

ALPHEUS FLOW LIMITER STANDARD TYPE (AS) Product description



Table of contents:

The task of a flow limiter	3
Operational description	4
Dry weather operation	4
Storm flow operation	5
Manual pull device for flushing the sewer and for de-blocking function	6
Design flow	7
Change in the flow design value	7
Different control concepts	8
An overview of dimensions and weights	9
Minimum manhole dimensions and installation dimensions	10
Emergency draining of the ALPHEUS chamber	11
Discharge opening / wall opening / outgoing pipes	12
Profiling the inlet to the ALPHEUS	13
Installation in a rectangular chamber	14
Installation in circular chambers	15
Optional components	16
ADAPT TYPE adapter for circular chambers	16
TYPE SZ integrated bypass facility (spindle lifting system)	17
Adapter with integrated emergency bypass facility TYPE ADAPT – NE	18
Adapter with integrated bypass facility and emergency overflow TYPE ADAPT – NE - NÜ	19
Integrated gate valve TYPE INT-FS	20
Installation examples	21
Additional equipment for remote monitoring	22
Recording the controller position	22
Electronic recording of the regulating position	22
Electronic recording of blockages	22
Incorporating the ALPHEUS Flow LIMITER into the design	22
Advantages of the ALPHEUS Flow LIMITER – STANDARD TYPE	23

The task of a flow limiter

A combined storm/sewerage network provides common carriage for storm water and sewage. Depending on the catchment size this will consist of a number of collection systems all eventually discharging into the principle main sewer leading to a wastewater treatment facility. The design of the sewerage system is governed by the capacity of the receiving wastewater treatment facility. In order not to swamp the works a system of regulating or storing excess storm flows is required.

In the past flow control has been achieved through simple orifice plates or restricted pipe dimensions. However in order to make today's systems as effective as possible accurate flow regulation is required. Therefore high accuracy flow restricting devices are required to precisely restrict the discharge rate from a combined sewerage network – irrespective of the head of water – to allow a pre-designed flow of wastewater to be constantly discharged.

As many sewerage network storage systems do not have a power supply, **ESEP** has developed the ALPHEUS FLOW LIMITER, which runs without external power and with the same reliability as electrically actuated regulators.



ALPHEUS- STANDARD in a CSO-chamber

Operational description

When no power supply is available, the ALPHEUS FLOW LIMITER is the correct regulator for the job. Installed in front of the discharge orifice of a sewerage system in a wet chamber installation, the designed discharge rate is accurately controlled – irrespective of the water level in the tank.

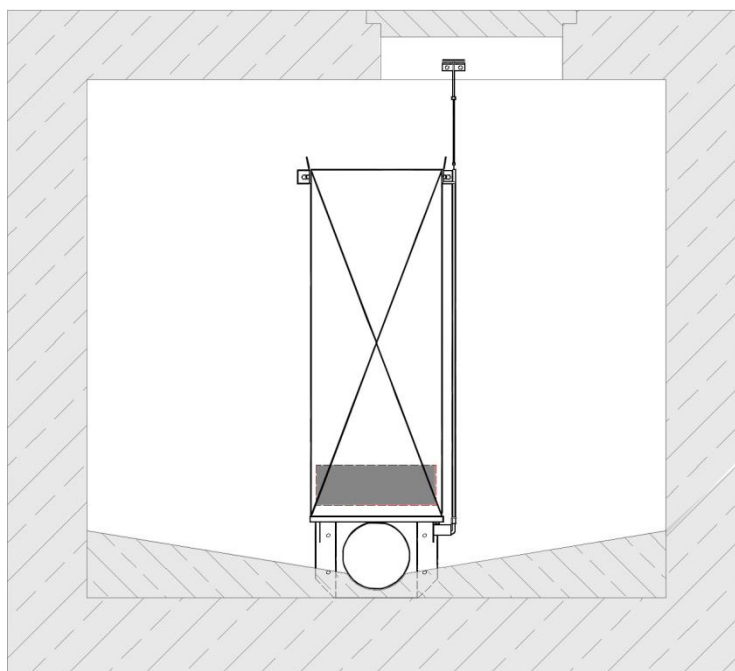
Accurate control, irrespective of head, is achieved with the help of a float, which is located inside the ALPHEUS' housing. The key design feature is that the housing is designed as a submersible bell: i.e. it is open at the bottom but is otherwise hermetically sealed. Consequently air is trapped within the housing and the water level inside the bell rises less than the level in the storm water tank because of the air pocket.

The benefit of the differential pressure is that the unit is smaller as we need less travel to achieve full regulation.

This reduced travel action enables a very compact unit design, which allows the ALPHEUS FLOW LIMITER to be installed even in very confined conditions. A further important advantage of the submersible bell housing over other designs is that the control mechanism lies inside the air zone, i.e. outside the wastewater and the risk of ragging is therefore prevented.

Dry weather operation

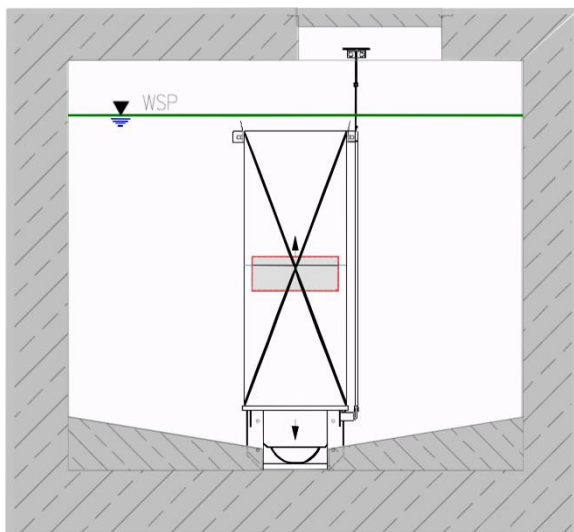
During dry weather flow the orifice plate of the ALPHEUS FLOW LIMITER is in its rest position and the orifice opening is completely free of obstruction. The float located underneath the ALPHEUS' hood is also in its rest position above the unrestricted orifice.



Storm flow operation

When wastewater flows into the storage system under storm conditions flow passes through the Alpheus but due to the higher volume, the level in the chamber rises. As it does so the level will rise within the Alpheus unit itself, if the level reaches the float in the Alpheus housing the control mechanism commences.

As the float rises it causes the orifice plate to lower over the outlet thereby reducing the cross sectional area.



The mechanism that transfers the upward momentum of the float to a downward movement of the orifice plate is located above the water level and is therefore free from ragging up. As the movement of the orifice plate is not matched to the upward movement of the float, it is controlled via a radial cam.

The gate disk, which is permanently connected to the float, has a radial cam in which a cam follower is guided. The cam follower is attached to a slide rod that in turn is attached to the orifice plate. The upward movement of the float is therefore converted into a downward movement of the slide rod thereby restricting the orifice.

The float beneath the hood does not need to travel the same distance as the water level in the tank itself. This is because of the air trapped under the bell housing that provides downward pressure on the float. This enables the Alpheus unit to fit into a smaller chamber than would otherwise be required if the float level always had to be the same level as the water in the tank.

Manual pull device for flushing the sewer and for de-blocking function

When the cross sectional area of the outlet orifice is reduced there is a greater possibility of the unit becoming blocked by debris carried by the storm water. Therefore it is important that the unit is equipped with a simple means of clearing the blockage. This device also offers potential to flush the sewer after a storm event.

The ALPHEUS- FLOW LIMITER, up to and including the model DN 350, is supplied with a manual pull device in the form of a stainless steel cable with a pulley and wall supports. When the stainless steel cable is pulled manually the operation of the float is reversed and the outlet orifice is opened partially or fully to allow the blockage to pass through.

This opening process takes place as long as the manual pull system is operated. The orifice plate then automatically returns to the regulating position – without any further action.

