

TERAKAN

sewage pipe of the next generation



5.0 [126.5]

0.33 [8.5]

Ø18.3 [466.0]

Ø19.2 [486.8]

6.8 [173.9]

3.5 [89.5]



MINERVA ŽALEC d.d.



KOVINOPLASTIKA PISKAR MP

TERAKAN

sewage pipe of the next generation

Kovinoplastika Piskar MP d.o.o. was the first Slovene company to begin producing double layer corrugated pipes from high density polyethylene, back in 1998.

The first market brand to be represented was the MAPIKAN - sewage system. Other system elements developed together with the sewage pipes, such as fittings and chambers. The MAPITEL pipes for protecting cables followed, as well as MAPIDREN pipes for road and tunnel drainage. All three market brands are well established in the Slovene market, as well as in neighboring countries.

Experience with its own production, new technologies on the market and new polymer materials, enabled the company to take a further step in development - the production of TERAKAN pipes.

The TERAKAN pipe combines the latest achievements in the production of plastic materials and tried and tested manufacturing technology.

The TERAKAN pipe structure is double-layered with a corrugated outer and smooth inner surface, and in this way is similar to its predecessor, the MAPIKAN pipe. The TERAKAN pipe is manufactured entirely from PP-B (polypropylene block copolymer) materials. They were specially developed for the production of unpressurized sewage pipes with high ring stiffness and represents the latest trend in materials used in the production of sewage and drainage pipes.




Advantages of the new TERAKAN pipe system

- **long lifespan** - the expected lifespan exceeds 100 years
- **in compliance with EN regulations** - EN 13476
- **simple and safe manipulation and installation**
- **excellent hydraulic properties**
- **excellent chemical resistance**
- **excellent mechanical properties** throughout a wide temperature range, good impact resistance at low temperatures, excellent properties in high temperatures.
- **excellent temperature resistance** - resistant to temperatures of up to 60°C, for a short-term also up to 90°C.
- **excellent abrasion resistance** - minimal wear due to abrasives, sand etc.
- **Light weight pipes** indicate economic, safe and easy manipulation and installation
- **ecologically sound solution** - the material used can be completely recycled, absolute leak tightness of pipe system prevents environmental pollution
- **the complete solution** - all elements of the system (pipes, fittings and chambers) are manufactured from the same material
- **flexibility** during production and installation - suitable for use of all classical methods of joining, processing and welding...
- **inexpensive complete system**
- **pipe flexibility** - pipe withstands large deformations without structural damage, tolerant to earth movements

LIGHTER



The corrugated structure and the use of a purposely designed base material allow the TERA KAN pipes to be lighter and at the same time more rigid than other types of plastic piping. Due to their low weight, the manipulation and installation of TERA KAN pipes is simple, which is especially suitable for the restricted space of a building site and in cities.

Pipe	kg/m
 TERA KAN	~10
PVC smooth pipe	~15
PE smooth pipe	~20
Polyester pipe	~30
Ductile iron pipe	~50
Concrete pipe	~100

DN300

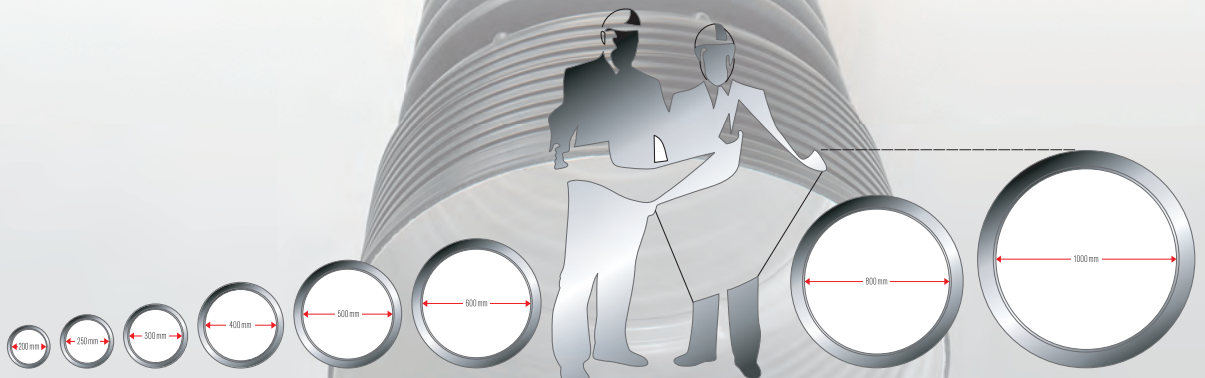
STRONGER

Due to their exceptional flexibility and high ring stiffness - SN 16 kN/m², TERA KAN piping is an excellent choice for use under the most demanding loadings and operating conditions.



