

**DANTONIT**



**Watertight solutions  
using natural materials**

[www.dantonit.dk](http://www.dantonit.dk)

**DANTONIT** is part of NCC A/S, the only Scandinavian manufacturer of certified bentonite products. We extract the bentonite from our own quarry on the island of Tåsinge.

At our factory in Odense, we produce a wide range of products for such purposes as sealing wells and boreholes in large construction projects, and membranes to protect areas against pollution.

# What is bentonite?

Bentonite is a plastic clay with a high content of the mineral montmorillonite. Formed by the decomposition of volcanic ash, montmorillonite was deposited in the ocean about 50 million years ago. Bentonite contains no artificial additives and is therefore a 100% natural material.

With its capacity to absorb large amounts of water, bentonite can be used to make completely waterproof products. The natural material is self-sealing,

which increases the range of applications and ensures a long product life. Bentonite is therefore ideal for use in solutions to prevent pollution and infiltration, as well as other applications such as the protection of cloudburst areas. This makes it an essential material in several different products. Our products focus primarily on sealing tasks, typically in large construction projects, such as foundation protection, the establishment of landfill membranes or other forms of groundwater flow and pollution protection.



# Dantonit and the environment

## Protecting the environment and our resources

Bentonite is a natural material and therefore contains no additives. Bentonite protects the environment from pollution by sealing against the ingress of water. Bentonite also acts as a barrier against chemicals and against the diffusion of most substances transported in water.

Landfills, oil and petrol facilities, etc. pose a potential contamination hazard. Incorporating a bentonite membrane below, above or around these will retain the

contaminants and protect the surrounding environment from pollution. Collection basins can be effectively sealed with bentonite, protecting against infiltration and allowing pollutants to be collected for further processing.

Dantonit is environmentally certified according to ISO 14001:2015. All products have a “Certificate of Environmental Safety” and a water hazard classification. The products have been tested in a German laboratory in accordance with German guidelines.





Material	Thickness	Permeation time	Water penetration
DantoCrude	0,5 m	302 years	0,003 liters/m <sup>2</sup> /day
DantoCrude	0,4 m	195 years	0,003 liters/m <sup>2</sup> /day
DantoCrude	0,3 m	111 years	0,004 liters/m <sup>2</sup> /day
DantoCrude	0,2 m	50 years	0,007 liters/m <sup>2</sup> /day
DantoCrude	0,1 m	13 years	0,013 liters/m <sup>2</sup> /day
Permeability criterion according to EN 14150			0,100 liters/m <sup>2</sup> /day

Calculation of permeation time and water penetration for a DantoCrude membrane is based on Darcy's law, and a hydraulic conductivity of  $1.5 \times 10^{-12}$  m/s has been used for DantoCrude. Geosynthetic barriers made of plastic and rubber are typically tested in accordance with EN 14150, where water penetration with a 10-meter water column is measured after 20 days. The permeability criterion for these materials is a maximum water penetration of 0.1 liters/m<sup>2</sup>/day. This criterion is easily met by DantoCrude. Furthermore, it will take many years before any water penetrates a DantoCrude membrane. The thicker the layer of DantoCrude, the longer it will take. Due to their lesser thickness, typically 1–2 cm, membranes of bentonite matting have a permeation time of a few days and do not meet the permeability criterion according to EN 14150 applicable to geosynthetic barriers.

# DantoCrude



Naturally moist calcium bentonite can be used to great advantage for the establishment of natural membranes in stormwater reservoirs, ponds and drainage ditches. This avoids the use of vulnerable plastic films, bentonite matting and thick traditional membranes made of ordinary clay.

DantoCrude membranes are denser, more robust and more flexible than thin, traditional bentonite plastic matting. DantoCrude membranes can be laid directly on the existing substrate and do not require the establishment of a protective substrate like bentonite plastic matting does. This saves time and costs for the contractor.

There are no time-consuming joints or bonds that can leak and require special equipment. At the same time, DantoCrude membranes provide greater safety against the penetration of contaminants such as petrol, oil and heavy metals.

If the DantoCrude membrane is damaged, it is able to repair itself due to its swelling properties, thus avoiding expensive and cumbersome patching work because of root penetration, for example.

