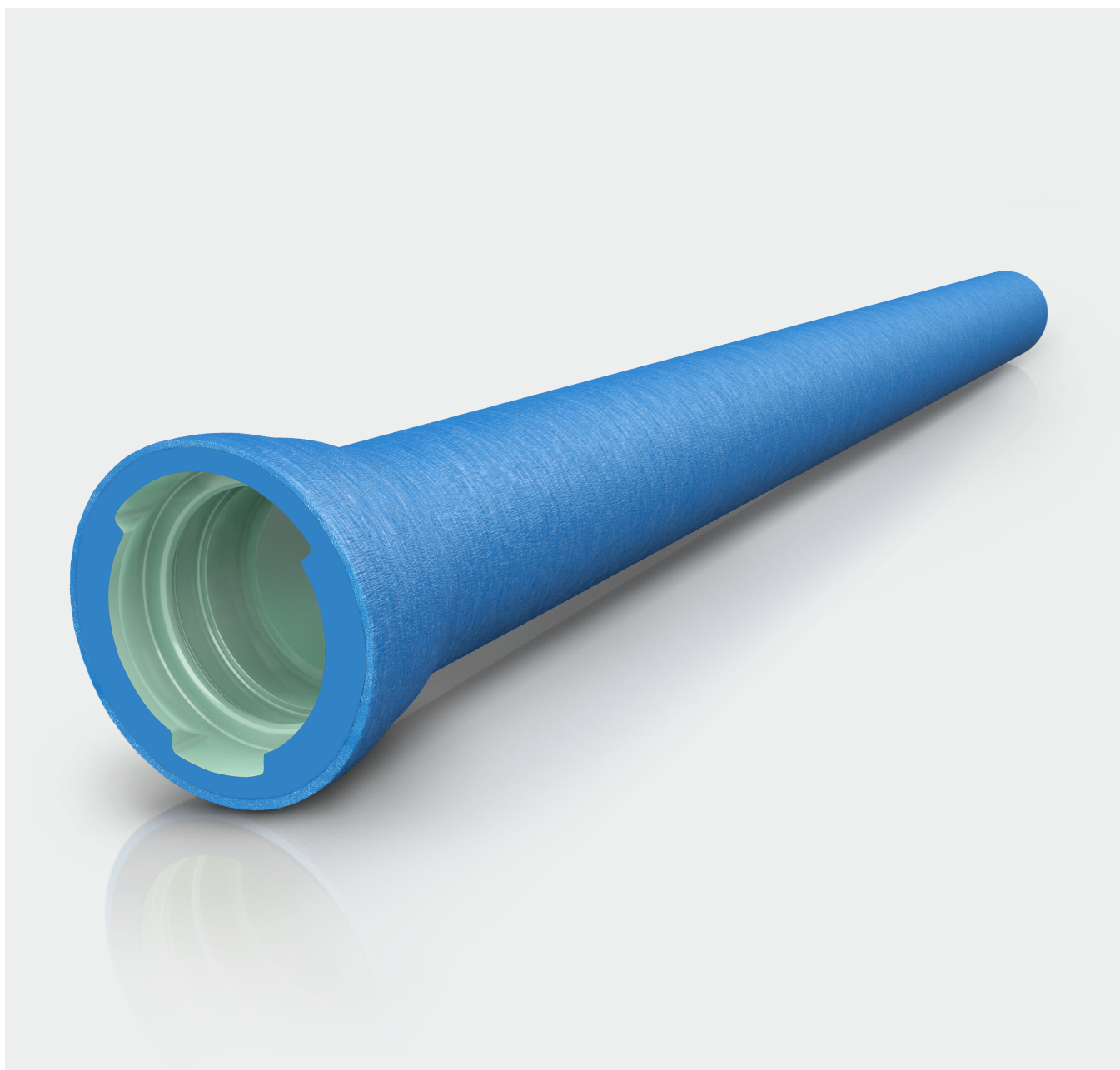




HYDRO

CEMPUR – THE PERFECT COMBINATION OF INNOVATIVE COATING EXPERTISE

Ductile cast-iron pipes with optimised energy efficiency for high-performance applications



