## KG 2000

Complete System Solutions from a Single Source

# Non-Pressure 

pipe system

## KG 2000 system advantages

## Economical, standardized high-load pipe system

The KG 2000 is a solid-wall pipe system standardized according to DIN EN 14758, which meets all the requirements of a modern sewage pipe system. The optimized polypropylene (PP-MD) has a high rigidity and optimal impact strength even at low temperatures while the measured ring stiffness is $\geq 10 \mathrm{kN} / \mathrm{m}^{2}$. The patented three-stage lip seal enables the pipe connection to be made easily and safely. Tested at 2.4 bar and with an extensive range of fittings, KG 2000 can also be used in drinking water protection zones. Its green colour, prevents any mix up with pipes and fittings of other systems. This guarantees a visible consistency of the quality and system homogeneity in sewage canals even after the pipes are installed. KG 2000 can be install according to DIN EN 1610 without any additional special requirements and can be installed in both deep and shallow installation depths under heavy traffic The robust material in combination with the wall thickness forms the basis for a high-load pipe system, which can withstand all loads in the sewage system over the long term.

## Concept



## High-load sewage pipe

KG 2000 is an extremely robust solid wall pipe with a homogeneous wall structure made from optimized PP-MD. Thanks to a special production process, KG 2000 pipes and fittings have a significantly higher modulus of elasticity and thus the perfect balance between rigidity and toughness. The high ring stiffness enables very good resilience, while the toughness makes KG 2000 particularly break-proof. The combination of these properties makes KG 2000 insensitive to impact at low temperatures, and can therefore be optimally installed even at minus degree temperatures.

## Extremely resilient

The material polypropylene has also established itself in a wide variety of areas and is particularly characterized by its excellent mechanical, chemical and physical properties. Thanks to the optimized material and the high wall thickness, KG 2000 can offer an even more robust behaviour during installation and operation. The ring stiffness measured according to DIN EN ISO 9699 is $\geq 10 \mathrm{kN} / \mathrm{m}^{2}$. Hence, KG 2000 can be used even under extreme conditions in the heavy load area (SLW 60) with a coverage of 0.5 m .


## Compliant and durable

In order to ensure the high quality and service life of pipes and fittings, high-tech production is carried out in accordance with the European standard DIN EN 14758-1. The long-term behaviour of pipes and fittings is also continuously examined by the MPA Darmstadt in a creep internal pressure test in accordance with EN ISO 1167. 30 years of experience in the direct extrusion of PP-MD, as well as permanently monitored quality make KG 2000 a recognized and proven sewage system for the next 100 years.

## Environmentally friendly

Its well thought-out construction and production make KG 2000 a particularly environmentally friendly system, with resource-saving and $\mathrm{CO}_{2}$-saving production with $100 \%$ recyclability on the one hand, and excellent groundwater protection with the help of the modern sealing system on the other. The green colour for pipes and fittings also prevents them from being mistaken and mixed up with conventional fittings. In this way, KG 2000 becomes a particularly leak-proof complete system, which, thanks to good camera inspection, is also ideally suited for later construction and warranty acceptance.

## Connection technology

## Triple protection

KG 2000 offers excellent sealing reliability so that waste water cannot escape from sewage networks, groundwater cannot enter the pipes, and the environment is thus not additionally polluted. KG 2000's patented sealing system consists of a sleeve with a specially designed sealing bead and a fitted triple lip sealing element.

- With the first lip, the clamping and retaining lip, the sealing element is fixed in the bead so that it cannot move.
- The subsequent wiper lip prevents dirt and sand from entering.
- The sealing lip ultimately seals the pipe connection permanently.

The result: A shift-proof, permanent protection against infiltration and exfiltration.


1. Clamping and retaining lip
2. Wiper lip
3. Sealing lip


## Low insertion forces

In addition to a high level of sealing security, the special construction of the sealing element also has an economic effect. The gradation of the sealing lips leads to a minimization of the insertion forces, which reduces the use of technical aids and ensures that special tools are not required. In this way, a lot of time is saved when laying KG 2000.

