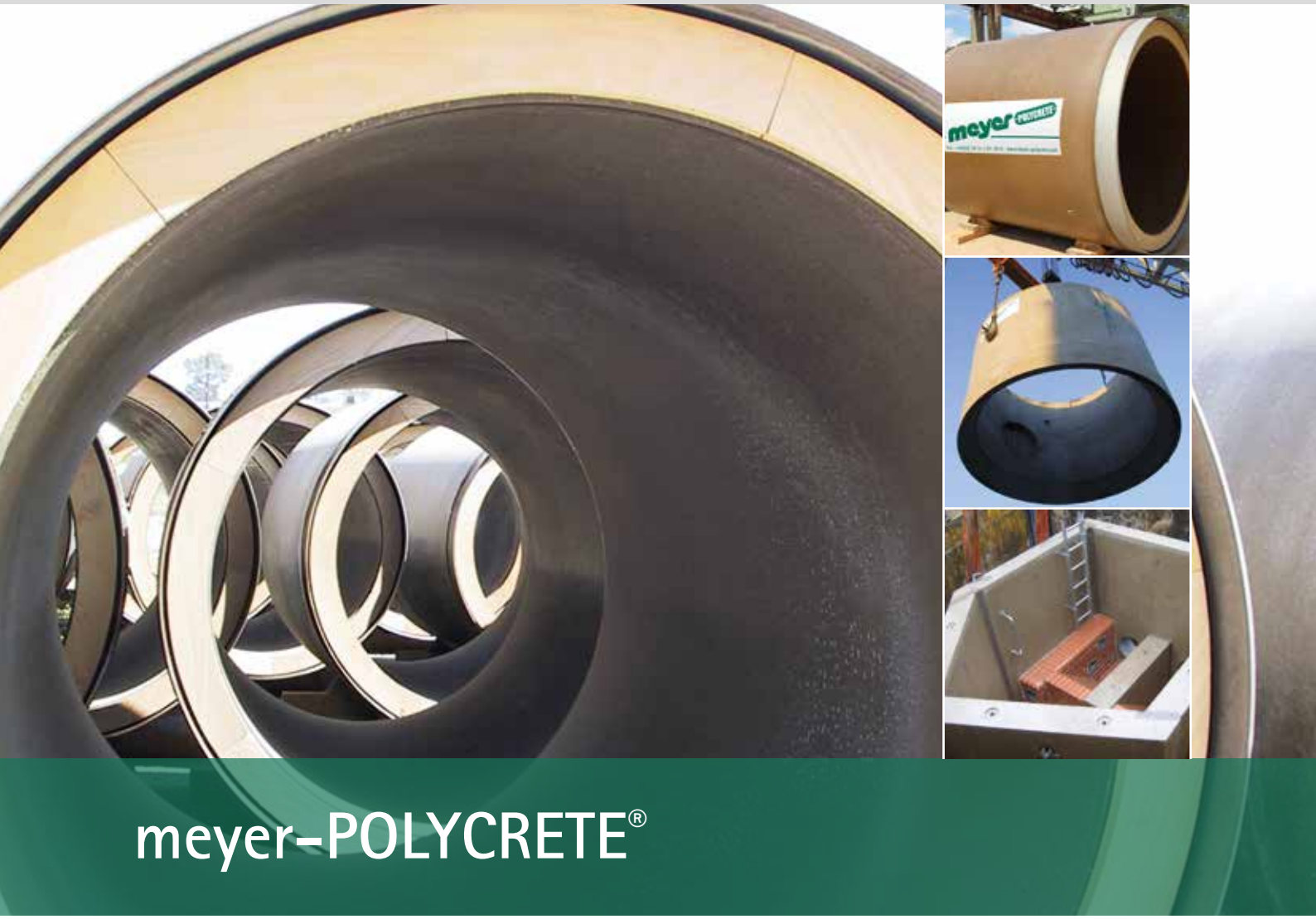


meyer-POLYCRETE®

Jacking Pipes | Sink Shafts | Shaft Structures

www.meyer-polycrete.com

Pipe jacking – the technology that breaks new ground

Superior performance under ground

Underground pipe jacking is a construction method that has been tried and tested for years, and that has well-known, undisputed advantages, especially in residential areas. At the same time this process makes particularly high demands on the pipe due to the extreme jacking loads applied during installation. The pipe must sustain these enormous forces and transfer them evenly and in a controlled manner, which requires perfect dimensional accuracy.
Meyer-POLYCRETE has specialized in this application area. Our POLYCRETE® jacking pipes have proven their usefulness in this environment over decades.

The consistent use of high quality resins and aggregate materials in advanced recipes enables the pipes to reliably cope with high jacking forces. Thanks to a modern casting process with subsequent milling of the spigot ends the pipes feature excellent dimensional accuracy. And furthermore the very smooth, non-absorbing outer pipe surface minimizes static and dynamic friction and thus the breakaway and jacking resistance. This allows remarkable jacking lengths without using intermediate jacking stations.

POLYCRETE®- the ideal sewer material

Polymer concrete material

POLYCRETE® jacking pipes are made from reactive resin moulding material with filler. The most common material name for this is polymer concrete (or PRC as an abbreviation for 'polyester resin concrete'). The moulding material complies with DIN 16946-2, type 1140.
This combination of high quality polyester resins and pressure-resistant quartzites leads to a product that combines the best properties of the input materials. The result is a sewer material that fulfils the high requirements in pipe jacking applications and that also performs excellently in the course of sewer operation. These positive characteristics in long-term practical application ensure the long service life that is essential for a cost-efficient sewer system.