DantoCrude membranes shape themselves to the substrate and adhere tightly to foundations and penetrating pipes. Ordinary construction equipment can be used to lay the membrane.

## Natural membranes, landfills and watercourses

There are two methods to choose from: laying and compacting DantoCrude on a solid surface or milling DantoCon Seal N into the existing subsoil to create what is known as a milled membrane. A more detailed work description can be found at [www.dantonit.dk](http://www.dantonit.dk)

More bentonite is used for a DantoCrude membrane than for the milled membrane. However, a DantoCrude membrane has lower permeability and saves on the cost of milling bentonite into the subsoil or a sand layer.

DantoCrude is also used in connection with water-based infrastructure and areas of environmental concern for:

- Sealing dikes and dams.
- Retention of leachate in landfills.
- Enclosure of oil and chemical storage facilities.
- Management of surface water from landfill slopes.

### Comparison of different membrane types

Membrane type	Thickness in cm	Hydraulic conductivity m/s	Advection Flow mm/year	Permeation time number of years
Milled membrane	30	$1 \cdot 10^{-10}$	25	5
DantoCrude membrane	10	$1 \cdot 10^{-12}$	1	63
Traditional bentonite matting	1	$5 \cdot 10^{-11}$	49	1 month

### Milled membrane: Addition of DantoCon Seal N when creating a milled membrane

Soil type	Natural clay content	Bentonite per 10 cm membrane	Bentonite addition
Sand	< 5%	12 - 14 kg/m <sup>2</sup>	6-7%
Sand, clay	5 - 10%	10 - 12 kg/m <sup>2</sup>	5-6%
Sand, heavy clay	10 - 12%	8 kg/m <sup>2</sup>	4%
Clay, heavily sanded	12 - 14%	6 kg/m <sup>2</sup>	3%
Clay, sandy	> 14%	6 kg/m <sup>2</sup>	Maximum 3%

### DantoCrude quantity for dense membrane

Water depth in m	Membrane thickness in cm	Quantity kg per m <sup>2</sup>
2,4 or less	10	165
2,5 - 4,9	15	250
5 or more	20	330

# DantoBES



DantoBES can be used to solve many different construction and civil engineering tasks:

- Sealing concrete structures against groundwater ingress.
- BES membranes, using a co-mixture of stone dust or sand to form a membrane under landfills, filling stations and parking lots, where it can replace plastic films and ordinary clay membranes.
- Mixing with cement to produce pumpable concrete for filling and sealing in connection with tunnel construction.

## **Sealing around building foundations**

DantoBES is made from sand and DantoCon Seal N. The factory-mixed DantoBES is a ready-to-use product for situations where you need to establish a robust seal. Working with the BES mix is quick and easy. It just has to be laid and compacted – and the harder it is compacted, the better the seal. This solution is extremely robust.

DantoBES makes use of bentonite's natural properties, following the small movements of the soil and the buildings over time. It therefore provides a good seal year after year. The material is resistant to fossil fuels and most chemicals, making it widely applicable in urban environments and similar areas where there is a risk of such substances leaching into the ground.

DantoBES is an entirely natural material, just like all the other Dantonit products.

### Product description

DantoBES – Bentonite Enhanced Sand – is a special sand optimized with bentonite powder to provide low permeability. The material is entirely natural and very easy to use, whether you want to create a waterproof surface for an outdoor area, seal around a building foundation, or construct a small pond. Its ease of use makes it a preferred choice in many situations where smaller construction machinery is required or where space constraints limit working conditions.

The structure of the sand used in DantoBES allows for easy compaction, reducing the effort needed to achieve the necessary density in the final application. This is a significant advantage since the better the material is compacted, the more watertight the result will be.

### Specifications

Typical Measured Values

Description:	
Moisture content, as delivered (%)	30
Density, as delivered (kg/m <sup>3</sup> )	1.300
Moisture content; optimal at Std. Proctor 95 (%)	11
Density; Std. Proctor 95 (kg/m <sup>3</sup> )	1800
Hydraulic conductivity (m/sec)	1*10 <sup>-10</sup>

*Permeability value measured at a density of only 1700 kg / m<sup>3</sup>*

### Construction applications and water sealing

To prevent rising groundwater under roads and structures, DantoCon Seal N can be mixed with stone dust and applied in a 30–40 cm thick layer. This creates a stable BES (Bentonite Enhanced Soil) membrane with low permeability. The same membrane type is also beneficial for preventing water infiltration, for example, in the construction of parking lots and roads in water extraction areas, as a base and top membrane for landfills and storage sites, as well as in membranes around pipeline trenches.