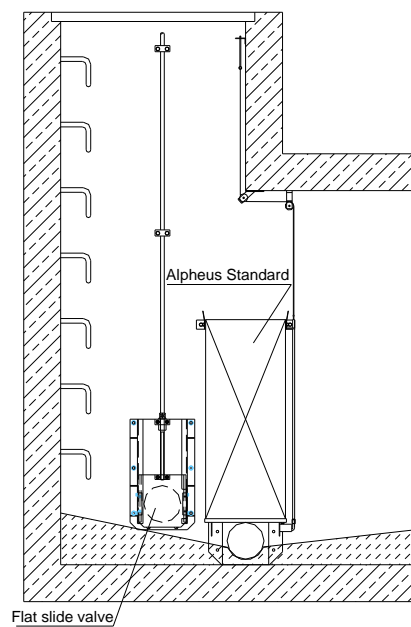
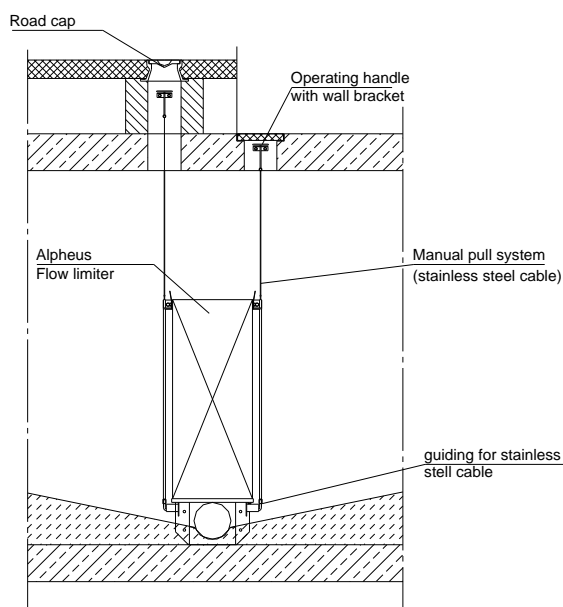
The operating handle of the manual pull system is located so that the personnel can easily access and use it. A road cap located above the controller is recommended for below ground units. In the case of tanks at ground level, the handle of the pulling rope can be located in an easily accessible position near to an access opening and above the maximum top water level. In both situations, it is important to ensure the cable is guided vertically as far as possible. If vertical guiding is not possible, **ESEP** can supply the necessary guide roller.

The manual pulling device does not replace the emergency draining (bypass) device required in accordance with ATV Standard A 166.

Situation 1:
Buried
retention tank

Situation 2 :
Ground level
retention tank

Situation 3:
Pull rope with idler pulley



Standard version: manual pull system to the right

Design flow

The nominal sizes of the FLOW LIMITER are selected according to the calculated design flow value detailed below. The guidelines of the ATV Standard A 111 / A 166 are to be followed for the design. A minimum size of DN 200 is required for foul and combined water.

Nominal size DN	Head of water (Standard) 1)	Flow capacity	Areas of use
100	4 m	2 - 10 l/s	Storm water
150	4 m	7 - 26 l/s	Storm water
200	4 m	10 - 48 l/s	Storm/combined water
250	4 m	20 - 82 l/s	Storm/combined water
300	4 m	35 - 128 l/s	Storm/combined water
350	4 m	60 - 185 l/s	Storm/combined water
400	4 m	80 - 256 l/s	Storm/combined water
450	4 m	140 - 340 l/s	Storm/combined water
500	4 m	210 - 438 l/s	Storm/combined water
550	4 m	300 - 550 l/s	Storm/combined water
600	4 m	370 - 680 l/s	Storm/combined water
650	4 m	450 - 820 l/s	Storm/combined water
700	4 m	540 - 980 l/s	Storm/combined water
750	4 m	650 - 1170 l/s	Storm/combined water
800	4 m	760 - 1370 l/s	Storm/combined water
850	4 m	890 - 1590 l/s	Storm/combined water
900	4 m	1020 - 1830 l/s	Storm/combined water
950	4 m	1170 - 2090 l/s	Regen-/Abwasser
1000	4 m	1330 - 2400 l/s	Regen-/Abwasser

1) Please contact us for higher maximum heads.

Change in the flow design value

The flow design value set in the factory can be changed by approx. +/- 20% without replacing any parts simply by readjusting the slide rod.

If the design flow needs to be changed by a larger amount once the ALPHEUS has been installed, this can be accommodated without replacing the whole device. In this case only the gate disc responsible for the regulation requires replacement.

ESEP requires the following information in order to produce the new gate disc:

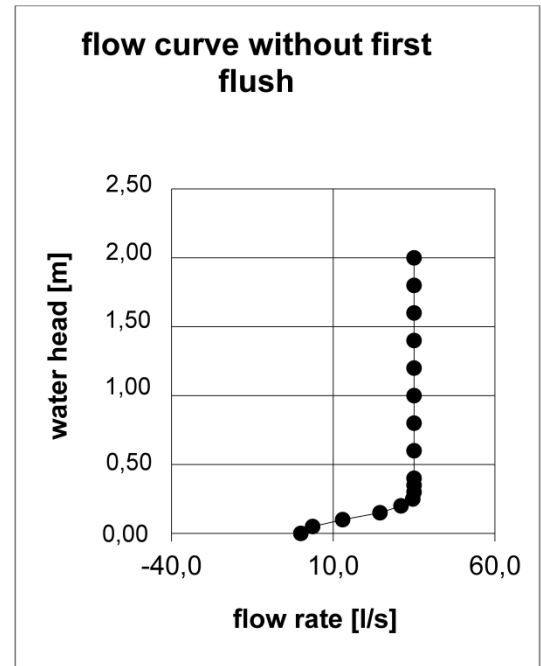
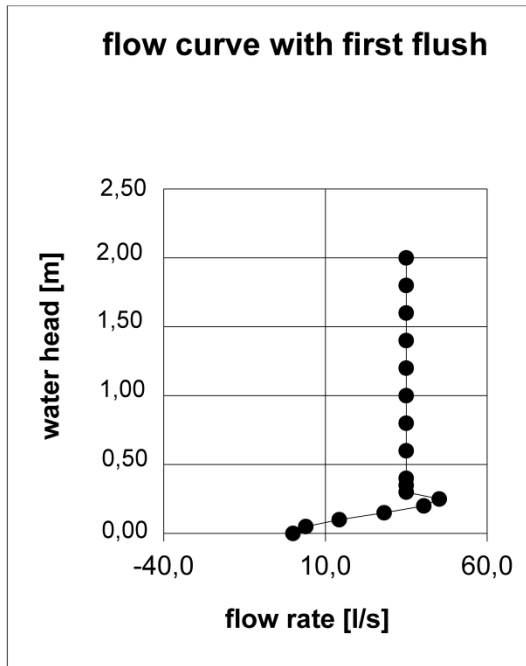
- a) Order or serial number
- b) New design flow
- c) Maximum head of water

Different control concepts

The ALPHEUS FLOW LIMITER is available with two different control concepts:

a) Unit design **with first flush**

b) Unit design **without first flush**
(with orifice restriction)



The standard ALPHEUS FLOW LIMITER is supplied with the "First flush" option. In this version regulation does not begin until the head is approx. 5 cm above the crown of the orifice outlet.

Until this point has been reached the water flows uncontrolled through the ALPHEUS, this causes a surge flush (first flush). The duration of this flushing surge depends on the incoming flow rate.