Strong and durable

The close bond between resin and aggregate materials results in high abrasion resistance inside and outside and allows the reliable absorption of high compressive and bending stress (e.g. jacking forces and traffic loads) with small wall thickness and reduced pipe weight.

The rigid POLYCRETE® pipes are structurally stable, avoiding any height differences on the ground surface as well as any leaks due to any offset of the pipe connections.

At the same time the material is so robust and impact resistant that it is perfectly suited for practical applications on construction sites and in operation. In particular it is resistant to high-pressure cleaning, and no fragments break off when branch connection holes are drilled in a finished pipe. The smooth and even inner surface of the pipes and manholes increases the flow speed of the transported medium, which in turn reduces the formation of sludge deposits.

Material with many advantages

Due to the excellent chemical material characteristics POLYCRETE® products are well-suited for problematic situations because:

- The polyester resin is most resistant to aggressive media.
- The quartz aggregate does not suffer from chemical attack.
- The material structure is free from capillaries, does not absorb water and does not permit any gas diffusion.
- The material structure made from high quality polyester resin and pressure-resistant quartzites does not permit damage by osmosis along any fibres.

POLYCRETE® products made by meyer-POLYCRETE are therefore extremely resistant, even when exposed to aggressive soils, waste waters and gases (pH range 0.5 to 14) and can securely withstand biogenic sulphuric acid. Due to the high temperature resistance of the base material high media temperatures of up to + 85°C are possible.

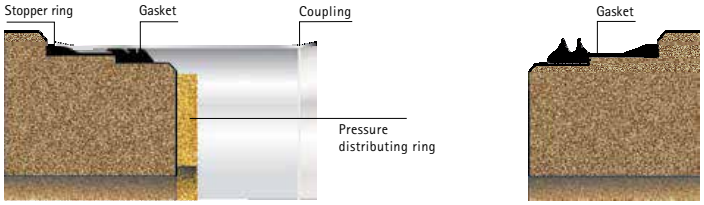
The POLYCRETE® jacking pipe

Convincing quality

The specific properties as well as the dimensions of the pipes are defined in the basic standard DIN 54815. The pipes comply with the international product standards EN 14636-1, ISO 18672-1 and ASTM D 6783-05.
Their high quality is assured through the consistent implementation of the factory's own production monitoring, and the materials testing agency of North Rhine Westphalia, MPA NRW, continuously monitors the quality in accordance with the product standards and with the approval certificate from the Federal Railway Authority.
Depending on the nominal diameter and the respective requirements of the jacking technology the pipes are manufactured in lengths of one, two or three metres. Fitting lengths and rocker pipes for connection to shafts are also manufactured in the necessary short lengths in accordance with customer specifications. The use of metal moulds for production guarantees dimensional accuracy and smooth, even pipe surfaces over the complete length.
The interior diameter corresponds to the nominal diameter (DN). Each nominal diameter is combined with an external diameter, which in turn matches the standard jacking machines. The external pipe diameter can be adapted to special static requirements or other technical requirements if necessary.

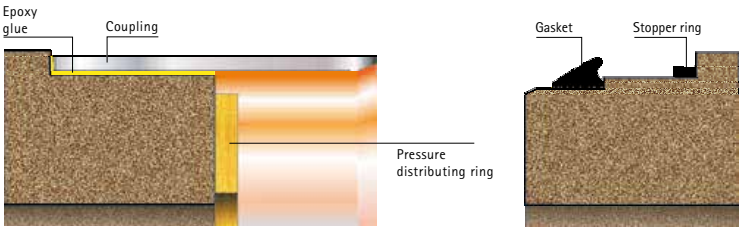
We will gladly send you our technical specifications so you can take the right materials into account in any tenders or bidding opportunity.

POLYCRETE® jacking pipe DN 250 – DN 1000



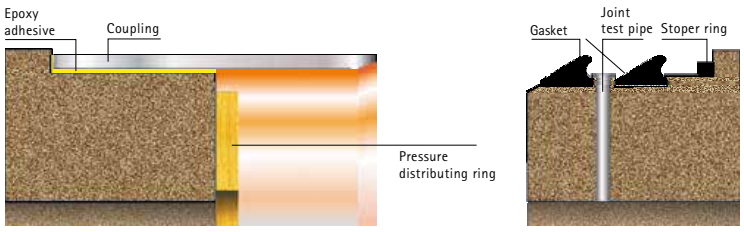
Internal diameter DN	External diameter da	Wall thickness s	Length L	Permissible jacking force*		Pipe weight**
(mm)	(mm)	(mm)	(m)	(t)	(kN)	(kg/m)
250	360	55	1 and 2	65	635	120
300	400	50	1 and 2	65	640	125
400	550	75	1 and 2	155	1560	255
500	660	80	2	200	1980	335
600	760	80	2	240	2350	390
700	860	80	2	260	2550	445
800	960	80	2 and 3	305	2990	505
900	1100	100	2 and 3	435	4300	720
1000	1185	92.5	2 and 3	425	4200	735