### Sealing of building foundations and concrete structures

- Permanently adheres to surfaces, sealing them against water penetration.
- Easy and efficient to work with.
- No need for adhesives, joints, or leak-prone pipe penetrations.
- The seal conforms to the shape of the structure.
- No need for protective underlay or final surface covering.
- The material can be customized as needed and functions in all environments.
- The seal remains permanently flexible, preventing cracks over time.
- Can be applied using standard construction equipment.
- Keeps overall installation costs low.

# DantoGran



## **DantoGran has many applications**

DantoGran 0 - 30 mm is used to seal decommissioned drinking water wells, as it complies with the Danish Environmental Protection Agency's very strict legislation on the decommissioning of boreholes and wells, which is intended to ensure that there is no contamination of groundwater or connections between different aquifers.

The DantoGran 0 - 30 mm granulate is also used for the establishment of drainage ditches, roadreinforcement

and various types of contamination membranes to protect against percolate leaching from parking lots or filling stations, for example. The fact that the product is easy and efficient to lay out using ordinary construction machinery, without any kind of gluing or joints, is a major benefit. The result is an unusually robust and tight seal that consists entirely of natural products.

DantoGran is characterized by its high swelling index, high water capacity and good absorption properties.

## Construction work, well sealing, drainage ditches and moisture absorption

A comparison with other sealing materials shows that DantoGran 0 - 30 mm is the safest method of well sealing:

Sealing material	Thickness in cm	Hydraulic conductivity m/s	Advection	
			Flow mm/year	Permeation time number of years
Bentonite	30	$5 \cdot 10^{-12}$	0,3	381
Clay	30	$1 \cdot 10^{-9}$	631	2
Sand	30	$1 \cdot 10^{-4}$	6.307.200	10 minutes

### Advantages of bentonite sealing

- 100% pure natural product.
- Superior when sealing foundations and penetrations in lakes, canals and stormwater reservoirs.
- Long-lasting solution.
- No bonds/joints or leaks around penetrating pipes.
- If the membrane is damaged, it will repair itself.
- Water cannot get under the membrane and create bulging.
- Membrane follows shape of substrate.
- Total establishment costs are kept low.
- Laying out the membrane is a simple procedure.
- Can be laid using ordinary construction equipment.
- The membrane is significantly denser, more robust and flexible than traditional plastic membranes.

# DantoPlug



DantoPlug pellets are superior for plugging boreholes, separating groundwater layers and sealing wells. They are made from pure Danish bentonite, so that no environmentally harmful substances are added to the groundwater.

One of the characteristics of DantoPlug pellets is their excellent capacity to swell on contact with water.

In order to avoid unintentional bridging when filling in the borehole, DantoPlug is manufactured through a special process that delays the start of the swelling process without impairing the sealing ability or swelling pressure.

# Plugging of boreholes, encapsulation and geotechnology

Typical measurement values for freshwater use (pH7)

	DantoPlug Super / Super M	Best Practice Field Manual
Water content (mass fraction in %)	20	-
Swelling start (min.)	>15	>15
Fines content (fluff test) (%)	<1	<5
Sinking speed (m/min)	21 / 23	>20
Product form, pellets (dia. mm)	8	6-10
Swelling pressure (kN/m <sup>2</sup> ) after 4 weeks	80	>75
Density, as supplied (g/cm <sup>3</sup> )	1,10	-
Hydraulic conductivity (m/s)	≤ 5*10 <sup>-12</sup>	<1*10 <sup>-10</sup>
Shear strength after installation (over/under ss) (kN/m <sup>2</sup> ) (kN/m <sup>2</sup> = kPa)	≥40	>25
Magnetic susceptibility (SI unit)	- / 0,0403	-

## Guide

DantoPlug pellets are supplied in 500 and 1,000 kg Big Bags and 25 kg sacks.

The borehole should be filled in slowly at a steady pace to avoid bridging the hole.