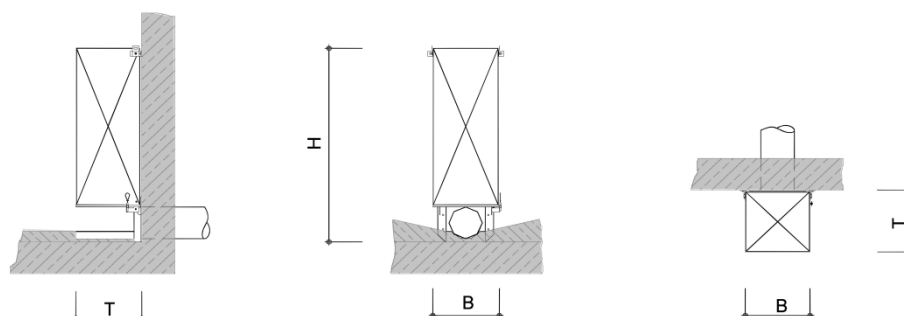
The advantage of the flushing surge is that the solids carried along with the initial storm event can flow through the full opening of the ALPHEUS and the risk of blockage is minimised.

The disadvantage of the flushing surge is, however, that the sewer systems and facilities downstream of the ALPHEUS are exposed to higher hydraulic loads than they are during the actual flow control.

If these downstream areas cannot withstand such hydraulic overloads even for a short time (e.g. small wastewater treatment works or smaller inlet works), a *pre-restriction* must be made to the ALPHEUS. The **pre-restriction** reduces the original outlet orifice cross-section. If a storm event now occurs, the Alpheus unit will regulate immediately.

The pre-restriction however, has the disadvantage that the smaller cross-sectional area of outlet orifice flow is more susceptible to blockages.

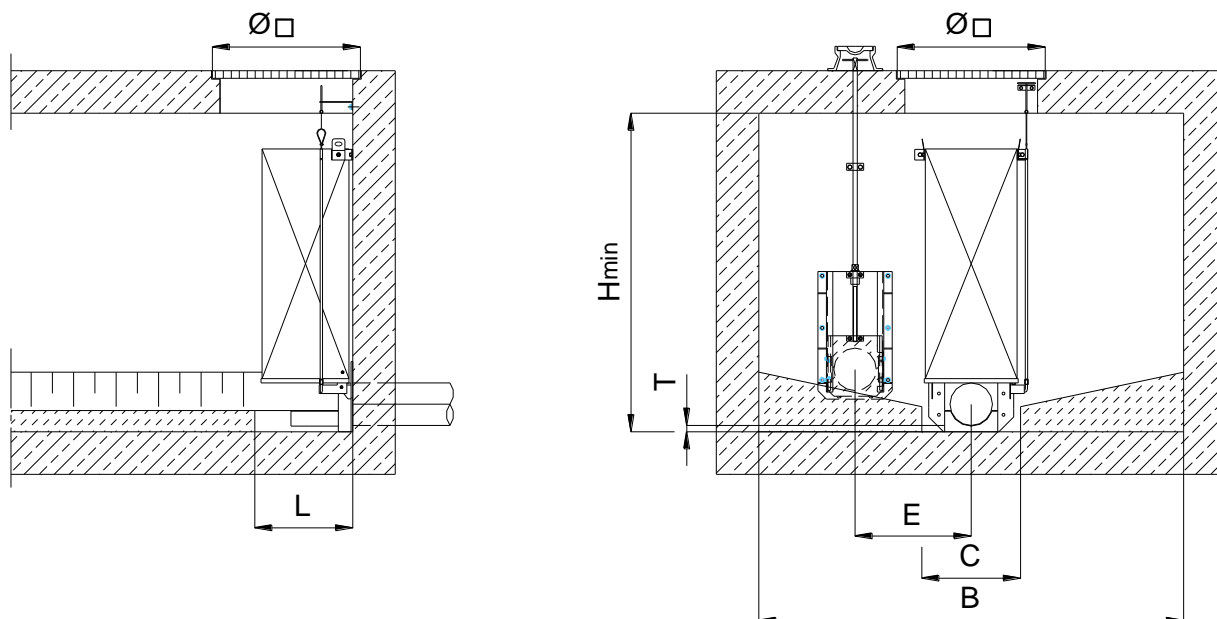
An overview of dimensions and weights



Nominal size DN	H H Standard mm	H H min mm (1)	B mm (2)	T mm	G kg
100	1230	690	442	414	65
150	1280	880	442	414	65
200	1330	990	442	414	65
250	1580	1140	492	488	90
300	1830	1290	542	563	110
350	2080	1440	592	637	140
400	2330	1590	682	733	180
450	2580	1740	732	807	220
500	2830	1890	782	883	260
550	3080	2040	872	978	300
600	3330	2190	922	1053	350
650	3580	2340	974	1162	400
700	3730	2490	1024	1237	450
750	3780	2640	1074	1312	500
800	3830	2790	1124	1387	550
850	3880	2940	1174	1462	630
900	3930	3090	1224	1537	680
950	3980	3240	1274	1612	730
1000	4030	3390	1324	1687	780

- 1) If the structure/chamber has a lower height dimension, it is possible to produce the ALPHEUS with a smaller unit height. The max. head of water should be no more than 2 x unit height.
- 2) Width of the unit is without hood fixing angle.

Minimum manhole dimensions and installed dimensions



Nomi nal size	H _{min} Alpheus - height (1) + mm	B _{min} Structure width mm	E _{min} Axis centre spacing (2) mm	□ _{min} Installation opening mm	Ø _{min} Installation opening (3) mm	C _{min} Opening width (4) mm	L _{min} Opening length mm	T _{min} Opening depth below pipe invert mm
100	550	1500	500	500 x 450	610	500	500	30
150	550	1500	500	500 x 450	610	500	500	30
200	550	1500	500	500 x 450	610	500	500	30
250	600	1550	550	550 x 525	700	550	550	30
300	700	1600	550	600 x 600	800	600	600	30
350	850	1650	600	660 x 710	1000	650	650	30
400	980	1700	650	710 x 785	1050	700	750	30
450	1100	1700	650	760 x 860	1150	700	800	30
500	1200	1850	700	810 x 935	1250	750	900	30
550	1450	1950	750	860 x 1010	1350	800	950	30
600	1560	2050	750	910 x 1085	1450	850	1050	50
650	1710	2100	850	960 x 1160	1500	900	1150	50
700	1760	2300	850	1010 x 1235	1600	950	1200	50
750	1860	2300	950	1060 x 1310	1700	1000	1300	50
800	1960	2650	980	1140 x 1440	1800	1050	1350	50
850	2060	2700	1000	1190 x 1515	1850	1100	1450	50
900	2160	2750	1050	1240 x 1590	1950	1150	1550	50
950	2260	2850	1050	1290 x 1665	2050	1200	1600	50
1000	2360	2950	1100	1340 x 1740	2150	1250	1700	50

- 1) The minimum structure height given only applies:
 - if there is no manhole access directly above the unit.
 - for FLOW LIMITERS with the standard unit height
 - for FLOW LIMITERS with reduced unit height

Please contact us if you require any special dimensions.

If it is possible, an installation opening should be provided above the unit.

A special version with a hood that can be removed from the front can be selected if the clear structure height is inadequate, or if a sufficiently sized manhole opening is not available above the ALPHEUS.

For units with a hood removable from the front H_{min} is as follows:

AS 100 to AS 300 = height of Alpheus + 100 mm

AS 350 to AS 500 = height of Alpheus + 150 mm

AS 550 to AS 1000 = height of Alpheus + 300 mm

- 2) Axis centre spacing between Alpheus Flow Limiter and separate bypass-penstock with following nominal sizes:

AS 100 to AS 400 in combination with a bypass-penstock DN 200

AS 450 to AS 550 in combination with a bypass-penstock DN 250

AS 600 to AS 700 in combination with a bypass-penstock DN 300

AS 750 to AS 1000 in combination with a bypass-penstock DN 400

- 3) Installation opening without steps:

In many cases, it helps to briefly lift the tapered section of the access manhole during the installation period, so that the full manhole cross-section is available during installation.
- 4) An opening in the profiling concrete only has to be provided if the profiling concrete is to be placed before the FLOW LIMITER is installed.