## Multiple tests

In addition to the tightness test required by the standard, KG 2000 is also tested for tightness under a particularly high pressure of 2.4 bar by the MPA Darmstadt. Successful completion of this leak test exceeds the requirements of the Water Management Act and makes KG 2000 optimally suited for use in drinking water protection zones.

## High flexibility

In contrast to permanently integrated seals, the KG 2000 sealing system allows the sealing element to be flexibly removed and reinserted. In this way, any contamination can be cleaned on site at any time. A visual inspection is possible without any problems. Depending on the application, the use of NBR seals may also be required. If oil and petrol resistance is required, the KG 2000 sealing element can be changed quickly and practically on the construction site. It is not necessary to replace the entire system; Pipes and fittings can simply be reused.

# KG 2000 product range 


* Dimensions and delivery times available on request.

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KG 2000 • Branch $87^{\circ}$

| DN/OD | DN/OD | Article | z1 | z2 | z3 | $\mathbf{t}$ | t1 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{D}_{\mathbf{1}}$ | $\mathbf{D}_{\mathbf{2}}$ | No. | $\mathbf{m m}$ | $\mathbf{m m}$ | $\mathbf{m m}$ | $\mathbf{m m}$ | $\mathbf{m m}$ |
| 110 | 110 | 4021906 | 59 | 62 | 62 | 72 | 72 |
| 160 | 110 | 3030904 | 55 | 85 | 68 | 95 | 72 |
| 160 | 160 | 3030905 | 81 | 91 | 91 | 95 | 95 |


KG 2000 • Sleeve socket


* Dimensions and delivery times available on request.


KG 2000 • Connection to concrete pipe

| DN/OD | Article | Drilling machine | t | L |
| :--- | :---: | :---: | :---: | :---: |
| $\mathbf{D}_{\mathbf{1}}{ }^{*}$ | No. | mm | $\mathbf{m m}$ | mm |
| 160 | 3029874 | 186 | 95 | 165 |
| 200 | 3029873 | 226 | 123 | 197 |
| ${ }^{*}$ D1 $=160$ for concrete pipes from DN 300; |  |  |  |  |
| D1 $=200$ for concrete pipes from DN 400. |  |  |  |  |


Backflow protection made of PP • Single lock

| DN/OD | Article | L | B | H |
| :--- | :---: | :---: | :---: | :---: |
| $\mathbf{D}_{\mathbf{1}}$ | No. | $\mathbf{m m}$ | $\mathbf{m m}$ | $\mathbf{m m}$ |
| 110 | 4041736 | 287 | 188 | 210 |
| 125 | 4041737 | 318 | 202 | 228 |
| 160 | 4041738 | 367 | 243 | 274 |
| 200 | 4041076 | 480 | 311 | 328 |





## KG 2000 standard statics

In addition to the pipe characteristics, the soil values, installation conditions and loads are included in the static calculation according to DVWK-ATV A127. Before starting construction, the installation conditions must be checked against those of the static calculation. According to DVWK-ATV Worksheet A127, a vertical diameter change as a long-term value of $\leq 6 \%$ is permissible for flexible pipe systems.

In addition to the long-term deformation, the stress and stability verification must also be carried out. These verifications are fulfilled for all calculations with the specified installation parameters.

The deformations determined in the standard statics are based on the following installation parameters:

- Traffic load: Heavy traffic SLW 60 (road)
- Coverage height: 0.5 m-6.0 m
- Natural ground: G3 (92 \%)
- Pipeline zone: G1 (95 \%)
- Covered ground: G3 (92 \%)
- Coverage conditions: A1
- Embedding conditions: B1
- Groundwater: available (up to max. 5.0 m)
- Slope angle: $60^{\circ}$
- Supporting angle: $2 \alpha=90^{\circ}$
- Trench width: according to DIN EN 1610

