KG2000 Installation-Instructions

The recommendations of the DIN 1986-1, DIN 1986-4, DIN EN 1610 and DIN EN 752 apply for the execution and installation of wastewater pipes.

1. SCOPE

The following instructions apply for the use and installation of pressureless KG2000 solid wall pipe systems made of mineral-reinforced polypropylene (PP-MD) installed in the ground.

They apply for:

- may green (RAL 6017) KG2000 pipes according to DIN EN 14758-1 with ring stiffness SN 10
- KG2000 pipes that are may green (RAL 6017) on the outside and pure white (RAL 9010) on the inside according to DIN EN 14758-1 with ring stiffness SN 16
- KG2000 pipes that are blue (RAL 5015) on the outside and pure white (RAL 9010) on the inside according to DIN EN 14758-1 with ring stiffness SN 16

(The guidelines for the use of flammable building materials in construction and the special installation information for domestic drainage pipe installations must be observed for pipes within buildings.)

2. APPLICATION FIELD

The sewage pipes and fittings made of PP-MD are supplied with a plug-in sleeve and an SBR seal factory inserted. Connections that cannot be pulled apart can be created using the IP-plus welding system by the company Sabug GmbH (www.sabug.de).

The sewage pipes and fittings made of PP-MD can be used as:

- a main line in the ground, below or outside buildings (UD)
- a main line inaccessible in a base plate
- a collector pipe
- a pipe for condensation from furnaces
- a connection duct and connecting pipe in gravity drainage systems installed in the ground to discharge wastewater and rainwater
- a ventilation system, hygienically suitable for fresh air acc. to VDI 6022; radon-proof
- a geothermal heat exchanger system
- a main line in water protection zones II and III

Taking into account the Water Resources Act according to § 62, they are suitable for many applications but especially for:

- fuel station wastewater (only with NBR seal)
- canteen wastewater (only with NBR seal)
- slurry, manure, seeping silage juices (only with an IP welding ring)

They can be operated up to approx. 40°C with a heat tracing system.

The recommendations of the DIN 1986-1, DIN 1986-4 and DIN EN 1610 apply for the execution of wastewater pipes.

The KG2000 products are resistant to a constant wastewater temperature of 80° C. They can also withstand wastewater temperatures of 110°C for short periods (1-5 min. per day). for prolonged periods (60 minutes per day), they withstand wastewater temperatures of 90° C.

KG2000 sewer pipes and fittings are suitable for discharging chemically-aggressive wastewater in a range of pH 1 (acidic) to pH 13 (alkaline). They are resistant to household wastewater according to DIN 1986-3. The norm ISO TR 10358 (new for supplement 1 DIN 8078) must be observed for discharging industrial wastewater.

They can be laid in heavy duty areas (SLW 60) with a minimum coverage of 0.5 m in line with the structural analysis guidelines and a maximum cover of 9 m in line with the structural analysis guidelines, and can also be installed at groundwater level.

KG2000: Installation-Instructions

3. STRUCUTURAL ANALYSIS PROOF

In case of differences to the structural analysis guidelines, structural analysis proof must be provided. The object questionnaire needs to be completed here (https://www.ostendorf-kunststoffe.com/services/objektfragebogen). In compliance with ATV-DVWK-A 127, the vertical deformation of the installed pipes may not exceed 6%.

4. TRANSPORTING AND STORING PIPES AND PIPELINE PARTS

The pipeline parts must be transported with suitable vehicles and loaded and unloaded by qualified persons. The parts of the pipe must be protected against damage. If possible, the pipes should lie flat along their entire length during transportation to prevent sagging and bending. Impacts, especially at temperatures close to zero, should be avoided.
Pipes and fittings can be stored outdoors. The following should be taken into account when storing pipes:

- The pipes must be stored in such a way that correct stacking is ensured and deformations are avoided.
- The rows of pipes can be stored with and without intermediate timber blocks.
- The pipe sleeves should be exposed in the horizontal and vertical direction during storage.
- The stacking height should not exceed 2 m (max. 2 pallets).

Rubber sealing elements may not be stored outdoors for extended periods, unless they are protected adequately.

5. PIPE TRENCH AND PIPE INSTALLATION

5.1 Trench width

The minimum trench width, measured near the base of the pipe, is stated in the following tables according to the trench depth and/or nominal width DN/OD. The respectively larger value is decisive.