The dimensions given are only valid if the nominal size of the FLOW LIMITER corresponds to the nominal size of the discharge opening. Please contact us if the discharge openings are larger.

Emergency draining of the Alpheus chamber

In accordance with ATV Standard A 166, a higher emergency bypass pipe with a minimum diameter of DN 200 is to be provided parallel to each Alpheus device, through which the wastewater can be drained by gravity in the event of a blockage.

Although the ALPHEUS Standard TYPE has a manual pull device and the ALPHEUS AUTOMATIC TYPE has an automatic de-blocking system, in extreme cases a large blockage of the regulator can occur, which cannot be resolved by either of the de-blocking systems. In cases such as these, the upstream sewer network including the storage chambers may have to be pumped out, unless a bypass arrangement is installed. For this reason, we always recommend the installation of an emergency draining facility.

ESEP supplies several emergency drainage options for use with our regulating devices:

- a) For the simplest arrangement, we recommend the **ESEP** gate valve, which can be bolted by the side of the ALPHEUS to provide an emergency bypass. Depending on the manhole arrangement, the emergency bypass may require additional pipe work downstream to return the flow into the existing sewer.

- b) If it is not possible to use a gate valve for space reasons, e.g. structure too narrow or a bypass pipe cannot be laid (e.g. in case of retrofitting), it is possible to use an integrated emergency draining facility, TYPE SZ or the adapter with an integrated emergency draining facility, TYPE ADAPT-NE. Further details of these two options are detailed in the following chapter, optional components.

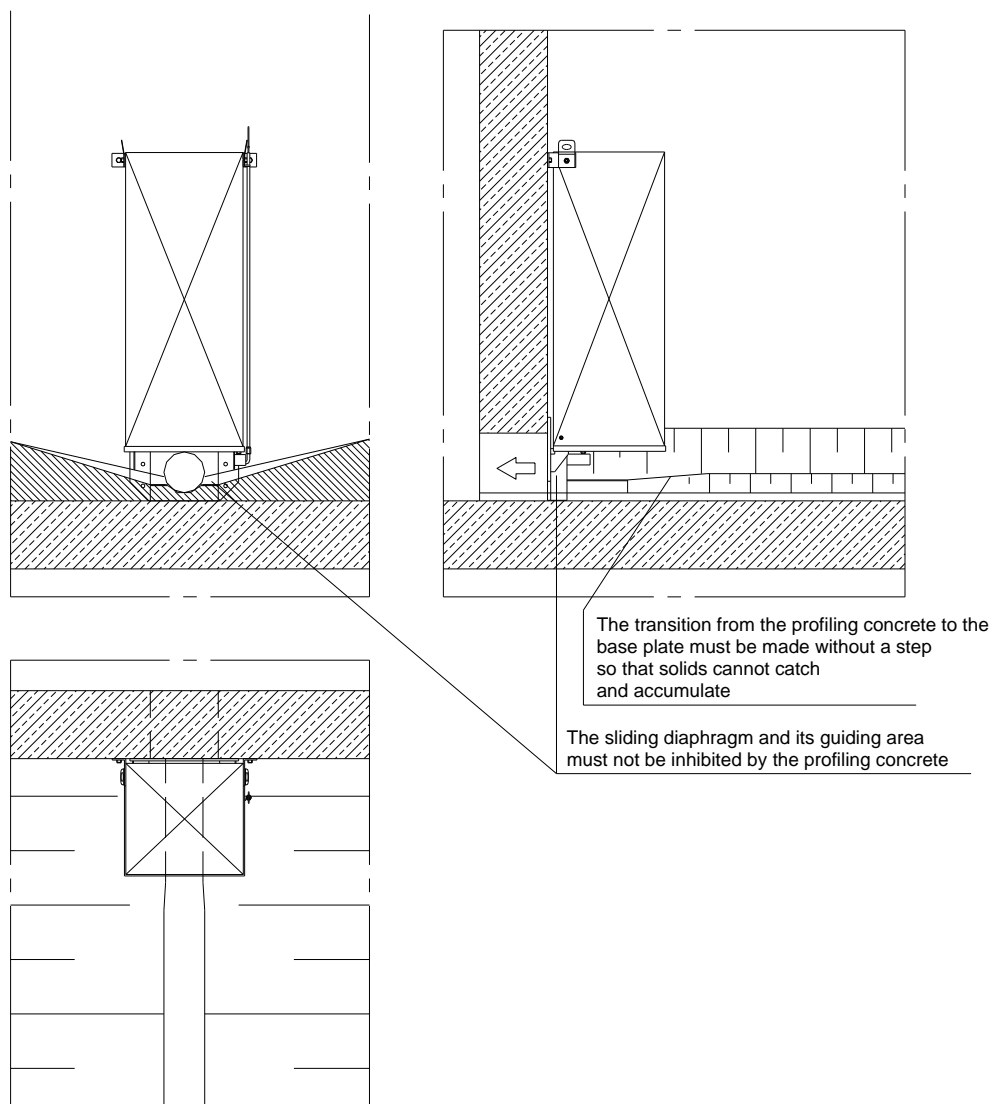
NOTE: The slide valves of flow restrictor devices and bypass pipes in “wet” and “semi-dry” structures are to be equipped with slide rods or spindle extensions in accordance with ATV Standard A 166 for safety reasons, so that they can be operated without entering the structures or tanks.

Discharge opening / wall opening / outgoing pipes

The diameter of the discharge opening must be at least the same size as the diameter of the ALPHEUS FLOW LIMITER. Larger discharge openings are of course possible, but the base plate design of the FLOW LIMITER will need to be made larger to accommodate such an arrangement.

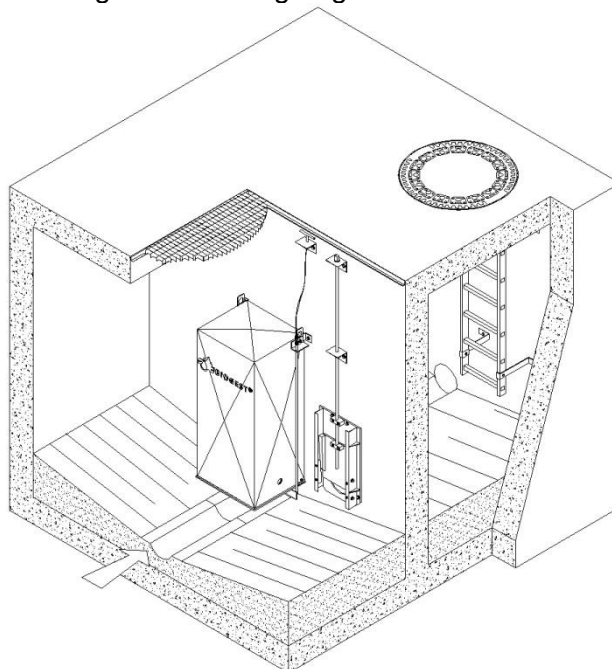
Profiling the inlet to the ALPHEUS

The dry weather channel must be constructed with a half-pipe or one-third pipe, so that a smooth dry weather flume is achieved. The flow velocity across the chamber should be high enough to prevent settlement. Care needs to be taken with the invert levels to ensure that there are no steps. The Alpheus unit has a pre-fabricated base plate and when installed this should exactly match the level of the DWF flume to prevent deposition of solids.

