



PURE AIR SOLUTIONS

ACTUS



Activated Carbon Filter for Odour Control

ACTUS 22.08.2013/01



PURE
AIR
SOLUTIONS





Pure Air Solutions, leader in odour and VOC Control!

Dear reader,

Pure Air Solutions is the world's leading Odour and VOC control specialist. Our customer focus, industrial know-how and technological leadership has put us at the forefront of the industry.

This trend will continue over the coming decades, as Pure Air Solutions further develops innovation solutions to improve the economic efficiency and environmental performance of air pollution control systems. Subsequently we have twice been awarded, in 2011 and in 2013, by the European Union with the most prestigious Marie Curie (FP7) grant for Research & Technological Development. This extensive experience and profound knowledge is directly applied in all our products.

It is with great pleasure to present and outline the benefits of the ACTUS to you in this product brochure.

André Schoonhoven
CEO of Pure Air Solutions



PURE
AIR
SOLUTIONS



WASTE WATER ODOUR CONTROL

EFFICIENT REMOVAL OF WASTE WATER ODOURS

Our ACTUS series of water regenerable carbon filters has been specially designed for the wastewater treatment market. The ACTUS unites the best European Activated Carbon with Dutch design, manufacturing and quality assurance to meet the highest international standards for eliminating odours from wastewater processes.

In waste water treatment processes several sources of odours are identified. Headworks, sludge treatment and pumping stations are examples of sources where waste water odours usually are recognized. Typically Hydrogen Sulphide (H₂S), which gives the smell of rotten eggs, mercaptans and other organic compounds (VOC's) are produced. All these odours are removed efficiently from the gas stream by the ACTUS with a guaranteed odour removal performance.

TYPICAL APPLICATIONS

The ACTUS Activated Carbon Filter offers a solution for the elimination of:

- hydrogen sulfide (H₂S)
- volatile organic compounds (VOC)
- mercaptans

ACTUS MODULAR SERIES AND CUSTOM MADE

We offer a complete series of ACTUS Filters ranging from skid-mounted modular systems for low air flows to custom designed systems capable of handling large air flows in excess of 20.000 m³/h.

The ACTUS as stand-alone unit is particularly useful for low air flows, low odour loads, remote locations and for the control of specific volatile organic compounds.

ACTUS RND

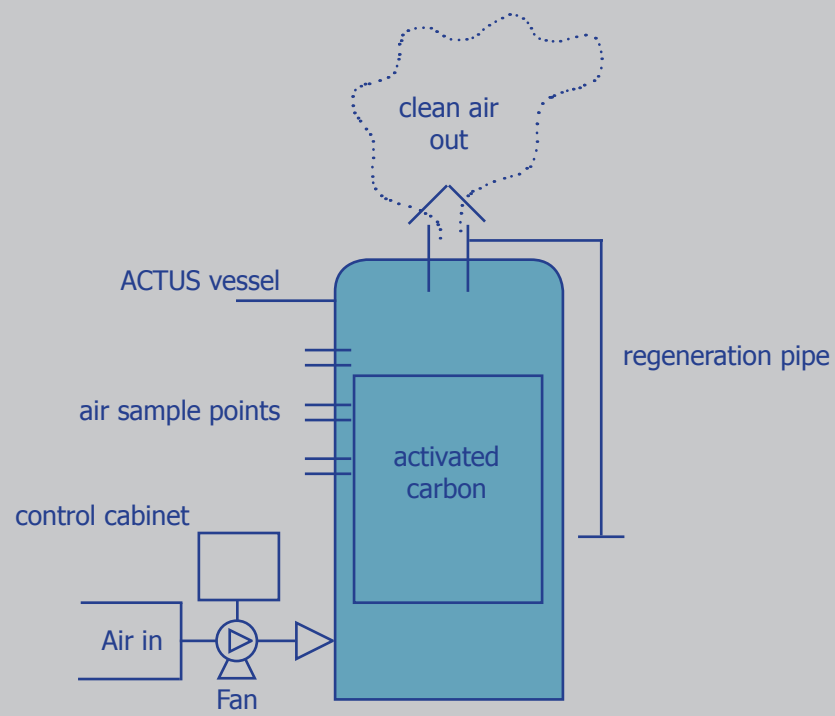
product type	Qty	Air flow m ³ /h	H ₂ S ppm/avg	Diameter mm	Pressure drop Pa	Carbon Weight kg
RND 500	1	100	10	500	540	41
RND 800	1	250	10	800	529	106
RND 1000	1	500	10	1000	742	165
RND 1500	1	850	30-35	1500	967	619
RND 1800	1	1200	30-35	1800	817	891
RND 2000	1	1600	30-35	2000	863	1100

