## ACO Building Service

Backflow systems









Stop that backflow

ACO backflow stops and lifting plant







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#### What causes backflow?

Wastewater can backflow into buildings whenever wastewater can no longer drain off optimally into the public sewers. The dimensioning of drainage installations today takes into consideration economic aspects and self-cleaning effects based on average rainfall events. However, heavy rainfall which exceeds the reference rainfall level can also occur. This means that the drainage installations can be overloaded at any time.

In addition to periods of heavy rainfall, wastewater can also be prevented from draining off as quickly as required by unwanted reductions in pipe cross sections caused by deposits or blockages in sewer pipes, not to mention cracked pipes, pump failures in public sewers, and floods – all can lead to sewage backflowing into a building.



#### Levels are rising

The flood on the River Oder in 1997, the Whitsun flood, the "Flood of the millennium" in 2002 on the Elbe and its tributaries, the major flooding in the Alps in 2005, and the extraordinary amount of snow in East Bavaria in February 2006 all point in one direction: extreme floods and heavy rain and snow falls are increasing across the whole of Europe. And they will become even more frequent in future. Flooding is basically a combination of two factors: water input and surface area. The first has increased: more heavy rainfall. The second has decreased: less unpaved and unbuilt-up areas. Paradoxically, the construction of flood prevention dikes on rivers has already increased the frequency of flooding. Scientists at the Max Planck Institute for Meteorology have observed a long term trend since the middle of the 70s of "an increase in flood events" affecting numerous rivers in west and south Germany and neighbouring countries. Even if these rivers do no break their banks, there is always a risk that sudden heavy rainfall can affect already overloaded sewers which are often only designed to handle average rainfall events. If the capacity of the sewer shafts is exceeded, wastewater follows the natural law of communicating pipes: it flows back into buildings. To prevent backflow, drainage installations below the backflow level have to be properly protected

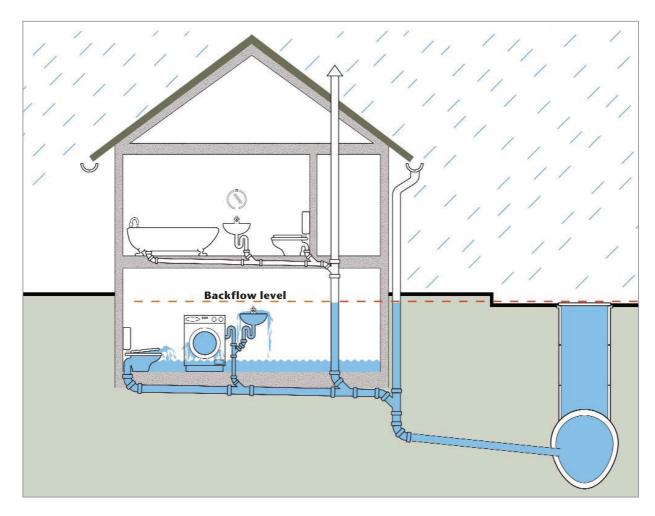
# Local authorities are not liable for extraordinary floods or rainfall

Home owners can no longer rely on the public sewers during extreme rainfall events. If water flows out of sewers during "floods of the century", and causes damage to private homes, local authorities cannot be held liable according to the decision handed down by the German Federal Court of Justice (BGH) in Karlsruhe. Local authorities can claim "force majeure" under such circumstances. Although local authorities are responsible for the safe operation of the sewer system and are responsible for any damage caused during normal conditions, this no longer applies to "completely unusual and rare disastrous rainfall", according to the BGH. Their justification is that "liability for risks associated with pipe networks" are limited by the "economic strength of the local authorities". Extra costs for wider pipes have to stay within reasonable proportion to the additional protection provided by such measures. No fixed limit has been defined. It is clear however that local authorities no longer have to dimension their systems to cope with rain "which occurs more rarely than every 100 years".