POLYCRETE® jacking pipe DN 1000 – DN 2200



Internal diameter DN	External diameter da	Wall thickness s	Length L	Permissible jacking force*		Pipe weight**
(mm)	(mm)	(mm)	(m)	(t)	(kN)	(kg/m)
1000	1185	92,5	2 and 3	405	4010	735
1000	1280	140	3	705	6930	1155
1200	1485	142,5	3	810	7990	1370
1400	1720	160	3	1025	10090	1810
1600	1940	170	3	1275	12520	2185
1800	2160	180	3	1500	14740	2580
2000	2400	200	3	1875	18400	3185
2200	2630	215	3	2170	21310	3755

POLYCRETE® jacking pipe DN 2400 – DN 2600



Internal diameter DN	External diameter da	Wall thickness s	Length L	Permissible jacking force*		Pipe weight**
(mm)	(mm)	(mm)	(m)	(t)	(kN)	(kg/m)
2400***	2870	235	3	2280	22400	4380
2600***	3100	250	3	2600	25510	5150

*) Minimum values for straight jacking in loose soil, with controlled installation, without pilot bore | **) Maximum values | ***) Diameter only on request

Quickly connected

The shaft connections

With nominal pipe diameters up to DN 800 and lengths up to 2 m the jacking is mostly done from round sink shafts in radial direction. However, the construction of insertion and reception shafts is often very costly. Here it may be more cost-efficient to install POLYCRETE® system manholes after completion of the jacking work. POLYCRETE® manholes have the same characteristics in use as the POLYCRETE® jacking pipes.
For larger pipe diameters or lengths the pipe jacking work is done from insertion pits, which can subsequently be furnished with polygonal POLYCRETE® shaft structures of uniform quality.
POLYCRETE® system manholes and shaft structures are equipped with factory-fitted connection pieces. The space between the shaft and the last jacking pipe is generally closed by a fitting length that functions as a double joint.

The house connections

When pipe jacking is in residential areas, collection systems and or storm sewers, house connections are created afterwards, either from the shafts ('Berlin method') or directly from the sewer if it is large enough to walk in. In contrast to many other pipe systems the homogenous, non-reinforced material structure allows you to drill connection holes in POLYCRETE® jacking pipes without difficulties and without any follow-up corrosion protection work.

Moulded connection pieces, sockets or pieces for approved or standardised pipe systems can be installed. The necessary holes are made with normal core drilling equipment.

meyer-POLYCRETE delivers the complete system

- POLYCRETE® jacking pipes DN 250 to DN 1000 with loose coupling
- POLYCRETE® jacking pipes DN 1000 to DN 2600 with coupling, firmly mounted on one side
- POLYCRETE® system manholes DN 1000 to DN 2600
- POLYCRETE® sink shafts DN 1600 to DN 2600 (reception and intermediate shafts)
- POLYCRETE® shaft structures (polygonal, made from panels)

The use of POLYCRETE® jacking pipes in combination with POLYCRETE® manholes and shafts leads to a closed sewer system with consistent quality and resistance all around. The system including quick and easy coordination of delivery comes from a single source - from meyer-POLYCRETE.

Reliable and safe

Pipes in use

POLYCRETE® jacking pipes fulfil the requirements of worksheet A 125 of the DWA (German Association for Water Resources, Waste Water and Waste) guidelines, formerly called ATV. One particularly important point is the perpendicularity of the front faces and thus the plane parallelism of the pipe ends, achieved by milling each individual pipe. This plan parallelism guarantees that the jacking forces are introduced evenly into the wall of the pipe. The pipe surface is extremely smooth so that outer friction during the jacking process is very small. Large permissible jacking forces combined with a smooth pipe surface allow long jacking drives and make the work cost-efficient.

Whether it is in the planning phase or installation phase - our technical department will check the suitability of POLYCRETE® jacking pipes for your particular application. We provide verifiable static calculations as required by the Approval of the Federal Railway Authority that take into account the new DWA worksheet A 161 (currently yellow paper). For this step we need comprehensive information on the installation conditions and load situation.

Feel free to request the data sheet 'Load Details for POLYCRETE® Jacking Pipes acc. to DIN EN 14636-1, ISO 18672-1' and ASTM D 6783-05 from us.

Pipe joints

The pipe joints include the couplings and the gaskets as well as an intermediate joint layer for passing on the jacking force - the pressure distributing ring.
Couplings are mounted as a loose element for nominal diameters smaller than DN 1000, and firmly mounted on one side for nominal diameters greater than DN 1000. Both variants can be delivered for nominal diameter DN 1000. The gasket is drawn on to the pipe end at the factory and cannot be moved; guide rings are delivered pre-assembled on one side.
Couplings, which are preferably manufactured from stainless steel, guarantee the transversal stability of the pipe joint required for jacking. Couplings and gaskets are made exclusively from standardised materials that fulfil the requirements of DWA worksheet A 125 as well as all applicable standards.
The standard pipe joints for POLYCRETE® jacking pipes are designed for pressure-free pipelines and can withstand a test pressure of up to 2.4 bar. For applications with increased pressure requirements a special joint design is provided, e.g. with a chambered seal or with a seal that can be activated after the jacking.

The quality of the pressure distributing ring plays an important role in the even transfer of the longitudinal forces in the pipeline. Depending on the expected jacking forces and the drive radius we employ either chipboard or knot-free softwood. Pressure distributing rings are usually pre-assembled in the factory, too.