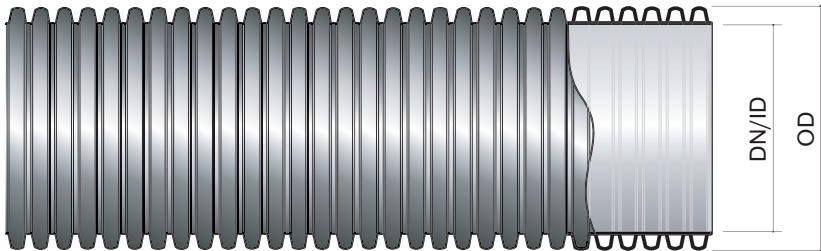
LARGER

TERAKAN pipes are manufactured in accordance with the EN 13476-3 standard and are classified by their inner - light diameter DN / ID from 200 mm to 1000 mm.



Dimensions

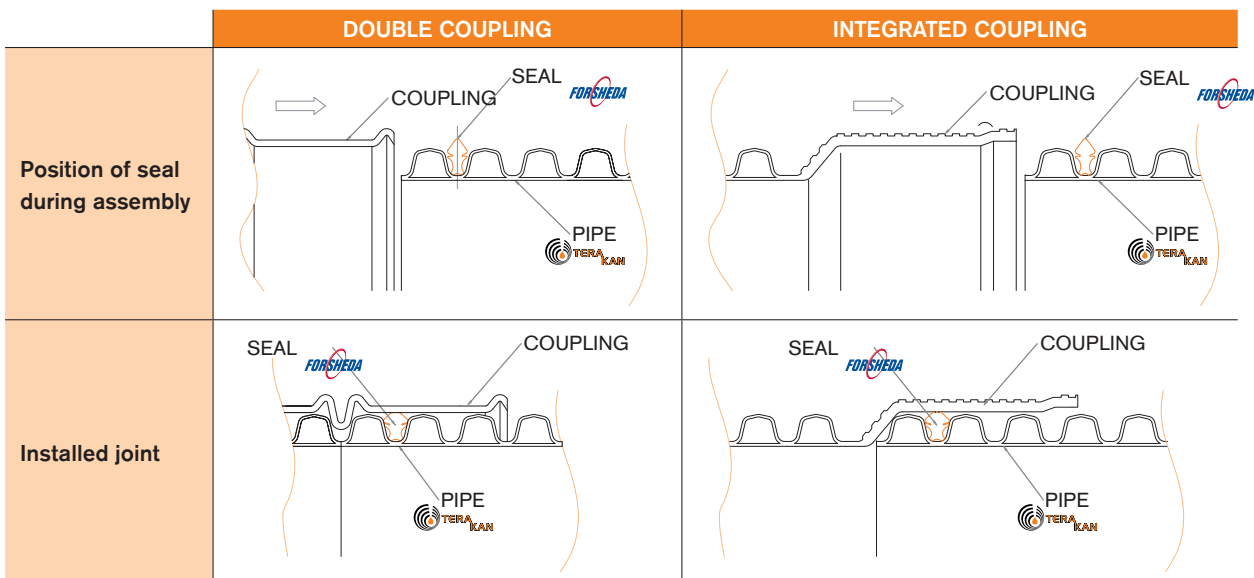
Nominal size	DN		200	250	300	400	500	600	800	1000
Outside diameter	OD	mm	228	292	345	461	580	695	928	1168
SN 8 kN/m ²	ID	mm	200	250	300	406	511	612	816	1026
	m	kg	2,1	3,6	4,9	8,5	13,1	17,8	31,6	47,6
SN 16 kN/m ²	ID	mm	198	250	296	394	495	592	790	992
	m	kg	2,8	4,0	5,5	10,2	14,8	20,6	36,4	55,7



Pipe joints

TERAKAN pipes are usually joined using couplings and seals. The coupling can be integrated on the pipe or a separately produced double coupling. In the first case, one seal is needed, and two in the second.