Minimum trench width according to the installation norm DIN EN 1610 depending on the nominal width DN/OD

Nominal width DN/OD	Minimum trench width (OD_h + x) (m)		
	filled trenches	open trenches ß > 60°	open trenches ß ≤ 60°
≤ 225	OD_h + 0.40	OD_h + 0.40	
> 225 to ≤ 350	OD_h + 0.50	OD_h + 0.50	OD_h + 0.40
> 350 to ≤ 700	OD_h + 0.70	OD_h + 0.70	OD_h + 0.40

With respect to OD_h + x, x/2 corresponds to the minimum clearance between the pipe and the trench wall and/or trench shoring. The OD_h is the outer diameter of the pipe in metres and ß is the slope angle of the unshored trench measured above the horizontal.

Minimum trench width depends on the trench depth

Trench depth (m)	Minimum trench width (m)
< 1.00	no minimum trench width specified
≥ 1.00 to ≤ 1.75	0.80
> 1.75 to ≤ 4.00	0.90
> 4.00	1.00

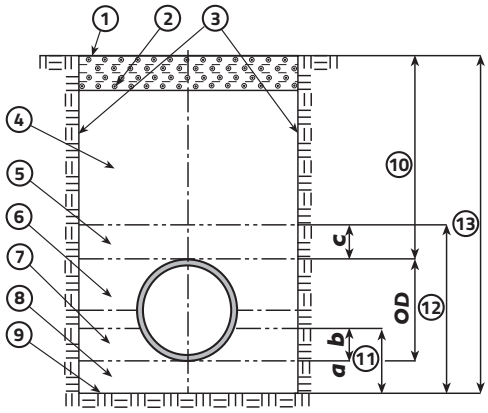
5.2 Trench drainage

The base of the trench must be free of water to ensure correct installation of the pipe and correct compaction in the pipeline zone. This is achieved by means of seepage packing material and French drains or by dewatering.

5.3 Production of the pipeline zone (pipe bedding)

5.3.1 Bedding material

The grain size of the bedding material for the pipeline zone depends on the diameter of the pipe:
max. 22 mm for DN/OD ≤ 200
max. 40 mm for DN/OD > 200 to DN/OD ≤ 500
max. 60 mm for DN/OD = 630
Granular, loose building materials, such as poorly graded gravel, material with graduated grain (compactable), sand, all-in mixed grain sizes and crushed building materials, are allowed. These may also be recycling building materials.



1) Surface
2) Lower edge of the road structure or rail construction if there is one
3) Trench walls
4) Main filling (3.6)*
5) Cover (3.5)*
6) Side filling (3.12)*
7) Upper bedding layer, b
8) Lower bedding layer, a
9) Trench base
10) Cover height (3.3)*
11) Bedding thickness (3.1)*
12) Thickness of the pipeline zone (3.4)*
13) Trench depth (3.13)*
a) Thickness of the lower bedding layer
b) Thickness of the upper bedding layer
c) Cover thickness
OD_V vertical outer diameter

*The references in the key come from the DIN EN 1610.

5.3.2 Lower bedding layer

The lower bedding layer must be created and compacted depending on the incline. Unless otherwise specified, the thickness of the lower bedding layer a, measured below the base of the pipe, may not be less than 100 mm in normal soil conditions and less than 150 mm on rock or very firm soil. This layer is part of the pipe bearing and should guarantee even distribution of the stress. It must be created carefully so that no weight is focussed on specific points. Suitable recesses (head-holes) must be created near the sleeves, and tamped correctly again after the pipes have been connected.

5.3.3 Upper bedding layer

The thickness of the upper bedding layer depends on the bearing angle and must correspond to the structural analysis calculations. This is also part of the pipe bearings and therefore needs to be compacted carefully. Backfilling of the pipeline at the side below the pipe is very important. When installing and compacting the bedding material, care must be taken to ensure that the position and height of the pipeline are not changed. The pressure distribution on the circumference of the pipe primarily depends on the design of the pipe bearing. The bearing angle is decisive for the deformation proof. According to the structural analysis requirements, this lies between 60° and 180°. **According to ATV 127, a fixed concrete support for plastic pipes is not permitted due to possible edge pressure.**
The bearing density of the soil in the upper bedding layer assumed in a static calculation must be achieved by appropriate compaction. It must be verified on request (e.g. by measuring the Proctor density or by dynamic probing).

