FRÄNKISCHE

Stormwater Management Manual 7.1

Stormwater management
Stormwater treatment

TRANSPORT 1 | TREATMENT 2

4 CHALLEGES – 1 SOLUTION

3 STORAGE | 4 DISCHARGE

Last modified: January 2016

DRAINAGE SYSTEMS

ELECTRICAL SYSTEMS

BUILDING TECHNOLOGY

INDUSTRIAL PRODUCTS

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Responsibility

Rain has a lot of positive aspects. Rain fills our water storage tanks. Rain is free of charge: the pure and precious elixir of life sent from above.

But if it rains too much, if impervious surfaces interrupt the natural water cycle, if stormwater remains unused or if groundwater gets polluted because of heavily polluted stormwater runoff, e.g. from trafficked areas, rain can be costly.

Stormwater management seeks to ensure that stormwater is used wisely, both economically and ecologically, and to cope with unpredictability. At best, the natural water cycle can be maintained using smart technologies and design – and the priceless resource stormwater can also be used in a sustainable manner.

This is a complex task.
FRÄNKISCHE - we set the standard.

Stormwater: our competency

Your connection to us

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Important note:

General information on using our products and systems:
Information about or assessments of the use and installation of our products and systems are exclusively provided on the basis of the information submitted. We do not assume any liability for damage caused by incomplete information. If the actual situation deviates from the planned situation or if a new situation occurs or if different or new installation techniques are applied, these must be agreed upon with FRÄNKISCHE, since these situations or techniques may lead to different conclusions.

Notwithstanding the above, the customer is solely responsible for verifying the suitability of our products and systems for the intended purpose.

In addition, we do not assume any liability or responsibility for system characteristics and functionalities when third-party products or accessories are used in combination with FRÄNKISCHE systems. We only assume liability when original FRÄNKISCHE products are used.

For use in other countries than Germany, country-specific standards and regulations must also be observed.

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Introduction

Farsightedness

There is a lot of construction going on. According to the Federal Statistical Office*, residential and trafficked areas grew by 81 hectares a day in Germany between 2008 and 2011, which is equivalent to 116 football fields. Around 43 – 50 % of which are impervious surfaces in urban areas like streets, railways or airfields.

Due to the increasing amount of impervious surfaces, planning engineers and builders will face great challenges: in each construction project, possible effects of events such as heavy rains on sewer networks, wastewater treatment systems or waterbodies in general must be taken into account. Any such task cannot be tackled if one keeps in mind only the efficiency a single project.

"After us, the deluge" would not be a good idea. Nowadays, stormwater management must be understood as an integrated overall system, capable of future planning thanks to perfectly matching components.

* Press release no. 023 as of 17 January 2013

What we would like to tell you about FRÄNKISCHE

Focused on the future

FRÄNKISCHE is a family enterprise that was founded in 1906 under the name of "Fränkische Isolierrohr- und Metallwaren-Werke Gg. Schäfer & Cie".

At the beginning of the 70s, the company changed its name to "Fränkische Rohrwerke Gebr. Kirchner GmbH & Co. KG". FRÄNKISCHE's history is characterised by numerous product and process innovations like the development of the world's first production lines for continuously extruded corrugated electrical installation conduits made of plastic and the first ever continuously extruded drainage pipe.

Today, FRÄNKISCHE has 21 production facilities and sales offices on four continents and is run in third generation by Otto Kirchner.

FRÄNKISCHE provides solutions for stormwater management, road drainage, track drainage and agricultural drainage. Focus is also placed on pipe systems for building drainage, wastewater sewers, cable protection, plumbing and heating installations, and for many different industrial and automotive applications.

Today, FRÄNKISCHE is a leader in the design, manufacture and sale of pipes, shafts and plastic system components for various fields of application. We have gained extensive competencies in producing corrugated pipes. This was mainly possible due to our uncompromising proactive customer orientation that helps us find new, innovative solutions, which are today the basis for our long-term success.

The corporate headquarters in Königsberg/Germany

Your partner in drainage technology

Water. Know-how. Consulting.

Water is a priceless natural resource! Water is the elixir of life! Water is powerful, and sometimes that power is very destructive. Water can damage or destroy buildings and flood roads and streets.

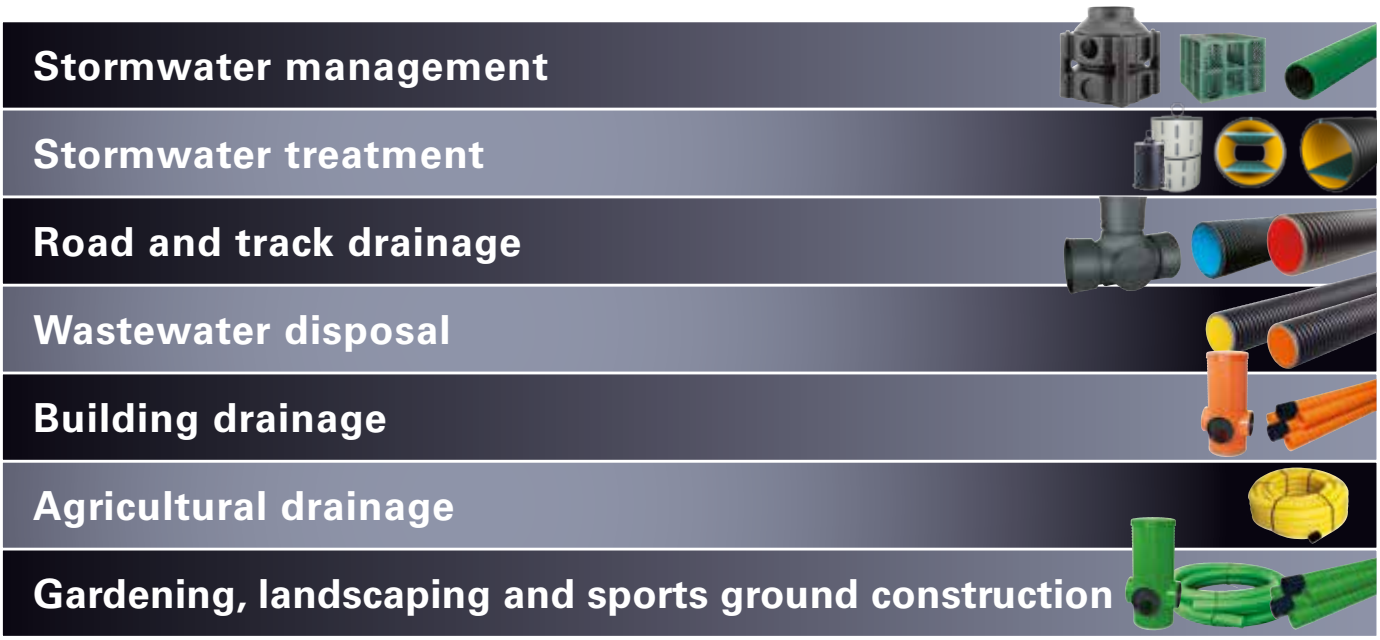
Modern life would be unthinkable without drainage systems.

Every drainage project presents new challenges.

FRÄNKISCHE is your competent and reliable partner in drainage technology and offers project-specific, custom-tailored solutions to design engineers and institutions: in civil engineering, road engineering, industrial engineering and commercial engineering, for airfields or in landscaping – simply everywhere.

Innovative solutions, an efficient use of raw materials, maintenance-friendliness and strictly quality-controlled manufacturing help us provide state-of-the-art solutions to meet always increasing demands on safety and environmental protection.

Our solutions help water find its way back into the natural water cycle.



Stormwater: our competency

Rain falls on roads, squares, roofs, airports, stadiums and many other impervious surfaces. Wherever it cannot be treated, stored and discharged naturally, our competencies are needed: **re-establishing the natural water cycle where it has been interrupted and re-channelling water back to natural storage areas - economically, ecologically and wisely.**

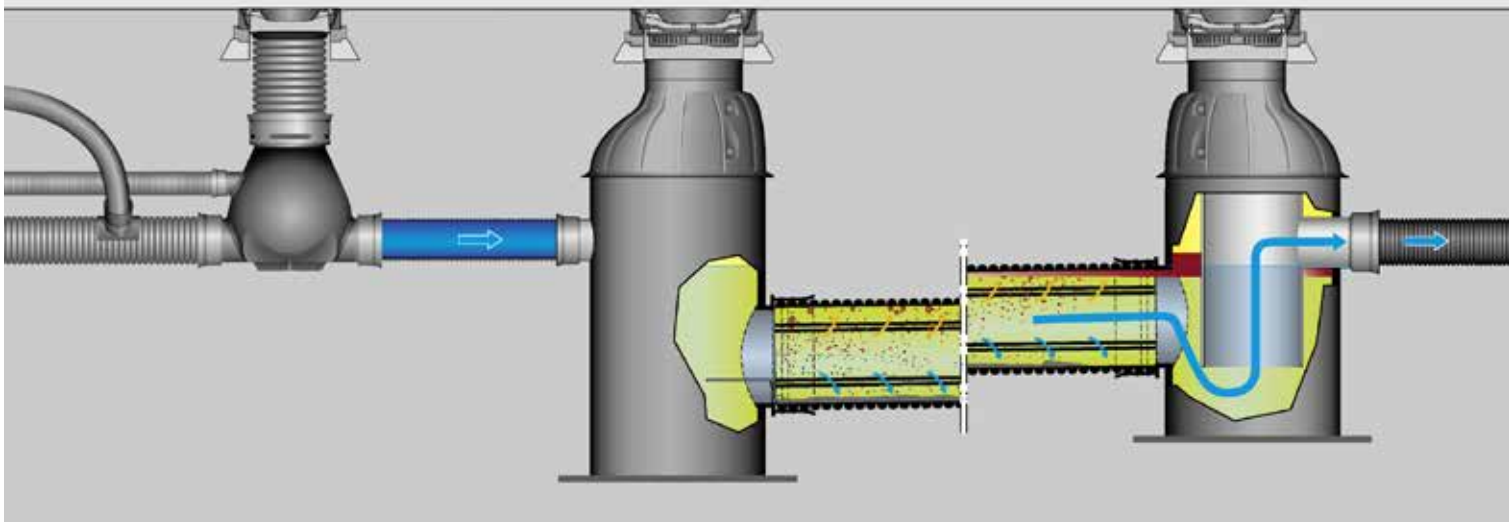
We have worked in the fields of **stormwater management, urban drainage, as well as road and track drainage for more than 30 years.** We know today that every task related to stormwater requires integrated, systems thinking.

Our solutions are characterised by

- 100 % physical, functional and systematic reliability of all components,
- 100 % compatibility of all components and systems in the functional chain,
- long durability and excellent maintenance-friendliness across all areas of operation.

1 Transport

2 Treatment



4 challenges – 1 solution

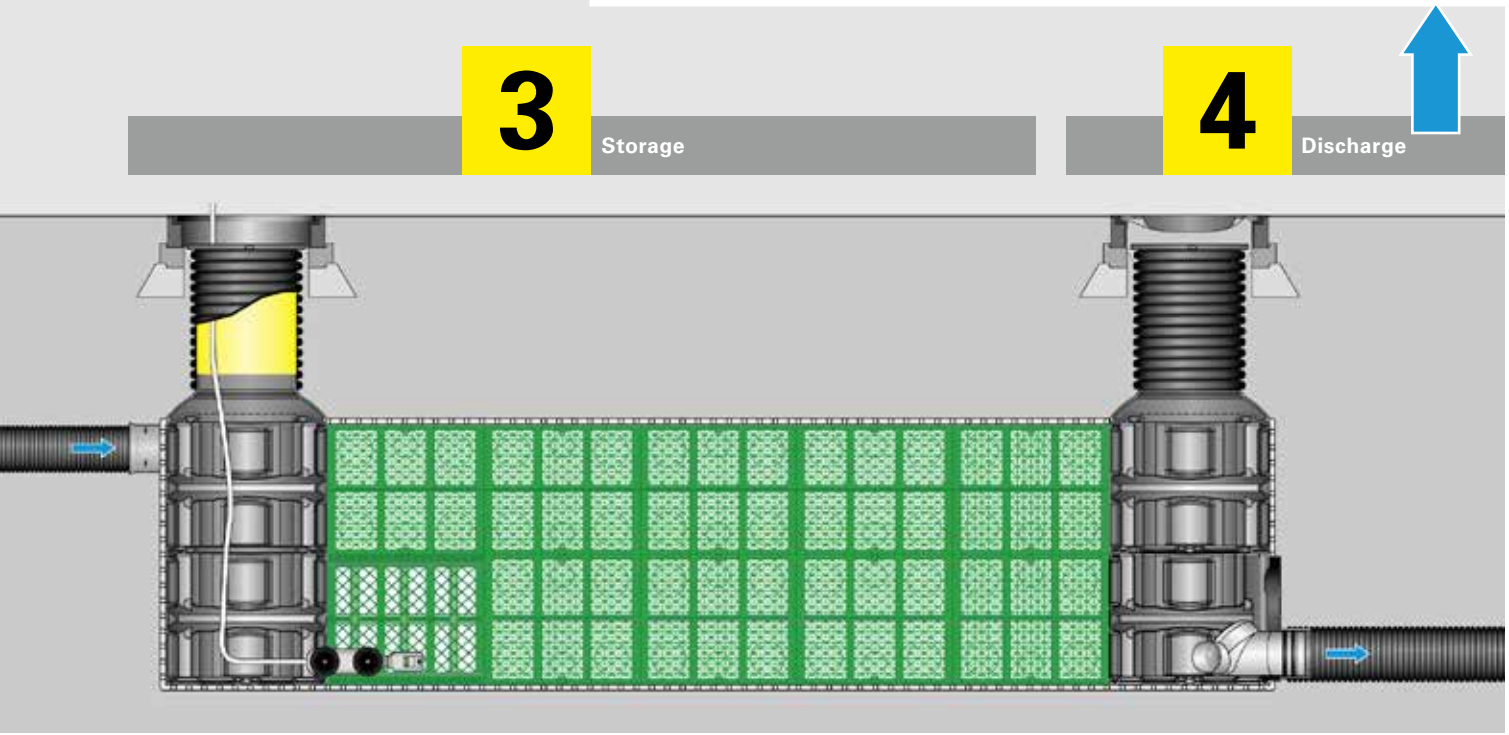
We provide a full service, i.e. all system components including all steps before or after construction can be provided from a single source, if necessary.

On the one hand, this makes project realisation highly efficient and, on the other hand, this guarantees an efficient system maintenance. In this context, we focus on protecting our customers' investments.

All our drainage systems always meet the four fundamental tasks in handling stormwater:

- Transport
- Treatment
- Storage
- Discharge

Depending on the project-specific framework conditions, we combine our well-matched product components to create a complete system, thus providing an integrated system solution to your drainage needs. Our focus is on meeting all requirements under public law in accordance with the needs of the operators. Finally, the natural water cycle is re-established.



Our services

We know what we are talking about!

Any task related to handling stormwater presents individual challenges. Framework conditions of individual projects vary significantly:

- quantity and characteristic of stormwater
- entry of pollutants from surfaces and the air in the respective area depending on land-use
- geological, hydrogeological conditions
- aspects of urban development and landscaping

to name but a few considerations which must be made beforehand.

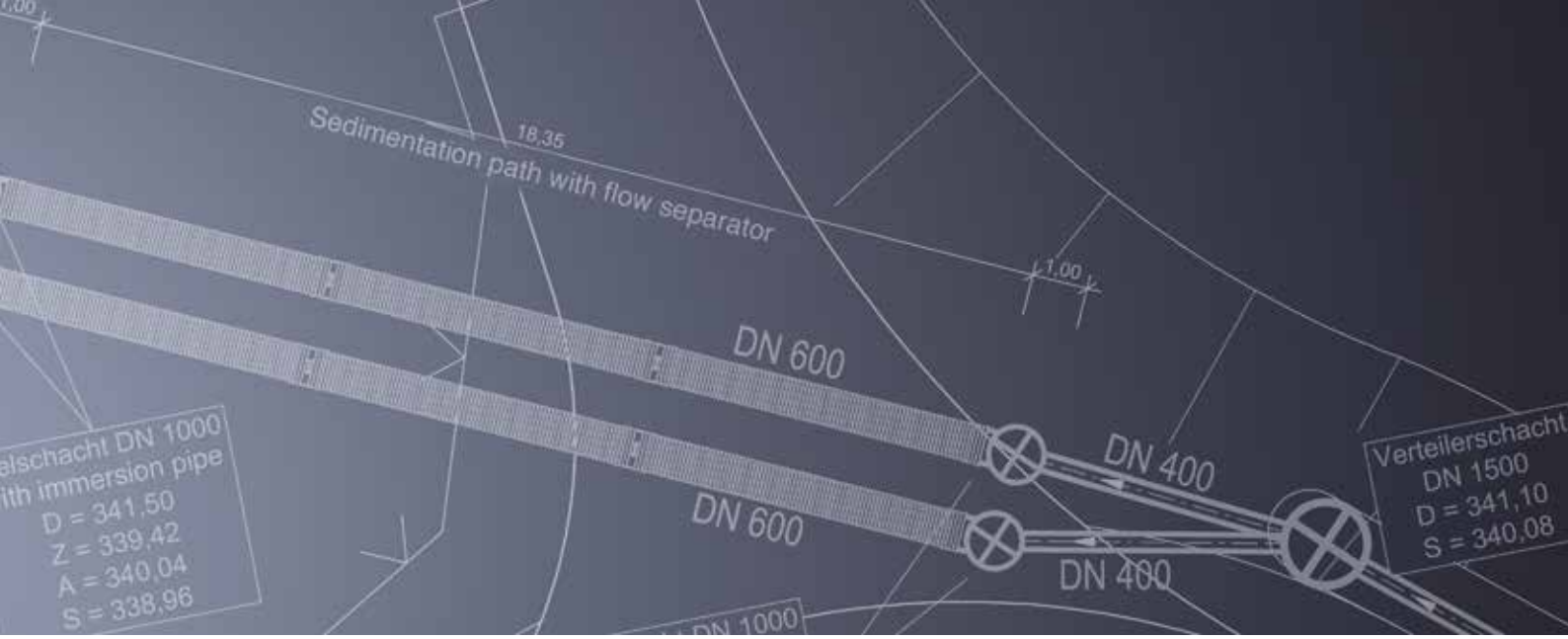
We have many years of practical experience with all aspects of design and construction of drainage systems.

We provide local technical assistance during all project phases. We design complete systems, dimension system components using state-of-the-art technology and help you realise your construction project. You receive the complete stormwater management system from a single source.

In addition to construction companies and design engineers, our consulting services are particularly interesting for builders / project developers who want to sustainably protect their investment by economic and durable solutions.

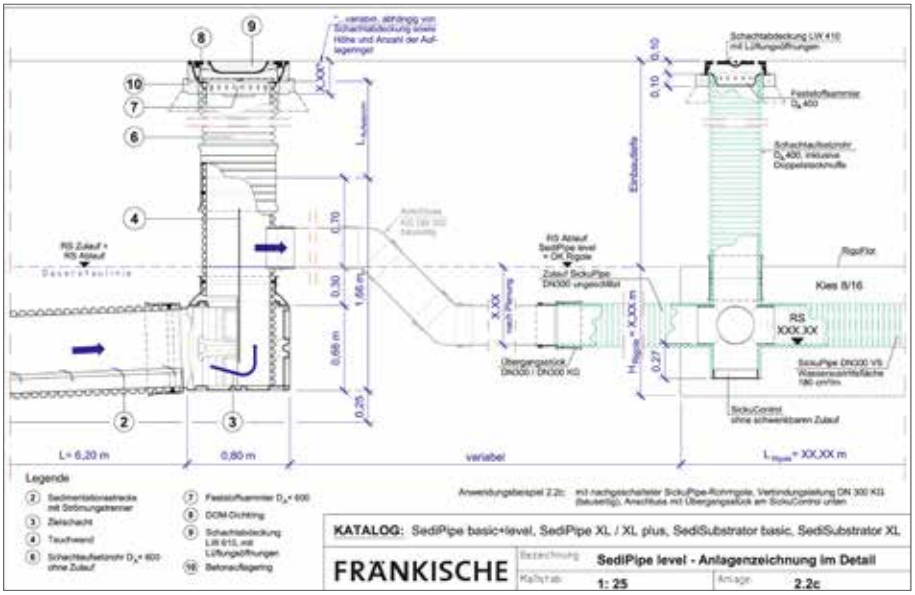
Of course, we also provide you with

- comprehensive information
- CAD templates
- tender documents
- installation and maintenance manuals
- structural analyses
- software
- project questionnaires for system dimensioning
- local workshops and training programmes



CAD library

Documents such as CAD catalogues and CAD drawings are availble for download under "stormwater management" on our website. Standard installation situations and detailed drawings are shown as sections and plans, which can be modified by the planning engineer to meet specific project needs. These drawings can then be included in the design documents or added to the tender documents as illustrative detailed drawings.



Example: SediPipe level – detailed installation drawing

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Downloads

Select **competence**

Stormwater management

and **document type:**

CAD data

Software decision aids ...

RigoPlan® professional offers new functions

RigoPlan professional can be used to design different types of systems, such as infiltration systems, retention basins with overflow control and stormwater treatment systems.

On the basis of current regulations

- Dimensioning of different types of infiltration systems acc. to DWA-A 138
- Dimensioning of stormwater holding facilities acc. to DWA-A 117
- Dimensioning of stormwater treatment systems
  - acc. to DWA-M 153
  - in conformity with the working aids for stormwater handling in urban areas (*"Arbeitshilfen für den Umgang mit Regenwasser in Siedlungsgebieten"*) of the Regional Office for Environment, Measurements and Environmental Protection of Baden Württemberg - LUBW (*Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg*)
- Proof of overflow outside buildings acc. to DIN 1986-100

Dimensioning stormwater management and treatment systems is often a complex task, since each and every structure must be designed according to local conditions and problem-prone areas. To provide even better support to planning engineers dealing with this task, and to enable them to work systematically, we have completely revised our RigoPlan professional software and upgraded it with a number of additional tools.

Easy use and compliance with regulations

The Excel-based software developed has been triggered by the requirements of daily work, and boasts a lot of new features:

- Different types of areas can be allocated to various treatment systems in one dimensioning step
- Areas with different types of pollution (lorry trafficked areas, residential areas, school yards, etc.) require appropriate treatment; by selecting the degree of pollution, a suitable stormwater treatment system can be determined
- On the basis of dimensioning, automatic generation of the material list, which can be individually adapted, and corresponding tender documents
- Optimised design of dimensioning printouts directly for Water Act applications
- Additional information through a direct link to www.fraenkische.com
- This software can depict FRÄNKISCHE stormwater treatment systems, that are approved by the German Institute for Building Technology (DIBt), in an evaluation procedure according to DWA-M 153.
- Country-specific requirements, e.g. those of Baden Württemberg, can be considered.

NB

Free of charge Excel-based full version, i.e. no installation required.

RigoPlan® professional highlights

A 138 / A 117 dimensioning:

- Extended dimensioning for A 138 / A 117 possible, e. g. additional water volumes/storage, vortex outlets, etc.
- Separate area allocation for underdrained swale systems
- Determination of overflow water volumes

Stormwater treatment

- Dimensioning acc. to DWA-M 153
- Easy selection of waterbodies and high stress points using a table
- Extended dimensioning possible, e.g. Sedi systems in connection with root zones
- Four discharge systems subject to separate dimensioning (through three stormwater treatment systems and one direct discharge) for areas possible (areas can be allocated separately)

Material list

- On the basis of dimensioning, automatic generation of the material list, which can be individually adapted, and corresponding tender documents

Rainfall data

- Direct import of rainfall data from the KOSTRA atlas possible
- For approximate dimensioning, model rainfall data can be loaded
- Individual creation of customised rainfall patterns

Programme options

- The dimensioned objects can be saved as separate project files. These project files are in Excel format with the extension .FRW. These files can be used as regular Excel files, e.g. in order to enter additional project information and calculations.
- Projects saved with RigoPlan professional can be imported into the programme even if the project file has been extended individually.
- Creation of individual company addresses for several employees possible.
- Direct Internet connections possible through corresponding links, e.g.:
  - regional contacts
  - information on products from the field of drainage
  - product drawings
  - tender documents (on the Internet)
  - software updates for RigoPlan professional
  - FRÄNKISCHE website

Free download

www.fraenkische.com

Downloads

Select **competence**

Stormwater management

and **document type:**

Software

Please register and download the software free of charge.

Consequence

The effects of climate change are all around: one-hundred-year floods, long periods of summer drought, more precipitation in winter, massive road damage, groundwater pollution and groundwater depletion.
Exceptional situations? Everyday life. Since the cause cannot be eliminated quickly, concepts of limitation as well as long-term damage prevention are in great demand.

Thus, the removal, treatment, storage and controlled discharge of stormwater will become the task of management in urban, road and track drainage. Management implies well-directed application of profound expertise in order to create practical solutions.

This is exactly supposed to be the goal of stormwater management systems: make theory and practice meet. Quick, reliable, sustainable, flexible.

Basics

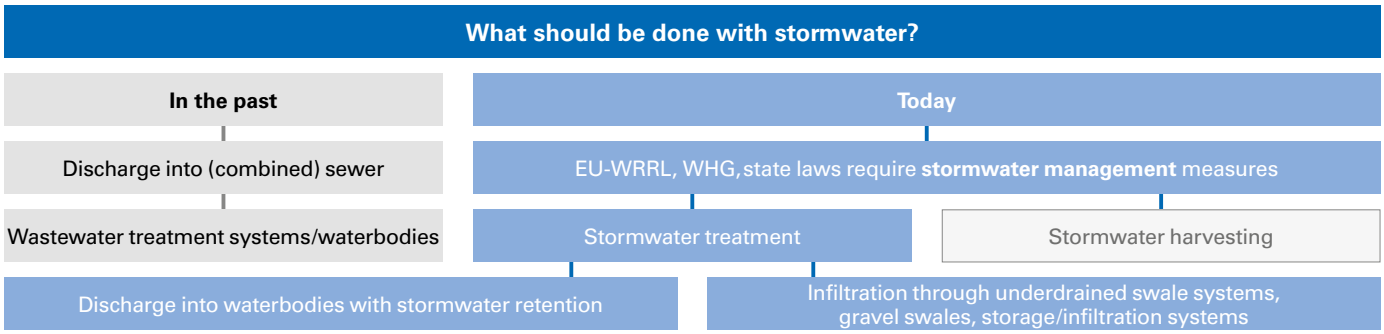
Stormwater management TODAY

EU regulation framework

With the EU Water Framework Directive, EU member states have created a common basis for comprehensive water protection. This also takes into consideration water collection areas that cross state lines. The general objective is to achieve and/or maintain a sound condition of surface water and groundwater by 2015. To achieve this goal, the German Federal Water Act (*Wasserhaushaltsgesetz, WHG*) was adapted in Germany and brought into effect in March 2010 as amended. Now, in the case of resettlement, accumulating stormwater must primarily be returned to the local natural water cycle. In addition, the best available technologies must be used for technical solutions in relation to the benefit-cost ratio.

In the past, stormwater used to be very often mixed with other wastewater in combined sewer systems, collected from large areas and discharged. Before the development of central, local wastewater treatment systems, stormwater and wastewater were then separated again, as far as possible and with a lot of effort, and in most cases the stormwater was diverted into waterbodies without any limitations. On the basis of the new legal requirements, we are now encouraged to use state-of-the-art technology for preferably decentralised treatment, storage and controlled discharge or harvesting of stormwater. As far as possible, the decentralised infiltration of stormwater must be preferred over the temporary retention with a vortex element to control the discharge into a waterbody.

Our system solutions for stormwater management use state-of-the-art technology and comply with the legal requirements regarding best available technologies.



Drainage aspects

Bottlenecks in centralised sewer networks can be eliminated by specifically disconnecting stormwater collection areas or decentralised retention measures, decreasing the likelihood of hazardous flooding.

Systems for the decentralised management of stormwater by infiltration and/or retention allow for a reduced and controlled total runoff in local sewer networks.

Re-channelling stormwater into the local natural water cycle is a wise goal in terms of technology, water regulations, environment and economy.

Basics in Germany

The applicable technical guideline, the DWA A 138 worksheet "Planning, Construction and Operation of Facilities for the Percolation of Precipitation Water" (*Planung, Bau und Betrieb von Anlagen zur Versickerung von Niederschlagswasser*) describes all kinds of occurring stormwater and possible types of professional infiltration in accordance with the respective pollution potential.

The goal is to achieve sustainable stormwater management by taking soil and water protection considerations into account.

The DWA-M 153 bulletin provides recommendations for handling stormwater (*Handlungsempfehlungen zum Umgang mit Regenwasser*). The bulletin suggests types of pretreatment before stormwater infiltrates or is diverted into a waterbody.

Please refer to the DWA-A 117 worksheet "Dimensioning of Stormwater Holding Facilities" (*Bemessung von Regenrückhalteräumen*) when dimensioning storage systems.

"Rainwater Harvesting Systems" (*Regenwassernutzungsanlagen*) are standardised by DIN 1989. In addition, local provisions and regulations apply.

Rain tax

Local authorities often raise a "discharge fee" per m² of paved surface up to EUR 2.00 per m²/year. Infiltration systems therefore amortize after just a short time. The planning engineer should point that out to the builder.

Choosing a system

Important factors in choosing a suitable infiltration system

- Stormwater quality regarding the pollution level (particle and chemical pollution)
- Geological and hydrogeological conditions (backfill soil permeability, ground water level)
- Distance of buildings with basements from infiltration systems
- Aspects of urban development (existing green spaces, degree of surface impermeability)

The degree of stormwater pollution and geological conditions have a direct impact on choosing a suitable infiltration system.
In case of favourable permeability values (k_f value), full infiltration can be achieved, while in case of low permeability values, the main focus is on retention and time-lagged discharge.

The stormwater pollution potential is decisive for the type of infiltration system.

Unpolluted stormwater can infiltrate through space-saving subsoil pipe swales or storage/infiltration systems.

Suitable pretreatment measures must, however, be employed to clean polluted stormwater.

In addition to underdrained swales, high-performance technical systems, which are characterised in particular by their safe and efficient maintenance, are also frequently used today (see Stormwater Treatment section).

System components ...

Stormwater treatment

Treatment performance

Root zone

Trough or swale

Retains fine particles and adsorbs dissolved materials

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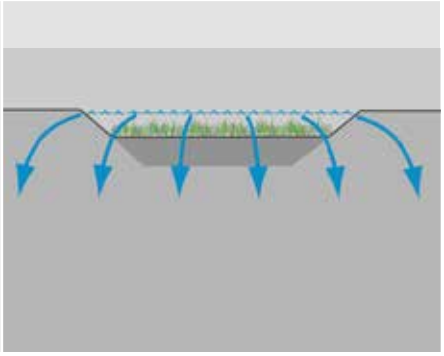

Stormwater treatment systems

RigoClean

Protects the stormwater treatment system against coarse dirt particles, mud and light liquids

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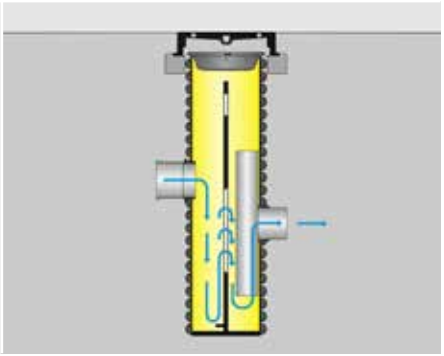

SediPipe

Sedimentation helps retain fine particles
Retains light liquids in case of spills

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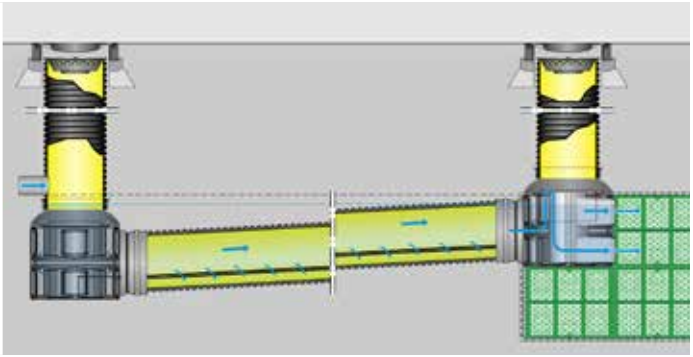

SediSubstrator

Sedimentation helps retain fine particles + adsorption of dissolved materials

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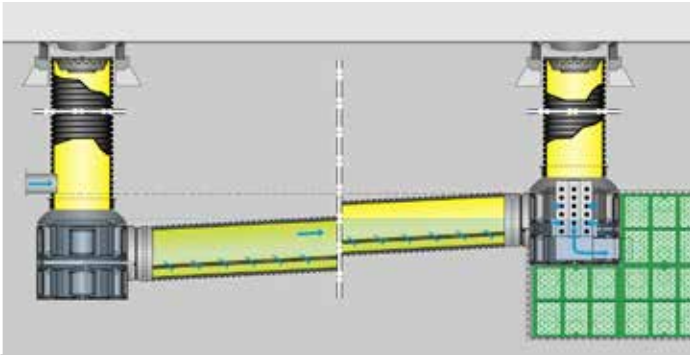

Stormwater management

Infiltration, retention

Underdrained swale with MuriPipe

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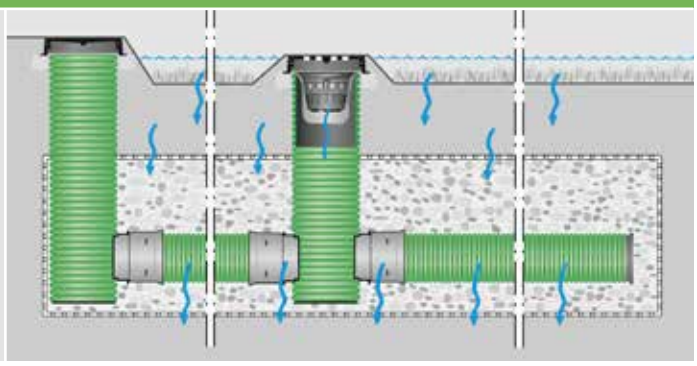

Pipe swale with SickuPipe

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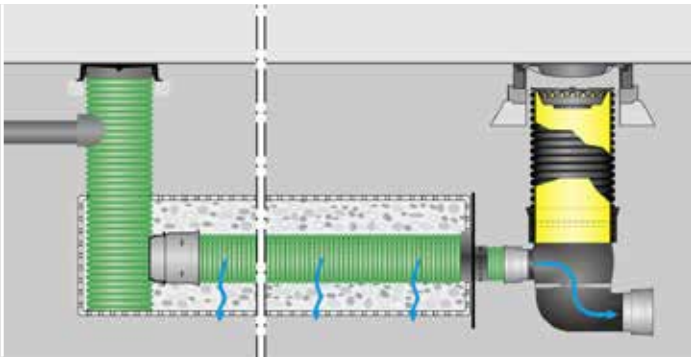

Storage/infiltration system with Rigofill inspect

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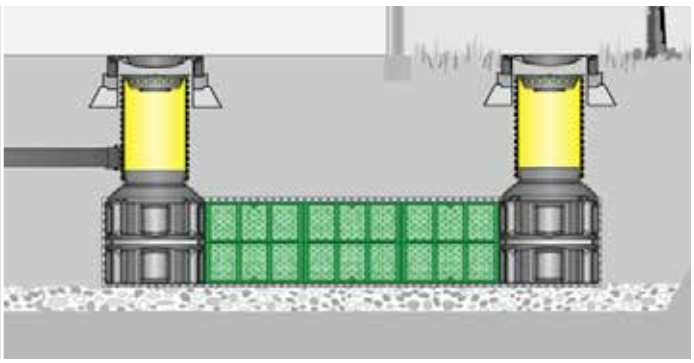

Space requirement

Retention, harvesting, fire water storage

Stormwater harvesting systems with RigoCollect

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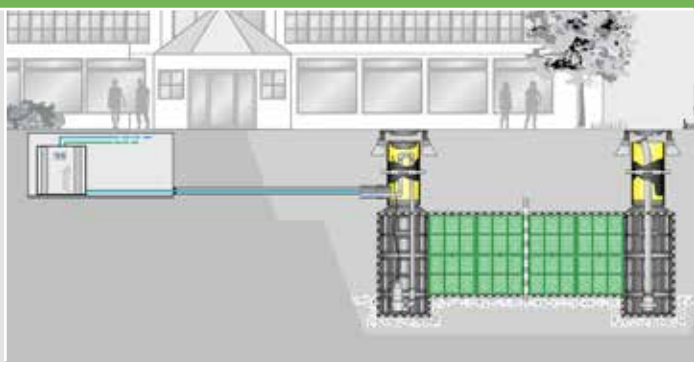


Stormwater treatment – the path to clean water

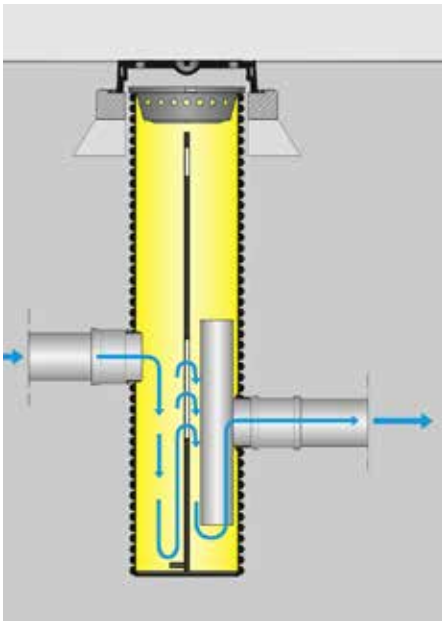
Pretreatment is often necessary before stormwater infiltrates or is diverted into waterbodies. For more details, please refer to the DWA-M 153 bulletin or local regulations.

FRÄNKISCHE offers underground treatment systems that do not affect the use of space and ensure a systematic elimination of pollutants.

The three types of systems

- RigoClean,
- SediPipe and
- SediSubstrator

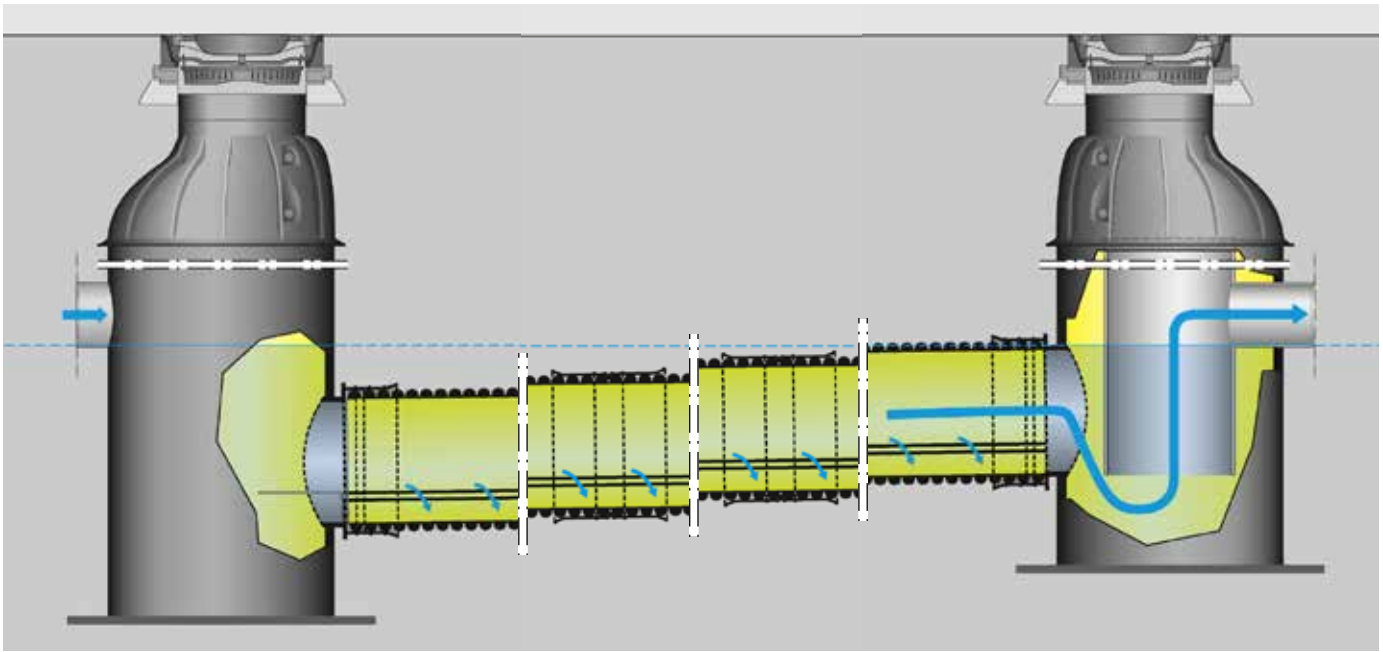
are tailored to the various needs.



RigoClean cleaning shaft

SediPipe XL

Stormwater treatment with SediPipe®



Example: SediPipe XL

Stormwater infiltration – give back to nature

Storage/infiltration systems considerably increase the storage volume. High-performance storage/ infiltration systems can be installed even in confined space.

Underdrained swale infiltration systems make excellent use of the protection potential of the soil, effectively removing floatables.

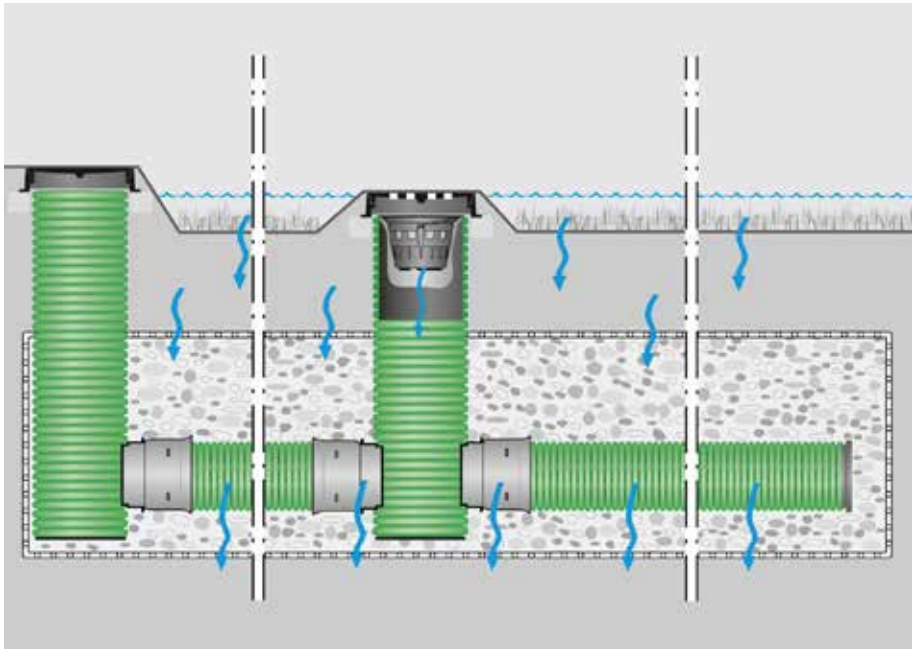
Pipe swale infiltration systems divert stormwater through backfilled pipe swales into the subsoil without requiring a permeable surface/undeveloped area.

Pipe swales and underdrained swale systems with SickuPipe and MuriPipe

Stormwater should infiltrate wherever it occurs and be returned to the natural water cycle.

Stormwater and surface water are not wastewater. If possible, stormwater and surface water should not be diverted into the sewer system.

A decentralised infiltration through underdrained swale systems, pipe swales and storage/infiltration systems returns the water to the natural water cycle where it belongs.

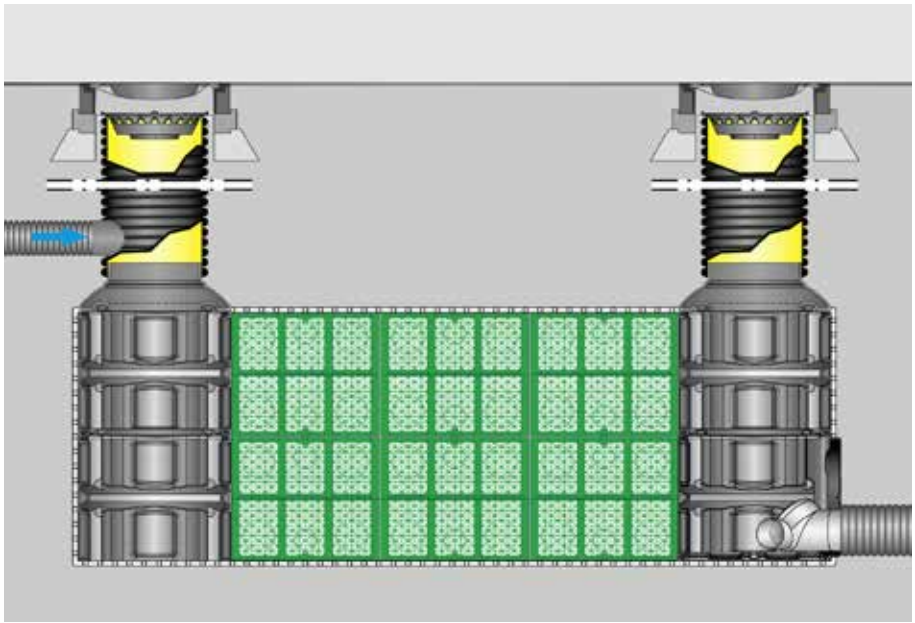


Example of infiltration through an underdrained swale system without vortex outlet

Stormwater retention – instead of flooding

Infiltration/storage systems
Sealed or unsealed infiltration/storage systems are a reasonably priced alternative to conventional storage facilities like retention channels or underground concrete tanks!

Stormwater retention with Rigofill® inspect or Rigo®Collect



Example of a storage/infiltration system with vortex outlet through QuadroLimit, without sealing

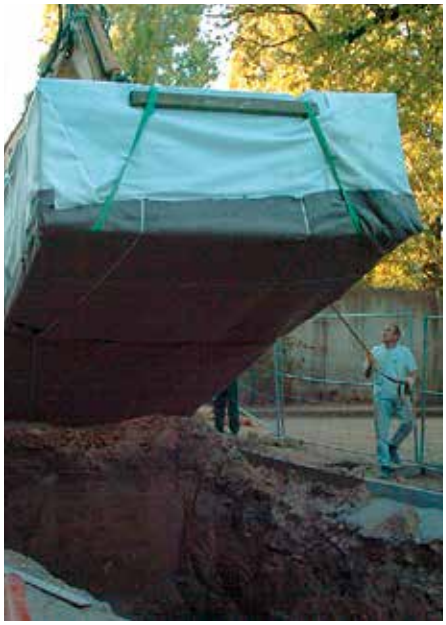
If subsoil conditions are unfavourable to infiltration, the goal is to store the stormwater and ensure a retarded, timelagged discharge. Exposure to impulsive stress can be eliminated or reduced in sewer networks, wastewater treatment systems and waterbodies.

To achieve this, systems with vortex outlets must be used. The stormwater distributes evenly in the system where it can be stored and then discharged in a controlled manner through throttle shafts.

If infiltration must be avoided or to prevent unintended discharge of groundwater or strata water (e.g. in case of contaminated soil), it is necessary to seal the storage system. This is how an absolutely tight underground storage/infiltration system named RigoCollect is created.

Stormwater harvesting – saving resources

A RigoCollect stormwater tank is built to use stormwater in the home. One of the first steps is installing a membrane.



The tank can be pre-fabricated up to a certain size. Installation is a routine job for experts.

Due to the modular design, RigoCollect stormwater storage tanks can be built in virtually any size and geometry.

Storage with Rigo®Collect

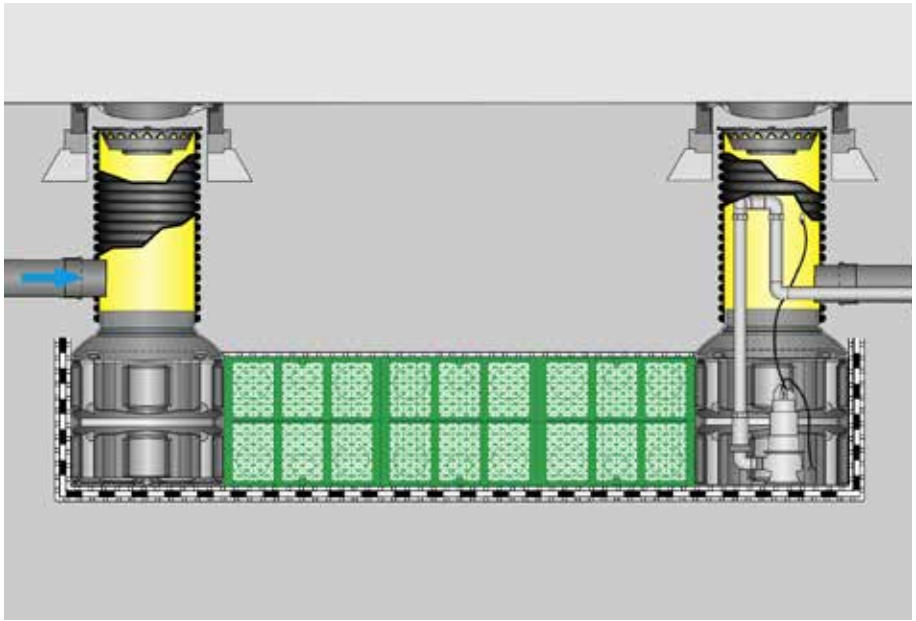
Water – particularly drinking water – is a priceless resource which should be treated responsibly and used sparingly.

It is therefore wise to collect, store and use stormwater if the water must not necessarily be suitable for drinking purposes, instead of allowing the water to infiltrate into the soil unused or diverting it into the sewer system.

For technical applications, the need for preparatory measures like softening and demineralisation, that are often required for tap water, is removed if stormwater is used, since it hardly contains any lime and minerals.

There is a great variety of applications: use in toilets, cooling tower operation, washing machines, irrigation of sports facilities and greens, car wash, etc.

The use of the modular RigoCollect system allows to find solutions that meet project-specific requirements, even under the most difficult conditions, such as little space, high traffic loads, low cover, high groundwater level, tight deadlines, etc.



Example of a RigoCollect stormwater harvesting system, used as a reservoir (filter and control not illustrated)

Fire water storage ...

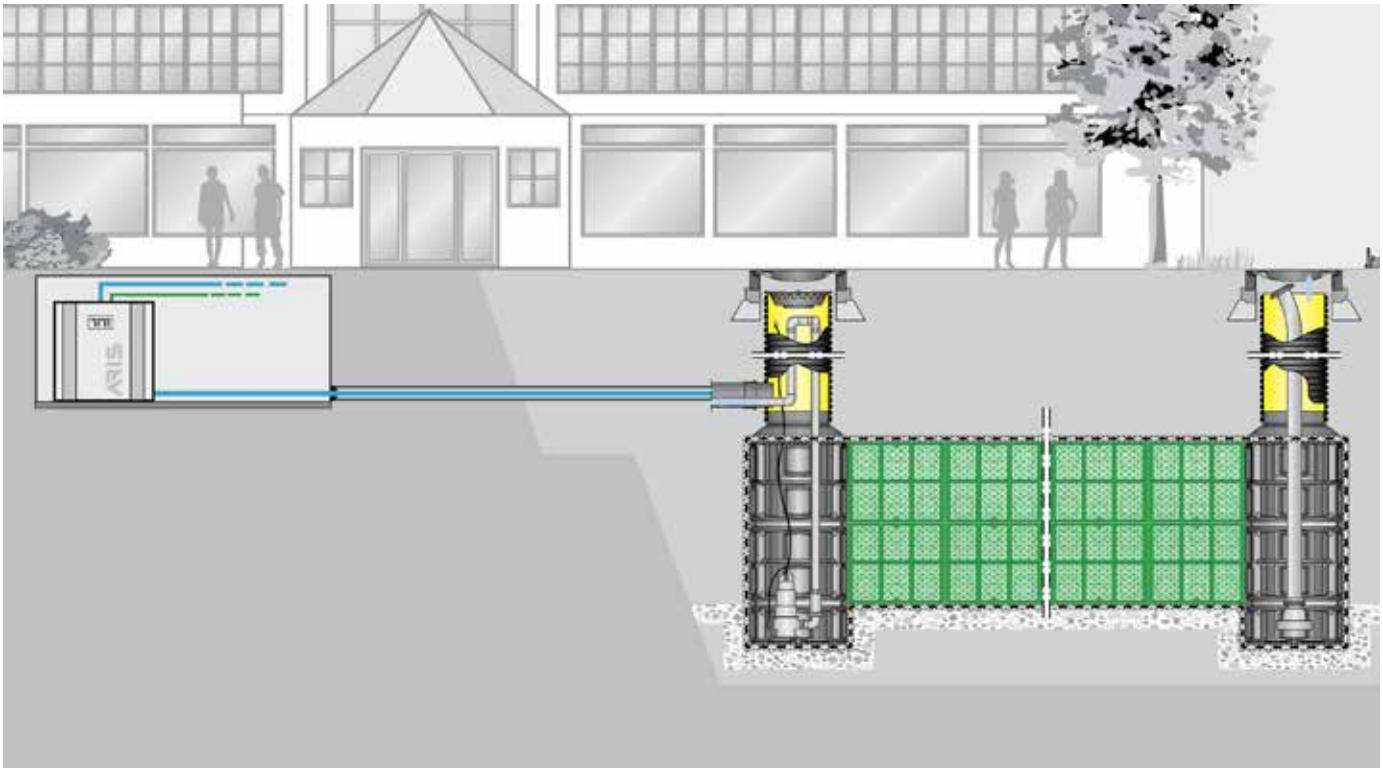
The control system will be adjusted to meet project needs in terms of scope and equipment. Pumps, fittings and filters can be controlled and monitored as needed. Remote monitoring through an existing building management system is possible along with through the telephone network or the internet.

Short construction time and immediate full loading capacity ensure swift and easy progress on site. Small dimensions remove the need for heavy tools.

The geometric flexibility allows the required volume to be adjusted even in confined space and challenging construction conditions. During ongoing construction work in existing facilities, the use of trafficked areas is affected as little as possible due to the “moving construction site”, i.e. only a small part of the excavation pit is open.

Storage with Rigo®Collect – seize the benefits!

- The flexible geometry – modular design - allows for any shape, including angled or graded
- Very shallow construction depth possible. Minimum total height: 35 cm.
- Very short construction periods (up to 300 m³/day)
- Can be filled and loaded immediately
- Can be easily divided in challenging subsoil conditions (taking into account existing lines)
- High traffic loading capacity (SLW 60)
- Realisation by sections and a "moving construction site" as a solution to tight installation conditions
- Extremely small dimensions and mounting dimensions
- Absolute ageing resistance
- The patented inspection tunnel allows the entire volume of the structure to be CCTV inspected
- The integrated shaft system allows for built-in components of up to Ø 50 cm (filter, vortexes, pumps, fittings...)
- Complies with DIN 14230 for underground fire water tanks
- Certified by the German Testing Institute for Fire Safety and Security (*VdS*) for sprinkler reservoirs
- An everything-from-one-source solution from storage and equipment engineering to maintenance
- Ideal inspectability when filled – no significant effort for fire water redundancies as is the case with classic construction types



Example of a RigoCollect fire water storage

Protection

Stormwater that is drained from impervious and trafficked surfaces can cause problems for waterbodies or groundwater due to the amount of discharge or its content.

Even though the water quality in Germany and other EU states has improved as a result of sewer networks and statutory regulations, there is still a lot to do. Huge concrete tanks requiring a lot of space and a considerable excavation depth are only one part of the entire solution. Space-saving underground sedimentation systems are particularly welcome in areas where space is scarce.

We think that clean water and efficient stormwater treatment are issues affecting our future.

Planning stormwater treatment

Innovative solutions to protect waterbodies

Protection of waterbodies – a must for everyone

Urbanised living environments often heavily pollute stormwater so that its discharge into the groundwater or surface waterbodies would pose a severe threat to the environment. This requires adequate stormwater treatment, which is also increasingly required by authorities.

Pollution results e.g. from road traffic, emissions from industrial facilities or from metal roofs. Stormwater runoff can be polluted by the following materials:

- Coarse organic or inorganic particles, e.g. stones, leaves
- Sand and other fine and ultra-fine particles
- Particle-bound pollutants, e.g. PAH
- Dissolved pollutants, e.g. heavy metals (such as copper, zinc and lead)
- Light liquids such as gasoline and oil

Applicable regulations place a certain demand on the treatment of polluted stormwater runoff. The DWA-A 138 worksheet, for example, requires the unconditional consideration of soil and water protection for the infiltration of stormwater runoff. Frequently, the DWA-M 153 bulletin is used as a basis for selecting a suitable treatment system.

Stormwater treatment before infiltration

Aboveground treatment systems like underdrained swale systems require lots of space – usually 10 to 15 percent of the area to be drained! This space is often not available within urban areas.

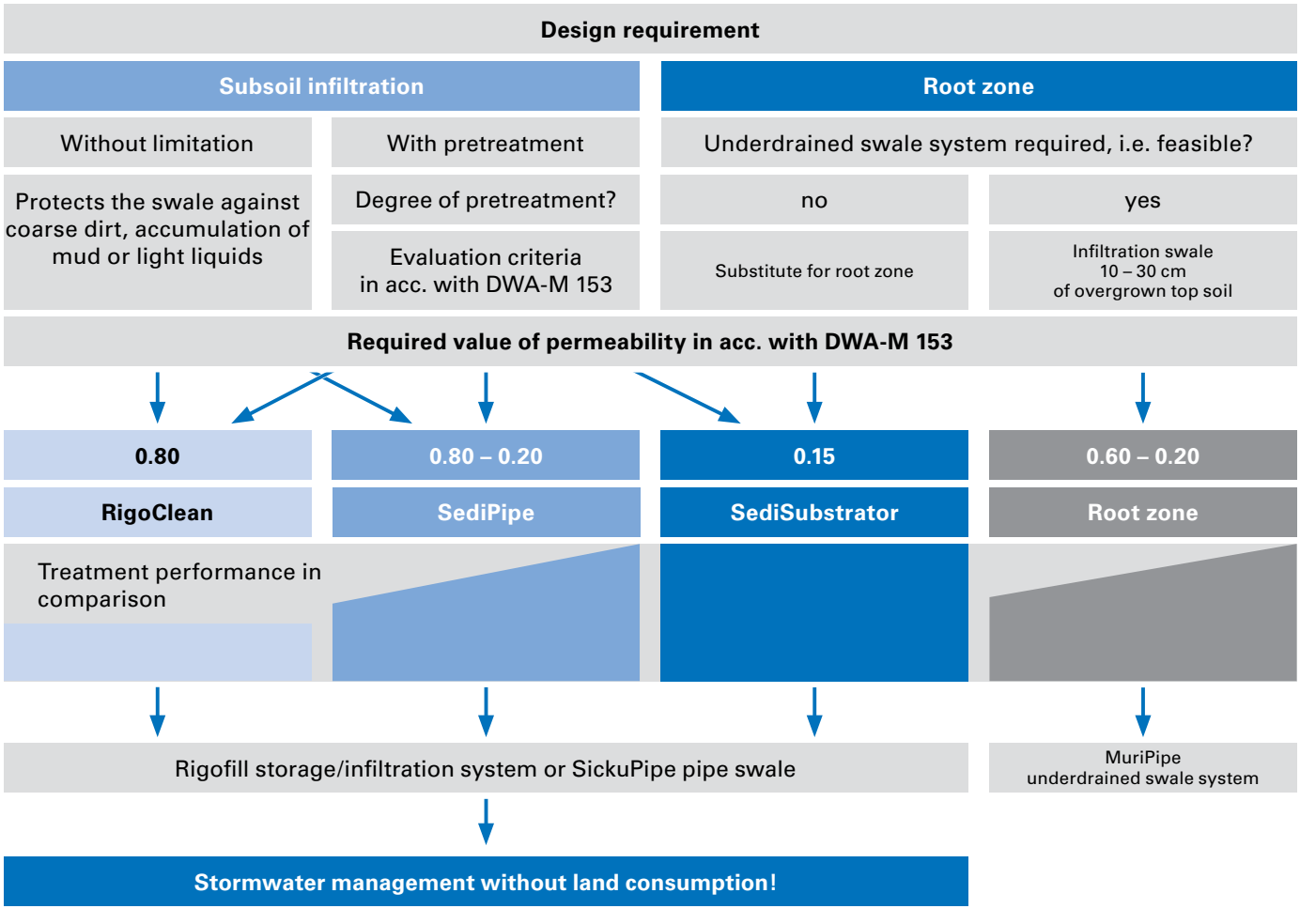
By using subsoil systems such as

- RigoClean
- SediPipe
- SediSubstrator

precious space can be saved.