The complete range

POLYCRETE® jacking pipes DN 250 to DN 1000

This is the most important range of nominal diameters because it makes up the largest portion of the total length of the sewer network.

It is often practical from a construction perspective to make a jacking drive over the longest distance possible and install an intermediate manhole afterwards. The high permissible jacking forces of POLYCRETE® jacking pipes in combination with their smooth, non-porous outer pipe surface allows you to proceed in this most economical way without any further issues.

Stainless steel couplings offer the maximum security for functioning pipe joints over long jacking distances, even with the most difficult soil conditions.

POLYCRETE® jacking pipes DN 1000 to DN 2600

The use of intermediate jacking stations is necessary for achieving very long jacking drives. Since POLYCRETE® jacking pipes can be jacked over comparatively long stretches, the number of the required intermediate jacking stations can generally be significantly reduced. meyer-POLYCRETE delivers intermediate jacking stations comprising two POLYCRETE® jacking pipes as leading and trailing pipes along with the matching steel parts - the expansion jacket, the pressure distributing rings as well as the anti-torsion safeguard for pipes with kite-shaped profile - but without hydraulic cylinders. Steel parts are manufactured after consultation with the customer.

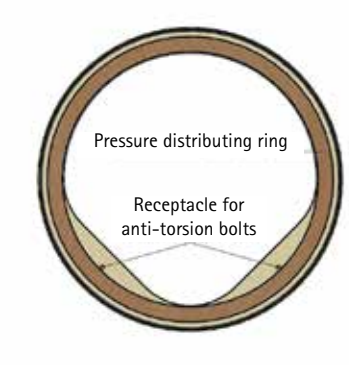
Bentonite is injected to lubricate the pipeline. The corresponding injection ports are integrated into the POLYCRETE® jacking pipes in the factory in accordance with the customer's specifications.

Of course it is also possible with POLYCRETE® jacking pipes to create a curved route. In that case short pipes can also be manufactured to accomodate a narow bend radius.

POLYCRETE® jacking pipes DN 800 to DN 2000 with kite-shaped profile

The kite-shaped profile combines the advantages of the circular profile and the egg-shaped profile. In this pipe the flow rate is higher than in a circular cross-section pipe during periods of dry weather, and it thus has better self-cleaning characteristics. If, e. g. old brickwork egg-shaped profile sewers are replaced by POLYCRETE® jacking pipes that are driven along the old pipe route, the result is a significant gain in valuable overflow capacity. The shapes of the kite-shaped POLYCRETE® jacking pipes have been designed to allow the easy installation of house connection lines on the springing line later on.

POLYCRETE® jacking pipes with kite-shaped profile DN 800 – DN 2000

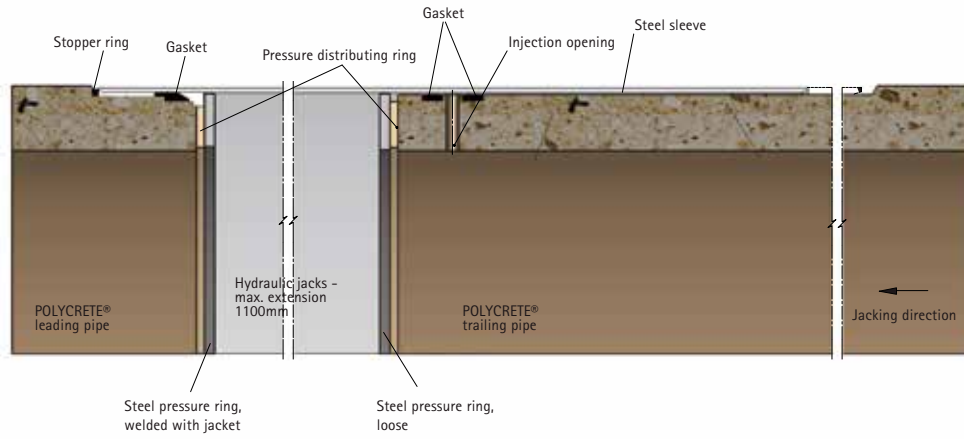


Internal diameter DN	External diameter da	Wall thickness s	Length L	Permissible jacking force*		Pipe weight**
(mm)	(mm)	(mm)	(m)	(t)	(kN)	(kg/m)
800	960	80	2 and 3	305	2990	565
1000	1185	92,5	2 and 3	405	4010	815
1000	1280	140	3	705	6930	1230
1200	1485	142,5	3	810	7990	1525
1400	1720	160	3	1025	10090	2125
1600	1940	170	3	1275	12520	2595
1800	2160	180	3	1500	14740	3025
2000	2400	200	3	1875	18400	3690