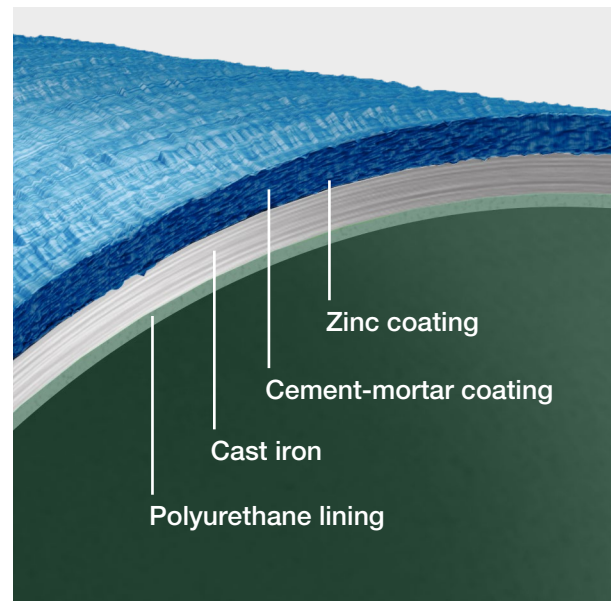
ZEROWATERLOSS
vonroll-hydro.world

CEMPUR – Our strongest component

CEMPUR pipes feature impressive hydraulic properties with a technical operating life of 140 years. They are fully protected pipes made from ductile cast iron for high-performance applications, with pore-free polyurethane (PUR) inner linings and cement-mortar coating (CMC) on the outside. Our strongest component is particularly suitable for all applications relating to turbine pipes in difficult terrain, and for installation in the revolutionary sponge city concept.

CEMPUR – Benefits at a glance

- Technical operating life of up to 140 years
- Fully protected pipe
- CMC is considered to be a reinforced coating in accordance with EN 545 and 598, usable in all soil types of any corrosiveness
- Compatible with the sponge city concept: Full use of the excavated material and the excavated space as water storage
- Extremely quick, reliable and cost-effective installation (even in applications where frost can occur)
- PUR lining with a layer thickness of 1.3–1.5 mm
- Suitable for all water types (including low-lime and lime-dissolving water) and (industrial) wastewater with pH values of 1–14
- Minimal wall roughness of $k = 0.0014 \text{ mm}$ (in accordance with SVGW W4) and the maximum possible nominal inside diameter for the relevant nominal size for maximum hydraulic capacity



Use

- Communal supply and drainage
- Projects with trenchless installation
- Industry and mining (use in media from pH 1–14 is possible), turbine pipes and anergy networks:
Ideal hydraulic capacity
- With exceptional structural strength characteristics, the ideal solution for projects:
 - With very small or very large pipe covers
 - In non-loadbearing soils
 - Using post installation (one support per pipe)
 - On bridges or supporting walls (can be installed as a self-supporting system with one support per pipe)
 - With very high traffic and earth loads (airports, rail transport, motorways)

Ductile cast-iron pipes – for sustainability in the life cycle

High operating reliability, economical operation and a long operating life are key criteria when selecting a suitable pipe material for the construction of a pipe system.

Alongside the classic drinking water supply and wastewater disposal, the excellent technical properties of ductile cast iron enable use in exceptionally high-performance applications. As a result, cast pipe systems have become an increasingly popular solution for alternative applications.

Whether these are used for industrial applications (e.g. fire extinguisher systems, process water discharge), in the energy industry, for pressure pipes in hydroelectric power plants, for "cold" district heating networks, in industrial snowmaking or for alternative trenchless installation technologies, ductile cast-iron pipes have gained acceptance as a superior pipe material.

