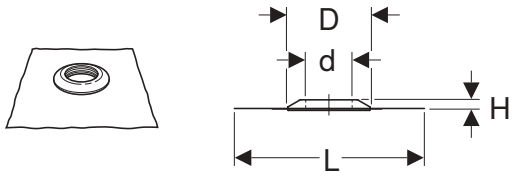


Table 24: Dimensions depending on the pipe dimension

DN	d [mm]	D [cm]	H [cm]	L [cm]
50	50	13.5	2.5	50
56	56	13.5	2.5	50
70	75	19.5	2.5	50
90	90	19.5	2.5	50
100	110	19.5	2.5	50
125	125	21	2.5	50

Changes in the length of the pipe must be prevented in the area of the sealed wall and ceiling feed-throughs by embedding anchor points (electrofusion couplings, flange bushings, bends) in concrete or using the corresponding anchor point construction.

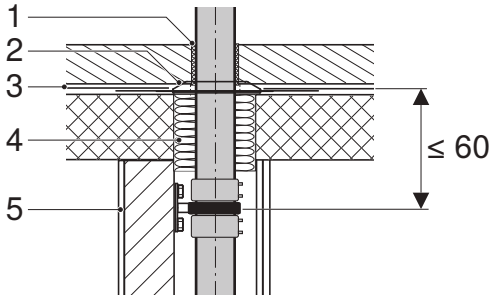


Figure 145: Ceiling feed-through with moisture sealing

1 Insulation hose
2 Moisture sealing
3 Sealing foil
4 Insulation
5 Anchor point with 2 Geberit electrofusion couplings

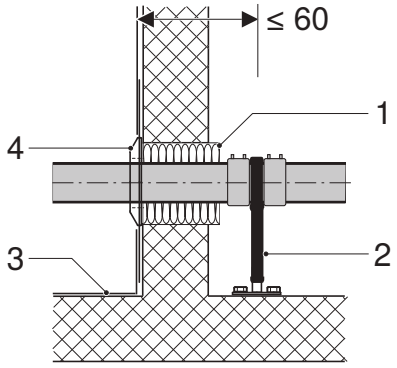


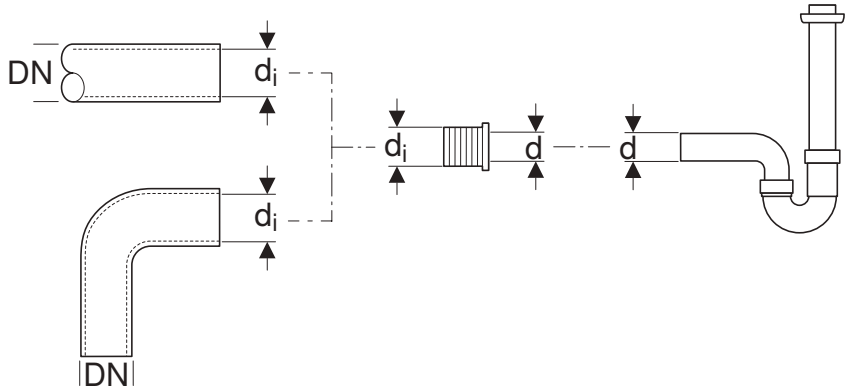
Figure 146: Wall feed-through with moisture sealing

1 Insulation
2 Anchor point with 2 Geberit electrofusion couplings
3 Sealing foil
4 Moisture sealing

5.3 WASTE FITTINGS AND TRAPS

5.3.1 Connection with a Geberit sleeve

Sanitary appliances can be connected to the drainage system directly and without further measures. The connection is made with the Geberit sleeve and a straight pipe section or a bend 90° with a long leg.



Pipe section/bend 90°		Sleeve		Sanitary appliance
DN	**d_i [mm]**	**d_i [mm]**	**d [mm]**	**d [mm]**
50	44	44	32	32
56	50	50	32	32
56	50	50	40	40
60	57	57	32	32
60	57	57	40	40
60	63	63	56	56
60	63	63	56	56
70	70	70	50	50

5.4 GEBERIT AIR ADMITTANCE VALVE GRB50

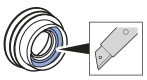
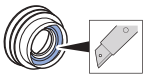
5.4.1 System description

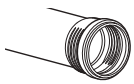
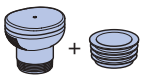
The Geberit air admittance valve GRB50 is a valve which prevents pressure fluctuations and negative pressure within the drainage systems. The air admittance valve allows air to enter the discharge pipe but prevents sewer gases from escaping.

Application range

The Geberit air admittance valve GRB50 is connected to the discharge pipe within the building. This can be established directly via a ring seal socket or using the enclosed sleeve. The Geberit air admittance valve GRB50 is suitable for the following drainage systems and dimensions:



Geberit Silent-db20		
ø 56 / DN 56	✓ + ✓	306.050.14.1
ø 63 / DN 60	✓ + ✓	–
Geberit PE		
ø 32 / DN 30	✓ + ✓	–
ø 40 / DN 40	✓ + ✓	
ø 50 / DN 50	✓ + ✗	361.779.16.3
ø 56 / DN 56	✓ + ✗	361.752.16.3
ø 63 / DN 60	✓ + ✓	–
Geberit Silent-PP		
ø 32 / DN 30	✓ + ✓	–
ø 40 / DN 40	✓ + ✓	


Geberit Silent-PP		
ø 50 / DN 50	✓ + ✗	–

Function

Normally, the diaphragms of the Geberit air admittance valve GRB50 are closed. The flow of waste water generates negative pressure in the pipe system. This causes the diaphragms in the air admittance valve to open and allow outside air to flow in. Once the pressure has been equalised, the diaphragms close automatically.

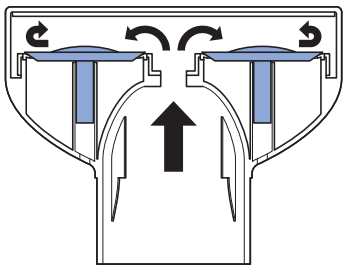


Figure 147: Closed air admittance valve (normal condition)

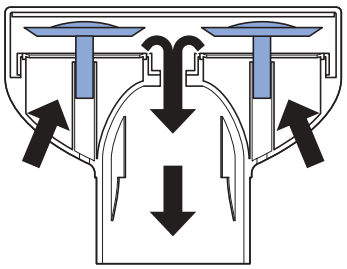
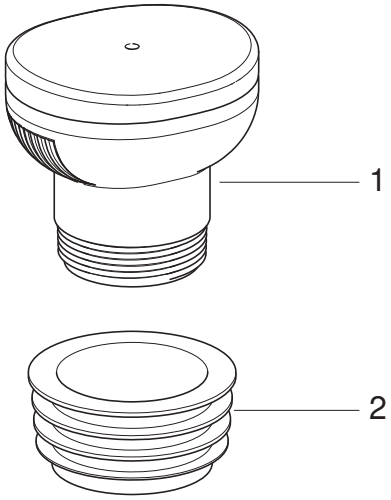