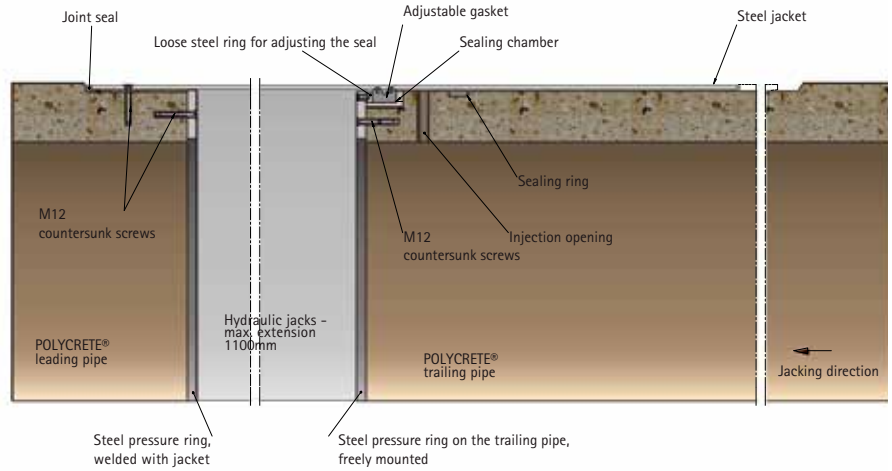
*) Minimum values for straight jacking in loose soil, with controlled installation, without pilot bore | **) Maximum values

Intermediate jacking stations (interjack stations)

Standard version



Special version



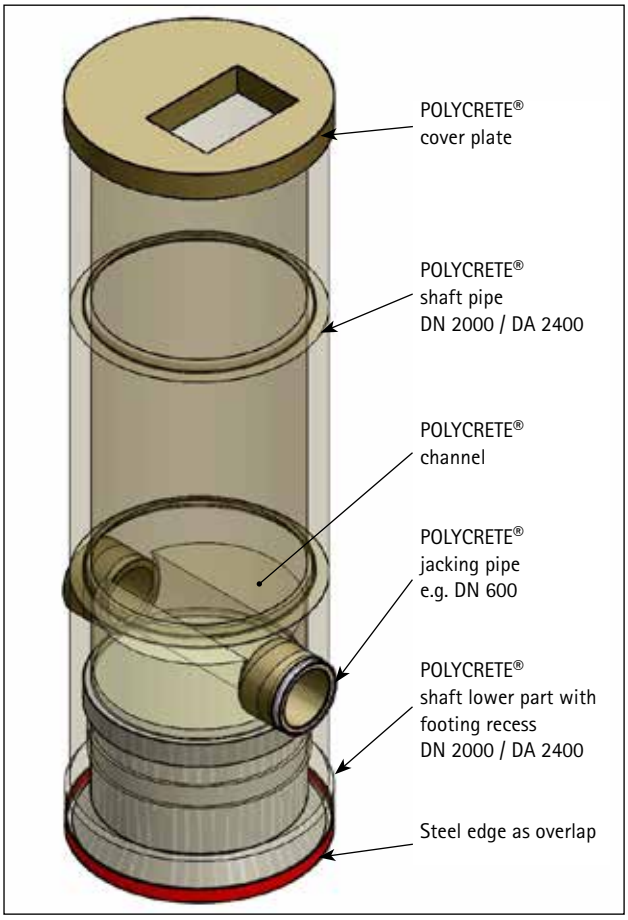
POLYCRETE® sink shafts

Intermediate and reception shafts for micro-tunnelling

POLYCRETE® prefabricated shafts are particularly cost-efficient when installed as sink shafts where the ground water level is high. The details of these sink shafts are tailored for their intended function and installation position, also taking buoyancy protection into account.

With their functions as intermediate and reception shafts they are an environmentally friendly and economical solution for micro-tunnelling. As a manufacturer with a comprehensive range of jacking technology we plan, design and produce intermediate and reception shafts in the dimensions required by the jacking machinery.

Of course POLYCRETE® sink shafts can be furnished for different purposes, e.g. as pump stations, valve shafts or measuring stations.