Ductile cast-iron pipes – with their outstanding properties – provide major advantages throughout the entire range of services:

Technical

- High pressure resistance with large safety reserves
- Maximum static load-bearing capacity, high and low covers are possible
- Innovative thrust-protected/longitudinal positive locking joints
- High-performance solutions thanks to wall thicknesses, coatings and linings being optimised according to the application
- Certified in accordance with EN 545/598, audited by MPA NRW

Economical

- Very long operating life of up to 140 years with the same good material properties
- Ductile cast iron standard fittings for optimised pipe layout and connection line solutions
- Deflectable up to 5°, saves on fittings
- Simple to handle and process, low-maintenance
- Economically the most efficient solution on the market

Ecological

- Socket systems with fully sealed pipe joints
- Linings and coatings suitable for foodstuffs
- Protection of drinking water and ground water by diffusion-tight pipe walls
- Ecological, environmentally friendly material, sustainable and recyclable
- Swiss/German quality products

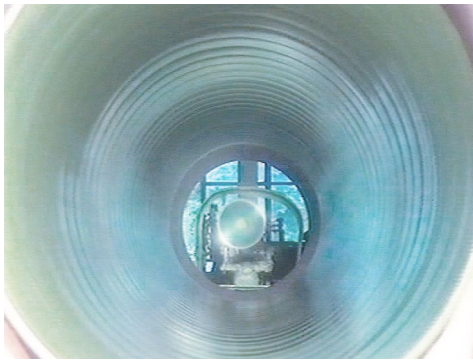
The systematic use of ductile cast-iron pipe systems increases the average operating life in the networks, which means that the required investment cycles remain manageable in a controllable manner.

Innovative PUR lining – energy efficient and mechanically robust

In order to make full use of the exceptional properties of ductile cast-iron pipes, vonRoll hydro has developed and perfected a polyurethane (PUR) lining. PUR boasts the very highest standards of hygiene and unrivalled corrosion protection whilst ensuring the maximum possible flow through the pipe.

Ductile cast-iron pipes with a polyurethane lining are standardised in EN 545 and EN 598. The polyurethane (PUR) lining is applied to the ground and blasted inner surface of the pipes in accordance with standard EN 15655 using a two-component thermal spraying process and separates the flow medium from the iron with high electrical impedance.

The PUR lining meets the requirements of the German Environmental Protection Agency's "Guideline for Hygienic Assessment of Organic Coatings in Contact with Drinking Water" as well as the requirements of the DVGW Worksheet W 270.

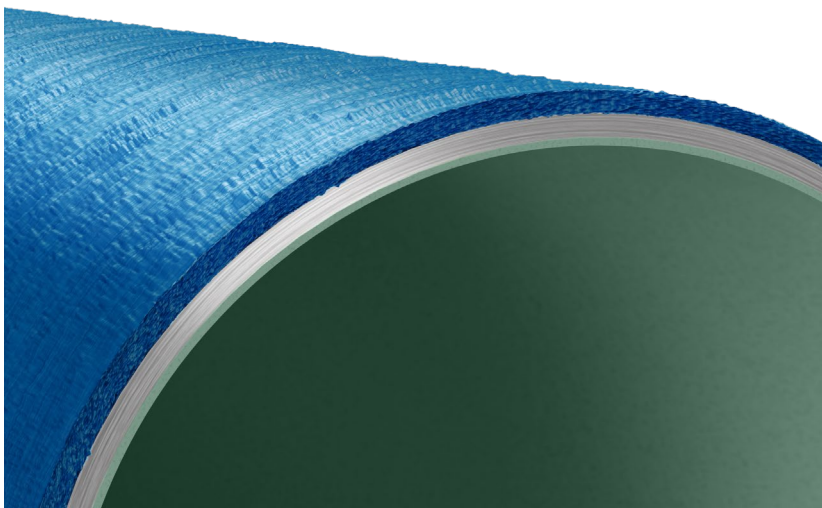


In addition, the PUR lining can permanently withstand various chemical and mechanical loads (e.g. soft, acidic or salt water, debris in wastewater or high-pressure cleaning) and ensures resistance against all types of wastewater.

Polyurethane (PUR)-coated cast-iron pipes are ideal for energy-efficient use in various supply and disposal networks.