Figure 148: Open air admittance valve (negative pressure in the pipe system)

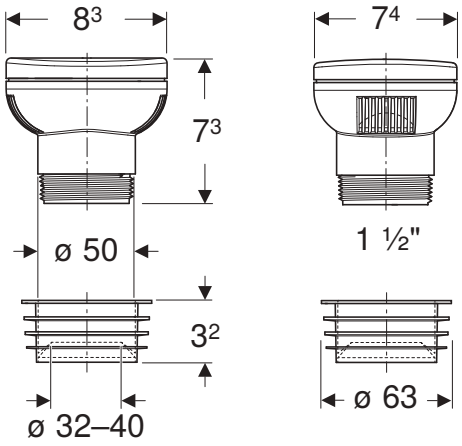
Construction and materials



Position	Designation	Material	Remarks
1	Housing	ABS (acrylonitrile-butadiene-styrene)	Injection-moulded and welded
1.1	Diaphragms	TPE (thermoplastic elastomers)	Installed in housing
2	Sleeve	TPE (thermoplastic elastomers)	–

Technical data

- Maximum air capacity with diaphragms open: 7.2 l/s at -250 Pa.
- Dimensions:



Standards and approvals

Table 25: Relevant product standards for the Geberit GRB50 air admittance valve

Standard	Title
BS EN 12380:2002-12-17	Air admittance valves for drainage systems - Requirements, test methods and evaluation of conformity
DIN 1986-100:2016-12	Drainage systems on private ground - Part 100: Specifications in relation to DIN EN 752 and DIN EN 12056
BS EN 12056-1:2000-09-15	Gravity drainage systems inside buildings - Part 1: General and performance requirements
BS EN 12056-2:2000-09-15	Gravity drainage systems inside buildings - Part 2: Waste water systems, planning and calculation

Table 26: Existing approvals for the Geberit GRB50 air admittance valve

Approval designation	Relevant in
Class of fire E according to EN 13501-1	EU
CE marking	EU
Keymark	EU

5.4.2 Planning

Pipe ventilation requirements

In conjunction with a stack vent, Geberit air admittance valves GRB50 may be used for the following applications:

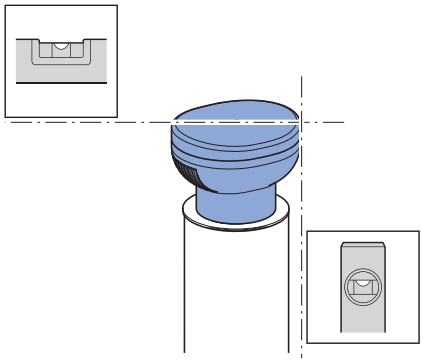
- as a replacement for indirect secondary ventilation systems
- for individual ventilation systems used in existing sanitary appliances with drainage malfunctions

5.4.3 Installation

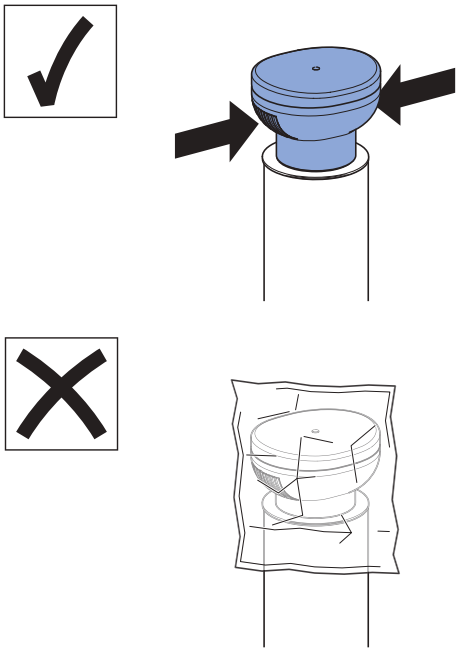
Installation rules

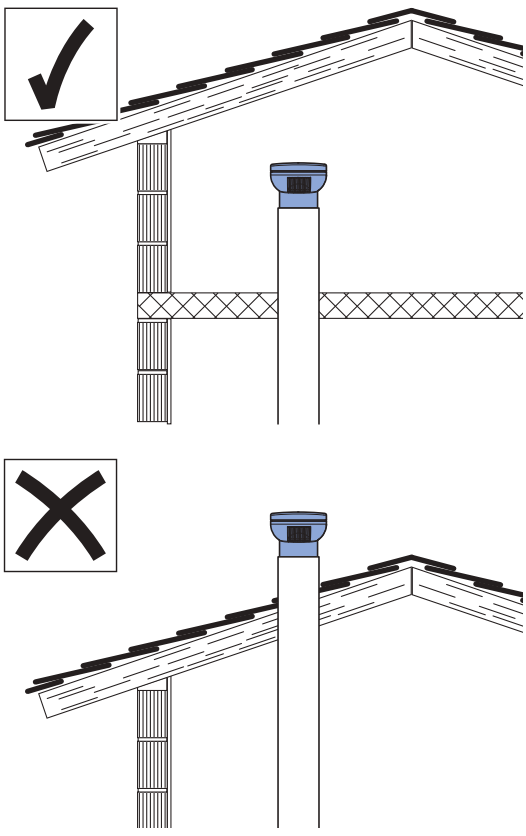
To ensure that the Geberit air admittance valve GRB50 functions correctly, the following points must be observed during installation:

- Insert the air admittance valve all the way into the pipeline.
- Install the air admittance valve vertically.



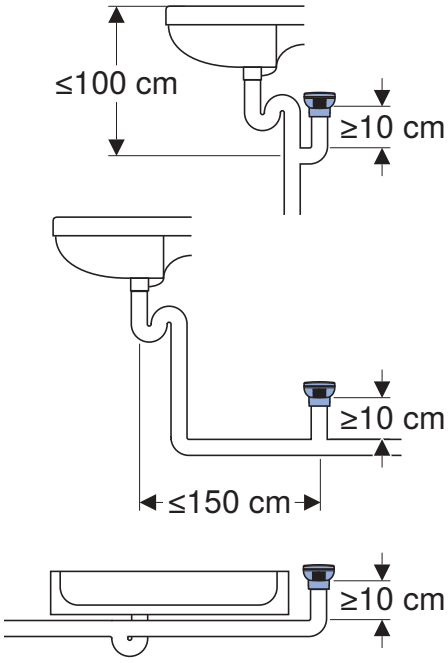
- The air admittance valve may be installed below the overflow edge of the sanitary appliance.
- There must be an unrestricted air supply to the air admittance valve at all times.
- For installation in a prewall, use a fan housing to ensure adequate air supply.
- Ensure that the air admittance valve is easily accessible for maintenance purposes.
- Do not cover the openings of the air admittance valve.
- The air admittance valve must only be installed inside buildings.