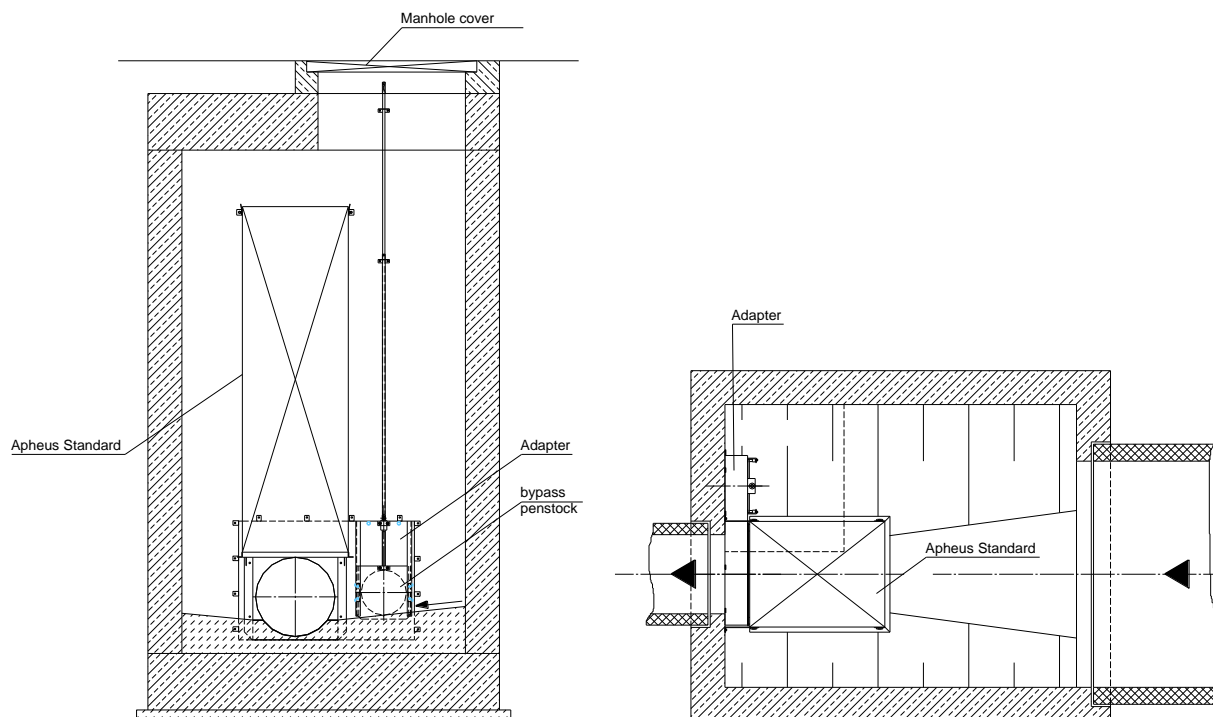


Installation in a rectangular chamber

A vertical installation surface is required for installation of the ALPHEUS FLOW LIMITER. The bottom of the unit is fixed to the wall via the base plate with four wall plugs and bolts in front of the outlet orifice and to the wall using the two fixing angle brackets mounted on the housing.



ALPHEUS- STANDARD and separate emergency bypass using a slide valve.



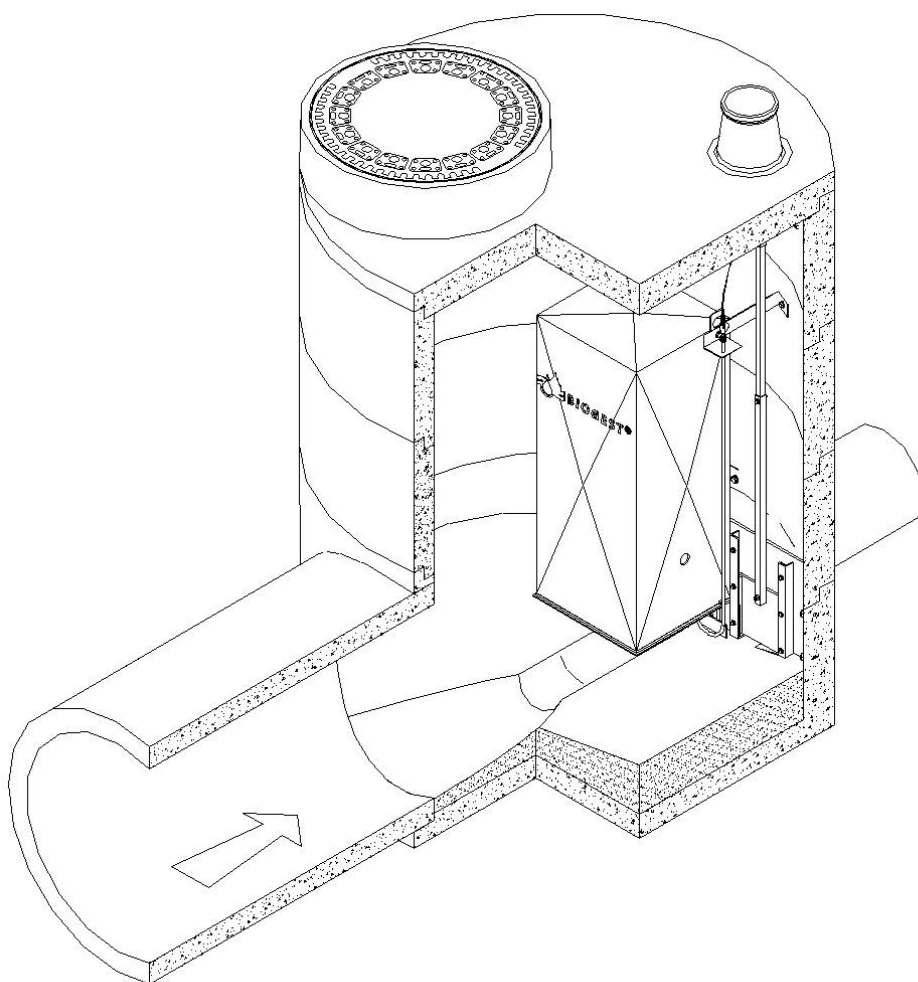
ALPHEUS STANDARD with an integral adapter incorporating an emergency bypass facility and gate valve.

Installation in circular chambers

ALPHEUS FLOW LIMITERS can be installed in suitably dimensioned circular chambers. A flat and vertical installation surface (concrete surface) is required for the ALPHEUS unit to be fixed correctly.

If a flat and vertical installation surface is not available, **ESEP** can supply an adapter, which balances out the radius of the shaft (see the following optional components).

The following diagram shows the installation of an ALPHEUS STANDARD DN 200 together with an adapter with integrated emergency bypass facility in a DN 1500 chamber.



ALPHEUS - STANDARD DN 200 and adapter with integrated emergency draining facility in a circular DN 1500 chamber.

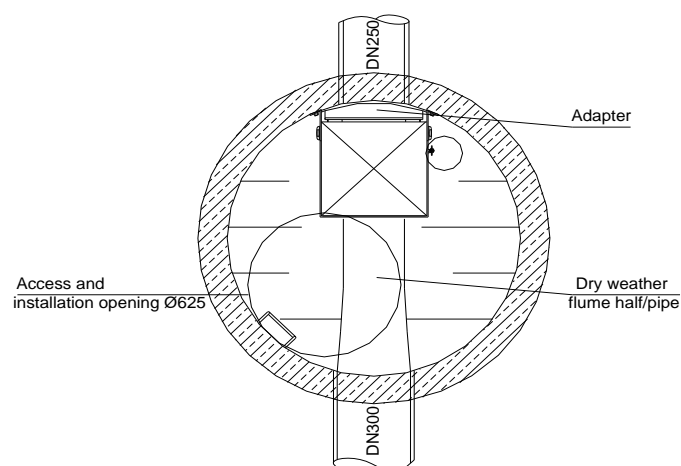
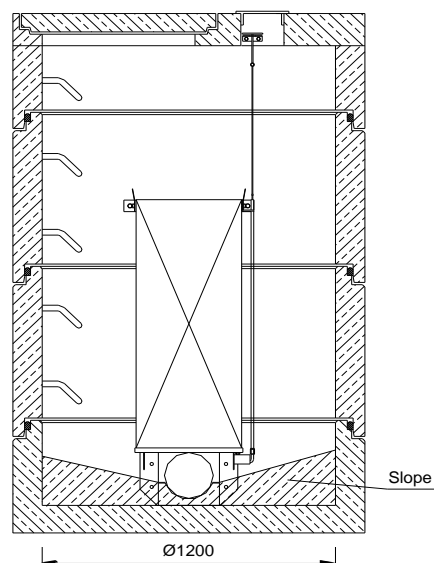
Optional components

ADAPT TYPE adapter for circular chambers

An adapter manufactured from stainless steel enables the ALPHEUS FLOW LIMITER to be directly fixed to a circular chamber saving time-consuming and expensive site work to create a flat and vertical installation surface in front of the outlet.