This decision handed down in May 2004 strengthens the hand of local authorities who stipulate that landowners bear sole responsibility for protecting their property against backflow.



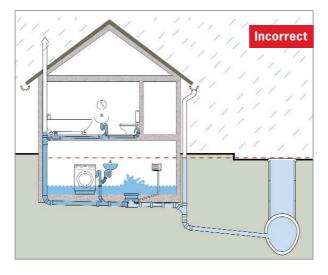
#### **Backflow level**

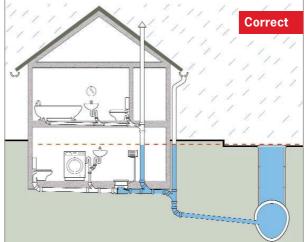


The backflow level is the highest level (water level) to which wastewater can rise in a drainage installation. The backflow level is defined by the local authority (local bylaws). In the absence of any specific definition, the backflow level is usually taken as the level of the road above the sewer connections.

All drainage installations below this level are at risk of backflow and should therefore be protected by implementing the appropriate measures.

#### Installation principles for backflow safety valves





Drainage installations which lie above the backflow level (figure left) must not be connected to a backflow safety valve (lifting plant or backflow stop). This is because it would prevent wastewater draining off properly from installations above the backflow level during a backflow situation. According to the principle of communicating pipes, the wastewater would first flow up out of the deepest lying drains below the backflow level and flood the cellar.

This is why all drainage installations installed above the backflow level must be connected to the sewer downstream of the backflow stops (figure right). During a backflow event, the down pipe will not fill higher than the level of the street, and the backflow stop prevents the wastewater backing up into deeper lying drainage installations – instead it forces it to rise up through the manhole cover of the sewers.

#### Type classification of backflow stops pursuant to EN 13564-1

Туре	Installation	Automatic seal	Emergency seal	Area of application
0	Horizontal pipe	1	0	rain water installations
1	Horizontal pipe	1	1*	rain water installations
2	Horizontal pipe	2	1*	rain water installations/ wastewater free of faeces
3	Horizontal pipe	1 (pneumatic or electric)	1	wastewater free of faeces, waste- water containing faeces (designated "F")
4	Fitted in floor drains	1	1*	wastewater free of faeces
5	Fitted in floor drains	2	1*	wastewater free of faeces

 $<sup>^{\</sup>star}$  Emergency seal can be combined with an automatic seal.

The use of different types is regulated by national law. The following table defines the specific authorisations applying to Germany, Austria and Switzerland.

Country	Differences
Germany	Types 2, 3 and 5 are authorised for wastewater free of faeces. Only Type 3 with designation "F" can be used for wastewater containing faeces.
Austria	Types 0 to 5 are authorised for use with wastewater free of faeces. Only Type 3 can be used for wastewater con taining faeces.
Switzerland	Backflow stops can only be used subject to prior case-by-case authorisation.

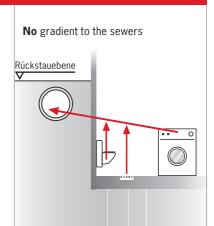


#### Which backflow safety valve is best for which application?

#### Wastewater type

# Down gradient into the sewers Rückstauebene

**Wastewater outflow** 



#### **Wastewater free of faeces**





#### **ACO JUNIOR®**

Cellar drain with Type 5 backflow stop



#### ACO TRIPLEX-K

Backflow stop for continuous pipe Type 2



#### **ACO SINKAMAT®-K**

Underground (top) or above ground (below) lifting plant for wastewater free of faeces





#### Wastewater containing faeces



#### ACO QUATRIX®-K

Backflow stop for continuous pipes Type 3F



#### ACO MULI-STAR mono or duo

Lifting plant for wastewater containing





The benefits of ACO TRIPLEX-K backflow safety valves

#### and QUATRIX®-K using the shaft system

#### **Extensions for deeper installation**

If a backflow stop has to be installed at a much deeper level for structural reasons, it is easy to convert the ACO backflow safety valve shaft systems with the optional extensions. It is also easy to manually put together several extensions if required.