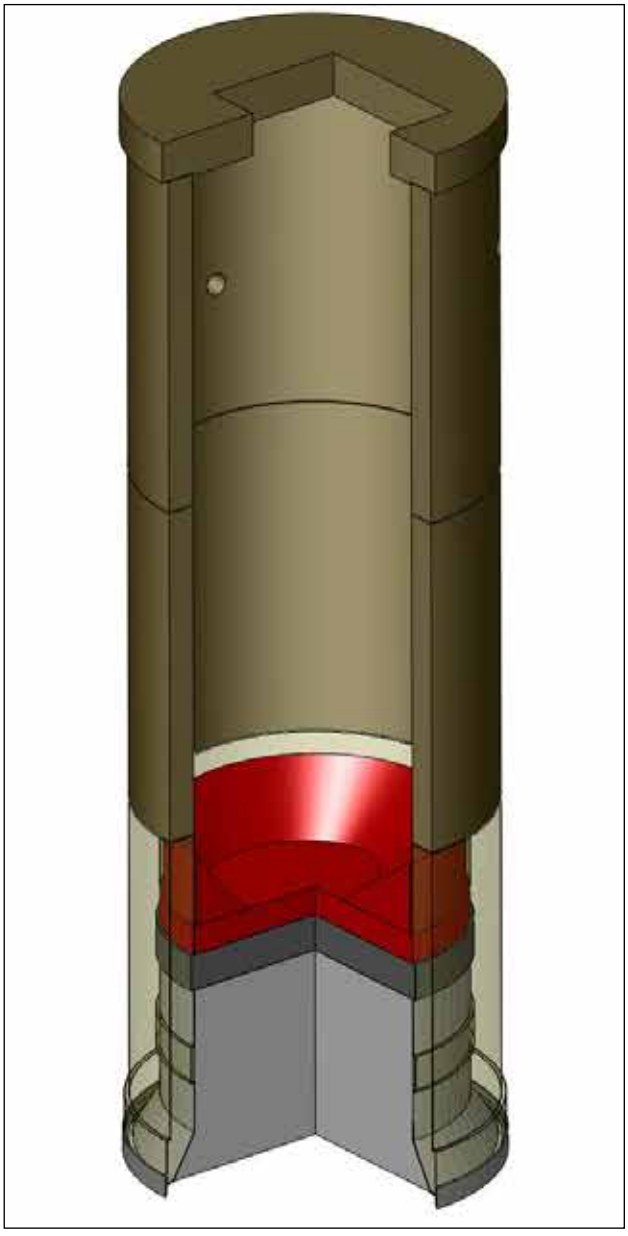


POLYCRETE® sink shaft DN 2000 / DA 2400 as reception shaft

POLYCRETE® sink shafts DN 1600 – DN 2600

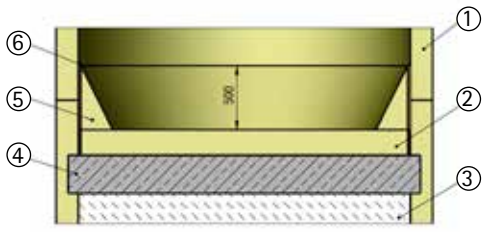
Internal diameter DN	Wall thickness	Connection DN max.	Effective height min.	Effective height max.	Weight Pipe
(mm)	(mm)	(mm)	(mm)	(m)	(kg/m)
1600	145	1000	1200	> 10	1835
1800	160	1200	1450	> 10	2270
2000	200	1400	1650	> 10	3180
2600	175	1800	2100	10	3510

Guide values for dimensions and weights



POLYCRETE® sink shaft DN 2000

Dome with facing masonry



1 POLYCRETE® shaft pipe
2 POLYCRETE® base plate
3 Underwater concrete
4 Steel reinforced concrete plate
5 POLYCRETE® concave bottom element
6 Adhesive joint

Detail of concave bottom element installation

First the underwater concrete and the steel reinforced concrete plate are installed. Then the POLYCRETE® base plate with the concave POLYCRETE® bottom element is set into the shaft as a special component and glued firmly to the shaft wall. Thus the consistently use of high-quality materials helps you achieve a completely sealed shaft space with corrosion protection all around.

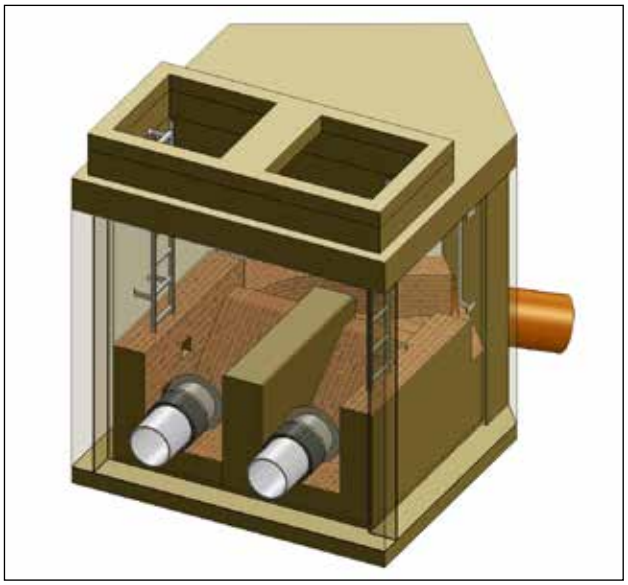
POLYCRETE® shaft structures

Individually planned and delivered ready-to-connect

For larger connection diameters, various different inlets and outlets and particular technical requirements the compact system manhole elements are often not sufficient. In such cases it is recommended to install POLYCRETE® shaft structures. They are individually planned, designed and manufactured in close cooperation with the user for specific dimensions, loads and site conditions.

Oval and polygonal shaft structures are assembled in the factory in any combination of prefabricated circular shell sections and flat panels made of polymer concrete. The structurally optimised design with high material strength allows a relatively thin wall thickness. Thus external dimensions and weight are minimized, and even large structures can be transported and installed conveniently and at a lower cost.

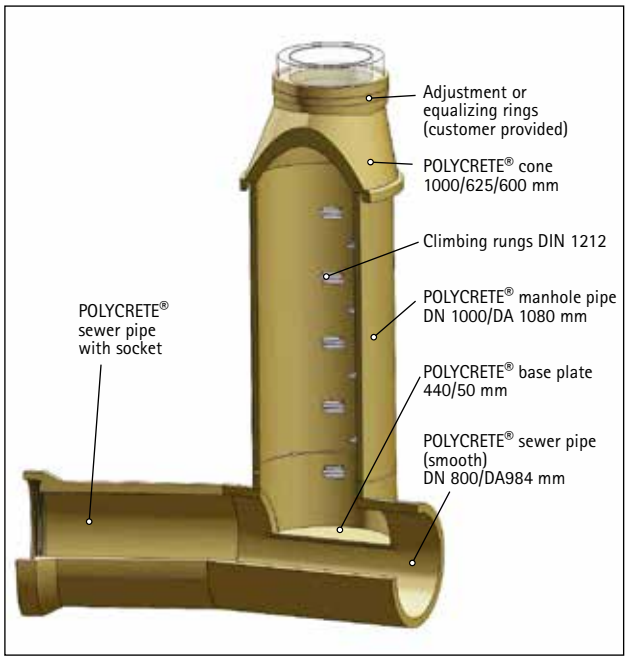
Production in the factory is carried out under optimum conditions, independent of the weather, and ensures a consistent quality level of project-related complex engineering structures for the complete sewer system. Unsatisfactory compromises necessitated by on-site assembly are avoided, and the leak-tight connection of the POLYCRETE® shaft structure to the sewer system is assured through installation-friendly, integrated connections.