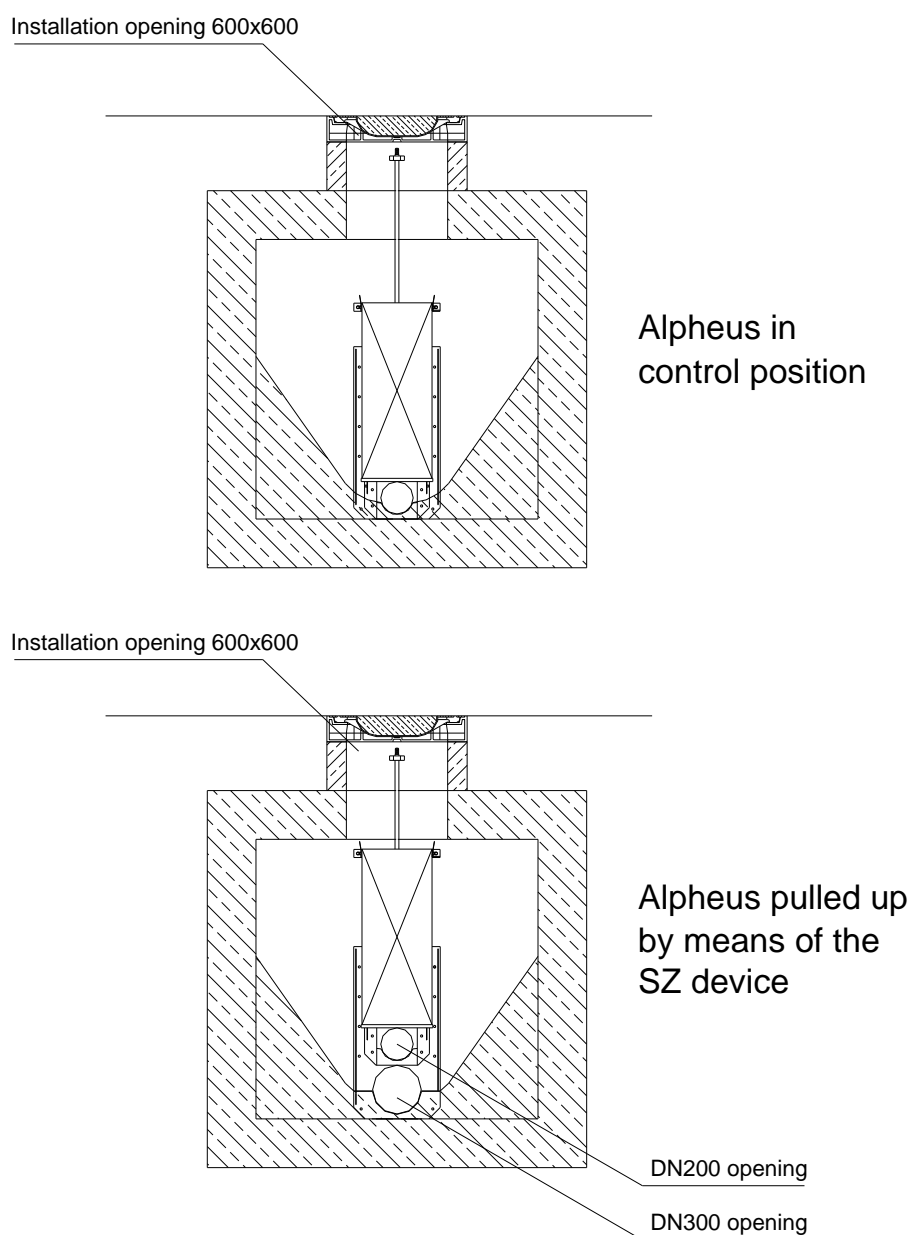
Adapter, type ADAPT, to square the radius in circular chambers



ALPHEUS – STANDARD with adapter in a circular chamber

TYPE SZ integrated bypass facility (spindle lifting system)

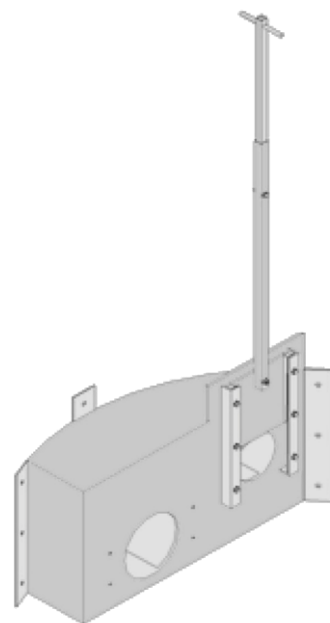
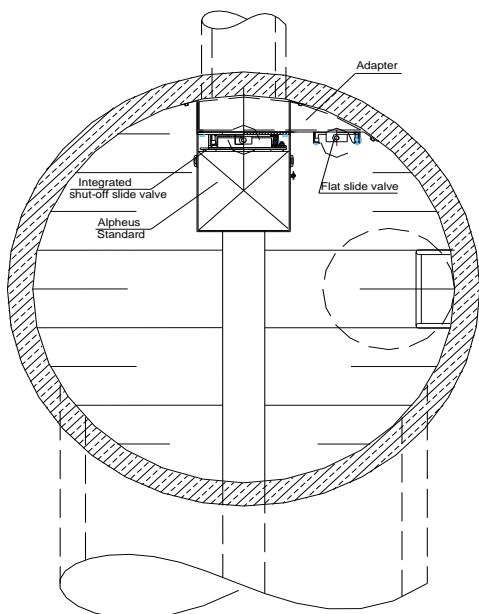
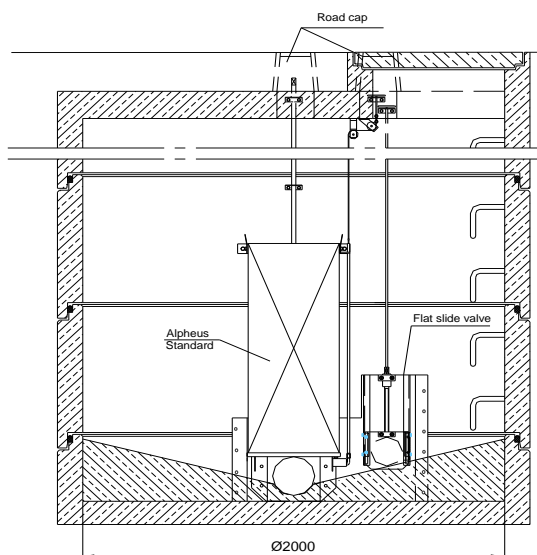
With the **"SZ"** device, the complete ALPHEUS FLOW LIMITER can be lifted up with the help of the spindle. Any coarse materials causing a blockage in front of the discharge opening are then punched through the larger cross-sectional area of the outlet, so that the chamber can be drained. Any remaining coarse material can then be removed from the tank so that the ALPHEUS FLOW LIMITER can be replaced in its working position. Use of the ALPHEUS TYPE "SZ" is dependent on the geometry of the storm water tank. Where new storage systems are to be built, the facility can be easily accommodated within the design and realised at a low cost and minimal effort. Where a retro fit is required due consideration must be given to the ease and practicality of installing the lifting device.