#### Sealing flange for pressurised water

If the floor plate needs to be protected against pressurised water, it is possible to equip the shaft system with an optional sealing flange. This flange provides reliable protection to keep the soil moisture out of the cellar. The height of the flange is infinitely adjustable for easy adaptation to the level of the floor plate.



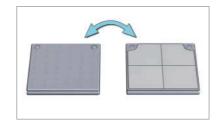
#### Adjustment to the tile pattern and floor level

The top section for load class K3 is infinitely height adjustable and tiltable. This allows the cover to be perfectly adjusted to the floor height and the tile pattern. A specially adapted locking system also prevents small children from removing the cover.



#### Multi-option cover to suit customer's requirements

Use either side of the cover as required. The uniform side is a plastic cover. If tiles are laid in the installation room, turn the cover round and use the side which is recessed to accommodate the matching tiles.



#### The ACO JUNIOR® cellar drain with backflow stop

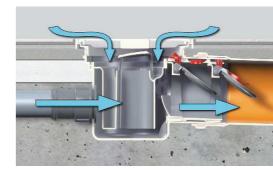
The ACO JUNIOR® cellar drain with backflow stop is a Type 5 backflow stop in accordance with EN 13564. Because of its compact dimensions, this cellar drain is ideal for refurbishing cellars where the drainage systems are being upgraded by installing a backflow stop in one of the old drains.

The ACO JUNIOR® cellar drain with backflow stop has two flaps including an emergency seal. It is installed in the floor plate. Wastewater enters the drain via the grating. It is also possible to connect drainage installations to the drain, such as showers, washing machines or sinks lying beneath the backflow level, by adding a DN 50 inlet to the drain on site.

During normal operating conditions, the flaps hang loose. The force of flowing wastewater pushes open the flap in the flow direction to drain the wastewater in

the direction of the sewer. If there is backflow, the wastewater backing up from the sewer flows against the normal flow direction and comes into contact with the outer backflow flap. This prevents wastewater from the sewers from flowing back into the building. The second flap is an extra safety feature to ensure that the backflow stop functions even when the first flap fails to close properly because of the presence of dirt, etc. The emergency seal integrated into the second flap provides additional security and can be operated manually. Note that when the emergency seal is locked in position, it also prevents wastewater generated in the building from flowing into the sewer! It is therefore very important that this emergency seal is reopened again immediately after returning to the building, e.g. after a holiday.

# Awarded the innovation prize at BAU 2007 in Munich







#### **Product benefits**

- Compact dimensions ideal for refurbishment
- No tools required to assemble and dismantle the sludge bucket and backflow device
- Rotatable top section for optimal adjustment to the tile pattern
- Extensions available for flexible adjustment to deeper installation positions

#### Installation example



ACO JUNIOR® cellar drain with backflow stop DN 100 Type 5 pursuant to EN 13564.



#### **Backflow systems**

#### **Article description**

ACO JUNIOR® cellar drain with backflow stop, DN 100 Type 5 pursuant to EN 13564, Made of plastic with removable sludge bucket

and odour trap, 60 mm water trap.

Shut off unit with two backflow flaps and a manually lockable emergency seal,

top section made of plastic with frame dimensions 197 x 197 m  $\,$ 

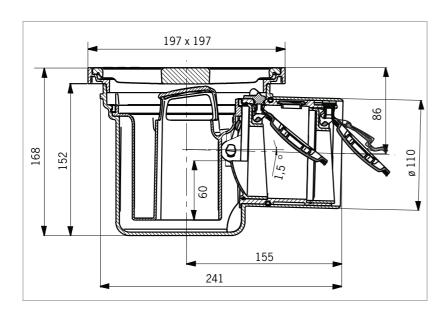
and grey grating class K3.