Air admittance valve mounting and installation dimensions

The following dimensions must be taken into account when installing Geberit air admittance valves GRB50:



5.4.4 Maintenance

General maintenance notes

The Geberit air admittance valve GRB50 is maintenance-free. We recommend checking and cleaning the air admittance valve on a regular basis. The following points must be observed:

- The air admittance valve must not be covered.
- The air admittance valve must be inserted so it is secure and square.
- Remove any dirt such as particles.

5.5 WASTE WATER PREFABRICATION

It is possible to make entire made-to-measure pipe runs in a specialist workshop. Waste water prefabrication has the following advantages:

- time savings on the building site
- possibility of economic efficiencies

5.5.1 Planning and implementation of the waste water prefabrication

In order to ensure the economic efficiency of the waste water prefabrication, this must be thoroughly planned before the actual implementation.

The following must be observed when planning the waste water prefabrication:

1. The isometrics of the pipe run must be determined with all the necessary information (e.g. distance between axes, slope, levels).
2. Pipe diameters must be dimensioned and suitable fittings must be selected.
3. The pipe lengths must be determined with the X-dimension method based on the X-dimension of the fittings.

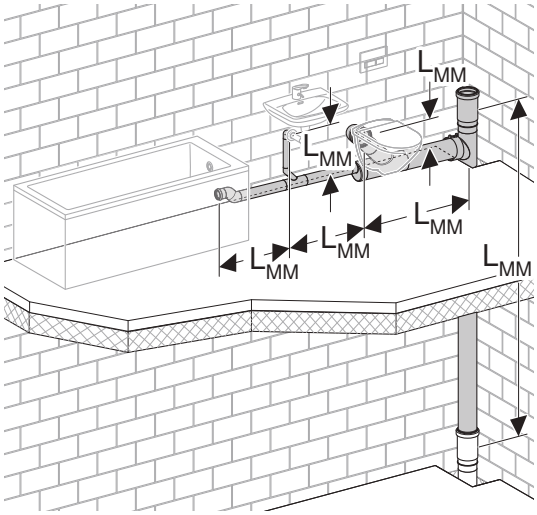


Figure 149: Plan of the waste water prefabrication with the distances determined (L_{MM})

The following must be observed when implementing the waste water prefabrication:

1. It is essential that the logistical restrictions are taken into account, such as the transport of the prefabricated pipe runs or the space requirements on the building site.
2. As many pipe runs as possible can be welded together. All connection types are suitable for prefabrication.
3. Electrofusion couplings and expansion sockets must be mounted on the prefabricated pipe runs on the building site to form a complete system.

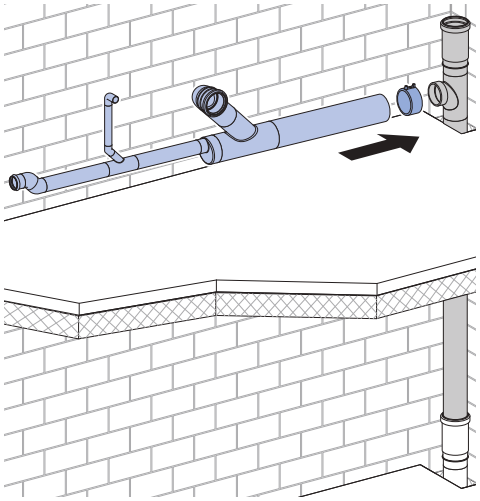


Figure 150: Mounting of prefabricated pipe runs on the building site

5.5.2 Determination of the effective pipe length with the X-dimension method

The determination of the effective pipe length with the X-dimension method is an important step for the successful planning of the waste water prefabrication. The following example determines the effective pipe length for a Geberit HDPE pipe with 2 common Geberit HDPE fittings (Geberit HDPE bend with large leg and Geberit HDPE branch fitting 88.5°, swept-entry).

The effective pipe length L_{eff} is determined with the following formula for a structure with a Geberit HDPE bend with large leg and a Geberit HDPE branch fitting 88.5°, swept-entry:

$L_{eff} = L_M - (X2_{branch\ fitting} + X2_{bend}) + (2 \bullet \text{welding loss})$

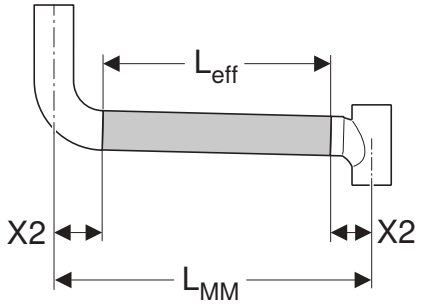


Figure 151: Determination of the effective pipe length with the X-dimension method based on the example of the fittings Geberit HDPE bend with large leg and Geberit HDPE branch fitting 88.5°, swept-entry

L_{eff} Effective pipe length [cm]
L_{MM} Pipe length, middle to middle
X2 Leg length of fitting (X-dimension) [cm]

The X-dimension of the planned fitting must be taken from the Geberit catalogue. The mass from the Geberit catalogue for the 2 fittings for the sample calculation are listed below:

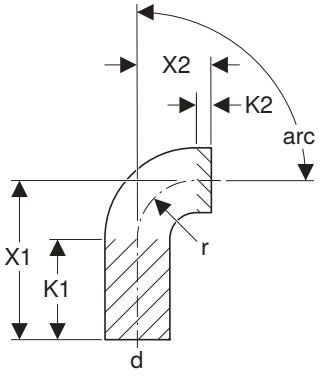


Figure 152: Geberit HDPE bend with large leg

Art. no.	d [mm]	DN	K1 [cm]	X1 [cm]	X2 [cm]	arc / angle [°]	r [cm]
367.055.16.1	110	100	17	27	10	90	10

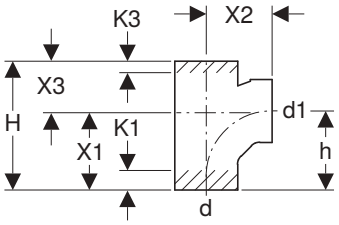


Figure 153: Geberit HDPE branch fitting 88.5°, swept-entry

Art. no.	d [mm]	d1 [mm]	DN	H [cm]	h [cm]	X1 [cm]	X2 [cm]	X3 [cm]	K1 [cm][1)]	K3 [cm][1)]
367.163.16.1	110	110	100 / 100	22.5	13.8	13.5	11.5	9	2.5	0

[1)] The K-mass determines the maximum cutting of the fitting.

Given:

- $X2_{bend} + X2_{branch\ fitting} = 10 + 11.5 = 21.5$ cm
- $L_M = 85$ cm
- welding loss from butt welding = 0.5 cm

Required:

- effective pipe length L_{eff}

Solution:

$L_{eff} = 85 - 21.5 + (2 \cdot 0.5)$

$L_{eff} = 64.5$ cm

5.6 INSTALLATION

It is essential to observe the full operating instructions for the corresponding welding tools to ensure the safe and proper use of the welding tools.

