3-IN-1 PRODUCT | DRAIN PIPE – ARTIFICIAL GRAVEL – GEOTEXTILE

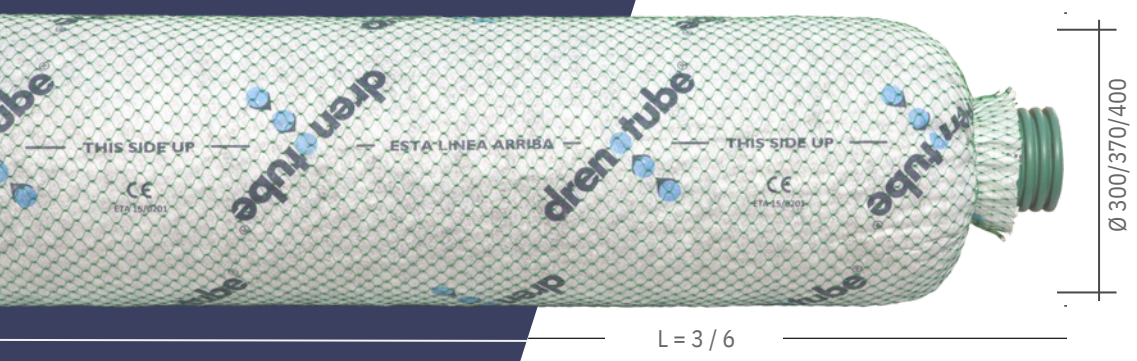
drentube®

PREASSEMBLED DRAINAGE SYSTEM

No gravel is needed

DIMENSIONS AND FLOW RATES ACCORDING TO SLOPE (i)

TOP VIEW



Ø 300/370/400

L = 3 / 6

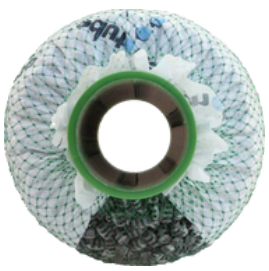
BOTTOM VIEW

Ø 110/125/160/200

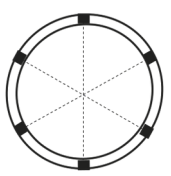
There is an opening along the bottom side to avoid clogging and to extend service life over 25 years.

Polypropylene Mesh

FRONT VIEW



Geosynthetic Gravel



Corrugated pipe with 6 slits around the perimeter

Ø Pipe mm Ext. / Int.	Ø drenotube®	Ring Stiffness	Length m	Flow Rate i 0,5%	Flow Rate i 1,5%	Flow Rate i 2,5%	Water Retention Capacity
110/ 93	300 mm	SN4 / SN8	3 / 6	2,5 l/ sec	4,3 l/ sec	5,6 l/ sec	32 l/ml
125/ 108	300 mm	SN4 / SN8	3 / 6	3,8 l/ sec	6,5 l/ sec	8,4 l/ sec	33,5 l/ml
160/ 138	370 mm	SN4 / SN8	3 / 6	7,5 l/ sec	13 l/ sec	16,5 l/ sec	51,5 l/ml
200/ 167	400 mm	SN4 / SN8	3 / 6	12 l/ sec	20,8 l/ sec	26,9 l/ sec	63,4 l/ml

Same need different solution: before and after drenotube®

French Drainage

- Manual installation of 3 different materials
- Heavy materials, hard to transport
- Machinary need
- Slow installation: 15 meters / hour aprox.
- High labour cost

drenotube® - 3 in 1 system

- Easy to carry by hand; 1,3 - 2,5 kg/m
- Less machinary needed and better accessibility
- Fast installation: 150 meters / hour
- Low labour cost
- Ensures greater uniformity in installation
- Certified system

Composition of Drenotube®

drenotube® is a drainage system that replaces the traditional system (French drain).