Outlet socket DN 100 with  $1.5^{\rm o}$  socket slope for connection to plastic pipes pursuant to DIN 19534 and DIN 19537.

Drain performance: 1.6 l/s Weight: approx. 1.2 kg



Article	Article No.	DN
ACO JUNIOR®	2130.00.77	100
Inlet socket	2410.00.04	50
Extension, ,	2040.00.06	
Height 130 mm ACO maintenance kit	2120.00.00	
700 maintenance kit	2120.00.00	







#### ACO TRIPLEX-K-2 double backflow stop with shaft system

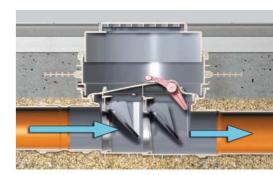
The ACO TRIPLEX-K-2 backflow stop is a Type 2 backflow safety valve pursuant to EN 15364. This product has been specially designed for installation in floor plates. The backflow stop can be equipped with a sealing flange against pressurised water. The ACO TRIPLEX-K-2 is specified for use with wastewater free of faeces. It must only be connected to drainage installations generating wastewater free of faeces, e.g. floor drains, showers or washing machines located below the backflow level.

During normal operating conditions, the flaps hang loose. The force of flowing wastewater pushes open the flap in the flow direction to drain the wastewater in the direction of the sewer. If there is backflow, the wastewater backing up from the sewer flows against the normal flow direction and comes into contact with the outer backflow

flap. This prevents wastewater from the sewers from flowing back into the building. The second flap is an extra safety feature to ensure that the backflow stop functions even when the first flap fails to close properly because of the presence of dirt, etc. The ACO TRIPLEX-K-2 also has an emergency seal. This is integrated within the rear flap. This is an additional safety feature and is actuated manually. The emergency seal can be easily actuated without a great deal of force and is safely in position when a loud click is heard.

Note that when the emergency seal is locked in position, it also prevents wastewater generated in the building from flowing into the sewer! It is therefore very important that this emergency seal is reopened again immediately after returning to the building, e.g. after a holiday.





#### **Product benefits**

- Minimal intrinsic gradient 12 mm, and so optimal for refurbishment
- Height adjustable top section for perfect adaptation to floor level
- Optional step-wise height adjustable sealing flange for flexible adaptation to the sealing level
- Easily convertible to an automatic backflow stop for wastewater containing faeces



#### Installation example



ACO TRIPLEX-K-2 double backflow stop, DN 100 Type 2 pursuant to EN 13564 for installation within floor plates. Figure shows TRIPLEX-K-2 with optional sealing flange to protect the device against pressurised water.

ACO TRIPLEX®-K-2 double backflow stop, DIN.... Type 2 pursuant to EN 13564 for installation in floor plates.

With telescopic, adjustable top section and cover plate K3.

Retrofittable with adjustable flange to seal against pressurised water.

For wastewater free of faeces (grey water),

for installation in pipe systems, gradient 12 mm, with two automatically closing backflow flaps, with integrated emergency seal.

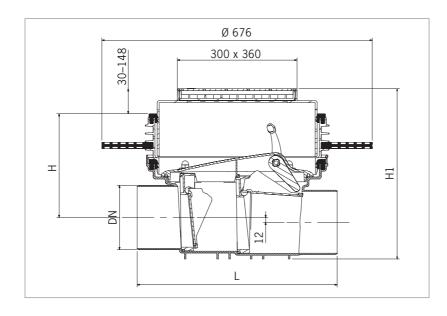
Safe manual locking with audible click signal when locked, with cleaning and maintenance opening and inspection pipe. Convertible to automatic Type 3F backflow stop for use with wastewater containing faeces pursuant to DIN EN 13564.