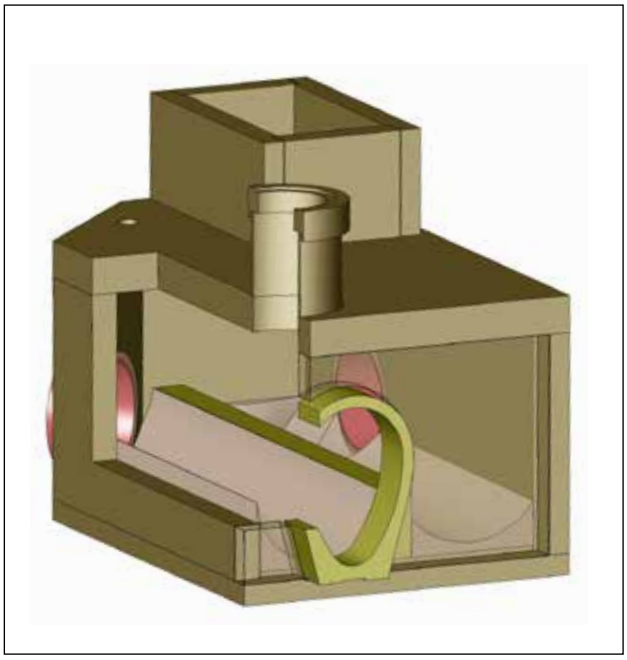
Examples of individually manufactured shaft structures

Cost, deadline and quality risks are thus avoided. The construction project is easier to calculate and almost always more cost-efficient for contractors and sewer system operators alike thanks to the quick and timely delivery of prefabricated POLYCRETE® shaft structures.

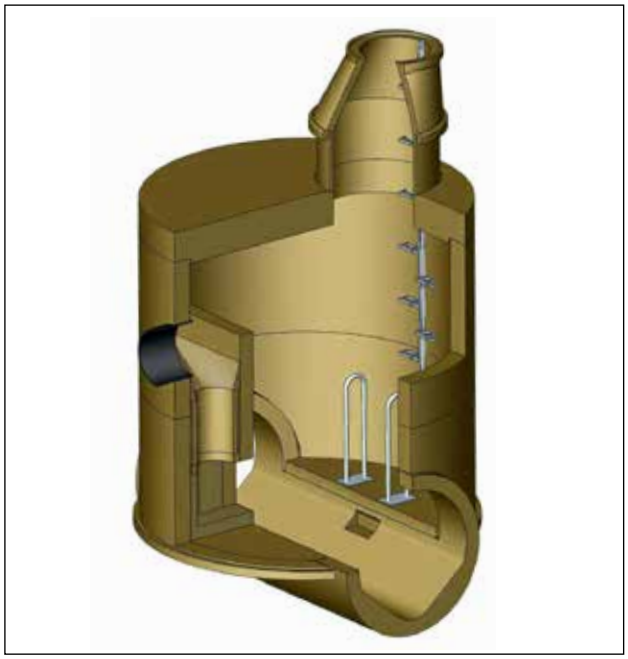
Individually planned shaft structures – examples



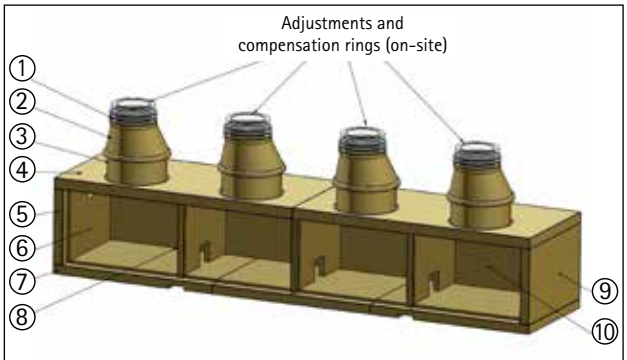
POLYCRETE® tangential manhole



POLYCRETE® overflow structure



POLYCRETE® tangential manhole DN 2000 with interior drop pass-through pipe DN 800 - kite profile



1 POLYCRETE® adjustment rings PRC-M-AU
2 POLYCRETE® shaft cone DN 1000/625/600 mm
3 POLYCRETE® shaft pipe DN 1000/DA1080mm, Bl=520 mm
4 POLYCRETE® cover plate, d= 250 mm (2-part) incl. 4 x opening 1000 mm
5 POLYCRETE® wall panel 4, d= 220 mm
6 POLYCRETE® wall panel 3, d= 220 mm (2-part)
7 POLYCRETE® floor plate, d= 220 mm (2-part)
8 POLYCRETE® dividing wall, 1 to 4, d= 100 mm incl. openings 400 x 400 mm
9 POLYCRETE® wall panel 2, d= 220 mm
10 POLYCRETE® wall panel 1, d= 220 mm (2-part)