Table 1 | ACTUS Modular Series – Sizing information

STAND -ALONE OR AS WASTE WATER ODOURS

The skid-mounted, pre-assembled modular ACTUS series are ranging in flow capacity from 100 – 1.600 m³/h with a typical performance guarantee, based on the specified average H₂S load, of 0,1 ppm H₂S at outlet. For larger air flow rates the custom designed ACTUS unit is often installed as an extra module on top of our SULPHUS Biotrickling reactor, acting as an second 'polishing step'.

Proces flow diagram ACTUS



SIMPLE DESIGN, TO MAKE LIFE EASY

FACTORY ASSEMBLED AND SKID MOUNTED

The ACTUS vessel is fully corrosion resistance and is standard fabricated in a filament wound polyester fibre glass in accordance with relevant European standards and PS 15-69 specification. Fans are manufactured of steel and completely coated with a special corrosion resistant coating.

A local control panel mounted on the side of the vessel contains the motor starter for the fan and the power disconnect.

The ACTUS vessel, loaded with media prior to shipment, and fan are factory assembled on a skid, wired and tested at our premises in the Netherlands. The skids are manufactured from (among others) fibre reinforced polyester UNP profiles of 140mm x 6mm offering a light but strong and durable structure. The skid with the equipment will then be loaded in a standard 20ft or 40ft container. At arrival the ACTUS is ready for 'plug and play' installation on site, only the utilities (electricity and air) should be installed to start-up the system.

UNIQUE AND VALUABLE FEATURES

The carbon bed is supported by a HDPE/PP support structure which is resistant to the process condition. This also allows that the load is transferred equally over the bottom surface. To monitor the pressure drop across the carbon bed a pressure gauge is installed and mounted at the vessel, clearly visible for men standing near the vessel.

In addition the vessel is equipped with a number of air sample points to be able to monitor the air inside the carbon and just above it. The Activated Carbon is placed inside a special designed PP/PE bag with appropriate sized meshes to minimize pressure drop and keep the pelletized carbon

inside. This bag can be lifted via fixed lifting lugs designed to lift the load of saturated carbon. The roof of the vessel can easily be removed for fill and re-fill of the carbon. The vessel is equipped with appropriate number of anchors.

A regeneration PVC-U pipe with flange (or other) connection is mounted alongside the vessel. The pipe is connected to a nozzle located above the carbon bed. In case regeneration is required, a simple potable water pump system with appropriate water flow can be connected for regeneration of the carbon. In case an automatic regeneration system is chosen, this pipe is directly connected to the regeneration panel.

A drain nozzle with valve is available for removal of the water coming from humid air and regeneration.

THE ACTUS IN SUMMARY

- ☑ Pre-assembled and skid-mounted system.
- ☑ Modular for air flow rates from 100 –1600m³/h.
- ☑ Custom-made units for high air flows, stand-alone or integrated in SULPHUS Biotrickling.
- ☑ High performance, water regenerable carbon media with high adsorption capacity.
- ☑ Easy removable roof and specially designed bag for fast renewal of carbon media.
- ☑ All materials fully corrosion resistance for high-quality and sustainable operation.
- ☑ Volume control, damper, carbon sample ports, differential pressure gauge at hand.



PURE
AIR
SOLUTIONS



SIMPLE DESIGN, TO MAKE LIFE EASY

THE CARBON MEDIA TYPE

The ACTUS filters are designed to work with a wide range of media, its selection is based on the specific application. Anyway, in the interest of our clients we promote cost-effective, reliable and high-quality solutions. To achieve this we select the most appropriate materials and only work with suppliers who satisfy our QA procedures and meet our high international standards. While being cost-effective with no concessions on quality, reliability and performance, we have specified the quality of Norit RST as our preferred media for waste water odours. With Norit RST inside the ACTUS we can ensure the best performance.

HIGH H2S ADSORPTION CAPACITY LEVEL

Norit RST1 is produced in The Netherlands and made of renewable material, having unique catalytic properties without the presence of an impregnant. Norit RST has an hydrogen Sulfide (H2S) adsorption capacity of 36 g/100 g when applied as fresh carbon. When the carbon is saturated on H2S, it can be regenerated by water, allowing an increased carbon life time. This grade can be operated on applications with a relative humidity from 40 – 100 %. Besides catalytic adsorption, Norit RST has a physical adsorption capacity to remove compounds like VOC and siloxanes. Low concentrations on mercaptans and ammonia are also handled by Norit RST.