The seal is inserted between the first and second pipe ribs. Any impurities are initially removed and acid-free grease is applied to the seal together with the coupling. The coupling is pushed over the installed seal with a constant pressure until the inner restraint is sitting on the pipe end. When joining pipes of larger dimensions it is feasible to use the available mechanization, although it is then necessary to make sure the pipes do not get damaged.



Pipe transport

Nominal size	Outside diameter	Bars in pallet	Pipes on the truck
DN/ID	OD	piece	m
200	228	27	1296
250	292	12	576
300	345	8	384
400	461	5	240
500	580	-	228
600	695	-	144
800	928	-	66
1000	1168	-	42



New PP-B material for sewage pipes

The use of PP materials in public sewage systems began in the middle of the 90s in northern Europe - mainly in Scandinavian countries. By the year 1998, 25% of all new sewage systems in Sweden were constructed from pipes which used PP as the base material.

The first wastewater and rainwater sewage systems from PP materials have been in use for over 20 years, while this type of material has been in use for over 25 years in the home sewage system field and has practically ousted other materials (PVC).

With the use of new methods of pipe inspection (using cameras) and receiving the first statistics of their damages, there is a greater awareness of the meaning of quality sewage systems. On this basis, in 1998 the first PP materials purposely designed for producing sewage and drainage pipes were created.

Essential properties of the purposely designed material:

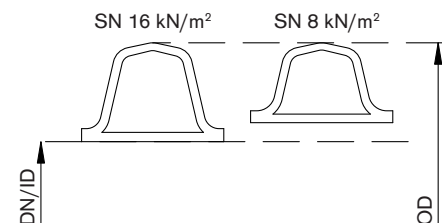
- **High stiffness**
- **High impact strength at low temperature**
- **Tailored nucleating agents** for the exact determination of the desired rigidity and durability of the material

		PE 80	Standard PP-B	Purpose PP-B	Standard
MFR _{2,16 - 230°C}	g/10min		0,3	0,3	ISO 1133
Density	g/cm ³	0,95	0,90	0,90	ISO 1183
Modulus of elasticity	MPa	850	1300	1700	ISO 527-2
Tensile stress at yield	MPa	22	28	30	ISO 527-2
Impact +23°C	kJ/m ²	24	50	70	ISO 179/1eA
strength -20°C		8	4	7	

Ring stiffness

The ring stiffness of the TERAkan pipes essentially exceeds the stiffness of other similar pipes on the market. The standard production process includes two ring stiffness classes, which are SN 8 kN/m² and SN 16 kN/m². It is possible to produce pipes of such rigidity due to the use of the patented technology, where we can alter the height of the pipe's profile to reach both classes respectively.

For the same reason, TERAkan pipes easily fulfill other standard defined criteria, above all the required 30% ring flexibility.



EasyPipe98-MP is a computer program used for structural calculation of buried pipes. The calculation is made on the basis of the universally accepted regulation ATV-DVWK-A 127 of the German association for water, wastewater and waste. The aforementioned program as well as detailed technical specifications of the product are available free of charge at our commercial department for all project planners and other interested parties.

EasyPipe98

When to use TERAkan SN 16 kN/m² ?

In city centers:

- because of high traffic and other loadings,
- because they offer maximum assurance for planner, manager and investor,
- because it is difficult to ensure optimal installation conditions among other existing installations,
- because potential repair costs often many times exceed difference in investment.

For low cover depths:

- in combination with traffic or other loadings,
- for transverse connections on highways...