POLYCRETE® shaft structure
overall length 9.55 m

Straight to the point

POLYCRETE® jacking pipes from meyer-POLYCRETE offer:

- High compressive strength
  - High jacking forces with low wall thicknesses
- Precise plane parallelism of pipe faces
  - Uniform pressure transfer
- Optimum elasticity
  - Dissipation of stress peaks, reduction of rupture risk
- Tested fatigue strength
  - Approval from the Federal Railway Authority for POLYCRETE® jacking pipes for installation underneath railway tracks up to and including DN 2000
- Impact resistant, highly stress-resistant material
  - Resistant to high-pressure cleaning, trouble-free connection hole drilling
- Stable shape, extremely small dimensional tolerances
  - Leak tight connections, no ovality, no bottom offset
- Smooth, uniform, non-absorbing outer surface
  - Low surface friction
- Steel / stainless steel sleeve
  - Maximum security during jacking
- Low weight = easier handling
- High corrosion resistance, good resistance to chemicals
  - Reliable long-term operation
- Material structure made from high quality polyester resin and pressure-resistant quarzites:
  - Does not permit damage through osmosis along fibres
- High temperature resistance up to a media temperature of 85°C
- Smooth, uniform, non-porous surfaces
  - High flow speed with reduced sludge deposits
- Adaptable dimensions
  - Use with all jacking machines
- Complete system
  - POLYCRETE® sink shafts, POLYCRETE® shaft structures, POLYCRETE® jacking pipes and POLYCRETE® system manholes in consistently high quality, from a single source

In use throughout the world

Construction projects	Country	Nominal diameter (mm)	Length (m)	Year	Comments
Leverkusen – Schloss Morsbroich	Germany	800 - 1200	407	1992	Length 1m, curved drive with r=115m
Chemnitz	Germany	800	1394	1994	
Vallejo	USA	1200	768	1997	
Los Angeles	USA	1067 (42")	2703	1998	
Hamburg Graumannsweg	Germany	2600	437	2000	Curved drive with r=600m
Wuppertal - animal tunnel	Germany	2600	85	2001	Motorway tunnel, depth up to 13m
Berlin - Arkonaplatz	Germany	600/900 egg profile	153	2002	Internal egg cross section
Lübeck - Herrentunnel - Seelandstr.	Germany	1000		2002	Reachstacker loading, depth up to 8m
Sydney - Hoxton Park	Australia	1400 - 1800	1950	2003	
Attendorn - Sondern	Germany	1600		2003	Rocky substrate, depth up to 90m, curved drive with r=600m
Hamburg - Eichenstr.	Germany	1600	327	2006	Curved drive with r=300m
New York - Warnerville	U.S.A.	300	583	2007	Jacking length up to 140 m, without inter-jacking stations
Mazarron – Desaladora de Valdelentisco	Spain	2000	680	2007	Transport of seawater, rocky substrate
Montpellier	France	1200	324	2007	Depth up to 11m
La Coruna – Emisario Edar de Bens	Spain	1800	553	2008	Low pressure pipe, sea outlet, rocky substrate, depth up to 18m
Minsk	Belarus	1000		2008	Depth up to 17m
Aguilas - Desaladora - Gualadentin	Spain	2000	410	2009	Low pressure pipe - sea outlet
Hamburg - Wendenstr.	Germany	1200 kite profile	455	2009	Curved drive with r=500m
Powidz – Military Airport	Poland	400 - 1200	1180	2011	Aircraft loads
Freiberg - ZKA collector	Germany	1400	1368	2010	Jacking length 300m without inter-jacking stations, curved drive with r=345m, 12m deep
Gda´nsk – Airport	Poland	1400 kite profile	420	2010	Aircraft loads
Warsaw – Połczy´nska Street	Poland	600 - 1400	1050	2010	
Gda´nsk - Arena Baltycka - Wielopole	Poland	1600 kite profile	1536	2011	Railway loads
Katowice - GIGABLOK	Poland	500 - 1800	2683	2011	Smallest covering of 1m, traffic loads
Logan	Australia	250 + 500	1178	2011	Rocky substrate
Honolulu - BWFM 1	U.S.A. - Hawaii	1800	390	2012	Low pressure pipe, curved drive with r=274m
Brno-Rekonstrukce a dostavba kanalizace	Czech Republic	1800+2000 kite profile	42	2013	Railway loads
Sawtell NSW	Australia	800	132	2013	
Hamburg-Heidenkampsweg	Germany	1200	162	2013	
Balice Airport	Poland	1000	249	2013	
Saarlouis-Neuforweiler	Germany	800	530	2013	Rocky substrate, depth up to 12m
Hamburg-Duvenacker	Germany	250 + 600 + 700	415	2013	Motorway tunnel, depth up to 8m
Bellbrowie Brisbane	Australia	500	840	2013	Rocky substrate
Poznan-Niepodleglosci	Polen	2200	138	2014	Waste water main collector
Gothenburg	Sweden	500	278	2014	Rocky substrate
Miami	U.S.A.	1200	1256	2014/15	Very long drive lengths
Kaliningrad	Russia	900	471	2015	Very high groundwater levels
Montpellier	France	1200	318	2015	Waste water main collector

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