The following installation processes are abridged and incomplete versions from Geberit installation manuals. They contain the key steps. The full installation instructions included with the product must be used for the installation.

Unless otherwise stated, the dimensions are given in cm.

5.6.1 Creating welding joints

Welding procedure

Pipe connections can be created with the following welding procedures:

- butt welding
- electrofusion welding (up to d160)
- electrofusion with integrated thermal fuse (from d200)

Welding joint with a welding plate

Butt welding must be carried out with a Geberit welding plate.

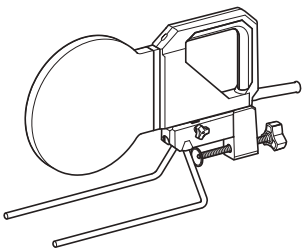


Figure 154: Geberit welding plate

The following rules must be observed for carrying out butt welding with a Geberit welding plate:

- Butt welding can be carried out by hand up to d75 with the help of the Geberit jointing guide. The Geberit Universal or Media welding machine must be used from d90.
- Higher contact pressure must be taken into account for pipes with thicker walls.
- The welding bead must be approximately half as thick as the wall thickness of the pipe.

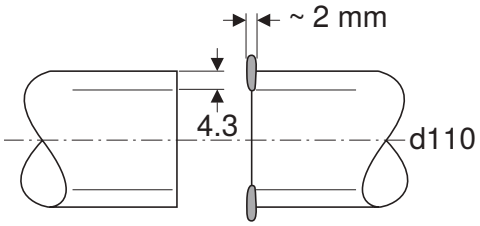


Figure 155: Example of the thickness of the welding bead with a wall thickness = 4.3 mm

Reference values for butt welding Geberit Silent-db20 and Geberit HDPE pipes

d [mm]	Welding allowance per weld seam [cm]		Warm-up time[1] [s]		Time for pressure build-up [s]	Welding time [min]	Welding force [N]
	Silent-db20	HDPE	Silent-db20	HDPE	Silent-db20 / HDPE		
32	–	0.3	–	40	4	3	50
40	–	0.3	–	40	4	3	60
50	–	0.3	–	40	4	3	70
56	0.3	0.3	45	40	4	3	80
63	0.3	0.3	45	40	4	3	90
75	0.4	0.3	50	40	4	4	100
90	0.5	0.4	70	50	5	5	150
110	0.6	0.5	85	60	5	5	220
125	–	0.5	–	70	5	5	280
160	0.8	0.7	110	90	5	5	450
200	–	0.7	–	100	5	5	570
200[2]	–	0.8	–	110	5	5.5	700
250	–	0.8	–	110	5	5	900
250[2]	–	1.0	–	120	5	6	1100
315	–	1.0	–	140	6	6	1400
315[2]	–	1.3	–	150	6	7	1750

– Not available

1) If Geberit HDPE is welded with Geberit Silent-db20, the warm-up time of Geberit Silent-db20 applies.

2) Geberit HDPE pipes PN4

Geberit pipes and fittings

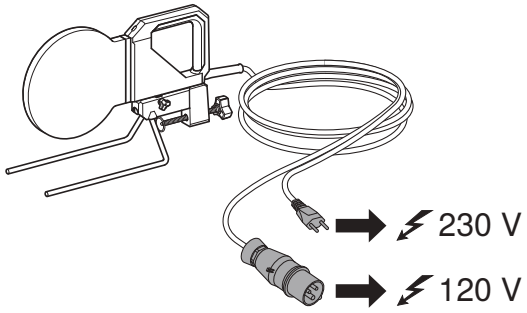
⚠ WARNING

Risk of injury from burns

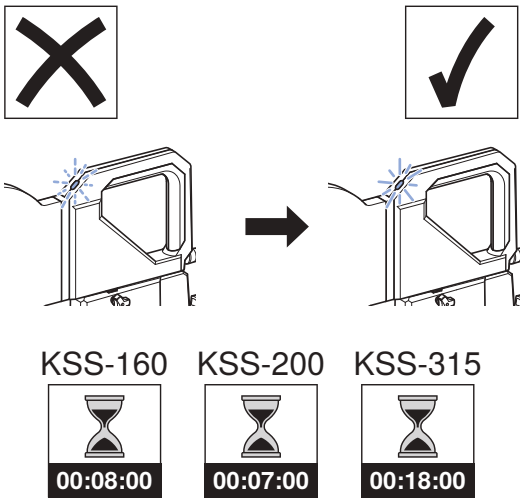
Risk of burns from hot Geberit welding plate.

- ► Do not touch the welding plate during operation or during the cooling-down phase.
- ► Wear protective gloves.
- ► Insert the welding plate into the provided stand during breaks in work.

1 Connect the mains plug to the power supply system.

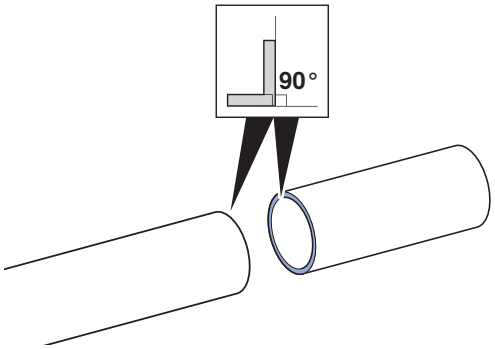


The indicator light flashes red during the heat-up phase. The indicator light lights up green as soon as the welding temperature is reached.



KSS-160	KSS-200	KSS-315
00:08:00	00:07:00	00:18:00

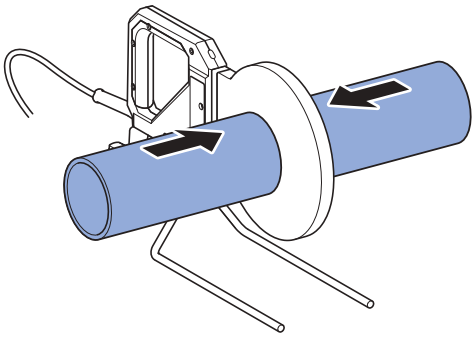
2 Cut pipes or fittings to length at a right angle and clean heavily soiled surfaces.



Heating pipes or fittings:

- d32 only by hand
- d40–75 by hand or with a Geberit welding machine
- d90–315 only with a Geberit welding machine

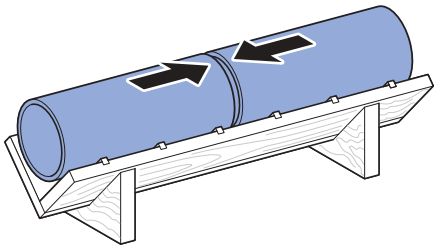
▶ Heat pipes or fittings by pressing the side to be welded against the Geberit welding plate with the required contact pressure.



Connecting pipes or fittings:

- d32 only on the jointing guide
- d40–75 on the jointing guide or with a Geberit welding machine
- d90–315 only with a Geberit welding machine

▶ To achieve a high-tensile joint between pipes or fittings, apply even pressure to bond the pipes or fittings together immediately after heating.