Trafficked areas or recreational and leisure zones, for example, can be built over the systems.

The following table shows which system is necessary for a particular treatment requirement.



Replacing stormwater sedimentation tanks with SediPipe®

Stormwater treatment before discharge in surface waterbodies

Stormwater discharge in a separate sewer system is frequently treated in stormwater sedimentation tanks before discharging into surface waterbodies. Pollutants that are carried in the water must be retained in the tank through sedimentation. Conventional concrete facilities with a rectangular design according to DWA-A 166 require a lot of space and a considerable excavation depth. With SediPipe, such facilities can be built underground, with a shallow excavation depth and without land take. The need for complex vortex systems, overflow structures and bypasses is removed. The land is, for example, available for parking.

Concrete stormwater sedimentation tank

SediPipe (here 10 x SediPipe 600/12) substitutes a concrete stormwater sedimentation tank

Rigo® Clean ...

Infiltration systems must be sustainable and reliable. If particles are carried into the infiltration system, the infiltration performance may continuously decrease.

The RigoClean cleaning shaft retains coarse dirt and fine particles of up to 0.5 mm and protects the system.
In addition, it also retains floatables and light liquids. RigoClean has been designed for connected areas of up to 500 or 1,000 m².

To perform maintenance, remove the strainer and vacuum the sediment.

RigoClean is suitable for infiltration of rooftop runoff or unpolluted runoff from paved surfaces.

RigoClean can also be used as a pre-treatment upstream of SediPipe or SediSubstrator.

Pass-through value in acc. with DWA M 153 bulletin
0.8

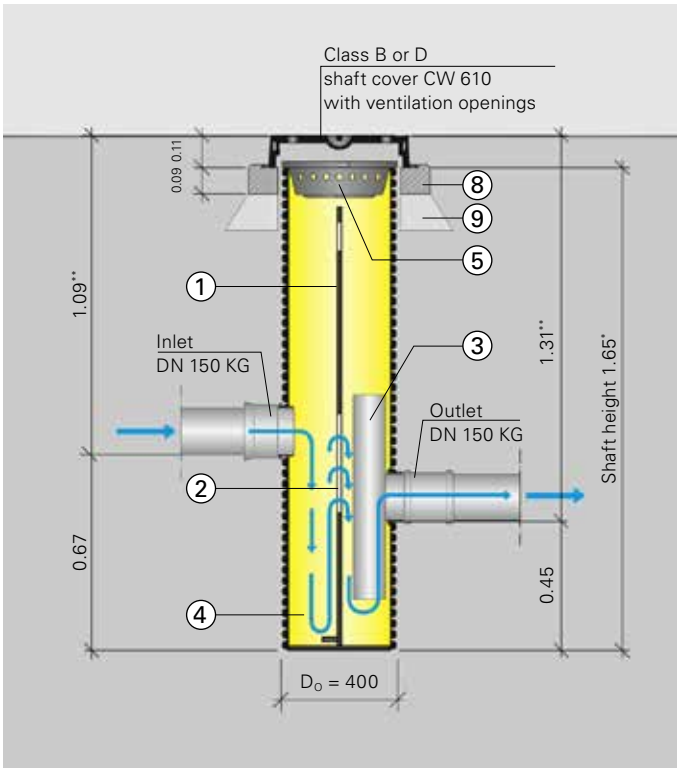
Functional elements include:

① Strainer
② Stainless steel strainer
③ Immersion pipe (retention of light liquids)
④ Mud collector
⑤ Sediment trap D_O 400
⑥ Sediment trap D_O 600
⑦ Dirt hopper
⑧ Concrete support ring for shaft cover CW 410
⑨ Bearing free from stationary loads, to be supplied on site

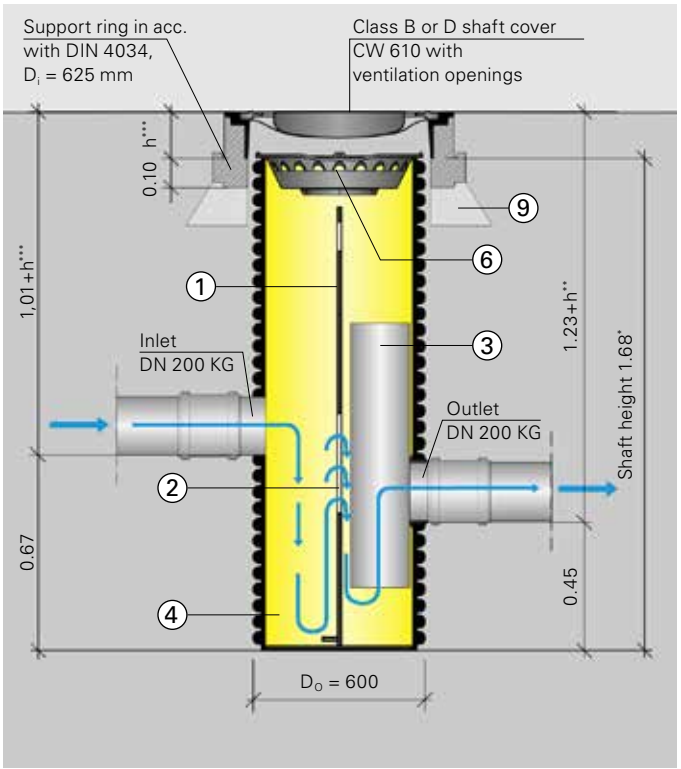
Rigo®Clean with lateral inlet for 500 and 1,000 m²

RigoClean with lateral inlet is connected directly upstream to the system.

It is fed through conventional road gullies, gullies in courtyards or from rooftop runoff.



RigoClean 500 with lateral inlet
* Project-specific shaft height available upon request
** Adjustable due to additional support ring (to be supplied on site)

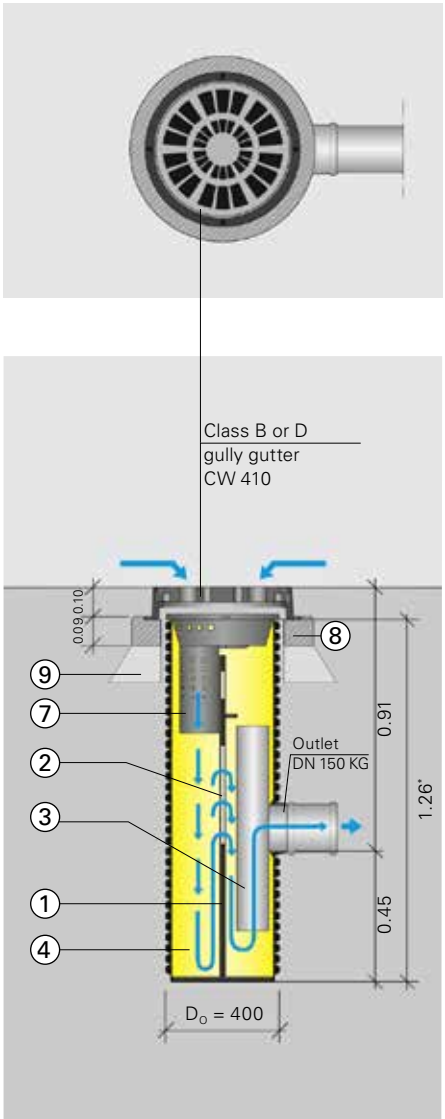


RigoClean 1000 with lateral inlet
* Project-specific shaft height available upon request
** Height depends on design and load class
*** Adjustable due to additional support ring (to be supplied on site)

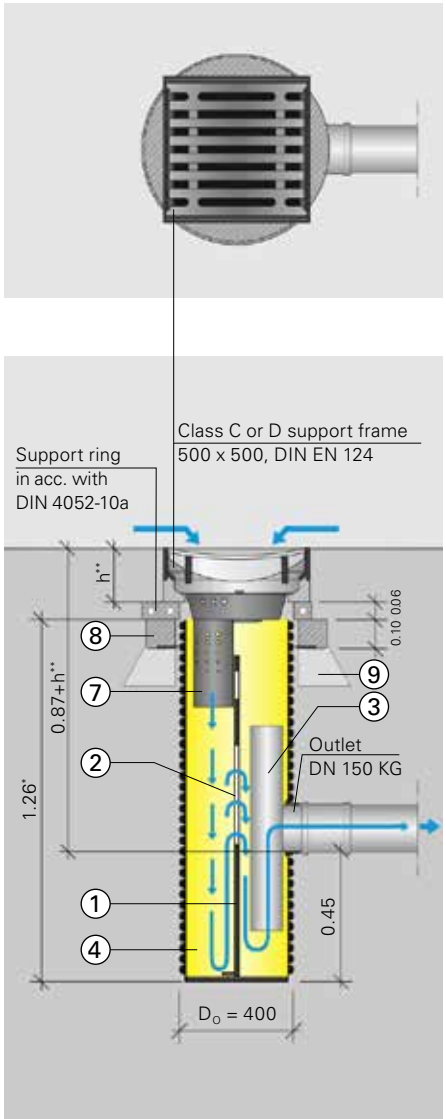
Rigo® Clean with upper inlet for 500 m²

RigoClean with upper inlet also fulfils the purpose of a road gully. The dirt hopper retains coarse dirt and admits the water into the first chamber.

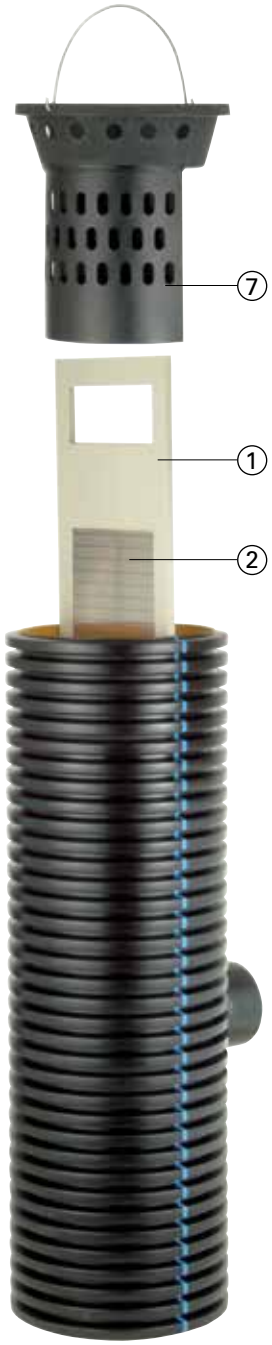
Gutters are available in shapes including round and square 500/500 (gutter or desk type).



RigoClean 500 with upper inlet and round gully gutter
* Project-specific shaft height available upon request

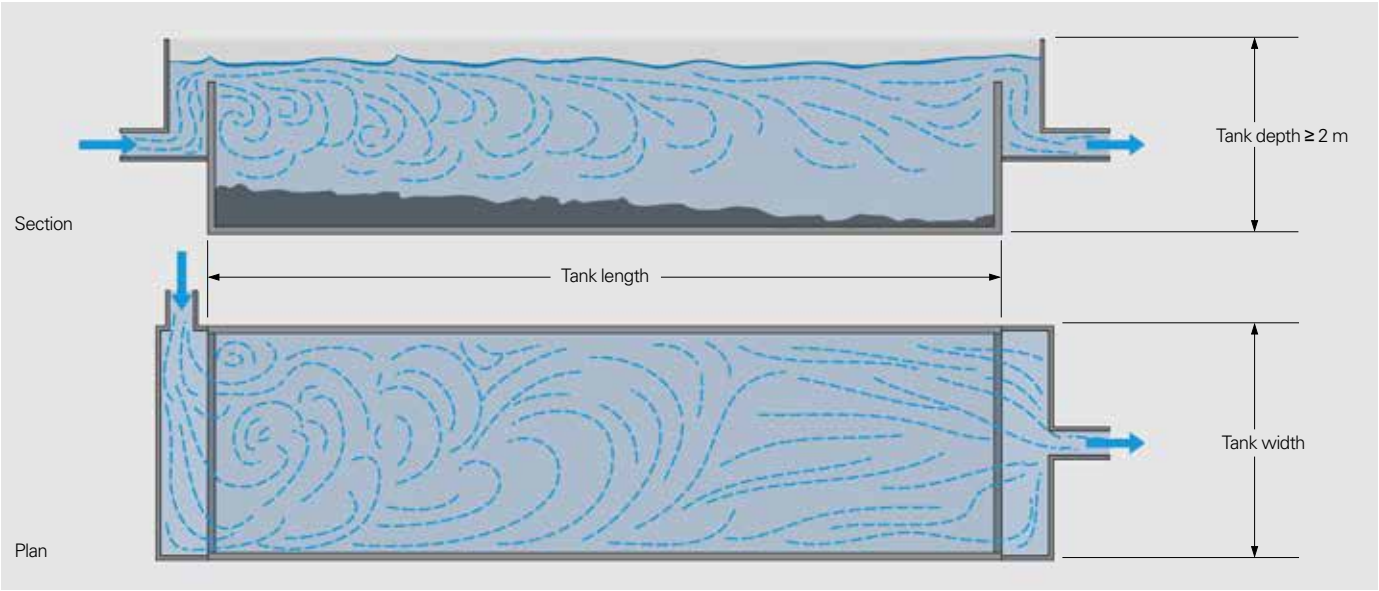


RigoClean 500 with upper inlet and square gully gutter 500/500
* Project-specific shaft height available upon request
** Height depends on design and load class



RigoClean with upper inlet

Stormwater sedimentation tank with permanent water level



Examples of currents in rectangular stormwater sedimentation tanks with different water movements

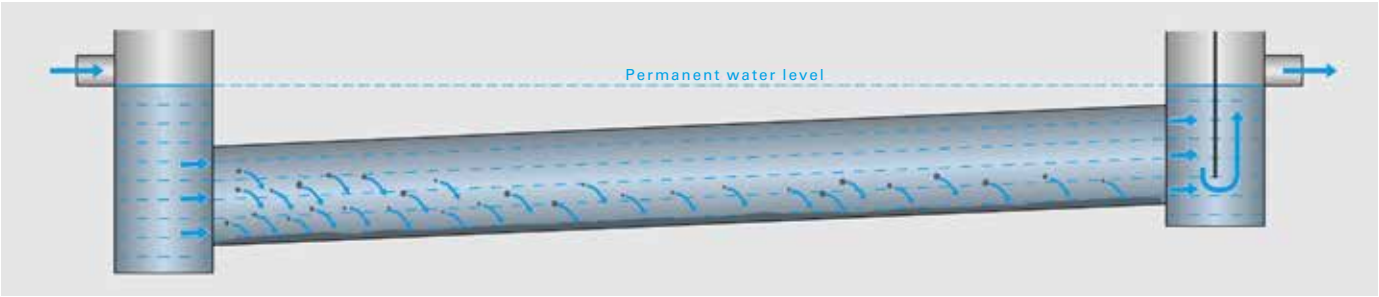
Pollutants that are carried in stormwater runoff are mainly bound to small and smallest particles. These can be removed from the water by sedimentation. However, sedimentation is time consuming, because particles, in particular polluted ultra-fine particles, sink very slowly to the ground. To achieve the required retention time, the flow velocity must be significantly reduced in conventional sedimentation systems, e.g. stormwater sedimentation tanks with a permanent water level. Unwanted currents frequently occur in such tanks, which complicate sedimentation. In addition, the tank must have a certain depth to prevent the sediment on the ground from being re-entrained.

To achieve this, large construction volumes are required – large and compact structures are the result.

SediPipe solves this problem differently – in an innovative and cost-effective way!

Geometry makes the difference

With SediPipe, the sedimentation chamber is stretched and tubular, which promotes sedimentation in two ways: a **flow rectification** occurs, and time and distance until a particle settles are reduced. The rectification effect in the pipe prevents vortex generation and short-circuiting, the water runs constantly from the start shaft to the target shaft. A particle only needs to cover the short distance to the pipe bottom, the necessary retention time is reduced. SediPipe therefore requires a significantly lower construction volume than a stormwater sedimentation tank.

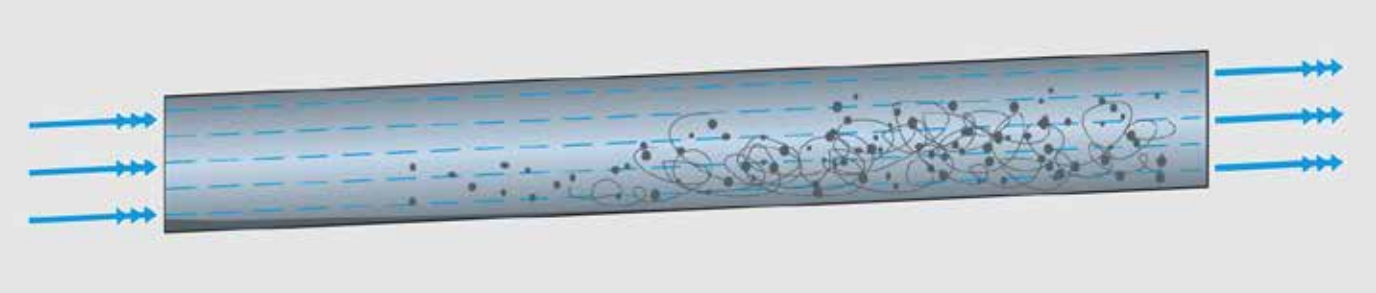


Stretched sedimentation chamber: **flow rectification**

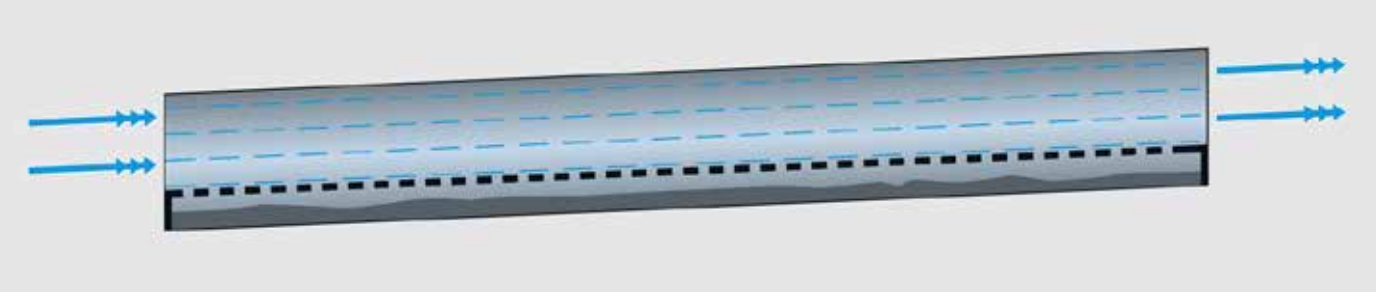
… optimised retention of fine particles

The highlight is the flow separator

Heavy rains occur only rarely, but they would re-entrain the sediment from the pipe due to high flow velocities **(remobilisation)**. The flow separator prevents this: It forms a zone in the lower pipe section where there is little water movement which is free of flows and in which the sediment is protected from discharge – **sediment control** takes place.



Pipe without flow separator: **remobilisation**



Pipe with flow separator: **sediment control**

Proven treatment performance

The DWA M 153 bulletin describes stormwater treatment systems with regards to their treatment performance. For instance, type D24 stormwater sedimentation tanks (systems with a permanent water level and a flow rate of 10 m/h) have been designed for the separation of the finest grain fractions. SediPipe corresponds to this type as well as types D25 and D21. The treatment performance has been scientifically proven by the Institute of Water Engineering and Urban Water Management (*Institut für Wasserbau und Siedlungswasserwirtschaft*) at the Leipzig University of Applied Sciences.

SediPipe laboratory model

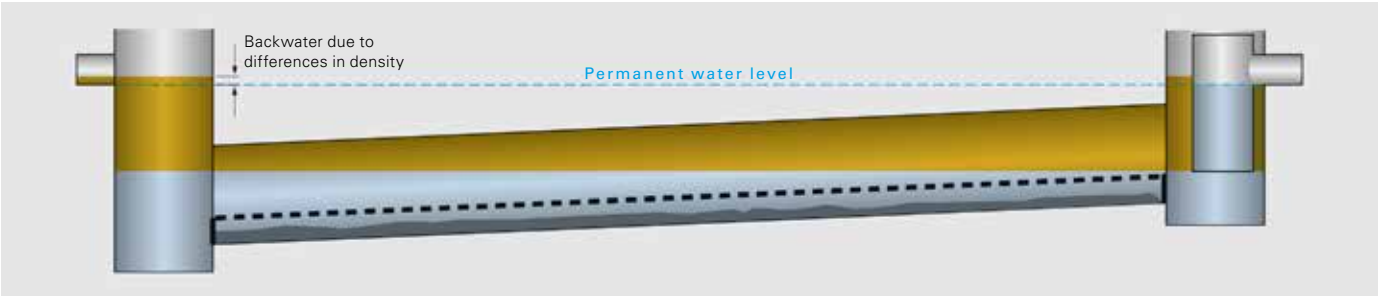
Retention of light liquids in case of spills

Spills of light liquids can never be entirely excluded, especially in trafficked areas. In case of an accident, for example, a diesel fuel tank may leak, a hydraulic hose may break or oil-bearing fire water may develop during a vehicle fire. Other similar scenarios are possible. Light liquids are among the substances hazardous to water – they must under no circumstances enter downstream waterbodies or the groundwater!

In case of spills, SediPipe effectively prevents water pollution!

Protection in dry weather

All SediPipe systems are equipped with an immersion wall and/or an immersion pipe in the target shaft. Leaking fuel or oil is safely and reliably retained in the system in dry weather. The oil storage volume depends on the type and the size of the system. The oil collected after a spill must be removed from the system immediately and disposed of appropriately!

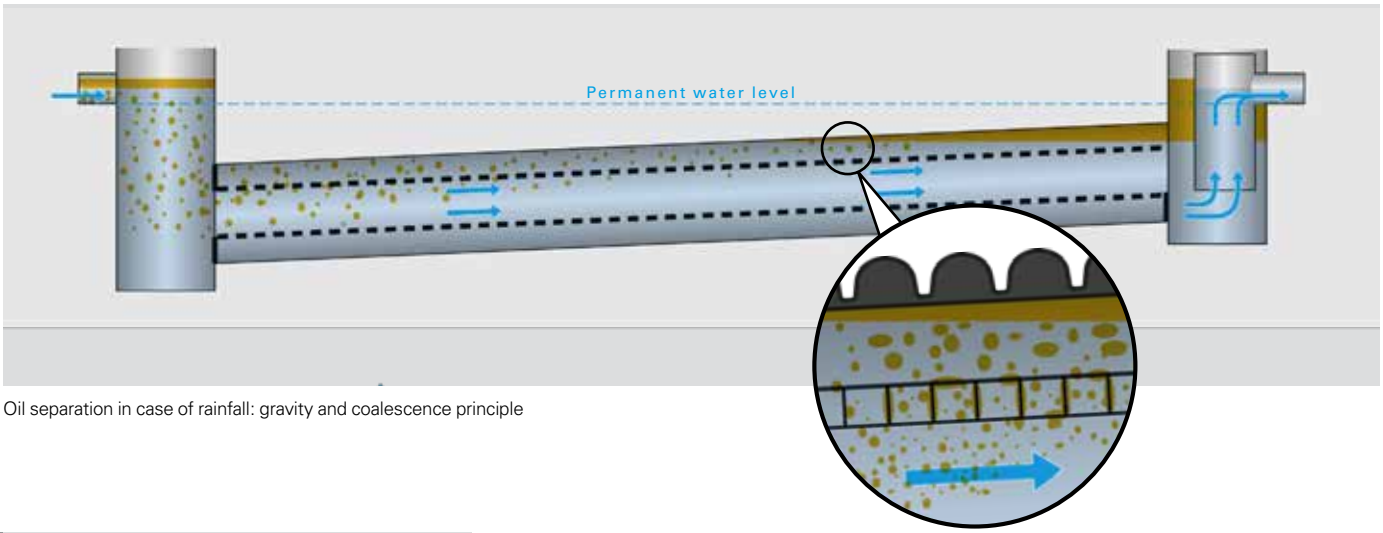


Oil retention in dry weather

Protection during rainfall or fire-fighting operations

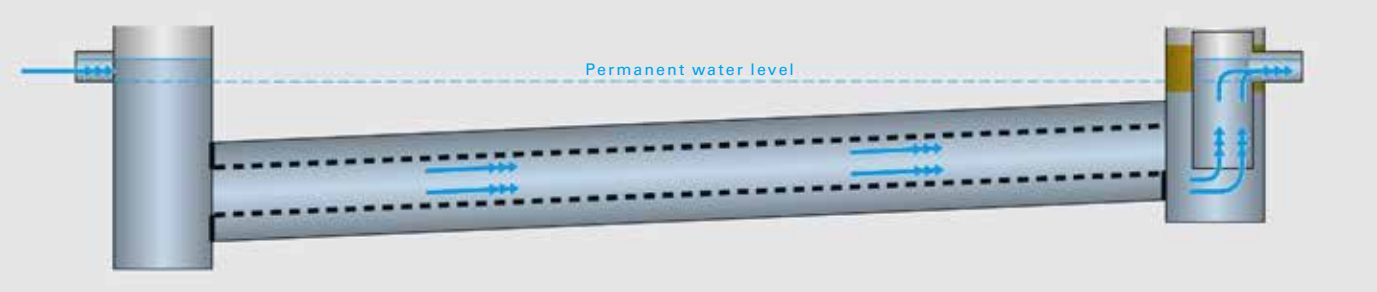
Spills do not adhere to schedules, they can also occur during rainfall. In fire-fighting operations, a water-oil mixture may enter the system. The moving water divides the entrained oil into many small and thinly dispersed oil drops, which rise very slowly in the system and are hard to separate. SediPipe XL plus systems are equipped with an additional upper flow separator. The oil is collected in the upper pipe section, where there is little water movement, and it forms a stable oil film in the target shaft. In addition, the flow separator serves as a coalescence element: small oil drops are captured by the grid structure and merged to form larger drops which can be separated easily. Thus, light liquids are reliably separated during rainfall. Also in case of subsequent heavy rains, the separated oil is not re-entrained.

Oil that is collected after a spill must be removed from the system immediately and disposed of appropriately.



Oil separation in case of rainfall: gravity and coalescence principle

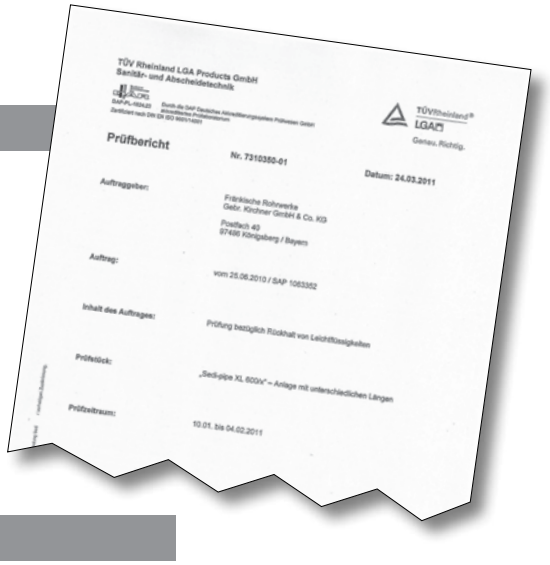
… prevention in case of spills



Reliable oil retention in the target shaft in case of subsequent heavy rains

Proven filtration performance

SediPipe XL plus systems have been tested for the retention of light liquids by the TÜV Rheinland LGA Products GmbH. The discharge values match those of an oil separator class I according to DIN EN 858-1 (residual oil level ≤ 5.0 mg/l, which corresponds to an oil retention of at least 99.9%).


TÜV Rheinland LGA Products GmbH
Sanitär- und Abscheidetechnik

Prüfbericht

Nr. 7310360-01

Datum: 24.03.2011

Auftraggeber:

Fränkische Rohrwerke
Gebr. Kirchner GmbH & Co. KG
Postfach 40
97486 Königsberg / Bayern

Auftrag:

vom 25.06.2010 / SAP 106382

Inhalt des Auftrages:

Prüfung bezüglich Rückhalt von Leichtflüssigkeiten

Prüfstück:

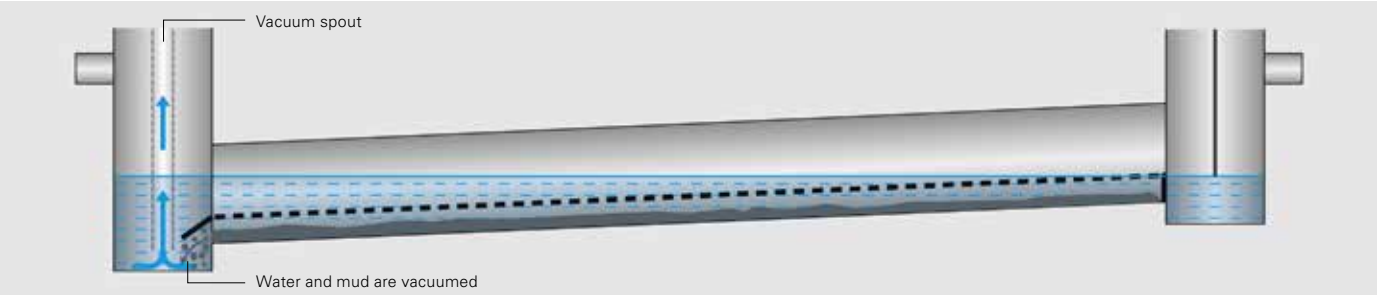
„SediPipe XL 600V" – Anlage mit unterschiedlichen Längen

Prüfzeitraum:

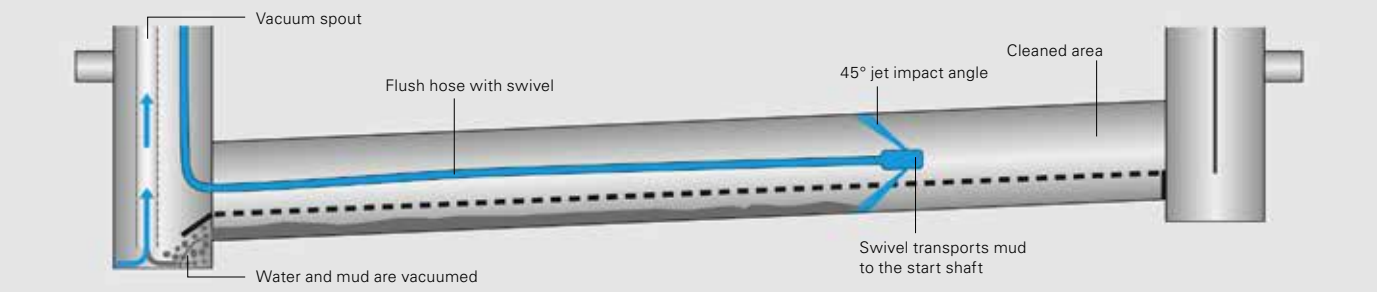
10.01. bis 04.02.2011

Easy maintenance

Conventional sewer cleaning methods are used to maintain SediPipe. The system maintains a permanent water level which keeps the sediment muddy. The contents of the system are vacuumed from the start shaft. The valve flap opens and releases the sediment to the lowest point. The system is then clean and can be operated again.



Emptying with vacuum spout



Cleaning with vacuum spout and flush hose

SediPipe® – quick and easy installation

Convenient and cost-effective installation

- Pre-fabricated systems – short construction periods
- Reduced transport costs thanks to favourable sizes and weights
- Convenient installation thanks to low part weights
- Integration into the stormwater sewer network

Installation of sedimentation pipe

Documentation

A technical documentation is included with every SediPipe system.

It includes:

- Maintenance instructions
- Technical drawing
- Installation manual

Free download

www.fraenkische.com

Downloads

Select **competence**

Stormwater management

and **document type:**

Maintenance

Installation of sedimentation pipe

Connecting sedimentation pipe and target shaft to a storage/infiltration system

SediPipe® basic

North Rhine-Westphalia State Agency for Nature, Environment and Consumer Protection

PROOF OF EQUALITY
of decentralised stormwater treatment systems as compared to stormwater sedimentation tanks in North Rhine-Westphalia (LANUV list)

SediPipe basic systems have been designed to directly connect to Rigofill inspect. This makes SediPipe basic an integrated component of the Rigofill system.

The inlet at the start shaft is 360 degrees rotatable. The inlet diameter can be selected from DN 200 to DN 300. The outlet of the target shaft is tailored to connect to the inspection tunnel of Rigofill inspect.

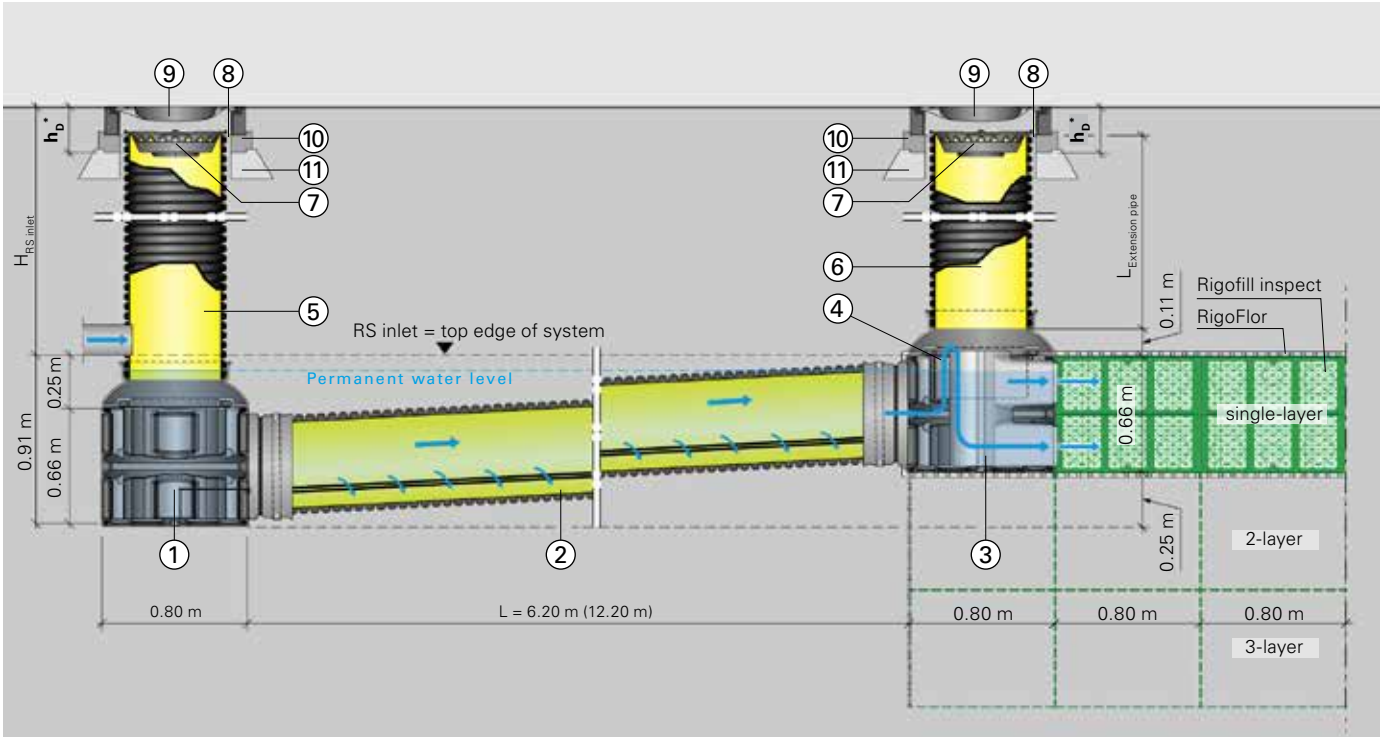
The flow direction of the target shaft – straight, right hand, left hand – is chosen such that it will match the direction of the inspection tunnel.

SediPipe basic	400/6	500/6	500/12	600/6	600/12
Pipe diameter (mm)	400	500	500	600	600
Pipe length (m)	6	6	12	6	12

Caption

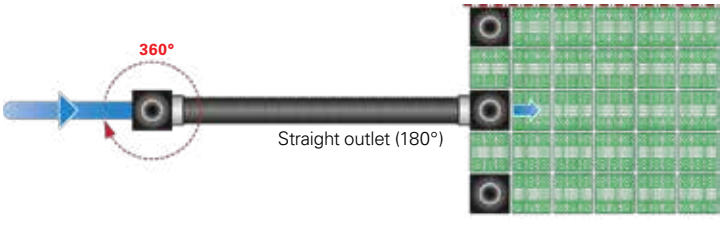
1. Start shaft with maintenance console
2. Sedimentation path with flow separator
3. Target shaft to connect Rigofill
4. Immersion wall
5. Extension pipe D_O 600 with 360° rotatable inlet
6. Extension pipe D_O 600 without inlet
7. Sediment trap D_O 600
8. DOM sealing ring
9. Shaft cover CW 610 with ventilation openings, to be supplied on site
10. Concrete support ring, to be supplied on site
11. Bearing free from stationary loads, to be supplied on site

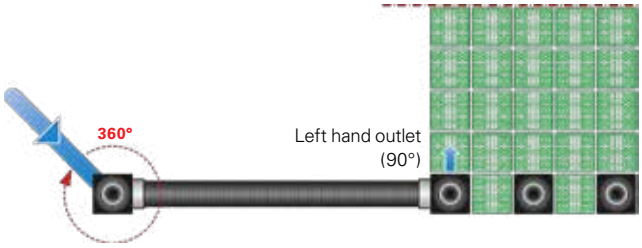
Section of SediPipe® basic



Example: SediPipe basic 500/6 (500/12) with downstream Rigofill inspect storage/infiltration system
*Adjustable, depending on shaft cover, height and number of support rings

Installation examples for SediPipe basic with different flow directions with direct connection to Rigofill systems





SediPipe® level ...

North Rhine-Westphalia State Agency for Nature, Environment and Consumer Protection

PROOF OF EQUALITY
of decentralised stormwater treatment systems as compared to stormwater sedimentation tanks in North Rhine-Westphalia (LANUV list)

In case of SediPipe level systems, inlet and outlet are same level. This allows minimum installation depths of the drain pipe and/or the downstream systems.

SediPipe level can be used universally for a wide range of purposes:

- Discharge into a surface waterbody or sewer
- Installation upstream of or in parallel with a SickuPipe pipe swale
- Installation upstream of or in parallel with a Rigofill storage/infiltration system (non-integrated construction)

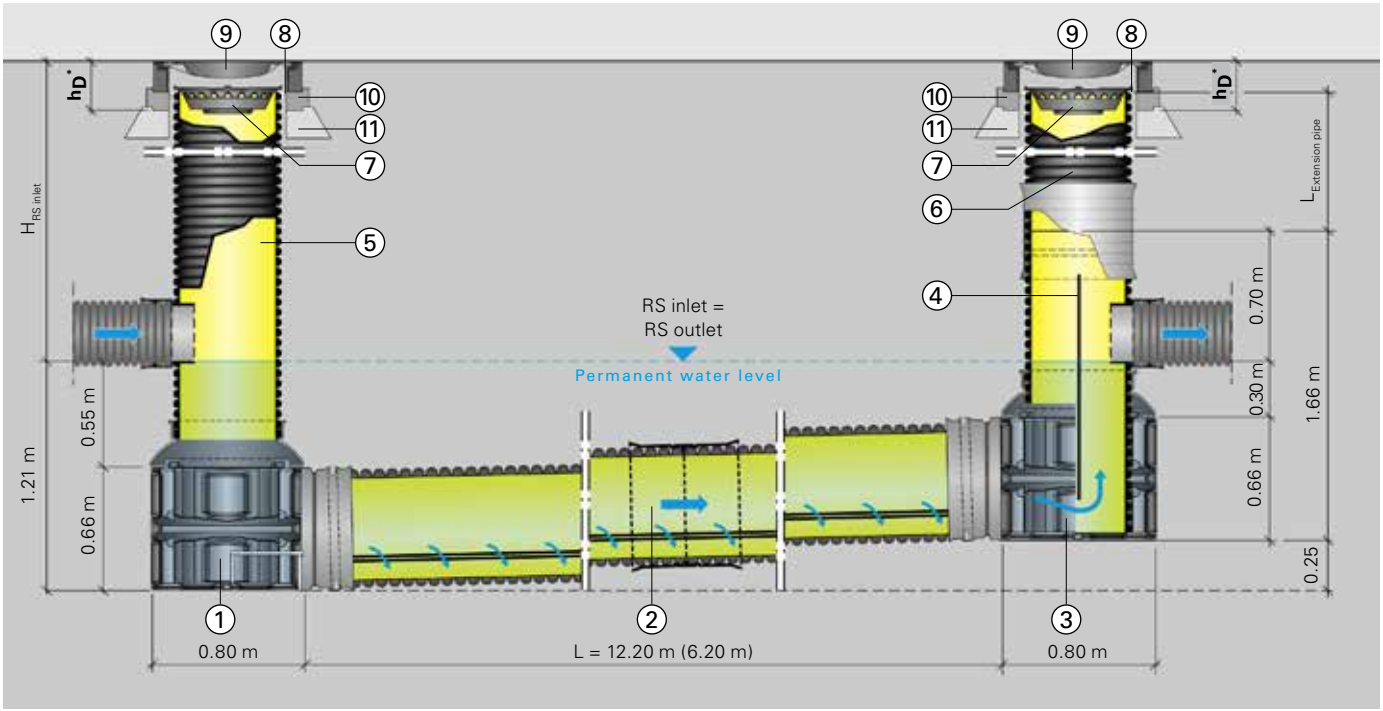
The inlet at the start shaft is 360 degrees rotatable. Inlet and outlet diameters can be selected from DN 200 to DN 300. The flow direction of the target shaft is available in straight, left and right designs or may be factory-set to a customised angle anywhere from 90 degrees to 270 degrees. The system can easily be adapted to on-site requirements. Project-specific designs are available upon request.

SediPipe level	400/6	500/6	500/12	600/6	600/12
Pipe diameter (mm)	400	500	500	600	600
Pipe length (m)	6	6	12	6	12

Caption

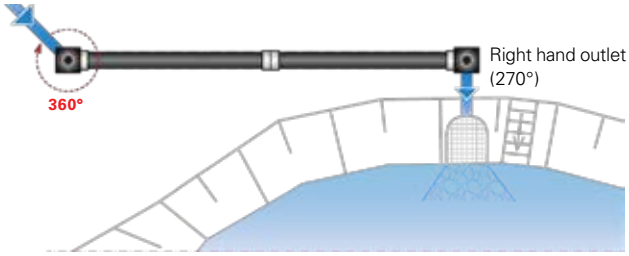
1. Start shaft with maintenance console
2. Sedimentation path with flow separator
3. Target shaft
4. Immersion wall
5. Extension pipe D_O 600 with inlet, project-specific
6. Extension pipe D_O 600 without inlet
7. Sediment trap D_O 600
8. DOM sealing ring
9. Shaft cover CW 610 with ventilation openings, to be supplied on site
10. Concrete support ring, to be supplied on site
11. Bearing free from stationary loads, to be supplied on site

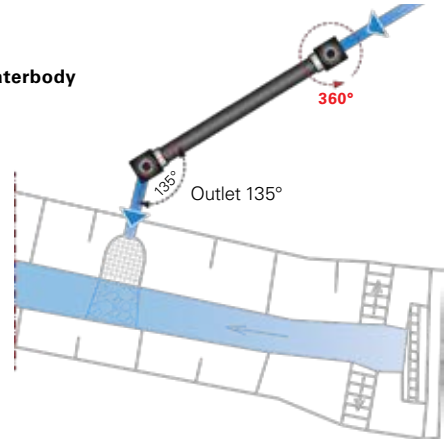
Section of SediPipe® level

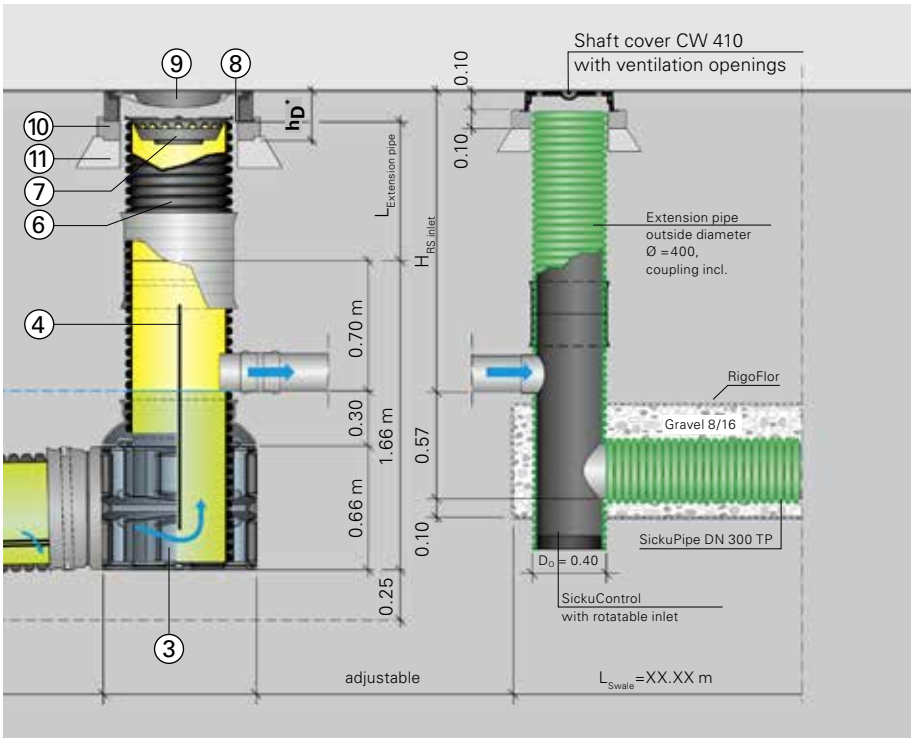


Example 1: SediPipe level 600/12 (600/6) with discharge into a surface waterbody or sewer
* Adjustable, depending on shaft cover, height and number of support rings

Installation examples of SediPipe level with different flow directions and discharge into a surface waterbody

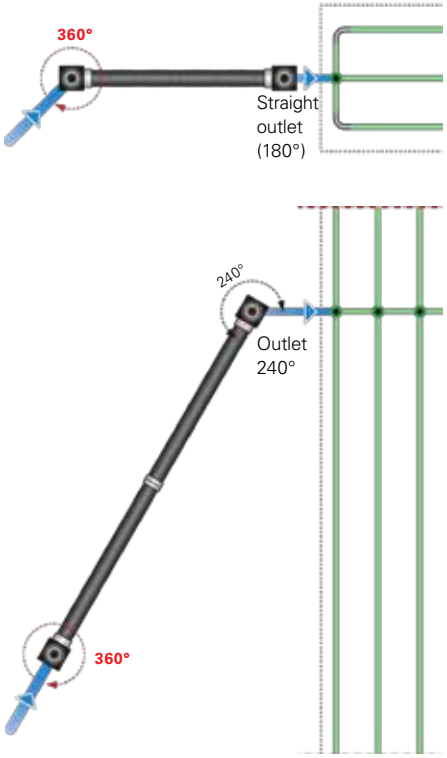


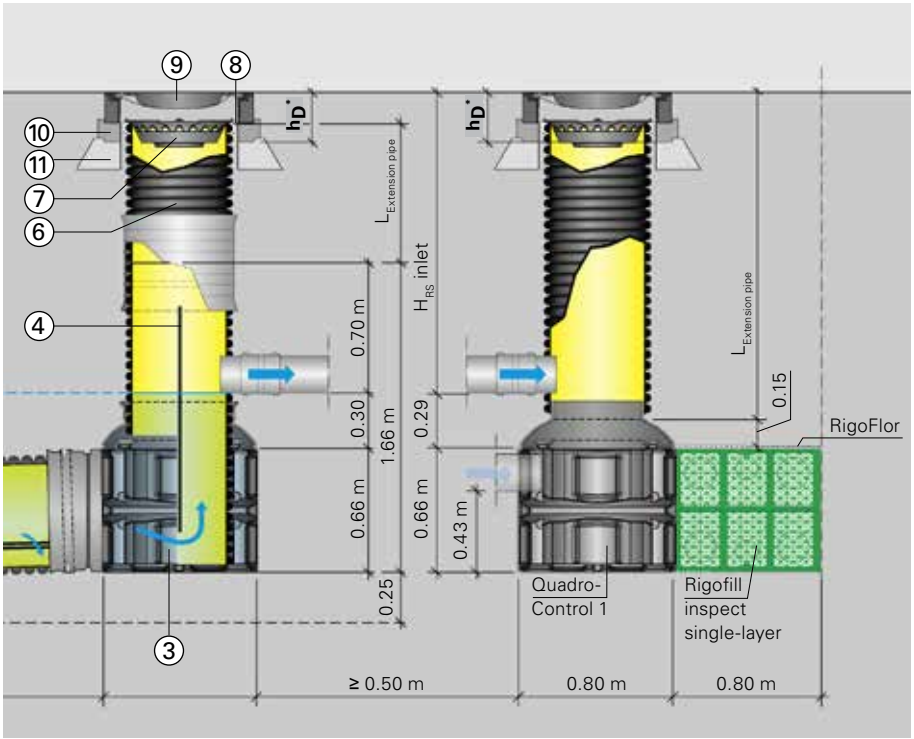




Example 2: SediPipe level with downstream SickuPipe pipe swale, connection pipe DN 200 to SickuControl rotatable inlet

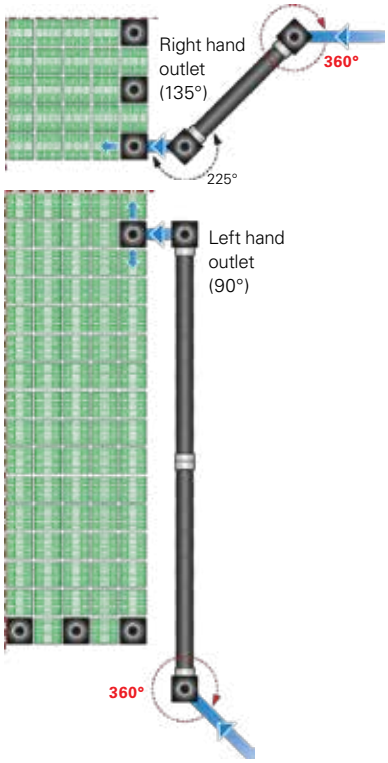
Installation examples of SediPipe level with different flow directions upstream of or in parallel with a SickuPipe pipe swale





Example 3: SediPipe level with downstream Rigofill inspect swale, connection pipe DN 200 to QuadroControl extension pipe or shaft body

Installation examples of SediPipe level with different flow directions upstream of or in parallel with a Rigofill storage/infiltration system (non-integrated design)



SediPipe® XL

North Rhine-Westphalia State Agency for Nature, Environment and Consumer Protection

PROOF OF EQUALITY
of decentralised stormwater treatment systems as compared to stormwater sedimentation tanks in North Rhine-Westphalia (LANUV list)

SediPipe XL has revolutionised design and construction of stormwater sewers! SediPipe XL helps eliminate the boundaries between centralised and decentralised stormwater treatment – the size of the system and the point of installation can be selected to perfectly suit your needs. Thanks to the modular design, they can be adapted to every situation and may easily be incorporated into existing sewer networks.

SediPipe XL has been designed according to project specifications. Upon request, we will also provide planning support.
Non-standard geometries and lengths are available upon request.

High-performance sedimentation systems

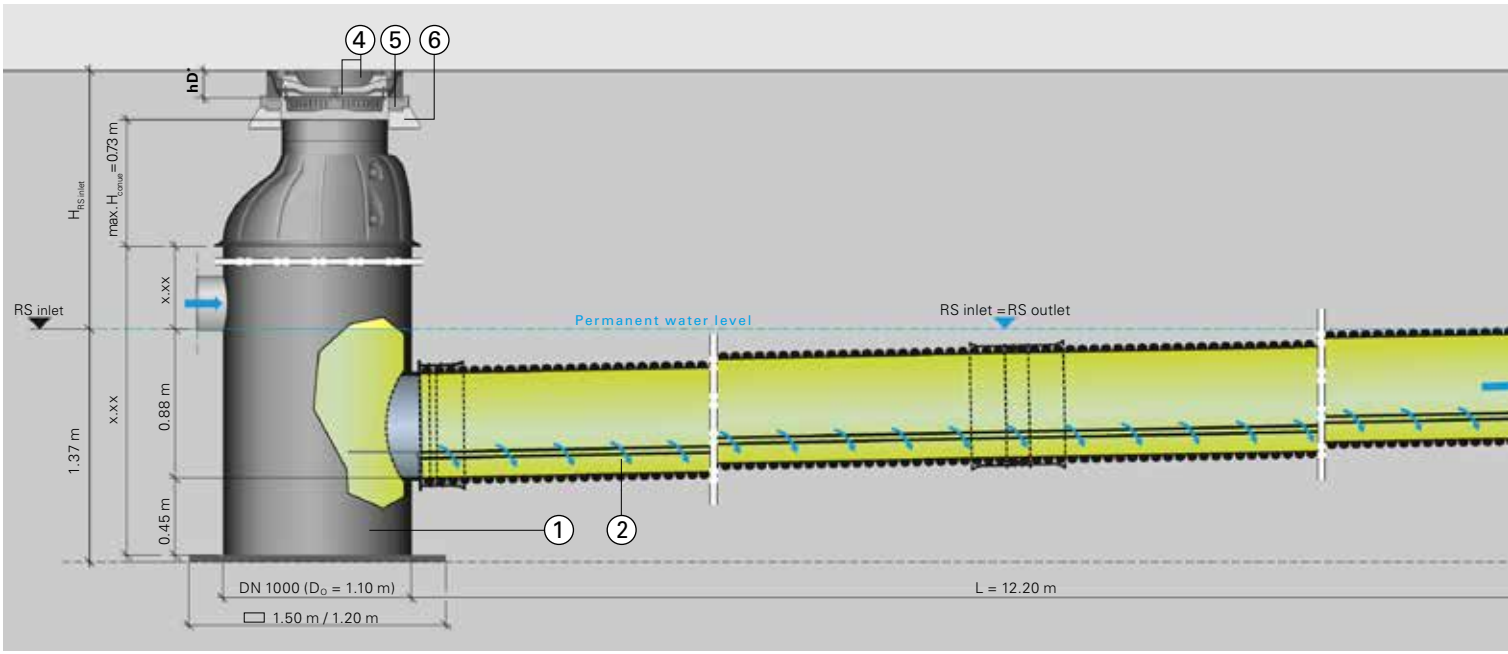
The high-performance systems of the XL series provide the following advantages:

- Sedimentation of coarse and fine particles
- High treatment performance
- Connection of large areas
- Installation into stormwater sewer networks
- Substitution of conventional stormwater sedimentation tanks
- Large storage volumes for sediments
- Completely underground – no space required
- Installation under trafficked areas
- Pre-fabricated systems – short construction period
- Highly convenient maintenance thanks to DN 1000 shafts
- Use of sewer water, pressure cleaning and inspection technology

SediPipe XL	600/6	600/12	600/18	600/24
Pipe diameter (mm)	600	600	600	600
Pipe length (m)	6	12	18	24

SediPipe XL 600/12 has been awarded the "*IKT-geprüft gem. Trennerlass*" certificate of the IKT Institute for Underground Infrastructure (*Institut für Unterirdische Infrastruktur GmbH*) from Gelsenkirchen.
Due to additional practical audit procedures, the applicability of the system for decentralised stormwater treatment in conformity with requirements of the North Rhine-Westphalia Ministry of the Environment (LANUV) has been proven.

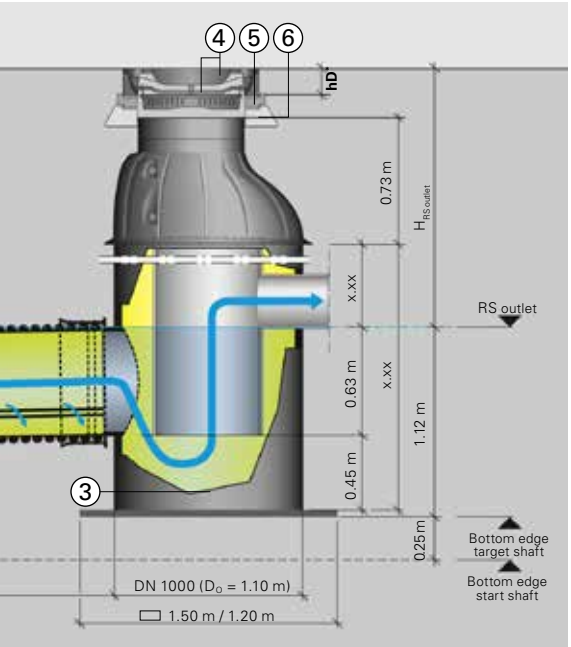
Section of SediPipe® XL



Example: SediPipe XL 600/12

* Adjustable, depending on shaft cover, height and number of support rings

... high-performance modular system



Caption

① Start shaft DN 1000
with inlet, maintenance console and mud collector

② Sedimentation path DN 600
with lower flow separator (6, 12, 18 or 24 m length)

③ Target shaft DN 1000
with immersion pipe for retaining light liquids and outlet

④ Shaft cover CW 610
with ventilation openings and dirt trap according to DIN 1221
(to be supplied on site)

⑤ Concrete support ring (to be supplied on site)

⑥ BARD ring (concrete support ring) optional or on-site concrete support

SediPipe® XL plus ...

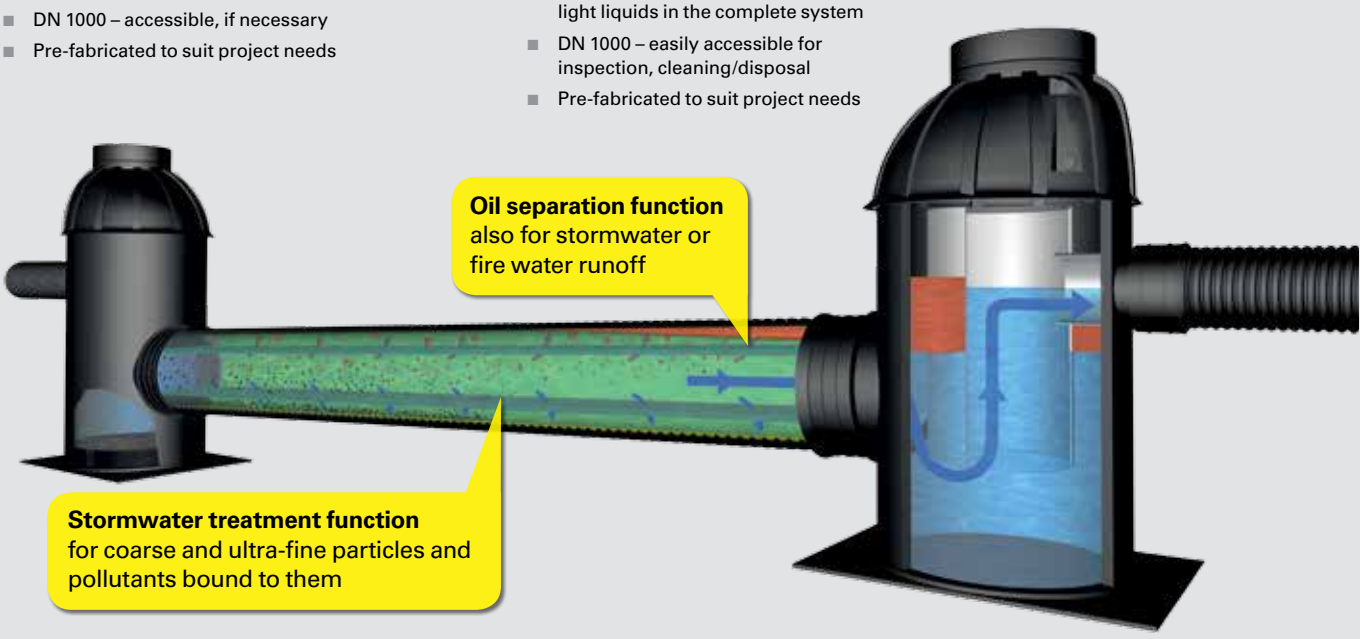
Our fast-paced and increasingly mobile society also leads to an increase in the number of hazard sources: accidents with leaking diesel fuel tanks, breaking hydraulic hoses, oil-bearing fire water during vehicle fires and much more!

Spilled light liquids or leaks during such spills are hazardous to water and must not enter downstream waterbodies and the groundwater. In dry weather, conventional stormwater sedimentation tanks provide the required retention. During rainfall events, however, they approach the limits of their capability.