Prefabricated

Drenotube® comes fully assembled from the factory and is subject to strict quality controls according to its certifications. Unlike traditional in-situ drainage systems, which are more prone to construction defects due to reliance on the skill and diligence of the workers, Drenotube® ensures consistent quality.
It consists of a double-wall slotted drainage pipe, coated with geosynthetic gravel. The assembly is secured with a high-strength polyethylene mesh with flanges at the ends. Between the mesh and the geosynthetic particles, a 125 g/m² geotextile sheet is placed, acting as a filter to prevent fine soil particles from penetrating and eventually clogging the drainage system.

Modular

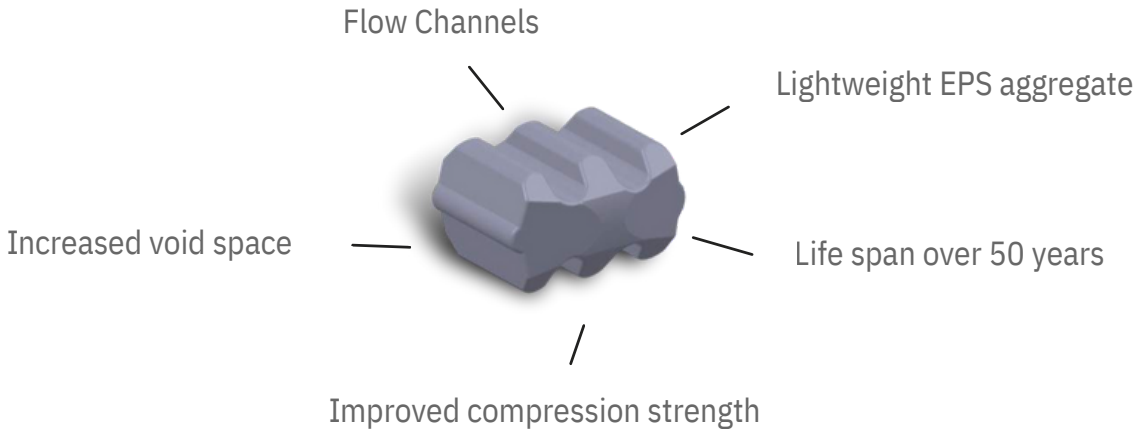
For drainage applications, drenotube® is manufactured using 4 different pipe diameters: 110, 125, 160 and 200. All our systems can be easely combined with our Bundel version (drenotube® without the central drainage pipe).
Each drenotube® unit includes a polyethylene quick-connect sleeve to facilitate joining the pipes.

Typical Applications

drenotube® is suitable for all types of longitudinal drainage, including roads, railways, tunnels, perimeter drainage for buildings, landscaping, urban developments, sports fields, retaining walls and agricultural applications.

Geosynthetic Gravel

Geosynthetic gravel is designed to enhance drainage performance. Its shape is engineered to increase hydraulic efficiency, thanks to its low weight and high uniformity, which improve hydraulic flow capacity, with a retention capacity of 40%.



DRENOTUBE® ADVANTAGES

PERFORMANCE AND RELIABILITY

- Drainage capacity 30% more efficient than traditional gravel drainage systems.
- 100% consistent industrial quality throughout all manufacturing stages and quality control processes.
- System marketed for over 20 years and successfully proven in thousands of projects.
- Certified in Europe under the European Technical Assessment (ETA 15/0201) since 2015.

COST EFFECTIVE

- More cost-effective than traditional systems, reducing installation time and labor costs.
- Unify materials to save transportation costs.
- Reduces excavation volume thanks to its compact shape.
- No gravel required.

SIMPLE AND FAST INSTALLATION

- **drenotube®** is easily installed by connecting the units together using the fast/click coupling sleeve.
- Fast installation: up to 10 meters per minute.
- 100 times lighter than gravel and manually installable without mechanical equipment, reducing the risk of accidents.
- Prefabricated system that ensures fine soil particles do not penetrate the drainage system.
- **drenotube®** is flexible and adapts to terrain shapes and obstacles (slopes, buildings, etc.).