Butt welding by hand

Butt welding can be carried out by hand up to d75. The Geberit welding machine Universal or Media must be used from d90.

✓ Pipes are dry and clean.

1 Cut pipes to length at a right angle to the pipe axis.

2 Heat pipe ends.

3 Press pipe ends gently onto the plate.

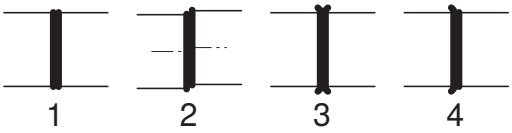
4 Only hold pipe ends in such a way that heat can flow in evenly.

5 Immediately connect pipe ends axially after welding bead has formed.

6 Slowly increase contact pressure to reference value.

7 Check weld seam.

⇨ Result



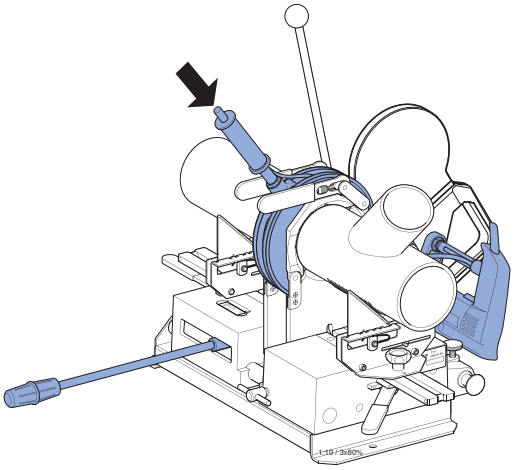
1 Perfectly
2 Incorrect, off the axis
3 Incorrect, contact pressure too high at start of welding
4 Incorrect, uneven welding temperature

Do not accelerate cooling-down process with cold objects or using water.

Butt welding with a machine

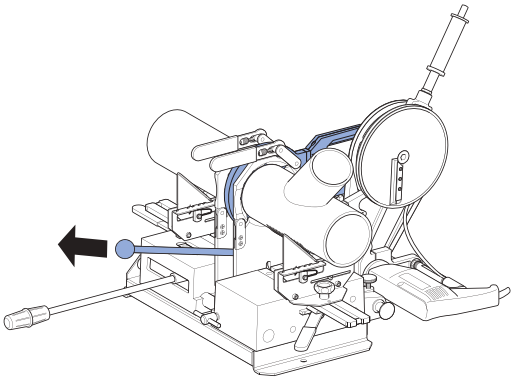
1 Align and clamp fittings or clean pipe ends that have been cut at a right angle in the welding machine.

2 Surface plane pipe ends at a right angle.



3 Press the pipes ends gently against the folded-in welding plate.

4 Only hold pipe in such a way that the heat can flow in evenly.

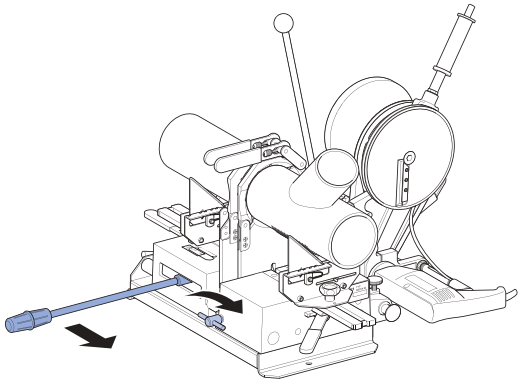


5 Move the tension devices apart after the welding bead has formed.

6 Swing out the welding plate.

7 Immediately connect the pipe ends.

8 Continuously increase contact pressure to the prescribed value during the prescribed time.

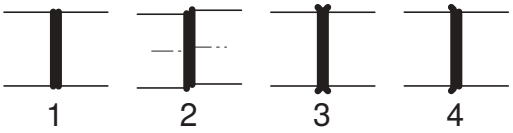


9 Fix pipes/fittings with a holder and allow them to cool down.

10 Release the holder and unclamp the welded pipes/fittings.

11 Check weld seam.

⇨ Result



1 Perfectly
2 Incorrect, off the axis
3 Incorrect, contact pressure too high at start of welding
4 Incorrect, uneven welding temperature

Welding joint with an electrofusion coupling

Welding joints on pipes and fittings can be created with Geberit electrofusion couplings and Geberit electrofusion tools with the Geberit welding systems. In order to ensure the quality of the welding joint, electrofusion couplings as well as the pipes and fittings must be adapted to the automatic control of the welding by means of the electrofusion tool.

Geberit electrofusion couplings must only be processed with approved electrofusion tools.

Figure 156: Geberit electrofusion coupling with indicator (d40–160)

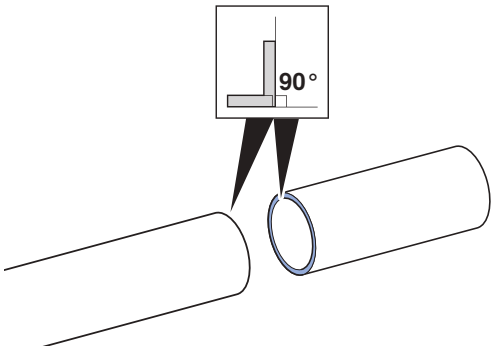
Creating an electrofusion connection

Electrofusion tools are equipped with an automatic mechanism that prevents a double weld when a coupling connection cable is connected.

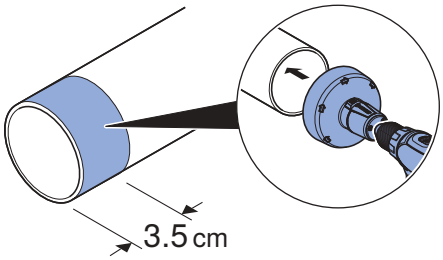
The required welding time is adjusted automatically in accordance with the ambient temperature.

✓ Pipes, fittings and welding joints are dry and clean.

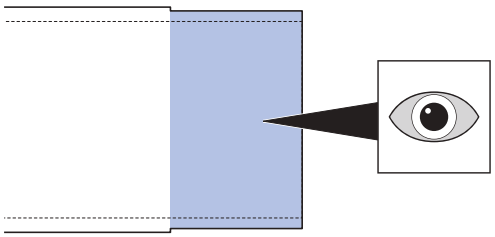
1 Cut pipes or fittings to length at a right angle and clean heavily soiled surfaces.



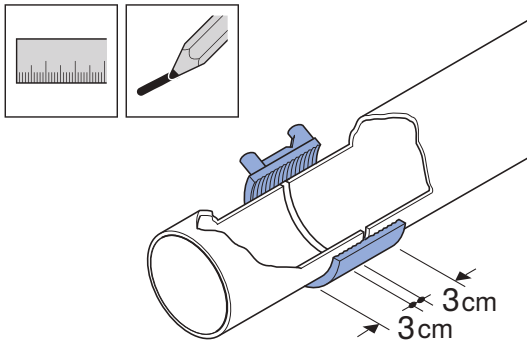
2 Scrape pipe/fitting surface in the insertion area of the electrofusion coupling with a Geberit pipe scraper or standard scraper (knife). Only remove a thin layer evenly from the top oxide layer. No recesses must form.