### Indicative consumption in kg/meter:

Borehole Ø " mm	Filtering pipe Ø [mm]									
	0	50	100	125	160	200	250	315	400	500
4 100	8,64	6,48								
6 150	19,43	17,27	10,79	5,94						
8 200	34,54	32,38	25,91	21,05	12,43					
10 250	53,97	51,81	45,33	40,48	31,86	19,43				
12 300	77,72	75,56	69,08	64,22	55,61	43,18	23,75			
16 400	138,16	136,00	129,53	124,67	116,05	103,62	84,19	52,48		
20 500	215,88	213,72	207,24	202,38	193,77	181,34	161,91	130,19	77,72	
24 600	310,86	308,70	302,23	297,37	288,75	276,32	256,89	225,18	172,70	94,99

### Number of 25 kg sacks/meter:

Borehole Ø " mm	Filtering pipe Ø [mm]									
	0	50	100	125	160	200	250	315	400	500
4 100	0,35	0,26								
6 150	0,78	0,69	0,43	0,24						
8 200	1,38	1,30	1,04	0,84	0,50					
10 250	2,16	2,07	1,81	1,62	1,27	0,78				
12 300	3,11	3,02	2,76	2,57	2,22	1,73	0,95			
16 400	5,53	5,44	5,18	4,99	4,64	4,14	3,37	2,10		
20 500	8,64	8,55	8,29	8,10	7,75	7,25	6,48	5,21	3,11	
24 600	12,43	12,35	12,09	11,89	11,55	11,05	10,28	9,01	6,91	3,80

# DantoCon Thermal R



Thermal R products are designed for sealing electrical cables laid in pipes.

The primary task of the products is to conduct heat away from the electrical cables to extend their service life.

Several types of Thermal R products have been developed that achieve different thermal resistance after curing, as a range of requirements exist regarding this property.

The products are designed to be easily mixed with water. The resulting mixture is a viscous, low-density liquid. This makes it easy to subsequently pump it into the pipe, enclosing the electrical cables and filling the pipe with the heat-conducting product.

The products will harden slightly over time, while still allowing removal for cable repairs. After repair, it is easy to refill the pipe with a new mixture of the Thermal R product used.

## DantoCon Thermal R05S and R06S

DantoCon Thermal R05S and R06S are specially developed heat-conducting materials for temperature control of electrical cables that have been run in underground pipelines. Both products are delivered in powder form and simply need to be mixed with freshwater before use.

DantoCon Thermal R06S is resistant to sulfate and can therefore be used in sulfate-containing soils. Two weeks after injection, the material will have achieved its permanent firm consistency, which allows the cable to be removed as needed at a later date.

### DantoCon Thermal R05S

#### Specific properties

Concentration (% water)	38
Resistivity after 1 week (mK/W) ASTM.D5334-14	0,47
Conductivity after 1 week (W/mK) ASTM.D5334-14	2,13
Density of the ready mixture (kg/l) Tolerance: (1.60 - 1.64)	1,62
Water residue after 24 hours (%)	< 1

#### Measured values in the mixed condition

Resistivity (mK/W) ASTM.D5334-14	≤ 0,60
Conductivity (W/mK) ASTM.D5334-14	≥ 1,67

#### Mixing ratio per 1 m<sup>3</sup> ready mixture

Water (l)	616
DantoCon Thermal R05S (kg)	1.004

#### Mixing ratio per 1,000 kg dry material

Water (l)	600
DantoCon Thermal R05S (kg)	1.000

### DantoCon Thermal R06S

#### Special properties

Concentration (% water)	43
Resistivity after 1 week (mK/W) ASTM.D5334-14	0,63
Conductivity after 1 week (W/mK) ASTM.D5334-14	1,59
Density of the ready mixture (kg/l) Tolerance: (1.54 - 1.58)	1,55
Water residue after 24 hours (%)	< 1