5.3.4 Upper bedding layer: Filling and compacting the side filling

The side filling should be backfilled and compacted on the left and right at the same time. This supports the pipe in the bearing area to keep vertical deformation to a minimum. Compaction should be carried out manually or with light compaction equipment. The pipeline may not be moved. Sand cones or other aids may be helpful.
If trench shoring has to be removed after the side filling has been produced, careful re-compaction is essential after the trench shoring has been gradually removed.

KG2000: Installation-Instructions

5.3.5 Upper bedding layer: Filling and compacting cover zone c

A cover zone c 150 mm thick in the compacted state and 100 mm thick above a joint must be created above the pipe. This compacting should also be carried out manually or with light compaction equipment.

A further 15 cm must then be backfilled and compacted again by hand or with light mechanical equipment.

5.3.6 Main filling

Medium-weight compaction equipment can be used from 30 cm pipe covering. The pipe trench should be compacted in approx. 30 cm sections in layers.

High loads on the covered pipeline during the construction phase, e.g. driving with heavy construction equipment or vehicles, should be avoided.

Mechanical compaction with medium-heavy to heavy compaction equipment directly above the pipeline should only be carried out when there is a minimum cover of 1m.

Equipment type		Service weight (kg) or width (m) and centrifugal force (kN)	Compaction classes								
			Non-cohesive soils (GE, GW, GI, SE, SW, SI)			Low cohesive soils (GU, GT, SU, ST)			Cohesive mixed soils, silt (GU, GT, SU, ST, UL, UM)		
			Suitability	Filling height cm	No. transitions	Suitability	Filling height cm	No. transitions	Suitability	Filling height cm	No. transitions
1. Light compacting equipment (mainly for pipeline zone)											
Vibratory tamper	Light	- 30	+	- 20	2 - 4	+	- 20	2 - 4	-	-	-
	Medium	30 - 60	o	20 - 40	2 - 4	o	20 - 30	3 - 4	-	-	-
	Heavy	60 - 100	o	30 - 50	2 - 4	o	20 - 40	3 - 4			
Surface shaker	Light	- 100	+	- 20	3 - 5	+	-15	4 - 6	-	-	-
	Medium	100 - 300	o	20 - 30	3 - 5	o	15 - 25	4 - 6	-	-	-
Attachment compactor	Small	< 0,4m und < 25kN	+	20 - 40	5s - 12s	+	30 - 40	5s - 12s	-	-	-
2. Medium and heavy compacting equipment (above the pipeline zone, from approx. 1 m)											
Vibratory tamper	Medium	30 - 60	+	20 - 40	2-4	+	20 - 30	2 - 4	o	10 - 30	2 - 4
	Heavy	60 - 100	+	30 - 50	2-4	+	20 - 40	2 - 4	o	20 - 30	2 - 4
Surface shaker	Medium	100 - 300	+	20 - 40	3-5	o	20 - 40	3 - 5	-	-	-
	Heavy	300 - 750	+	30 - 60	3-5	o	30 - 50	3 - 5	-	-	-
Vibratory rollers	Heavy	600 - 8000	+	30 - 80	4-6	+	30 - 60	4 - 6	o	30 - 60	4 - 6
Attachment compactor	Medium	0,4 m - 0,75 m und 25kN - 75kN	+	30 - 75	5s - 12s	+	30 - 70	5s - 12s	o	30 - 70	8s - 15s
	Large	> 0,75 m und > 75 kN	+	50 - 100	5s - 12s	+	50 - 100	5s - 12s	+	50 - 100	8s - 15s

+ = recommended o = usually suitable - = unsuitable

Application areas of recommended mechanical compacting equipment, source DWA-A139 /last update March 2019.

The above information represents average performance values. In unfavourable conditions (e.g. relatively high water content, trench shoring), it may be necessary to reduce the specified filling heights, while in particularly favourable conditions it is possible to exceed them.

Precise values can only be determined by a trial compaction.

5.3.7 Special types of bedding or support constructions

In the case of unstable ground, such as peat or quicksand, the base of the trench has a low load-bearing capability for the pipeline bedding, and more settling or settling differences can be expected. In this case, special measures are necessary; for instance, it may be necessary to exchange the soil, stabilise the soil, Soil stabilisation (e.g. use of geotextiles, wood mesh or filter gravel) or use poles and load-bearing ledgers to support the pipeline. The pipes always need lateral support in this case. Steps must be taken to ensure a bedding layer between the ledgers and the pipes to prevent direct contact.