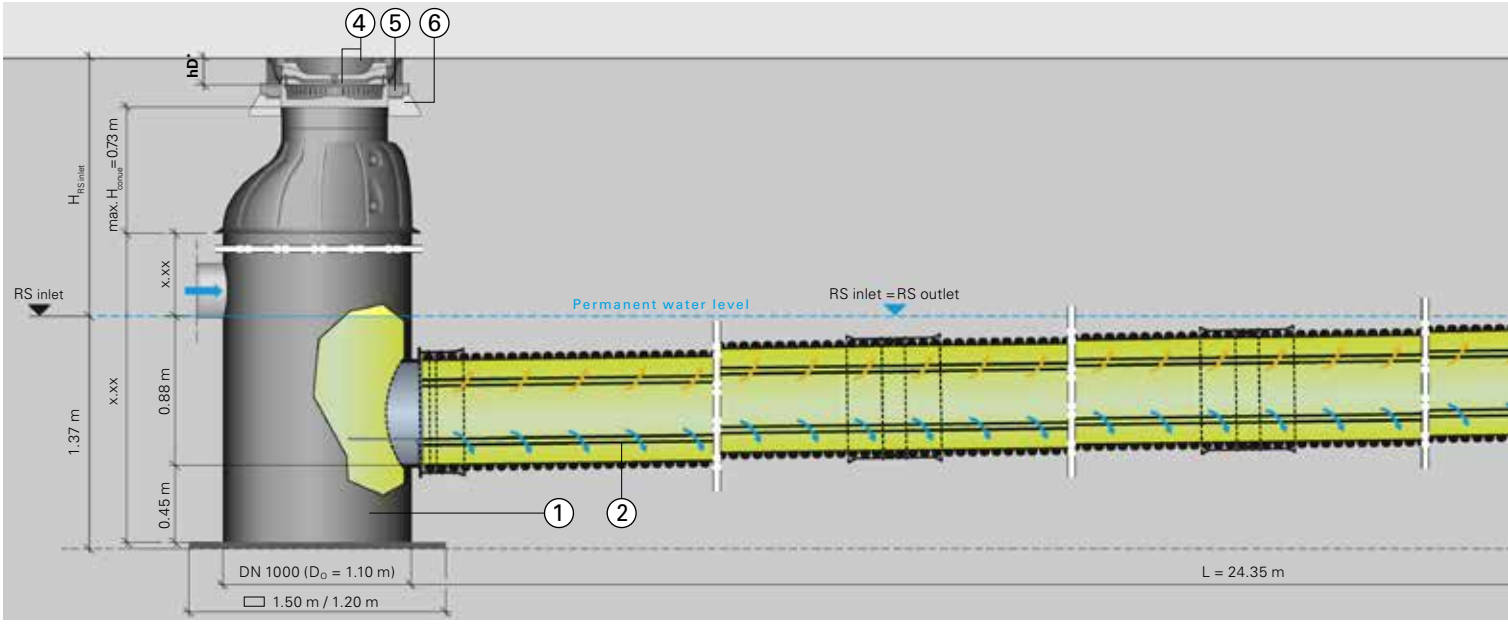
SediPipe XL plus has a second upper flow separator, which overcomes exactly these limits and separates light liquids reliably also during rainfall events. The system provides safe storage of separated particles even in case of subsequent heavy rainfall events.

Start shaft
- With inlet and maintenance console
- Mud and rubble collector
- DN 1000 – accessible, if necessary
- Pre-fabricated to suit project needs

Target shaft
- With immersion pipe and outlet
- Activates the retention volume for light liquids in the complete system
- DN 1000 – easily accessible for inspection, cleaning/disposal
- Pre-fabricated to suit project needs



Section of SediPipe® XL plus



Example: SediPipe XL plus 600/24

* Adjustable, depending on shaft cover, height and number of support rings

… more safety for light liquids

SediPipe® XL plus

- Sedimentation of coarse and fine particles
- Retention of light liquids in dry weather (spills)
- Separation of light liquids in case of rainfall (spills)

NB

SediPipe XL plus systems are no oil separators according to DIN EN 858-1 and may not be used for applications provided therein! SediPipe XL plus systems have been exclusively designed for prevention in case of spills!
See pages 36 – 37.

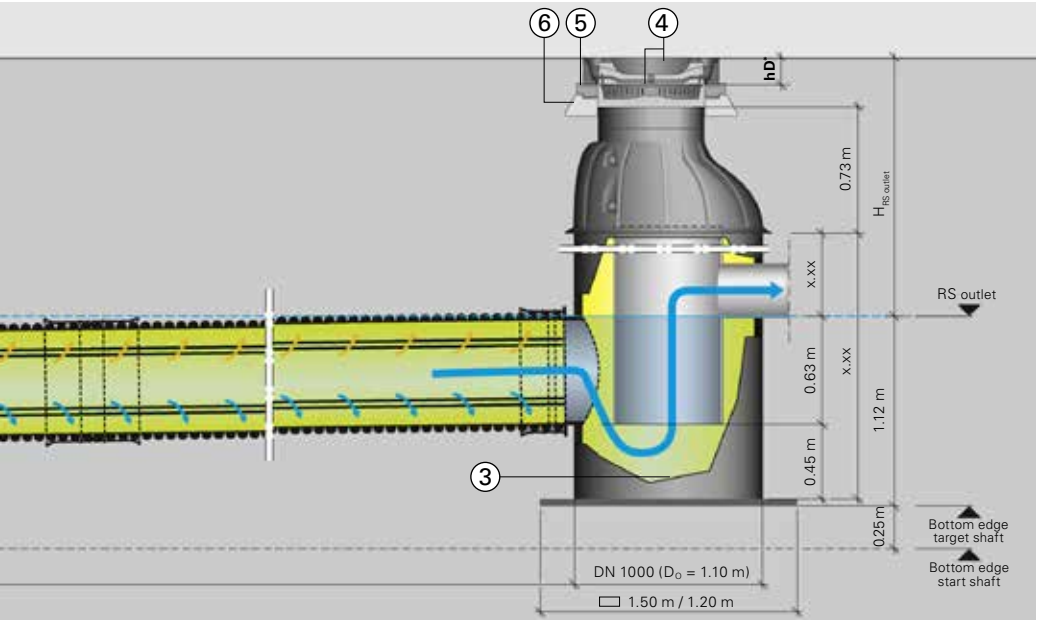
SediPipe XL plus systems are specifically designed for the particular project.
Upon request, we will also provide planning support.
Non-standard geometries and lengths are available upon request.

High-performance sedimentation systems

The high-performance systems of the XL plus series provide the following advantages:

- High separation performance for light liquids according to DIN EN 858-1 (class I)
- Tested by the TÜV-Rheinland LGA Products GmbH
- High stormwater treatment performance – replaces conventional stormwater sedimentation tanks
- Optimum protection of waterbodies in case of spills
- Large storage volume for sediments and light liquids (oil retention volume up to 5 m³ per system)
- Can be installed under areas exposed to heavy traffic loads
- Pre-fabricated to suit project needs/ light construction – minimum construction time
- Connection of large areas
- DN 1000 shafts – optimum accessibility for inspection and cleaning/ disposal
- Minimised maintenance requirements thanks to jetting resistance

SediPipe XL plus	600/6	600/12	600/18	600/24
Pipe diameter (mm)	600	600	600	600
Pipe length (m)	6	12	18	24



Caption

① Start shaft DN 1000
with inlet, maintenance console and mud collector

② Sedimentation path DN 600 with lower and upper flow separator (length 6, 12, 18 or 24 m)

③ Target shaft DN 1000
with immersion pipe for retaining light liquids and outlet

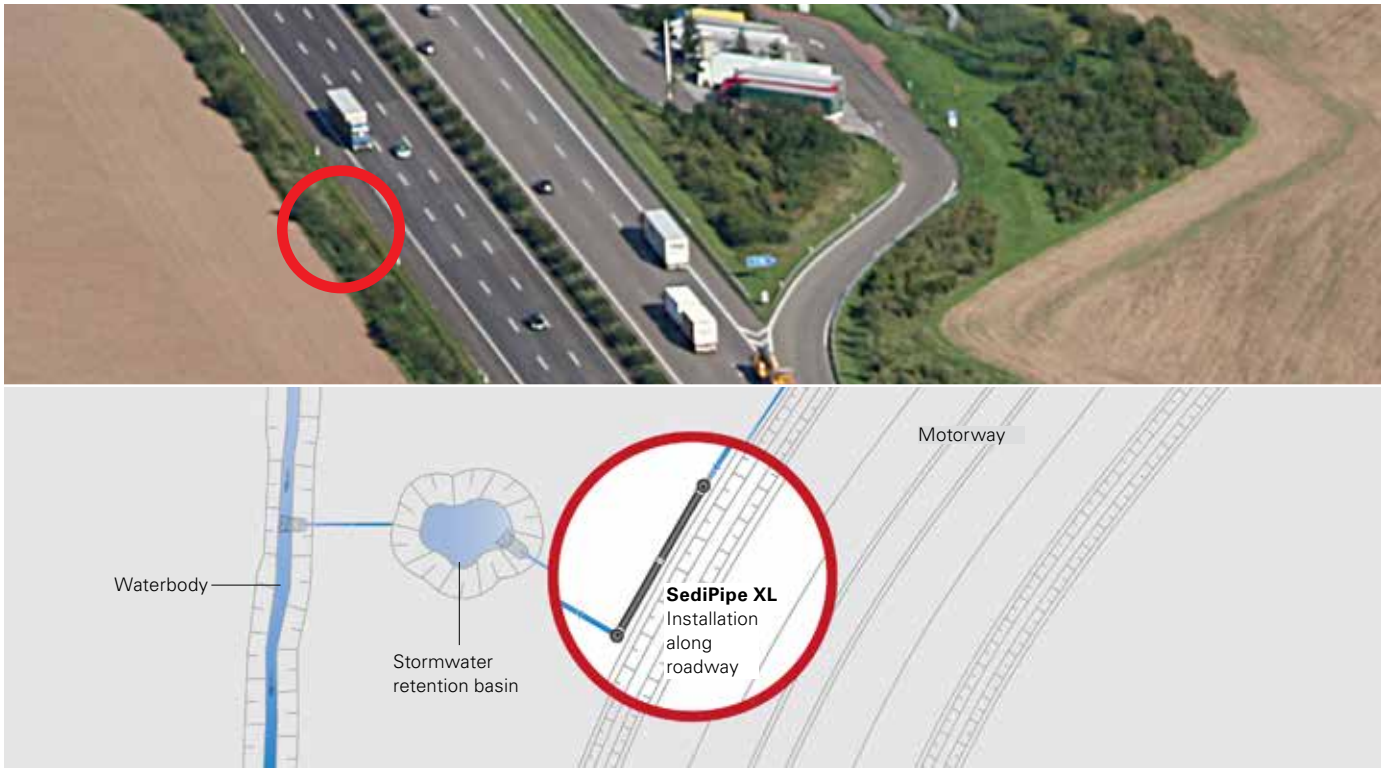
④ Shaft cover CW 610
with ventilation openings and dirt trap according to DIN 1221
(to be supplied on site)

⑤ Concrete support ring
(to be supplied on site)

⑥ BARD ring (concrete support ring)
optional or on-site concrete support

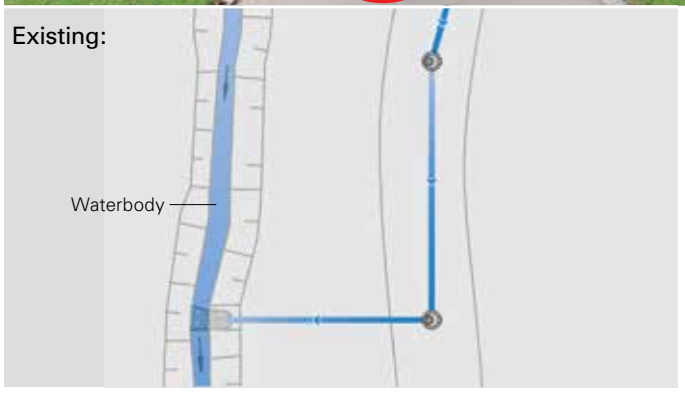
Examples of ...

Example 1: substitution of a decentralised stormwater sedimentation tank



Decentralised, roadside installation of a SediPipe in a space-saving manner directly along the road

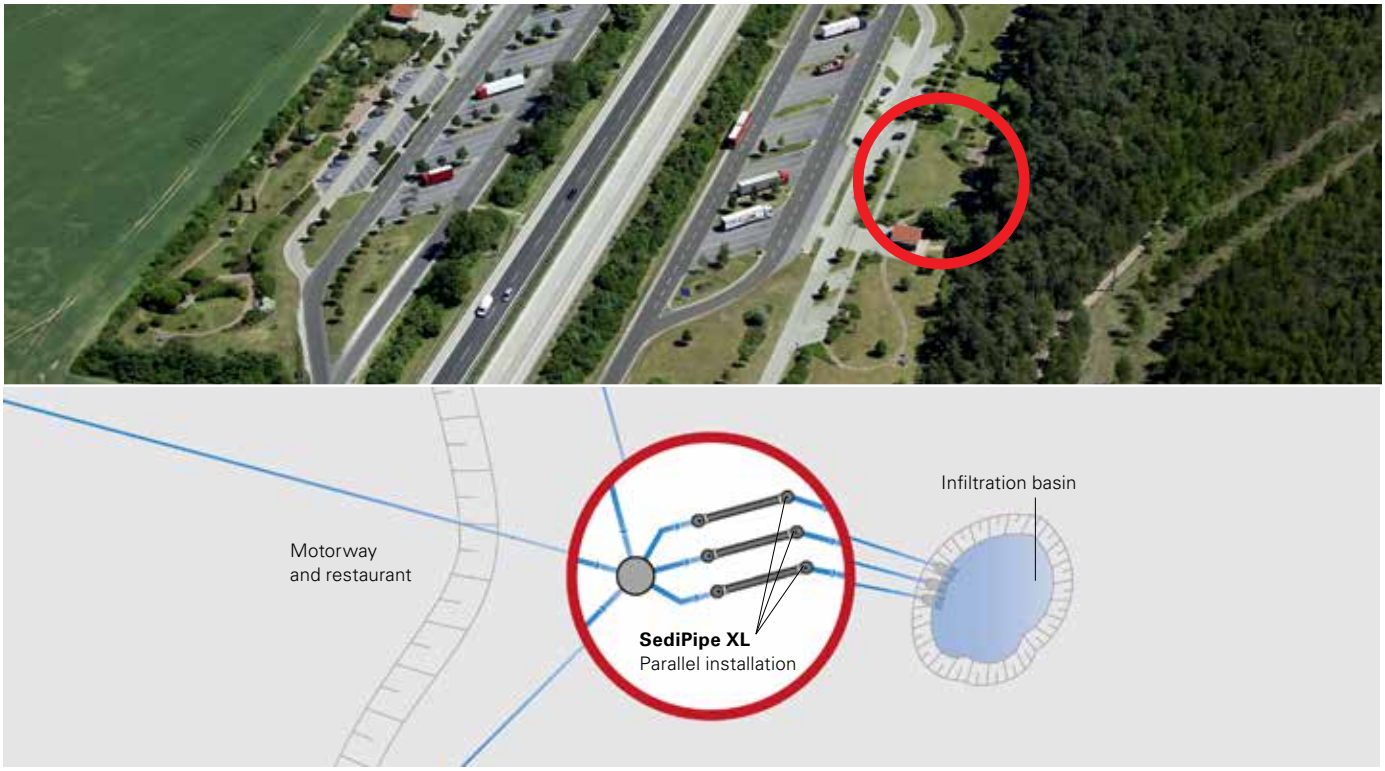
Example 2: integration into an existing stormwater sewer



Existing stormwater sewer without pretreatment

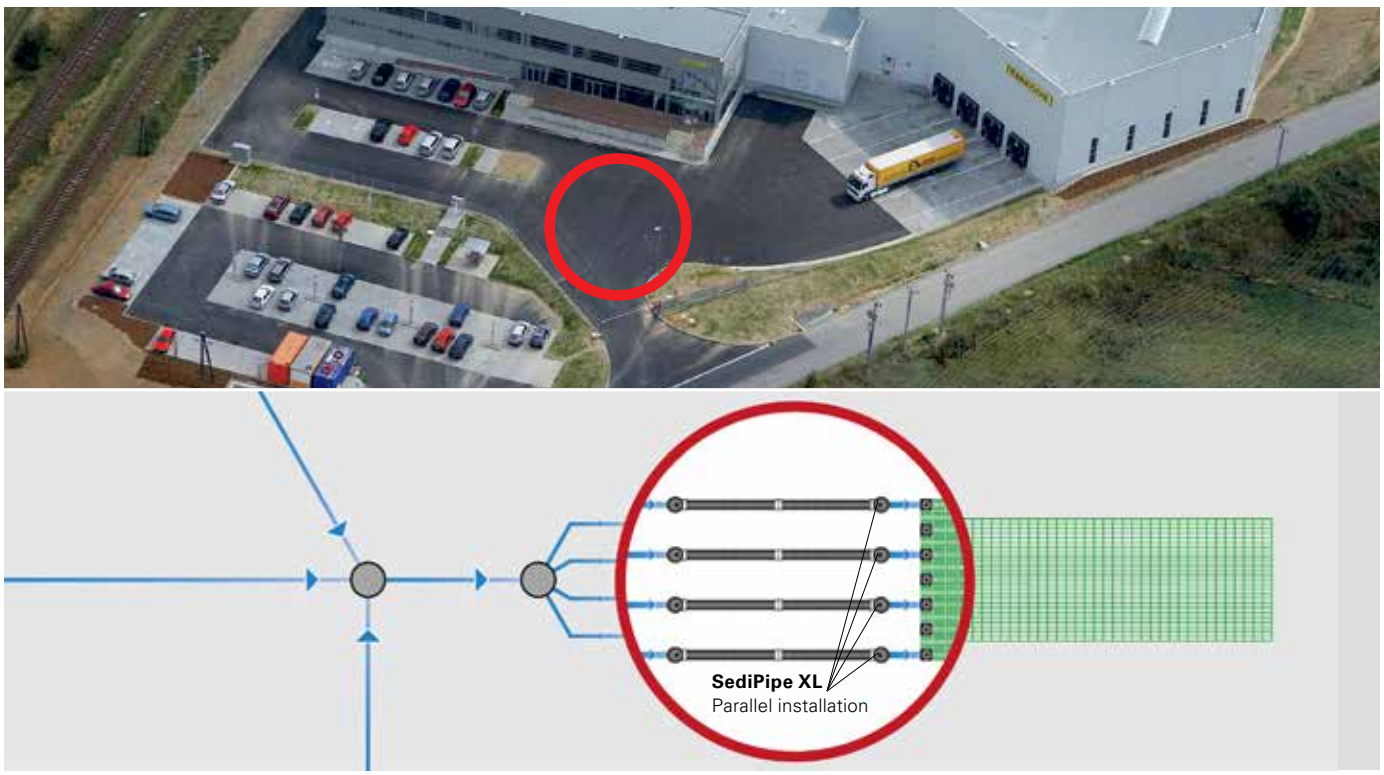
Existing stormwater sewer with SediPipe pretreatment

Example 3: substitution of a centralised stormwater sedimentation tank



SediPipe as pretreatment upstream of infiltration basins

Example 4: implementation of subsoil infiltration systems



Cleaning the road runoff and rooftop runoff of a commercial property prior to the discharge into a storage/infiltration system according to DWA-M 153

Convincing performance parameters ...

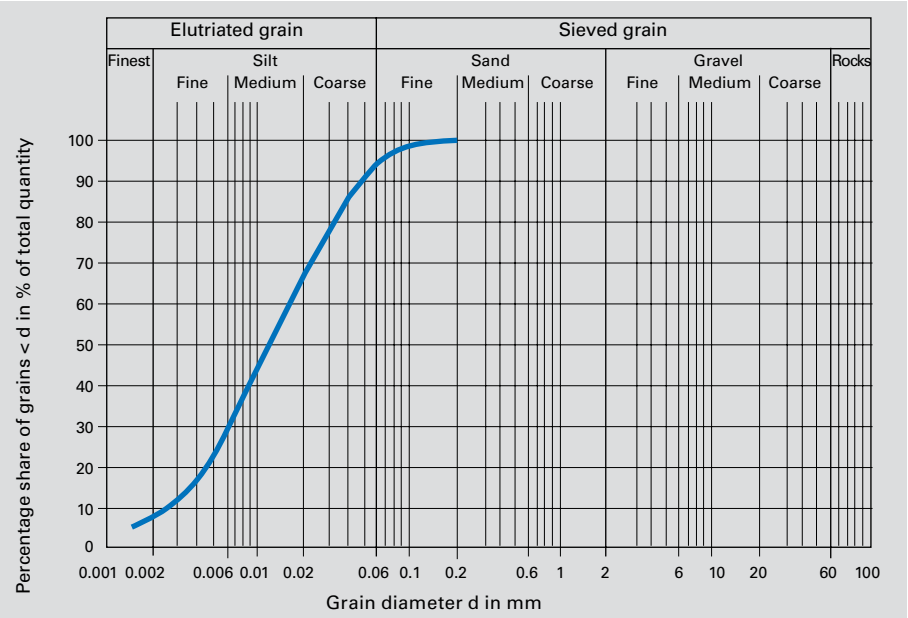
SediPipe® and DWA-M 153

The performance of SediPipe has been evaluated through various tests by independent testing institutes.

The effectiveness of SediPipe was compared to the effectiveness of stormwater sedimentation tanks for classification in the DWA M 153 bulletin. In that, pass-through values of 0.80 to 0.20 could be assigned.

(IWS (Institute for Water Engineering and Urban Water Management *(Institut für Wasserbau und Siedlungswasserwirtschaft)* test report))

Retention of fine-grained particles



In situ tests that were performed on heavily trafficked motorway sections examined the grain size curve of the sediment. **It was found that the sedimentation path mainly retained grain groups of the clay and silt fractions between 0.002 and 0.06 mm (> 90%).** A large part of the pollutants that are carried in the water, such as PAH and heavy metals, is bound to this grain fraction.

Appropriate dimensioning

The system size depends on the pass-through value and the connectable area. The required pass-through value is de-termined in accordance with the DWA M 153 bulletin.

Intermediate values can be interpolated (see graphic). The RigoPlan professional dimensioning software is available for professional planning.

No remobilisation

Remobilisation tests show that particles that have accumulated along the length of the sedimentation path will not be re-entrained during the next heavy rain (see page 35).

Hydraulic proof

Project-specific hydraulic proof can be provided upon request.

Use of SediPipe® according to DWA-M 153 table A.4c type D25

System type	D25			
Pass-through value	0.80	0.70	0.65	0.35
r_{crit} [l/(s · ha)]	15	30	45	$r_{(15.1)}$ **
SediPipe basic	**Connectable area A_u (m²)**			
400/6	7,350*	3,700*	2,450	1,100
500/6	9,250*	4,650*	3,100	1,400
600/6	11,900*	5,950*	3,950*	1,800
500/12	15,450*	7,700*	5,150*	2,300
600/12	23,350*	11,700*	7,800*	3,500*

* As of 3.250 m² A_u (for r_{dim} = 200 l/s · ha) project-specific hydraulic considerations are required.

SediPipe level	Connectable area A_u (m²)			
400/6	7,350*	3,700	2,450	1,100
500/6	9,250*	4,650	3,100	1,400
600/6	11,900*	5,950	3,950	1,800
500/12	15,450*	7,700*	5,150	2,300
600/12	23,350*	11,700*	7,800*	3,500

* As of 6.000 m² A_u (for r_{dim} = 200 l/s · ha) project-specific hydraulic considerations are required.

SediPipe XL/XL plus	Connectable area A_u (m²)			
600/6	11,900*	5,950	3,950	1,800
600/12	23,350*	11,700*	7,800*	3,500
600/18	30,350*	15,150*	10,100*	4,550
600/24	44,450*	22,200*	14,800*	6,650

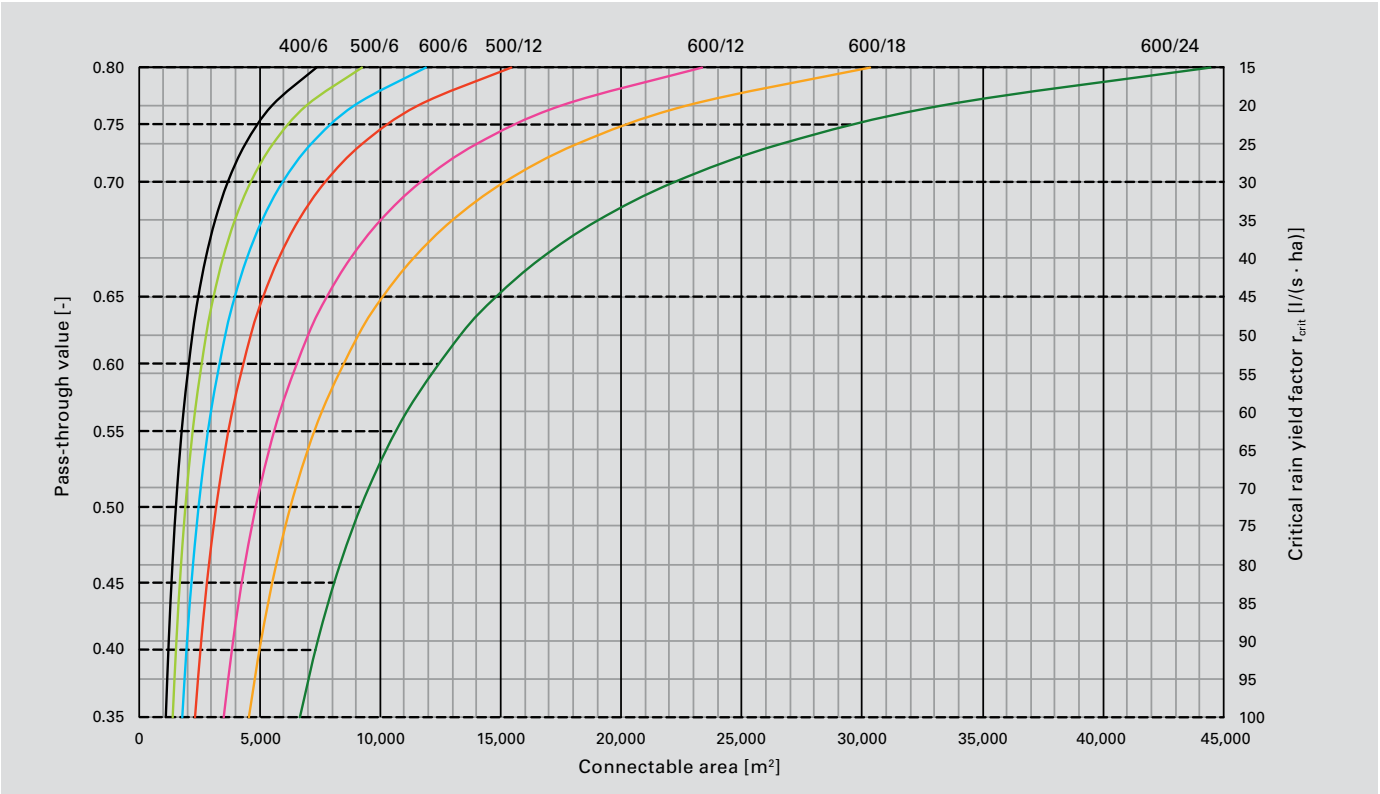
* As of 7.500 m² A_u (for r_{dim} = 200 l/s · ha) project-specific hydraulic considerations are required.
Values rounded to whole 50 m² ** $r_{(15,1)}$ = 100 l/s · ha

D 25

Pass-through value acc. to DWA M 153 bulletin

0.80 to 0.35

Type D25 sedimentation systems according to DWA-M 153 are sedimentation systems that have been designed with a maximum flow rate of 18 m/h. Sedimentation systems are used to sediment solids with a grain diameter greater than 0.1 mm.



SediPipe performance characteristics, connectable area A_u depending on the required pass-through value in acc. with DWA M 153

Convincing performance parameters ...

Use of SediPipe® according to DWA-M 153 table A.4c type D24

System type	D24			
Pass-through value	0.65	0.55	0.50	0.25
r_{crit} [l/s · ha]	15	30	45	$r_{(15.1)}$ **
SediPipe basic	**Connectable area A_u (m²)**			
400/6	4,000*	2,000	1,350	600
500/6	5,000*	2,500	1,650	750
600/6	6,550*	3,250*	2,200	1,000
500/12	8,550*	4,300*	2,850	1,300
600/12	13,250*	6,650*	4,400*	2,000

* As of 3.250 m² A_u (for r_{dim} = 200 l/s · ha) project-specific hydraulic considerations are required.

SediPipe level	Connectable area A_u (m²)			
400/6	4,000	2,000	1,350	600
500/6	5,000	2,500	1,650	750
600/6	6,550*	3,250	2,200	1,000
500/12	8,550*	4,300	2,850	1,300
600/12	13,250*	6,650*	4,400	2,000

* As of 6.000 m² A_u (for r_{dim} = 200 l/s · ha) project-specific hydraulic considerations are required.

SediPipe XL/XL plus	Connectable area A_u (m²)			
600/6	6,550	3,250	2,200	1,000
600/12	13,250*	6,650	4,400	2,000
600/18	16,450*	8,250*	5,500	2,450
600/24	25,100*	12,550*	8,350*	3,750

* As of 7.500 m² A_u (for r_{dim} = 200 l/s · ha) project-specific hydraulic considerations are required.
Values rounded to whole 50 m² ** $r_{(15,1)}$ = 100 l/s · ha

D 24

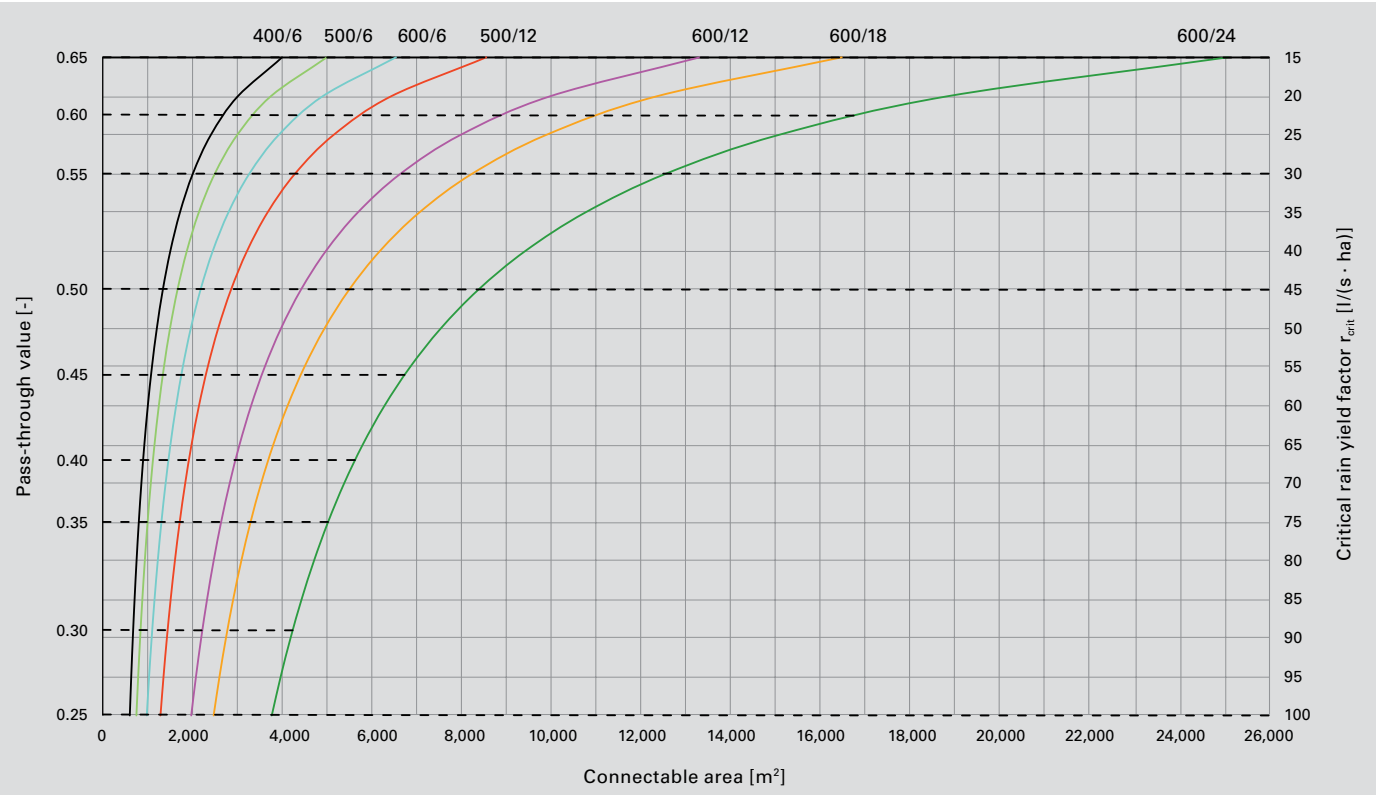
Pass-through value acc. to DWA M 153 bulletin

0.65 to 0.25

Type D24 sedimentation systems according to DWA-M 153 are stormwater sedimentation tanks that have been designed with a maximum flow rate of 10 m/h.
These systems have been designed for the separation of finest grain fractions. In addition, the precipitated sediment may not be swirled up, even with high hydraulic loads. SediPipe meets these requirements.

NB

Country-specific dimensions, e.g. those of Baden Württemberg (see working aids for handling stormwater in settlement areas - (*"Arbeitshilfen für den Umgang mit Regenwasser in Siedlungsgebieten"*), table 4b) can be calculated, if necessary.



SediPipe performance characteristics, connectable area A_u depending on the required pass-through value in acc. with DWA M 153

Use of SediPipe® according to DWA-M 153 table A.4c type D21

NB

Type D21 sedimentation systems according to DWA-M 153 are systems with a maximum flow rate of 9 m/h at the load case for rain with the rain yield factor $r_{(15.1)}$*.

These systems have been designed for the separation of finest grain fractions. In addition, the precipitated sediment may not be swirled up, even with high hydraulic loads. SediPipe meets these requirements.

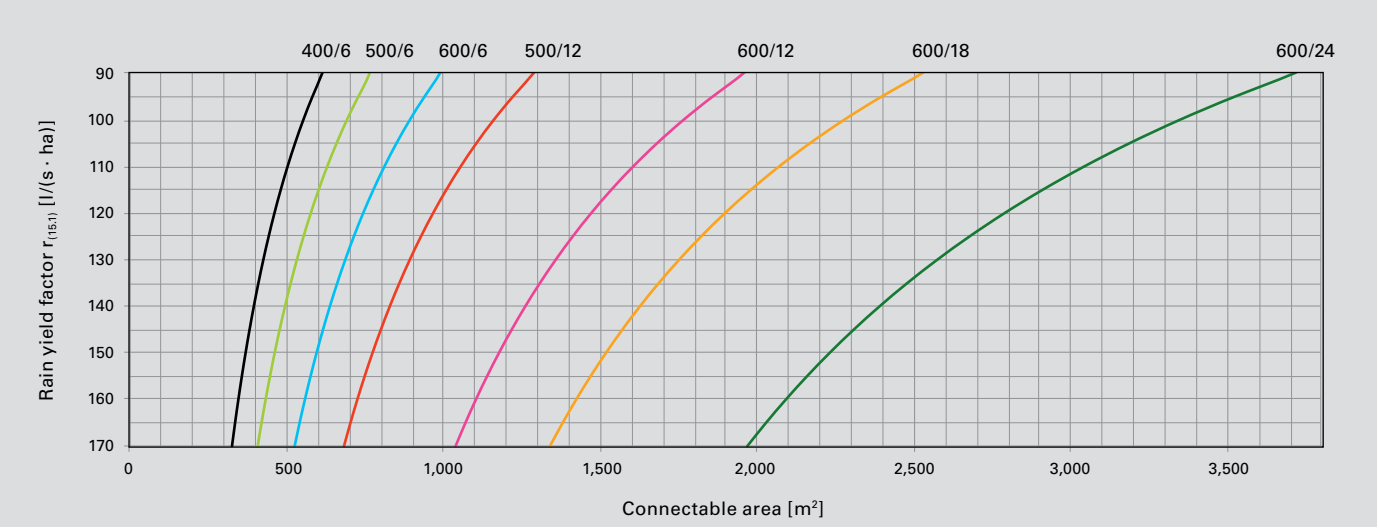
D 21

Pass-through value acc. to DWA M 153 bulletin

0.20

System type	D21																
Recommended pass-through value	0.2																
$r_{(15.1)}$* [l/(s · ha)]	90	95	100	105	110	115	120	125	130	135	140	145	150	155	160	165	170
SediPipe basic / level	**Connectable area A_u (m²)**																
400/6	613	581	552	526	502	480	460	441	425	409	394	381	368	356	345	334	325
500/6	768	727	691	658	628	601	576	553	531	512	494	477	461	446	432	419	406
600/6	991	938	891	849	810	775	743	713	686	660	637	615	594	575	557	540	524
500/12	1,288	1,220	1,159	1,104	1,054	1,008	966	927	892	859	828	799	773	748	724	702	682
600/12	1,960	1,857	1,764	1,680	1,604	1,534	1,470	1,411	1,357	1,307	1,260	1,217	1,176	1,138	1,103	1,069	1,038
SediPipe XL/XL plus	**Connectable area A_u (m²)**																
600/6	991	938	891	849	810	775	743	713	686	660	637	615	594	575	557	540	524
600/12	1,960	1,857	1,764	1,680	1,604	1,534	1,470	1,411	1,357	1,307	1,260	1,217	1,176	1,138	1,103	1,069	1,038
600/18	2,529	2,396	2,276	2,167	2,069	1,979	1,896	1,821	1,751	1,686	1,626	1,570	1,517	1,468	1,422	1,379	1,339
600/24	3,717	3,522	3,346	3,186	3,042	2,909	2,788	2,677	2,574	2,478	2,390	2,307	2,230	2,159	2,091	2,028	1,968

* $r_{(15.1)}$ = rain yield factor with a rainfall duration of 15 min. and annual recurrence



SediPipe performance characteristics, connectable area A_u depending on the required pass-through value in acc. with DWA M 153

Use of SediPipe® XL plus

Should spills occur, type D25, D24 and D21 SediPipe systems reliably retain large amounts of light liquids in dry weather and separate particles in general.

SediPipe XL plus types even achieve the same separation performance as coalescence separators during rainfalls. SediPipe XL plus can protect vulnerable areas, such as those under the RiStWag directive for construction works on roads in capture areas (water protection zones), against light liquids.

Tested flow rate of SediPipe XL plus			
Test	Acc. to DIN EN 858, separator class I	Acc. to DIN EN 858, separator class II	Discharge in case of heavy rain
Discharge concentration	**max. 5 mg/l**	**max. 100 mg/l**	**0 mg/l**
Performance parameter	Corresponds to the filtration performance of a coalescence separator	Corresponds to the filtration performance of a gravity separator	No discharge of separated light liquids
SediPipe XL plus 600/6	20 l/s	30 l/s	100 l/s
SediPipe XL plus 600/12	30 l/s	40 l/s	100 l/s
SediPipe XL plus 600/18	30 l/s	40 l/s	100 l/s
SediPipe XL plus 600/24	30 l/s	40 l/s	100 l/s

NB **SediPipe XL plus is no oil separator (see pages 36 – 37)**

SediSubstrator® XL – DIBt approved

SediSubstrator XL is a stormwater treatment system for heavily polluted stormwater runoff, e.g. from trafficked areas. The system separates washed-up particles, particle-bound pollutants, dissolved heavy metals and light liquids (oil) from stormwater and reliably retains these materials in the system.

SediSubstrator XL 600/12 and 600/12+12 have been tested according to the strict DIBt requirements. This facilitates official approval procedures regarding stormwater infiltration systems and, depending on the country, also discharge into surface waterbodies.

General building authority certification: DIBt: Z-84.2-11

SediSubstrator® XL – substitutes the "root zone"

Infiltration into the root zone is the natural form of stormwater treatment featuring high treatment performance. Aboveground systems, such as underdrained swale systems, treat water according to this principle. However, this requires lots of space, usually 10 percent to 15 percent of the area to be drained – in urbanised areas frequently a significant obstacle.

SediSubstrator XL serves as a technical substitute of the root zone – but with relevant advantages:

- No space requirement
- DIBt-tested and always controllable treatment performance
- Defined, professional elimination of pollutants

Highly efficient: the two-step principle

(A) (B) Sedimentation

- Retention of **coarse particles** in the start shaft (e.g. stones, sand)
- Retention of **fine and ultra-fine particles** in the sedimentation pipe
- Prevention of remobilisation of the sediment thanks to patented flow separator
- Large mud chamber for long operating intervals
- Easy cleaning using common sewer cleaning technology

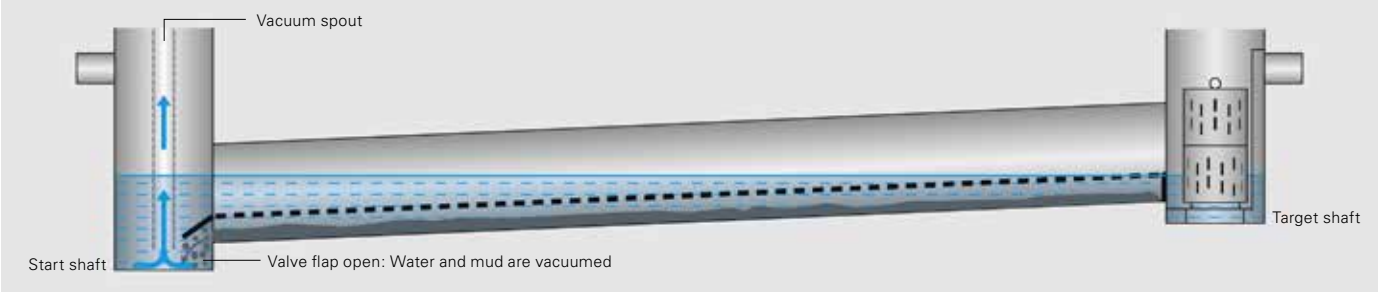
(C) Adsorption of dissolved pollutants (substrate cartridge)

- Retention of **dissolved pollutants** (e.g. heavy metals)
- Retention of **light liquids/oil**
- High binding capacity of SediSorp substrate
- Easy substrate change without requiring access to the shaft

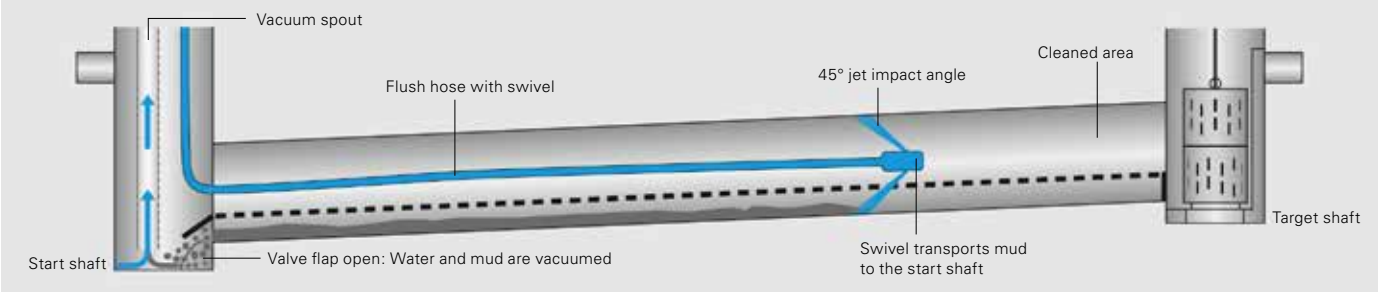
Easy maintenance

Sedimentation system

Common sewer cleaning methods are used to maintain the system. It keeps a permanent water level which ensures that the sediment remains muddy. The contents of the system are vacuumed from the start shaft. The valve flap opens and releases the sediment to the lowest point. The system is then clean and can be operated again.



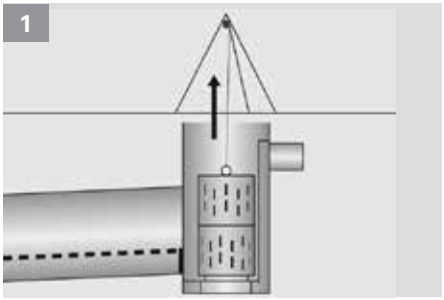
Emptying with vacuum spout

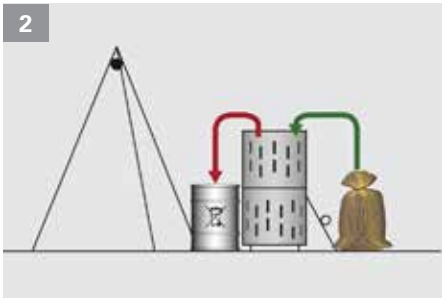


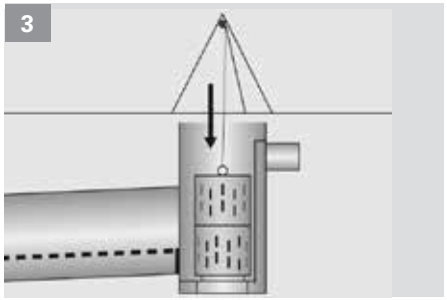
Cleaning with vacuum spout and flush hose

Substrate cartridge

1. Remove the cartridge elements from the shaft for maintenance.
2. Change the filter substrate (SediSorp) on site.
3. Return the refilled substrate cartridge – done!







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Downloads

Select **competence**

Stormwater management

and **document type:**

Maintenance

NB:

Maintenance and inspection must be performed by qualified experts only.

The recommended maintenance interval is 4 years.

Hersteller
HeGo Biotec GmbH
14167 Berlin
Herstellwerk
P.U.S. Produktions- und Umweltservice GmbH
02991 Lauta

Z-84.2-11

TÜVRheinland LGA
Bautechnik

SediSorp

NB:

The SediSorp substrate contained in the cartridge is quality-monitored and has been awarded the DIBt Ü mark of conformity.

Fields of application

High amounts of pollutants can be expected in trafficked areas where vehicles frequently start, stop or manoeuvre.

These include:

- intersections
- highly frequented access roads
- highly frequented parking spaces
- lorry-trafficked commercial and industrial premises

SediSubstrator XL is the best-suited system to treat stormwater runoff in these cases.

Benefits for the operator

- Facilitated approval under the Water Act thanks to DIBt certification
- Long operating intervals thanks to large mud chamber and high capacity cartridge
- Reliable two-step principle – no risk of blockage of the adsorption cartridge
- Easy to clean "from aboveground" using common sewer cleaning technology – no access required!
- Inexpensive to maintain thanks to substrate replacement – no cartridge change required!

D 11

Recommended pass-through value acc. to DWA-M 153 bulletin for DIBt-approved systems:

0.15

Benefits for design and installation

- Recommended pass-through value according to DWA-M 153 bulletin for DIBt-approved systems: 0.15 (analogous to D11 systems, tab. A.4b)
- For connectable areas of up to 3,000 m²
- Space-saving installation in the sewer network also under trafficked areas
- Easy to install – pre-fabricated complete system with ready-to-connect shafts

Planning

SediSubstrator XL can be perfectly tailored to specific project needs. The system size is simply selected according to the area to be connected. The 600/12+12 system can be used for two separate connectable areas.

The discharge rate of 100 l/(s*ha) has been hydraulically tested according to the DIBt test principles. The network-hydraulic relationships must be analysed for each specific project. The DIBt test principles do not require that an emergency overflow is included in the system. A project-specific installation outside of the system, e.g. in separate receiving waters, must be agreed with the approving authority, if necessary.

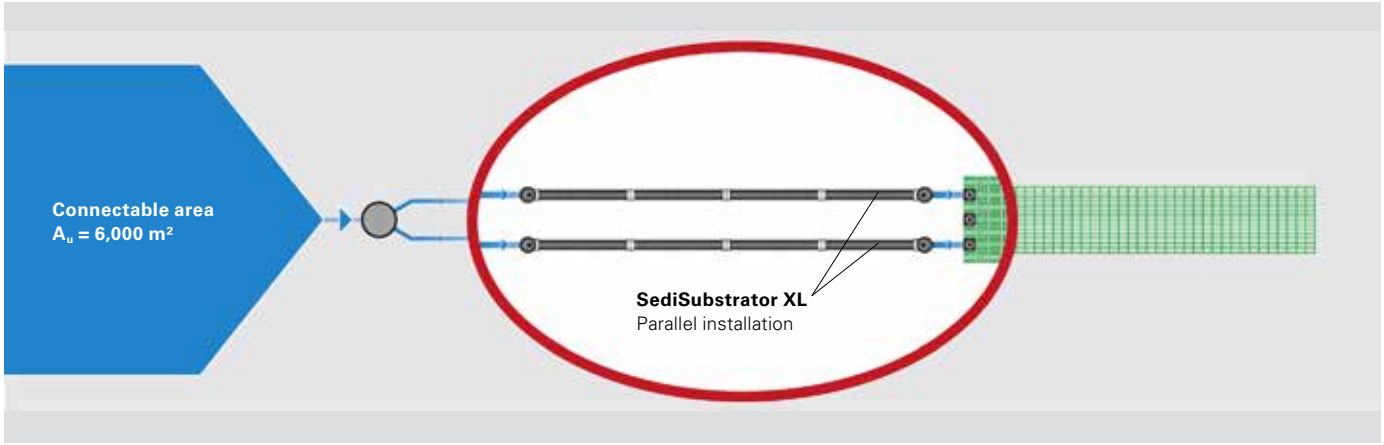
SediSubstrator XL system overview

Type	Connectable area (m²)	Sedimentation path		Number of cartridge elements	Design discharge acc. to DIBt test principles [l/s]
		DN	Length (m)		
600/12	1,500	600	12	2	15.0
600/18	2,250	600	18	3	22.5
600/24	3,000	600	24	4	30.0
600/12+12.	1,500+1,500	600	12+12	4	15.0+15.0

* DIBt approved system

Installation examples

SediSubstrator® XL 600/24

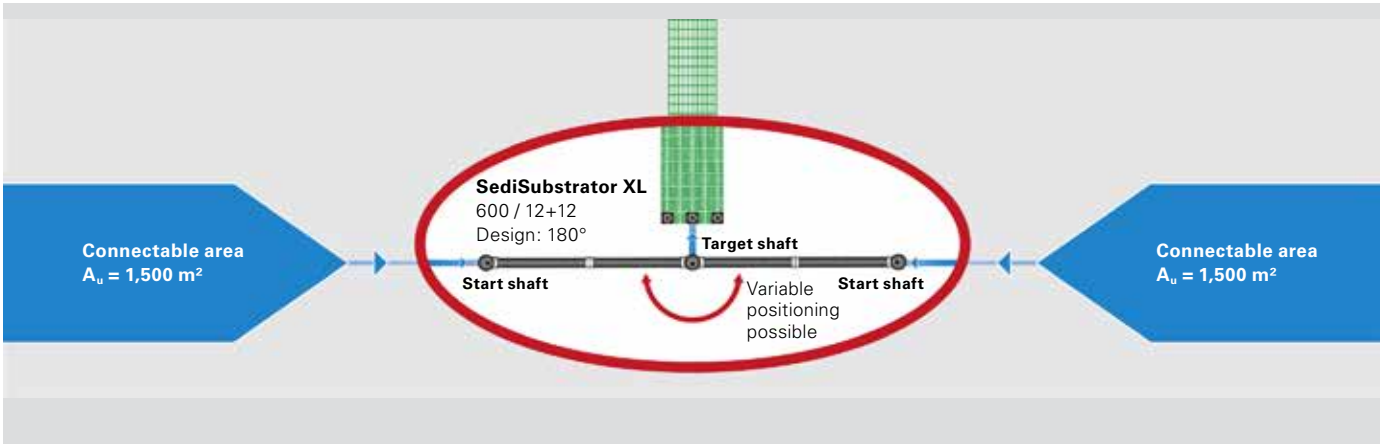


Treatment of road runoff from a heavily lorry-trafficked commercial property prior to discharge into a storage/infiltration system according to DWA-M 153.
Connectable area A_u = 6,000 m²

Installation examples

SediSubstrator® XL 600/12+12

In this design, two sedimentation paths are connected to one target shaft with a substrate cartridge. 1,500 m² can be connected to each start shaft. The angle between the two sedimentation paths can be freely selected between 90 degrees and 180 degrees.

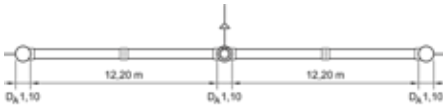


SediSubstrator XL as pre-treatment upstream of infiltration systems at a heavily trafficked lorry rest area.
Connectable area A_u = 2 x 1,500 m²

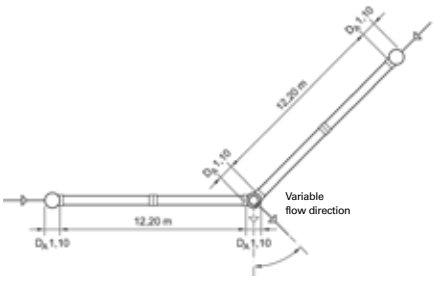
SediSubstrator® XL 600/12+12

SediSubstrator XL 600/12+12 has its own special design. The system has two start shafts, i.e. two sedimentation paths leading to one target shaft. The angle between the two sedimentation paths can be freely selected between 90 degrees and 180 degrees at the time of order.

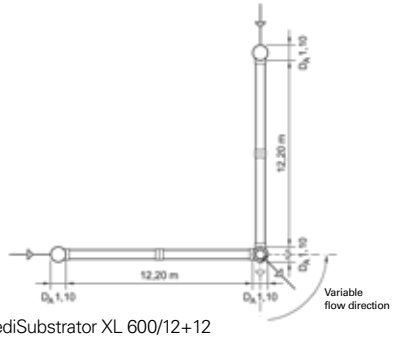
Designs:



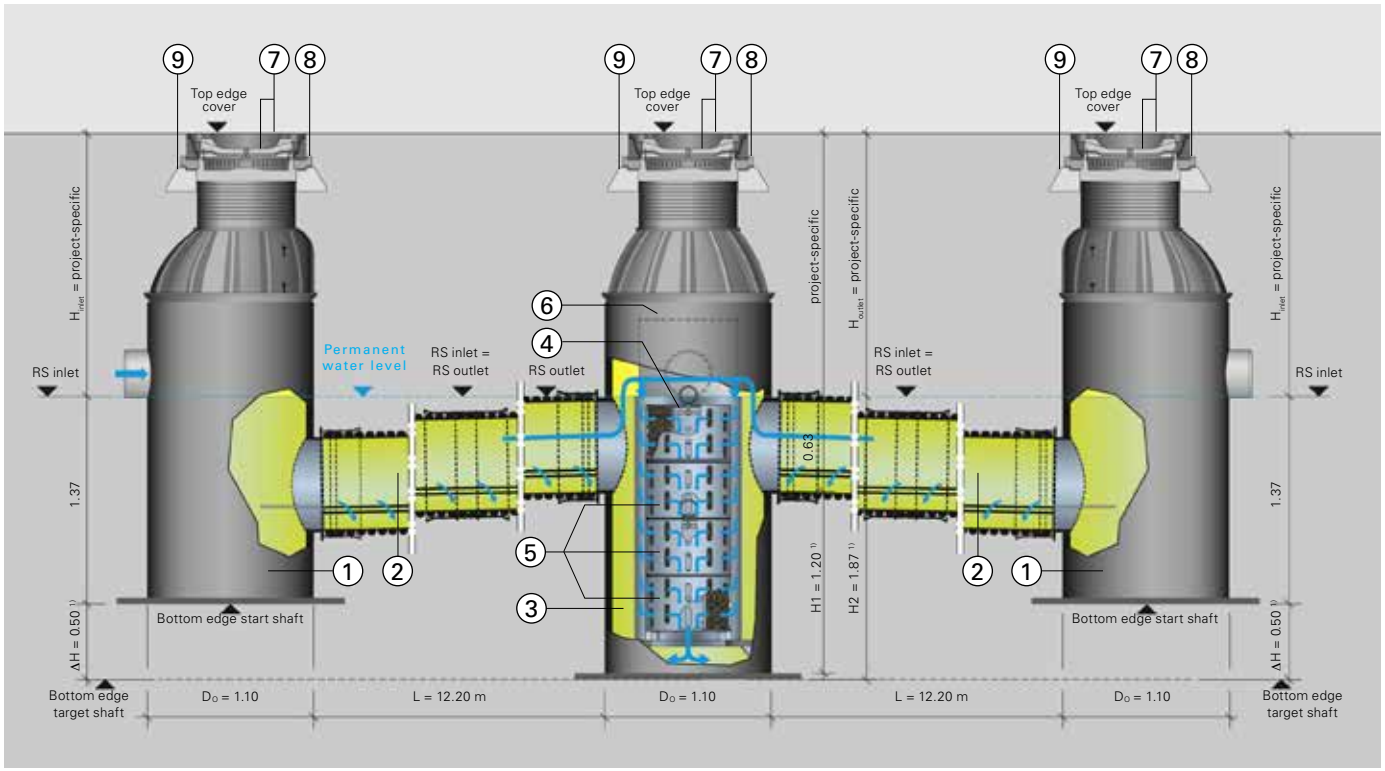
SediSubstrator XL 600/12+12
180°



SediSubstrator XL 600/12+12
135°



SediSubstrator XL 600/12+12
90°



Example: SediSubstrator XL 600/12+12 with shaft cone

Caption

① Start shaft
② Sedimentation pipe
③ Target shaft
④ Cover element
⑤ Base element
⑥ Maintenance flap (closed during operation)
⑦ Shaft cover CW 610*
⑧ Optionally: Concrete support ring*
⑨ BARD ring (concrete support ring)

*to be supplied on site

SediSubstrator® basic ...

The intensive process of designing and developing SediSubstrator XL also benefited the SediSubstrator basic treatment system, which is optionally suitable for small trafficked areas of up to max. 940 m². The quality-monitored SediSorp substrate (bearing the Ü mark of conformity) used in any installation with SediSubstrator XL, is also used in the smaller basic version.

... substitution for the "root zone"

As is the case with SediSubstrator XL, the SediSubstrator basic treatment system can serve as a technical substitution for what is called the "root zone".

Ultra-fine particles, heavy metals and other dissolved pollutants are adsorbed in the "root zone" by physicochemical processes.

NB:

All other performance parameters are identical to the SediPipe basic sedimentation system.

Fields of application

- Heavily trafficked roads, intersections, parking lots
- Uncoated metal surfaces like street lamps, crash barriers and roofs

SediSubstrator basic separates sediment, dissolved pollutants and light liquids from stormwater runoff from these trafficked areas in two stages.

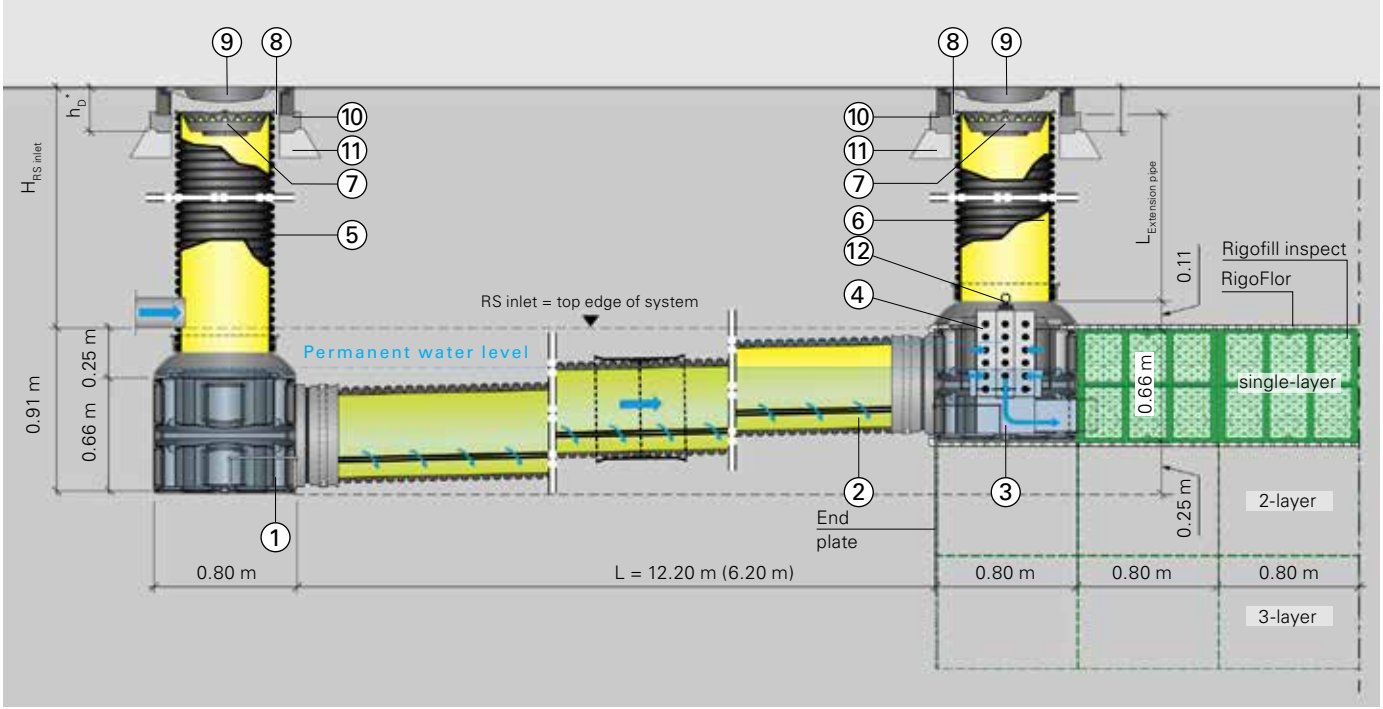
Highly efficient: the two-step principle

A combination of adsorption by means of a substrate and upstream sedimentation through the SediPipe principle and patented flow separator leads to an optimum treatment performance. Since virtually the entire necessary retention of all solids and fine particles takes place in the sedimentation system, the particular task of the SediSorp substrate is to bind dissolved heavy metals, light liquids and hydrocarbons. The substrate cartridge used boasts long service life and is very easy to replace during regular maintenance work (recommended cleaning interval: 4 years!).