#### Measured values in the mixed condition

Resistivity (mK/W) ASTM.D5334-14	≤ 0,72
Conductivity (W/mK) ASTM.D5334-14	≥ 1,39

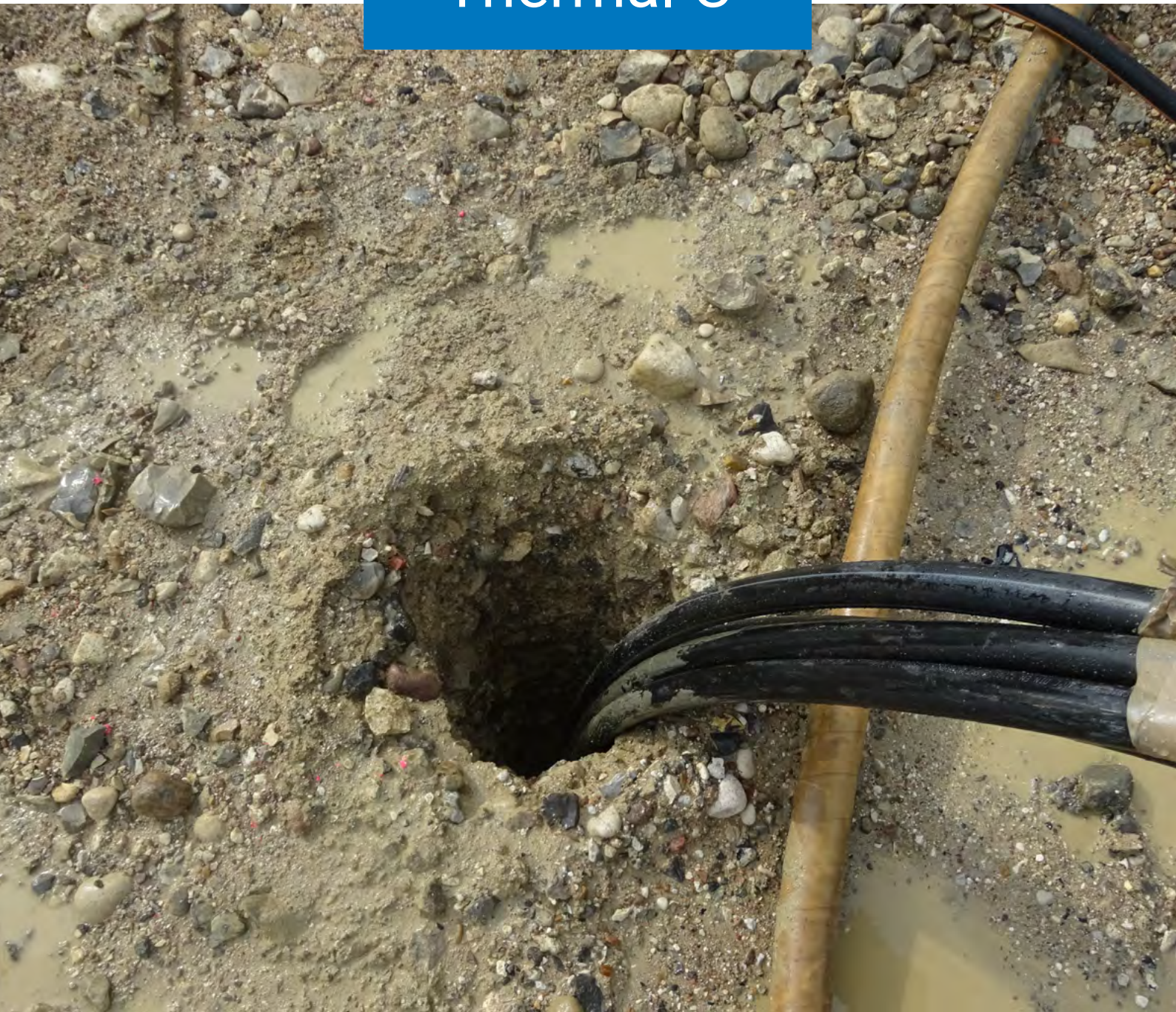
#### Mixing ratio per 1 m<sup>3</sup> ready mixture

Water (l)	677
DantoCon Thermal R06S (kg)	889

#### Mixing ratio per 1,000 kg dry material

Water (l)	750
DantoCon Thermal R06S (kg)	1.000

# DantoCon Thermal C



## **Product for sealing geothermal boreholes**

When a geothermal borehole is to be sealed, the sealing material is usually required to have high thermal conductivity. DantoCon Thermal C2L is a new, specially developed material that has an increased capacity to conduct heat from the soil to the geothermal installation. This bentonite-based material comes in powder form, ready for mixing with water so it can be pumped.