REGENERATION

Since the carbon converts hydrogen sulfide predominantly into sulfuric acid, Norit RST can be regenerated with water. Results by Norit R&D showed that the H2S adsorption capacity of regenerated carbon was 60 – 80 % of the initial adsorption capacity, when regeneration was performed with 5 – 10 bed volumes water at approximately 1 bed volume per hour in upflow direction. Underneath graph illustrates the H2S adsorption capacity of Norit RST with a regeneration efficiency of 70 %. Depending on actual conditions, higher efficiencies are achievable.

DRYING

After each regeneration step it is advised to perform a drying step to remove the larger part of the retained water until a relative humidity of less than 80 % is achieved. The necessity of a drying step depends on local weather conditions. Another option could be starting the adsorption cycle with the flow of the medium to be purified. In both cases the starting flow should be low to prevent formation of an acidic mist which may corrode the downstream piping.

THE REGENERATION EFFICIENCY

The regeneration efficiency depends on the H2S inlet concentration and will be higher at low H2S concentrations. A regeneration efficiency of 60 – 80 % is achievable when applying an H2S inlet concentration of approximately 100 ppm. Sewage air typically contains 3 – 10 ppm, which allows Norit RST to be able to achieve even higher regeneration efficiencies in the field. Norit RST is especially suitable for water regeneration in applications up to 100 ppm H2S. From 100 – 1000 ppm on H2S the formation of elemental sulfur increases, which cannot be washed out during water regeneration.

CARBON LIFE TIME

The life time of Norit RST is influenced by the presence of actual concentrations of hydrogen sulfide and other (organic) compounds in the gas stream. Very high levels on H2S or compounds other than H2S, cannot be washed out with water regeneration resulting in limited service life time of the carbon.

¹ Taken from Norit Digital Library, Document TB 0164, Version 11-11



ACTUS - Norit inside

Pure Air Solutions promote cost-effective solutions, with zero concessions on quality and sustainability. Therefore, we always strive for the best possible return on our installations. To achieve this we select the most appropriate materials and work with preferred suppliers who have satisfied our QA procedures and therefore meet our standards. For the Actus we have specified the quality of Norit, as they are one of the leading companies in the field of activated carbon. With Norit RST as a final polishing stage inside the ACTUS, we can ensure the optimum performance.

Norit Digital Library

taken from Norit

Summary

Why should Norit RST portfolio be chosen:

- High H₂S adsorption capacity level
- Made of renewable material
- No impregnation
- Water regenerable allowing long life times
- High siloxanes and VOC adsorption level

Properties Norit RST		
Impregnated		No
Oxygen necessary		Yes
• minimum concentration O ₂ : H ₂ S	Molar basis	4 : 1
Relative humidity necessary		Yes
• working range	%	40 – 100
• optimum	%	60 – 70
H ₂ S adsorption capacity	g/100 g	36
Adsorbed H ₂ S water regenerable		Yes
• regenerability * ¹	%	60 – 80
• preferable H ₂ S range for optimal regeneration	ppm	< 10
• applicable H ₂ S range for regeneration	ppm	10 – 100
Empty bed contact time	s	3 – 6
Superficial velocity		
• RST 3	cm/s	5 – 30
• RST 4	cm/s	5 – 40
BTEX * ²	g/100 g	22
D5 Siloxane (1 ppm, 20 °C)	g/100 g	38
Mercaptans * ³	g/100 g	2
Apparent density	kg/m ³	350

Table 1: overview properties Norit RST.

*¹ Results on regenerability analyzed by Norit R&D. Testing conditions: H₂S inlet concentration 100 ppm; air temperature 20 °C; atmospheric pressure; relative humidity 80 %. Regeneration cycle: water flow approx. 1 bed volume per hour during 5 bed volumes, water temperature 20 °C.

*² Benzene, toluene, ethyl benzene and xylene concentration 10 ppm each, 20 °C

*³ Ethyl mercaptan concentration 1 ppm

Note: All data and suggestions regarding the use of our products are believed to be reliable and given in good faith. However, they are given without guarantee, as the use of our products is beyond our control, and are not to be construed as recommendation or instigation to violate any existing patent. Any product quality information given was valid at the time of issuance of the publication. However, we maintain a policy of continuous development and reserve the right to amend product quality aspects without notice.