|  | $\begin{aligned} & \text { Installation } \\ & \text { depth } \end{aligned}$ | Deformation (long-term) <br> GOK/5.0 m without | Safety against bulging | Tension |
| :---: | :---: | :---: | :---: | :---: |
|  |  |  | GOK/5.0 m without | GOK/5.0 m without |
| DN/OD 110 | $0.50 \text { m }$ $6.00 \text { m }$ | < 6.00 \% | > 2.00 | $<2.50$ |
| DN/OD 125 | $\begin{aligned} & 0.50 \mathrm{~m} \\ & 6.00 \mathrm{~m} \end{aligned}$ | < 6.00 \% | > 2.00 | <2.50 |
| DN/OD 160 | $\begin{aligned} & 0.50 \mathrm{~m} \\ & 6.00 \mathrm{~m} \end{aligned}$ | < 6.00 \% | > 2.00 | <2.50 |
| DN/OD 200 | $\begin{aligned} & 0.50 \mathrm{~m} \\ & 6.00 \mathrm{~m} \end{aligned}$ | < 6.00 \% | > 2.00 | <2.50 |
| DN/OD 250 | $\begin{aligned} & 0.50 \mathrm{~m} \\ & 6.00 \mathrm{~m} \end{aligned}$ | < 6.00 \% | > 2.00 | <2.50 |
| DN/OD 315 | $\begin{aligned} & 0.50 \mathrm{~m} \\ & 6.00 \mathrm{~m} \end{aligned}$ | < 6.00 \% | > 2.00 | <2.50 |
| DN/OD 400 | $\begin{aligned} & 0.50 \mathrm{~m} \\ & 6.00 \mathrm{~m} \end{aligned}$ | < 6.00 \% | > 2.00 | <2.50 |

## Long-term deformation in \% with different coverage heights in m



In case of grossly different installation conditions, the required evidence should be verified by means of a separate static calculation.
A verifiable static calculation for our pipe systems can be requested free of charge if an order is placed on the basis of a completed static object questionnaire.

## KG 2000 hydraulics

Drainage capacity of KG 2000 according to DIN EN 14758 according to ATV A 110 "Hydraulic dimensioning of sewers and pipes with circular profiles"

## With full filling $\mathrm{h} / \mathrm{di}=1.0$ and drainage lines with shafts $\mathrm{kb}=\mathbf{0 . 5} \mathbf{~ m m}$