For high cover depths:

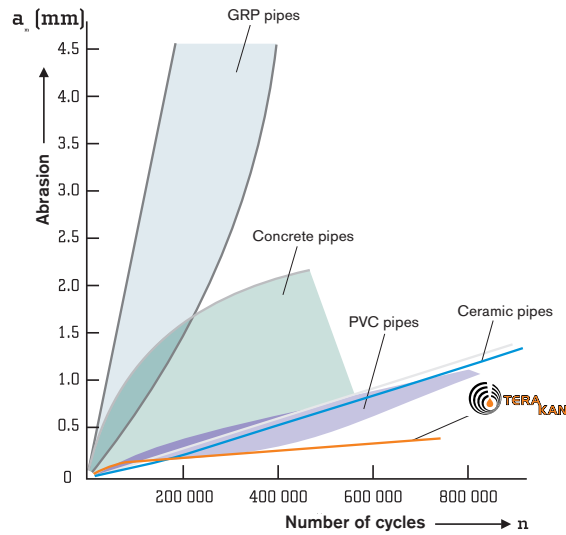
- on dump yards, dikes and dams, where cover depths can exceed 30 m,
- where high cover depths are in combination with ground water and traffic loadings.

Everywhere, where required due to loadings combination and installation conditions.



Abrasion

The TERAKAN pipe demonstrates excellent resistance to abrasion. Resistance is measured by the Darmstadt method, where the level of abrasion is monitored depending on the number of cycles made with an abrasive medium. The best results (lowest abrasion) were shown by pipes produced from polypropylene, which include TERAKAN pipes.



Pipe flow rate

The comparison of the flow rate between TERAKAN and PVC smooth pipes is carried out using the Prandtl-Colebrook method in accordance with regulation ATV-DVWK-A 110 »Hydraulic Dimensioning and Performance Verification of Sewers and Drains«. Same operating conditions - $k_b=0,25\text{mm}$ have been taken into account in the calculations, the difference shown is a result of the difference in the inner diameter of the pipes.

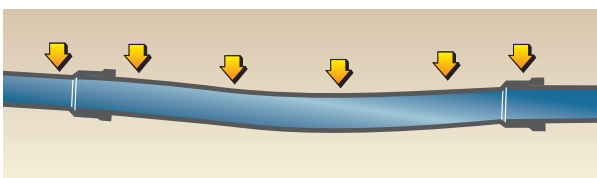
The calculation of the flow rate parameters under specific operating conditions and at various levels of capacity is undertaken by the **MP flowG**. It enables the calculation of the flow rate in the TERAKAN, MAPIKAN pipes and the smooth PE sewage pipes.



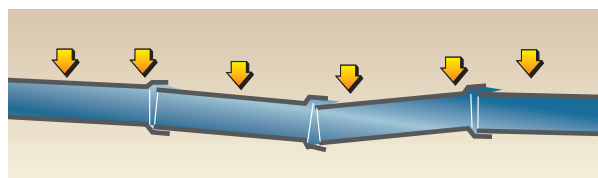
TERAKAN SN 8kN/m ²		PVC SN 8kN/m ²		Maximum flow rate (l/s) at inclination							
DN/ID	ID	DN/OD	ID	0,20%		0,50%		1%		5%	
				TERAKAN	PVC	TERAKAN	PVC	TERAKAN	PVC	TERAKAN	PVC
200	200	200	187,4	17	15	27	24	40	35	90	80
250	249,9	250	235,4	33	29	53	47	76	67	171	152
300	300,1	315	296,6	54	53	86	84	122	119	277	152
400	406,4	400	376,6	119	102	191	164	272	234	614	527
500	511,2	500	470,8	218	185	349	296	496	421	1119	949
600	611,5	630	593,2	349	328	558	525	793	746	1787	1682
800	816,4	800	753,8	745	635	1189	1014	1689	1440	3802	3241
1000	1025,5	1000	941,8	1354	1142	2157	1819	3064	2584	6891	5812

Tightness of pipe system

Use of the TERAKAN pipe, inclusive of all the joints, fittings and manholes, ensures the leaktightness of the complete system. Individual elements, such as manholes, inspection chambers and fittings, are all tested when produced and carry with them test reports. Longer pipe length, flexibility and use of integrated joints additionally reduce the possibility of faults forming and subsequently the untightness of the system.



Flexible pipe can adapt to earth movement or uneven terrain through its whole length. TERAKAN pipe stays undamaged and the joint leaktight.

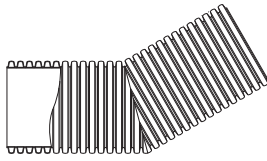


Rigid pipe can compensate for unevenness in terrain with just angular deflection on its joint. Lack of flexibility in combination with relatively short coupling can cause untightness of the pipe system.