Caution: For health and safety related aspects of a Norit activated carbon, please refer to the corresponding Material Safety Datasheet (MSDS), which is available on request.

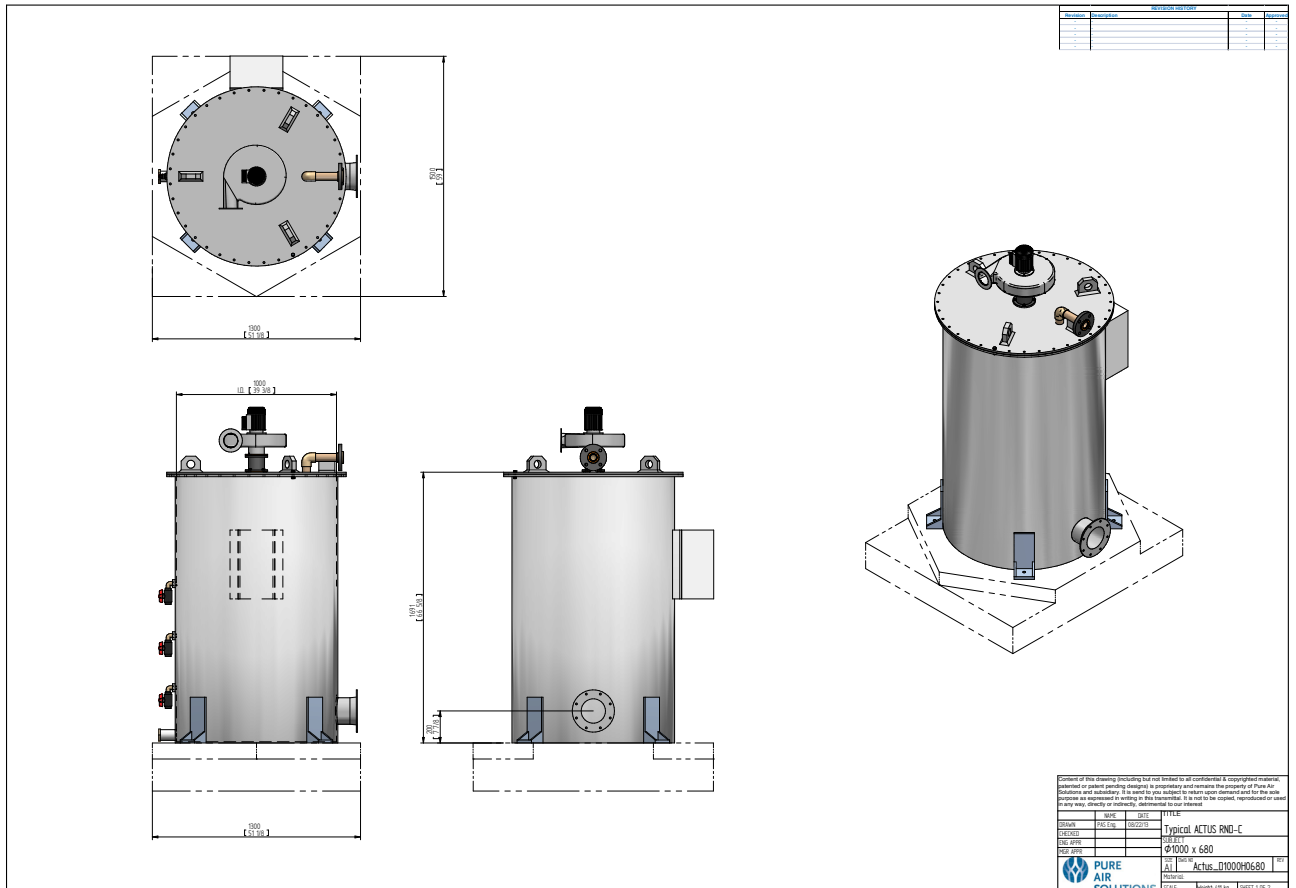
This technical bulletin (issue 11-11) replaces previous issues

Norit
leading in purification

Activated Carbon



ACTUS Technical drawing



Underneath curves show pressure drop characteristics of Norit RST 3 and 4 mm pellets.