Weight 6.5kg



Article No.	DN	Ø (mm)	L (mm)	H (mm)	H1 (mm)
620366	100	110	460	297	393–512
620367	150	160	500	272	393–512

For optional components and accessories see page 18/19.





#### ACO TRIPLEX-K-2 double backflow stop

The ACO TRIPLEX-K-2 double backflow stop corresponds to Type 2 EN 13564. This product is specially designed for installation in an unenclosed wastewater pipe. This backflow stop is naturally also suitable for subsequent installation in existing shafts thanks to its compact dimensions.

This backflow stop is specified for use with wastewater free of faeces. It must only be connected to drainage installations generating wastewater free of faeces, e.g. floor drains, showers or washing machines located below the backflow level. During normal operating conditions, the flaps hang loose. The force of flowing wastewater pushes open the flap in the flow direction to drain the wastewater in the direction of the sewer. If there is backflow, the wastewater backing up from the sewer flows against the normal flow direction and comes into

contact with the outer backflow flap. This prevents wastewater from the sewers from flowing back into the building. The second flap is an extra safety feature to ensure that the backflow stop functions even when the first flap fails to close properly because of the presence of dirt, etc.

The ACO TRIPLEX-K-2 also has an emergency seal. This is integrated within the rear flap. This is an additional safety feature and is actuated manually. The emergency seal can be easily actuated without a great deal of force and is safely in position when a loud click is heard.

Note that when the emergency seal is locked in position, it also prevents wastewater generated in the building from flowing into the sewer! It is therefore very important that this emergency seal is reo-

#### **Product benefits**

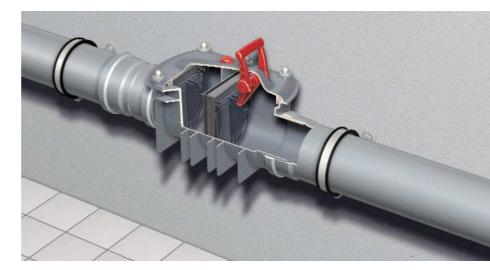
 Minimal intrinsic gradient 12 mm, and so optimal for refurbishment

pened again immediately after returning

to the building, e.g. after a holiday.

 Easily convertible to an automatic backflow stop for wastewater containing faeces

#### Installation example



ACO TRIPLEX-K-2 double backflow stop, DN 100 Type 2 pursuant to EN 13564 for installation in unenclosed pipes.



ACO TRIPLEX-K-2 double backflow stop, DN.... Type 2 pursuant to EN 13564 for installation in unenclosed drainpipes.

For wastewater free of faeces (grey water),

for installation in pipe systems, gradient  $12\,\mathrm{mm}$ , with two automatically closing backflow flaps, with integrated emergency seal.

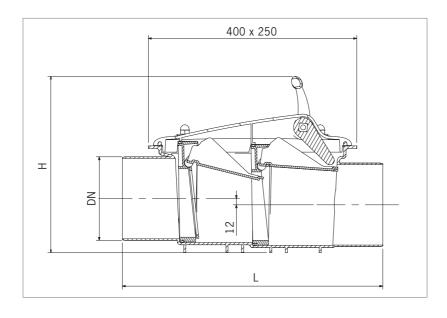
Safe manual locking with audible click signal when locked, with cleaning and maintenance opening and inspection pipe. Convertible to automatic Type 3F backflow stop for use with wastewater containing faeces pursuant to EN 13564.

Weight 3.5kg



Article No.	Article No. DN		L (mm)	H (mm)	
620364	100	110	460	338	
620365	150	160	500	338	

For optional components and accessories see page 18/19.