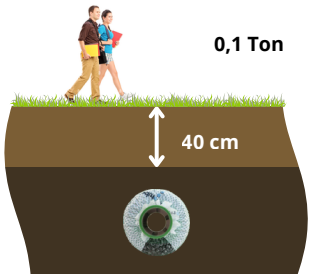
SUSTAINABLE

- The geosynthetic gravel is made from 100% recycled plastic material.
- 100% of the components are recyclable.
- Prevents gravel extraction from quarries, helping to preserve the natural environment.
- Tested system with an estimated minimum life span of 25 years.
- All components are inert and do not contaminate the soil.

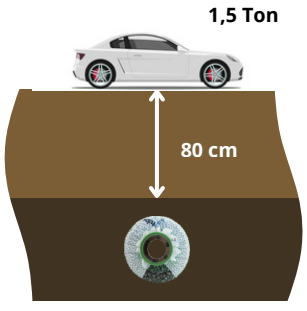
CERTIFIED

ETA 15/0201

Installation Depths and Loads Applied to Drenotube®



The minimum installation depth for drenotube® is 40 cm. At this depth, the system may be subjected to pedestrian traffic or other light loads, using soil backfill with a density of 1,500 kg/m³.



drenotube® is also designed to be used in light traffic applications. As an additional measure to ensure that the pipe does not collapse under pressure, we recommend using the SN8 (8 kN) rating and maintaining a minimum depth of 80 cm measured from the top of the drenotube®.

Drenotube® Performance Under Load

- The performance of drenotube® under a direct load of 1,000 kg has been demonstrated through compression and aging tests. The test was conducted with a 29 × 30 cm plate at the Aitex Laboratory in accordance with UNE-EN ISO 604:2010.
- The evaluation is based on a drenotube® installation with a 25-year life span and current technical knowledge and experience.
- Additional drainage tests under different loads have been carried out at the Cecam Laboratory (Center for Construction Studies and Materials Analysis).
- The drainage capacity measured in the laboratory may differ from actual field installations. Performance depends on various factors, including soil permeability, head pressure, slope, soil layer composition, porosity, density, groundwater level, and other site-specific conditions.

drenotube® SYSTEM FOR ALL TYPES OF LONGITUDINAL DRAINAGE

Installation of drenotube® foundation drainage – San Enrique de Guadiaro, Spain

Our perimeter drainage system is responsible for capturing and redirecting water until its evacuation, in order to prevent moisture in the structure's foundations.

We have a large portfolio of building projects in which drenotube® has been used as a drainage system, such as this project, carried out by the construction company Bonifacio Solís, where drenotube® was used for the installation of perimeter drainage for a project in San Enrique de Guadiaro, Cádiz.

drenotube® installation in a residential building - Sitges, Spain

Our system is ideal for foundation drainage installations, as it offers major benefits such as:

-Easy-to-install system, even in areas with difficult access.

-No machinery required.

-On-site personnel can work more safely and without any risk.

-Adapts to any type of contour or layout.