Caption

1. Start shaft with maintenance console
2. Sedimentation path with flow separator
3. Target shaft with outlet DN 200
4. Substrate cartridge SediSubstrator basic
5. Extension pipe D_O 600 with 360° rotatable inlet
6. Extension pipe D_O 600 without inlet
7. Sediment trap D_O 600
8. DOM sealing ring
9. Shaft cover CW 610 with ventilation openings, to be supplied on site
10. Concrete support ring, to be supplied on site
11. Bearing free from stationary loads, to be supplied on site
12. Optionally: Emergency overflow sealing

Section of SediSubstrator® basic



Example: SediSubstrator basic 500/12 (500/6) with downstream Rigofill inspect infiltration system

*Adjustable, depending on shaft cover, height and number of support rings

SediSubstrator® basic

In situ tests on highly trafficked motorway sections have been used to evaluate the performance of SediSubstrator basic.

It was found that the treatment performance could be further improved by adding a substrate step.

The substrate adsorbs most of the dissolved pollutants, in particular dissolved heavy metals. SediSubstrator basic achieves a treatment performance that is also typical of what is called the "root zone" – test report of the Engineering Association for Urban Hydrology *(Ingenieurgesellschaft für Stadthydrologie (IFS))*.

SediSubstrator basic is furnished with an integrated emergency overflow (see caption item 12). Optionally, the emergency overflow can be sealed according to the DIBt test criteria which imply no emergency overflow. With a sealed emergency overflow, the system is designed for a load case for rain of 100 l/(s · ha) in terms of hydraulics analogous to DIBT test principles. Network-hydraulic relations must thus be analysed for each specific project. Possible installation of the emergency overflow outside of the system, e.g. in separate receiving waters, must be agreed on with the approving authority, if necessary.

D 11

Recommended pass-through value acc. to DWA M 153 bulletin

0.15

Substrate cartridge SediSubstrator basic

SediSubstrator basic	400/6	500/6	500/12
Pipe diameter (mm)	400	500	500
Pipe length (m)	6	6	12
Connectable area A_u	450 m²	560 m²	940 m²

Documentation

Technical documentation is included with every SediSubstrator basic system.

It includes:

- Maintenance instructions
- Technical drawing
- Installation manual
- Order form for substrate cartridge SediSubstrator basic

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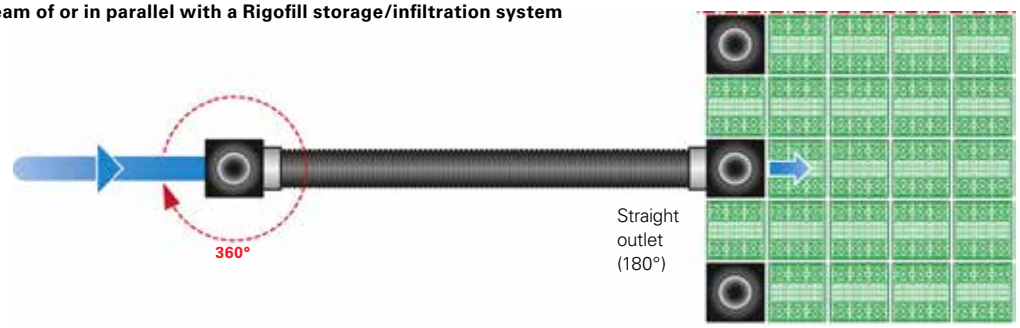
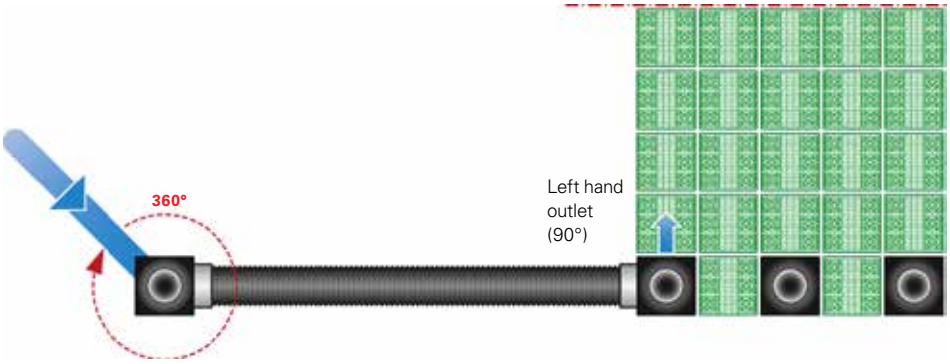
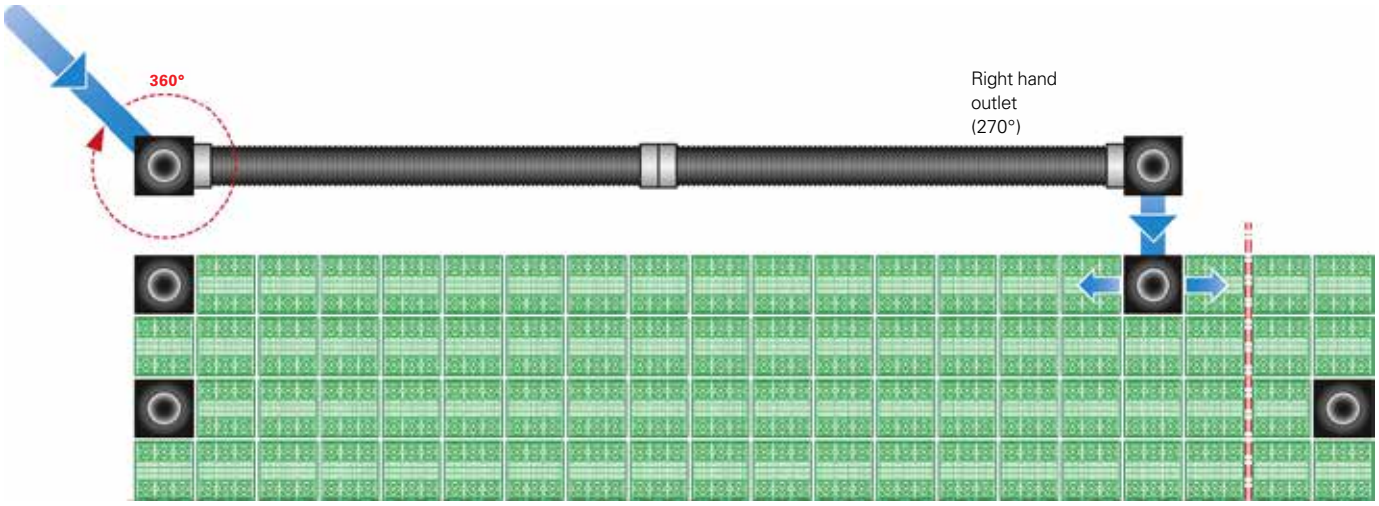
Maintenance

Exemplary installations of SediSubstrator® basic ...

... with different flow directions upstream of or in parallel with a Rigofill storage/infiltration system







Designing stormwater infiltration

Expertise

Forest floors, fields and meadows effectively collect, transport and sensibly distribute stormwater in a controlled manner. Built-up areas with impervious surfaces, however, make natural infiltration of stormwater into the subsoil practically impossible. The water ends up in the sewer system and must be cleaned before it can be returned to the natural water cycle. In the meantime, the ecosystem “lacks” it to refill the waterbodies and to maintain the ground water level.

What can be done? The quicker and more efficient urban, road and track drainage work, the better for nature. Our system solutions in the field of stormwater management are particularly important, since they support the natural way of water into the subsoil.

Designing and dimensioning infiltration systems

DWA-A 138

Key calculation values according to DWA-A 138
(depends on local conditions)

- Value of soil permeability k_f value (m/s), statistical height of heavy rain (e.g. KOSTRA data)
- Connectable area (m^2) and runoff coefficient ψ_m
- Dimensioning of systems, e.g. system width and system height, storage coefficient

If the storage volume in a gravel swale is insufficient, it can be considerably increased by using storage/infiltration modules.

The graphic to the right helps assess permeability.

To avoid malfunctioning or overdimensioning of the system, the k_f value of the soil should be examined and determined exactly.

Drainage water

If drainage water, e.g. from building drainage systems, has to be infiltrated, infiltration quantities and time must be taken into consideration.

Consistence of the soil

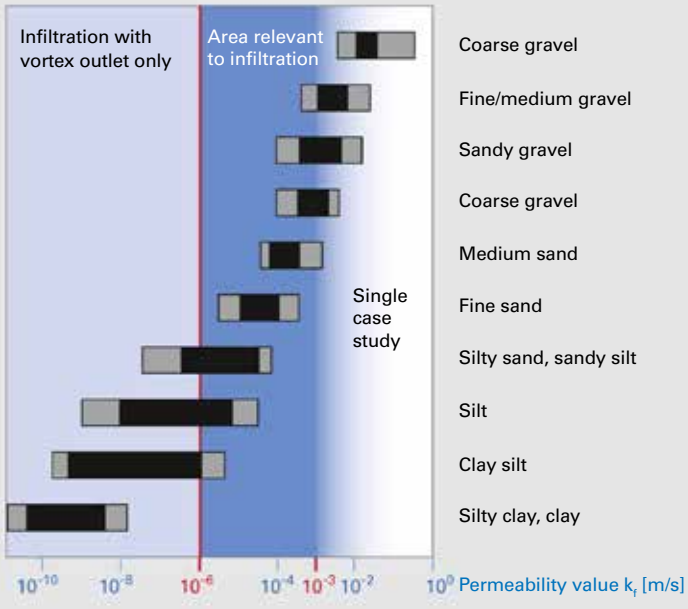
The consistence of the soil is of great importance for dimensioning the infiltration system.

A vortex outlet is necessary if the permeability value (k_f value) is lower 1×10^{-6} m/s. This is possible if a throttle shaft is used.

The agreed vortex or feed quantity can be adjusted using a vortex valve or ARO throttle element.

Soil evaluation

A site appraisal is recommended to evaluate soil permeability and installation conditions.



Rain yield factor

DWA-A 138 governs the design, dimensioning and realisation of infiltration systems.

Decentralised infiltration systems must be dimensioned according to applicable local mean heavy rainfall (e.g. KOSTRA data). For dimensioning centralised and connected systems, hydraulic evidence must be carried out using long-term simulation.

For dimensioning decentralised systems, "Precipitation height for Germany – KOSTRA" *(Starkniederschlagshöhen für Deutschland – KOSTRA; Deutscher Wetterdienst; 1997)* or applicable local heavy rainfall analyses are considered. Usually, a five-year frequency is required for decentralised systems (n = 0.2/a); for underdrained swale systems, the swale can be dimensioned with a one-year frequency (n = 1/a) if there is a swale emergency overflow drain.

Proof of flood safety

Recently, it has become increasingly important to protect populated areas against flooding.

When designing a drainage system, it must therefore be determined whether overflowing stormwater can be diverted into the nearest waterbody without damage when the drainage system overflows.
If topographically necessary floodways cannot be guaranteed (e.g. due to completely built-up land in the area of swales), and if there are no floodable areas, swales and retention systems must be dimensioned such that they can absorb the total quantity of water that accrues, even during heavy rain events, without any damage being caused.

Depending on the protection requirements of the land or neighbouring buildings, load case for rain is assumed that occurs once every 30 (n = 0.033/a) to 100 years (n = 0.01/a) (in accordance with DIN 1986-100 and DWA-A 118 or DIN EN 752).

Swale calculation example acc. to KOSTRA data

Duration [1] [min or h]	Rain yield factor [1] [l/s ha]	Swale length [2] [m]
5 min	425.40	25.90
10 min	272.00	32.89
15 min	209.60	37.76
20 min	174.10	41.53
30 min	134.10	47.34
45 min	103.40	53.67
60 min	86.00	58.37
90 min	62.00	60.77
2 h	49.20	61.99
3 h	**35.50**	**62.60** [3]
4 h	28.20	62.14
6 h	20.40	59.90
9 h	14.70	55.46
12 h	11.70	51.48
18 h	8.20	43.27
24 h	6.50	38.09
48 h	4.10	28.81
72 h	3.10	23.33

[1] Example data for a 8.45 x 8.45 km grid field acc. to KOSTRA atlas for Germany.
Use local rainfall data, e.g. from the KOSTRA atlas, for the exact dimensioning of swales.

[2] Calculation acc. to DWA-A 138. Please also consult RigoPlan professional planning software, pages 14 – 15, to dimension swales.

[3] The decisive rainfall event determines the necessary swale size (other parameters are determined prior to dimensioning).

Minimum swale length for r_D L_{swale} = 62.60 m

Designing pipe swales...

Pipe infiltration takes significantly better advantage of the protection potential of the soil than the frequently used isolated shaft infiltration.

Fine particles that are carried in the water are mostly retained thanks to spread distribution of the water and the cleaning efficiency of the soil.

DWA-A 138 therefore recommends using pipe infiltration instead of shaft infiltration.

Pipe swales consist of a perforated pipe or pipe system and a gravel bedding around the pipe.

Stormwater runoff is channelled underground into the pipe system and infiltrates through the pipe system into the gravel swale.

Practical experience has shown that nominal dimensions of 300 mm are ideal for the pipe system **(SickuPipe system)**.

Infiltration pipes and swales must be installed such that filter stability is ensured.

Single pipe swale

Structure of the SickuPipe swale

The storage volume of the swale comprises of the volume of the SickuPipe pipe system and the void ratio of the gravel backfill. The allowable void ratio of the gravel is 30 % to 35 % of the gravel volume; 30 % should be used to be on the safe side.

We recommend using washed gravel (grain size of 8/16 or 16/32). Gravel backfill should be wrapped in geotextile **(RigoFlor)**.

The swale should be installed frost-proof. The minimum depth of cover over the top of the pipe where traffic loads apply is 0.50 m. DIN EN 1610 and ZTVA-StB 89 must be observed.
A lateral distance of 1.5 times the distance between the bottom of the excavation and the top edge of the terrain must be maintained between the swale and the basement of the building if the basement is not impermeable against pressing water.

If stormwater runoff from larger areas must be infiltrated, pipe infiltration fields are more efficient than narrow single pipe swales. The spacing between pipes should not exceed 1.5 m.

To ensure even distribution of water, both the infiltration pipes and the gravel backfill should be installed level; in case of pipe infiltration fields, infiltration pipes must be connected.

Swales are sustainable and reliable drainage systems. A sufficient number of **(SickuControl)** inspection shafts must be installed for inspection and maintenance (see pages 68 – 69).

This enables CCTV inspection and flushing of the pipe system, if necessary.

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Stormwater management

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Maintenance

An initial inspection and, if necessary, flushing of the infiltration system should be performed upon completion.

According to DWA-A 138, infiltration systems should be inspected at least every six months and cleaned, if necessary.

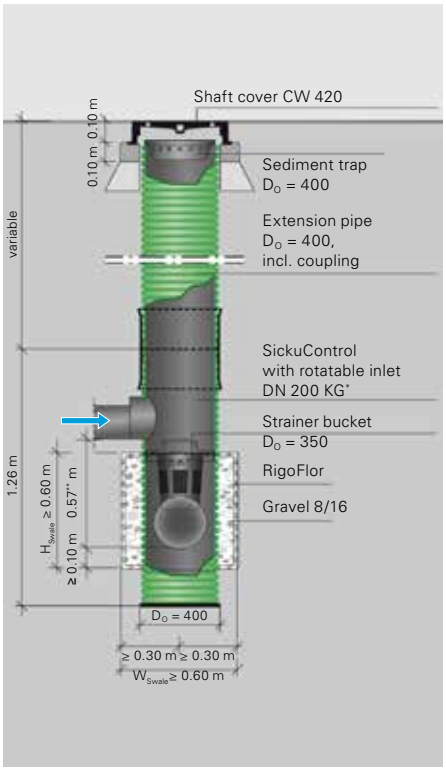
... with the SickuPipe system

A pipe infiltration field

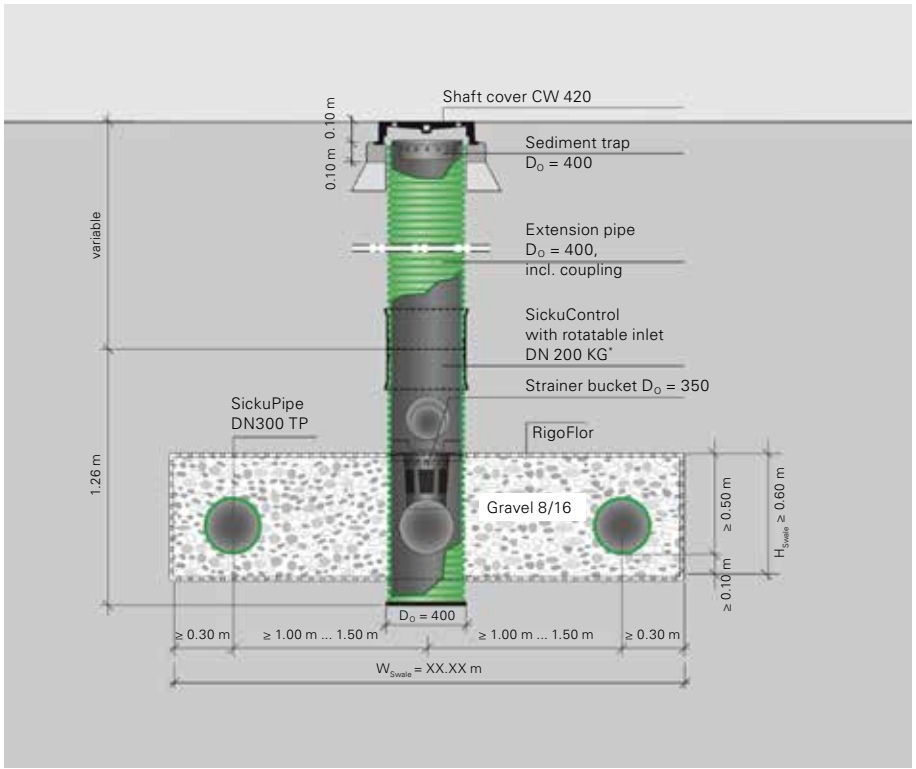
The minimum swale width for single pipe swales is 60 cm.

Pipes in multi-pipe swales must be spaced at least 30 cm apart from the edge of the swale and must observe a spacing between the axes of 1 to 1.5 m.

The gravel backfill should be at least 60 cm deep and the gravel bed for the pipes should be at least 10 cm deep.



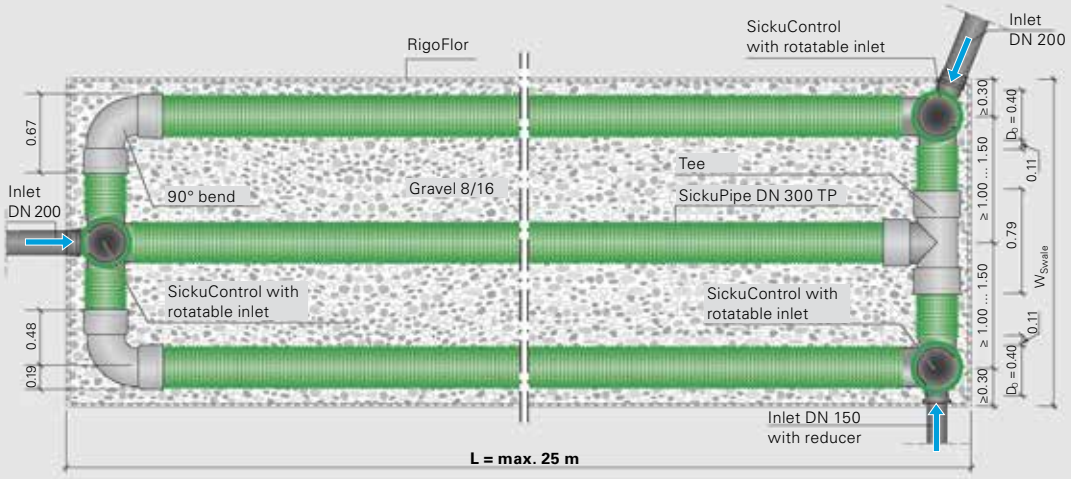
Section of a single pipe swale
* See page 130 for reducers.
** can be shortened to 0.45 m



Section of a 3-pipe swale
* See page 130 for reducers.

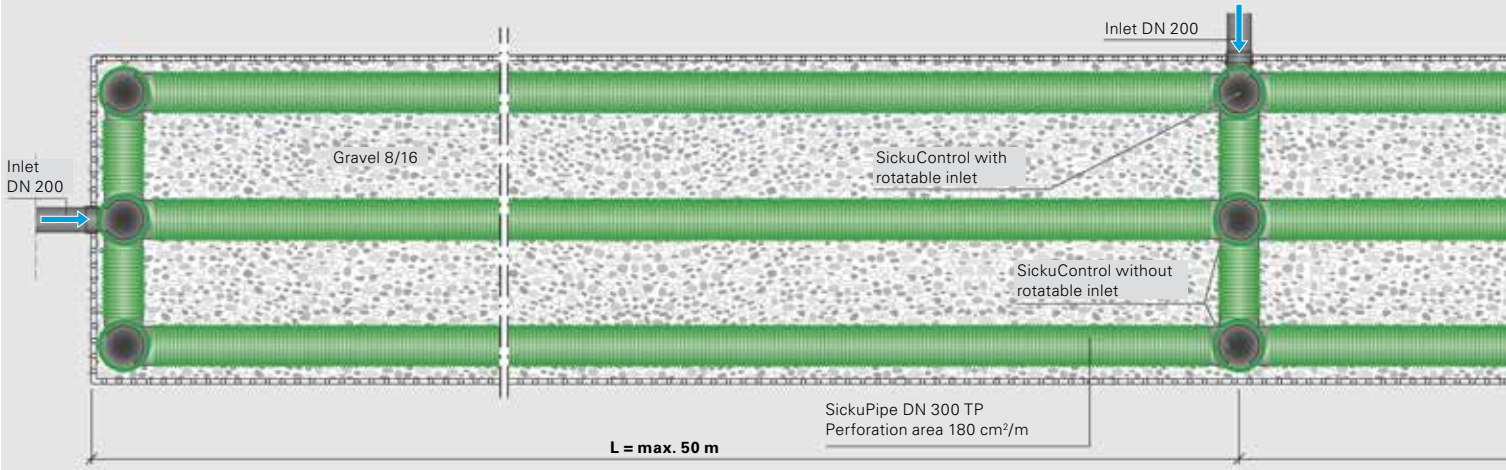
Examples of pipe swales...

3-pipe SickuPipe pipe swale of up to 25 m



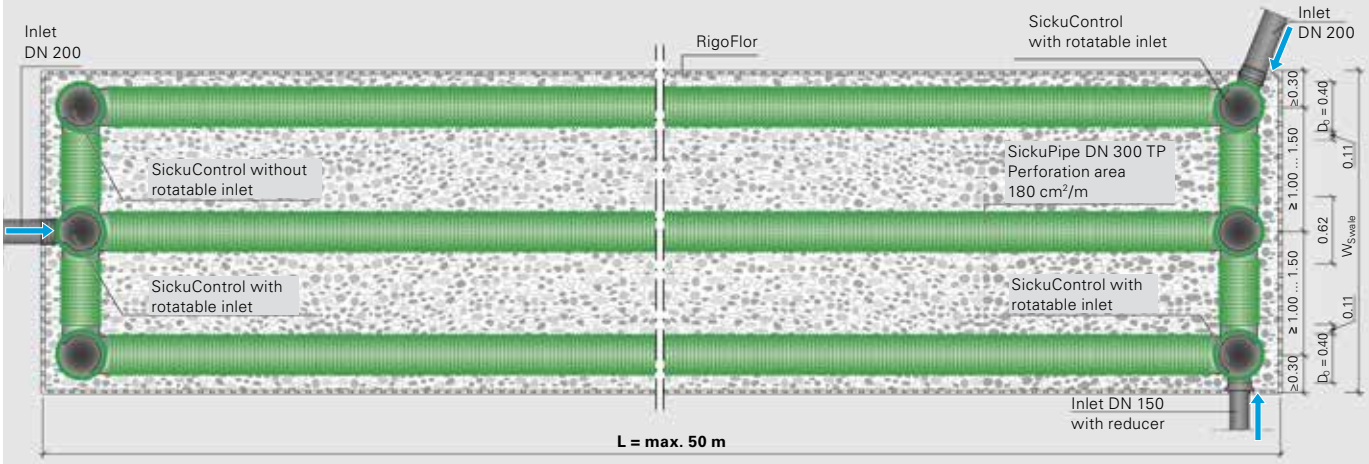
Pipe length less than 25 m: **1 shaft per pipe**

3-pipe SickuPipe pipe swale over 50 m

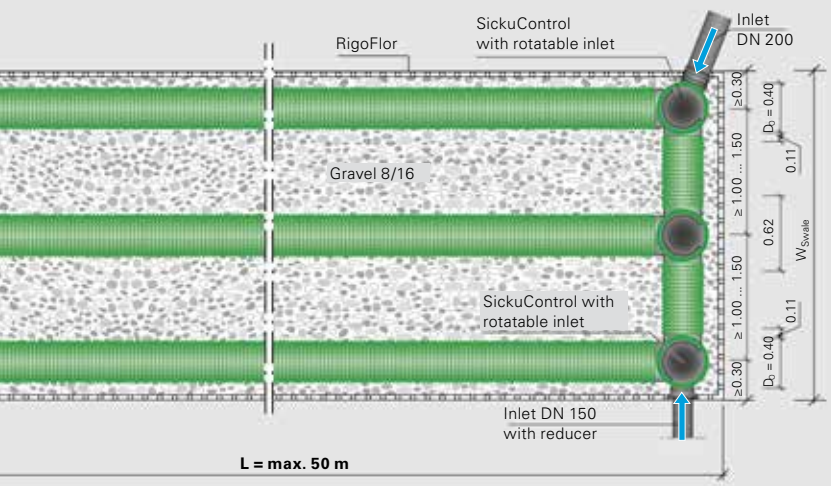


Pipe length larger than 50 m: **2 shafts spaced 50 m apart per pipe** (beginning, middle, end)

3-pipe SickuPipe pipe swale of up to 50 m



Pipe length less than 50 m: **2 shafts per pipe** (beginning and end)



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Designing underdrained swale systems ...

Underdrained swale systems are suitable for use in any soil. Depending on the soil infiltration capacity, the infiltration or retention with a significantly vortexed, delayed discharge into the sewer or the natural receiving waters will prevail. This makes the system ideal for areas where impermeable soils that have an unfavourable k_f value prevail. The vegetation/soil layer of the swale provides a superior cleaning effect. This makes underdrained swale systems also suitable for heavily polluted surface water, e.g. road runoff from heavily trafficked areas, and industrial and commercial areas.

Shallow swales harmonically blend with the urban structure and are hardly noticed

Underdrained swale infiltration in a development area

The principle of underdrained swale infiltration

Stormwater is stored in the swale before it filters through the man-made vegetation layer and enters the gravel swale. In the gravel swale, the water evenly seeps into the void spaces between the gravel. The MuriPipe infiltration pipe controls the flow and distribution of the water. It is generally recommended that an emergency overflow from the swale into the system is accomodated. An emergency overflow is essential if the frequency of overflows in the swale exceeds that of the entire underdrained swale system. If the soil is sufficiently permeable for water ($k_f \geq 1 \times 10\text{-}6$ m/s), the water completely infiltrates through the system into the ground. The water will only partially infiltrate in soils with a relatively low permeability. The remaining water is stored in the system and flows through the pipe and the throttle shaft into the natural receiving waters.

If individual underdrained swale elements are connected or used in combination with infiltration swales, throttle and inspection shafts, etc., a system known as an underdrained swale system (MuriPipe system) is created. This allows complete development sites to be designed and drained and ensures the ecological integrity of stormwater management.

Structure of an underdrained swale system

The vegetated infiltration swale and the gravel swale underneath with the MuriPipe distribution/transport pipe constitute the central core of the underdrained swale infiltration system. Rigofill inspect storage/infiltration modules can be used as an alternative to gravel swales.

The bottom layer of the swale consists of an approx. 10 - 30 cm thick, manmade vegetation layer with grass seed that must have a permanent water permeability ranging from 1×10^{-5} to 5×10^{-5} m/s.

The swale is filled with washed gravel (e.g. 8/16 or 16/32) and wrapped in RigoFlor geotextile.

... with the MuriPipe system

Underdrained swale infiltration to drain car park runoff. The system is fed through gutters.

Swale overflow: D_O 400 filter set and gully gutter

An initial inspection and, if necessary, flushing of the infiltration system should be performed upon completion. According to DWA-A 138, infiltration systems should be inspected at least every six months and cleaned, if necessary. Dirt trap and geotextile filter bag must be cleaned or replaced.

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and **document type:**

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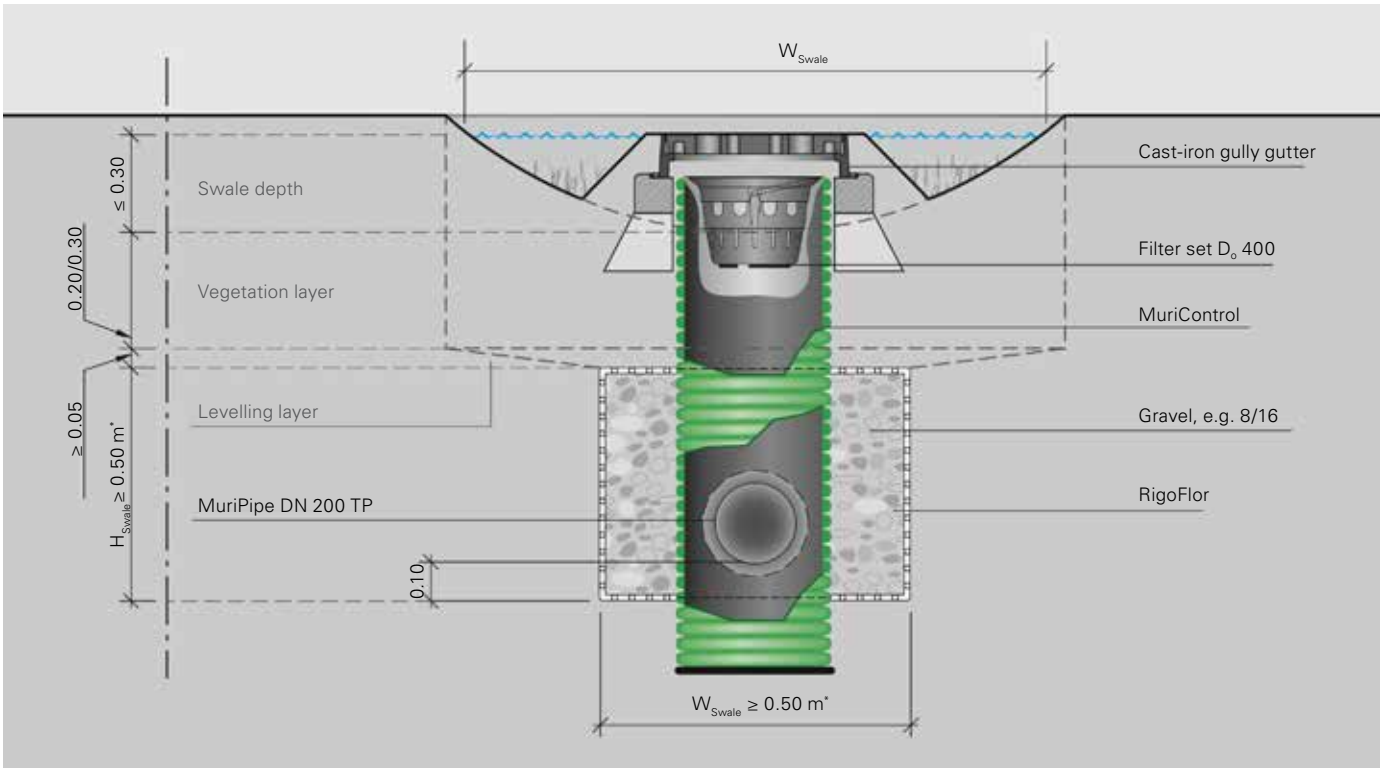
Section of an underdrained swale system

The MuriPipe infiltration pipe is embedded in the swale. The infiltration swale is usually fed through the shoulder strip or directly through drain channels.

If unpolluted stormwater, e.g. roof runoff, is directly fed into the swale pipe, it is recommended that MuriPipe DN 300 TP is used.

NB

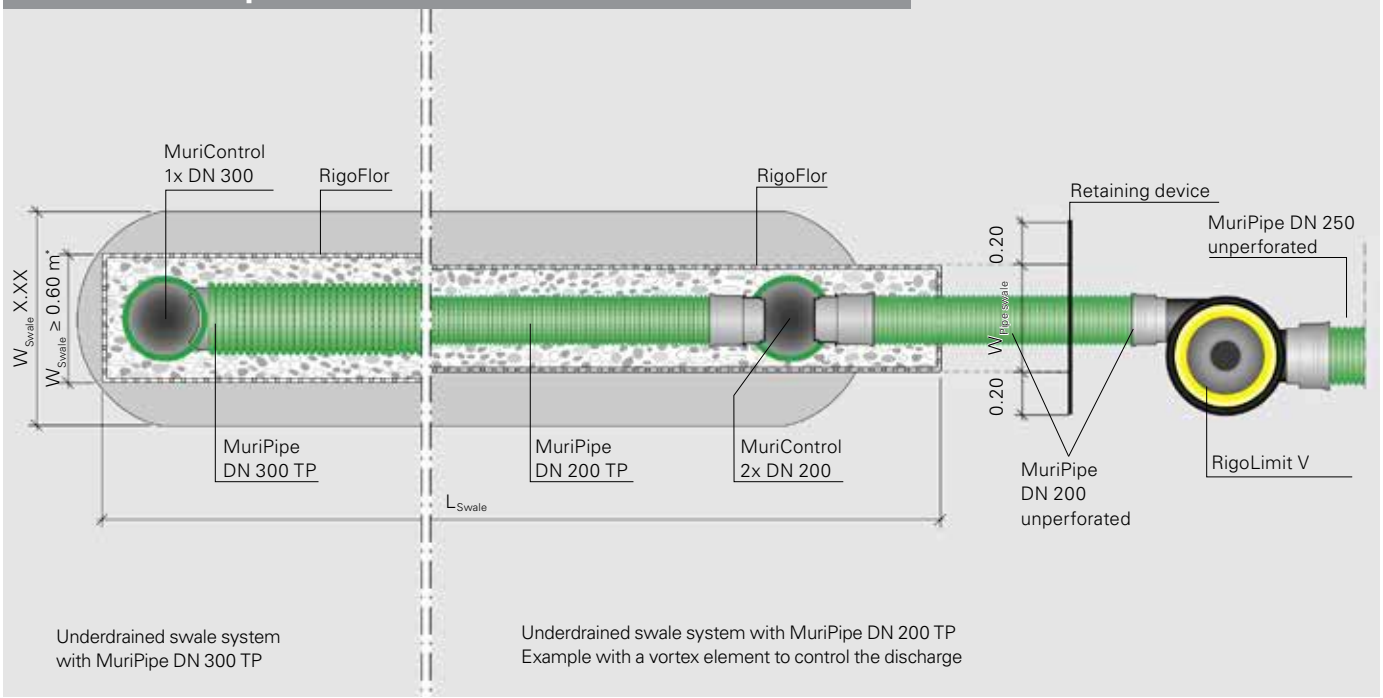
Please refer to the section on SickuPipe for arranging multi-pipe systems.



* for MuriPipe DN 300: H_{Swale} ≥ 0.60 m; W_{Swale} ≥ 0.60 m

Underdrained swale infiltration with MuriPipe

Plan of MuriPipe

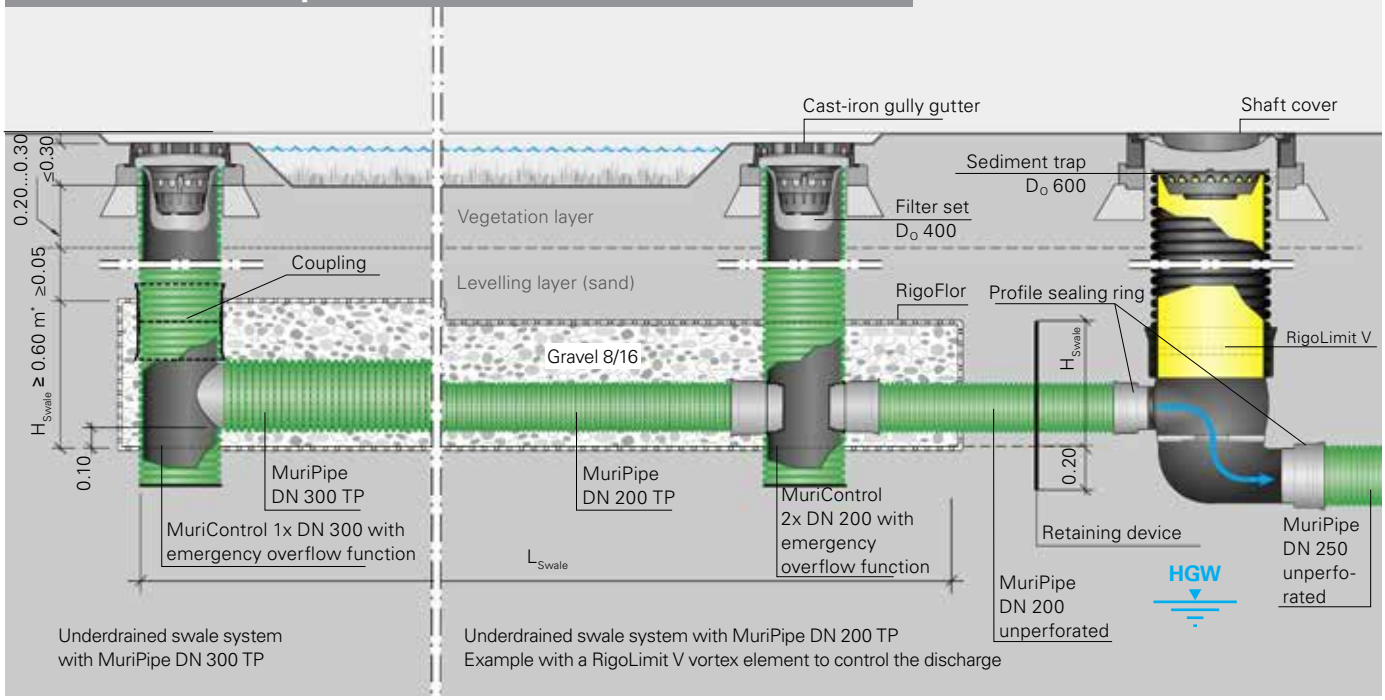


Underdrained swale system with MuriPipe DN 300 TP

Underdrained swale system with MuriPipe DN 200 TP
Example with a vortex element to control the discharge

* for MuriPipe DN 200: W_{Swale} ≥ 0.50 m

Section of MuriPipe



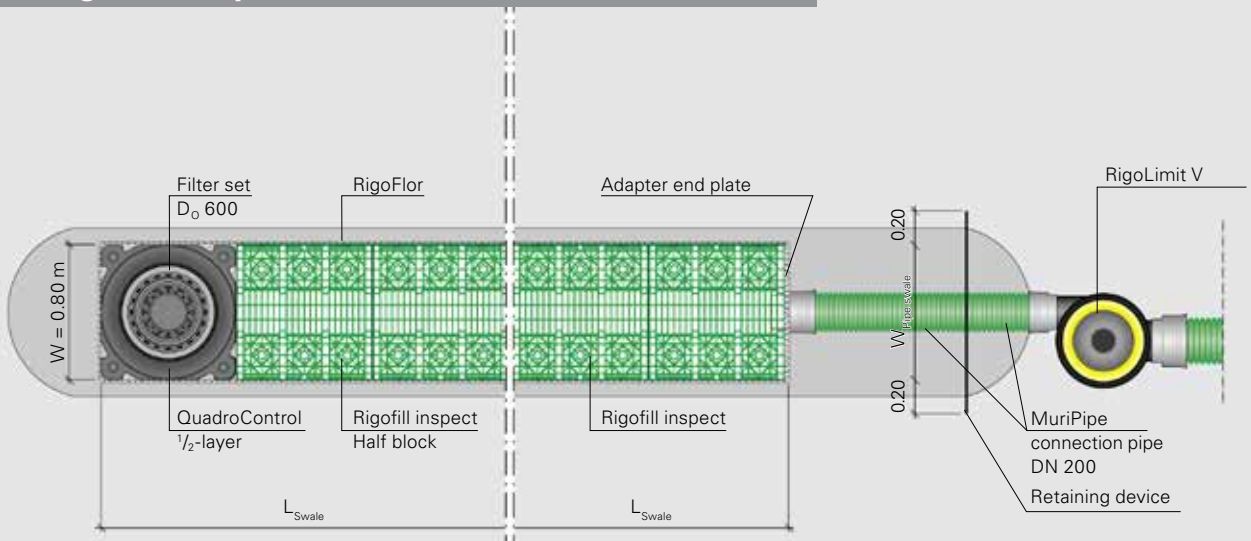
Underdrained swale system with MuriPipe DN 300 TP

Underdrained swale system with MuriPipe DN 200 TP
Example with a RigoLimit V vortex element to control the discharge

* for MuriPipe DN 200: H_{Swale} ≥ 0.50 m

Underdrained swale infiltration with Rigofill® inspect

Plan of Rigofill® inspect



Underdrained swale system
with Rigofill inspect half block

Plan of an underdrained swale system with Rigofill inspect
Example with a vortex element to control the discharge

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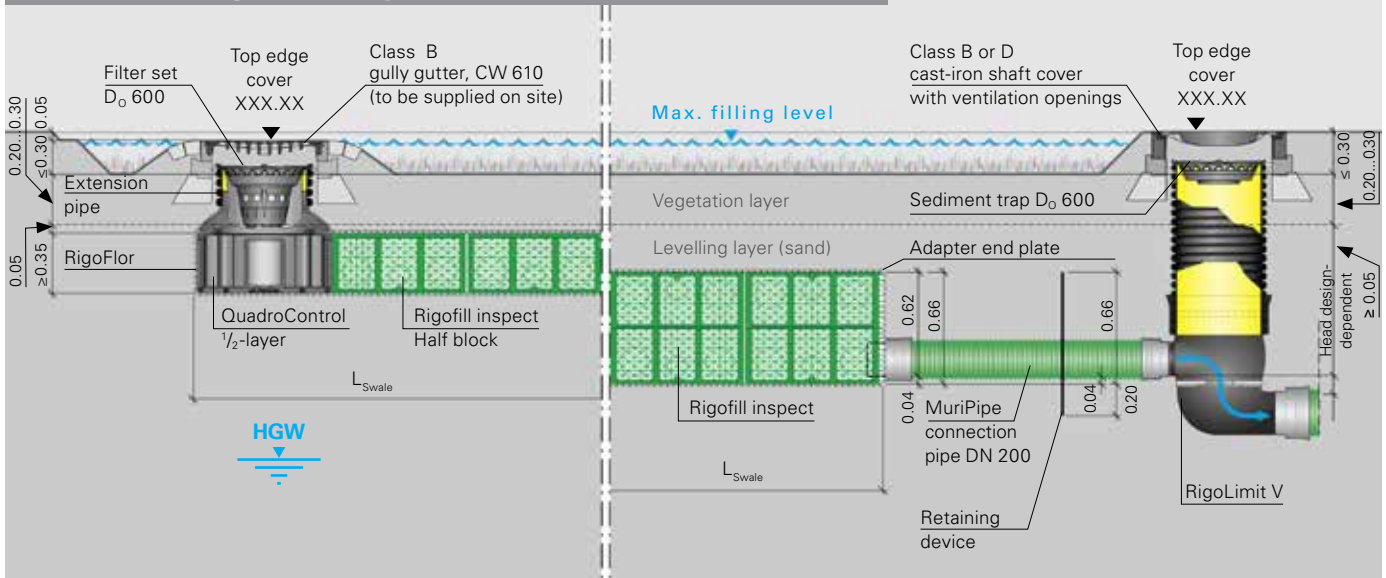
Downloads

Select **competence** and **document type:**

Stormwater management | CAD data

Section of Rigofill® inspect



Section of an underdrained swale system with Rigofill inspect
half block under unfavourable groundwater conditions

Section of an underdrained swale system with Rigofill inspect
Example with a RigoLimit V vortex element to control the discharge

Design principles for Rigofill® storage/infiltration systems

Why storage/infiltration systems?

Pipe swales and gravel swales can only use approx. 30 % of their volume to store water. Therefore, three times the required water storage volume must be excavated. In addition, large areas are needed, which frequently are not available in urban areas.

Storage/infiltration modules save an enormous amount of space and excavation work: They use 95 % of their volume to store water! Thus, subsoil storage spaces for stormwater can be built in a very efficient and cost-saving way.

Volume comparison between a gravel swale and a storage/infiltration module

System geometry

Sizes (length and width) of Rigofill storage/infiltration systems can be freely designed with hardly any limitations. The 80 cm cellular block type structure can easily be adapted to fit nearly any layout. With heights of 66 cm (full block) and 35 cm (half block), systems can be built in various sizes to accommodate any single- or multi-layer combination. Therefore, the system can very easily be adapted to on-site requirements. Under high ground water conditions or low backfill soil permeability, for example, rather shallow depth systems are to be preferred.

For soils with good permeability, however, high and compact systems are favourable and may be built accordingly. The maximum space available is used.

Tunnel arrangement

The inspection tunnels enable a complete camera inspection and flushing of the system, if necessary. To achieve this, the inspection tunnels of each row must be in line. The tunnels should run parallel to the longer system side, which minimises the inspection effort and the number of inspection shafts.

Arrangement of inspection shafts

QuadroControl shafts can be incorporated at any point in the system. Number of and point in the system are above all determined by the size of the system, access, pipe connections and design of the outdoor facilities. In order to ensure that inspection and/or flushing of the complete system is possible, each row should comprise at least one inspection shaft. With common camera or flushing technology, about 50 m of the system can be reached starting from the shaft; this means, if the shaft is incorporated in the middle of the system, up to 100 m can be reached. For connecting supply pipes, QuadroControl shafts should be used. The shaft position in the layout can be chosen such that supply pipe lengths are as short as possible. In addition, the shafts should be positioned such that the shaft covers do not interfere with the design of the outdoor facilities but can easily be accessed by vehicles for maintenance purposes. Adjacent shafts should be staggered in the layout.

Rigofill® inspect and Quadro® Control complement each other perfectly

Stormwater treatment

Stormwater inflow should generally be cleaned using upstream treatment systems. For details, please refer to the chapter on stormwater treatment.

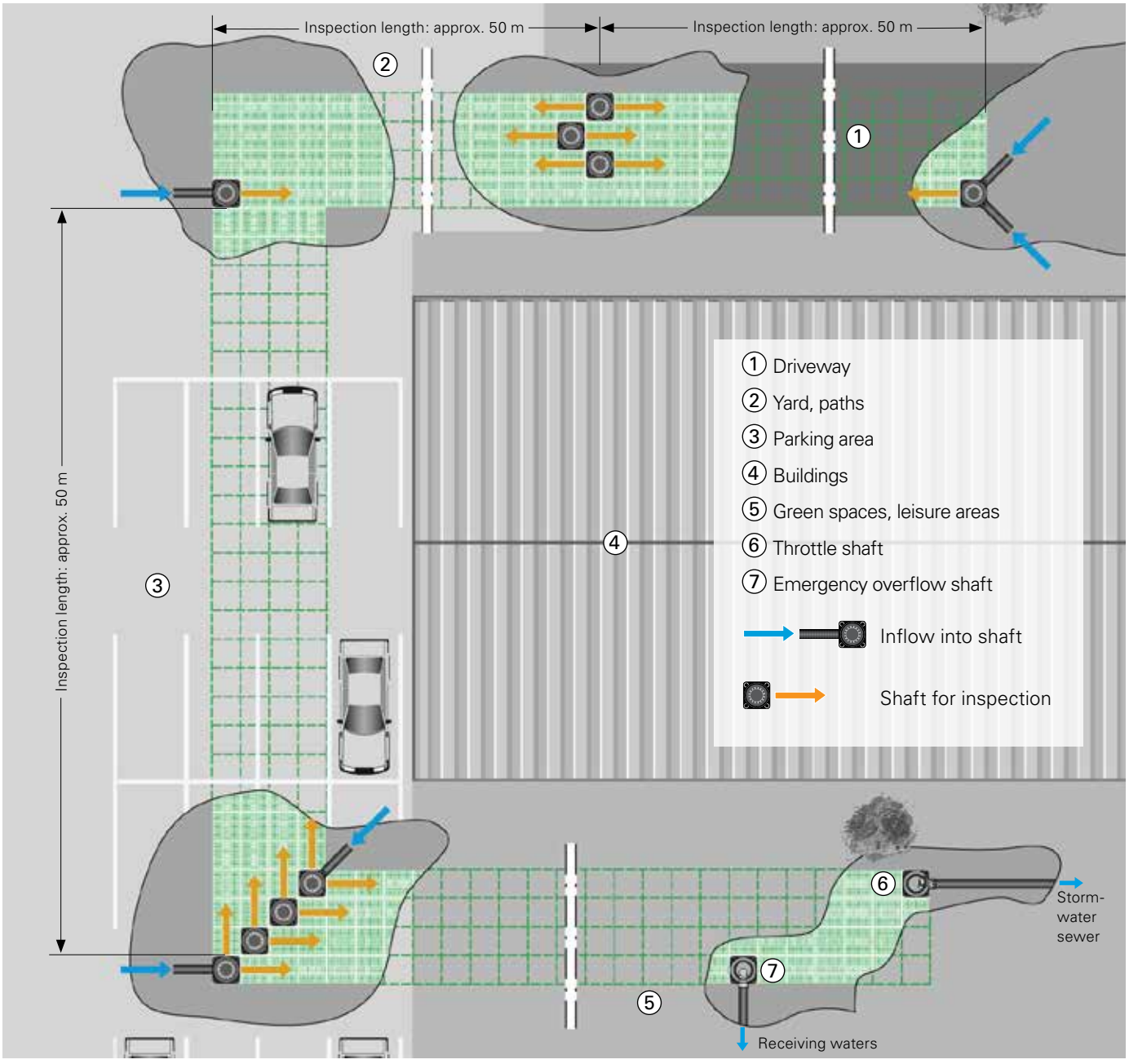
Discharge controlled by vortex element

For swales where no or no complete infiltration is possible, the discharge is usually controlled by a vortex element. The maximum discharge is indicated depending on the condition of the discharge point. For storage/infiltration systems, a throttle shaft that can be incorporated into the layout is available, which can be installed at any point alongside the system. It can be incorporated into the layout at a favourable point close to the discharge point. An additional integrated emergency overflow shaft may be installed optionally.

Land use

Rigofill storage/infiltration systems are suitable for traffic loads of up to HGV 60 if they are installed accordingly.

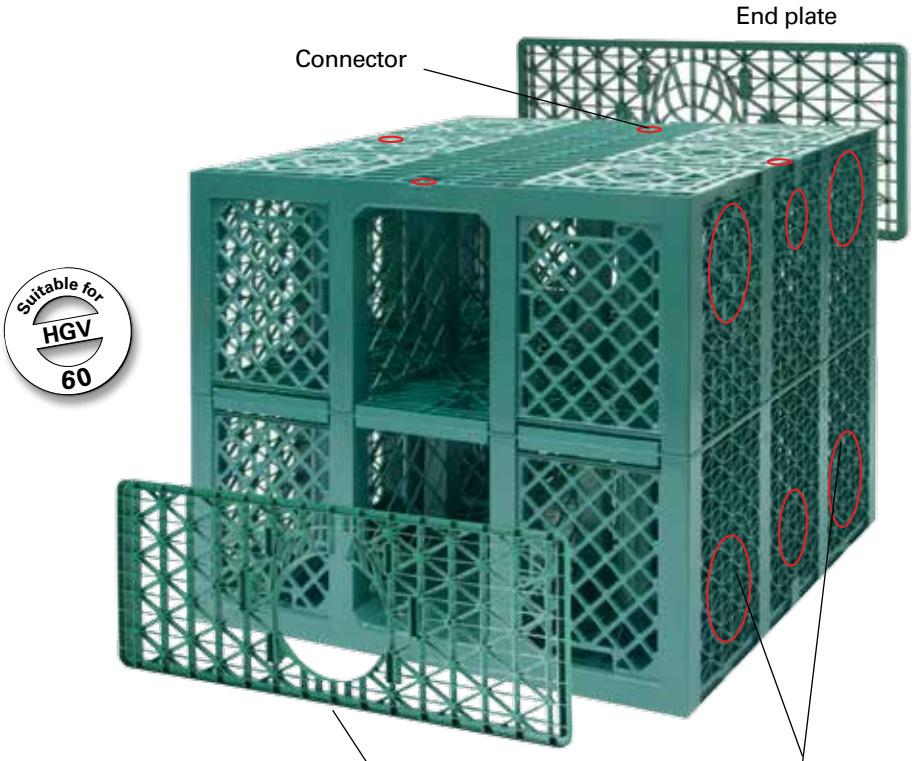
The system can, for example, be planned in combination with car parks but also with green spaces and leisure areas in a favourable way.



Rigofill® inspect, the universal modular system ...

The proven advantages of Rigofill® inspect

- **Highly durable storage/infiltration module with the following certifications:**
  - Approved in Germany by the General Building Authority *(Allgemeine bauaufsichtliche Zulassung)* of the German Institute for Building Technology *(Deutsches Institut für Bautechnik)* (DIBt certification, certificate no. Z-42.1-473)
  - Approved in France by the CSTB
  - Approved in Great Britain by the BBA
  - RAL certification for stormwater systems
- **CCTV accessible**
  The inspection tunnel allows the entire storage volume and the geotextile to be inspected.
- **Easy to install**
  Easy and quick to transport and install.
- **95% of storage volume**
  Considerable space saving compared to gravel swales, three times greater storage volume than gravel.
- **Universal component**
  Suitable for use in infiltration, storage and harvesting.
- **Unique, extensive network**
  Our technical consultants deliver prompt and competent on-site assistance.
- **Entire block volume can be flushed**



RAL GÜTEZEICHEN Regenwassersysteme

Rigofill inspect ...
zugelassen durch das Deutsche Institut für Bautechnik DIBt
FRÄNKISCHE Z-42.1-473 MFPA Leipzig
www.der-erste-mit.de

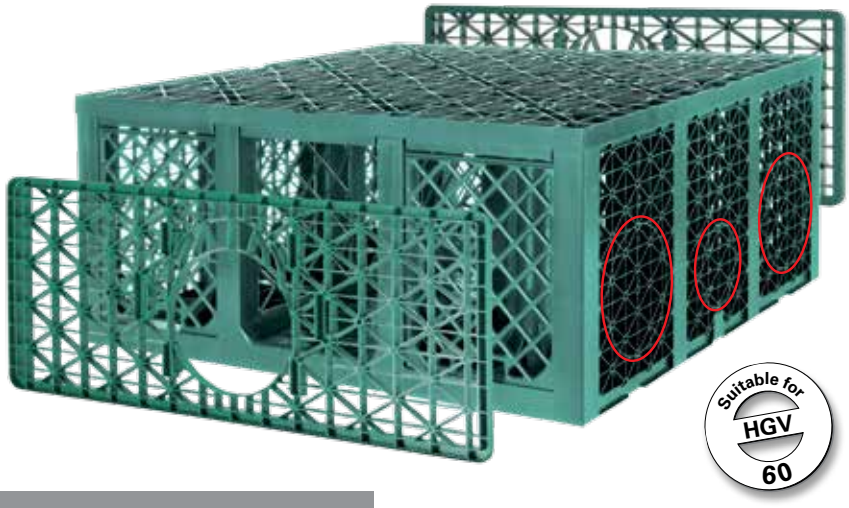
Rigofill inspect ...
CSTBat 676-34/02-PP-234

Rigofill inspect ...
BBA

The half block

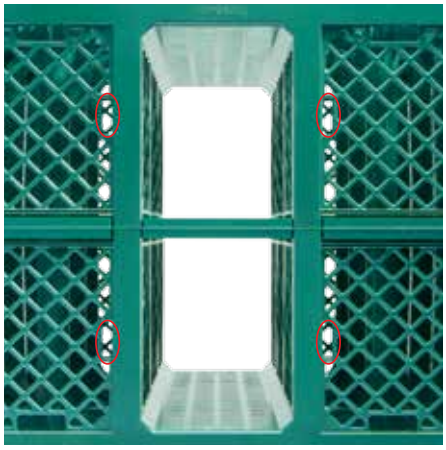
The Rigofill inspect half block is used for systems that only permit shallow building depths, e.g. under high ground water conditions.

Dimensions (W x D x H):
800 mm x 800 mm x 350 mm



Inspection tunnel

Large openings in the side wall of the tunnel allow the entire system to be inspected.



Inspection tunnel

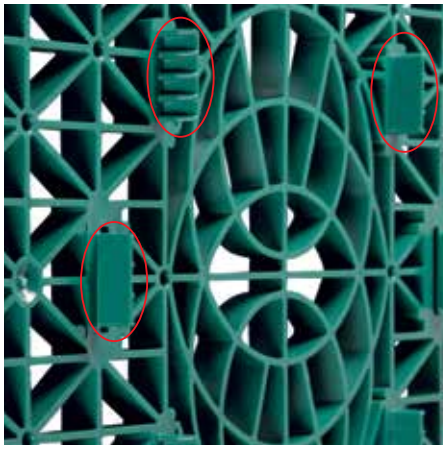
Rigofill inspect has an inspection tunnel with a cross section of 220 x 270 mm. This allows the entire storage volume and the geotextile to be inspected.

Accessories

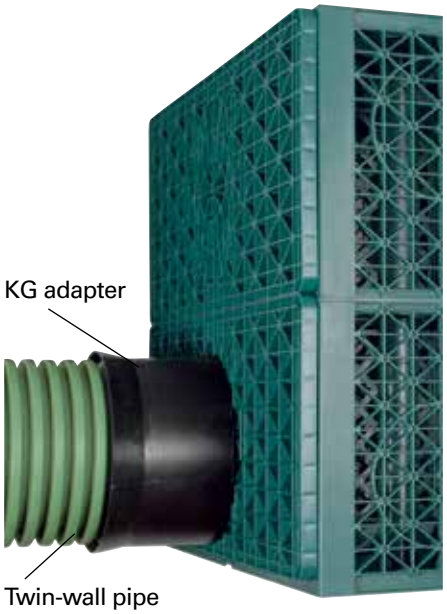
Each Rigofill inspect module offers connection points on all four sides. Connectors allow the blocks to be joined.

Connectors allow for quick and secure installation

End plates are used to cover tunnel ends. Adapter end plates connect to pipes.



The end plate can easily be snapped onto the adapter



Quadro® Control ...

- Can be freely incorporated in the Rigofill layout
- Compact design – easy to install
- The system is very easy to access, 500 mm inside shaft diameter (= clear access diameter)
- Can be incorporated* in the storage/infiltration system, simple geometry, no additional excavation required
- Can connect to any type of inlet
- System ventilation through extension pipe and shaft cover

* Volume can be taken into account when dimensioning the system volume.