#### ACO QUATRIX®-K black water automatic backflow stop with shaft system

The ACO QUATRIX®-K black water automatic backflow stop corresponds to Type 3F pursuant to EN 13564. This product is specially designed for installation in floor plates. The backflow stop can be retrofitted with a sealing flange to protect the device from pressurised water. The ACO black water automatic backflow stop is designed for use with wastewater containing fagers. Type 3F backflow

stop is designed for use with wastewater containing faeces. Type 3F backflow stops must be used whenever toilets are installed below the backflow level. Two flaps are open during normal operations. When water from the sewers backflows into the pipes, the operating stop is automatically closed by a pneumatic/electric control device. As soon as the wastewater rises up above the permissible height in the pipe, an under pressure sensor sends a signal back to the control unit. The control unit automatically operates the electric motor to close the operating stop. When water no longer backflows into the system, a sensor informs the control unit and the flap is automatically reopened.

The drainage installations connected to

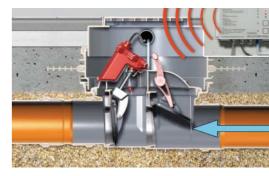
the backflow stop must not be used during a backflow situation! The presence of backflow is signalled by an optical and acoustic alarm. An integrated battery maintains continuous operations for up to 8 hours during a power cut. The ACO QUATRIX®-K also contains a manually operated emergency seal. The flap can be moved into three positions:

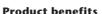
Position 1: flap closed, no wastewate can flow out

Position 2: flap open, wastewater can flow out but the operating seal will close automatically if there is backflow

Position 3: flap swings, the automatic flap functions like a simple backflow stop. This is required during the construction phase before installation of the motor and the control device.







- Minimal intrinsic gradient 12 mm, and so optimal for refurbishment
- Height adjustable top section for perfect adaptation to floor level
- Optional step-wise height adjustable sealing flange for flexible adaptation to the sealing level
- Pneumatic sensor for problem-free operation



#### **Installation example**



ACO QUATRIX®-K black water automatic backflow stop, DN 100 Type 3F pursuant to EN 13564 for installation in floor plates. Figure shows the ACO black water automatic backflow stop with the optional sealing flange to protect against pressurised water.

ACO QUATRIX®-K black water automatic backflow stop, DN  $\dots$  Type 3F pursuant to EN 13564 for installation in floor plates.

With telescopic, height adjustable top section and cover plate K3.

Retrofittable with adjustable flange to seal against pressurised water.

For water containing faeces (black water) and wastewater without faeces (grey water), flood safety classification IP 68.

For installation in pipes, gradient 12 mm,

with double backflow safety valve,

with automatic operating seal,

with manually actuated emergency seal,

with cleaning and maintenance opening, with inspection pipe.

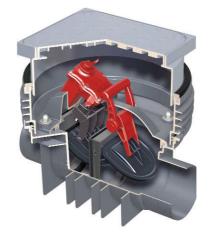
Electric control box IP 65,

with optical and acoustic backflow warning,

emergency power supply with safety battery

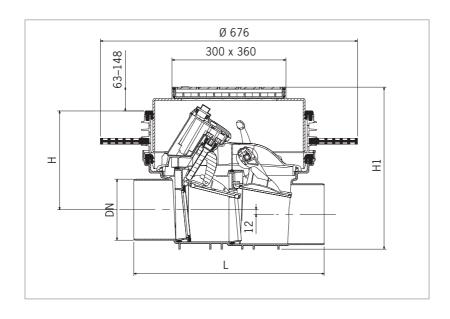
including all connection cables.

Weight 10.0 kg



Article No.	DN	Ø (mm)	L (mm)	H (mm)	H1 (mm)
620370	100	110	460	297	426–512
620371	150	160	500	272	426–512

Optional components and accessories see page 18/19.