| Gradient | DN/OD 110$\mathrm{di}=103.2 \mathrm{~mm}$ |  | DN/OD 125$\mathrm{di}=117.2 \mathrm{~mm}$ |  | DN/OD 160$\mathrm{di}=150.2 \mathrm{~mm}$ |  | DN/OD 200$\mathrm{di}=187.8 \mathrm{~mm}$ |  | DN/OD 250$\mathrm{di}=234.6 \mathrm{~mm}$ |  | DN/OD 315$\mathrm{di}=295.6 \mathrm{~mm}$ |  | DN/OD 400$\mathrm{di}=375.4 \mathrm{~mm}$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| [ $\mathrm{cm} / \mathrm{m}$ ] | [1/s] | [m/s] | [1/s] | [m/s] | [1/s] | [m/s] | [ [/s] | [m/s] | [ [/s] | [m/s] | [1/s] | [m/s] | [ $1 / \mathrm{s}$ ] | [m/s] |
| 0.2 | 2.93 | 0.35 | 4.12 | 0.38 | 7.98 | 0.45 | 14.42 | 0.52 | 26.11 | 0.60 | 48.15 | 0.70 | 90.53 | 0.82 |
| 0.3 | 3.61 | 0.43 | 5.08 | 0.47 | 9.84 | 0.56 | 17.76 | 0.64 | 32.13 | 0.74 | 59.22 | 0.86 | 111.30 | 1.01 |
| 0.4 | 4.19 | 0.50 | 5.89 | 0.55 | 11.40 | 0.64 | 20.58 | 0.74 | 37.22 | 0.86 | 68.57 | 1.00 | 128.81 | 1.16 |
| 0.5 | 4.70 | 0.56 | 6.60 | 0.61 | 12.78 | 0.72 | 23.07 | 0.83 | 41.70 | 0.96 | 76.80 | 1.12 | 144.25 | 1.30 |
| 0.6 | 5.17 | 0.62 | 7.25 | 0.67 | 14.03 | 0.79 | 25.31 | 0.92 | 45.75 | 1.06 | 84.25 | 1.23 | 158.21 | 1.43 |
| 0.7 | 5.59 | 0.67 | 7.85 | 0.73 | 15.18 | 0.86 | 27.38 | 0.99 | 49.48 | 1.14 | 91.10 | 1.33 | 171.05 | 1.55 |
| 0.8 | 5.99 | 0.72 | 8.40 | 0.78 | 16.25 | 0.92 | 29.30 | 1.06 | 52.95 | 1.22 | 97.48 | 1.42 | 182.99 | 1.65 |
| 0.9 | 6.36 | 0.76 | 8.92 | 0.83 | 17.25 | 0.97 | 31.11 | 1.13 | 56.20 | 1.30 | 103.46 | 1.51 | 194.22 | 1.75 |
| 1.0 | 6.70 | 0.80 | 9.42 | 0.87 | 18.20 | 1.03 | 32.82 | 1.19 | 59.29 | 1.37 | 109.13 | 1.59 | 204.83 | 1.85 |
| 1.1 | 7.05 | 0.84 | 9.88 | 0.92 | 19.11 | 1.08 | 34.45 | 1.25 | 62.22 | 1.44 | 114.52 | 1.67 | 214.93 | 1.94 |
| 1.2 | 7.36 | 0.88 | 10.33 | 0.96 | 19.97 | 1.13 | 36.00 | 1.30 | 65.02 | 1.50 | 119.66 | 1.74 | 224.58 | 2.03 |
| 1.3 | 7.67 | 0.92 | 10.76 | 1.00 | 20.80 | 1.17 | 37.49 | 1.36 | 67.71 | 1.57 | 124.60 | 1.82 | 233.83 | 2.11 |
| 1.4 | 7.97 | 0.95 | 11.18 | 1.04 | 21.60 | 1.22 | 38.92 | 1.41 | 70.29 | 1.63 | 129.35 | 1.88 | 242.74 | 2.19 |
| 1.5 | 8.25 | 0.99 | 11.57 | 1.07 | 22.37 | 1.26 | 40.31 | 1.46 | 72.79 | 1.68 | 133.94 | 1.95 | 251.33 | 2.27 |
| 2.0 | 9.55 | 1.14 | 13.40 | 1.24 | 25.88 | 1.46 | 46.62 | 1.69 | 84.17 | 1.95 | 154.86 | 2.26 | 290.53 | 2.62 |
| 2.5 | 10.70 | 1.28 | 15.00 | 1.39 | 28.97 | 1.63 | 52.18 | 1.89 | 94.20 | 2.18 | 173.29 | 2.53 | 325.07 | 2.94 |
| 3.0 | 11.73 | 1.40 | 16.45 | 1.52 | 31.76 | 1.79 | 57.21 | 2.07 | 103.27 | 2.39 | 189.95 | 2.77 | 356.30 | 3.22 |
| 4.0 | 13.57 | 1.62 | 19.03 | 1.76 | 36.73 | 2.07 | 66.15 | 2.39 | 119.37 | 2.76 | 219.54 | 3.20 | 411.75 | 3.72 |
| 5.0 | 15.19 | 1.82 | 21.30 | 1.97 | 41.10 | 2.32 | 74.02 | 2.68 | 133.56 | 3.09 | 245.60 | 3.58 | 460.60 | 4.16 |
| 8.0 | 19.26 | 2.30 | 26.99 | 2.50 | 52.08 | 2.94 | 93.76 | 3.39 | 169.16 | 3.91 | 311.02 | 4.53 | 583.18 | 5.27 |
| 10.0 | 21.55 | 2.58 | 30.20 | 2.80 | 58.27 | 3.29 | 104.89 | 3.79 | 189.23 | 4.38 | 347.89 | 5.07 | 652.27 | 5.89 |