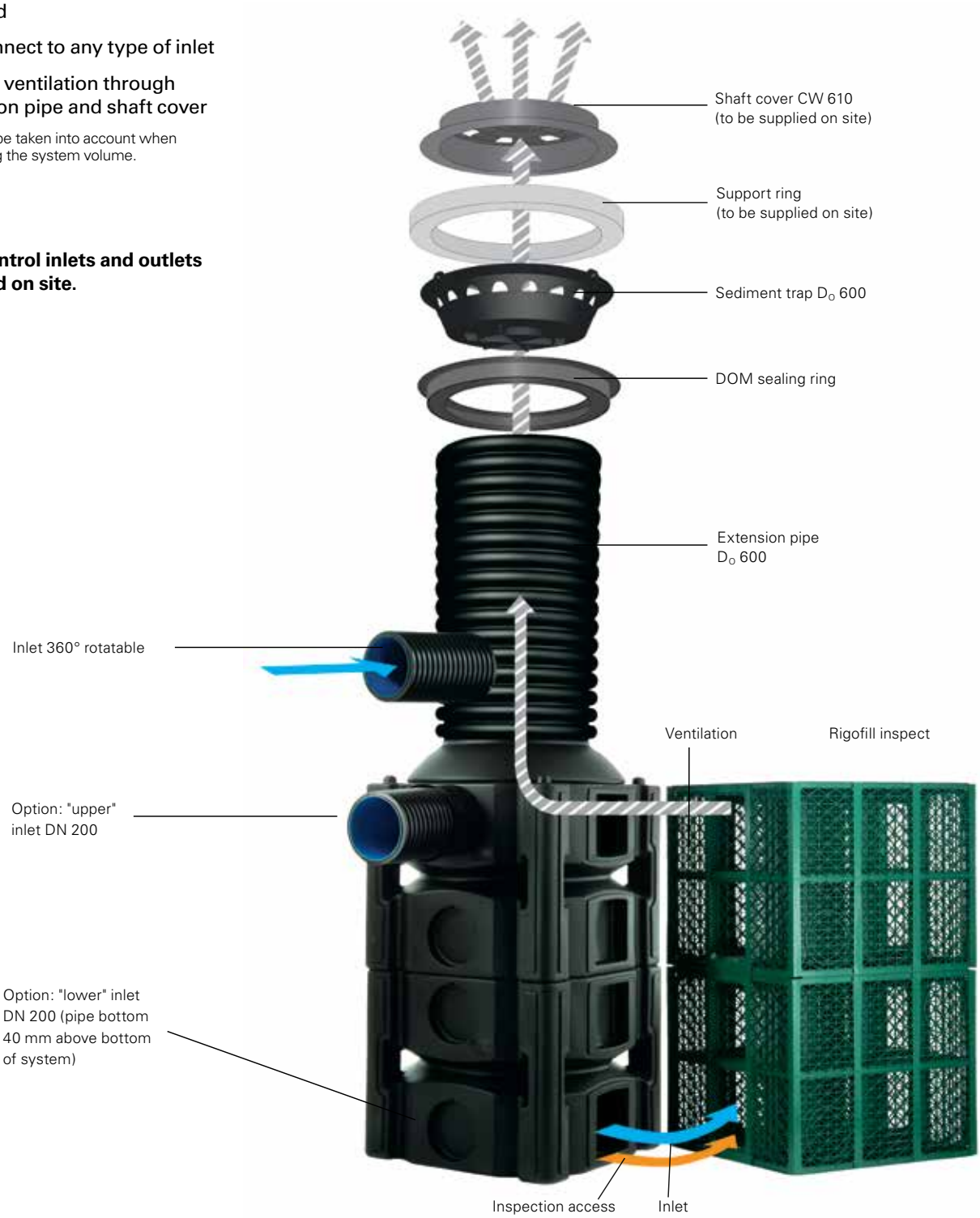
NB

QuadroControl inlets and outlets are opened on site.

- Approved by the German Institute for Building Technology (DIBt) (DIBt certification, certificate no. Z-42.1-473), approved in France by the CSTB in the context of application in Rigofill inspect systems

FRÄNKISCHE Z-42.1-473 MFPA Leipzig

CSTBat 676-34/02-PP-234

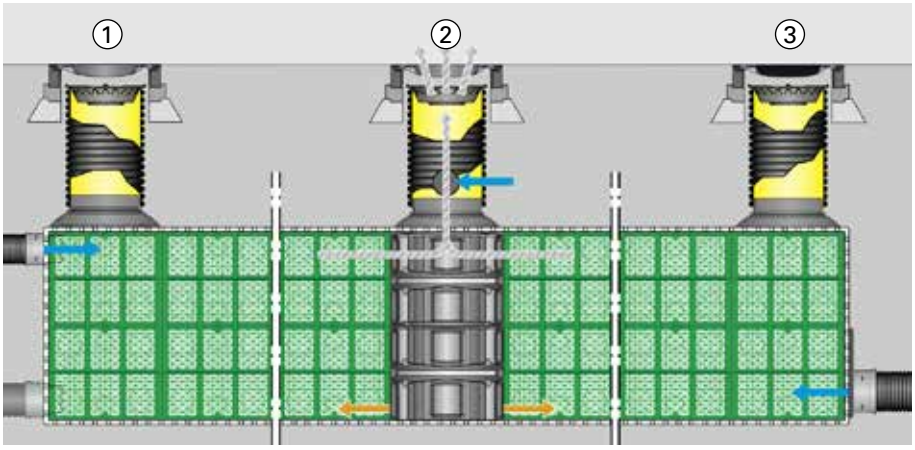


... the system shaft that fits the layout

QuadroControl is an inspection shaft that can be incorporated in Rigofill storage/infiltration systems. It can be installed at any point in the layout. QuadroControl provides convenient access to the inspection tunnel from aboveground (clear access diameter 500 mm). High-performance inspection and flushing equipment can easily be inserted into the inspection tunnel.

QuadroControl consists of individual shaft bodies, which are stacked on top of another according to the number of layers of the storage/infiltration system. Each shaft comprises of an inlet side with pipe connections DN 200 and three tunnel sides which have access openings for the inspection tunnel. Required pipe and tunnel connections are opened on site according to design specifications.

The shaft cone is the transition to the extension pipe. The length of the extension pipe is chosen depending on the installation depth. If necessary, it may also be equipped with a rotatable inlet connection (DN 200 to DN 300). Project-related solutions are available upon request.



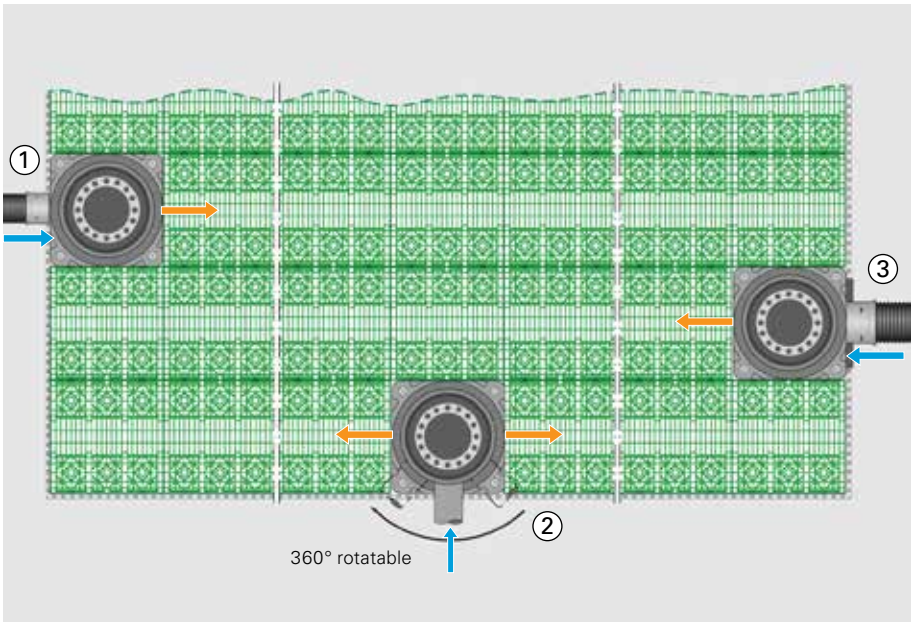
Example, section

Caption

① QuadroControl 2 (= 2-layer), inlet DN 200 at the shaft body top → (or bottom), "straight" tunnel connection, → extension pipe without inlet.

② QuadroControl 2 (= 2-layer), extension pipe with inlet DN 200 ← (360° rotatable), "left and right" tunnel connections. ← →

③ QuadroControl project shaft (2-layer), shaft body with inlet DN 300 (400, 500) ←, "straight" tunnel connection, ← extension pipe without inlet.



Example, plan

→ Inlet

→ Inspection access

Ventilation

Example shaft ① with inlet at the shaft body

CCTV inspection ...

Trust is good – safety is better

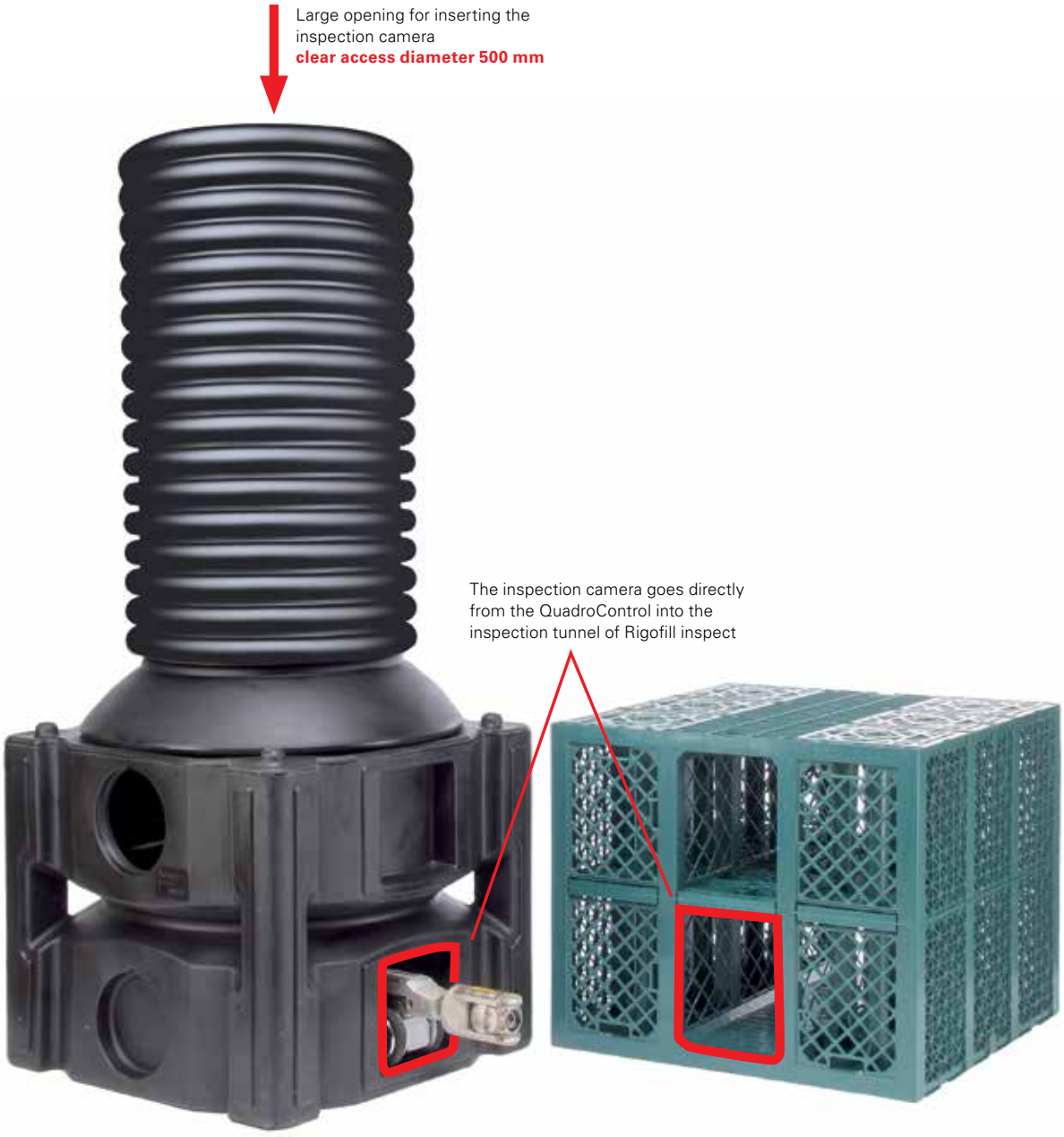
Storage/infiltration systems are durable structures for urban drainage; they must work reliably for decades. Durability and reliability are essential requirements. To this, the self-monitoring ordinances of the countries demand initial and recurring visual inspections upon commissioning and during operation.
The best way to inspect the state of a system using state-of-the-art technology is CCTV inspection. Thus, a storage/infiltration system can be checked excellently – for final acceptance or later.

Quadro®Control – the gateway to the system

Thanks to QuadroControl, CCTV inspection technology can be brought to the spot. The generously dimensioned access diameter allows unobstructed access "from aboveground" and the use of a camera dolly.

Rigofill® provides transparency in the system

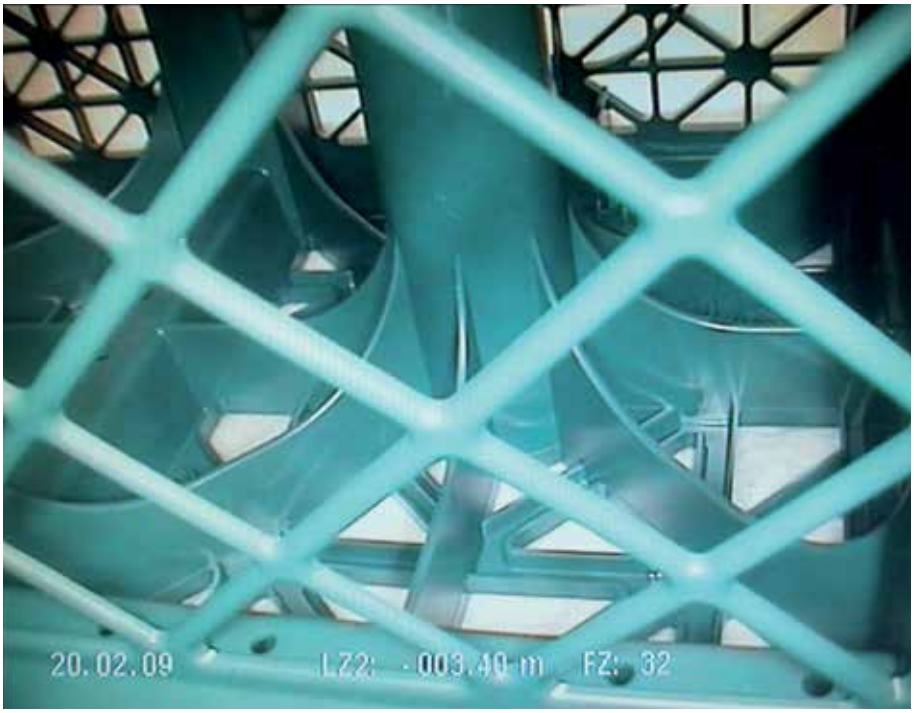
The unique design of the inspection tunnel allows for an unobstructed view of the entire storage volume and not only the inspection tunnel. For example, the load-bearing elements, the condition of the geotextile and the entire soil area can be visualised. Rigofill offers excellent opportunities to inspect the interior of a system at any time.



… for final acceptance and function control

Rigofill and QuadroControl have been designed for the use of modern CCTV inspection technology. A rotatable and height-adjustable camera head, for example, allows for the best possible view of the lateral soil, a controllable carriage allows for a constantly centred position, and high-performance optics and lighting allow for a perfect view (see page 98 for further information on inspectability).

Recommended: tender invitation for final acceptance inspection



Nothing remains hidden: the camera provides an excellent view of the storage/infiltration system

Final acceptance of sewers using camera inspection has long since become a matter of course in sewer construction. Also in the construction of storage/infiltration systems, the final acceptance inspection is important! Planning engineers should absolutely include this in their tender documents. For instructions on the professional system configuration of the CCTV inspection technology, please refer to **www.fraenkische.com**.

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Stormwater management

and **document type:**

Tender text

Installing storage/infiltration systems using Rigofill® systems

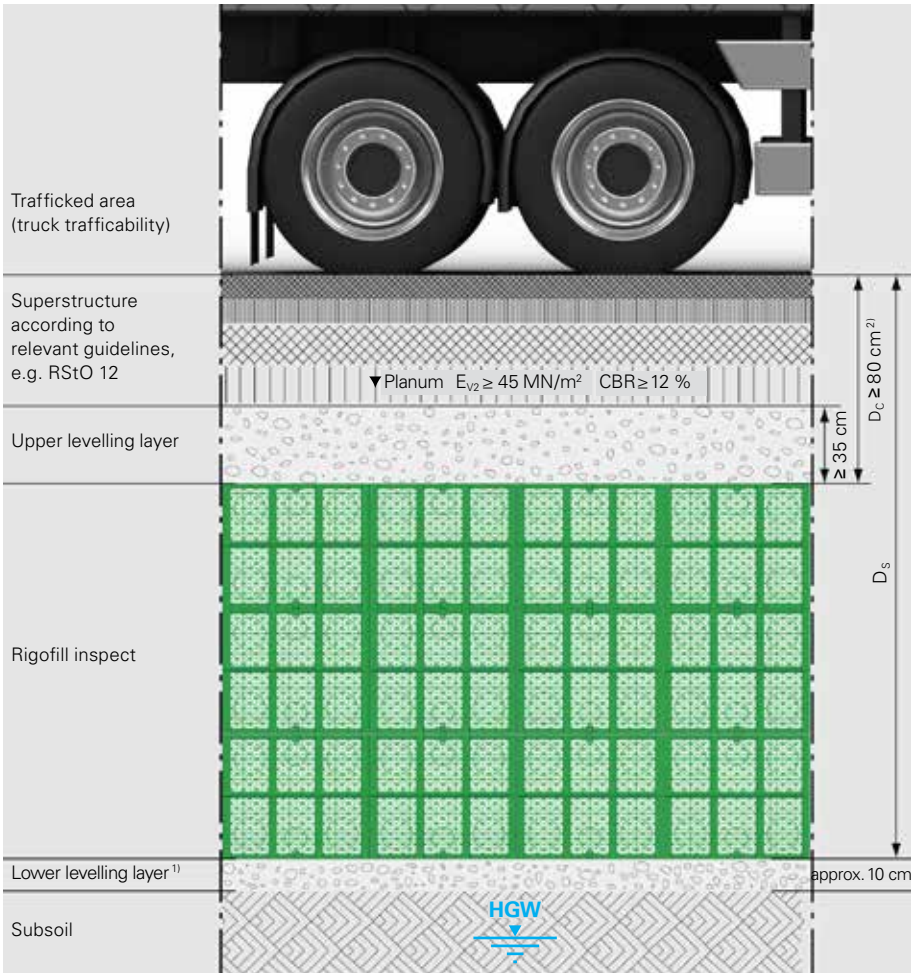
Stability analysis

Storage/infiltration systems are subsoil structures and must have sufficient load-carrying capacity against impacting soil and traffic loads. The stability must be proven according to Eurocode 7, taking into account partial safety factors and/or limiting factors. For soil temperatures of up to 23 °C, maximum depths of cover D_C of 4 m and soil depths D_S of 6 m are possible depending on installation parameters (e.g. soil type). Under trafficked areas, a minimum cover D_C of 80 cm must be observed.
Rigofill systems, which are used as watertight storage systems with impermeable membrane, have been designed for application above the highest groundwater level (HGW). Use in groundwater is possible under corresponding technical conditions after advice has been sought from FRÄNKISCHE. Please contact us!

Installation under trafficked areas

When installed under trafficked areas, the relevant guidelines line RStO 12 must be observed. To build the planum for the subsequent road layout, an upper levelling layer must be installed. It should preferably be built as a gravel sub-base with a thickness of at least 35 cm, other materials usually result in larger depths of cover. Generally, a uniform modulus of deformation $E_{V2} \geq 45$ MN/m² must be proven on the planum.

Standard installation under a trafficked area



Durability and trafficability

Professionally manufactured storage/infiltration modules have been designed to meet a minimum durability of 50 years. Within this period, a lot can change. For example, what was planned as a "green space" may become a car park during later construction activities. Likewise, an unpaved surface may be accessed by the fire service in case of an emergency. In such cases, a storage/infiltration system must not prove a hindrance or even a danger. Therefore, the storage/infiltration system should generally be designed for truck trafficability. Additionally, the position of the storage/infiltration system should be permanently marked by a sign.

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Select **competence**

Stormwater management

and **document type:**

Installation manual

[1] At least the same permeability (k_f) as the subsoil
[2] Lower cover upon request!

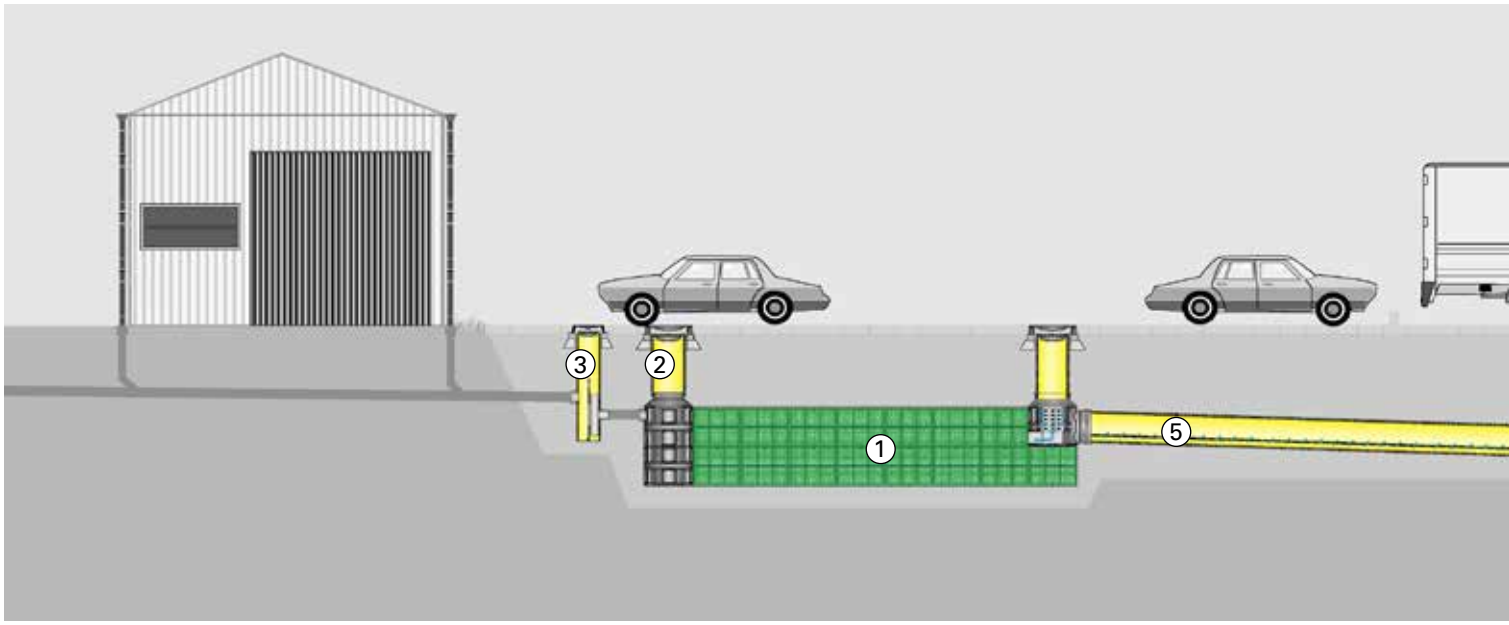
Examples of storage/infiltration systems ...

Storage/infiltration system: Single-layer Rigofill storage/infiltration system with front-end QuadroControl shafts

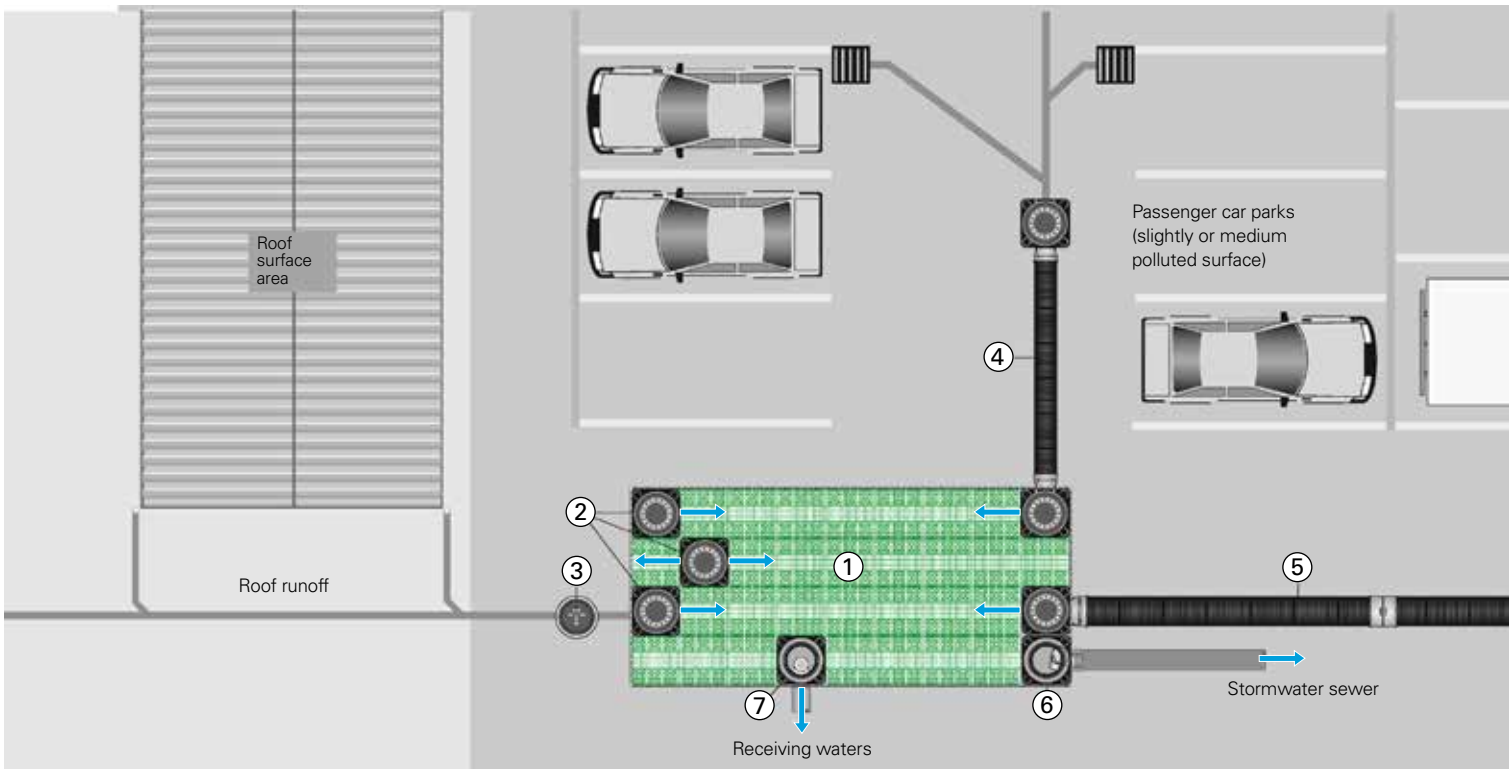
2-layer Rigofill storage/infiltration system with inflow distribution

Centred position of QuadroControl shafts

... using Rigofill® inspect and Quadro® Control ...

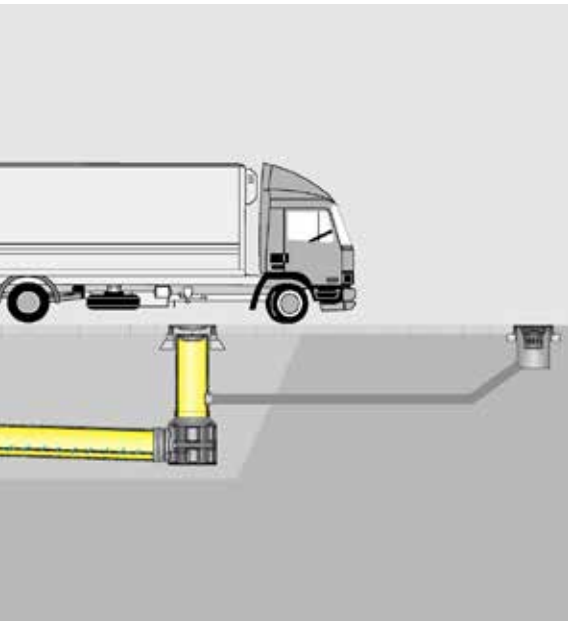


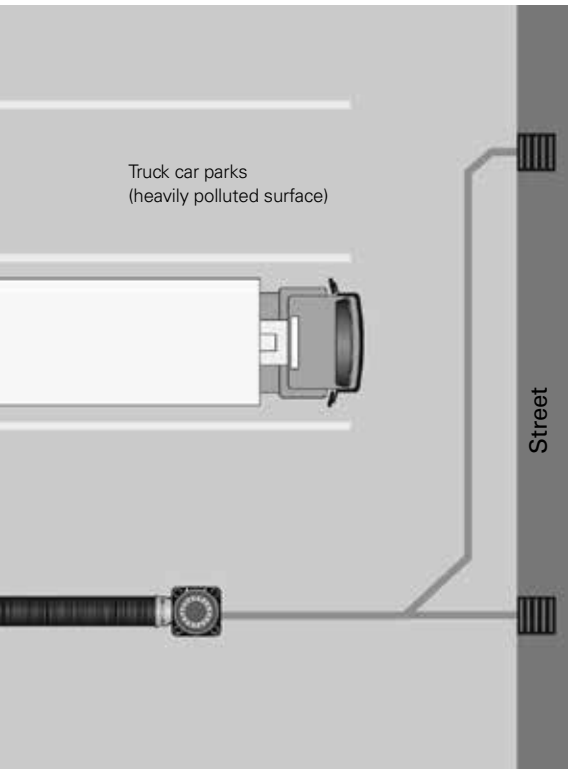
Simplified diagram: section



Simplified diagram: plan

… plus SediPipe® and SediSubstrator® for pretreatment





Caption

① Infiltration system with Rigofill inspect
Space-saving arrangement thanks to two layers of Rigofill inspect for soils of medium and good infiltration capacity

② QuadroControl (2-layer)
Integrated inspection shaft for infiltration system

③ RigoClean
filter shaft, e.g. for slightly polluted roof runoff

④ SediPipe basic 400/6, right hand outlet
Stormwater treatment system according to the principles of sedimentation for less heavily polluted runoff from trafficked areas, e.g. passenger car parks

⑤ SediSubstrator basic 500/12, straight outlet
Stormwater treatment system according to the principles of sedimentation and adsorption for heavily polluted runoff from trafficked areas, e.g. truck car parks

For stormwater retention facilities:

⑥ QuadroLimit 2
Throttle shaft with integrated vortex valve

⑦ QuadroOverflow 1
Emergency overflow shaft

Commitment

What should be done with all this water? Recent hundred year floods in Germany have revealed the dark side of the incomparably precious gift of water: its enormous force. In 2013, seven Central European countries suffered from severe flooding caused by continuous rainfall. "Christopher", "Dominik", "Frederik" and "Günther", the low-pressure systems* caused bad weather and made the water line of the Danube rise to almost 13 metres.

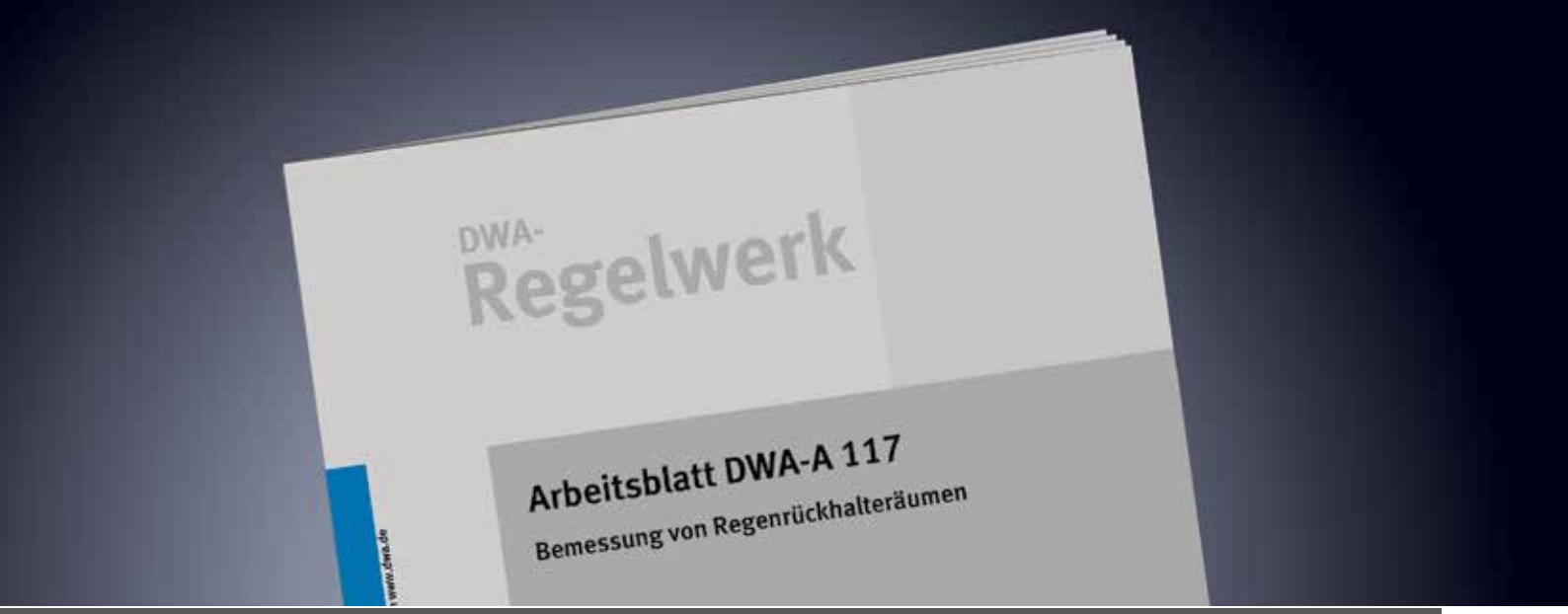
It is, therefore, all the more important to realise that well-designed stormwater retention can contribute to providing better flood control.

What we want to say: nowadays, controlled collection and storage of stormwater is part of modern urban development not only for ecological, but, most notably, also for economic reasons: According to the German Press Agency dpa**, the German federal states claimed damage of 6.7 billion euros due to the most recent hundred year flood. This is too much if there are ways and means at hand.

* wikipedia.org/wiki/Hochwasser_in_Mitteleuropa_2013

** dpa, 04.09.2013

Designing stormwater retention/harvesting and fire water storage



Designing and dimensioning stormwater retention facilities

If it is not possible to reduce stormwater runoff in an economical and environmental way where it occurs or in the direct vicinity, e.g.

- limitation of the surface sealing to the amount necessary for use, unsealing, or by means of
- infiltration or partial infiltration through stormwater

and there are special targets in terms of discharge balancing, stormwater retention facilities according to DWA-A 117 apply.

DWA-A 117

The DWA-A 117 worksheet regulates only dimensioning and proof of stormwater retention facilities, and it is applicable in the following fields:

- property drainage,
- in sewer systems
- prior to discharge into waterbodies.

Calculation method

To determine the required stormwater retention facility (RRR), two calculation methods can be applied:

- Dimensioning using statistical rainfall data (easy method)
- Verification using rainfall-runoff-simulation (long-term simulation)

For small, simply organised collection areas, calculation of stormwater retention facilities using an "easy method" is recommended.

Area of application

The "easy calculation method" can be chosen if the entire collection area up to the stormwater retention facility in question meets the following requirements:

- The sewaged capture area $A_{C,s}$ is ≤ 200 ha or the calculated flow time t_f is ≤ 15 minutes
- The permissible exceeding frequency of the RRR is ≥ 0.1/a, or the time of occurrence T_n ≤ 10 a
- The stormwater content of the vortex discharge rate is $q_{Vo,S,u}$ ≥ 2.0 l/(s · ha)

This means that, for instance, a flow time of half an hour is also possible, as long as the collection area $A_{C,k}$ is smaller than 200 ha. The same holds true the other way round.

Vortex outlet and the appropriate vortex selection

Uncontrolled vortexes, such as pipe vortexes, vortex valves or overflow structures, discharge relatively little water in the beginning of storage, and increasingly more as the basin is filled. According to the worksheet, for uncontrolled vortexes, the vortex outlet Q_{Th} shall apply as an arithmetic mean between the discharge at the beginning of storage and at full capacity. (For more information on vortex elements for discharge control, see page 104).

Frequent objectives of discharge balancing using retention facilities are

- Reduce surface and property runoff
- Save money on construction of drainage systems
- Connect development areas to existing drainage areas used to capacity
- Modernisation of overloaded sewer systems
- Protect waterbodies against hydraulic impact shock

Proof of overflow safety

See page 65

Determination of the volume with the easy method

Duration Rainfall duration [min. or h]	Load case for rain Rain yield factor r_N (n=0.2) [l/s ha]	Req. basin volume Req. V [m³]	Req. basin length Req. L [m]
5 min	459.01	107.39	18.40
10 min	338.21	153.90	26.37
15 min	267.75	177.58	30.42
20 min	221.59	190.24	32.59
30 min	**164.77**	**199.45**	**34.17**
45 min	119.00	195.38	33.47
60 min	93.13	182.27	31.23
90 min	64.91	145.39	24.91
2 h	49.81	102.56	17.57
3 h	34.00	10.37	1.78
4 h	25.81	-85.27	-14.61
6 h	17.41	-280.19	-48.00
9 h	11.71	-575.68	-98.63
12 h	8.81	-872.44	-149.47
18 h	5.90	-1,467.28	-251.38
24 h	4.43	-2,062.78	-353.41
48 h	2.22	-4,446.41	-761.79
72 h	1.48	-6,830.72	-1,170.28

Example of dimensioning printout RigoPlan professional dimensioning software FRÄNKISCHE

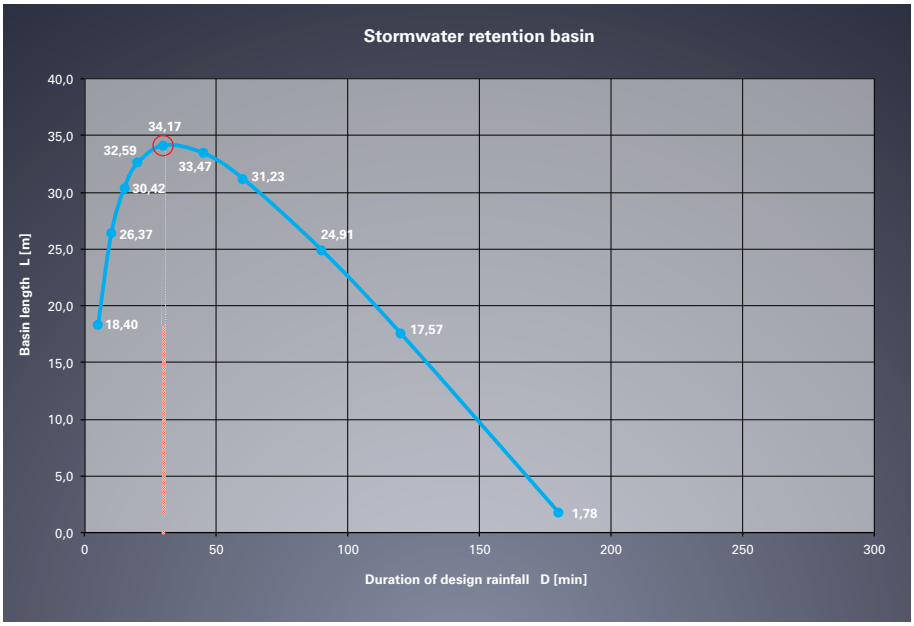


Diagram of the required basin lengths depending on duration of the load case for rain

Statistics of heavy rains

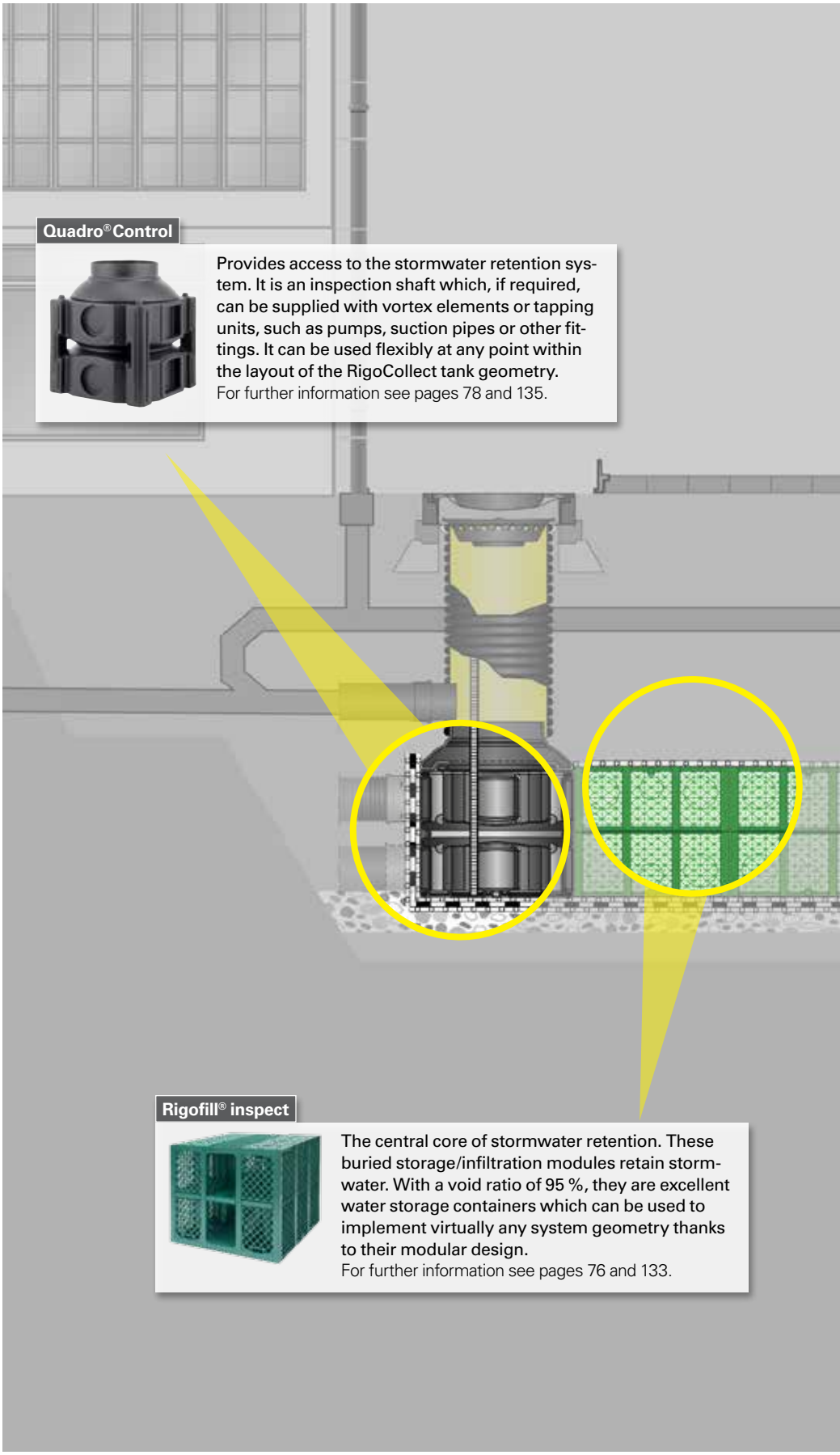
To calculate the decisive heavy rain volume, rainfall height and rain yield factors from the current KOSTRA atlas of the German Weather Service ("Coordinated local heavy rainfall analyses") must be used. The required specific storage volume $V_{s,u}$ results from the rain yield factor of the decisive duration D. For the repetitive determination of the volume, duration intervals, such as those in the heavy rainfall tables of the German Weather Service DWD, are sufficient.

Rigo® Collect stormwater retention

Stormwater retention with RigoCollect is a versatile, flexible alternative to conventional retention facilities. Short construction periods and immediate full loading capacity help to foster progress on site. The small tare volume of the storage element of some 5 % as well as its geometric flexibility help to adjust the required effective storage volume even in confined space, high ground water levels, etc.

For stormwater retention basins, shallow construction is often preferable in order to achieve discharge during gravity operation as well as to do without lifting systems. When using conventional types of basins, this shallow construction, particularly with concrete, can send prices skyrocketing. In this case, RigoCollect can boast all its principle-related advantages and provide the volume needed in a thrifty way, since, due to significantly lower component thickness, greater storage volume is available per m³ of the reconstructed space.

All necessary components, such as pumps, gate valves, throttles, filters, etc. are factory-provided, which makes RigoCollect a complete system with all the components, including installation, warranty and services from one source.



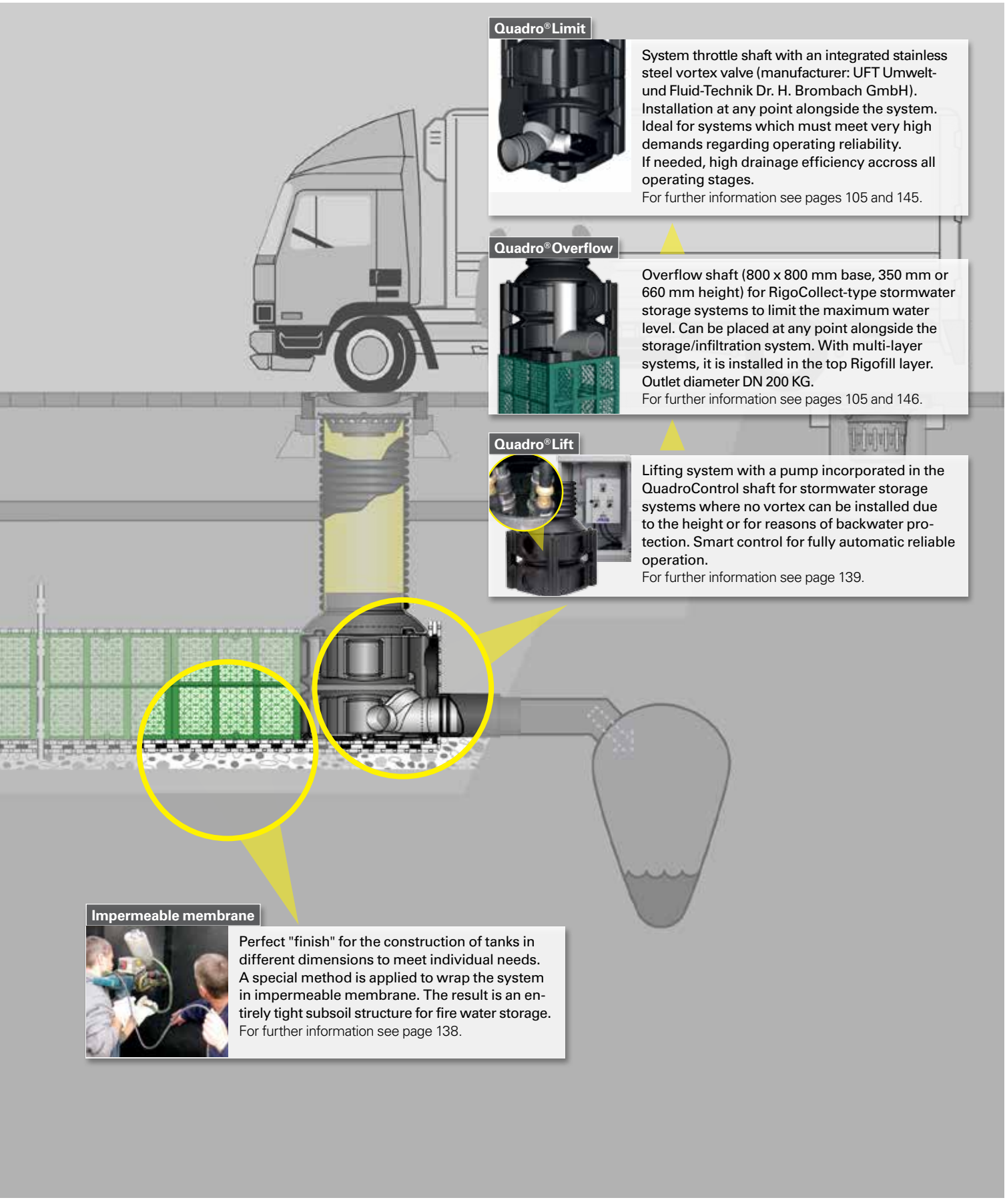
Quadro® Control

Provides access to the stormwater retention system. It is an inspection shaft which, if required, can be supplied with vortex elements or tapping units, such as pumps, suction pipes or other fittings. It can be used flexibly at any point within the layout of the RigoCollect tank geometry.
For further information see pages 78 and 135.

Rigofill® inspect

The central core of stormwater retention. These buried storage/infiltration modules retain stormwater. With a void ratio of 95 %, they are excellent water storage containers which can be used to implement virtually any system geometry thanks to their modular design.
For further information see pages 76 and 133.

for controlled management of heavy rains!



Quadro® Limit

System throttle shaft with an integrated stainless steel vortex valve (manufacturer: UFT Umwelt- und Fluid-Technik Dr. H. Brombach GmbH). Installation at any point alongside the system. Ideal for systems which must meet very high demands regarding operating reliability. If needed, high drainage efficiency accross all operating stages.
For further information see pages 105 and 145.

Quadro® Overflow

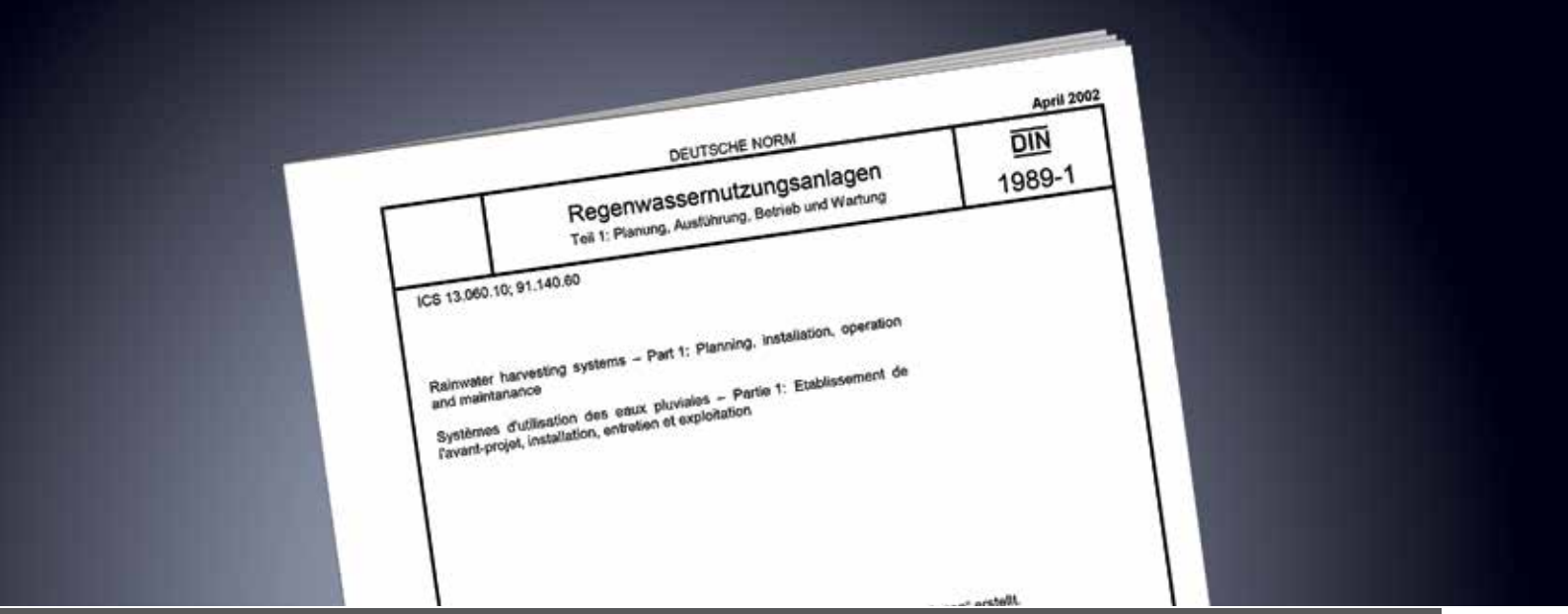
Overflow shaft (800 x 800 mm base, 350 mm or 660 mm height) for RigoCollect-type stormwater storage systems to limit the maximum water level. Can be placed at any point alongside the storage/infiltration system. With multi-layer systems, it is installed in the top Rigofill layer. Outlet diameter DN 200 KG.
For further information see pages 105 and 146.

Quadro® Lift

Lifting system with a pump incorporated in the QuadroControl shaft for stormwater storage systems where no vortex can be installed due to the height or for reasons of backwater protection. Smart control for fully automatic reliable operation.
For further information see page 139.

Impermeable membrane

Perfect "finish" for the construction of tanks in different dimensions to meet individual needs. A special method is applied to wrap the system in impermeable membrane. The result is an entirely tight subsoil structure for fire water storage.
For further information see page 138.



Designing and dimensioning stormwater harvesting systems

Water quality and hygiene

Modern stormwater harvesting systems constantly provide water in conformity with the European Bathing Water Directive. When applied properly, health risks can be ruled out.

Stormwater is technically purer than tap water and it suits better a lot of applications with higher demands on water quality (e.g. cooling, cleaning and process water). It is ideal for e.g. cleaning or evaporative cooling due to its low hardness and low conductivity. No lime - no lime-related problems! The need for preparatory measures, which are normally required for tap water, is removed. The phosphate content, which often causes problems in drinking water cycles, e.g. algae and biofilm development, is practically non-existent. Adding biocides can be reduced significantly and elutriation cycles, in their turn, made longer. Operational maintenance can be reduced considerably.

When designed and implemented properly, a lot of projects can be supplied with high-quality water, especially pure and ultra-pure water, using stormwater in an extremely economical way and without much effort. Substantial contribution to environmental protection and discharge relief is provided into the bargain.

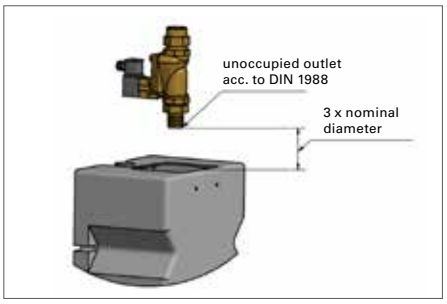
Along with typical conventional applications, such as irrigation of greens and use in toilets, the use of stormwater for cooling towers, car wash or as industrial process water has proven its worth in lots of instances.

Parameter	Unit	Quantity of samples	Division	TWV 2000
Oxidisability	Mg/l	> 50	0.5 – 8.4	5
Conductivity	µS/cm	> 60	29 – 103	2,500
pH		> 100	5.2 – 11.4	6.5 – 9.5
COD	Mg/l	> 20	4.3 – 34	
Sulphate	Mg/l	> 20	1.4 – 20	240
Ammonium	Mg/l	> 60	< 0.03 – 0.3	0.5
Nitrite	Mg/l	> 60	< 0.1 – 0.3	0.5
Nitrate	Mg/l	> 60	1.3 – 6.1	50
Iron	Mg/l	> 20	< 0,05 – 0,6	0.2
Manganese	Mg/l	> 20	< 0.02 (LOD) – 0.06	0.05
Copper	Mg/l	> 100	0.06 – 0.86	2
Lead	µg/l	> 100	6 – 20	10
Arsenic	µg/l	> 30	1 (LOD)	10
Cadmium	µg/l	> 20	0.5 (LOD)	5
Chromium	µg/l	> 20	5 (LOD)	50
Nickel	µg/l	> 20	< 5 (LOD)	20
Mercury	µg/l	> 20	< 0.05 (LOD)	1
PAL	µg/l	> 20	< 0.05 (LOD)	0.1
Pesticide	µg/l	6	< 0.1 (LOD)	0.5

Comparison of quality of water from stormwater tanks in operation and the limit values according to the Drinking Water Ordinance. [abbreviated version from: *Reinhardt Holländer in Wasser und Abfall, 7-8/2002*]

DIN 1988 and DIN EN 1717

Both standards are meant to protect drinking water. Among other things, they control the interface between drinking and non-drinking water systems. This also applies to drinking water feeding in stormwater harvesting systems. As an interface, only an unoccupied outlet is permissible, with drinking water covering a defined fall distance through the air in order to avoid recontamination. Check valves, pipe separators and similar devices do not fulfil these requirements! The branch pipe from the drinking water system to the free outlet shall be flushed cyclically in order to avoid stagnation and possible subsequent germ formation.



Drinking water feeding with an unoccupied outlet acc. to DIN 1988

DIN 1989

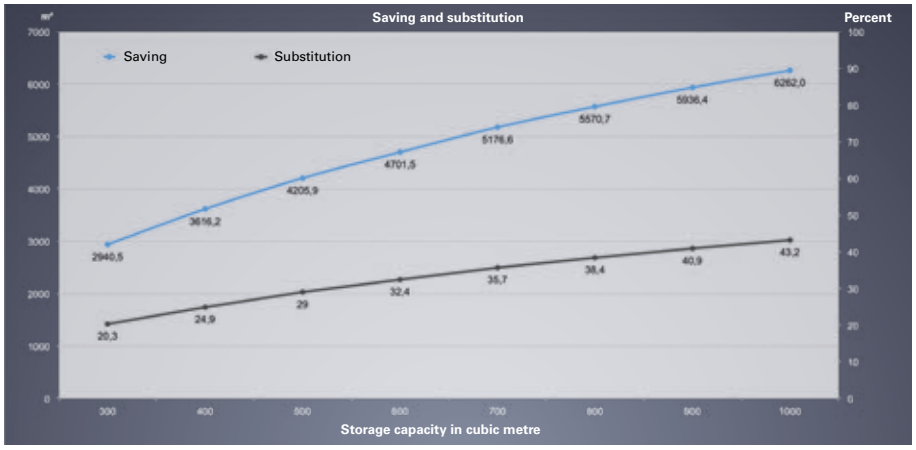
DIN 1989 applies to stormwater harvesting systems. It governs design, realisation, operation and maintenance (part 1), as well as system components such as filter (part 2), storage (part 3), and control and feeding units (part 4). DIN 1989 recommends to use a simulation-based calculation providing a realistic evaluation of annual savings of drinking water, depending on storage volume, on the basis of region-specific rainfall data and estimated consumption in terms of dimensioning stormwater storage tanks. The standard provides for a lot of variants for technical equipment, such as filters, pumps or other components, and a careful choice must be made to fit numerous applications.

Stormwater harvesting control units, combining in-house components (pressure increase, control, drinking water feeding) in one single unit, have become widespread. This helps to reduce installation time on site and the likelihood of errors into the bargain.

Adherence to the relevant standards and guidelines of drinking water protection is ensured by the manufacturer. If necessary, the stormwater harvesting control unit can carry out extensive monitoring and, for instance, check if the filter installed in the storage element needs to be cleaned.

Calculation method

A computer-aided storage layout can simulate stormwater harvesting operations with various sizes of tanks with the help of a ten-year rainfall series, which is exact to a day. It depicts annual savings of drinking water on the basis of which the optimal storage volume can be selected. Using local rainfall data is of particular importance, since rainfall in Germany varies considerably in duration, frequency and intensity.



Result of a storage simulation for an industrial application.

Design support

As part of design support, FRÄNKISCHE and ARIS provide comprehensive support in dimensioning and designing fire water storage and supply systems. Simply contact us with the outline of your project. To do so, an ARIS planning sheet is provided (simply scan the QR code), with the help of which we will collect all the relevant information to provide an optimal customised solution.

Rigo® Collect stormwater harvesting

RigoCollect water storage tanks are perfectly suited for stormwater harvesting as well. No matter if big or small, stretched, shallow or round the corner - the modular design makes installation easy even under difficult conditions.