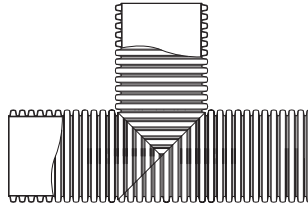
Fittings

Various joining elements, fittings and inspection and revision chambers are an integral part of the TERAkan piping system. All elements are produced in our own assembly workshop. If required, we can produce other special elements to our clients' specifications.

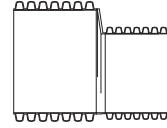
bend $\alpha=30^\circ$



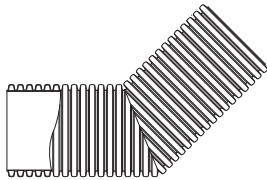
bend $\alpha=90^\circ$



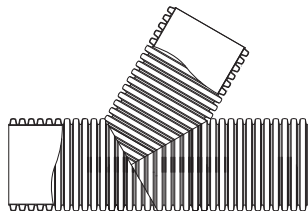
adapter



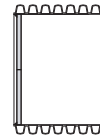
bend $\alpha=45^\circ$



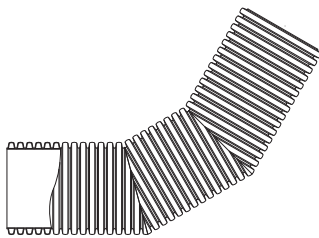
branch $\alpha=45^\circ$



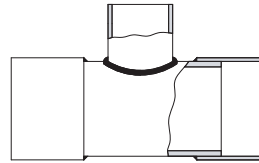
cap



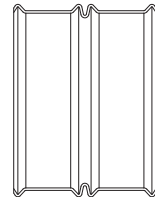
bend $\alpha=60^\circ$



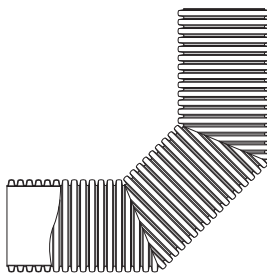
branch R $\alpha=90^\circ$



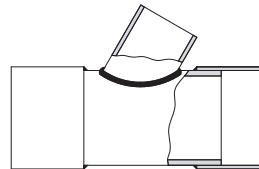
double coupling



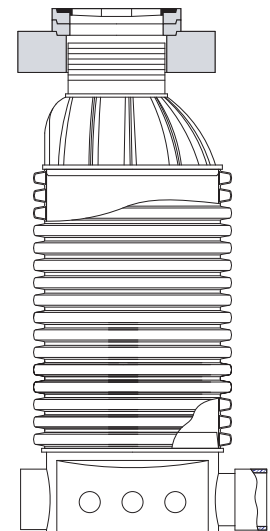
bend $\alpha=90^\circ$



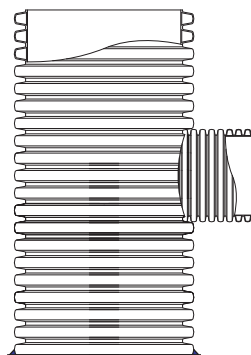
branch R $\alpha=45^\circ$



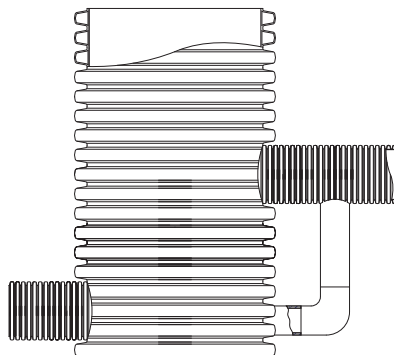
chamber with eccentric cone and moulded base



manhole



cascade chamber



TERAKAN - environmentally friendly pipe

Minimal possibility of pollution, due to:

- long lengths of pipe,
- quality joints, which ensure that piping is totally sealed.

Material recycling:

- this pipe, like all other PP pipes, can be recycled during production as well as after use.

Recycling energy:

- is an alternative method of recycling of the materials used, and implies extracting energy from the material (e.g. incinerating).

Heavy metals free:

- pipe does not contain heavy metal alloys or other hazardous additives.



Certified ISO 9001 : 2000 by



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