The successful, innovative vonRoll PUR lining exhibits unparalleled performance values:

- Suited to all types of water and wastewater from pH 1 to pH 14
- Suited to soft and lime-dissolving water types
- Hydraulically smooth, the wall roughness is $k = 0.0014$ to mm (in accordance with SVGW W4)
- Very large hydraulic interior cross-section
- Minimal pressure losses
- Ideal hydraulic capacity

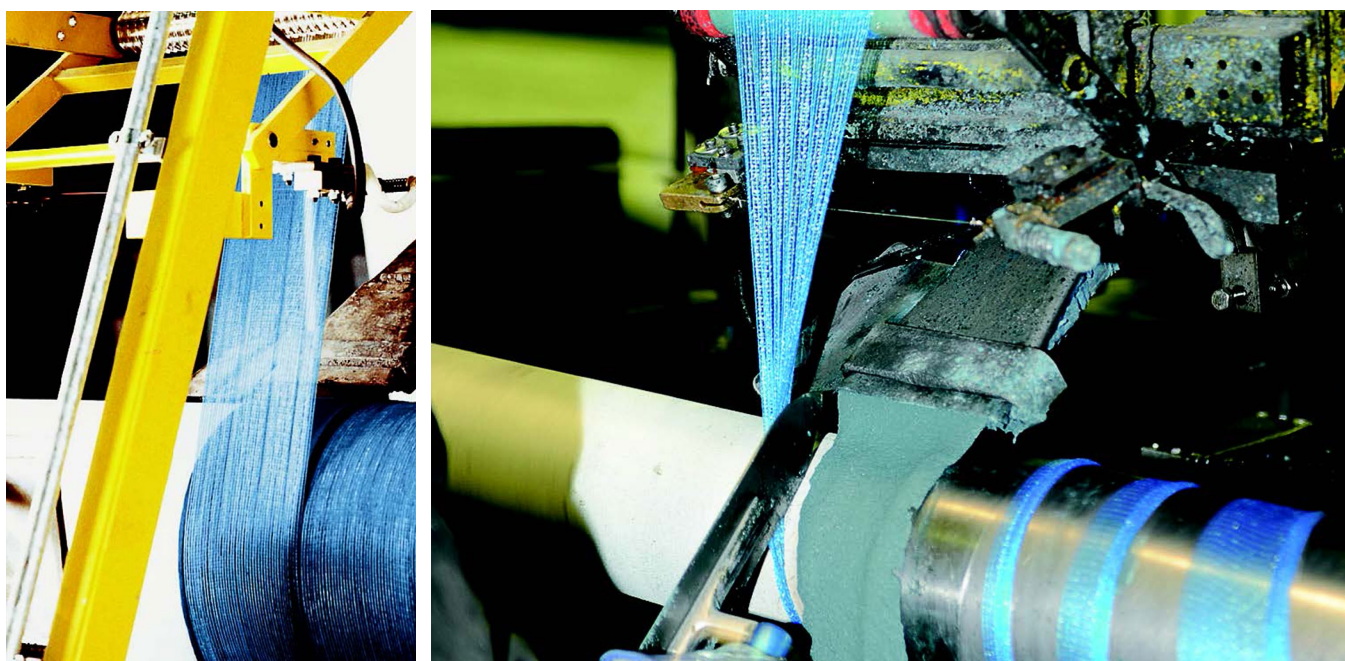


The PUR lining

- is predestined for pump operation where a high degree of energy effectiveness is key
- actively reduces the operating costs of the system
- is ideal for wastewater pipes with minimum gradients

Cement-mortar coating CMC – hard-wearing and perfect for harsh everyday use on construction sites

Ductile cast-iron pipes with CMC cement-mortar coating can be used in all soil types. The CMC prevents the entry of aggressive media and resists mechanical loads during transport and installation. It corresponds to EN 15542, with a nominal layer thickness of 5 mm. There is always a zinc coating of at least 200 g/m² under the CMC. The cement mortar is applied using an extrusion (winding) process or a spraying process.



This coating has proven to be extremely successful, particularly **during increased use in high-performance applications**. The excellent mechanical load capacity of the cement-mortar coating is determined by the two requirements of adhesive pull strength and impact resistance in accordance with EN 15542.