#### ACO QUATRIX®-K black water automatic backflow stop

The ACO QUATRIX®-K black water automatic backflow stop corresponds to Type 3F pursuant to EN 13564. This product is designed for use with wastewater containing faeces. Type 3F backflow stops must be used whenever toilets are installed below the backflow level. Two flaps are open during normal operations. When water from the sewers backflows into the pipes, the operating stop is automatically closed by a pneumatic/electric control device. As soon as the wastewater rises up above the permissible height in the pipe, an under pressure sensor sends a signal back to the control unit. The control unit automatically operates the electric motor to close the operating stop. When water no longer backflows into the system, a sensor informs the control unit and the flap is automatically reopened. The drainage installations connected to the backflow stop must not be used during a backflow situation! The presence of backflow is signalled by an optical and

acoustic alarm. An integrated battery maintains continuous operations for up to 8 hours during a power cut. The ACO QUATRIX®-K also contains a manually operated emergency seal. The flap can be moved into three positions:

Position 1: flap closed, no wastewater can flow out

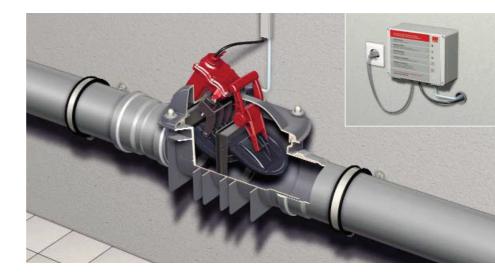
Position 2: flap open, wastewater can flow out but the operating seal will close automatically if the re is backflow

Position 3: flap swings, the automatic flap functions like a simple backflow stop. This is required during the construction phase before installation of the motor and the control device.

#### **Product benefits**

- Minimal intrinsic gradient 12 mm, and so optimal for refurbishment
- Height adjustable top section for perfect adaptation to floor level
- Optional step-wise height adjustable sealing flange for flexible adaptation to the sealing level
- Pneumatic sensor for problem-free operation

#### **Installation example**



ACO QUATRIX®-K black water automatic backflow stop, DN 100 Type 3F pursuant to EN 13564 for installation in unenclosed drainpi-

pes.

ACO QUATRIX®-K black water automatic backflow stop, DN  $\dots$  Type 3F pursuant to EN 13564 for installation in unenclosed drainpipes.

For water containing faeces (black water) and wastewater without faeces (grey water), flood safety classification IP 68.

For installation in pipes, gradient 12 mm,

with double backflow safety valve,

with automatic operating seal,

with manually actuated emergency seal,

with cleaning and maintenance opening, with inspection pipe.

Electric control box IP 65,

with optical and acoustic backflow warning,

emergency power supply with safety battery

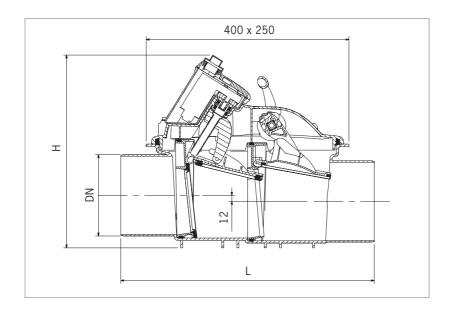
including all connection cables.

Weight 10.0 kg



Article No.	DN	Ø (mm) L (mm)		H (mm)	
620368	100	110	460	381	
620369	150	160	500	381	

Optional components and accessories see page 18/19.