The scraping must be checked by the user after the completion of the scraping procedure. In the event of incomplete scraping, the oxide layer must be manually removed at the affected positions on the pipe surface.



3 Mark the insertion depth of 3 cm on the pipes sections/fittings.



4 Insert pipe sections/fittings in the electrofusion coupling and check insertion depth: Ensure the ends are parallel

5 Connect device to mains voltage.

⇨ The mains connection indicator light ϟ lights up.

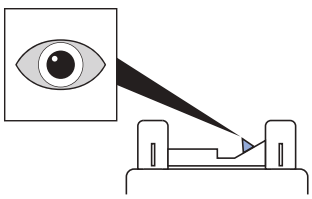
6 Connect the coupling connection cable with the Geberit electrofusion coupling / Geberit electrofusion tape.

⇨ The electrofusion machine will show a ready indicator

7 Press the start button.

⇨ Welding is completed after approx. 80 seconds.

⇨ The protruding yellow indicator on the electrofusion coupling shows that the welding has been performed.



Welding joint with a Geberit HDPE electrofusion coupling with integrated thermal fuse

Welding joints on pipes and fittings can be created with Geberit HDPE electrofusion couplings with integrated thermal fuse and approved electrofusion tools.

Figure 157: Geberit HDPE electrofusion coupling with integrated thermal fuse (d200–315)

The Geberit electrofusion couplings with integrated thermal fuse have 2 fuses that switch off the welding current once the corresponding temperature is reached. The same electrofusion coupling with integrated thermal fuse cannot be welded a second time.

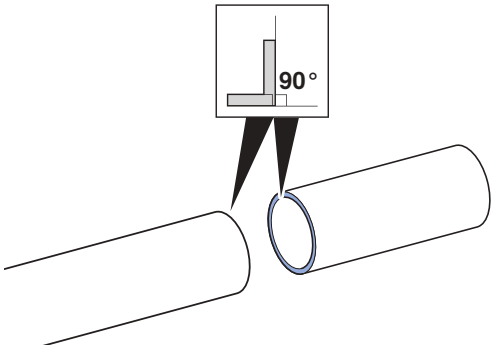
The voltage of the welding tool must be at least 200 volts under load or after turning on the starter switch. Therefore, no other devices must be connected during the welding process.

Pipes with larger diameters are prone to ovalisation especially during storage. Geberit pressure rings must be used in order to achieve a good welding result.

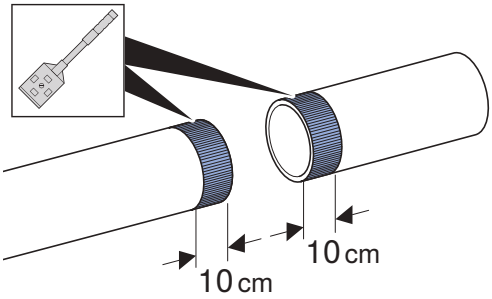
Figure 158: Geberit pressure ring

Creating welding joints with an electrofusion coupling with integrated thermal fuse

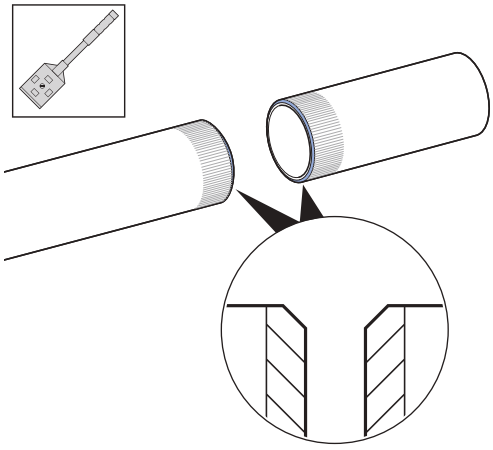
1 Cut pipes or fittings to length at a right angle and clean heavily soiled surfaces.



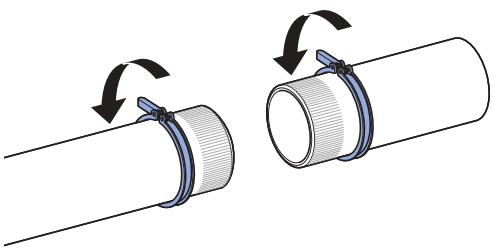
2 Scrape pipe or fitting surface in the insertion area of the electrofusion coupling with integrated thermal fuse with a standard pipe scraper. Only remove a thin layer evenly from the top oxide layer. No recesses must form.



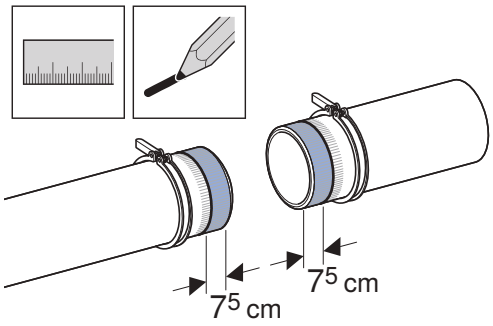
3 Debur and lightly chamfer pipe ends.



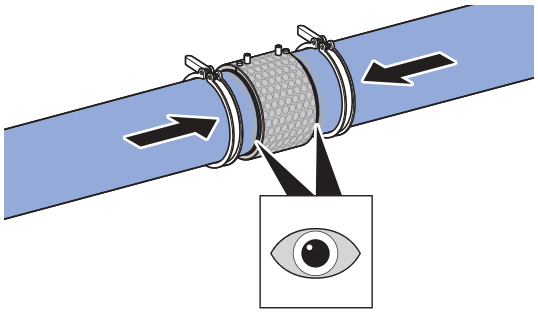
4 Attach pressure rings.



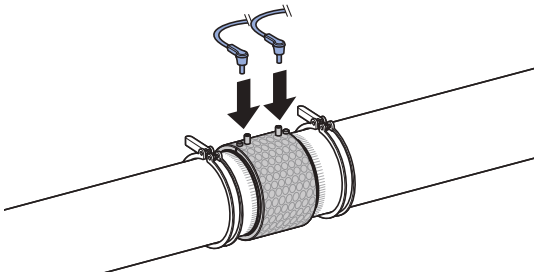
5 Mark clean pipe sections/fittings in the insertion area of the electrofusion coupling with integrated thermal fuse with the insertion depth of 7.5 cm.



6 Insert pipe sections/fittings in the electrofusion coupling with integrated thermal fuse and check insertion depth. The axes of the welding ends must match.