The CMC offers highly effective corrosion protection and protects against both chemical and mechanical attacks. The chemical protective effect is primarily based on the porosity and alkalinity of the mortar used based on blast furnace cement. Due to the influence of moisture in the ground or groundwater, a pH value >10 is permanently generated on the surface of the cast-iron pipe, which reliably prevents corrosion. The requirements for the cement-mortar coating CMC are determined such that damage to the cement-mortar layer can be virtually excluded both during professional transport and during installation in the toughest terrain.

Due to the excellent mechanical and chemical protective properties of the CMC, pipes with this outside coating can be used virtually anywhere. In accordance with Annex D to EN 545, ductile cast-iron pipes with a fibre-reinforced cement-mortar coating in accordance with EN 15542 can be installed in soil types of any corrosiveness.

DVGW Worksheet W 400-2, Annex G specifies the permissible pipe coating materials for ductile cast-iron pipes with a cement-mortar coating with grain sizes of 0 to 63 mm, with a maximum grain size of 100 mm, round or broken.



The CMC offers optimum mechanical protection in harsh everyday use on construction sites:

- Installation in soils with a maximum grain size of 100 mm, regardless of whether these particles are round or broken.
- Excavated material with a large grain size can be reused
- In mountainous and rocky terrain as stone damage protection during backfilling
- Use in trenchless installation processes, such as burst lining, horizontal directional drilling processes, pipe relining, etc.

Economic benefits of CMC:

- **No need to replace the soil or use additional pipe bedding, the excavated soil can be reused.**
- **Cost and time savings since no excavated material needs to be transported away and deposited.**
- **Permanent corrosion protection and thus long operating life (according to the DVGW, up to 140 years).**

CEMPUR – A pipe using individual, solution-oriented joint techniques

CEMPUR pipes are available in all socket joint technologies offered by the vonRoll hydro Group.

The socket joints in our ductile cast-iron pipe systems have impressive properties:

- Guaranteed tight connections (positive and negative pressure)
- Flexible, deflectable up to 5°
- Root-resistant joint technology
- Electrically insulating joint systems
- Longitudinal positive locking, with frictional locking or form fit
- For high-pressure applications, operating pressures of up to 100 bar
- Perfect for trenchless installation



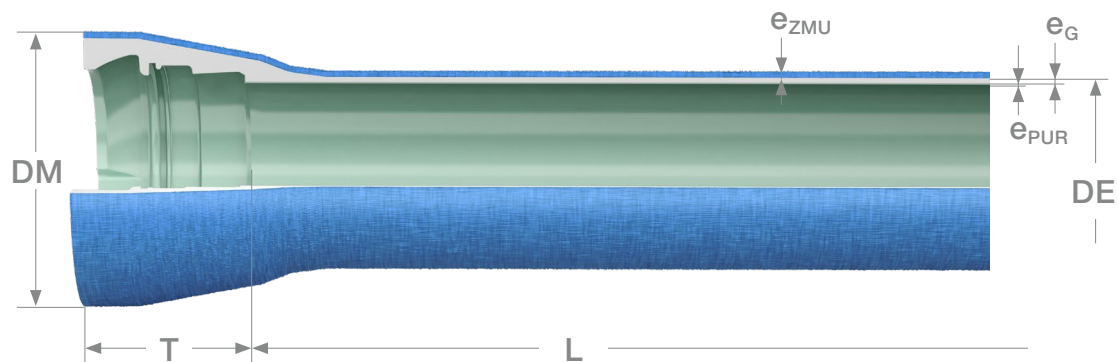
CEMPUR BLS socket pipe

Ductile cast-iron pipe in accordance with EN 545

BLS type push-in socket with double chamber

Lining: Polyurethane (PUR) in accordance with EN 15655

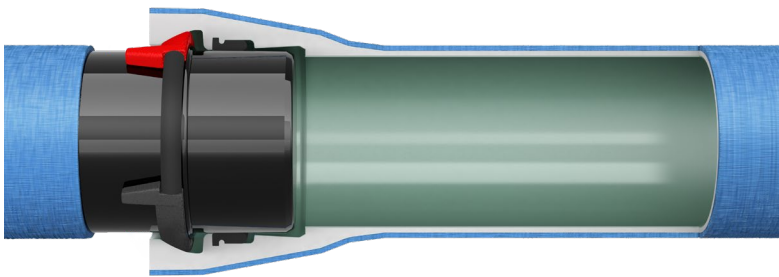
Coating: Zinc coating 200 g/m² and cement-mortar coating (CMC) in accordance with EN 15542