With partial filling $\mathbf{h} / \mathrm{di}=\mathbf{0 . 7}$ and drainage pipes with shafts $\mathbf{k b}=\mathbf{0 . 5} \mathbf{~ m m}$

| Gradient | DN/OD 110$\mathrm{di}=103.2 \mathrm{~mm}$ |  | DN/OD 125$\mathrm{di}=117.2 \mathrm{~mm}$ |  | DN/OD 160$\mathrm{di}=150.2 \mathrm{~mm}$ |  | DN/OD 200$\mathrm{di}=187.8 \mathrm{~mm}$ |  | DN/OD 250$\mathrm{di}=234.6 \mathrm{~mm}$ |  | DN/OD 315$\mathrm{di}=295.6 \mathrm{~mm}$ |  | DN/OD 400$\mathrm{di}=375.4 \mathrm{~mm}$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| [ $\mathrm{cm} / \mathrm{m}$ ] | [ $1 / \mathrm{s}$ ] | [m/s] | [1/s] | [m/s] | [ $1 / \mathrm{s}$ ] | [ $\mathrm{m} / \mathrm{s}$ ] | [ [/s] | [m/s] | [ $1 / \mathrm{s}$ ] | [ $\mathrm{m} / \mathrm{s}$ ] | [1/s] | [ $\mathrm{m} / \mathrm{s}$ ] | [ $1 / \mathrm{s}$ ] | [ $\mathrm{m} / \mathrm{s}$ ] |
| 0.2 | 2.43 | 0.39 | 3.40 | 0.42 | 6.60 | 0.50 | 12.00 | 0.58 | 21.70 | 0.67 | 40.00 | 0.78 | 75.20 | 0.91 |
| 0.3 | 3.00 | 0.48 | 4.20 | 0.52 | 8.10 | 0.62 | 14.70 | 0.71 | 26.70 | 0.83 | 49.20 | 0.96 | 95.50 | 1.12 |
| 0.4 | 3.40 | 0.56 | 4.90 | 0.61 | 9.40 | 0.72 | 17.10 | 0.83 | 30.90 | 0.96 | 57.00 | 1.11 | 107.00 | 1.29 |
| 0.5 | 3.90 | 0.63 | 5.40 | 0.68 | 10.60 | 0.80 | 19.10 | 0.93 | 34.60 | 1.07 | 63.80 | 1.24 | 119.90 | 1.45 |
| 0.6 | 4.20 | 0.69 | 6.00 | 0.75 | 11.60 | 0.88 | 21.00 | 1.02 | 38.00 | 1.18 | 70.00 | 1.37 | 131.50 | 1.59 |
| 0.7 | 4.60 | 0.74 | 5.50 | 0.81 | 12.60 | 0.95 | 22.70 | 1.10 | 41.10 | 1.27 | 75.70 | 1.48 | 142.10 | 1.72 |
| 0.8 | 4.90 | 0.80 | 6.90 | 0.87 | 13.50 | 1.02 | 24.30 | 1.18 | 44.00 | 1.36 | 81.00 | 1.58 | 152.10 | 1.84 |
| 0.9 | 5.20 | 0.85 | 7.40 | 0.92 | 14.30 | 1.08 | 25.80 | 1.25 | 46.70 | 1.45 | 86.10 | 1.68 | 161.40 | 1.95 |
| 1.0 | 5.50 | 0.89 | 7.80 | 0.97 | 15.10 | 1.14 | 27.20 | 1.32 | 49.20 | 1.53 | 90.70 | 1.77 | 170.20 | 2.06 |
| 1.1 | 5.80 | 0.94 | 8.20 | 1.02 | 15.88 | 1.20 | 28.60 | 1.39 | 51.70 | 1.60 | 95.20 | 1.86 | 178.60 | 2.16 |
| 1.2 | 6.10 | 0.98 | 8.50 | 1.07 | 16.60 | 1.25 | 29.90 | 1.45 | 54.00 | 1.67 | 99.50 | 1.94 | 186.60 | 2.26 |
| 1.3 | 6.30 | 1.02 | 8.90 | 1.11 | 17.29 | 1.31 | 31.10 | 1.51 | 56.20 | 1.74 | 103.60 | 2.02 | 194.30 | 2.35 |
| 1.4 | 6.60 | 1.06 | 9.20 | 1.15 | 17.90 | 1.36 | 32.30 | 1.57 | 58.40 | 1.81 | 107.50 | 2.10 | 201.70 | 2.44 |
| 1.5 | 6.80 | 1.10 | 9.60 | 1.19 | 18.60 | 1.40 | 33.50 | 1.62 | 60.50 | 1.87 | 111.30 | 2.17 | 208.90 | 2.53 |
| 2.0 | 7.90 | 1.27 | 11.10 | 1.38 | 21.50 | 1.62 | 38.70 | 1.88 | 69.90 | 2.17 | 128.70 | 2.51 | 241.50 | 2.92 |
| 2.5 | 8.80 | 1.42 | 12.40 | 1.55 | 24.00 | 1.82 | 43.30 | 2.10 | 78.30 | 2.42 | 144.00 | 2.81 | 270.20 | 3.27 |
| 3.0 | 9.70 | 1.56 | 13.60 | 1.70 | 26.40 | 1.99 | 47.50 | 2.30 | 85.80 | 2.66 | 157.90 | 3.08 | 296.10 | 3.58 |
| 4.0 | 11.20 | 1.80 | 15.80 | 1.96 | 30.50 | 2.31 | 55.00 | 2.60 | 99.20 | 3.07 | 182.50 | 3.56 | 342.20 | 4.14 |
| 5.0 | 12.60 | 2.02 | 17.70 | 2.20 | 34.10 | 2.58 | 61.50 | 2.98 | 111.00 | 3.44 | 204.17 | 3.98 | 382.90 | 4.63 |
| 8.0 | 16.00 | 2.56 | 22.44 | 2.78 | 43.30 | 3.27 | 77.90 | 3.77 | 140.60 | 4.35 | 258.50 | 5.04 | 484.80 | 5.86 |
| 10.0 | 17.90 | 2.86 | 25.10 | 3.11 | 48.40 | 3.66 | 87.20 | 4.22 | 157.30 | 4.87 | 289.20 | 5.64 | 542.20 | 6.55 |