5.3.8 Encasing in concrete

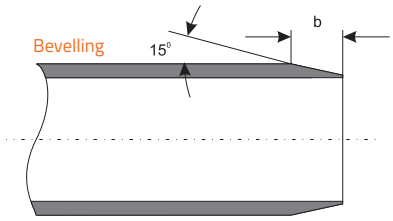
Pipes and fittings made of PP may be covered in concrete directly; however, the following information must be observed:

a) Optional: Cover the sleeve gap with tape to ensure that no cement slurry can penetrate and impair the function of the plug-in sleeve.

b) Secure the pipes to prevent buoyancy. The distance between the attachments should be selected so that no impermissible bending can occur (creation of water pockets).

c) Thermally-related changes in length must be taken into account both for installation and in practical use.

6. SHORTENING THE PIPES



Fittings may not be shortened, otherwise there is no guarantee that they will not leak.

A fine-tooth guide saw, a pipe cutter or a suitable cutting disc can be used to shorten the pipes to the required length. Tools used for cutting wood are also suitable, e.g. hand-held circular saws. Observe the safety regulations for the pipe trench!

The cutting line must be marked on the pipe! The pipe must always be cut at right angles to the pipe axis.

If the burr is not removed from the pipe immediately and the pipe is not bevelled, this must be carried out manually before installation. We recommend a finishing tool or a large file for this. Fittings may not be shortened, otherwise there is no guarantee that they will not leak.

DN/OD	110	125	160	200	250	315	400	500	630
b mm approx.	6	8	10	12	12	15	19	24	30

7. INSTALLATION OF THE PIPELINE

7.1 General

Work on installing the pipe should start at the lower end of the pipe; pipes are usually installed so that the sleeves point toward the upper end. In case of longer work interruptions, the pipelines must be protected to prevent penetration of materials (sand, dirt etc.). To this end, the ends of the pipe should be closed temporarily. Caps or end plugs should only be removed just before the pipes are connected.

7.2 Production of the plug connection

The pipe connection must be created carefully by experienced specialists. The enclosed sealing rings must be used to guarantee that there are no leaks. The pipe sleeve, the spigot end of the pipe and the seal must be checked for damage and cleaned before the connection process. Damaged pipes or seals may not be used or must be replaced.

If necessary, the insertion depth should be marked with a pen on the spigot end of the pipe to check whether the maximum insertion depth has been reached when the pipes are connected.

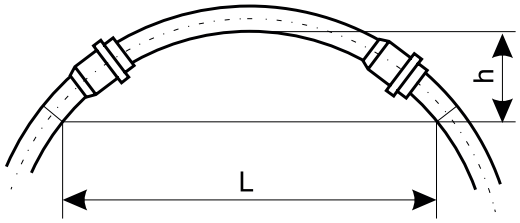
Now, slightly turn the spigot end into the sleeve until it tangibly reaches the stopper or the plug-in marking. The pipes must be connected parallel to the axis, either manually or using levers.

If levers are used, a squared timber must be placed crosswise in front of the pipe to ensure better force distribution when pushed together. Pipes and fittings must not be inserted using hammer blows and excavator shovels, as the risk of pipe damage is very high.

In exceptional cases, the flexibility of the plastic pipes DN/OD 110 to 200 allows them to be installed in a curved manner. The values of the following table may not be exceeded here.

Gauge h max. and/or bending radii R in m at a length L of:

DN/OD	110	125	160	200	250	315
8 m	0.24	0.21	0.17	0.13	0.11	0.08
12 m	0.54	0.48	0.38	0.30	0.24	0.19
16 m	0.97	0.85	0.67	0.53	0.42	0.34
R	33	38	47	61	75	95



Alternatively to the information in the table, a 1° deflection of the pipe connection in the KG2000 System is possible thanks to the patented 3-fold seal according to DIN EN 681-1.