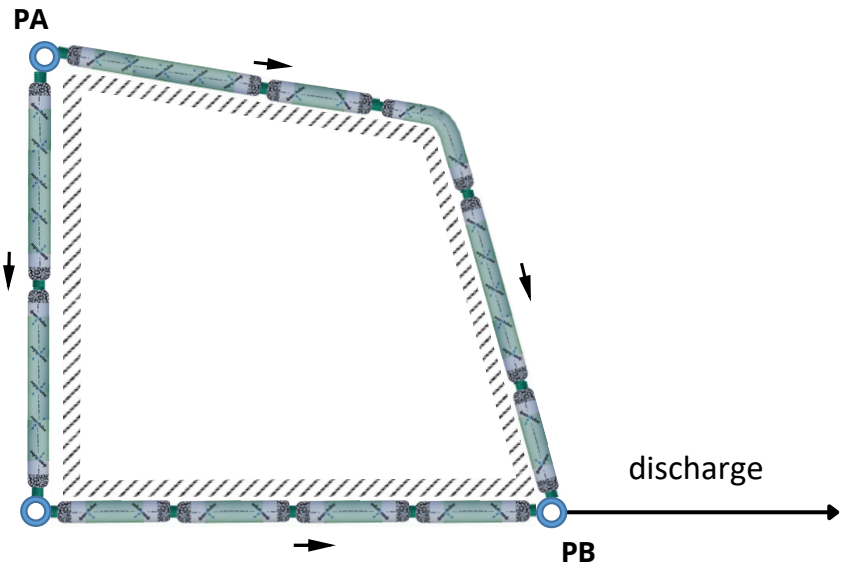
-Requires minimal storage space on site.

-Lightweight system, easy to transport by hand.

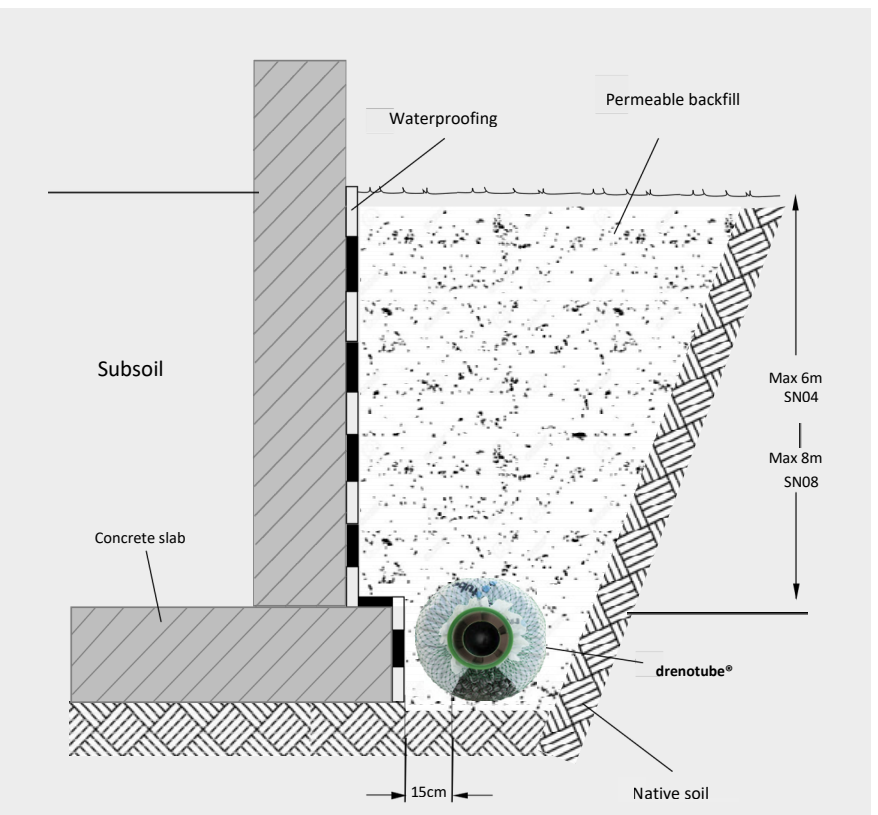
-Includes a quick-connect coupling.

-High water retention capacity, depending on the diameter.

drenotube® drainage cross section in foundations



	Construction / foundation		Slope direction > 0.5% < 2.5%
	drenotube® drainage pipe	**PA**	Highest point
	Inspection chambers	**PB**	Lowest point



drenotube® installation on road between Vila-seca and La Pineda, Tarragona – Spain

The prefabricated drenotube® drainage system is ideal for protecting the road platform because:

-It ensures proper management of both surface and subsurface water.