During the development of the product, there has been a strong focus on pumping and handling properties. The result is a material that is easy to work with and, when mixed correctly, is a fluid material with a homogeneous consistency during the water phase.

### DantoCon Thermal C2L

Description	Value	Standard / Equipment
Concentration (% water)	43	
Density of the ready mixture (kg/l)	1,56 - 1,63	500 ml measuring cylinder
Conductivity after 2 weeks (W/mK) ASTM.D5334-14]	≥ 2,0	ASTM.D5334-14
Hydraulic conductivity (m/s)	≤ 5x10 <sup>-11</sup>	DIN 18130-1
Compressive strength (tem.20°, 28days) [m/s]	≥ 1	ASTM D 2166

#### Mixing ratio per 1 m<sup>3</sup> ready mixture

Water (l)	664
DantoCon Thermal C2L (kg)	886

#### Mixing ratio per 1,000 kg dry material

Water (l)	750
DantoCon Thermal C2L (kg)	1.000

### DantoCon Thermal C2L-M

Description	Value	Standard / Equipment
Concentration (% water)	43	
Density of the ready mixture (kg/l)	1,56 -1,63	500 ml measuring cylinder
Conductivity after 2 weeks (W/mK) ASTM.D5334-14	> 2,0	ASTM.D5334-14
Hydraulic conductivity (m/s) )	≤ 1x10 <sup>-10</sup>	DIN 18130-1
Compressive strength (tem.20°, 28days) [m/s]	≥ 1	ASTM D 2166
Magnetic susceptibility (SI unit)	0,0486	SM 30 SH Instruments

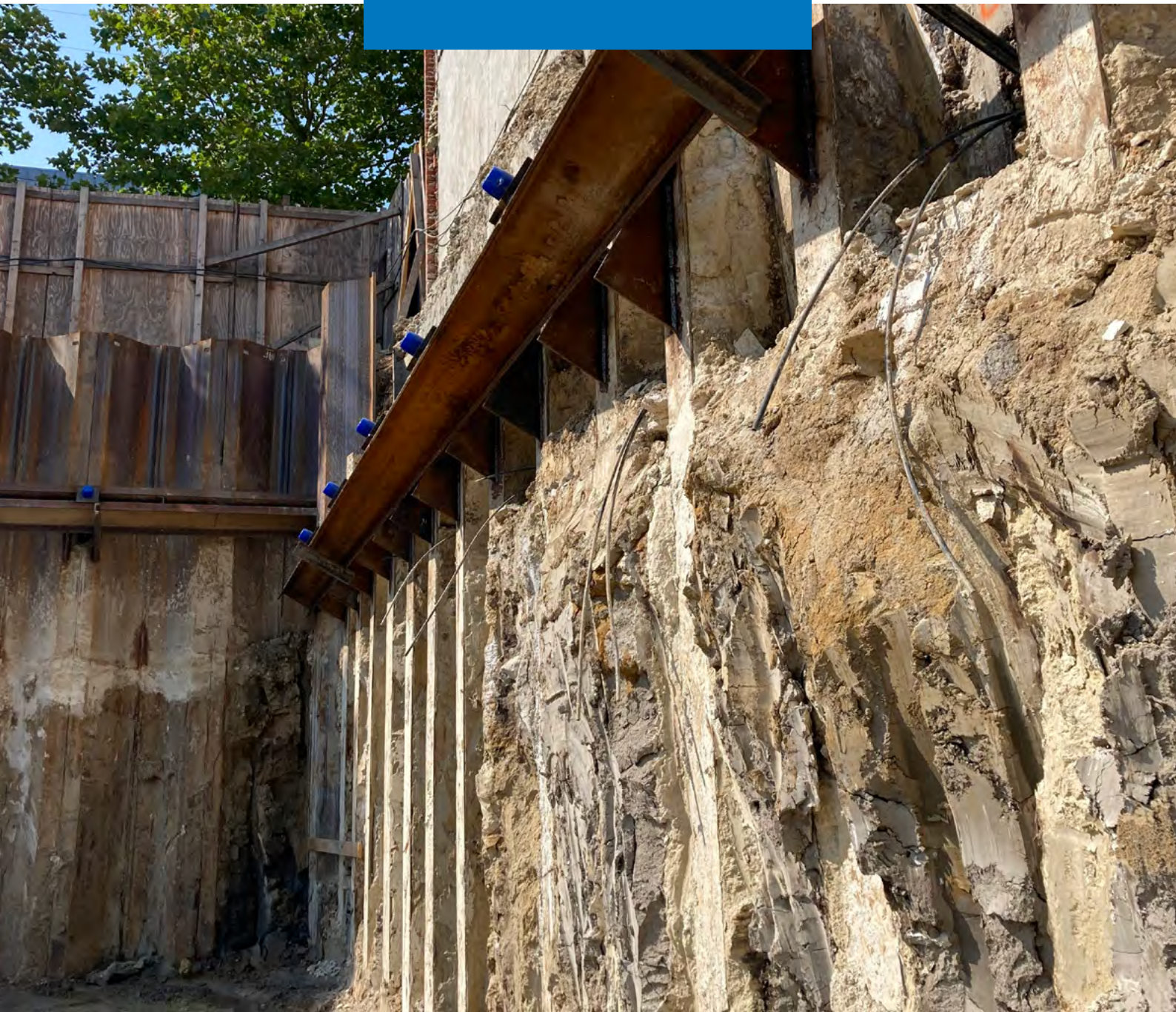
#### Mixing ratio per 1 m<sup>3</sup> ready mixture