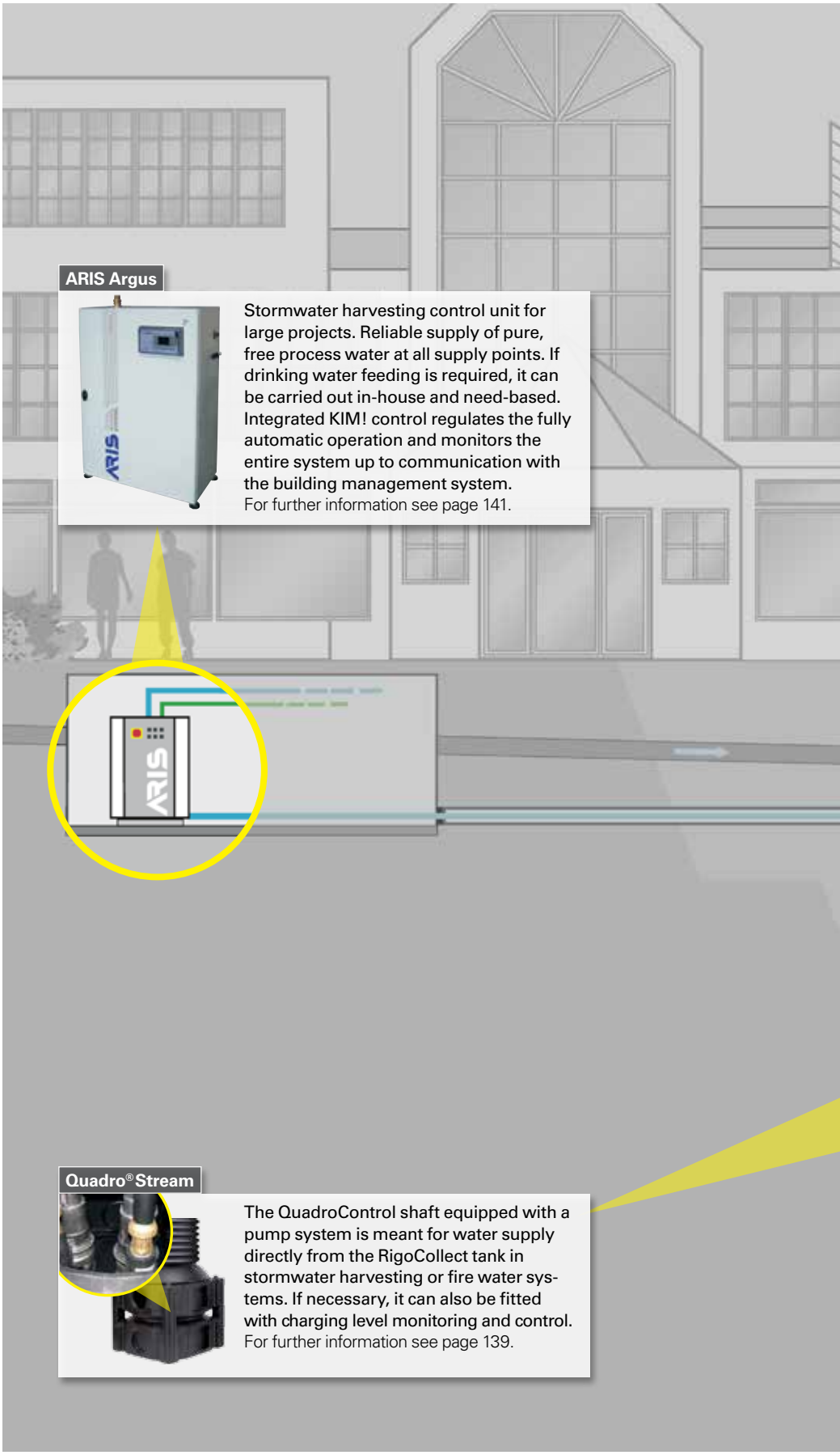
Storage system components, such as filters and charging pumps, are factory-integrated. But there is more than that: the stormwater harvesting control unit is also part of the overall package. Everything fits together and both greatest operating reliability and least maintenance effort can be taken for granted.

RigoCollect is part of a complete system with all the components, including installation, warranty and services from a single source.

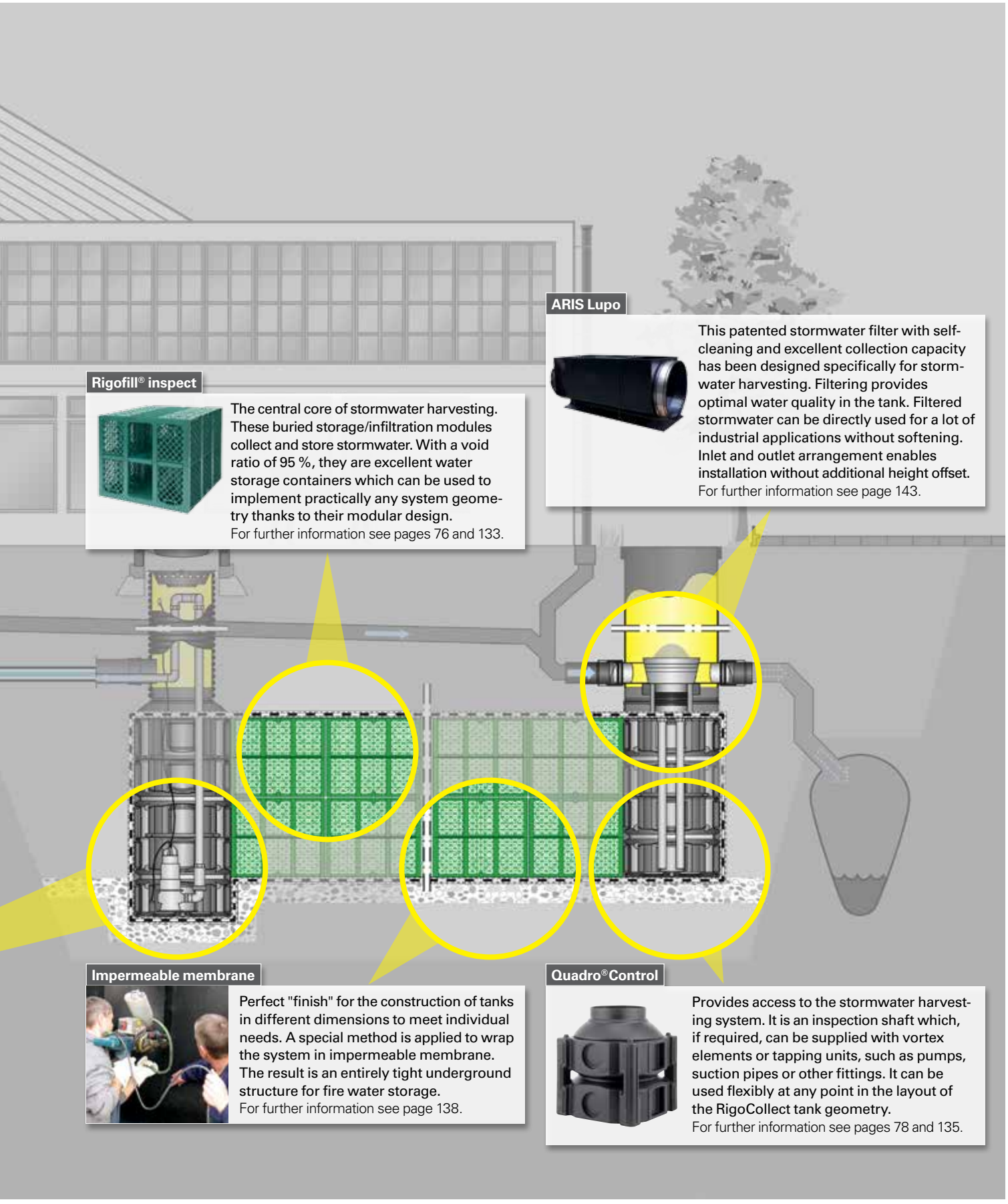
No matter if used in toilets or washing machines in multi-family dwellings, adiabatic air cooling or toilets in schools or administrative buildings, cooling towers or treatment facilities in industrial plants - stormwater used for these applications is a resource sent from up above for free!

Stormwater collected in high-quality structures is perfectly suited for use in

- washing machines
- cooling tower operation
- extract-air cooling units
- livestock drinking troughs
- workpiece cleaning
- car washes
- process water for the chemical industry
- toilets
- gardening and landscaping



Free water for a lot of applications



Rigofill® inspect

The central core of stormwater harvesting. These buried storage/infiltration modules collect and store stormwater. With a void ratio of 95 %, they are excellent water storage containers which can be used to implement practically any system geometry thanks to their modular design.
For further information see pages 76 and 133.

ARIS Lupo

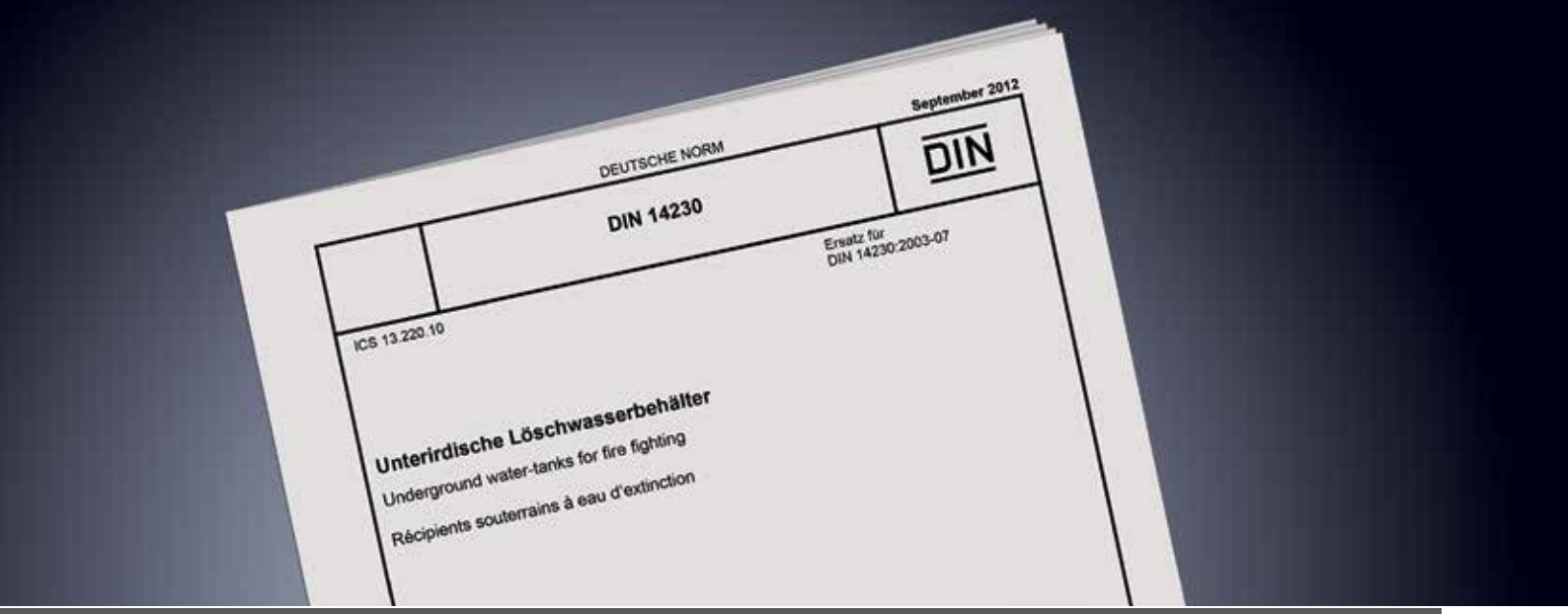
This patented stormwater filter with self-cleaning and excellent collection capacity has been designed specifically for stormwater harvesting. Filtering provides optimal water quality in the tank. Filtered stormwater can be directly used for a lot of industrial applications without softening. Inlet and outlet arrangement enables installation without additional height offset.
For further information see page 143.

Impermeable membrane

Perfect "finish" for the construction of tanks in different dimensions to meet individual needs. A special method is applied to wrap the system in impermeable membrane. The result is an entirely tight underground structure for fire water storage.
For further information see page 138.

Quadro® Control

Provides access to the stormwater harvesting system. It is an inspection shaft which, if required, can be supplied with vortex elements or tapping units, such as pumps, suction pipes or other fittings. It can be used flexibly at any point in the layout of the RigoCollect tank geometry.
For further information see pages 78 and 135.



Designing and dimensioning fire water tanks

In many cases, storage tanks are needed to secure fire fighting water supply. The extensive modernisation of the drinking water supply all over Germany and frequent reductions in the network is why fire water tanks are increasingly being required also in existing buildings for which supply from the public system was sufficient in the past. The demands regarding construction effort, time for installation and limiting operational factors during construction are particularly high in these cases. Just the right situation for a quick, flexible and modular system which adapts perfectly to any boundary conditions. The size of a fire water tank is determined by each project-specific situation.
First of all, it must be determined if the supply can be partially covered by the public system. Should this be the case, the size of the tank can be reduced by the amount stated in the cover note issued by the water supplier, multiplied by the required fire fighting duration. In the case of full supply from the fire water tank, this tank must be designed considering the entire fire fighting water demand.

DIN 14230

DIN 14230 governs the design of fire water tanks to supply hydrants and to be used by fire brigades.

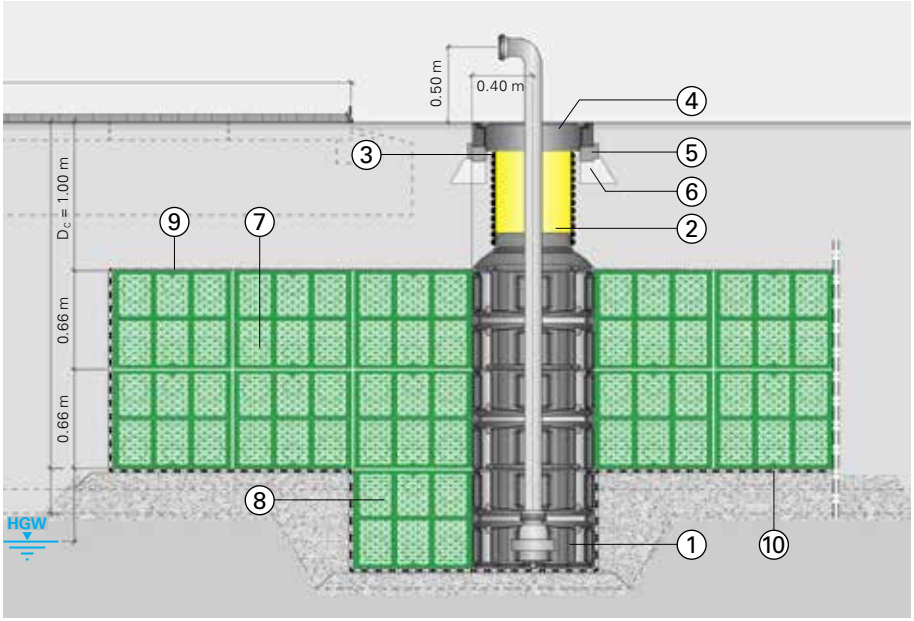
Key facts:

- The fire water tank must be designed such that the entire volume can be inspected and cleaned.
- There must be an air buffer of at least 100 mm between the water level and the top edge of the tank.
- The materials used must be water- and weather-resistant.
- The fire fighting water supply must remain ice-free at all times.
- Each newly installed fire water tank must be approved by authorities and institutes in charge.

In addition, the number and type of tapping units must be determined depending on the project situation and in coordination with the approving authority.

Category	Flow rate at minimum flow pressure [l/min]	Simultaneity	Minimum flow pressure [MPa]	Max. flow pressure [MPa]	Max. resting pressure [MPa]
Wall hydrant type S (self-protection)	24	2	0.20	0.8	1.2
Wall hydrant type F (fire fighting)	100	3	0.30		
	200	3	0.45		
Pillar hydrant DN 80	800	acc. to fire protection concept	0.15		
Pillar hydrant DN 100	1,600				
Underground hydrant DN 80	800				
Fire fighting water tapping "dry"	If water flow pressure is at least 200 l/min. at three tapping points at the same time, the pressure difference between fire fighting water feeding and the least favourable tapping point shall not exceed 0.1 MPa + geodetic height.				

Table for determining the fire fighting water volume – extract from DIN 14462 "Table 2 - Required flow rates and pressures for tapping fittings" (*"Tabelle 2 – Geforderte Durchflussmengen und Drücke an der Entnahmearmatur"*)



DIN 14230-compliant RigoCollect fire water tank with a suction point and tapping sump

Caption

1. Tapping shaft with integrated suction point
2. Extension pipe D_O 600
3. DOM sealing ring
4. Shaft cover (cover 2-piece)
5. Support ring acc. to DIN 4034, Part 1 (to be supplied on site)
6. Bearing free from stationary loads, to be supplied on site
7. Rigofill inspect 2-layer
8. Rigofill inspect 3-layer
9. RigoFlor
10. Impermeable foil

VdS-CEA 4001

Design and dimensions of sprinkler reservoirs must be agreed on with the approving authority beforehand. Sprinkler reservoirs are normally required by fire insurance and are a precondition for lower insurance rates. This rate only applies if the system is constructed in compliance with certain guidelines. The VdS-CEA 4001 directive, issued by the Insurance Association (VdS), often forms the basis. In addition to calculating the required storage volume, it also defines the type and design of the tapping units. In addition, charging level monitoring is required as well as a refeeding system capable of filling an entire tank within a maximum of 36 hours.

Reservoirs are subject to individual acceptance; type approval or similar procedures do not apply. Special designs can be implemented in agreement with VdS. Directives for RigoCollect have already been prepared. With their help, sprinkler reservoirs can be designed and constructed such that there is no impediment to VdS approval.

Sprinkler in action

Design support

As part of design support, FRÄNKISCHE and ARIS provide comprehensive support in dimensioning and designing fire water storage and supply systems. Simply contact us with the outline of your project.

To do so, an ARIS planning sheet is provided (simply scan the QR code), with the help of which we will collect all the relevant information to provide an optimal customised solution.

Rigo® Collect fire water storage

The flexibility of RigoCollect is of particular advantage for fire water storage. No matter if the tank must have a shallow design due to high groundwater level; tapping at different points on the property needs to be facilitated using a stretched tank, or, when constructing in the existing stock, just a small part of the parking lot with the buried tank shall be open in order not to interrupt the operation of the building:

All that can be easily done using RigoCollect.

Greatest safety has a top priority for fire protection. The everything-from-a-single-source principle makes sure that everything fits together, and a smooth acceptance process and operation of the entire system can be taken for granted. Suction points, pumps and separator stations have been designed to meet project-specific needs.

The top quality of sealing with the impermeable membrane approved by the German Institute for Building Technology (*Deutsches Institut für Bautechnik (DIBt)*), as well as installation by experts certified and monitored by the German Groundwater Protection Association (*Arbeitskreis Grundwasserschutz (AKGWS)*) ensure long-term leak-tightness of the tank. Plastic is an ideal material for reliable long-term storage of fire water, since it is corrosion-free and ageing resistant.

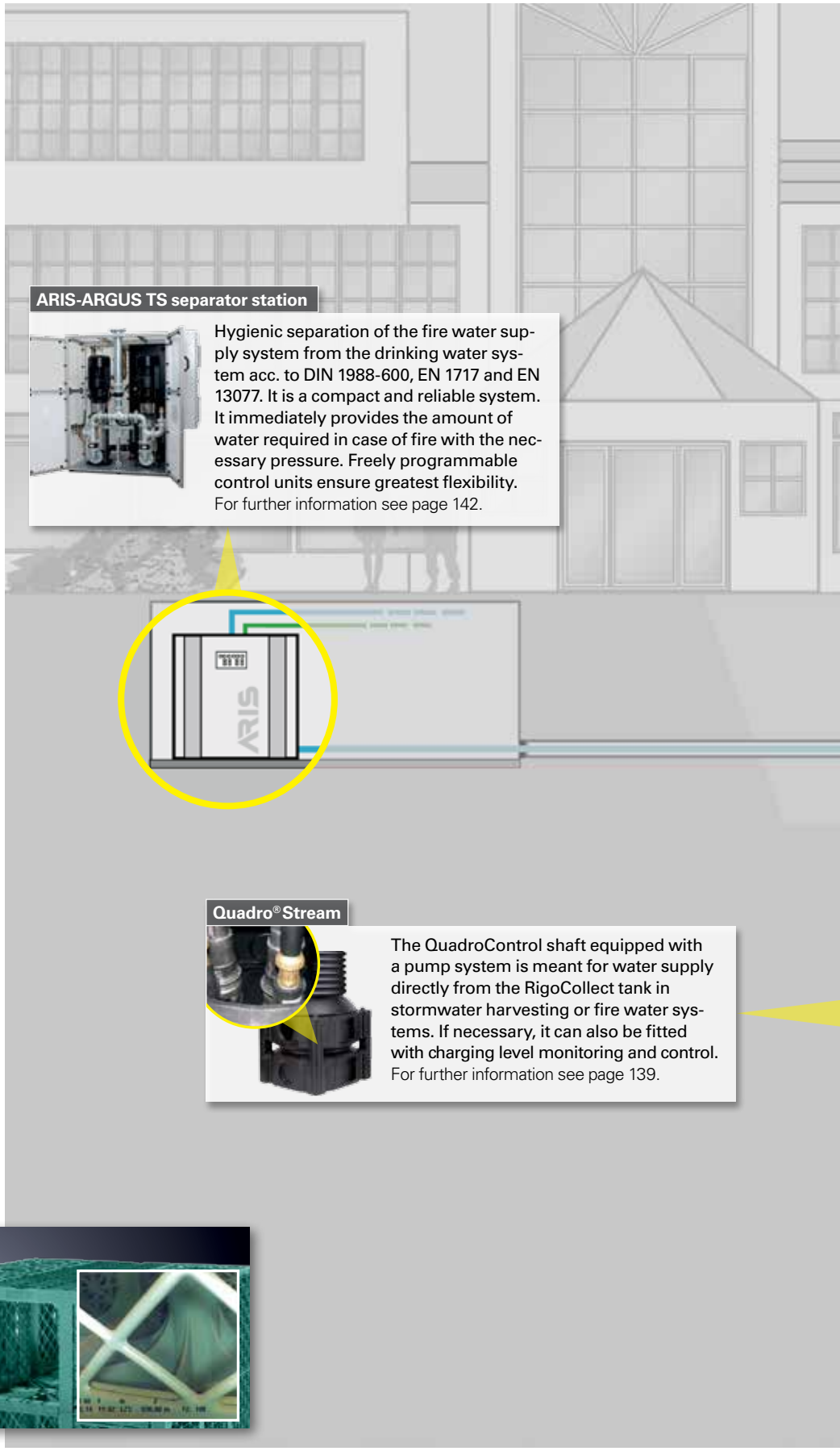
Extra benefit: RigoCollect tanks can be inspected using regular inspection cameras when filled! This makes inspection inexpensive and less complex. The reliability of supply always remains the same.

can be adopted by VdS

Complies with DIN 14230 (2012)!

RigoCollect – ideal inspectability when filled!

Proven by IBAK



ARIS-ARGUS TS separator station

Hygienic separation of the fire water supply system from the drinking water system acc. to DIN 1988-600, EN 1717 and EN 13077. It is a compact and reliable system. It immediately provides the amount of water required in case of fire with the necessary pressure. Freely programmable control units ensure greatest flexibility.
For further information see page 142.

Quadro® Stream

The QuadroControl shaft equipped with a pump system is meant for water supply directly from the RigoCollect tank in stormwater harvesting or fire water systems. If necessary, it can also be fitted with charging level monitoring and control.
For further information see page 139.

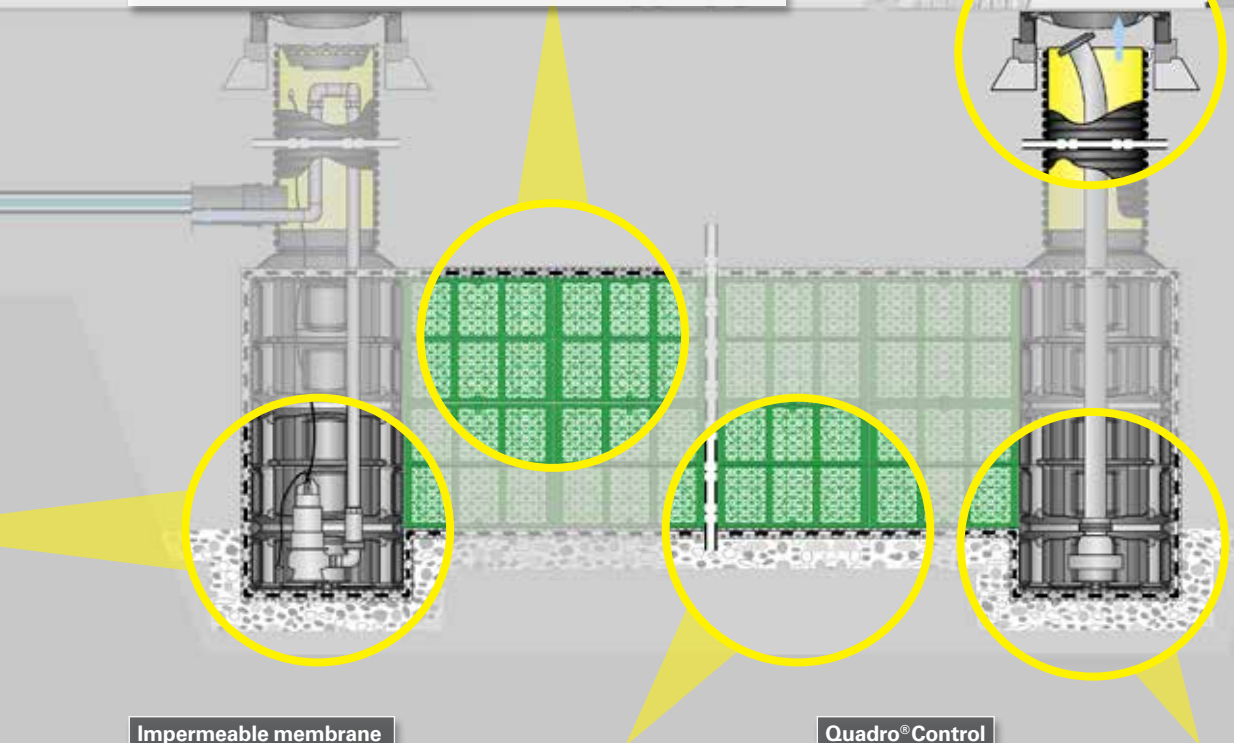
Safety to rely on!

Suction point

Complies with the provisions of DIN 14230 for fire water tapping by the fire service. Use of pillar and underground designs acc. to DIN 14244. If necessary, additional e.g. manually operated or automated gate valves can be added at any time.
For further information see page 140.

Rigofill® inspect

The central core of fire water storage. These buried storage/infiltration modules store fire water. With a void ratio of 95 %, they are excellent water storage containers which can be used to implement practically any system geometry thanks to their modular design.
For further information see pages 76 and 133.



Impermeable membrane

Perfect "finish" for the construction of tanks in different dimensions to meet individual needs. A special method is applied to wrap the system in impermeable membrane. The result is an entirely tight underground structure for fire water storage.
For further information see page 138.

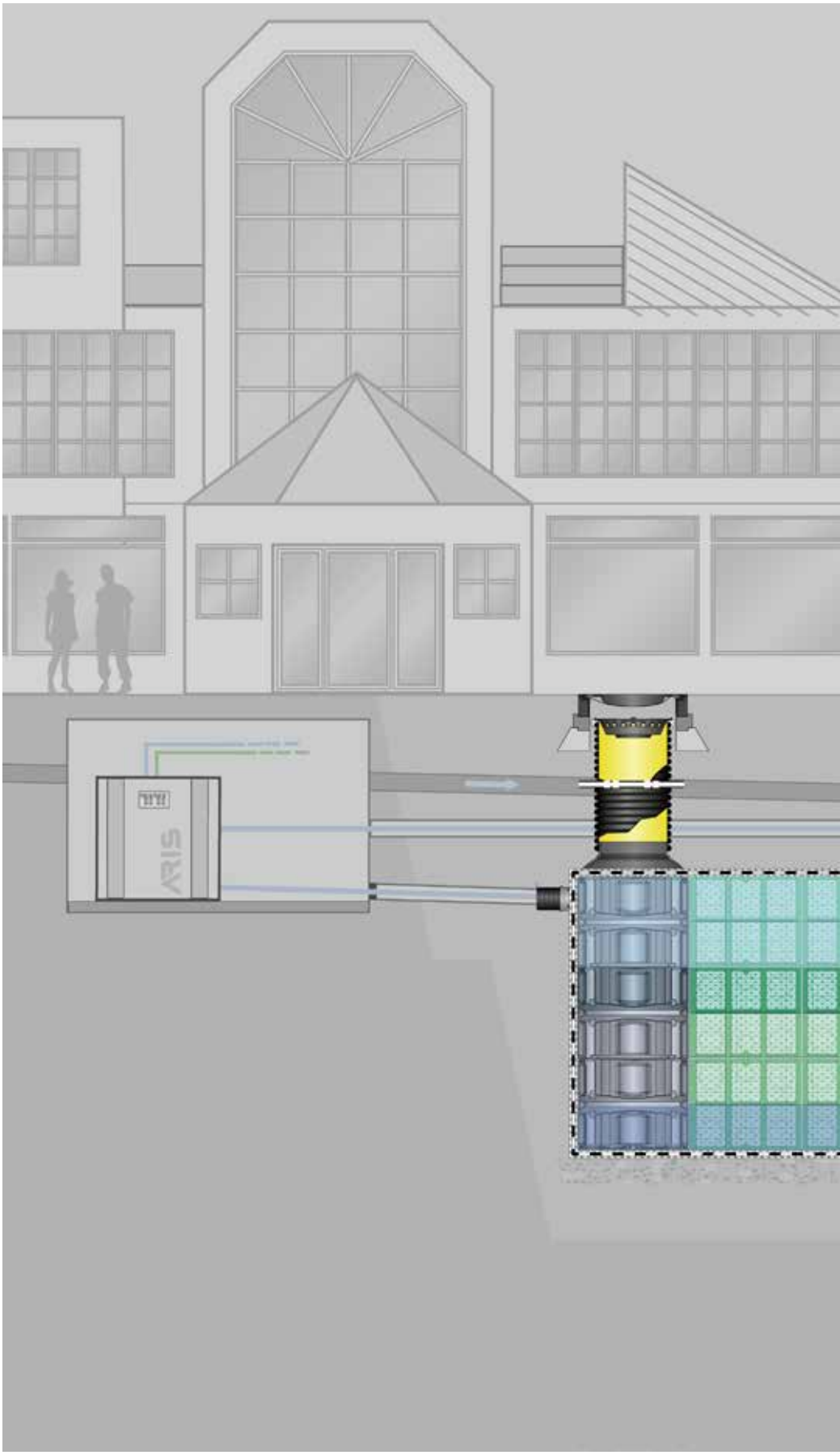
Quadro® Control

Provides access to the fire water storage system. It is an inspection shaft which, if required, can be supplied with vortex elements or tapping units, such as pumps, suction pipes or other fittings. It can be used flexibly at any point in the layout of the RigoCollect tank geometry.
For further information see pages 78 and 135.

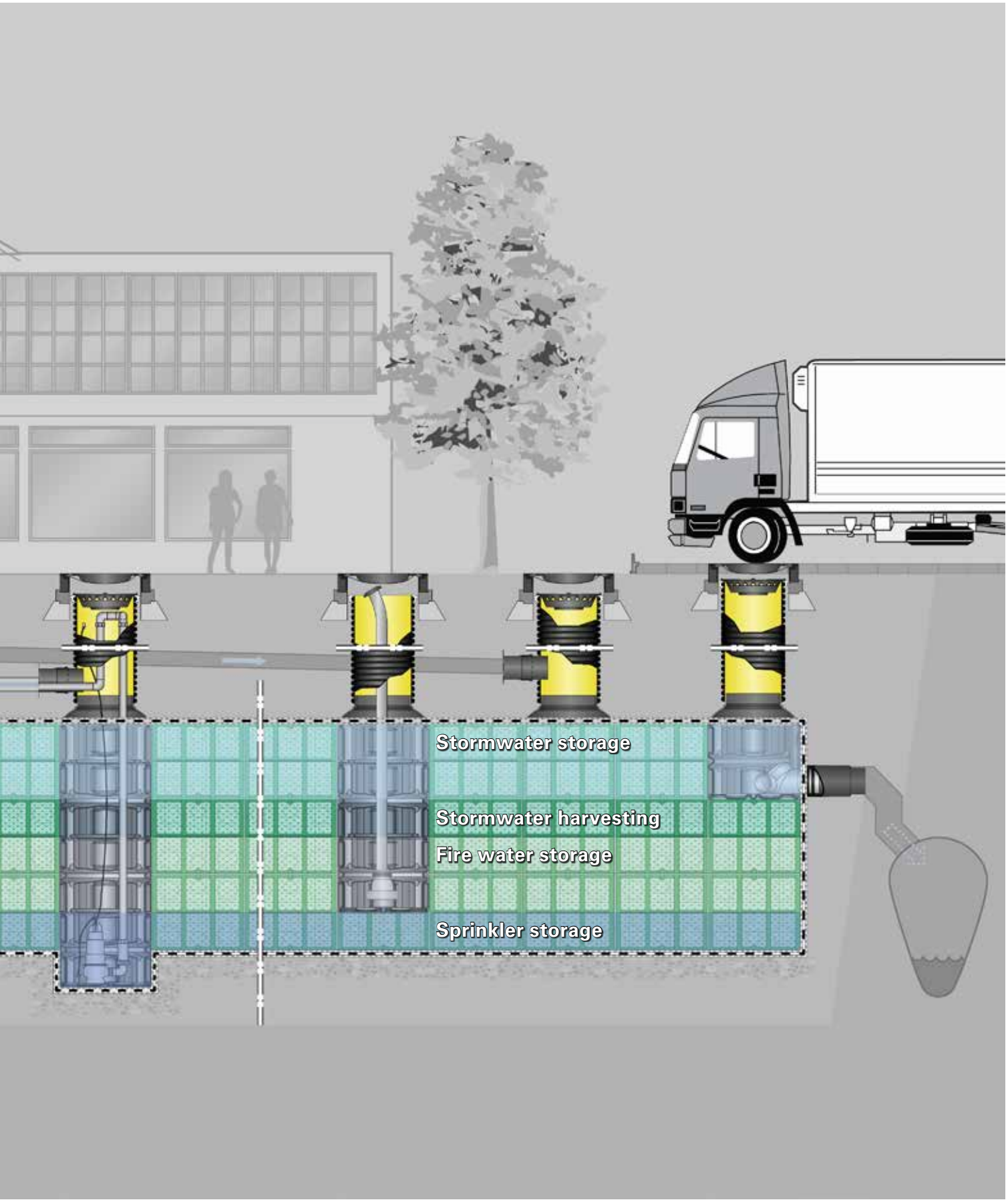
Fire water storage, stormwater harvesting and ...

Benefits in detail

- An all-in-one system saves money and space compared to individual structures.
- Maintenance and operation are less expensive.
- Systems used for fire water only are costly, since they are useful only in the event of fire, which will hopefully never occur. It is the combination with stormwater harvesting that saves money during normal operation!
- Continuous operation of the system improves operational reliability and reduces maintenance costs.
- A stormwater storage system installed in the upper part of a large storage tank allows for a very shallow design. This can facilitate the connection to the pipe under difficult conditions!



... stormwater storage – combination of benefits!



Flexibility

A lot of things happened over the last few years: Stormwater management evolved into a separate economic-environmental discipline for engineering offices. Paradigmas are shifting. But do we all think far enough ahead?

Stormwater, that is discharged through sewer systems into wastewater treatment systems, is removed from the natural water cycle for the period of treatment, especially from the area “where it is all happening”. As a result, small local streams and rivers do no longer carry enough water. With the help of decentralised systems, stormwater can, for instance, be stored locally in storage/infiltration systems to infiltrate with some time delay. If this is not possible, smart additional components must take over throttled discharge. So, the focus is on an individual case, which really is thinking ahead. Sports facilities, supermarket parking lots, new housing estates - the devil is in the detail. For there are practically no standard solutions in terms of drainage, it is rather a matter of experience coupled with the smartest system components. We bring both together as good as we can.

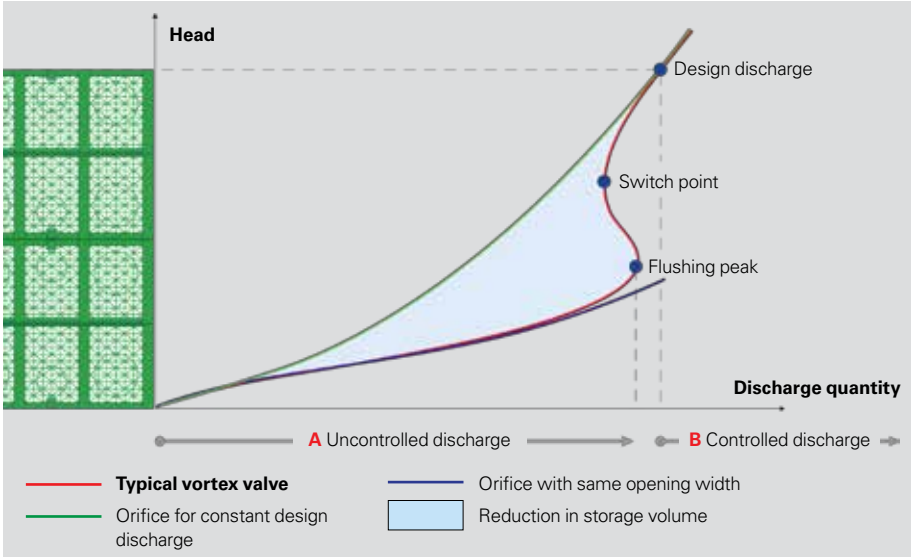
Designing controlled discharge

Discharge control/throttling with a vortex valve

The vortex valve

Compared to an orifice, a vortex valve generates a relatively constant discharge, irrespective of the water level in the storage/infiltration system. This ensures that the storage/infiltration system empties within the shortest time possible and is available again for the next rainfall event. Due to the cross-sectional geometry of the relatively large outlet opening, blockages can practically be ruled out.

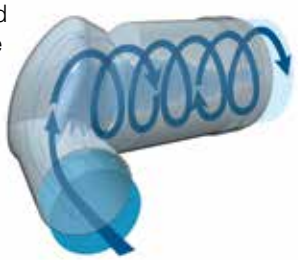
Operating principle



A Uncontrolled discharge

The large cross-sectional geometry of the outlet opening ensures a quick discharge up to the design discharge

B Controlled discharge



The vortex which starts in case of rising water levels ensures a nearly constant discharge

Clear advantages of vortex valves

- High drain efficiency across all operating stages
- High operating reliability thanks to large outlet opening – no risk of blockages
- Reduction in discharge time – system volume is available for the next rainfall event
- Self-cleaning through flushing peak effect (see discharge characteristic curve)
- Pressure cleaning possible
- Minimisation of required storage volume
- Self-activating and solely hydraulically controlled – no external power supply
- No moveable parts – no wear and tear
- In stainless steel design – robust, durable and chemically resistant
- Bottom-aligned installation possible – no height loss
- Easy installation – shaft as a component with integrated vortex valve completely pre-fabricated and ready to be installed

Quadro® Limit and Quadro® Overflow – system shafts with cellular block type structure

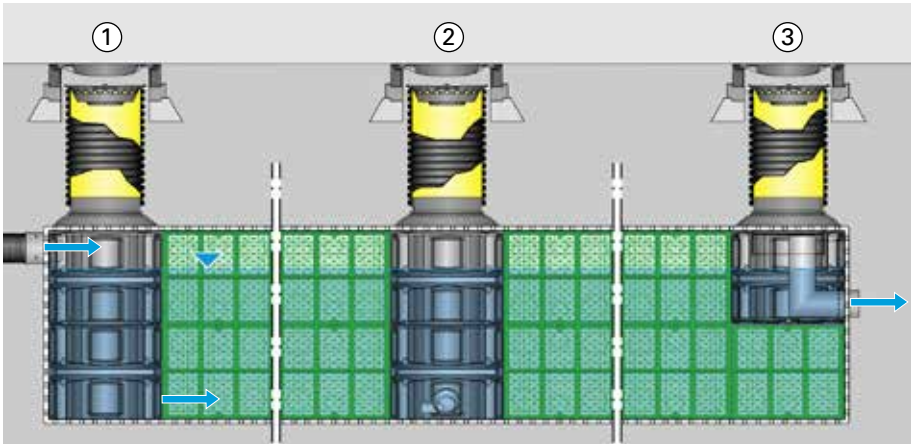
The turbo for the storage/ infiltration system

QuadroLimit combines the benefits of the QuadroControl system shaft with the advantages of proven stainless steel vortex valves (manufacturer: **UFT Umwelt- und Fluid-Technik Dr. H. Brombach GmbH**). QuadroLimit is manufactured and dimensioned according to each project's needs.

Modular solution for the layout

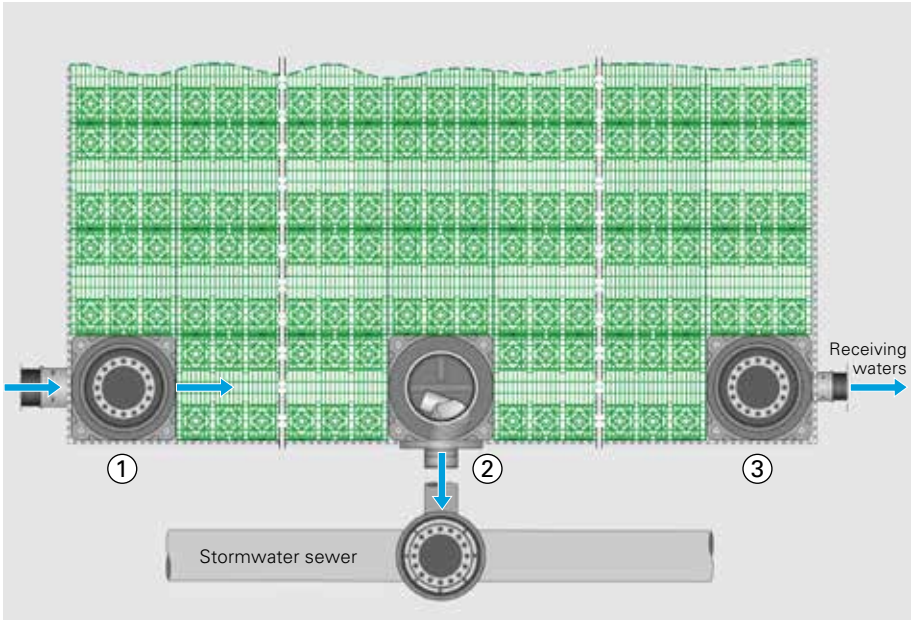
The ready-to-be-installed shaft can be easily incorporated at any point alongside the storage/infiltration system. No separate structure is required downstream the storage/infiltration system. If necessary, an integrated emergency overflow may be installed to limit the water head (QuadroOverflow).

QuadroLimit



Example, section

QuadroOverflow



Example, plan

Caption

① QuadroControl 2 (= 2-layer), inlet DN 200 at the top of the shaft body

② QuadroLimit 2 (= 2-layer)

③ Optionally: QuadroOverflow

→ Inlet/outlet

AquaLimit – throttle shaft not only for storage/infiltration systems

AquaLimit is a polypropylene (PP) ready-to-connect throttle shaft D_0 600 that is suitable for many applications and features an integrated stainless steel vortex valve manufactured by **UFT Umwelt- und Fluid-Technik Dr. Brombach GmbH**. AquaLimit combines a strong discharge performance with highest operational reliability. No movable parts are required when using vortex valves which guarantees minimised maintenance. The removable valve can be maintained and subsequently adjusted in the vortex outlet. Stormwater storage systems discharge quickly but at the same time in a controlled manner that does not harm the point of discharge. Therefore, the entire storage volume is quickly available for the next rainfall event.

NB

AquaLimit is manufactured and dimensioned according to each project's needs.

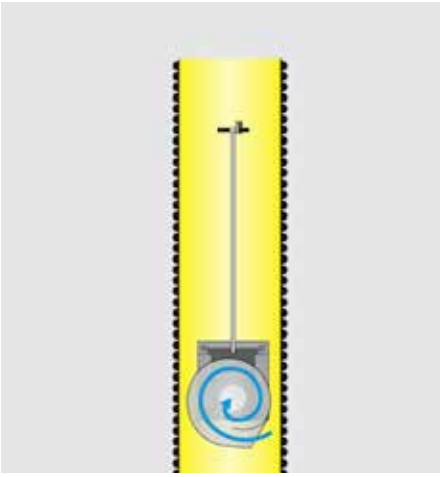
System benefits

Easy installation:

- Delivered ready-to-connect
- Install throttle shaft into the drainage system – done!
- Particularly efficient and convenient handling during installation as compared to conventional reinforced concrete shafts

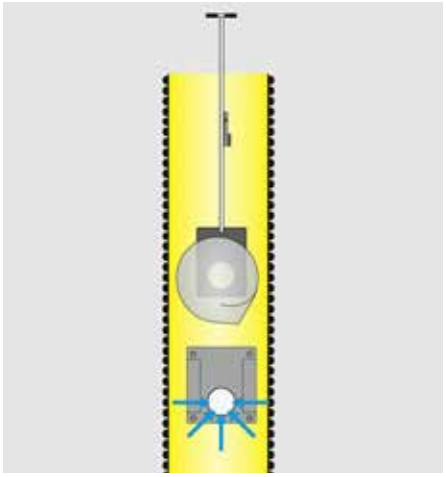
Operational requirements are fulfilled without requiring access to the shaft:

- Valve can be removed and re-inserted
- Emergency emptying of the tank possible
- Cleaning of the valve from aboveground without accessing the shaft
- Subsequent adjustment of the vortex outlet possible



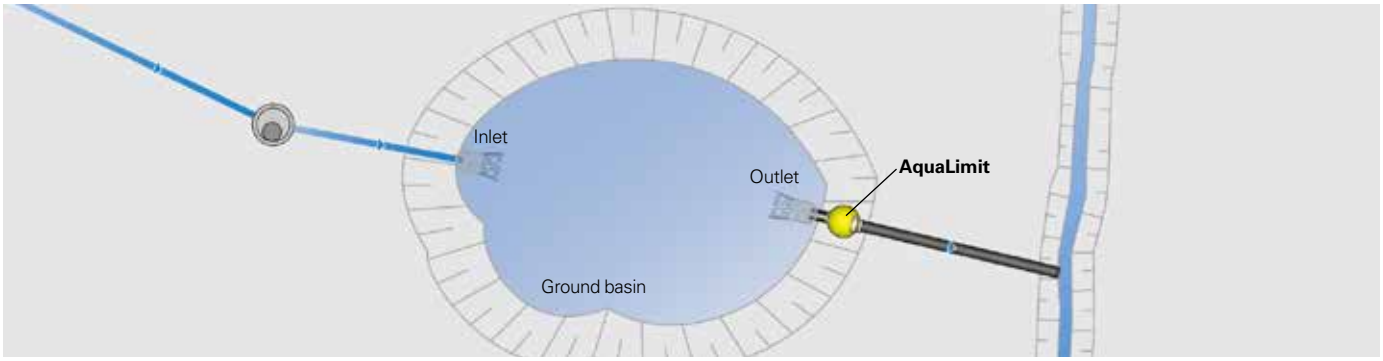
Control state: vortex effect

Particularly efficient operation thanks to lifting bars for on-site assembly and disassembly. The vortex valve can be removed and re-inserted at any time for maintenance or emergency emptying.



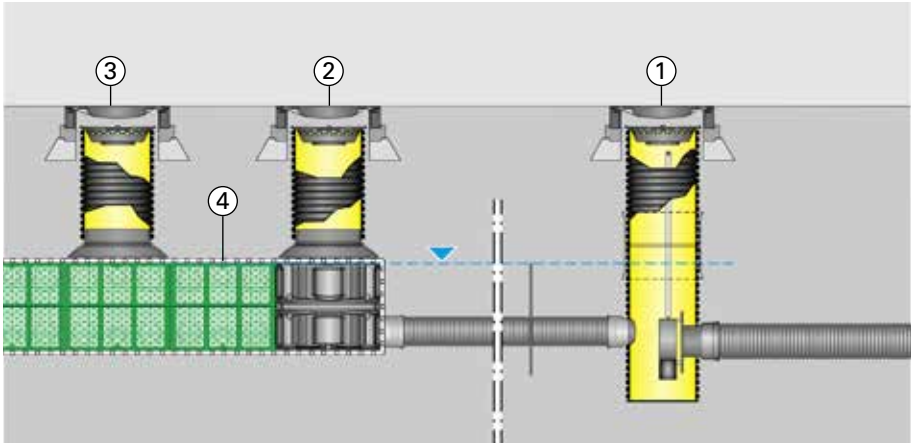
Valve removed: tank emptying, valve maintenance

Storage tank with AquaLimit

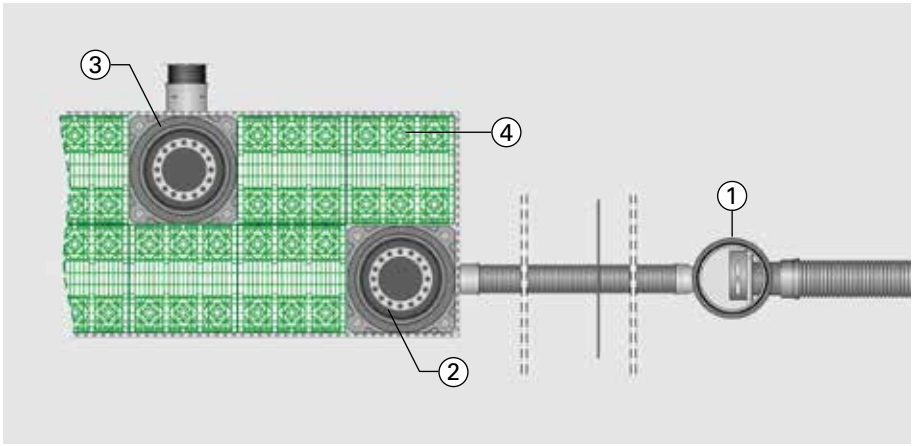


AquaLimit in ground basins

Storage/infiltration system with AquaLimit



Example, section



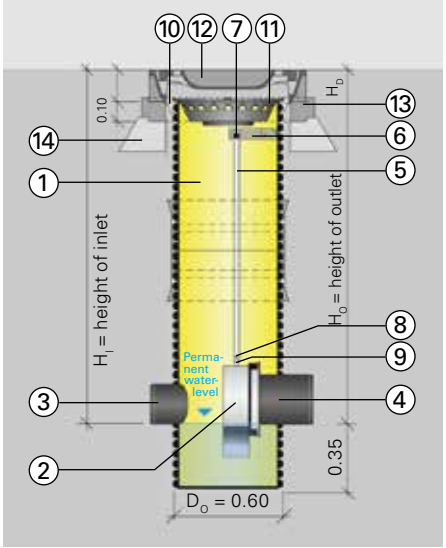
Example, plan

Storage/infiltration modules store stormwater and discharge it later. For storage/infiltration systems where no or only incomplete infiltration is possible, a vortex element normally controls discharge.

Caption

① **AquaLimit** throttle shaft D_O= 600
② **QuadroControl**
with outlet at the shaft bottom
③ Optionally: **QuadroOverflow**
emergency overflow shaft
④ **Rigofill inspect** –
storage/infiltration system
example: single-layer

Structure



① AquaLimit base shaft
② Vertical stainless steel vortex valve
③ Inlet DN 200 or DN 250
④ Outlet DN 250
⑤ Stainless steel lifting bar
⑥ Lifting bar fixture
⑦ Lifting bar handle
⑧ Connection of lifting bar with throttle valve (screw and self-locking nut)
⑨ Cuff at the valve crown
⑩ DOM sealing ring
(optional accessory)
⑪ Sediment trap, large
(optional accessory)
⑫ Shaft cover CW 610
(to be supplied on site)
⑬ Concrete support ring h=100 mm
(to be supplied on site)
⑭ Bearing free from stationary loads
(to be supplied on site)

RigoLimit V – throttle shaft

NEW

The shaft as a vortex body

RigoLimit V is the first plastic throttle shaft to generate the proven vortex flow in the shaft. The shaft and the throttle form a unit; built-in throttle elements are no longer needed.

The shaft boasts a straightforward and robust design. The innovative interior allows discharge quantities to be adapted to perfectly meet local requirements. With this state-of-the-art technology, RigoLimit V achieves uninterrupted operation with maximum flexibility. By changing the exchangeable orifice, the discharge quantity can be adjusted at any time.

The throttle characteristics of RigoLimit V have been defined by specialists from the UFT Umwelt- und Fluid-Technik Dr. H. Brombach GmbH.

The throttle shaft is manufactured to meet project-specific needs and delivered ready-to-connect. It can easily be installed into the complete system or the drainage system on site.

The vortex flow ranges from 0.5 l/s to 80 l/s and depends on the head.

RigoLimit V – clear advantages

System advantages of the vortex technology

- Cross-sectional geometry of large outlet opening – no risk of blockages
- Self-cleaning thanks to vortex effect
- High drain efficiency across all operating stages
- Emptying within the shortest amount of time
- Self-activating and solely hydraulically controlled – no external power supply
- No moveable parts – no wear and tear

Easy installation

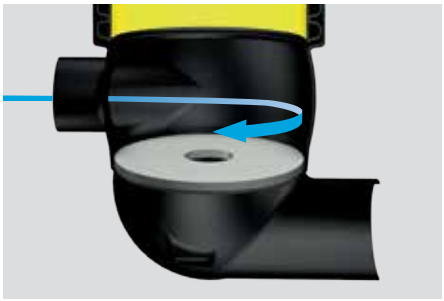
- Dimensioned and pre-assembled by FRÄNKISCHE
- Delivered ready-to-be-connected
- Easy installation into the drainage system
- Particularly easy to install as compared to reinforced concrete shafts

Operational requirements are fulfilled without requiring access to the shaft:

- High operating reliability thanks to large outlet opening (no risk of blockages)
- Fully revisable thanks to the exchangeable orifice
- Pressure cleaning possible
- Easy visual inspection during operation
- Easy adjustment to changed discharge conditions thanks to the exchangeable orifice
- Corrosion-free design, therefore very reliable and maintenance-free

Controlled discharge: ground basins, storage/infiltration systems and underdrained swale systems

Optimum flow rate



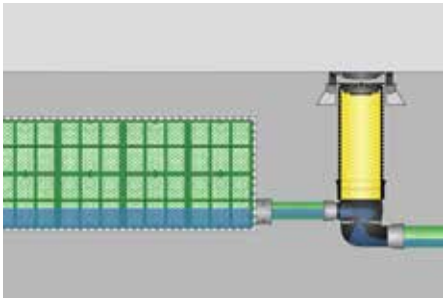
The stormwater running off the storage system flows through the inlet pipe into the throttle shaft. The water enters the shaft body tangentially.

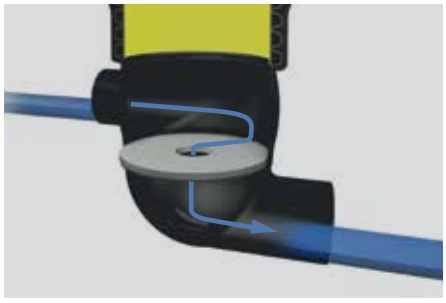
When large amounts of water enter the system, this provides the precondition for the generation of a self-regulating vortex flow.

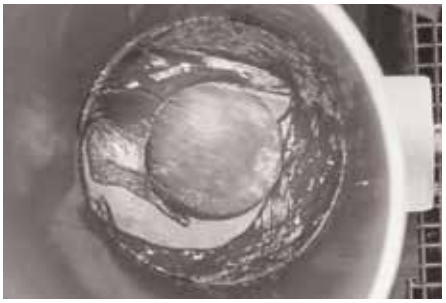
Discharge states

A: uncontrolled discharge (low water level)

In case of a low water level in the upstream storage system, the water is directly discharged in an uncontrolled manner through the large outlet opening with the cross-sectional geometry of the orifice. The large orifice diameter always ensures maximum operational reliability (no blockages).





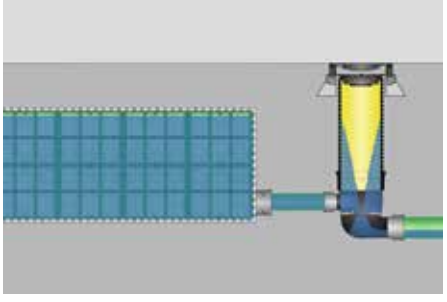


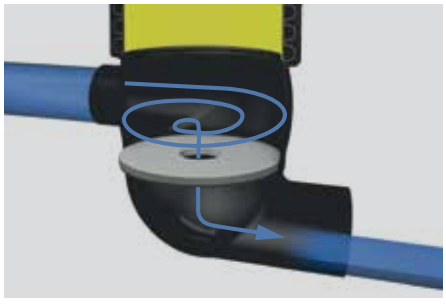
Uncontrolled discharge in case of a low water level

B: controlled discharge (high water level)

When water fills the basin, it has more energy in the tangential inlet to RigoLimit V. This creates a vortex flow with an air-filled vortex core which blocks the largest part of the aperture in the bottom of the vortex chamber. This constricts the large aperture cross-section which is desired for more operational reliability for throttling. At the same time, the strong vortex results in a self-cleaning effect when there is the risk of blockages, since dirt is simply dragged along. In addition, due to the centrifugal force of the rotating water counter pressure is generated along the vortex chamber wall, which limits the inflow. Below the outlet aperture, the water flushes as a water jet into the water in the shaft. Also in this case, there is a self-cleaning effect which helps flushing dirt.

Vortex in the shaft





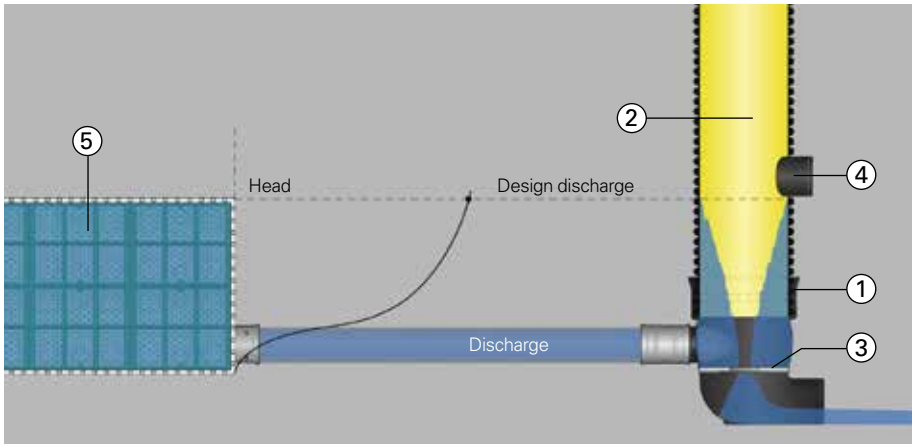
Controlled discharge in case of a high water level

Discharge from the exchangeable orifice

RigoLimit V – throttle shaft

NEW

Discharge graph

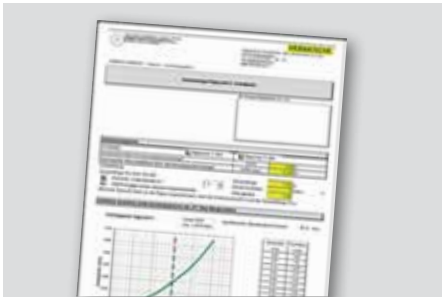


① **RigoLimit V** throttle shaft
② **RigoLimit V** extension pipe
③ Exchangeable orifice
④ Overflow (optional)
⑤ **Rigofill inspect** – storage/infiltration system
Example: 2-layer

Changing the orifice and dimensioning

If in case of changes in the collection area the size of the swale or the storm-water retention systems and thus the amount of water being discharged changes as well, the throttle outlet can be adjusted by changing the orifice.

FRÄNKISCHE will dimension the new orifice diameter. In this case, please use our order form.