-It reduces the environmental impact of the infrastructure, as drenotube® effectively helps protect both the road and the surrounding environment.

-A well-drained road is significantly safer for its users, and drenotube® contributes to overall road safety.

-It helps protect the road and minimizes maintenance costs.

drenotube® installation on a railway line near Súria – Spain

drenotube® system was used for the first time on this flood-prone section of track (as it runs through a cutting). The work was carried out on a single-track section, with several daily trains, a trench very close to the tracks, and in the presence of water. Similar installations were repeated on other sections, and the track remains in excellent condition to this day.

drenotube® has also been selected for high-profile projects such as the construction of Barcelona Metro Line 1 and a port area of the Ferrocarrils de Catalunya. Its presence in these landmark projects demonstrates the quality and effectiveness of drenotube® as a reliable solution for efficient drainage management in highly demanding environments.

drenotube® installation in landscaping – Avda. Paralelo, Barcelona, Spain

During the reurbanization works of Avda. Paralelo, a green island was to be constructed between both traffic directions to protect the street pavement from infiltrating water.
The installation of drenotube® was fast and caused minimal interference with both traffic and work time. This contrasts with conventional drainage, which would have required trucks delivering gravel, storing it along the route, and a mini-excavator to move the gravel and form the drainage in situ.

drenotube® installation in sports grounds – National Golf Center, Madrid, Spain

The drenotube® drainage system is ideal for golf courses and grass installations for the following reasons:
-Durability: Traditional installations with bare drainage pipes filled with sand or gravel clog quickly, whereas drenotube® lasts a lifetime.
-Ease of installation: As a prefabricated “all-in-one” system, it can be installed by maintenance staff.
No interference with play: If any geosynthetic particles remain on the surface, they do not cause problems like gravel does when struck by a club.
Minimal disruption: Any maintenance or interventions can be completed in a single day, minimizing impact on players and the course.
No heavy machinery required: Installing drenotube® does not require bringing machines onto the field.

Corrugated pipe	**Standard**	**Unit**	**Value**
Outer diameter	UNE EN 61386-1	mm	110
Inner diameter	UNE EN 61386-2-4	mm	SN04 : 93 SN08 : 92
Ring stiffness	UNE EN ISO 9969	kN/m2	SN04 : 4 SN08 : 8
Perforation type		º	360
Slits surface		cm²/m	50 (±10)
Polymer	UNE 53994 :2011		Polyethylene
Geosynthetic aggregate	**Standard**	**Unit**	**Value**
Bulk density	UNE 92120-2:1998	kg/m3	10
Specific weight	UNE 83134	kg/m3	20
Void space		%	40
Specific surface		m2/m3	230
Particle number		units/m3	~115.000
Water absorbtion 7 days	UNE EN 12087:1997	%	2
Water absorbtion 21 days	UNE EN 12087:1997	%	2,2
Particle size distribution	UNE EN 933-1	% pass	<8 mm: 0 <20 mm: 73 <25 mm: 100
Working temperature	-	ºC	-20 a +65
Color	-	-	Graphite
Geotextile filter	**Standard**	**Unit**	**Value**
Polymer	-	-	Polypropylene
Bonding technique	-	-	Needle punched
Mass per unit area	UNE EN ISO 9864	g/m2	120
Thickness 2 kPa	UNE EN ISO 9863-1	mm	0,7
Tensile strength MD/CMD	UNE EN ISO 10319	kN/m	8,0/8,0
Elongation at max. load MD/CMD	UNE EN ISO 10319	%	90/80
Static puncture resistance (CBR)	UNE EN ISO 12236	N	1300
Cone drop test	UNE EN ISO 13433	mm	28
Water permeability	UNE EN ISO 11058	m3/s/m2	0,12
In plane capacity @ 20 kPa	UNE EN ISO 12958	m3/s/m	1x10-6
Opening size O90	UNE EN ISO 12956	µm	80
UV protection			Yes
Net	**Unit**	**Value**	
Polymer	-	Polyethylene	
Weight per unit	g/m	40	
Semiperimeter	cm	51	
Net type	-	Oriented tubular	
drenotube ®	**Unit**	**Value**	
Length	m	3 or 6	
Weight	Kg/m	SN04 ~ 1,3 SN08 ~ 1,6	
Water retention capacity	l/ml	32	
Bundle diameter	mm	300	
Maximum installation depth	m	SN04 : 3 SN08 : 5	
Minimum installation depth	m	0,4	