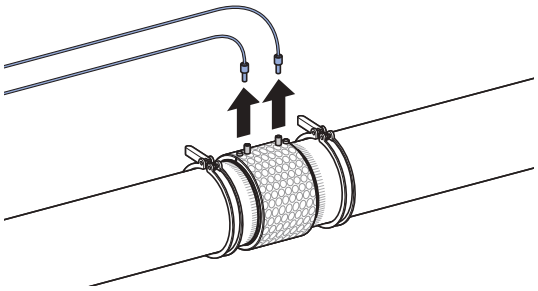
7 Connect coupling connection cables to the electrofusion coupling with integrated thermal fuse.



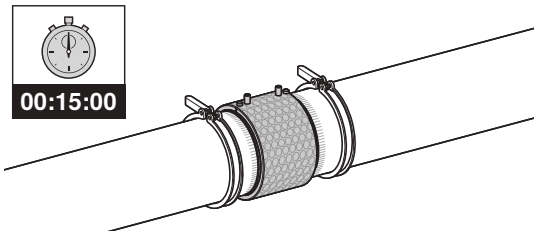
The welding time is dependent on the ambient temperature:


-10 °C	=	8–10 min.
0 °C	=	7–9 min.
10 °C	=	6–8 min.
20 °C	=	5–7 min.

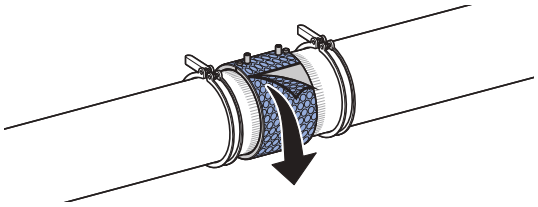
8 Pull off the coupling connection cable.



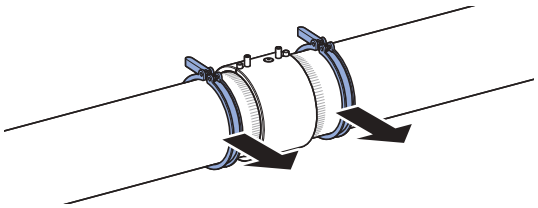
9 Allow electrofusion coupling with integrated thermal fuse to cool down for 15 minutes.



10 Remove foil from the electrofusion coupling with integrated thermal fuse.



11 Remove pressure rings.



5.6.2 Creating anchor points with electrofusion tape

The Geberit electrofusion tape is used to create anchor points for rigid installation on Geberit HDPE and Silent-db20 pipes. The Geberit electrofusion tape is not a pipe joint.

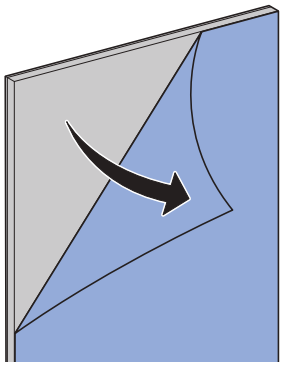
Figure 159: Geberit electrofusion tape for anchor point (d50–315)

Geberit electrofusion tape must only be processed with approved electrofusion machines.

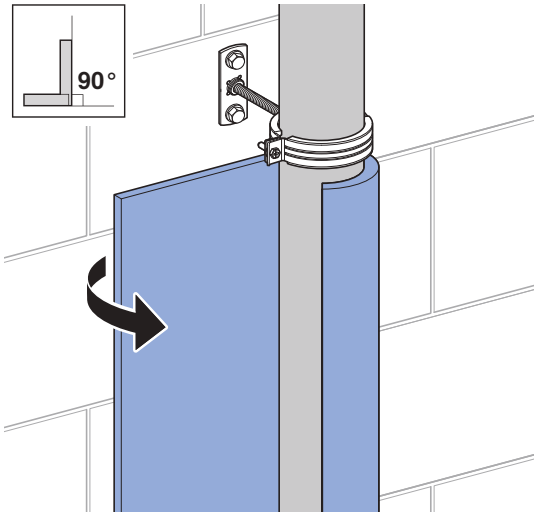
5.6.3 Installing the Geberit Isol Flex sound insulation mat

For detailed information on cutting the sound insulation mat for the common fittings and couplings, see the complete installation manual for the Geberit Isol Flex sound insulation mat.

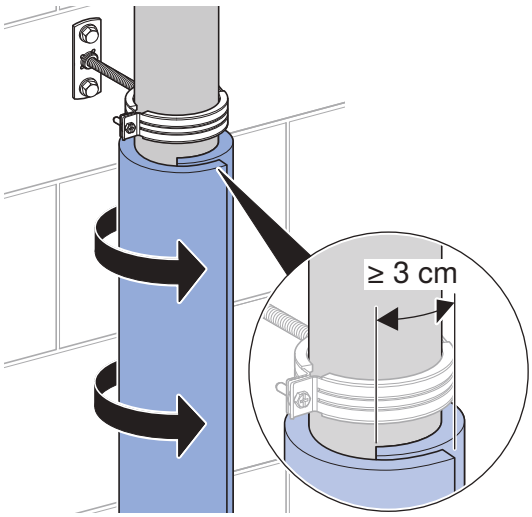
1 Remove backing film from the sound insulation mat.



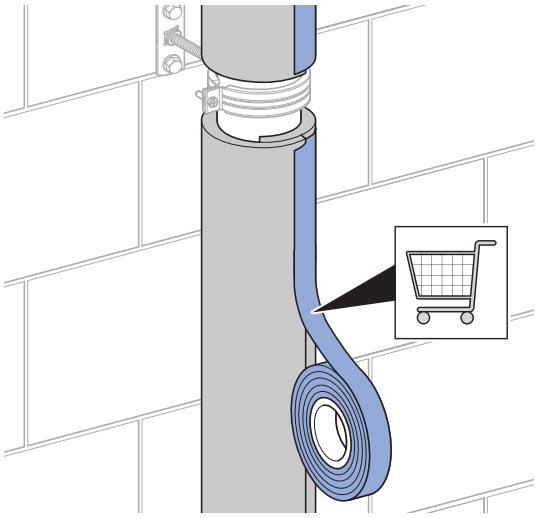
2 Position sound insulation mat around pipe.



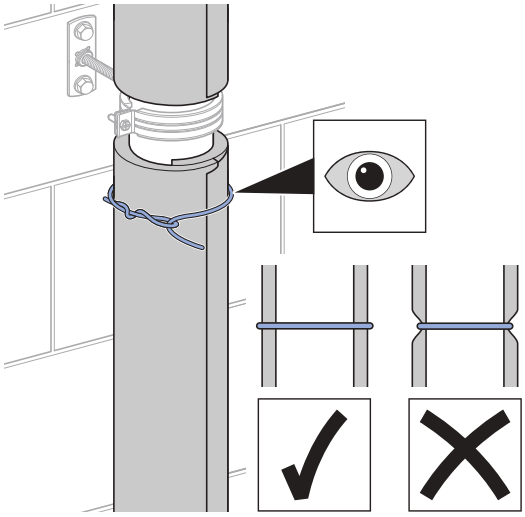
3 Stick down sound insulation mat.