We would like to point out that no warranty claims can be derived from these calculations.


KG 2000 must be installed in accordance with DIN EN 1610. KG 2000 pipes can be shortened to the required length on site if required. To do this, the pipe must be cut to length vertically with a fine-toothed saw. Fittings must not be shortened.


Burrs and bumps should be removed with a suitable tool, such as a scraper. Furthermore, the pipe is to be carefully chamfered again circumferential at the interface e.g. with a coarse file. uncontrolled power delivery and pipe damage.

Pipes with small nominal widths can easily be pushed together by hand; aids may have to be used for larger nominal widths. Pushing together e.g. with the help of a scoop is not permitted due to



The insertion depth of the spigot end into the socket is to be measured with a foot rule and for control purposes to be marked on the spigot end of the pipe to be connected. In this way, it can be checked whether the spigot has been inserted completely.


The spigot end and the inner surface of the socket must be clean and free from damage, otherwise the pipe must be cleaned or replaced. Check that the seals are correctly seated in the socket. The marked spigot end is to be applied with lubricant evenly and all around, and then pushed into the socket as far as it will go.


Slight changes in direction can be implemented by bending the socket by max. $0.5^{\circ}$. This corresponds to a deflection of 5 cm to 5 m . The position of the pipe must be checked and, if necessary, corrected accordingly after the connection has been made. Appropriate fittings from the product portfolio must be used for the transition to alternative pipelines.

## KG 2000 in practice



Easy to install


KG 2000 (waste water) and X-Stream (rainwater) in the two-pipe drainage system


Line crossing with subsequent renovation - no problem


As an external drop


Easy connection to profiled pipes


Can also be used as a drainage line

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Wavin is part of Orbia, a community of companies working together to tackle some of the world's most complex challenges. We are bound by a common purpose: To Advance Life Around the World

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