Corrugated pipe	**Standard**	**Unit**	**Value**
Outer diameter	UNE EN 61386-1	mm	125
Inner diameter	UNE EN 61386-2-4	mm	SN04 : 108 SN08 : 106
Ring stiffness	UNE EN ISO 9969	kN/m2	SN04 : 4 SN08 : 8
Perforation type		º	360
Slits surface		cm²/m	45 (±10)
Polymer	UNE 53994 :2011		Polyethylene
Geosynthetic aggregate	**Standard**	**Unit**	**Value**
Bulk density	UNE 92120-2:1998	kg/m3	10
Specific weight	UNE 83134	kg/m3	20
Void space		%	40
Specific surface		m2/m3	230
Particle number		units/m3	~115.000
Water absorbtion 7 days	UNE EN 12087:1997	%	2
Water absorbtion 21 days	UNE EN 12087:1997	%	2,2
Particle size distribution	UNE EN 933-1	% pass	<8 mm: 0 <20 mm: 73 <25 mm: 100
Working temperature	-	ºC	-20 a +65
Color	-	-	Graphite
Geotextile filter	**Standard**	**Unit**	**Value**
Polymer	-	-	Polypropylene
Bonding technique	-	-	Needle punched
Mass per unit area	UNE EN ISO 9864	g/m2	120
Thickness 2 kPa	UNE EN ISO 9863-1	mm	0,7
Tensile strength MD/CMD	UNE EN ISO 10319	kN/m	8,0/8,0
Elongation at max. load MD/CMD	UNE EN ISO 10319	%	90/80
Static puncture resistance (CBR)	UNE EN ISO 12236	N	1300
Cone drop test	UNE EN ISO 13433	mm	28
Water permeability	UNE EN ISO 11058	m3/s/m2	0,12
In plane capacity @ 20 kPa	UNE EN ISO 12958	m3/s/m	1x10-6
Opening size O90	UNE EN ISO 12956	µm	80
UV protection			Yes
Net	**Unit**	**Value**	
Polymer	-	Polyethylene	
Weight per unit	g/m	43 (±2)	
Semiperimeter	cm	64 (±1)	
Net type	-	Oriented tubular	
drenotube ®	**Unit**	**Value**	
Length	m	3 or 6	
Weight	Kg/m	SN04 ~ 1,66 SN08 ~ 1,97	
Water retention capacity	l/ml	33,5	
Bundle diameter	mm	325	
Maximum installation depth	m	SN04 : 3 SN08 : 5	
Minimum installation depth	m	0,4	