Project-specific design printout

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Select **competence**

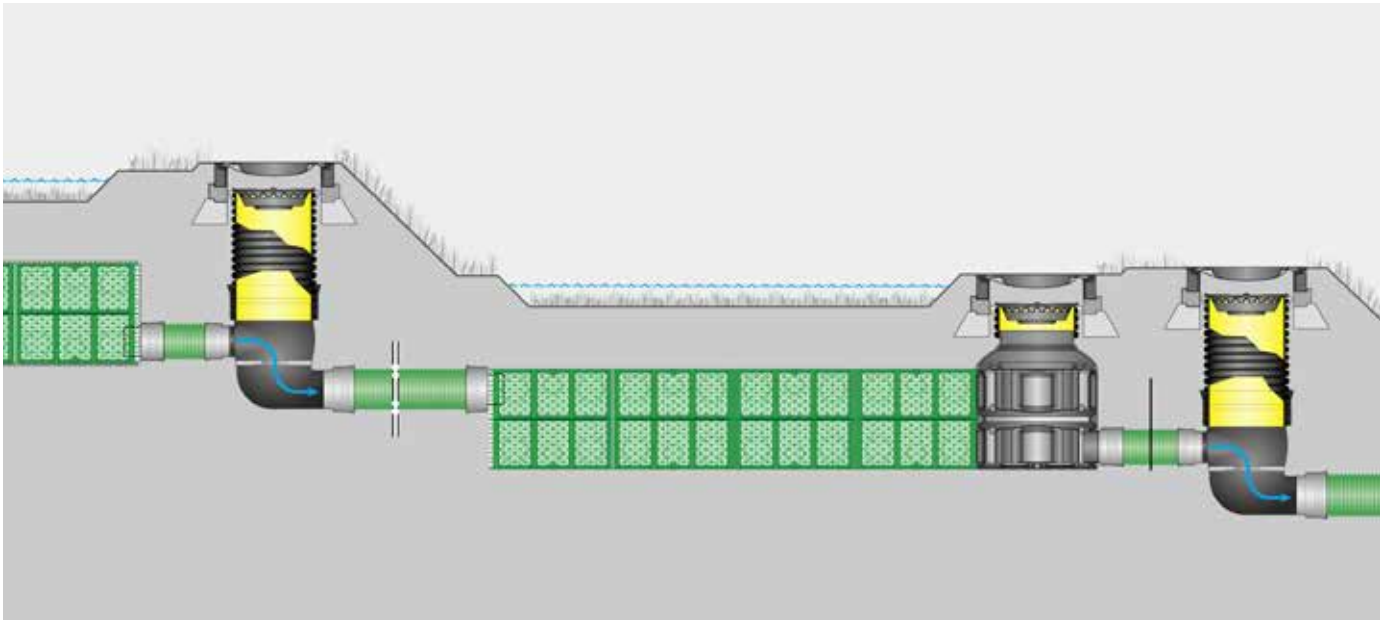
Stormwater management

and **document type:**

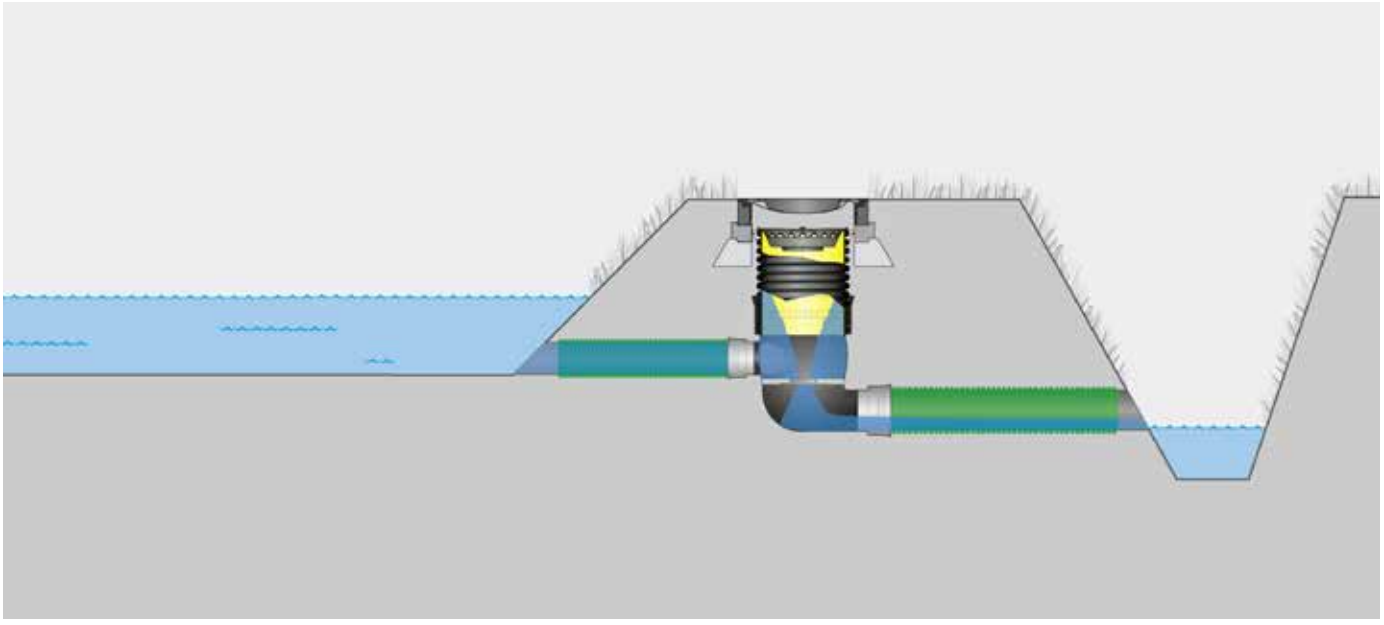
Order form

Controlled discharge: ground basins, storage/infiltration systems and underdrained swale systems

Application examples



Underdrained swale system with RigoLimit V in a cascade arrangement



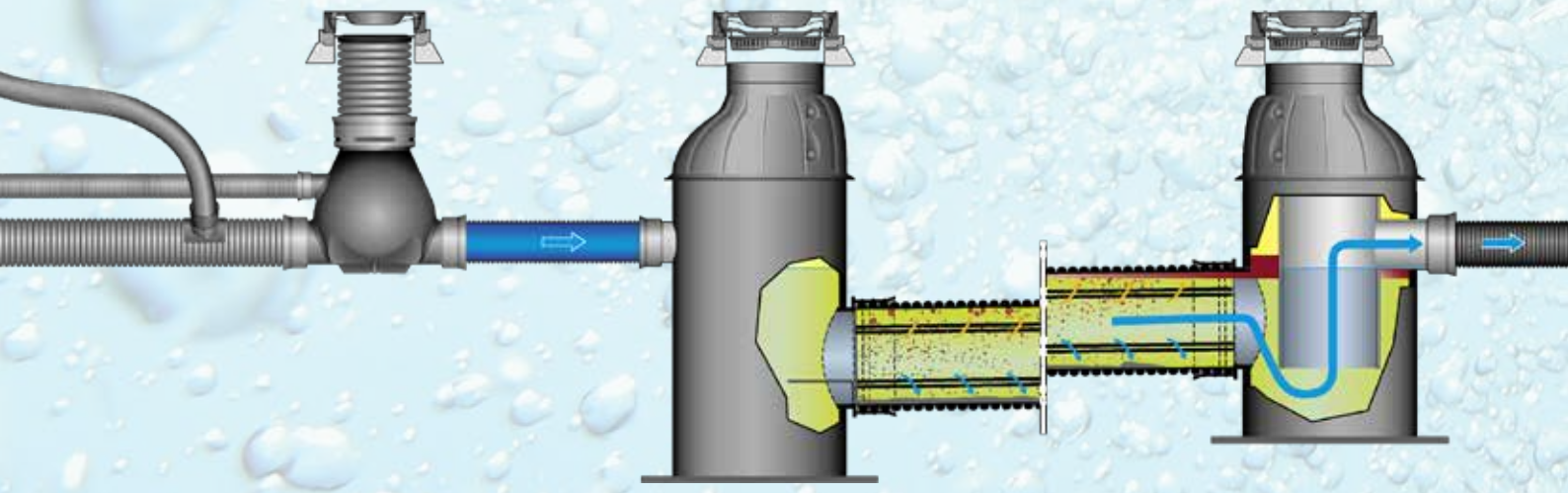
Ground basin

PRODUCTS

Stormwater transport

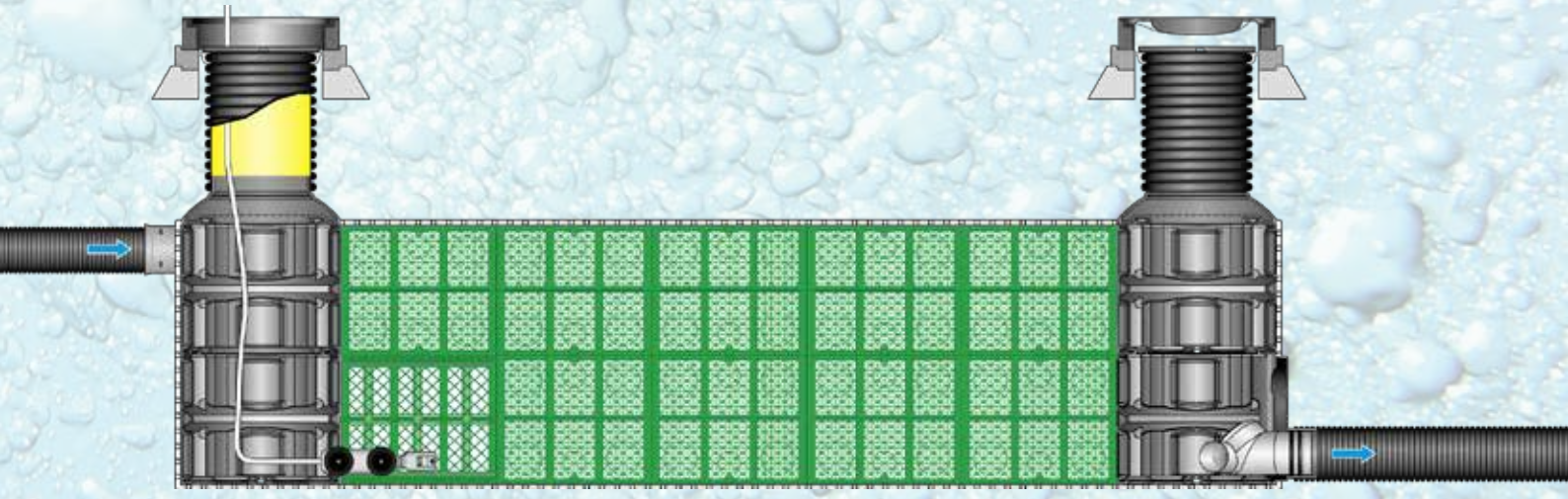
1 Transport

2 Treatment



3 Storage

4 Discharge



... regardless of application

Example: motorways

Example: tracks

Example: urban drainage

Example: commercial parking lots

Challenges and goals

Drainage systems help collect and discharge surface water (aquaplaning danger, icing danger), and water coming from outside.

Drainage and transport pipes are used to collect, channel or discharge different types and amounts of water.

Requirements

Studies and evaluations have shown that the majority of road construction measures will focus rather on repair or extension (expansion and improvement) of the existing network than on new constructions. This leads to high demands being placed on construction companies and products to be used. Efficiency, rapid construction progress while maintaining traffic flow, and lower costs while at the same time maintaining quality standards are essential in today's road and track construction. Modern drainage systems require durability, high load capacity, easy handling and ideal inspection-friendliness.

AquaPipe – SN 8 stormwater pipe system

Twin-wall PE-HD stormwater pipe (corrugated outside, smooth inside), including sealing ring and coupling. Black outside, blue inside. High load-bearing capacity (SN 8 according to DIN EN ISO 9969).

Application:
stormwater pipe system to drain roads and highways, to discharge municipal stormwater runoff from residential, commercial and industrial areas, and to discharge stormwater into receiving waters.

Strabusil – SN 4 drainage pipe

Locally perforated (LP), totally perforated (TP) and multi-purpose (MP) PE-HD pipe according to DIN 4262-1, type R2, total perforation area ≥ 50 cm²/m for LP, TP, MP, 1.2 mm ± 0.4 mm perforation width. Can be used in accordance with RAS-Ew "Directive relating to road construction – Part: drainage " (*Richtlinien für die Anlage von Straßen, Teil: Entwässerung*) (SN 4 according to DIN EN ISO 9969). Custom pipes available upon request.

Application:
drainage pipe to reliably drain roads, airfields, sports fields and when drainage pipes must meet increased demands.

Robukan SMR – SN 8 and SN 16 sewer pipe

PP sewer pipe with corrugated outside and smooth inside according to DIN EN 13476. Ring stiffness class SN 8 or SN 16 according to DIN EN ISO 9969. Yellow (SN 8) or orange (SN 16) inside, black outside, homogeneously welded. With red and blue colour stripes extruded into the pipe surface. For SN 16, the inner pipe has a minimum wall thickness of 3.5 mm according to DWA-A 142 TWZ II+III requirements.

Application:
as wastewater/combined sewer pipe (red coloured stripe "up") for wastewater from homes and buildings, or as a stormwater sewer (blue coloured stripe "up") for stormwater runoff from roads, alleys, squares and roofs.

RailPipe – SN 16 drainage pipe

Locally perforated (LP), totally perforated (TP) and multi-purpose (MP) SN 16 PP pipe in proven twin-wall design (corrugated outside,smooth inside), according to DIN 4262-1 R2 type and DIN 13476. Fulfills the special requirements of DBS 918064 of Deutsche Bahn AG. Features manufacturer-related product qualification (HPQ).

Application:
specifically designed for track drainage (external pressure range and outside the pressure range) or for applications that require extremely high demands.

Stormwater treatment shaft
with removable strainer.

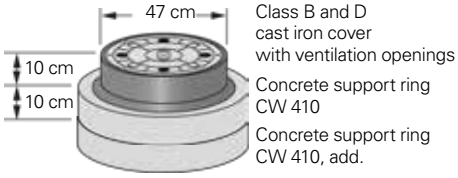
Application:
treatment of slightly polluted stormwater runoff, inlet connection established with pipes.

Product	Technical data	Cat. no.:
RigoClean 500 with lateral inlet	for connectable areas of up to 500 m²; inlet and outlet DN 150 KG; D_O = 400; D_I = 350; H = 1,650 mm	**515.96.002**
RigoClean 1000 with lateral inlet	for connectable areas of up to 1,000 m²; inlet and outlet DN 200 KG; D_O = 600; D_I = 500; H = 1,680 mm	**515.96.012**
RigoClean project shaft	For order forms, see **www.fraenkische.com**	**515.96.000**

NB

For standard design, see page 32, for other designs, order project shaft.

Accessories for Rigo®Clean 500 with lateral inlet



Product	Technical data	Cat. no.:
Shaft cover	Class B 125 **with** ventilation openings CW 410 with cast iron frame and concrete support ring	**516.84.000**
	Class D 400 **with** ventilation openings CW 410 with cast iron frame and concrete support ring	**516.84.400**
DOM sealing ring	for extension pipe D_O 400; as seal between concrete support ring and extension pipe	**507.19.403**
Concrete support ring CW 410, add.	height adjustment (optional)	**517.84.001**
Sediment trap D_O 400	for D_O 400 shaft	**516.91.002**

Accessories for Rigo®Clean 1000 with lateral inlet

Product	Technical data	Cat. no.:
Sediment trap D_O 600	for shaft D_O 400	**519.91.095**
DOM sealing ring	for extension pipe D_O 600; as seal between concrete support ring and extension pipe	**519.19.505**
Shaft covers* acc. to DIN EN 124	class B or D CW 610	to be supplied on-site
Support ring acc. to DIN 4034, Part 1*	H = 100 mm	to be supplied on-site

* See illustration on page 32

Rigo® Clean with upper inlet

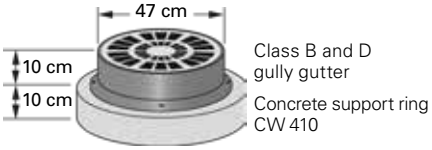
Stormwater treatment shaft
with removable strainer.

Application:
treatment of slightly polluted stormwater runoff, inlet connection established with gully gutter or support frame.

Product	Technical data	Cat. no.:
RigoClean 500 with upper inlet, dirt hopper incl.	for connectable areas of up to 500 m^2; with outlet DN 150 KG; D_O = 400; D_I = 350; H = 1,240 mm	**515.96.001**
RigoClean project shaft	For order forms, see **www.fraenkische.com**	**515.96.000**

NB

For standard design, see page 33,
for other designs, order project shaft.



Accessories for Rigo® Clean 500 with upper inlet

Product	Technical data	Cat. no.:
Gully gutter, cast iron frame incl., concrete support ring CW 410	cast iron; class B 125	**516.84.100**
	cast iron; class D 400	**516.84.500**
DOM sealing ring	for extension pipe D_O 400; as seal between concrete support ring and extension pipe	**507.19.403**
Support frame 500/500	class C or D desk or gutter type acc. to DIN 19583/DIN 19571	to be supplied on-site
Support ring acc. to DIN 4052, Part 10a	for use with support frame 500/500	to be supplied on-site

North Rhine-Westphalia State Agency for Nature, Environment and Consumer Protection

PROOF OF EQUALITY

of decentralised stormwater treatment systems as compared to stormwater sedimentation tanks in North Rhine-Westphalia (LANUV list)

Stormwater treatment system comprising of

- Start shaft
- Sedimentation path
- Target shaft for Rigofill inspect connection

Recommended accessories:

see page 137 for shaft accessories D_o 600

Application:

treatment of polluted stormwater runoff with direct connection to Rigofill storage/infiltration systems without pipe joint

NB

Select project-specific details according to design specifications:

- **Flow direction (straight, right, left)**

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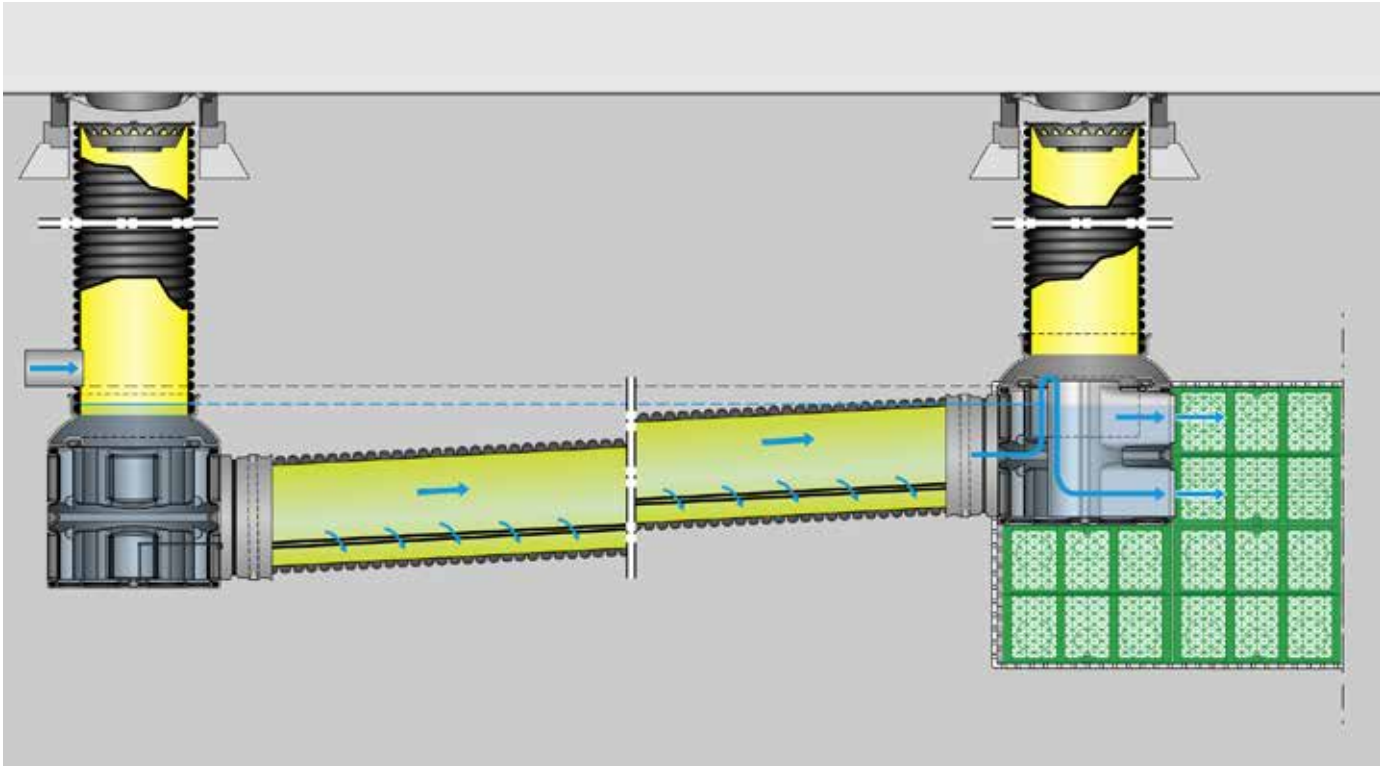
Select **competence**

Stormwater management

and **document type:**

Order form

Product	Technical data	Cat. no.:
SediPipe basic 400/6; left hand outlet	DN 400 sedimentation path, 6 m length	**515.97.469**
SediPipe basic 400/6; straight outlet		**515.97.460**
SediPipe basic 400/6; right hand outlet		**515.97.463**
SediPipe basic 500/6; left hand outlet	DN 500 sedimentation path, 6 m length	**515.97.569**
SediPipe basic 500/6; straight outlet		**515.97.560**
SediPipe basic 500/6; right hand outlet		**515.97.563**
SediPipe basic 600/6; left hand outlet	DN 600 sedimentation path, 6 m length	**515.97.669**
SediPipe basic 600/6; straight outlet		**515.97.660**
SediPipe basic 600/6; right hand outlet		**515.97.663**
SediPipe basic 500/12; left hand outlet	DN 500 sedimentation path, 2 x 6 m length	**515.97.519**
SediPipe basic 500/12; straight outlet		**515.97.510**
SediPipe basic 500/12; right hand outlet		**515.97.513**
SediPipe basic 600/12; left hand outlet	DN 600 sedimentation path, 2 x 6 m length	**515.97.619**
SediPipe basic 600/12; straight outlet		**515.97.610**
SediPipe basic 600/12; right hand outlet		**515.97.613**



SediPipe® level at a glance

North Rhine-Westphalia State Agency for Nature, Environment and Consumer Protection

PROOF OF EQUALITY

of decentralised stormwater treatment systems as compared to stormwater sedimentation tanks in North Rhine-Westphalia (LANUV list)

Stormwater treatment system comprising of

- Start shaft
- Sedimentation path
- Target shaft with outlet (inlet/outlet same level) at the extension pipe

Recommended accessories:
see page 137 for shaft accessories D_o 600

Application:
Treatment of polluted stormwater runoff with inlet/outlet same level and universal pipe connection for all downstream installations.

NB

Select project-specific details according to design specifications:

- **Flow direction (straight, right, left)**

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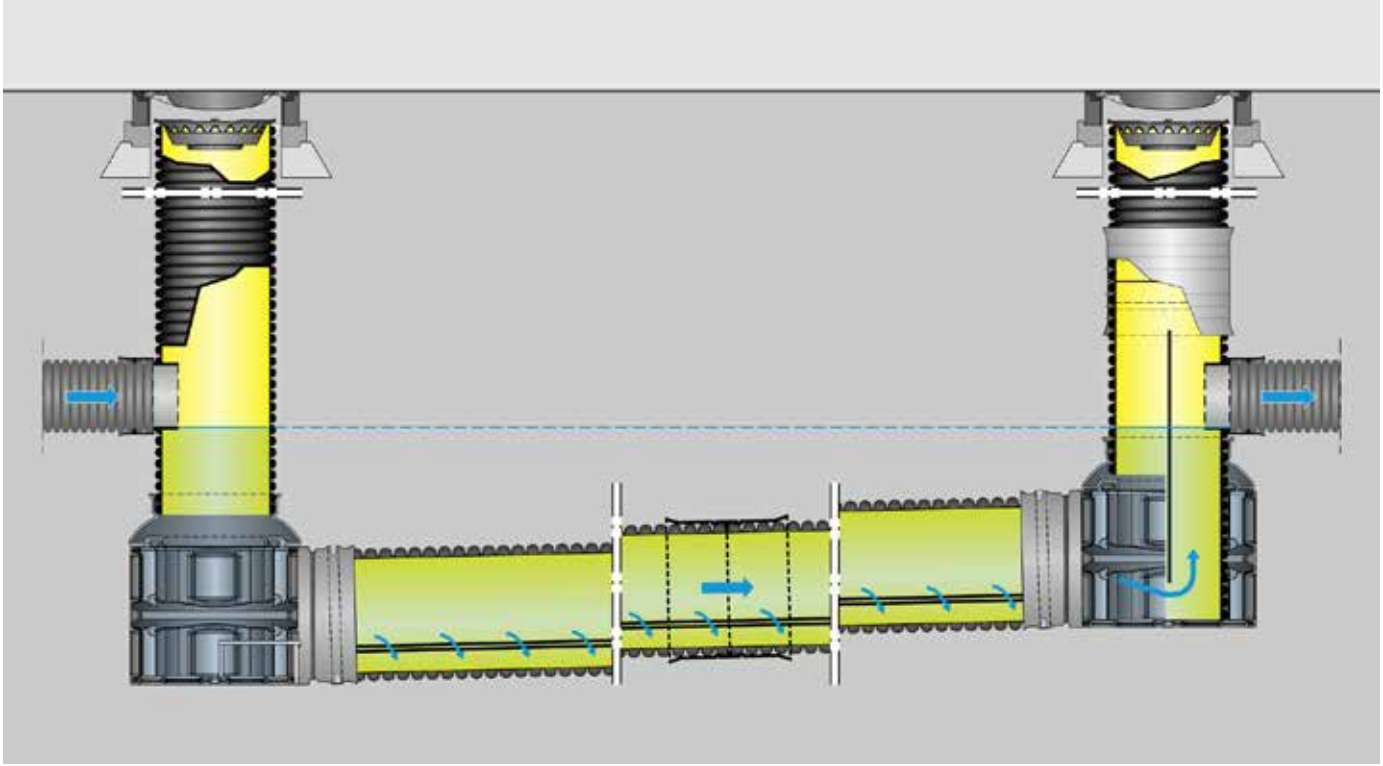
Select **competence**

Stormwater management

and **document type:**

Order form

Product	Technical data	Cat. no.:
SediPipe level 400/6	DN 400 sedimentation path, 6 m length	**515.97.468**
SediPipe level 500/6	DN 500 sedimentation path, 6 m length	**515.97.568**
SediPipe level 600/6	DN 600 sedimentation path, 6 m length	**515.97.668**
SediPipe level 500/12	DN 500 sedimentation path, 2 x 6 m length	**515.97.518**
SediPipe level 600/12	DN 600 sedimentation path, 2 x 6 m length	**515.97.618**



SediPipe® XL at a glance

North Rhine-Westphalia State Agency for Nature, Environment and Consumer Protection

PROOF OF EQUALITY

of decentralised stormwater treatment systems as compared to stormwater sedimentation tanks in North Rhine-Westphalia (LANUV list)

Stormwater treatment system comprising of

- Start shaft DN 1000
- Sedimentation path DN 600 with lower flow separator
- Target shaft DN 1000 with immersion pipe

Application:
treatment of polluted stormwater runoff from large connectable areas and retention of light liquids in case of spills in dry weather.

NB

Select project-specific details according to design specifications:

- **Inlet and** outlet diameter
- **Inlet depth**

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Select **competence**

Stormwater management

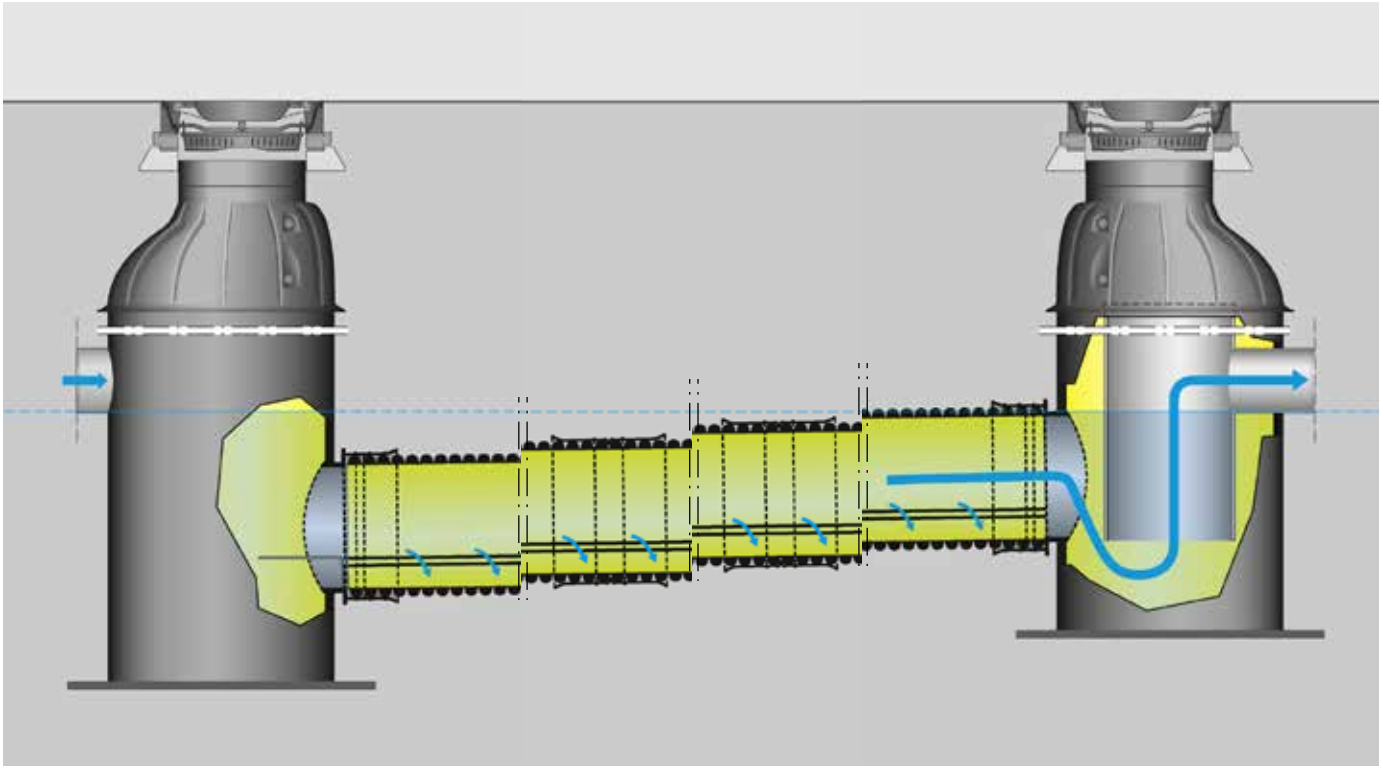
and **document type:**

Order form

Customised geometries and lengths available upon request.

Product	Technical data	Cat. no.:
SediPipe XL 600/6	Sedimentation path DN 600, 6 m length, with lower flow separator	**515.97.691**
SediPipe XL 600/12	Sedimentation path DN 600, 12 m (2 x 6 m) length, with lower flow separator	**515.97.692**
SediPipe XL 600/18	Sedimentation path DN 600, 18 m (3 x 6 m) length, with lower flow separator	**515.97.693**
SediPipe XL 600/24	Sedimentation path DN 600, 24 m (4 x 6 m) length, with lower flow separator	**515.97.694**
BARD ring	concrete equalisation ring	**515.97.021**

SediPipe XL 600/12 has been awarded the "IKT-geprüft gem. Trennerlass" certificate of the IKT Institute for Underground Infrastructure (*Institut für Unterirdische Infrastruktur GmbH*) from Gelsenkirchen.
Due to additional practical audit procedures, the applicability of the system for decentralised stormwater treatment in conformity with requirements of the North Rhine-Westphalia Ministry of the Environment (LANUV) has been proven.



SediPipe® XL plus at a glance

NB

Select project-specific details according to design specifications:

- **Inlet and** outlet diameter
- **Inlet depth**

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Select **competence**

Stormwater management

and **document type:**

Order form

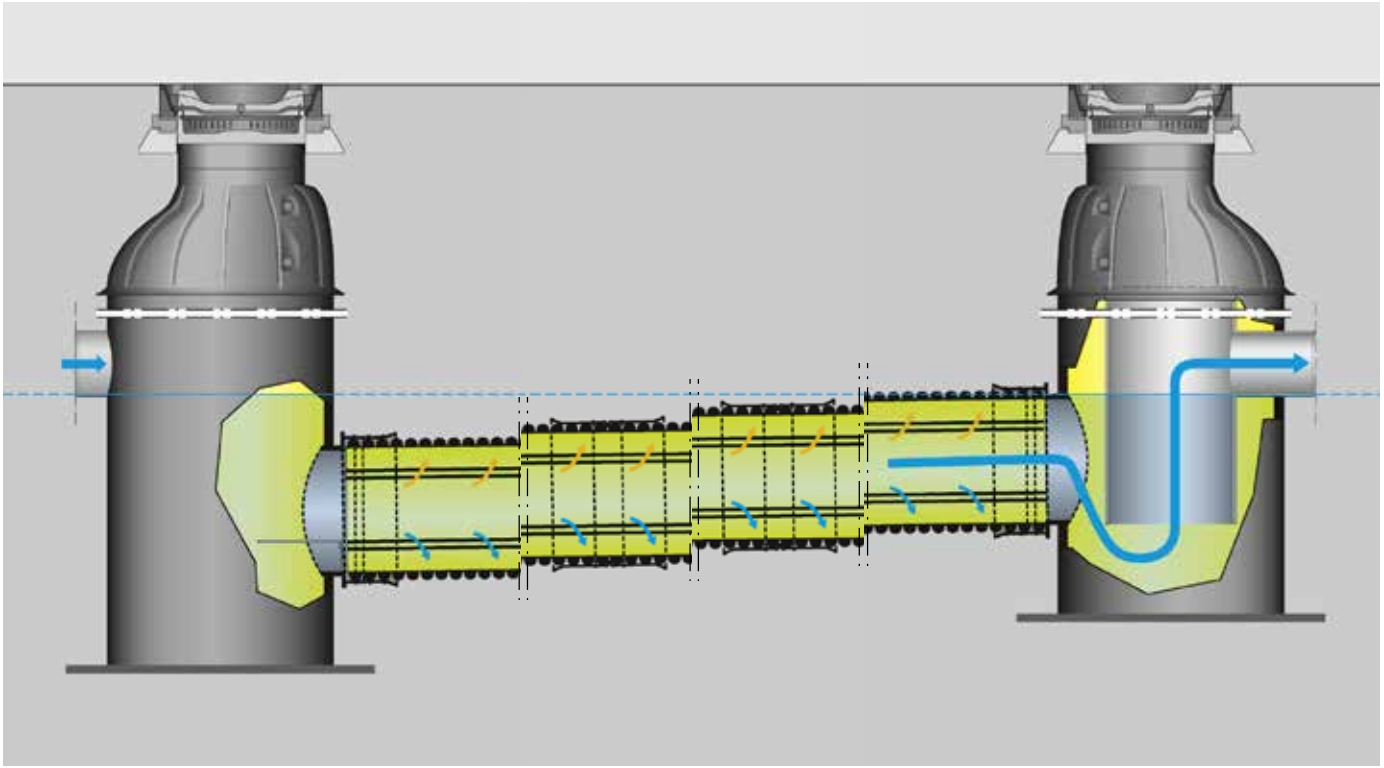
Customised geometries and lengths available upon request.

Stormwater treatment system comprising of

- Start shaft DN 1000
- Sedimentation path DN 600 with lower and upper flow separator
- Target shaft DN 1000 with immersion pipe

Application:
treatment of polluted stormwater runoff from large connectable areas and retention of light liquids in case of spills in dry weather and during rainfall events.

Product	Technical data	Cat. no.:
SediPipe XL plus 600/6	Sedimentation path DN 600, 6 m length, with lower and upper flow separator	**515.97.621**
SediPipe XL plus 600/12	Sedimentation path DN 600, 12 m (2 x 6 m) length, with lower and upper flow separator	**515.97.622**
SediPipe XL plus 600/18	Sedimentation path DN 600, 18 m (3 x 6 m) length, with lower and upper flow separator	**515.97.623**
SediPipe XL plus 600/24	Sedimentation path DN 600, 24 m (4 x 6 m) length, with lower and upper flow separator	**515.97.624**
BARD ring	Concrete equalisation ring	**515.97.021**



SediSubstrator® XL at a glance

NB

Select project-specific details according to design specifications:

- **Invert height inlet, outlet**
- **Shaft heights**

Stormwater treatment system comprising of

- Start shaft DN 1000 with inlet, maintenance console, mud collector, cone with BARD ring (shaft cover to be supplied on site)
- Sedimentation path DN 600 with patented flow separator incl. couplings, sealing rings and lubricant
- Target shaft DN 1000 with outlet DN 300, cartridge elements, cone and BARD ring (shaft cover to be supplied on site)

Application:
treatment of highly polluted stormwater runoff from large connectable areas to subsequently infiltrate.

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Downloads

Select **competence**

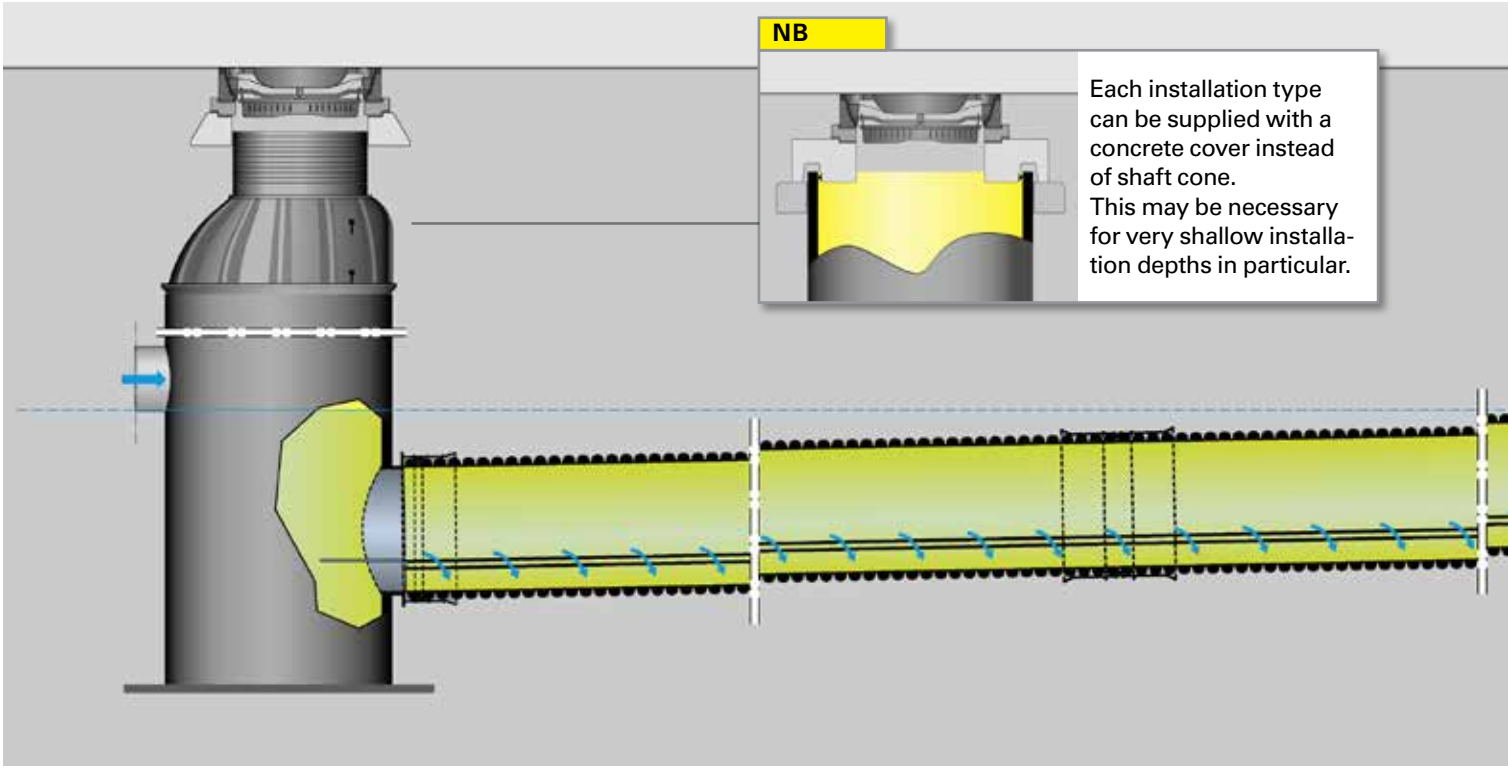
Stormwater management

and **document type:**

Order form

Product	Technical data	Cat. no.:
SediSubstrator XL 600/12*	Sedimentation path DN 600, 12 m length; two cartridge elements	**515.98.692**
SediSubstrator XL 600/18	Sedimentation path DN 600, 18 m length; three cartridge elements	**515.98.693**
SediSubstrator XL 600/24	Sedimentation path DN 600, 24 m length; four cartridge elements	**515.98.694**
SediSubstrator XL 600/12+12*	Sedimentation path DN 600, 2 x 12 m length, four cartridge elements	**515.98.690**

* DIBt approved system



Substrate cartridge

Spare parts for SediSubstrator® XL cartridge elements

Product	Technical data	Cat. no.:
Corpus cover element	Ø 560 mm; height approx. 380 mm	**515.98.018**
Corpus base element	Ø 560 mm; height approx. 380 mm	**515.98.017**
Internal elements	comprising of: sealing cover disk, drainage layer outside and inside, gauze layer	**515.98.016**
Bottom seal	15 mm thickness; 1 ring	**515.98.015**

Hersteller: HeGo Biotec GmbH 14167 Berlin Herstellwerk: P.U.S. Produktions- und Umweltservice GmbH 02991 Lauta Z-84.2-11 TÜVRheinland LGA Bautechnik

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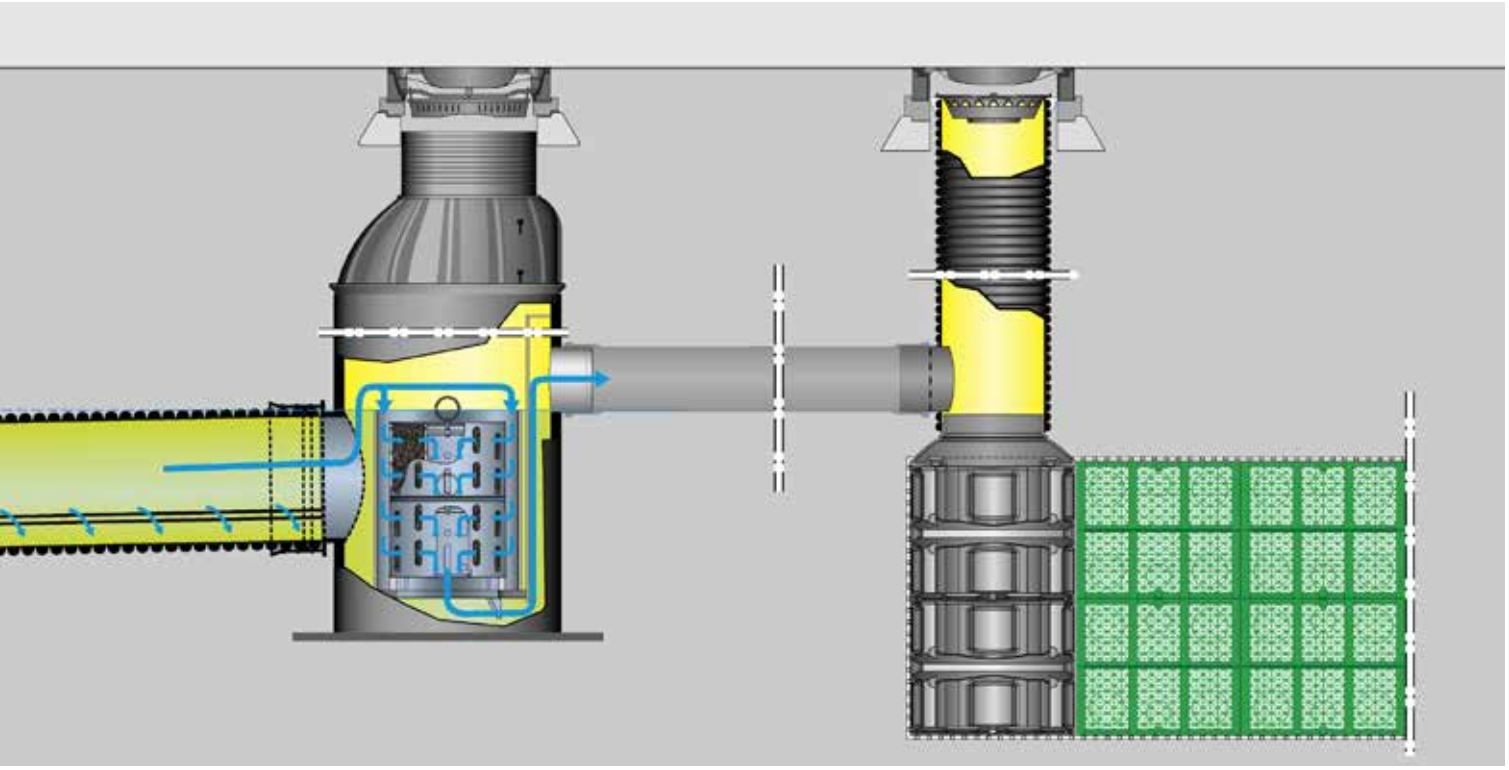
Select **competence**

Stormwater management

and **document type:**

Order form

Please use the **spare parts substrate cartridge SediSubstrator XL** order form!



SediSubstrator® basic at a glance

Substrate cartridge

NB

Select project-specific details according to design specifications:

- **Flow direction (straight, right, left)**

Free download

www.fraenkische.com

Downloads

Select **competence**

Stormwater management

and **document type:**

Order form

Stormwater treatment system comprising of

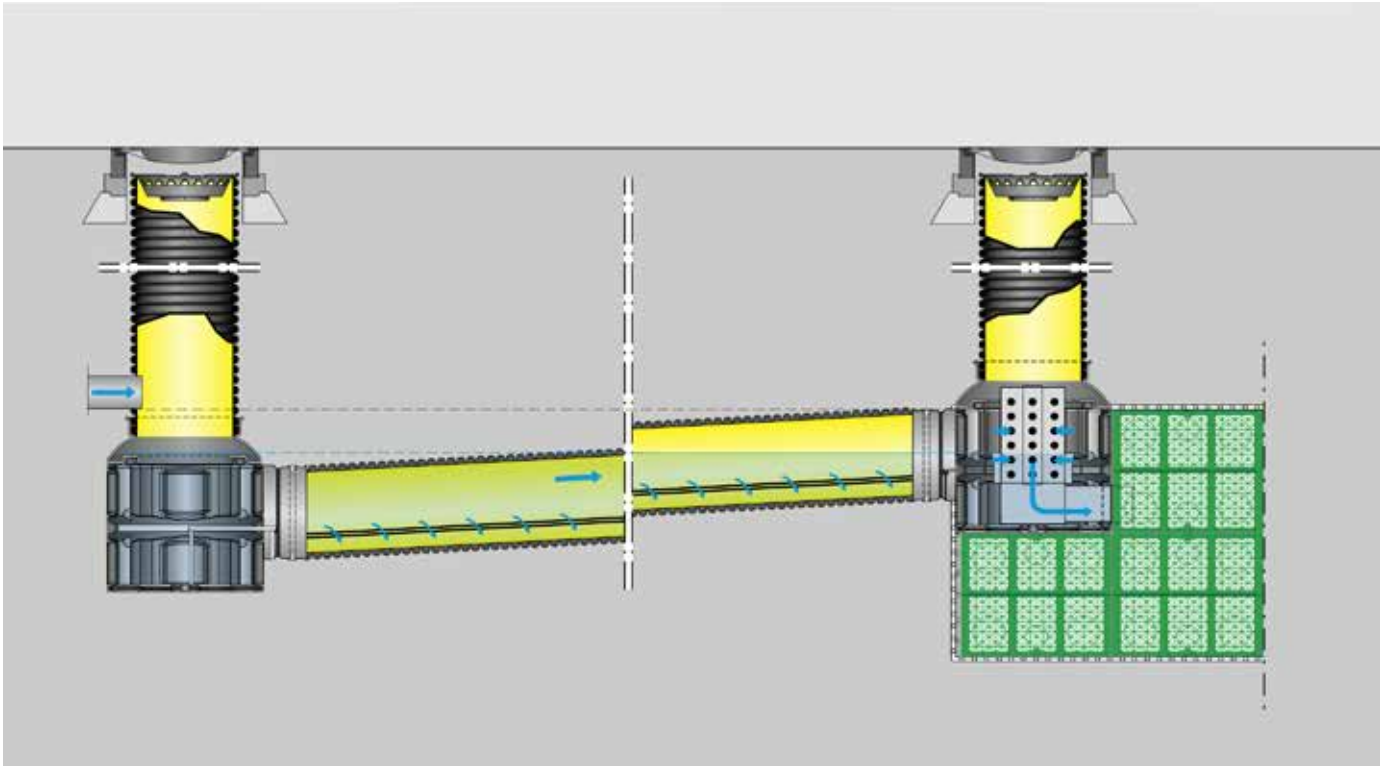
- Start shaft
- Sedimentation path
- Target shaft incl. substrate cartridge, with outlet DN 200

Recommended accessories:
see page 137 for shaft accessories D_o 600

Application:
treatment of polluted stormwater runoff from trafficked areas upstream of subsoil infiltration.

Product	Technical data	Cat. no.:
SediSubstrator 400/6; left hand outlet	Sedimentation path DN 400, 6 m length	**515.98.469**
SediSubstrator 400/6; straight outlet		**515.98.460**
SediSubstrator 400/6; right hand outlet		**515.98.463**
SediSubstrator 500/6; left hand outlet	Sedimentation path DN 500, 6 m length	**515.98.569**
SediSubstrator 500/6; straight outlet		**515.98.560**
SediSubstrator 500/6; right hand outlet		**515.98.563**
SediSubstrator 500/12; left hand outlet	Sedimentation path DN 500, 2 x 6 m length	**515.98.519**
SediSubstrator 500/12; straight outlet		**515.98.510**
SediSubstrator 500/12; right hand outlet		**515.98.513**
Substrate cartridge to be replaced acc. to **maintenance interval**	Ø 400 mm; height approx. 520 mm; weight: approx. 32 kg	**515.98.002**
Emergency overflow sealing*	to seal the overflow opening in the substrate cartridge	**515.98.003**

* optionally



SickuPipe / MuriPipe infiltration pipe

Raw material saving twin-wall design environmentally friendly + recyclable

PE

Polyethylene (PE-HD) swale infiltration pipe with large perforation area
Totally perforated (TP) pipe (type R2) according to DIN 4262-1 and DIN 19666, nominal diameter: DN/ID 200 or 300, twin-wall design (smooth inside, corrugated outside), circumferentially arranged perforations, with a proven maximum total perforation area according to DWAA 138, perforation area ≥ 180 or ≥ 150 cm²/m, proof of jetting resistance according to DIN 19523, colour: green, with one coupling, sand-tight, 6 m length, quality approved.

Recommended accessories:
see page 126 for infiltration pipe accessories

Application:
totally perforated (TP) pipe for distributing and infiltrating stormwater and drainage water in gravel swales (pipe swales and/or underdrained swale systems according to DWA-A 138).

NB

DN/ID 300 TP:
total perforation area ≥ 180 cm²/m

DN/ID 200 TP:
total perforation area ≥ 150 cm²/m

Product	Technical data	Qty.	Cat. no.:
SickuPipe 300 TP perforated swale infiltration pipe	DN/ID 300; 6 m length total perforation area ≥ 180 cm²/m D_O = 347; D_I = 300	54 m	**511.00.300**
MuriPipe 200 TP perforated swale infiltration pipe	DN/ID 200; 6 m length perforation area ≥ 150 cm²/m D_O = 235; D_I = 200	138 m	**512.00.200**
MuriPipe 300 TP perforated swale infiltration pipe	DN/ID 300; 6 m length total perforation area ≥ 180 cm²/m D_O = 347; D_I = 300	54 m	**512.00.300**

SickuPipe / MuriPipe unperforated

Raw material saving twin-wall design environmentally friendly + recyclable

PE

Unperforated swale pipe
Polyethylene (PE-HD) transport pipe (UP, type R2) according to DIN 4262-1 and DIN 19666, nominal diameter DN/ID 200 or 300, twin-wall design (smooth inside, corrugated outside), proof of jetting resistance according to DIN 19523, colour: green, with one coupling, sand-tight, 6 m length, quality-approved.

Recommended accessories:
see page 126 for infiltration pipe accessories

Application:
transport pipe for distributing stormwater runoff and drainage water into gravel swales (pipe swales and/or underdrained swale systems according to DWA-A 138).

Product	Technical data	Qty.	Cat. no.:
SickuPipe 300 unperforated swale pipe	DN/ID 300; 6 m length D_O = 347; D_I = 300	54 m	**511.10.300**
MuriPipe 200 unperforated swale pipe	DN/ID 200; 6 m length D_O = 235; D_I = 200	138 m	**512.10.200**
MuriPipe 300 unperforated swale pipe	DN/ID 300; 6 m length D_O = 347; D_I = 300	54 m	**512.10.300**

Accessories for SickuPipe / MuriPipe DN 300

Product	Technical data	Cat. no.:
Coupling	DN 300 (SD = sand-tight connection)	**516.10.300**
End plug	DN 300	**516.80.300**
15° bend	DN 300	**516.23.300**
30° bend	DN 300	**516.22.300**
45° bend	DN 300	**516.21.300**
90° bend	DN 300	**516.20.300**
Tee	DN 300/DN 300	**516.30.300**
	DN 300/DN 200 KG*	**516.38.300**
KG coupling adapter with reducer	DN 300/DN 100 KG; plug-in spigot outlet	**516.63.300**
	DN 300/DN 150 KG; plug-in spigot outlet	**516.62.300**
	DN 300/DN 200 KG; plug-in spigot outlet	**516.61.300**
KG adapter with spigot	DN 300/DN 300 KG push-fit coupling	**516.60.300**
Reducer	DN 300/DN 200; twin-wall pipe	**516.69.300**
Shaft lining	DN 300	**516.88.300**
Ventilation unit comprising of:		**516.90.000**
Saddle	DN 300	**516.65.300**
Twin-wall pipe	DN 110; 3 m length	**561.80.110**
Ventilation cap	DN 110	**516.90.110**

* For inlet reducers, see shaft accessories on page 130.

Additional accessories available upon request.

Accessories for MuriPipe DN 200

Product	Technical data	Cat. no.:
Coupling	DN 200 (SD = sand-tight connection)	**517.10.200**
End plug	DN 200	**517.80.200**
15° bend	DN 200	**517.23.200**
30° bend	DN 200	**517.22.200**
45° bend	DN 200	**517.21.200**
90° bend	DN 200	**517.20.200**
Tee	DN 200/DN 200	**517.30.200**
Tee	DN 200/DN 150 KG	**517.37.200**
Shaft lining	DN 200	**517.88.200**

Additional accessories available upon request.

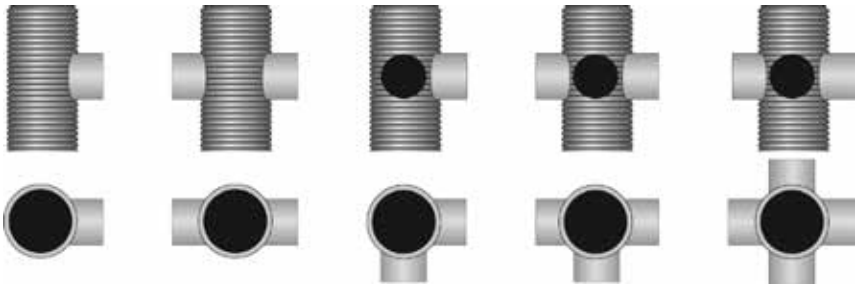
SickuControl

Universal shaft for pipe swales and underdrained swale systems
Polyethylene (PE-HD) shaft, twin-wall design (smooth inside, corrugated outside), outside diameter: D_o 400, with integrated sedimentation chamber, colour: green, with 1 to 4 connections DN 300 for SickuPipe swale infiltration pipe, MuriPipe 300 TP, SickuPipe unperforated swale pipe or MuriPipe 300, can be extended using coupling and extension pipe (shaft accessories D_o 400), available with or without rotatable inlet with connection DN 200 (Drän/KG).

Recommended accessories:
see page 130 for shaft accessories D_o 400

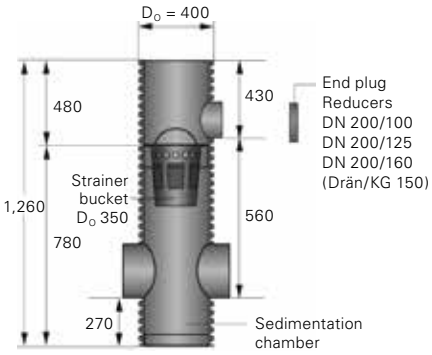
Application:
multi-purpose (MP) shaft for pipe swales and underdrained swale systems acc. to DWA-A 138, for inlet connection, distribution of stormwater runoff and ventilation as well as for inspection and maintenance of the system.

SickuControl designs

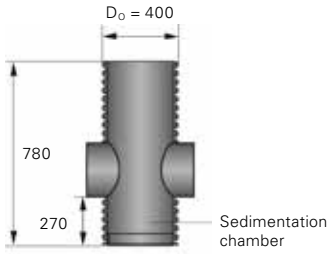


1x DN 300 | 2x DN 300 (180°) | 2x DN 300 (90°) | 3x DN 300 (T-shaped) | 4x DN 300 (cross-shaped)

SickuControl with rotatable inlet



SickuControl without rotatable inlet



Product	Technical data	Cat. no.:
SickuControl with rotatable inlet	1 x DN 300	**511.40.401**
	2 x DN 300 (180°)	**511.40.402**
	2 x DN 300 (90°)	**511.41.402**
	3 x DN 300 (T-shaped)	**511.40.403**
	4 x DN 300 (cross-shaped)	**511.40.404**
SickuControl without rotatable inlet	1 x DN 300	**511.42.401**
	2 x DN 300 (180°)	**511.42.402**
	2 x DN 300 (90°)	**511.43.402**
	3 x DN 300 (T-shaped)	**511.42.403**
	4 x DN 300 (cross-shaped)	**511.42.404**
SickuControl project shaft	For order forms, see **www.fraenkische.com**	**511.40.400**

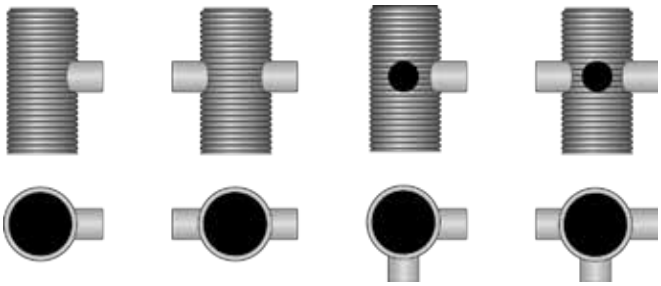
MuriControl

Flushing and inspection shaft for underdrained swale systems
Polyethylene (PE-HD) shaft, twin-wall design (smooth inside, corrugated outside), outside diameter D_o 400, with sedimentation chamber, colour green, with 1 to 3 connections DN 200 for Muri-Pipe 200 TP swale infiltration pipe and/or MuriPipe 200 unperforated swale pipe, connections arranged at different heights can compensate height differences in terrain, can be extended using coupling and extension pipe (shaft accessories).

Recommended accessories:
see page 130 for shaft accessories D_o 400

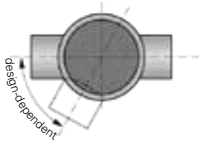
Application:
multi-purpose shaft for underdrained swale systems according to DWA-A 138, for water distribution and ventilation, as overflow as well as for inspection and maintenance of the swale.

MuriControl designs

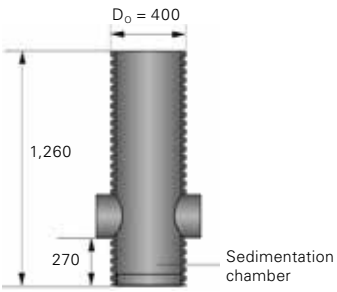


1x DN 200 | 2x DN 200 (180°) | 2x DN 200 (90°) | 3x DN 200 (T-shaped)

MuriControl project shaft



MuriControl



Product	Technical data	Cat. no.:
MuriControl	1 x DN 200	**512.92.001**
	2 x DN 200 (180°)	**512.92.002**
	2 x DN 200 (90°)	**512.92.004**
	3 x DN 200 (T-shaped)	**512.92.003**
MuriControl project shaft	For order forms, see **www.fraenkische.com**	**512.41.400**

NB

Number, height and direction of connections can be selected according to project needs.