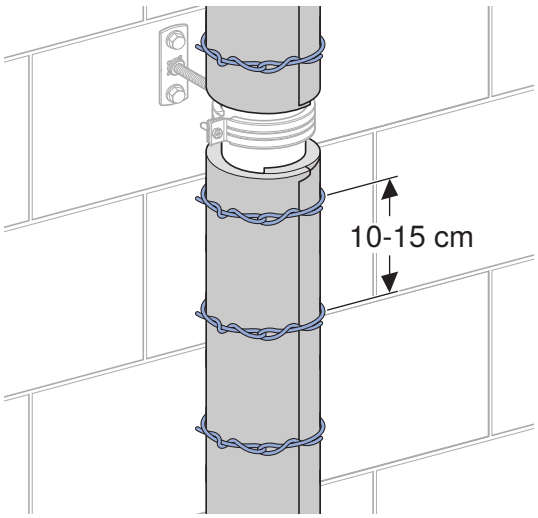
4 Tape off material overlap with suitable insulating adhesive tape.



5 Secure bonding of the sound insulation mat with binding wire.

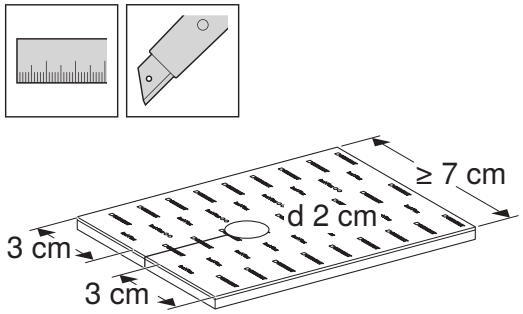


6 Attach binding wire.



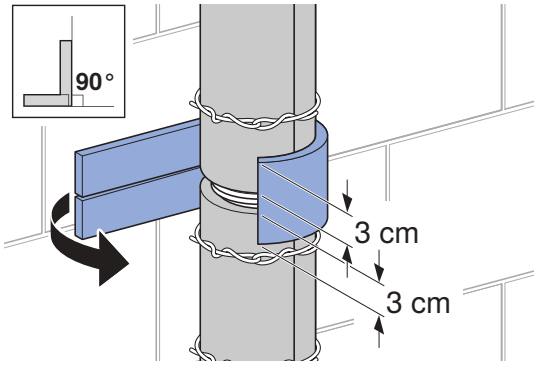
7

Measure and cut sound insulation mat.



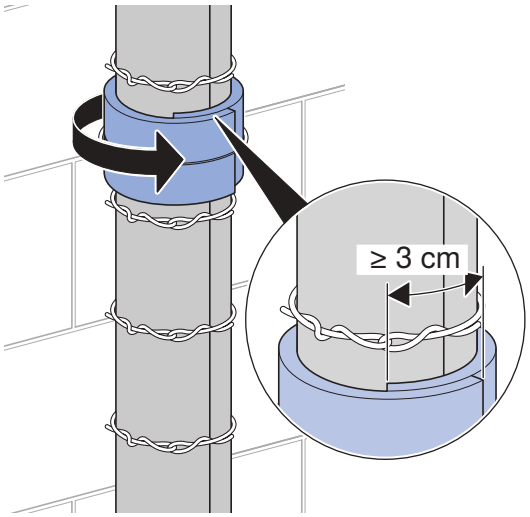
8

Wrap sound insulation mat around pipe bracket and stick down.

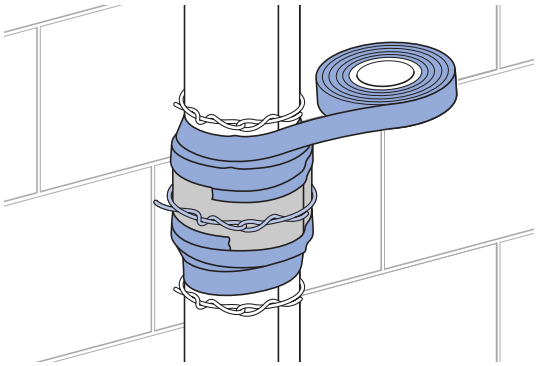


9

Secure bonding of the sound insulation mat with binding wire.



10 Tape off material overlap with suitable insulating adhesive tape.



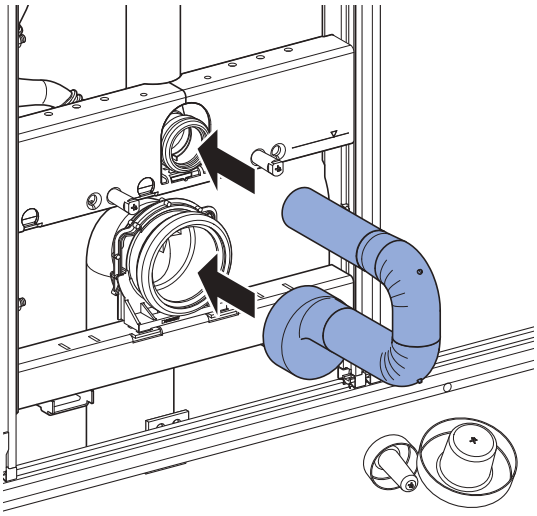
5.7 COMMISSIONING

5.7.1 Leak test

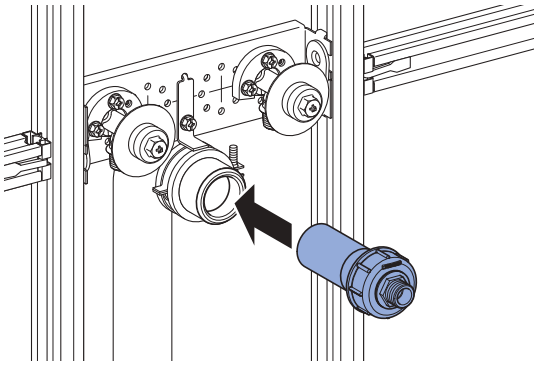
Leak tests on sanitary installations are an integral part of quality assurance. Although drainage systems do not carry pressurised media in contrast to supply systems, the waste water can still result in material damage in the case of leaks. For this reason, the drainage system must be rinsed thoroughly before closing the ducts in order to be able to identify and repair leaks.

Geberit recommends the following procedure for performing the leak test:

- Start the leak test on the sanitary appliances at the top pipe branch. This means that the entire length of the stack can be checked right at the beginning.
- Check all connections to the sanitary appliances and all branch pipes and stacks.
- Connect flush bends and connection bends to perform a leak test on WCs with a concealed cistern.



- Install an extended straight adapter with male thread and plain end to each connection in order to ensure that the first connection point is included in the leak test. The extended straight adapter can be used for all waste fittings and traps.



The country-specific regulations and standards for performing the leak test must be observed.

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