KG2000: Installation-Instructions

8. STABILISATION OF THE PIPELINE ZONE

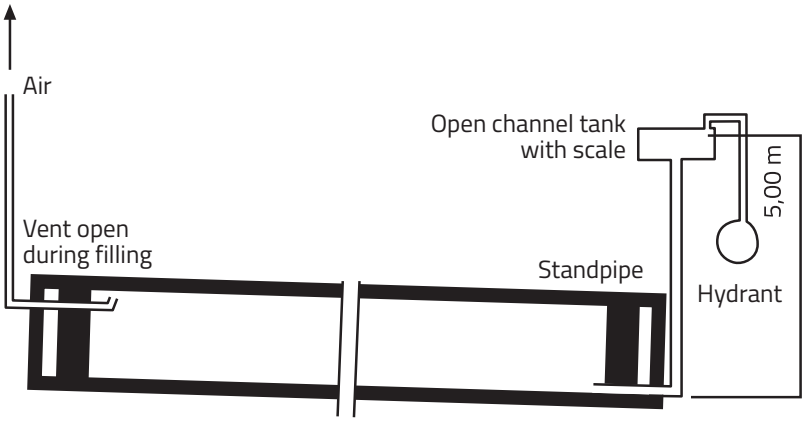
The pipeline zone can be designed in line with the drawing (see Page 1). Geotextiles can be used on the ground of the pipeline zone to prevent the earth becoming soft. Additional stabilisation of the pipeline zone can be achieved using plastic grids, wood grids or filter gravel.

9. CHECKING FOR LEAKS

The pipelines, shafts and inspection openings are tested for leaks either with air (method 'L') or with water (method 'W'). With respect to the method 'L', the number of corrective steps and repeat tests is unlimited in case of leaks. In case of one-off or repeat failure of the test with air, it is allowed to test with water and the result of the water test alone is decisive.

Testing with water

All openings of the tested section of pipeline, including all branches and junctions, must be closed in a watertight and pressure-tight manner, and secured so that they cannot be forced open. We recommend, especially in the outdoor sections, anchoring the number of fittings by positioning poles or using appropriate securing clips to prevent changes to the position. Pipes and test plugs on straight pipelines also require appropriate support to counter horizontal pressure forces. The pipes that have not yet been covered should be secured to prevent changes of position. The pipeline must be filled with water so that it is free of air. Therefore it is filled slowly from the lowest point of the pipe so that the air in the pipe can escape through the adequately dimensioned venting points at the highest point of the pipeline.



An adequate pause (1 hour) should be planned between filling and testing the pipeline to allow any air left in the pipe from the filling process to escape gradually. The test pressure is measured at the deepest point of the test section. Open channel pipes must be tested with 0.5 bar over-pressure. The test pressure, which must be applied before the start of the test, must be maintained for 30 minutes according to DIN EN 1610. If necessary, the water quantity required for the water intake must be constantly refilled and measured.

The test requirement is met, if the volume of the added water is not greater than 0.15 l/m² in 30 min for pipelines.
Remark: m² describes the wetted inner surface.

Testing with air

General information: The alternative air pressure test is a standard method thanks to its many advantages over water pressure tests. Testing with air (method 'L'): Testing times for pipelines (without shafts and inspection openings) after taking the pipe diameters into account are provided as recommendations in the following table:

The method should be determined by the client. For reasons of safety, please handle and test carefully. Ensure that the blocking elements sit tightly!

Test methods	Test pressure P_0* (mbar)	Pressure loss Δp (kPa)	DN/OD 110 (test time in min.)	DN/OD 125 (test time in min.)	DN/OD 160 (test time in min.)	DN/OD 200 (test time in min.)	DN/OD 250 (test time in min.)	DN/OD 315 (test time in min.)	DN/OD 400 (test time in min.)	DN/OD 500 (test time in min.)	DN/OD 630 (test time in min.)
LC	100	15	3	3	3	3	4	5	5	7	9
LC**	100	15	7	7	7	7	10	14	14	17	24

* Pressure above atmospheric pressure

** Test times apply for use in drinking water abstraction areas

10. INSTALLATION INSTRUCTIONS

1. If necessary, our KG2000 pipes can be shortened to the required length on the building site. A saw, standard flex or a professional pipe cutting system can be used for this.

2. Burr or areas of unevenness that are created when the pipes are shortened should be removed with suitable tools. Also, care should be taken to ensure that the interface has a new clean bevel. A flex or file can be used for this. For cutting and bevelling the pipes, we recommend the company Marcrist www.marcrist.de

3. The insertion depth of the spigot end in the sleeve should be clearly marked to allow controls to check that the spigot end has been inserted fully.