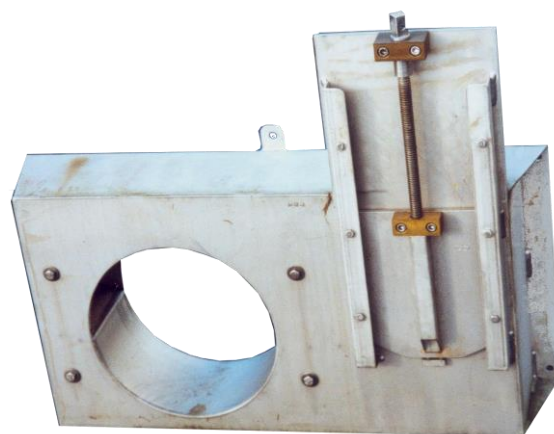
ALPHEUS - Standard DN 200 with SZ-device

Adapter with integrated emergency bypass facility TYPE ADAPT-NE

Many chambers often only have one discharge outlet. To realize the emergency bypass facility required to meet standards such as ATV Standard A166 a separate bypass system must be installed at great expense due to the additional pipe work required to return the flow from the bypass back into the continuation flow. The integrated adapter provides an emergency bypass facility in an easier and more cost effective method.



Adapter with emergency bypass facility for a circular chamber

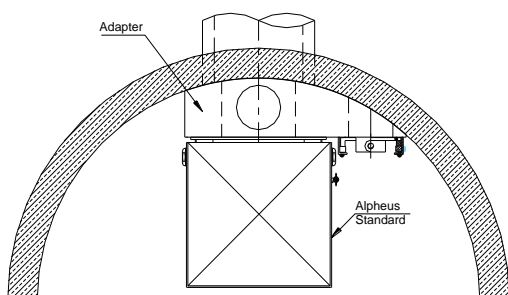
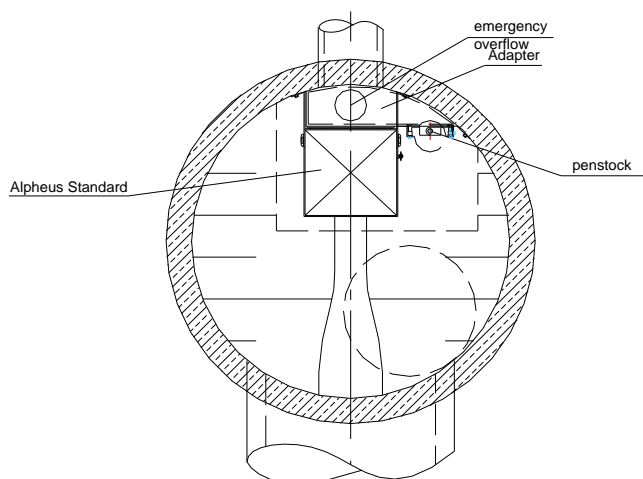
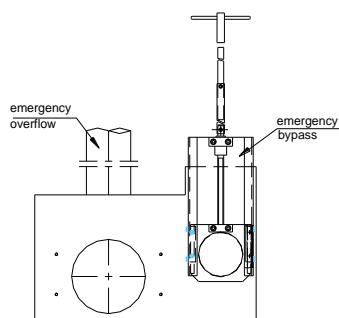
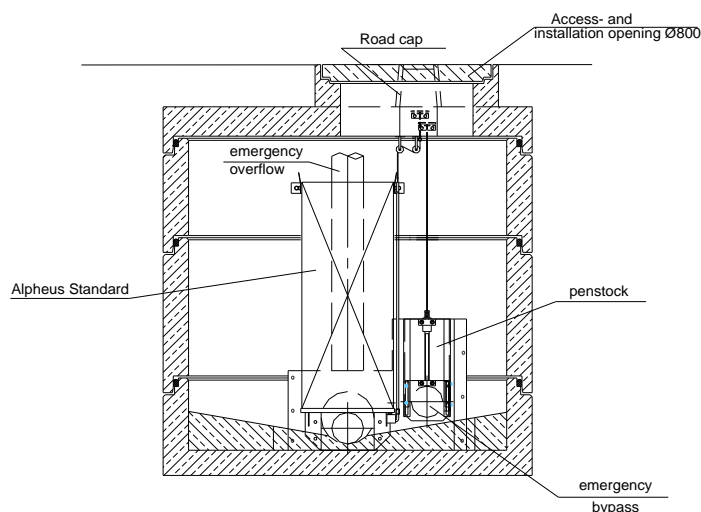
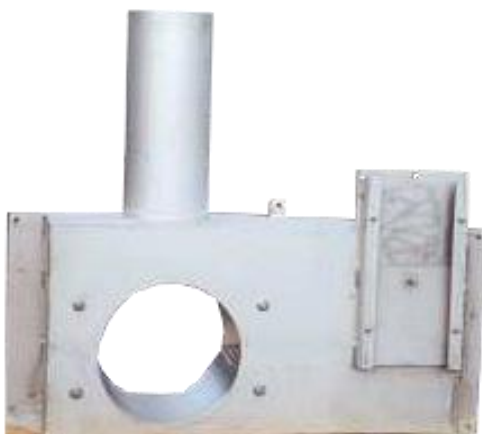


Adapter with emergency bypass facility for a rectangular chamber

Adapter with integrated bypass facility and emergency overflow TYPE ADAPT-NE-NÜ

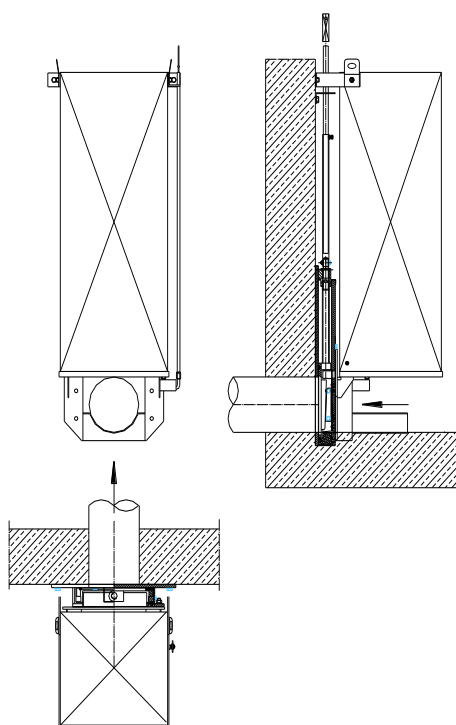
This adapter provides three additional functions, it is a very compact system, and is available for installation in a rectangular or circular chambers.

- Function 1: Squares the radius
Time-consuming construction of a concrete installation surface is eliminated.
- Function 2: Emergency bypass facility
This allows an emergency bypass facility that does not require any additional holes to be cut into the chamber.
- Function 3: Emergency overflow
Removes the need to construct an overflow from the bypass back to the continuation flow sewer.