Corrugated pipe	**Standard**	**Unit**	**Value**
Outer diameter	UNE EN 61386-1	mm	160
Inner diameter	UNE EN 61386-2-4	mm	SN04 : 138 SN08 : 137
Ring stiffness	UNE EN ISO 9969	kN/m2	SN04 : 4 SN08 : 8
Perforation type		º	360
Slits surface		cm²/m	71 (±10)
Polymer	UNE 53994 :2011		Polyethylene
Geosynthetic aggregate	**Standard**	**Unit**	**Value**
Bulk density	UNE 92120-2:1998	kg/m3	10
Specific weight	UNE 83134	kg/m3	20
Void space		%	40
Specific surface		m2/m3	230
Particle number		units/m3	~115.000
Water absorbtion 7 days	UNE EN 12087:1997	%	2
Water absorbtion 21 days	UNE EN 12087:1997	%	2,2
Particle size distribution	UNE EN 933-1	% pass	<8 mm: 0 <20 mm: 73 <25 mm: 100
Working temperature	-	ºC	-20 a +65
Color	-	-	Graphite
Geotextile filter	**Standard**	**Unit**	**Value**
Polymer	-	-	Polypropylene
Bonding technique	-	-	Needle punched
Mass per unit area	UNE EN ISO 9864	g/m2	120
Thickness 2 kPa	UNE EN ISO 9863-1	mm	0,7
Tensile strength MD/CMD	UNE EN ISO 10319	kN/m	8,0/8,0
Elongation at max. load MD/CMD	UNE EN ISO 10319	%	90/80
Static puncture resistance (CBR)	UNE EN ISO 12236	N	1300
Cone drop test	UNE EN ISO 13433	mm	28
Water permeability	UNE EN ISO 11058	m3/s/m2	0,12
In plane capacity @ 20 kPa	UNE EN ISO 12958	m3/s/m	1x10-6
Opening size O90	UNE EN ISO 12956	µm	80
UV protection			Yes
Net	**Unit**	**Value**	
Polymer	-	Polyethylene	
Weight per unit	g/m	49	
Semiperimeter	cm	63	
Net type	-	Oriented tubular	
drenotube ®	**Unit**	**Value**	
Length	m	3 or 6	
Weight	Kg/m	SN04 ~ 2,15 SN08 ~ 2,5	
Water retention capacity	l/ml	51,5	
Bundle diameter	mm	370	
Maximum installation depth	m	SN04 : 3 SN08 : 5	
Minimum installation depth	m	0,4	

Corrugated pipe	**Standard**	**Unit**	**Value**
Outer diameter	UNE EN 61386-1	mm	200
Inner diameter	UNE EN 61386-2-4	mm	SN04 : 167 SN08 : 167
Ring stiffness	UNE EN ISO 9969	kN/m2	SN04 : 4 SN08 : 8
Perforation type		º	360
Slits surface		cm²/m	72 (±10)
Polymer	UNE 53994 :2011		Polyethylene
Geosynthetic aggregate	**Standard**	**Unit**	**Value**
Bulk density	UNE 92120-2:1998	kg/m3	10
Specific weight	UNE 83134	kg/m3	20
Void space		%	40
Specific surface		m2/m3	230
Particle number		units/m3	~115.000
Water absorbtion 7 days	UNE EN 12087:1997	%	2
Water absorbtion 21 days	UNE EN 12087:1997	%	2,2
Particle size distribution	UNE EN 933-1	% pass	<8 mm: 0 <20 mm: 73 <25 mm: 100
Working temperature	-	ºC	-20 a +65
Color	-	-	Graphite
Geotextile filter	**Standard**	**Unit**	**Value**
Polymer	-	-	Polypropylene
Bonding technique	-	-	Needle punched
Mass per unit area	UNE EN ISO 9864	g/m2	120
Thickness 2 kPa	UNE EN ISO 9863-1	mm	0,7
Tensile strength MD/CMD	UNE EN ISO 10319	kN/m	8,0/8,0
Elongation at max. load MD/CMD	UNE EN ISO 10319	%	90/80
Static puncture resistance (CBR)	UNE EN ISO 12236	N	1300
Cone drop test	UNE EN ISO 13433	mm	28
Water permeability	UNE EN ISO 11058	m3/s/m2	0,12
In plane capacity @ 20 kPa	UNE EN ISO 12958	m3/s/m	1x10-6
Opening size O90	UNE EN ISO 12956	µm	80
UV protection			Yes
Net	**Unit**	**Value**	
Polymer	-	Polyethylene	
Weight per unit	g/m	46 (±1)	
Semiperimeter	cm	85 (±1)	
Net type	-	Oriented tubular	
drenotube ®	**Unit**	**Value**	
Length	m	3 or 6	
Weight	Kg/m	SN04 ~ 2,42 SN08 ~ 2,75	
Water retention capacity	l/ml	63,4	
Bundle diameter	mm	400	
Maximum installation depth	m	SN04 : 3 SN08 : 5	
Minimum installation depth	m	0,4	