4. The spigot end of the pipe and the inside surface of the sleeve must be clean and free of damage. The surface of the inserted sealing ring in the bead must be well lubricated all round with a suitable lubricant. The cleaned spigot end can also optionally be provided with lubricant.

5. Pipes and fittings in smaller nominal widths can be connected easily by hand. We recommend using a tool for larger nominal widths, for instance a squared timber.

6. Once a section of piping has been installed, it is vital that sand be filled beneath the pipes. It is important that once the sand has been filled that the pipe is weighed down. This guarantees that the pipe lies flat on the ground and the recess are well filled.

7. The position must be checked carefully once the pipe system has been connected.

Technical changes, misprints and errors are reserved.

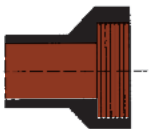
KG2000: Installation-Instructions

11. TRANSITION TO PIPE PARTS MADE OF STONEWARE AND CAST IRON

Connecting PP sewer pipes and fttings to stoneware pipe K socket

If stoneware piping ends with a socket, the PP pipe is connected using the connection piece for stoneware pipe socket (KG2000-USM). The connection is sealed with the stoneware pipe roll ring, which is mounted onto the connection piece and inserted into the stoneware pipe socket.

Stoneware pipe – K socket for roll ring



stoneware pipe
socket for roll ring

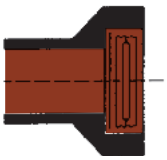
roll ring
(must be purchased from the stoneware pipe industry)

PP connection piece
KG2000-USM

Connecting PP sewer pipes and fittings to stoneware pipes with push-fit L socket

If stoneware piping ends with a L socket, the PP pipe is connected using the connection piece for stoneware pipe socket (KG2000-USM). The connecting piece is pushed into the sliding socket and no additional sealing is required.

stoneware pipe – L socket



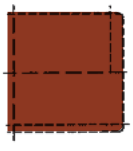
stoneware pipe
L socket

PP connection piece
KG2000-USM

Connection of stoneware pipe spigots of the standard load series to PP sewer pipes and fittings

If stoneware piping ends with an insertion end, the PP pipe is connected using the connection piece for stoneware pipe spigot end (KG2000-US). Sealing is achieved using a KG2000-US sleeve, which is integrated into the moulded part.

stoneware pipe – spigot end



stoneware pipe
spigot end
(standard load series)

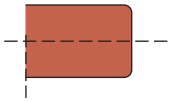
PP connection piece
KG2000-US

Connecting cast iron insertion ends to PP sewer pipes and fittings – DN/OD 110

If the DN/OD 110 cast iron pipe ends with a spigot end, the PP pipe is connected using the connection piece for cast-iron pipe (KG2000-UG). The PP connector (KG2000-UG) is always delivered without gasket. The sleeve must be ordered separately.

Push the sleeve onto the cast iron pipe spigot, then push the PP connector (KG2000-UG) onto the cast iron spigot with the sleeve.

Cast-iron pipe – spigot end



cast-iron pipe
– spigot end

GA-gasket
DN/OD 110

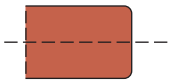
PP connection piece
KG2000-UG

Connecting cast iron insertion ends to PP sewer pipes and fittings – DN/OD 125-200

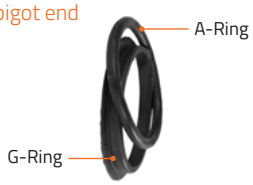
If the DN/OD 125-200 cast iron pipe ends with a spigot end, the PP pipe is connected using the connection piece for cast-iron pipe (KG2000-UG). The PP connector (KG2000-UG) is always delivered without gasket. The GA gasket set must be ordered separately.

The A-ring is a rolling ring and is used to safely guide the spigot of the pipe. The G-ring is used for sealing. First pull the A-ring onto the cast iron spigot, then fit the G-ring onto the rim of the cast iron spigot. Push the PP connector (KG2000-UG) onto the cast iron spigot with the GA rings.