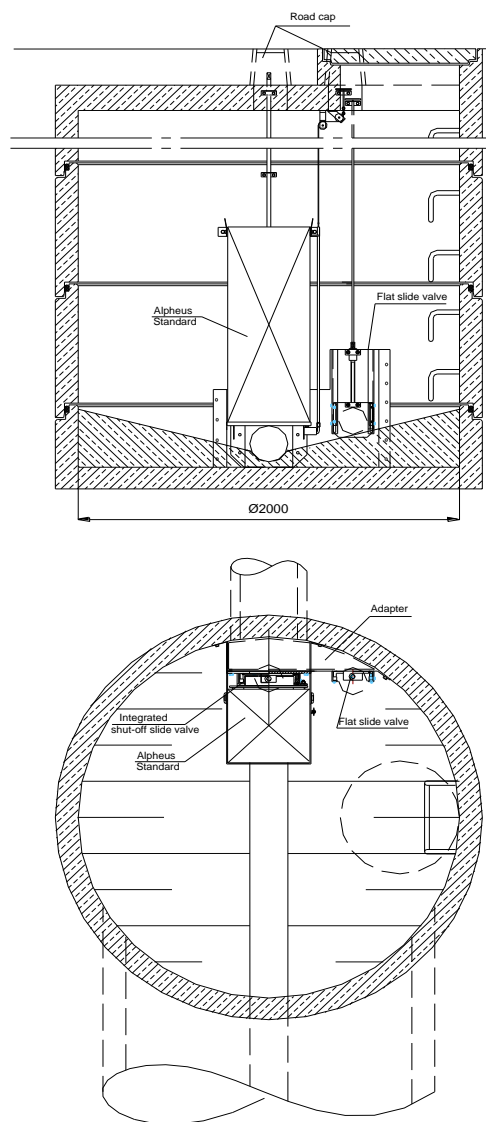


Integrated gate valve TYPE INT-FS

According to the ATV Standard A 166, all storm water tanks should have a flow restricting gate valve regardless of the type of flow restrictor used. The gate valve is required for the trial run, for tests according to the EKVO, for maintenance and repair work to the sewer network and for using the retention tank as an emergency storage tank.

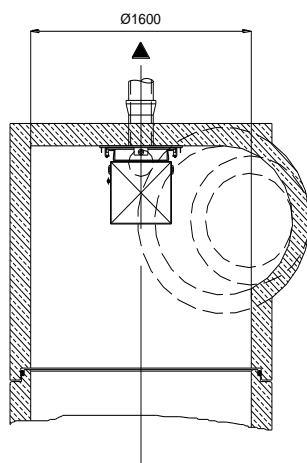
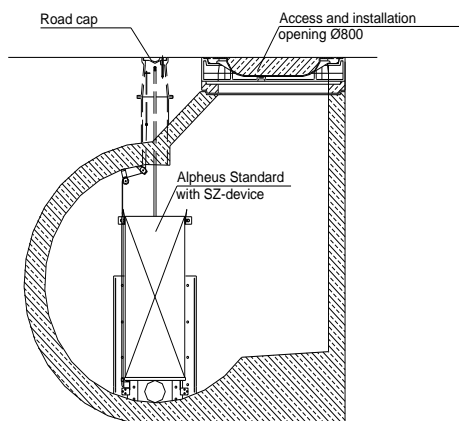


ALPHEUS – STANDARD with integrated gate valve

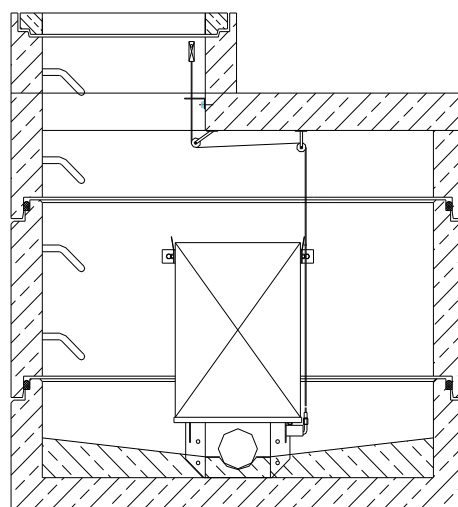
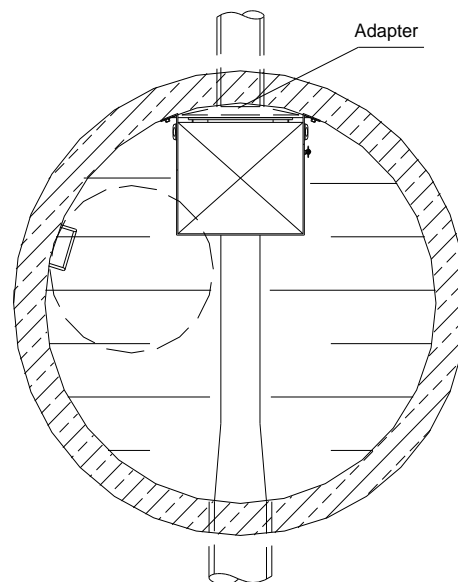
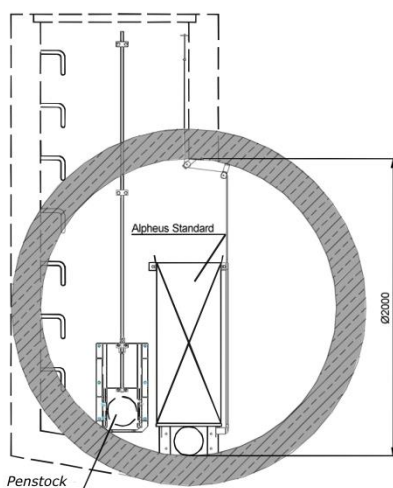


ALPHEUS - STANDARD in combination with an adapter with integrated emergency bypass facility and an integral gate valve.

Installation examples



ALPHEUS – STANDARD with an SZ-device in a tunnel sewer or pipe.



ALPHEUS – STANDARD in its reduced height variant in a circular chamber.

Additional equipment for remote monitoring.

ALPHEUS FLOW LIMITERS can be equipped with sensors and measuring devices, which enable the operating status and faults to be recorded and forwarded to a central control system.

Recording the controller position

Limit switch for registering the regulation position for display and registration of the neutral position / regulating position in a control cabinet / data recording system.

Electronic recording of the regulating position

Ultrasonic measuring system with signal output 4-20 mA for connection to a data recording system for display and registration of the float position and the slide valve position incl. supply of the data for preparation of a characteristic flow curve. Designed as a compact ultrasonic measuring device (Ex protected), installed in an additional stainless steel housing beneath the hood of the ALPHEUS FLOW LIMITER.

Electronic recording of blockages

Sensor for detection of a flow restrictor blockage for remote connection to a control system / data recording system. Vacuum switch for use in potentially explosive (Ex) areas. The vacuum switch is installed in an additional stainless steel housing beneath the hood of the ALPHEUS FLOW LIMITER. In addition, the regulator position must also be recorded for evaluation.

Incorporating the ALPHEUS FLOW LIMITER into the design

The surest method to avoid misunderstandings when incorporating the ALPHEUS FLOW LIMITER into your design is to contact **ESEP** directly - we are always pleased to help!

Send us a drawing of your chamber and a few brief explanations of your design requirements – we will then check the installation and comment on the most practical design.

Advantages of the ALPHEUS FLOW LIMITER - STANDARD TYPE

- An additional structure is not required for the installation of the ALPHEUS. The compact housing can be located in a small space, without any special design requirements for the chambers discharge arrangements. No step is required in the chamber base.
- Active surface water controlled restricting device in accordance with ATV Standard A111 / A 166
- The ALPHEUS is renowned for its precise regulation capabilities. The TÜV (German Technical Inspectorate) Rheinland determined a practically vertical Q/H line (test certificate dated 22.01.90).
- The control mechanism does not come into direct contact with the wastewater and is therefore protected against ragging and jamming.
- Units up to model no DN 350 are supplied with a manual pull device to open the outlet orifice totally in the event of a blockage. Provide the obstruction is < than the diameter of the outlet orifice the blockage will be punched through.
- The ALPHEUS operates without any external power. Electrical connection, compressed air, etc. are not required.
- The ALPHEUS, including all fixing materials, are manufactured in stainless steel. The risk of corrosion, generally associated with wastewater, is therefore minimised.
- The costs of the ALPHEUS FLOW LIMITER are particularly favourable compared to its benefits. Despite the high quality, the unit prices are favourable. In addition, the costs for installation are also low.

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