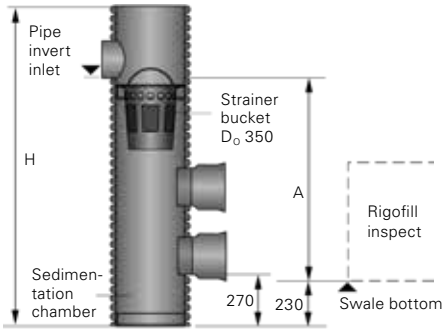
RigoControl

Universal shaft for storage/infiltration systems
Polyethylene (PE-HD) shaft in twin-wall design (smooth inside, corrugated outside), outside diameter: D_O 400, can be shortened, with sedimentation chamber, colour: green, with 2 connections DN 200 to connect to Rigofill inspect, available with or without rotatable inlet DN 200 with connection (Drän/KG) or with lower inlet.

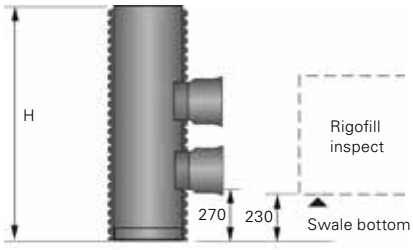
Recommended accessories:
see page 130 for shaft accessories D_O 400

Application:
multi-purpose shaft for Rigofill inspect infiltration/storage systems outside the layout of the system, for inlet connection and ventilation as well as for inspection and maintenance of the system.

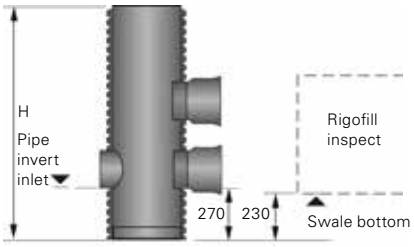
RigoControl 1 with rotatable inlet



RigoControl 1 without rotatable inlet



RigoControl 1 with lower inlet



NB

Connection accessories for RigoControl are included in the delivery (see table).

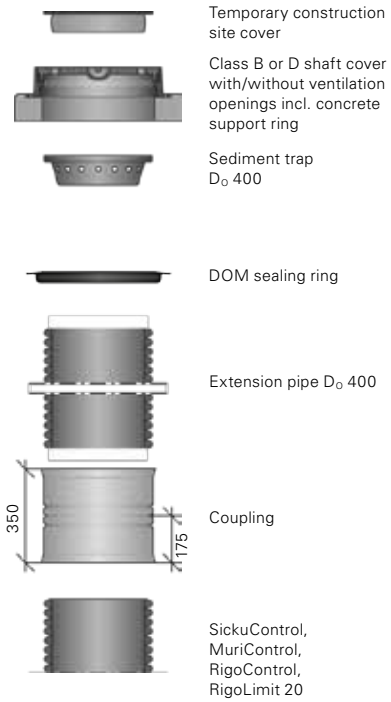
RigoControl allows inspection with CCTV cameras and jetting equipment access for cleaning.

Accessories included (number)	RigoControl		
	1	2	3
Connecting pipe DN 200, 300 mm length	2	2	2
Adapter KG 200	2	2	2
Adapter end plate DN 200	2	2	2
End plate	–	2	4

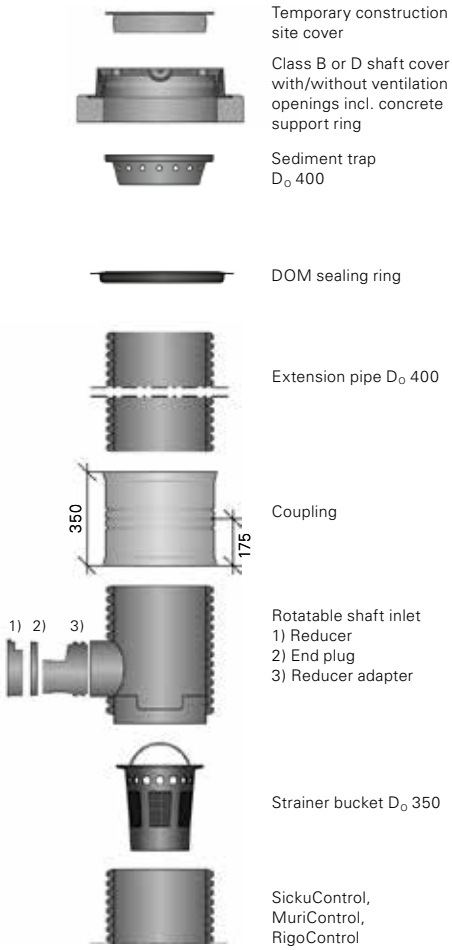
Product	Technical data	Cat. no.:
RigoControl 1 with rotatable inlet	suitable for single-layer Rigofill inspect systems H = 1.74 m, A = 1.10 m (can be shortened to 0.80 m)	**515.01.200**
RigoControl 2 with rotatable inlet	suitable for two-layer Rigofill inspect systems H = 2.52 m, A = 1.85 m (can be shortened to 1.50 m)	**515.02.200**
RigoControl 3 with rotatable inlet	suitable for three-layer Rigofill inspect systems H = 3.00 m, A = 2.35 m (can be shortened to 2.10 m)	**515.03.200**
RigoControl 1 without rotatable inlet	suitable for single-layer Rigofill inspect systems H = 1.26 m	**515.21.200**
RigoControl 2 without rotatable inlet	suitable for two-layer Rigofill inspect systems H = 2.03 m	**515.22.200**
RigoControl 3 without rotatable inlet	suitable for three-layer Rigofill inspect systems H = 2.52 m	**515.23.200**
RigoControl 1 with lower inlet	suitable for single-layer Rigofill inspect systems H = 1.26 m	**515.11.200**
RigoControl 2 with lower inlet	suitable for two-layer Rigofill inspect systems H = 2.03 m	**515.12.200**
RigoControl 3 with lower inlet	suitable for three-layer Rigofill inspect systems H = 2.52 m	**515.13.200**
RigoControl project shaft	For order forms, see **www.fraenkische.com**	**515.40.400**

Shaft accessories D_o 400 for Sicku-, Muri- and RigoControl

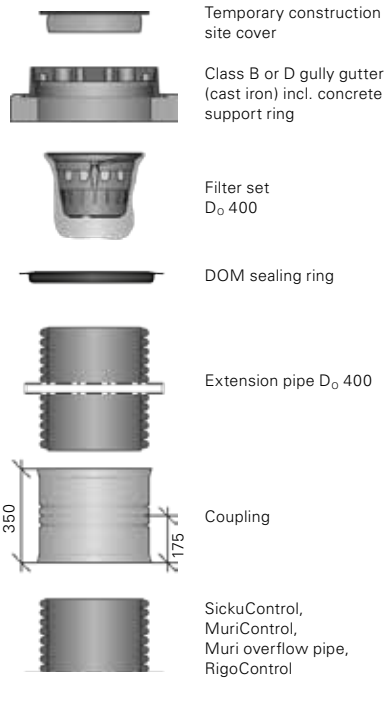
Structure of inspection shaft without rotatable inlet



Structure of inspection shaft with rotatable inlet



Structure of swale emergency overflow



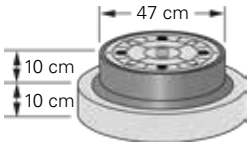
Product	Technical data	Cat. no.:
Extension pipe	PE-HD; D_o 400; 2 m length (coupling incl.)	**511.50.400**
Coupling	suitable for remainders of extension pipe, 175 mm insertion depth	**516.10.400**
DOM sealing ring	for extension pipe D_o 400; as seal between concrete support ring and extension pipe	**507.19.403**
Muri overflow pipe	PE-HD; D_o 400; 2 m length	**512.51.400**
Rotatable shaft inlet	for SickuControl, MuriControl and RigoControl; D_o 400; inlet KG 200	**516.38.400**
Reducer adapter	DN 300/KG 200	**516.14.300**
Reducer for rotatable shaft inlet *	DN 200/DN 100 Drän	**516.13.200**
	DN 200/DN 100 KG	**516.14.200**
	DN 200/DN 125 Drän/KG	**516.12.200**
	DN 200/DN 160 Drän/150 KG	**516.11.200**
End plug	DN 200, suitable for rotatable inlet	**516.80.200**
End cap	for outlet DN 300 SickuControl	**516.81.300**

* To be used with the reducer adapter

Shaft accessories D_o 400 for Sicku-, Muri- and RigoControl

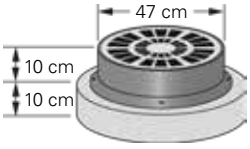
Temporary construction site cover

Class A cast iron cover (without ventilation openings) with fixture

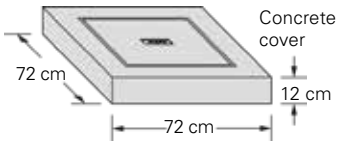


Class B and D cast iron cover with and without ventilation openings
Concrete support ring

Hook for class D cast iron cover with screwless interlocking



Class B and D gully gutter
Concrete support ring



Concrete cover

Sediment trap D_o 400

Filter set D_o 400

Strainer bucket D_o 350

Hook

Product	Technical data	Cat. no.:
Temporary construction site cover D_o 400	construction phase cover for shafts D_o 400	**516.80.400**
Shaft cover Class A 15	cast iron; with fixture, **without** ventilation openings	**516.85.100**
Shaft cover Class B 125*	cast iron; cast iron cover, cast iron frame, concrete support ring, **without** ventilation openings, CW 410	**516.84.001**
	cast iron; cast iron cover, cast iron frame, concrete support ring, **with** ventilation openings, CW 410	**516.84.000**
Shaft cover Class D 400	cast iron; cast iron cover, cast iron frame, concrete support ring, **without** ventilation openings, with screwless interlocking, CW 410	**516.84.401**
	cast iron; **surface-watertight**; cast iron cover with double screw connection, cast iron frame, concrete support ring, **without** ventilation openings, CW 410	**516.85.440**
	cast iron; cast iron cover, cast iron frame, concrete support ring, **with** ventilation openings, with screwless interlocking, CW 410	**516.84.400**
Hook	zinc-plated steel hook for class D covers with screwless interlocking	**555.86.990**
Gully gutter	cast iron; class B 125; gully gutter, cast iron frame, concrete support ring	**516.84.100**
Gully gutter with snap-on lock	cast iron; class D 400; gully gutter with snap-on lock, cast iron frame, concrete support ring	**516.84.500**
Shaft cover	concrete; 72 x 72 x 12 cm; outside of trafficked areas; without ventilation openings	**516.83.000**
Sediment trap D_o 400	suitable for installation under CW 410 shaft covers	**516.91.002**
Filter set D_o 400	dirt trap D_o 400 and geotextile filter bag D_o 400 for shafts D_o 400 as swale emergency overflow	**516.90.002**
Maintenance set D_o 400	3 geotextile filter bags D_o 400	**516.90.012**
Dirt trap D_o 400		**516.91.000**
Maintenance set D_o 350	3 geotextile filter bags D_o 350	**516.90.013**
Dirt trap D_o 350		**516.91.001**
Strainer bucket D_o 350	for installation under rotatable shaft inlet; strainer mesh size: 2.5 mm; for shafts D_o 400	**516.91.004**
Hook for strainer bucket	for filter and dirt trap; bent from 6 mm round steel; 90 cm length	**516.98.999**

* Also available with locking device upon request (surcharge) (delivery within 6 weeks)

Other accessories available upon request.

RigoFlor

CE
0799-CPD-55

Mechanically bonded and thermally treated Polypropylene (PP) geotextile with an unrivalled combination of excellent water permeability, great thickness and optimum opening width; ensures long-term filter functionality.
Geotextile class 3. CE-certified according to DIN EN 13252.

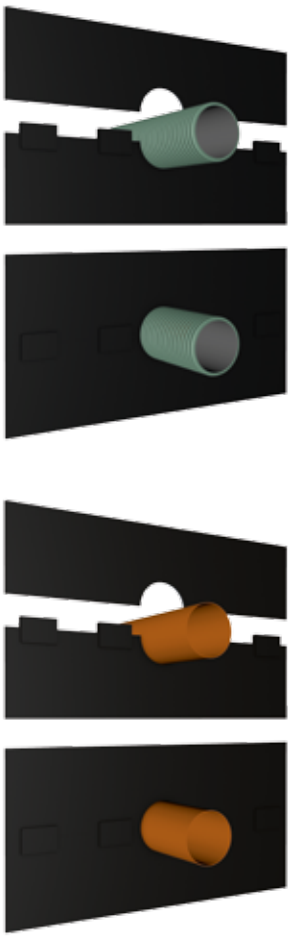
Application:
special geotextile lining for infiltration systems and for swale sheathing. Suitable for pipe swales, underdrained swale systems and storage/infiltration systems.

Important properties of RigoFlor:

Thickness:	≥ 2 mm
Puncture resistance:	2.0 kN
Geotextile class:	3
Characteristic. opening width:	0.08 mm
k_f value (at 20 kPa):	6 x 10^{-2} m/s
Water permeability acc. to EN ISO 11058:	90 l/sm²
Weight:	200 g/m²

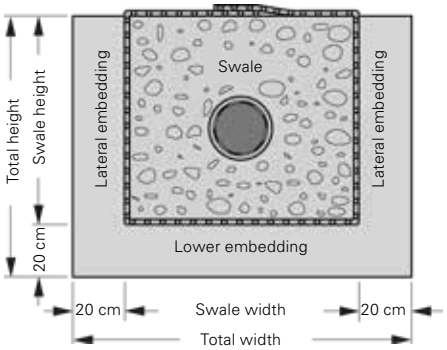
Product	Technical data	Cat. no.:
RigoFlor	W x L = 4 x 50 m = 200 m²	**516.95.000**
	W x L = 4 x 25 m = 100 m²	**516.95.002**
	W x L = 4 x 10 m = 40 m²	**516.95.003**

Retaining device

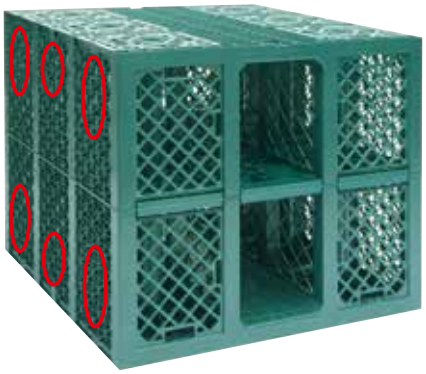


Stable PE panel with a thickness of 10 mm. The retaining device is placed downstream of the swale and, if applicable, upstream of the RigoLimit V or AquaLimit throttle shaft and is firmly embedded in the surrounding native soil. Sealing of the swale on the outlet side is created in form of a discharge barrier in order to prevent the uncontrolled discharge of water through the pipe swale. It is used in, e.g. cascading swales.

The device is delivered with the project-specific opening for the discharge pipe lead-through. The retaining device can consist of two or more parts depending on project-specific size. Thanks to the modular design, the discharge pipe can be installed in line. Individual elements are assembled on-site starting from the base without any additional tools.



Product	Technical data	Cat. no.:
Retaining device	manufactured acc. to project specifications. For order forms, see **www.fraenkische.com**	**517.93.000**



DIBt certification number:
Z-42.1-473

Suitable for HGV 60

Highly durable and hard-wearing Polypropylene (PP) storage/infiltration module
approved by the German Institute for Building Technology (DIBt), the French CSTB and the British BBA, RAL certified stormwater system, block type structure, colour: green, with a void ratio of 95 %, dimensions: 800 x 800 mm, 660 or 350 mm height, with lateral pipe connections for KG DN 100 and 150, can be fed three-dimensionally almost without any obstacles, offers connection points on all four sides, and can be combined as desired.

Continuous inspection tunnel, designed for the use of camera dollies with a camera size for pipes starting from DN 200, tunnel floor with gentle side slopes to guide the dolly, inspection tunnel with plates with large-meshed grid for inspecting the effective drainage surface as well as the entire system volume with all statically relevant bearing-type fixtures.

In combination with QuadroControl, the storage/infiltration system has been designed for professional final acceptance inspection and repeated inspection. Installation under trafficked areas and in large depths is possible, long-term carrying capacity has been proven.

Recommended accessories:
see page 134 for Rigofill inspect accessories and page 135 for QuadroControl

Application:
for construction of gravel-free swales for infiltration, retention and storage of stormwater runoff, and as RigoCollect system component, in combination with RigoFlor special geotextile lining, QuadroControl inspection shafts and additional accessories. Observe the Rigofill inspect installation manual!

RAL GÜTEZEICHEN Regenwassersysteme

Rigofill inspect ... zugelassen durch das Deutsche Institut für Bautechnik DIBt FRÄNKISCHE Z-42.1-473 MFPA Leipzig www.der-erste-mit.de

Rigofill inspect ... CSTBat 676-34/02-PP-234

Rigofill inspect ... BBA

NB

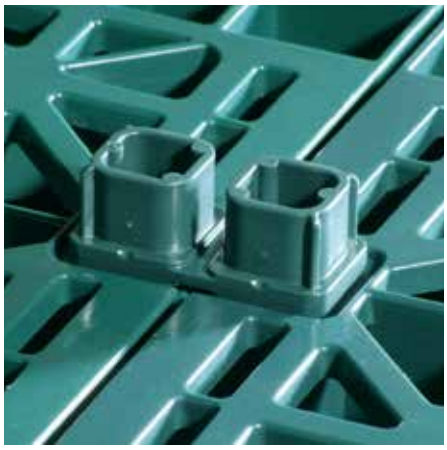
Inspectability of Rigofill inspect and QuadroControl systems has been tested and confirmed by leading manufacturers of CCTV pipe inspection technology.

Product	Technical data	Cat. no.:
Rigofill inspect block	W x D x H = 800 x 800 x 660 mm; 422 l gross volume 400 l storage volume, 20 kg weight	**515.90.005**
Rigofill inspect half block	W x D x H = 800 x 800 x 350 mm; 224 l gross volume 211 l storage volume, 12 kg weight	**515.90.006**

An end plate covers the tunnel openings where no connections are to be made to a Quadro-control shaft.

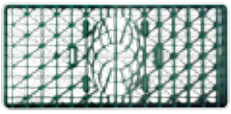
Adapter end plates are used to directly connect to pipes. End plates and adapter end plates are simply snapped into place.

Connectors secure Rigofill inspect during installation. The connectors must each be mounted on the top surface of the module, in the centre of each edge that neighbours another module.



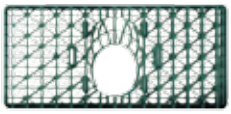
Multi-layer block connector

End plate



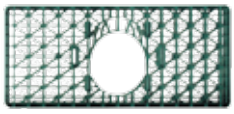
Product	Technical data	Cat. no.:
End plate	800 x 330 x 20 mm	**519.90.200**

Adapter end plate DN 150 KG



Product	Technical data	Cat. no.:
Adapter end plate DN 150 KG	800 x 330 x 20 mm	**519.90.215**

Adapter end plate DN 200 KG



Product	Technical data	Cat. no.:
Adapter end plate DN 200 KG	800 x 330 x 20 mm	**519.90.220**

KG/twin-wall pipe adapter DN 150

KG/twin-wall pipe adapter DN 200

Product	Technical data	Cat. no.:
Adapter DN 150	KG/twin-wall pipe adapter DN 150	**519.61.150**
Adapter DN 200	KG/twin-wall pipe adapter DN 200	**519.61.200**

Single-layer connector

Multi-layer connector

Product	Technical data		Cat. no.:
Single-layer connector (suitable for single-layer installations)	requirement for **single-layer** systems	1 pc. per block*	**519.90.001**
	requirement for **multiple layer systems**	2 pcs. per block*	
Multi-layer connector (suitable for multiple layer installations)	Requirement for **2-layer** systems	1 pc. per block*	**519.90.004**
	Requirement for **3-layer** systems	1.3 pcs. per block* (factor 1.3)	

* Please always order connectors separately – the above data is provided for information only. Obtain exact data on accessories for Rigofill inspect systems using the software available at **www.fraenkische.com**

QuadroControl 1/2

QuadroControl 1

QuadroControl 2

QuadroControl 3

System shaft for Rigofill inspect
Polyethylene (PE-HD) shaft, block-type structure, comprising of one or several shaft bodies plus cone, colour: black, dimensions: 800 x 800 mm, height according to the number of layers of the storage/infiltration system, dimensions compatible to Rigofill inspect, with an inlet side for pipe connections DN 200 KG or larger, with three tunnel sides to connect to Rigofill inspect (connection opening 220 x 220 mm) and with an even floor surface, designed for the use of automotive dollies with camera sizes for pipes starting from DN 200, with D_o = 600 mm extension pipe, 500 mm clear opening diameter, available with rotatable inlet connection.

Recommended accessories:
see page 137 for shaft accessories D_o 600

Application:
multifunctional system shaft for Rigofill inspect systems and RigoCollect systems, can be incorporated at any point within the system, for inlet connection and ventilation as well as for inspection and maintenance of the system.

NEW

Approved by the German Institute for Building Technology (DIBt) (DIBt certification, certificate no. Z-42.1-473), approved in France by the CSTB in the context of application in Rigofill inspect systems.

Product	Technical data	Cat. no.:
QuadroControl ½	W x D x H = 800 x 800 x 350 mm	**515.00.059**
QuadroControl 1	W x D x H = 800 x 800 x 660 mm	**515.01.009**
QuadroControl 1 ½	W x D x H = 800 x 800 x 1,010 mm	**515.01.059**
QuadroControl 2	W x D x H = 800 x 800 x 1,320 mm	**515.02.009**
QuadroControl 2 ½	W x D x H = 800 x 800 x 1,670 mm	**515.02.059**
QuadroControl 3	W x D x H = 800 x 800 x 1,980 mm	**515.03.009**

QuadroControl project shaft	For order forms, see **www.fraenkische.com**	**515.09.000**

NB

Required inlet and tunnel openings are provided on site.

Free download

www.fraenkische.com

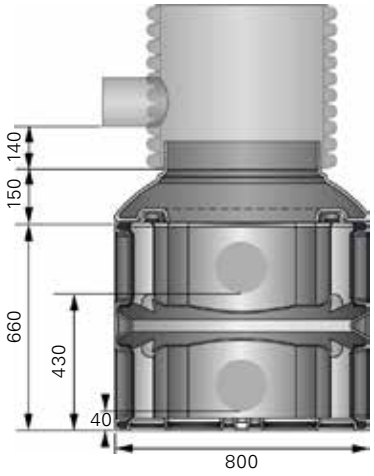
Downloads

Select **competence**

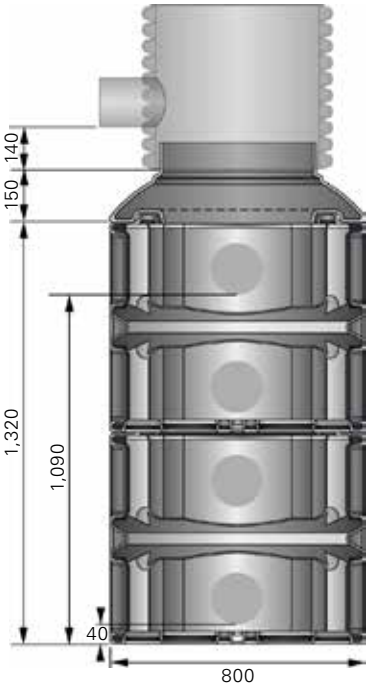
Stormwater management

and **document type:**

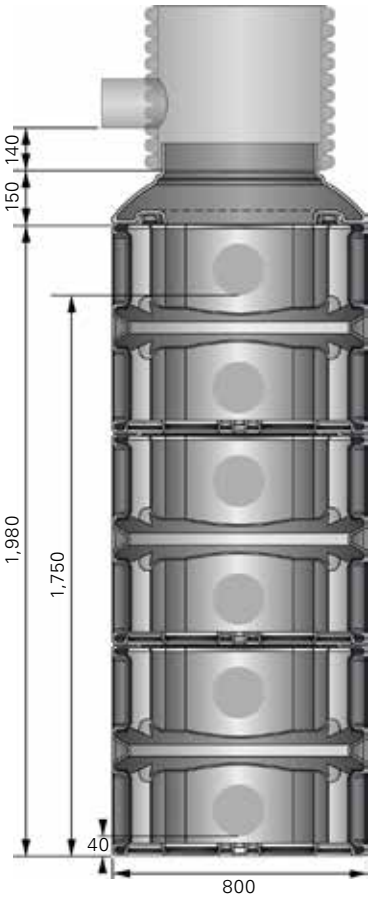
CAD data



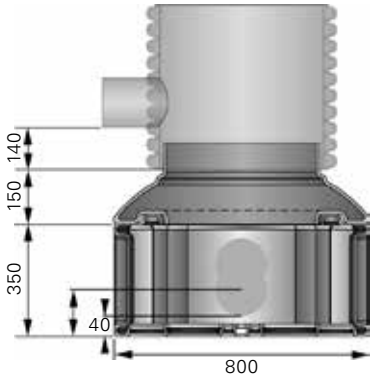
1-layer



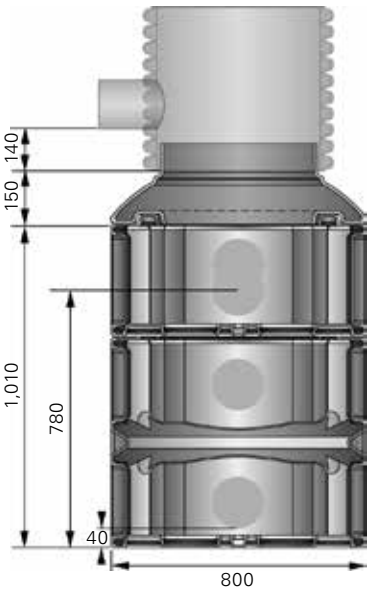
2-layer



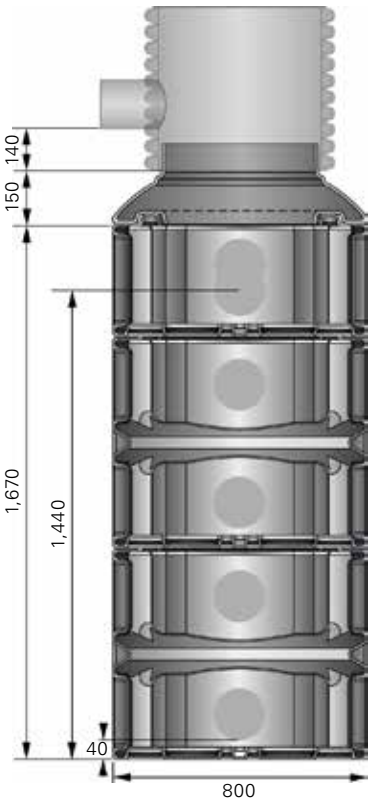
3-layer



1/2-layer



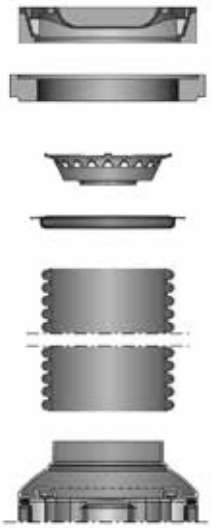
1 1/2-layer



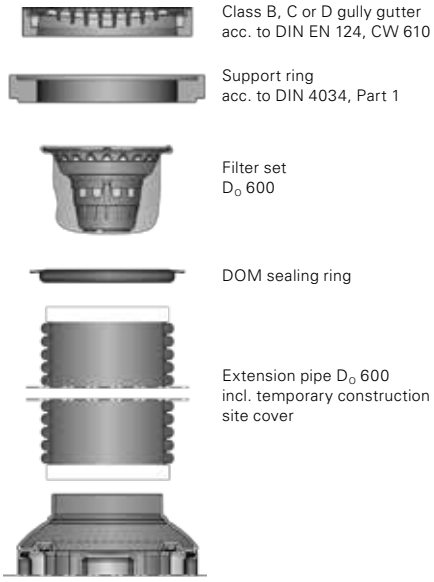
2 1/2-layer

Shaft accessories D_o 600

Structure of inspection shaft



Structure of swale emergency overflow



Product	Technical data	Cat. no.:
Extension pipe* without inlet	D_o 600; 1 m length	**515.50.551**
	D_o 600; 2 m length	**515.50.552**
	D_o 600; 3 m length	**515.50.553**
Extension pipe* without inlet; project-specific	D_o 600; for order forms, see **www.fraenkische.com**	**515.50.559**
Extension pipe* with inlet DN 200 KG	D_o 600; 1 m length	**515.50.521**
	D_o 600; 2 m length	**515.50.522**
	D_o 600; 3 m length	**515.50.523**
Extension pipe* with inlet DN 315 KG	D_o 600; 1 m length	**515.50.531**
	D_o 600; 2 m length	**515.50.532**
	D_o 600; 3 m length	**515.50.533**
Extension pipe* with inlet project-specific (max. DN 300)	D_o 600; For order forms, see **www.fraenkische.com**	**515.50.529**
DOM sealing ring	as seal between concrete support ring and extension pipe	**519.19.505**
Sediment trap D_o 600	suitable for installation under CW 610 shaft covers	**519.91.095**
Filter set D_o 600	swale emergency overflow for shafts D_o 600, comprising of dirt trap and geotextile filter bag	**519.91.002**
Geotextile filter bag D_o 600	replacement filter set D_o 600	**519.91.099**
Shaft covers according to DIN EN 124	class B or D; CW 610	**to be supplied on-site**
Gully gutter acc. to DIN EN 124	class B, C or D; CW 610	
Support ring acc. to DIN 4034, Part 1	100 mm high	

* Incl. pre-mounted temporary construction site cover.

Cooperation with our partner ARIS

Rigo®Collect system components

The cooperation combines the experience and expertise of FRÄNKISCHE and ARIS. This allows you to make use of the entire know-how and range of products of FRÄNKISCHE and to receive technical components of ARIS, coordinated and organised, a customised overall system in one single all-round carefree package. See pages 138 to 144 to find out more about the services offered by ARIS.

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73249 Wernau
Tel.: +49 7153 9290-0
Fax: +49 7153 9290-20
info@aris-systeme.de
www.aris-systeme.de

Impermeable membrane

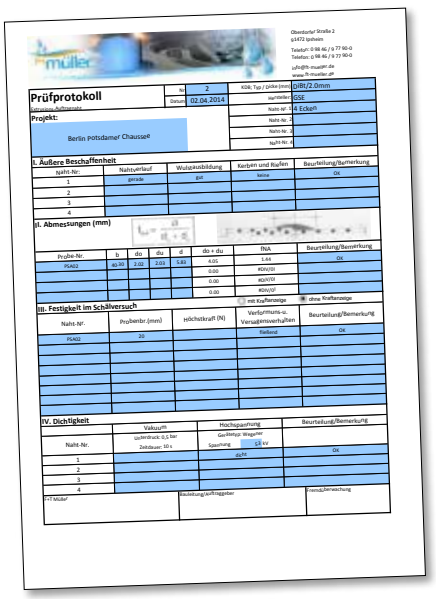
3

The impermeable high-density polyethylene (PE-HD) membrane (KDB) has proven its value for groundwater protection for many years. Installation, testing, documentation and certification methods have been adopted from the field of storage site construction, where they have been successfully used for almost 40 years.

Polyethylene is resistant to rodents and almost all chemicals. Due to its underground installation, it is completely corrosion-free and ageing resistant.

General building authority approval

By the general building authority approval, materials, which do not underlie any standard in terms of production and quality, are approved for installation. It is awarded by the German Institute for Civil Engineering (*DIBt – Deutsches Institut für Bautechnik*). The 2.0-mm thick impermeable membrane meets the highest quality requirements in terms of groundwater protection.


Prüfprotokoll

Projekt:

Berlin Potsdamer Chaussee

I. Äußere Beschaffenheit

II. Abmessungen (mm)

III. Festigkeit im Schälversuch

IV. Dichtigkeit

Association for Groundwater Protection (AKGWS)

In addition to the use of high-quality materials, installation of the KDB impermeable membrane by professionals must be impeccable. The Association for Groundwater Protection (*Arbeitskreis Grundwasserschutz (AKGWS)*) imposes very high standards on its members. The Federal Institute for Materials Research and Testing (*Bundesanstalt für Materialforschung und -prüfung (BAM)*) performs annual quality checks of all AKGWS specialist companies. Not only welding and testing equipment, but also operational processes and corresponding documentation are checked. What is more, contractor's approval according to the Federal Water Act (*Wasserhaushaltsgesetz (WHG § 19)*) as well as yearly testing of welding specialists by the technical inspection agency TÜV are required. All weld seams are inspected and documented.

After all, proof of public liability insurance with an amount covered of at least 2.5 million euros is required.

Upon completion and acceptance of the structure, the following documents are handed over: welding and test records, welding certificates of welders involved, AKGWS certificates, the Federal Water Act certificate issued by TÜV, DIBt approval of the impermeable membrane and self-monitoring record.

Only adhering to all the quality regulations of WHG and AKGWS, as well as having a complete set of documentation for the impermeable membrane and the executed work, you will obtain a system which meets the highest demands in terms of protection of our groundwater.

ARIS Quadro® Stream pump shaft

The QuadroControl shaft does not only provide easy access for inspection and cleaning, but also sufficient room for the installation of accessories which are needed in some tanks.

Equipped with the required pump systems, it evolves into QuadroStream and allows equipment in the system to be installed in the layout of the storage system. Water supply in stormwater harvesting and fire water systems can be covered directly from the RigoCollect tank. Type, size and number of pumps are defined according to project needs.

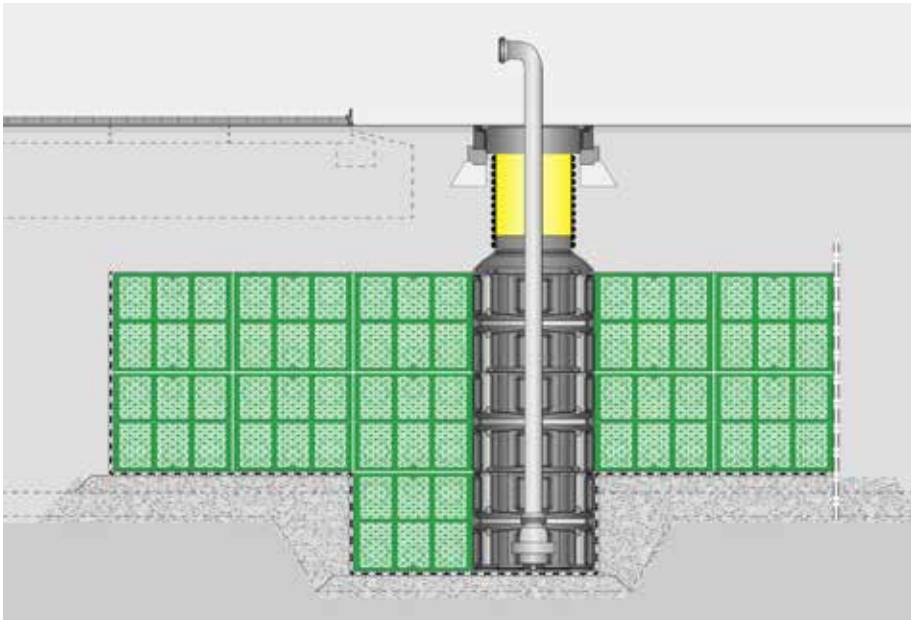
Whether one charging pump to bring water to a stormwater harvesting control unit or several pressure pumps to directly supply wall hydrants of a fire water network - it is a matter of individual needs. It goes without saying that additional components, such as charging level monitoring and control in connection with fire water storage, can also be incorporated. This way you will receive your tank with all the components as an overall service from one single source!

ARIS Quadro® Lift lifting system

In the case of stormwater storage, the way to a pipe or receiving waterbody normally leads through a vortex. If this is not possible due to height or for reasons of backwater protection, a lifting system must be provided. For this purpose, the required number of pumps of appropriate types and sizes are integrated into the QuadroControl shaft. An associated control provides reliable fully automatic operation. It complies with the requirements of property drainage, and is able to achieve e.g. a pump performance depending on rainfall intensity as well as to pump out water from the storage only after the end of the rainfall event. To do so, an ARIS planning sheet is provided (simply scan the QR code), with the help of which we will collect all the relevant parameters in order to provide the best possible, individual solution.

Tapping point

To enable the fire fighters to draw water, installation of a tapping point is required according to DIN 14230. Tapping points must be designed according to DIN 14244. Pillar and subsurface designs can be applied. Both designs are factory-integrated into the RigoCollect tank. An appropriate ventilation unit as well as standardised marking of the tapping unit are also included in the delivery.



Other components

Additional filter elements or fittings, such as manually operated or automated gate valves, can be added according to individual needs.

ARIS-ARGUS stormwater harvesting control unit

ARIS REGEN. WASSER. SYSTEME.

ENERGIE EFFIZIENZ

The ARIS-ARGUS is the central core of the ARIS-MODULAR stormwater harvesting system. Due to the cutting-edge concept, this stormwater harvesting control unit provides reliable, energy-saving operation in the system and performs all monitoring functions. The modular nature of ARIS-ARGUS with its freely programmable control enables optimal configuration, tailored to each particular system and application.

Functionality

The ARIS-ARGUS stormwater harvesting control unit combines all internal components of stormwater harvesting of a building in one single device. They have been perfectly factory-matched, and adherence to all the relevant standards and guidelines is guaranteed "ex works". Installation time and errors are minimised, thus improving operational reliability.

Advantages

- All components compactly fitted in one housing
- Entirely individual configuration
- Freely programmable
- Optimum operational reliability
- Factory-provided compliance with relevant standards and guidelines
- Very little space required
- Low level of operating noise

Energy efficiency

Direct series connection of the pumps in the tank and the device, as well as standard speed control of the base-load pump ensure the highest possible energy efficiency coupled with consistency of output pressure.

Equipment

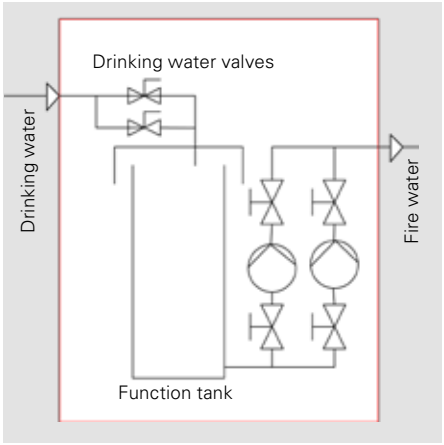
Thanks to the project-specific design, the stormwater harvesting control unit is as unique as your building. In addition to the number and performance of the pumps, which can be selected individually, a number of extra features can be added to the device, such as:

- Interface with building management system
- Remote monitoring and maintenance
- Control and monitoring of auxiliary equipment, e.g. irrigation and lifting units
- Recording of volume flow rates
- Monitoring of water quality
- Monitoring of downstream infiltration facilities
- External display of drinking water savings and visualisation of facility operation
- KIM! sensor technology: *KIM!*(***K**abelloses **I**ntegriertes **M**essverfahren*) is a wireless integrated measurement method to measure the filling level in the tank without any external sensor elements.

ARIS-ARGUS TS separator station

Separator stations ensure hygienic separation in fire water supply installations connected to the drinking water system according to DIN 1988-600, EN 1717 and EN 13077. This reliably prevents harmful effects on drinking water as well as due to stagnation (if water has not been removed for a long period of time).

In installations with mixed supply from the public system and own supply, the system ensures that the demand is preferably covered from the public system in order to be able to use own supply as long as possible. For the regular automatic self-test, however, water from own supply is mainly put through the cycle, and drinking water is only fed in the amount necessary for flushing the drinking water connection according to DIN 1988-600.



Separator station indirect

Advantages

- All components compactly fitted in one housing
- Entirely individual configuration
- Freely programmable
- Optimum operational reliability
- Factory-provided compliance with relevant standards and guidelines
- Very little space required
- Low level of operating noise
- Special designs for installation in very tight spaces
- Highest possible water efficiency during self-test and pipe flushing

Equipment

The system is individually designed to meet project-specific needs and to suit every particular situation. In addition to the number and performance of the pumps, which can be selected individually, a number of extra features can be added to the device, such as:

- Interface with building management system
- Remote monitoring and maintenance
- Recording of volume flow rates
- Separation of regular consumers in the event of fire
- Pressure control for each storey to protect multi-storey buildings

The benefits in detail

- There can be redundant components (i.e. existing several times) to guarantee operational reliability.
- Standards-compliant separation between fire water and drinking water is guaranteed by an unoccupied outlet.
- The system performs a cyclical self-test which checks all functions.
- The freely programmable control provides you with the certainty of being able to meet also future needs in terms of automatic flushing of the unoccupied outlet, which is a binding provision if water is removed seldomly or not at all and which are constantly becoming stricter, easily and without extensive alterations and retrofitting.
- The operating pressure required in the fire water system is created and maintained through an integrated booster station.
- The combination with stormwater harvesting and greywater recycling opens up completely new economic potentials – for the first time, fire water systems have a chance of amortising!

ARIS-LUPO filter system

ARIS REGEN. WASSER. SYSTEME.

The patented ARIS-LUPO filter system has been specifically designed as a tank filter for stormwater harvesting. The highly efficient purification process of ARIS-LUPO guarantees a high water yield and an optimal water quality in the tank.

Stormwater from well-designed systems filtered through LUPO is technically purer than conventional tap water, and, contrary to the latter, it can be directly used for a lot of industrial applications without softening. You can save twice: during water supply and treatment! Phosphate, traces of which are often contained in drinking water, also causes problems in water cycles, since it is the reason for algae growth and biofilm. Thanks to stormwater, adding biocides can be reduced significantly or even rendered unnecessary.

Inlet and outlet of the filter system are arranged such that no additional height offset is required, so it is easy to install, e.g. when retrofitting. Owing to the patented functional LUPO principle, it can be easily adjusted to any rooftop.

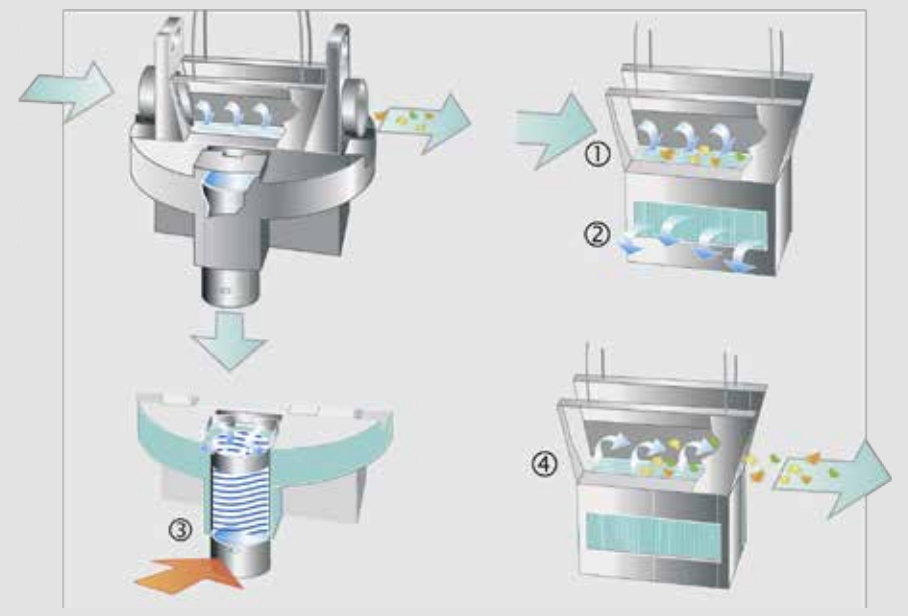
Functionality

① Main treatment: leaves and most particles are retained in the strainer until the self-cleaning process starts. Design and gap width of the strainer allow a high water yield of virtually 100 %.

② Fine filtration: Stormwater flows through a vertical strainer in a second filter stage. Subsequently, natural sedimentation and mineralisation take place in the tank.

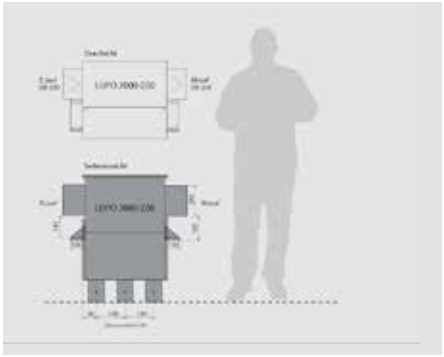
③ LUPO effect: there is an opening in the inlet pipe of the tank which closes due to the rising water level when the tank is full. An air buffer develops in the filter (LUPO effect) which prevents further inflow.

④ Self-cleaning: the water level in the filter rises, since the inlet pipe in the tank is blocked due to the LUPO effect. The filter strainer is automatically flushed and cleaned and floatables are flushed into the sewer.

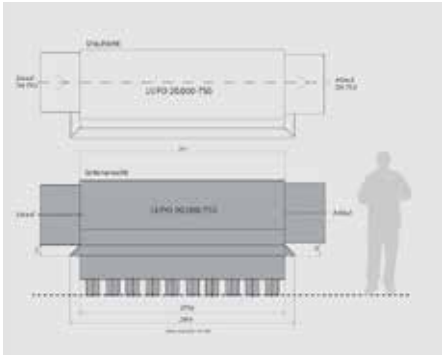


Schematic construction of the LUPO filter: example 200 m² / DN 100

LUPO tank filter systems



LUPO 2,000 m² / DN 200



LUPO 20,000 m² / DN 750

ARIS-LUPO filter for stormwater harvesting in a car wash with RigoCollect

Application examples

Clean water for use in

- toilets
- washing machines
- plant watering
- cooling
- cleaning
- all industrial processes

Customised designs

- Contamination monitoring (in combination with the ARIS-ARGUS stormwater harvesting control unit)
- Special sizes for any roof surface, even greater than 10,000 m²
- Connections adapted to special pipe materials and nominal diameters
- Active self-cleaning filter, no maintenance required

Advantages

- High collection capacity of nearly 100 %
- Virtually self-cleaning
- Easy and quick maintenance, no special tools or expertise required
- No wear and tear parts. The filter is made of polyethylene and stainless steel
- Easily adjustable to specific operating conditions

Care and maintenance

- Depending on surrounding conditions, remove the filter case 2 – 3 times a year and clean the strainer, if necessary

Product [m² / DN]	Technical data	Cat. no.:
LUPO 200/100	L x W x H = 59 x 59 x 60 cm; 6 l/s design flow rate; 10 l/s max. collection capacity; inlet and outlet DN 100; inlet stabiliser 1 x DN 100	**to be ordered/ supplied by ARIS**
LUPO 1.000/150	L x W x H = 57 x 47 x 64 cm; 30 l/s design flow rate; 60 l/s max. collection capacity; inlet and outlet DN 150; inlet stabiliser 2 x DN 100	
LUPO 1.000/200	L x W x H = 57 x 47 x 64 cm; 30 l/s design flow rate; 60 l/s max. collection capacity; inlet and outlet DN 200; inlet stabiliser 2 x DN 100	
LUPO 2.000/200	L x W x H = 72 x 50 x 58 cm; 60 l/s design flow rate; 120 l/s max. collection capacity; inlet and outlet DN 200; inlet stabiliser 3 x DN 100	
LUPO 2.000/250	L x W x H = 72 x 50 x 85 cm; 60 l/s design flow rate; 120 l/s max. collection capacity; inlet and outlet DN 250; inlet stabiliser 3 x DN 100	
LUPO 3.000/300	L x W x H = 127 x 70 x 92 cm; 90 l/s design flow rate; 240 l/s max. collection capacity; inlet and outlet DN ≤ 300; inlet stabiliser 3 x DN 150	
LUPO 6.000/400	L x W x H = 182 x 92 x 105 cm; 180 l/s design flow rate; 360 l/s max. collection capacity; inlet and outlet DN ≤ 400; inlet stabiliser 4 x DN 150	
LUPO 8.000/400	L x W x H = 237 x 92 x 105 cm; 240 l/s design flow rate; 480 l/s max. collection capacity; inlet and outlet DN ≤ 400; inlet stabiliser 5 x DN 150	
LUPO 10.000/500	L x W x H = 292 x 102 x 119 cm; 300 l/s design flow rate; 600 l/s max. collection capacity; inlet and outlet DN ≤ 500; inlet stabiliser 6 x DN 150	
LUPO 20.000/750	L x W x H = 330 x 110 x 142 cm; 600 l/s design flow rate; 1,200 l/s max. collection capacity; inlet and outlet DN ≤ 750; inlet stabiliser 10 x DN 150	

Throttle shaft for Rigofill-type stormwater storage systems
Polyethylene (PE-HD) shaft, block type structure, comprises of one or several shaft bodies plus cone, colour: black, dimensions: 800 x 800 mm, height depends on the number of layers of the storage/infiltration system, dimensions compatible with Rigofill inspect, with extension pipe D_0 600, 500 mm clear opening diameter. With integrated stainless steel vortex valve, manufacturer: **UFT Umwelt- und Fluid-Technik Dr. H. Brombach GmbH**, outlet diameter between DN/OD 250 KG and DN/OD 400 KG (depending on drain efficiency and head), vortex flow ranging from 4 l/s to 80 l/s (other values available on request).

Recommended accessories:
see page 137 for extension pipe D_0 600, DOM sealing ring, sediment trap, shaft covers

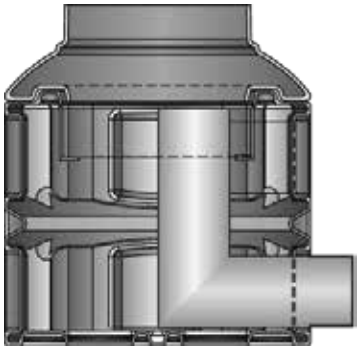
Application:
throttle shaft for Rigofill inspect and RigoCollect stormwater retention systems. Can be installed at any point alongside the system. Ideal for systems that must achieve high operational reliability and high drain efficiency across all operating stages.

Product	Technical data	Cat. no.:
QuadroLimit 1	W x D x H = 800 x 800 x 660 mm*	**515.01.002**
QuadroLimit 1 ½	W x D x H = 800 x 800 x 1,010 mm*	**515.01.052**
QuadroLimit 2	W x D x H = 800 x 800 x 1,320 mm*	**515.02.002**
QuadroLimit 2 ½	W x D x H = 800 x 800 x 1,670 mm*	**515.02.052**
QuadroLimit 3	W x D x H = 800 x 800 x 1,980 mm*	**515.03.002**
QuadroLimit project shaft	For order forms, see **www.fraenkische.com**	**515.09.002**

*** Plus cone height: 25 cm**

NB

1. **UFT vortex valves feature large outlet openings and a flushing peak in the discharge properties. There is no risk of blockages. The stainless steel material ensures maximum durability. Pressure cleaning can be used to clean the system. The vortex valve has no moveable parts and does not show any wear and tear. Long-term functionality and maintenance-friendliness are guaranteed.**
2. **The project-specific installation is conducted by FRÄNKISCHE in cooperation with UFT.**
3. **To place a precise order, please use the QuadroLimit order form.**



System shaft as tank overflow for Rigofill-type stormwater storage systems
Polyethylene (PE-HD) shaft, block type structure, comprises of shaft body and cone. Colour: black, dimensions: 800 x 800 mm, 350 mm or 660 mm height. Dimensions compatible with Rigofill inspect. With extension pipe D_O 600, 500 mm clear opening diameter. With integrated overflow pipe, top edge of overflow pipe and top edge of system same level. Outlet diameter DN 200 KG.

Recommended accessories:
see page 137 for extension pipe D_O 600, DOM sealing ring, sediment trap, shaft covers

Application:
overflow shaft for stormwater storage systems consisting of storage/infiltration modules and for RigoCollect systems to limit the maximum water head. QuadroOverflow can be installed at any point alongside the storage/infiltration system. In multi-layer systems, it is installed in the top Rigofill inspect layer.

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Downloads

Select **competence**

Stormwater management

and **document type:**

Order form

Product	Technical data	Cat. no.:
QuadroOverflow ½	W x D x H = 800 x 800 x 350 mm*	**515.00.051**
QuadroOverflow 1	W x D x H = 800 x 800 x 660 mm*	**515.01.001**

*** Plus cone height: 25 cm**

NB

See page 137 for shaft accessories D_O 600.

Throttle shaft for stormwater storage systems
Polypropylene (PP) shaft D_O 600, black outside, yellow inside. With integrated stainless steel vortex valve, manufacturer: **UFT Umwelt- und Fluid-Technik Dr. H. Brombach GmbH**, inlet diameter DN 200 or DN 250 KG or twin-wall pipe. Outlet diameter DN 250 KG. Vortex flow of up to approx. 40 l/s depending on head.

Recommended accessories:
see page 137 for shaft accessories D_O 600

Application:
throttle shaft for Rigofill inspect, MuriPipe stormwater storage systems or ground basins. Ideal for systems that must achieve high operating reliability and high drainage efficiency across all operating stages.

Product	Technical data	Cat. no.:
AquaLimit project shaft	For order forms, see **www.fraenkische.com**	**512.40.500**
DOM sealing ring	as seal between concrete support ring and extension pipe	**517.19.505**
Sediment trap D_O 600	suitable for installation under covers	**517.19.095**
Shaft covers acc. to DIN EN 124	class B or D; CW 610	**to be ordered/ supplied on site**
Gully gutter acc. to DIN EN 124	class B, C or D; CW 610	
Support ring acc. to DIN 4034, Part 1	100 mm high	

NB

1. **UFT vortex valves feature large outlet openings and a flushing peak in the discharge properties. There is no risk of blockages. The stainless steel material ensures maximum durability. Pressure cleaning can be used to clean the system. The vortex valve has no moveable parts and does not show any wear and tear. Long-term functionality and maintenance-friendliness are guaranteed.**
2. **The project-specific installation is conducted by FRÄNKISCHE in cooperation with UFT.**

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Stormwater management

and **document type:**

Order form

RigoLimit V

Throttle shaft for stormwater storage systems
Polyethylene (PE-HD) shaft D_O 600, extension pipe with black outside and yellow inside for optimum inspectability. Inlet diameter DN 200 KG. Outlet diameter DN 250 KG. Vortex flow ranging from 0.5 l/s to 80 l/s depending on head.

Application:
throttle shaft for Rigofill inspect, SickuPipe, MuriPipe stormwater storage systems or ground basins. Ideal for systems that must achieve high operating reliability and high drainage efficiency across all operating stages.

Class B or D shaft covers
acc. to DIN EN 124, CW 610

Support ring
acc. to DIN 4034, Part 1

Sediment trap
D_O 600

DOM sealing ring

Extension pipe D_O 600
incl. temporary construction site cover

Profile sealing ring

RigoLimit V

Product	Technical data	Cat. no.:
RigoLimit V throttle shaft profile sealing ring and exchangeable orifice included	D_O 600 For order forms, see **www.fraenkische.com**	**512.40.610**
Extension pipe	D_O = 600; 1 m length	**515.50.551**
	D_O = 600; 2 m length	**515.50.552**
	D_O = 600; 3 m length	**515.50.553**
Extension pipe; project-specific	D_O 600	**515.50.559**
Extension pipe with connection as emergency overflow; project-specific (max. DN 315 KG)	D_O 600	**515.50.529**
DOM sealing ring	as seal between concrete support ring and extension pipe	**519.19.505**
Sediment trap D_O 600	suitable for installation under shaft covers CW 610	**519.91.095**
Shaft covers acc. to DIN EN 124	class B or D; CW 610 with ventilation openings	**to be ordered/ supplied on site**
Support ring acc. to DIN 4034, Part 1	100 mm high D_I = 625 mm	

Accessories

Product	Technical data	Cat. no.:
Exchangeable orifice for subsequent adjustment of the discharge*	For order forms, see **www.fraenkische.com**	**517.91.600**

* Replacement: please contact us

Four challenges – one solution: This is how stormwater management is done today.

Where stormwater falls on paved surfaces it cannot drain away naturally. FRÄNKISCHE provides a system of perfectly matched components to ensure a reliable and efficient collection, treatment, storage and discharge of stormwater in any terrain.

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Future

Water is one of our most precious resources. First of all, we have drinking water in mind. However, stormwater is a valuable resource, too, since it affects groundwater quality and groundwater level. The principle of discharging stormwater runoff as fast as possible is more and more often challenged for reasons of water management and environmental protection. The goal of stormwater management is to disconnect stormwater drainage from the sewer system and to get closer to the natural water cycle.

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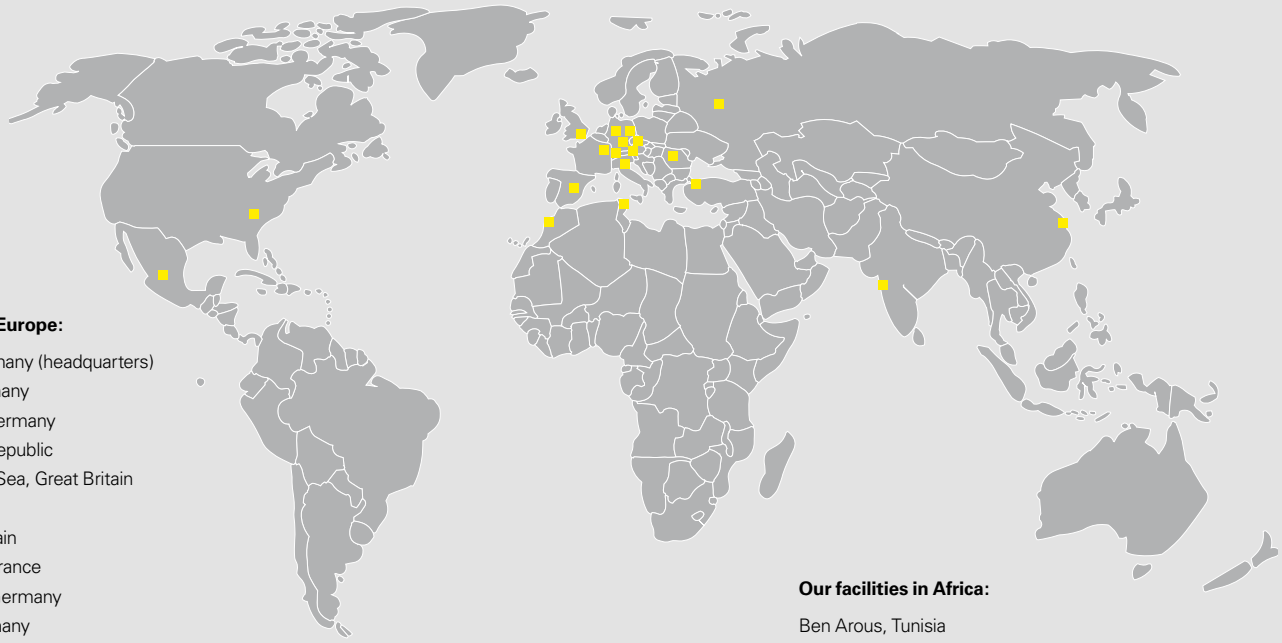
globally successful!



Our facilities in Europe:

Königsberg, Germany (headquarters)
Bückeburg, Germany
Schwarzheide, Germany
Okříšky, Czech Republic
St.-Leonards-on-Sea, Great Britain
Moscow, Russia
Yeles/Toledo, Spain
Torcy-le-Grand, France
Ebersbach/Fils, Germany
Hermsdorf, Germany
Mönchaltorf, Switzerland
Milan, Italy
Istanbul, Turkey
Cluj, Romania
Wels, Austria

Our facilities in Asia:

Anting/Shanghai, China
Pune, India

Our facilities in Africa:

Ben Arous, Tunisia
Casablanca, Morocco

Our facilities in North America and Mexico:

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Guanajuato, Mexico

FRÄNKISCHE is an innovative, growth oriented, medium-sized family-owned enterprise and industry leader in the design, manufacturing and marketing of technically superior corrugated pipe systems for drainage, electrical, building technology and industrial applications.

We currently employ about 2,900 people worldwide. Both our many years of experience and expertise in plastics processing, our consulting services and the large array of products are highly valued by our customers.

FRÄNKISCHE is a third generation family owned business that was established in 1906 and is now run by Otto Kirchner. Today, we are globally represented with production facilities and sales offices. The proximity to our customers enables us to develop products and solutions that are perfectly tailored to our customers' needs. Our action and business philosophy focus on our customers and their needs and requirements for our products.

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