Product

	Product	DN	email order no.	
	ACO single backflow stop TRIPLEX-K-0, DN Type 0 pursuant to DIN EN 13564 for installation in an unenclosed rainwater pipe. Installation in pipes, with an automatically closing backflow flap, cleaning and maintenance opening. Weight 3.5kg	100 150	620356 620357	
	ACO single backflow stop TRIPLEX-K-0, DN Type 0, pursuant to DIN EN 13564 for installation in floor plates, for rainwater. With telescopically adjustable top section, and cover plate K3. Retrofittable with adjustable flange to seal against pressurised water. For installation in pipes, with automatically closing backflow flap, cleaning and maintenance opening. Weight 6.5kg	100 150	620358 620359	
	ACO single backflow stop TRIPLEX-K-1, DN, Type 1, pursuant to DIN EN 13564, for installation in unenclosed pipes for rainwater. For installation in pipes, with an automatically closing backflow flap, with integrated emergency seal, secure manual closing with audible locking signal, cleaning and maintenance opening. Weight 3.5kg	100 150	620360 620361	
	ACO single backflow stop TRIPLEX-K-1, DN Type 1, pursuant to DIN EN 13564 for installation in floor plates for rainwater. With telescopically adjustable top section, and cover plate K3. Retrofittable with adjustable flange for sealing against pressurised water. For installation in pipes, with automatically closing backflow flap, with integrated emergency seal, safe manual locking thanks to audible locking signal, with cleaning and maintenance opening. Weight 6.5kg	100 150	620362 620363	
	ACO cleaning pipe TRIPLEX-K, DN for installation in unenclosed pipes. Retrofittable with backflow stop Type 0, 1, 2 or 3F. Weight 6,5 kg	100 150	620352 620353	
	ACO cleaning pipe TRIPLEX-K, DN for installation in floor plates. Retrofittable with backflow stop Type 0, 1, 2 or 3F. Weight 6,5 kg	100 150	620354 620355	

DN

Email

### 19

#### **Optional components and accessories**

#### . .

Conversion kit for QUATRIX®-K black water automatic backflow stop Type 3F. For converting cleaning pipes or backflow stops for wastewater free of faeces. DN 100/DN 150

**Product** 



Email order no.

ACO conversion kit for TRIPLEX-Kdouble backflow stop - Type 2.

For conversion of cleaning pipes and backflow stops Types 0 or 1. DN 100/DN 150



ACO operating sealing flap with push-in component for ACO QUATRIX®-K black water automatic backflow safety valve Type 3F. DN 100/DN 150



ACO emergency sealing flap with push-in component for ACO QUATRIX®-K black water automatic backflow stop Type 3F. DN 100/DN 150



ACO control box Protection Type IP65 for ACO QUATRIX®-K black-water automatic backflow stop Type 3F. DN 100/DN 150



ACO drive with 5 metres of cable for ACO QUATRIX®-K black water automatic backflow safety valve Type 3F.
DN 100/DN 150



ACO backflow sealing flap with push-in component for ACO TRIPLEX-K-2 double backflow stop Type 2, ACO TRIPLEX®-K-1 single backflow stop Type 1, ACO TRIPLEX-K-0 single backflow stop Type 0. DN 100/DN 150



ACO locking cover including rubber seal for ACO TRIPLEX-K-2 double backflow stop Type 2, ACO TRIPLEX-K-1 single backflow stop Type 1. DN 100/DN 150



#### Product Email order no.

ACO locking cover I including rubber seal for ACO TRIPLEX-K-O single backflow stop Type 0 ACO TRIPLEX®-K cleaning pipe DN 100/DN 150



ACO extension with lip seal for ACO backflow stops and ACO cleaning pipes for installation in floor pipes DN 100/DN 150 Installation height 100 mm



620381

ACO sealing flange for ACO backflow stops and ACO cleaning pipes for installation in floor plates DN 100/DN 150



ACO top section For ACO backflow stops and ACO cleaning pipes for installation in floor plates. DN 100/DN 150



ACO reversing cover, surface-water tight, For ACO backflow stops and ACO cleaning pipes for installation in floor plates. DN 100/DN 150



ACO test pipe for ACO TRIPLEX-K-2 and ACO QUATRIX®-K



#### **ACO Building Services product range**

#### Drainage

- Flat roof, balcony and terrace drains
- Floor drains and channels
- Bathroom systems
- Pipe systems
- Backflow stops
- Manhole covers

#### Separating

- Grease separators
- Starch separators
- Process engineering

#### Pumps

- Wastewater lifting plant
- Submersible pumps
  - Prefabricated pumping stations

#### **ACO Passavant GmbH**

Drainage stainless steel / plastic Pipe systems Separating technology Pumps / Lifting plant

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