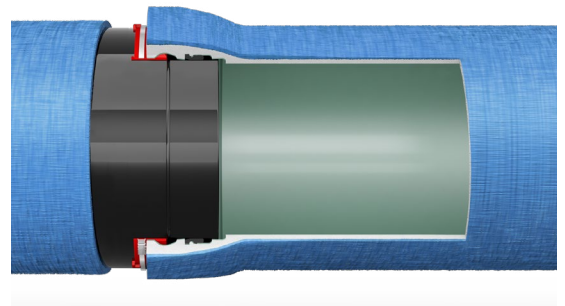
DN	Pipe class	L mm	DE mm (nominal)	e _c mm (minimal)	e _{PUR} mm (nominal)	e _{CMC} mm	DM mm	T mm	Weight kg/m (theoretical)
80	K10	6000	98 +1/-2.7	4.7	1.3	5	166	127	18
100	K10		118 +1/-2.8	4.7	1.3		192	135	22
125	K10		144 +1/-2.8	4.8	1.3		216	143	28
150	K10		170 +1/-2.9	5.1	1.3		249	150	35
200	K9		222 +1/-3.0	4.8	1.5		303	160	45
250	K9		274 +1/-3.1	5.2	1.5		367	165	59
300	K9		326 +1/-3.3	5.6	1.5		420	170	76
400	K9		429 +1/-3.5	6.4	1.5		531	190	108
500	K9		532 +1/-3.8	7.2	1.5		646	200	144
600	K9		635 +1/-4.0	8.0	1.5		742	175	191
700	K9		738 +1/-4.3	8.8	1.5		859	197	240

Thrust-resisting BLS

(form-fit)



BLS DN 80–500



BLS DN 600/700

DN	Number Lock	PFA bar	Permissible tensile strength kN (DVGW)	Possible deflection	Min. curve radius m	Lock set weight kg
80	2/3 ¹⁾	100/110 ¹⁾	70	5°	69	0.4/0.7 ¹⁾
100	2/3 ¹⁾	75/110 ¹⁾	100	5°	69	0.4/0.8 ¹⁾
125	2/3 ¹⁾	63/110 ¹⁾	140	5°	69	0.6/1.1 ¹⁾
150	2/3 ¹⁾	63/75 ¹⁾	165	5°	69	0.8/1.4 ¹⁾
200	2/3 ¹⁾	40/63 ¹⁾	230	4°	86	1.1/1.9 ¹⁾
250	2/3 ¹⁾	40/44 ¹⁾	308	4°	86	1.5/2.7 ¹⁾
300	4	40	380	4°	86	2.7
400	4	30	558	3°	115	4.4
500	4	30	860	3°	115	5.5
600	9	32	1200	2°	172	9
700	10	25	1400	1.5°	230	11

¹⁾ With high-pressure lock

The socket joint technologies from the vonRoll hydro Group are suitable for diverse areas of use and ensure maximum operating safety – particularly for high-performance applications.

Full range of fittings – for every installation situation

A universal full range of socket fittings is available for all joint technologies from the vonRoll hydro Group. The fully protected philosophy is ensured by an integral thick layer of epoxy resin in accordance with EN 14901 and increased requirements as per GSK/RAL-GZ 662.



The fully protected fittings range from the vonRoll hydro Group is suited to unlimited use in soil types of any corrosiveness (in accordance with EN 545) and fulfils the most demanding requirements both during installation and during continuous operation.

CEMPUR PIPES – for high-performance applications



CEMPUR pipes are the tailor-made solution for particularly harsh and demanding installation situations:

- In mountainous and rocky terrain
- Excavated material with a large grain size can be reused
- As stone damage protection during backfilling