Cast-iron pipe – spigot end



cast-iron pipe
– spigot end



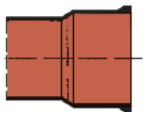
GA-set gasket
DN/OD 125, 160 and 200

PP connection piece
KG2000-UG

Connecting cast iron sockets to PP sewer pipes and fittings – DN/OD 110

If cast piping ends with a socket, the PP pipe is connected to the cast iron pipe socket without any connection piece. Put the sleeve onto the PP spigot. Push the PP spigot together with the sleeve into the cast iron pipe socket.

Cast-iron pipe – socket



cast-iron socket

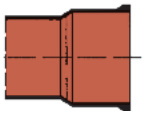
GA-gasket
DN/OD 110

PP spigot end
KG2000 spigot

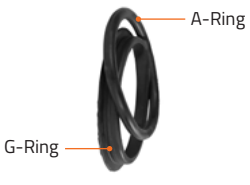
Connecting cast iron sockets to PP sewer pipes and fittings – DN/OD 125-200

If cast piping ends with a socket, the PP piping is connected to the cast iron pipe socket without any connection piece. The A-ring is a rolling ring and is used to safely guide the pipe spigot. The G-ring is used for sealing. First pull the A-ring onto the PP spigot, then fit the G-ring onto the rim of the PP spigot. Push the PP spigot together with the GA rings into the cast iron pipe socket.

Cast-iron pipe – socket



cast-iron socket



GA-set gasket
DN/OD 125, 160 and 200

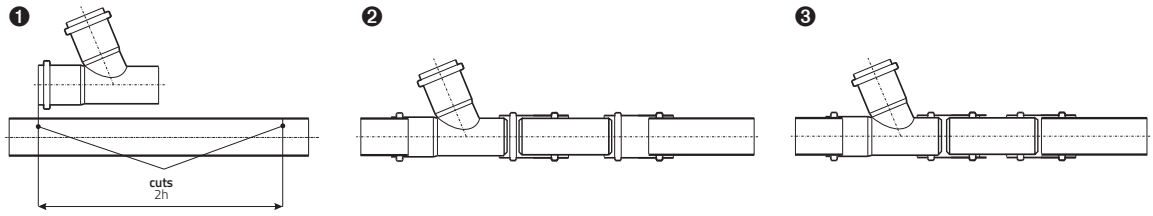
PP spigot end
KG2000 spigot

KG2000: Installation-Instructions

12. SUBSE QUENT CONNECTION TO PP SEWER PIPES

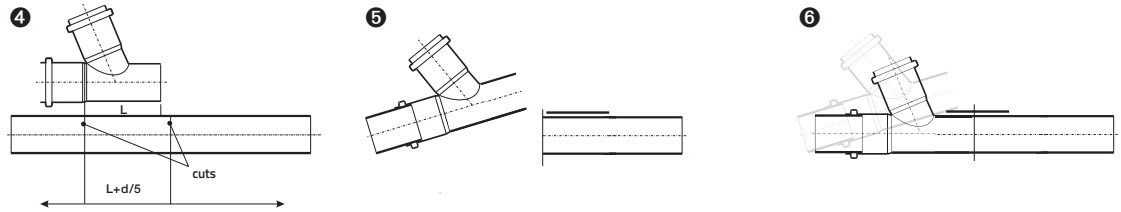
12.1 Installing a branch (procedure I)

In order to install a branch, a sufficiently long piece of pipe (length of the fittings + 2 d) is removed ❶, the pipe-ends are trimmed, cut at an angle and the branch is inserted. Sleeve sockets, with which the piping is once again closed, are pushed over both the other half of the pipe and over the adjusting piece to be inserted ❷ + ❸.



12.2 Inserting a branch (procedure II)

A piece of pipe equivalent to the total length of the branch plus a length approximately equivalent to d/5 is cut out of the piping at hand by means of cross section cuts ❹.



Both pipe ends are trimmed and slanted. A sleeve socket is then pushed over one end and the other pipe end is cautiously levered out, the branch is pushed on ❺ and the end of the pipe with the branch is brought back into the original position. The connection is made by means of pushing back the sleeve socket on the cut between the pipe and the fittings spigot end ❻.

Gebr. Ostendorf Kunststoffe GmbH · Rudolf-Diesel-Straße 6–8 · D-49377 Vechta
Tel. +49 (0) 4441 874-10 · Fax +49 (0) 4441 874-15 · verkauf@ostendorf-kunststoffe.com · www.ostendorf-kunststoffe.com

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