Water (l)	680
DantoCon Thermal C2L-M (kg)	900

#### Mixing ratio per 1,000 kg dry material

Water (l)	750
DantoCon Thermal C2L-M (kg)	1.000

# DantoCon Cem



DantoCon Cem products are mixed products of the dried bentonite fraction 0-1 mm plus a certain amount of low alkali cement. The products are mixed with a given amount of water and used as cement-stabilized grout (e.g. the Great Belt mix). This grout is a pumpable mixture that cures to a tight membrane or jacket. It is used for plugging and renovating boreholes, lining cavities around pipelines and stabilizing soil structures around boreholes and tunnels.

## **Pumpable sealant**

DantoCon Cem products are suitable for plugging or renovating new or existing boreholes where a pumpable sealing material is required. They are also used for support piles in foundation work.

### DantoCon Cem 50

#### Description

Concentration (% water)	60	65
Density of the ready mixture (kg/l)	1,34	1,28
Hydraulic conductivity after 4 weeks (m/sec)	$\leq 5 \cdot 10^{-9} - 6 \cdot 10^{-8}$	
Water residue after 24 hours	< 3	< 10
Compressive strength after 4 weeks (MPa)	3,4	1,6

#### Mixing ratio per 1 m<sup>3</sup> ready mixture

Water (l)	800	830
DantoCon Cem 50 (kg)	540	450

#### Mixing ratio per 1,000 kg dry material

Water (l)	1000	1000
DantoCon Cem 50 (kg)	1500	1850

### DantoCon Cem 100

#### Description

Concentration (% water)	50
Density of the ready mixture (kg/l)	1,47
Hydraulic conductivity after 4 weeks (m/sec)	$\leq 2 \cdot 10^{-10}$
Water residue after 24 hours	< 1
Compressive strength after 4 weeks (MPa)	7,8

#### Mixing ratio per 1 m<sup>3</sup> ready mixture

Water (l)	725
DantoCon Cem 100 (kg)	725

#### Blandingsforhold per 1.000 kg tørstof

Water (l)	1.000
DantoCon Cem 100 (kg)	1.000

### DantoCon Cem 300

#### Description

Concentration (% water)	41
Density of the ready mixture (kg/l)	1,65
Hydraulic conductivity after 4 weeks (m/sec)	$\leq 5 \cdot 10^{-11}$
Water residue after 24 hours	< 1
Compressive strength after 4 weeks (MPa)	27,6

#### Mixing ratio per 1 m<sup>3</sup> ready mixture

Water (l)	675
DantoCon Cem 300 (kg)	965

#### Mixing ratio per 1,000 kg dry material

Water (l)	700
DantoCon Cem 300 (kg)	1.000

# DANTONIT

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Data sheets, safety data sheets and environmental certificates can be found at

[www.dantonit.dk](http://www.dantonit.dk)