PERFORMANCE STATEMENT DR-2404-EN

CE

Basic Features	Performance			Technical Specifications
Drainage capacity under pressure for SN4 version (4kN/m2 ring stiffness) Above 60 kPa it is necessary to use a higher ring stiffness SN8 (8 kN /m2)		**DR300/110-SN4ST6**	**DR370/160-SN4ST6**	ETA 15/0201 22/04/2015
	kPa	liters/s/m		
	0	5,8	12,5	
	10	5,65	12,25	
	20	5,5	12	
	40	5,25	11,5	
	60	5	11	
	80	4,7	9,9	
	100	4,3	8	
	120	4	7,5	
b) Deformation under pressure (dry conditions)		**DR300/110-SN4ST6**	**DR370/160-SN4ST6**	ETA 15/0201 22/04/2015
	kPa	mm		
	10	40	40	
	20	50	65	
	40	72	90	
	60	100	110	
Deformation under pressure and ageing due to oxidation	Same value as b)			ETA 15/0201 22/04/2015
Deformation under pressure and ageing due to hydrolysis	Same value as b)			ETA 15/0201 22/04/2015
Deformation under pressure microbiologically aged	Same value as b)			ETA 15/0201 22/04/2015
Dangerous materials content	None, all components are inert			ETA 15/0201 22/04/2015

EUROPEAN ASSESSMENT DOCUMENT EAD 280001-00-0704 ETA 15 / 0201

PREASSEMBLED DRAINAGE & INFILTRATION SYSTEMS

SIMPLE INSTALLATION

CERTIFIED

COST EFFECTIVE

SUSTAINABLE

Technical Assistance:
drenotube® provides support in surveying and measurements to integrate our solutions into your projects.

CE
ETA 15/0201
ENVIRONMENTAL PERFORMANCE
Verification No: 7 - 418 : 2019

FUMOSO INDUSTRIAL S.A. LIMITED WARRANTY

drenotube® when installed and operated in a drainage system in accordance with Fumoso Industrial S.A. instructions, is warranted to the original purchaser "Holder" against defective materials and workmanship. Fumoso liability specifically excludes the cost of removal and/or installation of the drenotube® "Units" The limited warranty is exclusive. There are no other warranties with respect to the Units. This Limited Warranty shall be void if any part of the drenotube® system is manipulated by anyone other than Fumoso. The Limited Warranty does not extend to incidental, consequential, special or indirect damages. Fumoso shall not be liable for penalties or liquidated damages, including loss of production and profits, labor and materials, overhead costs, or other losses or expenses incurred by the Holder or any third party. Specifically excluded from Limited Warranty coverage are damage to the Units due to ordinary wear and tear, alteration, accident, misuse, abuse or neglect of the Units; the Units being subjected to vehicle traffic or other conditions which are not permitted by the installation instructions; failure to maintain the minimum ground covers set forth in the installation instruc tions; the placement of improper materials into the system containing the Units; failure of the Units due to improper siting or improper sizing or improper operation; or any other event not caused by Fumoso. This Limited Warranty shall be void if the Holder fails to comply with all of the terms set forth in this Limited Warranty. Further, in no event shall Fumoso be responsible for any loss or damage to the Holder, the Units, or any third party resulting from installation or shipment, or from any product liability claims of Holder or any third party. For this Limited Warranty to apply, the Units must be installed in accordance with all site conditions required by the local authorities and normatives and all other applicable laws and Fumoso Industrial S.A. installation instructions. No representative of Fumoso Industrial S.A. has the authority to change or extend this Limited Warranty. No warranty applies to any party other than the original Holder.

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