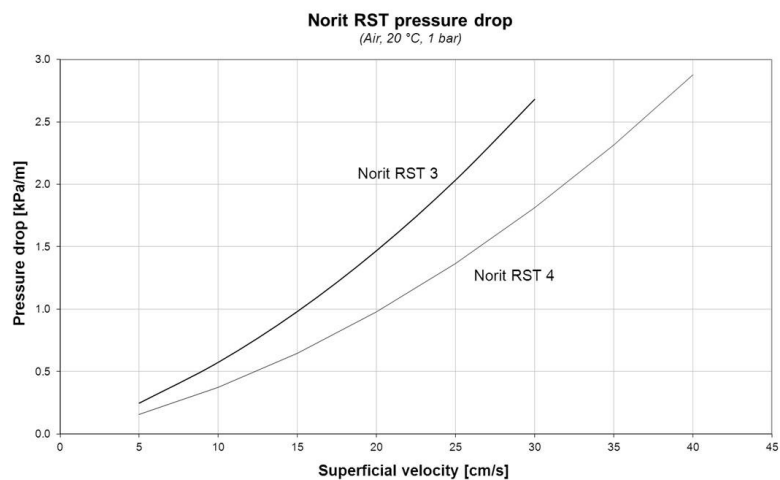
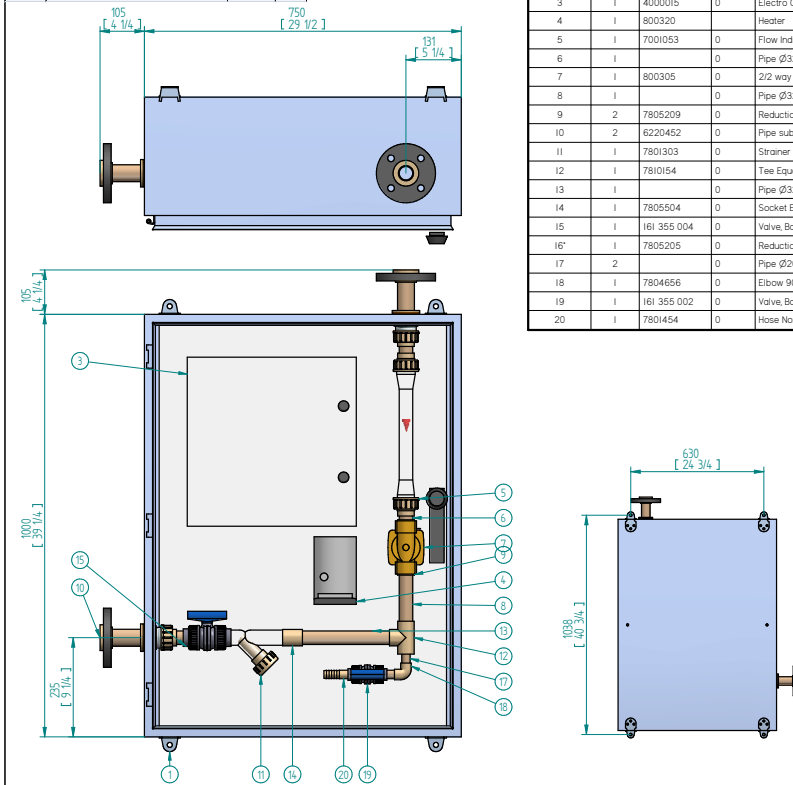


Figure 1: pressure drop curve of Norit RST grades. Operating conditions air: 20 °C; 1 bar.



ACTUS - Control panel

REVISION HISTORY			
Revision	Description	Date	Approved
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-



Item Number	Quantity	Document Number	Revision number	Title	Subject	Material	PAS Part No
1	1	6201524	0	Cabinet	1000x800x400		
3	1	4000015	0	Electro Cabinet	300x250x164	FIBER GLASS	
4	1	800320	0	Heater	230 V	Fiber Glass	800320
5	1	7001053	0	Flow Indicator	GF, Type SK12, Ø32		
6	1		0	Pipe Ø32x1,8, 1", PN10	L=50	PVC	
7	1	800305	0	2/2 way solenoid valve	Brass, G1/4	Brass, yellow brass	800305
8	1		0	Pipe Ø32x1,8, 1", PN10	L=150	PVC	
9	2	7805209	0	Reduction Short	Ø40-32, 1/4"-1"	PVC	
10	2	6220452	0	Pipe sub assembly d63	Flange & Tank adaptor d63		
11	1	7801303	0	Strainer Type 305	Ø32, 1"	PVC-U	
12	1	7810154	0	Tee Equal	Ø32, 1"	PVC	
13	1		0	Pipe Ø32x1,8, 1", PN10	L=250	PVC	
14	1	7805504	0	Socket Equal	Ø32, 1"	PVC	
15	1	161 355 004	0	Valve, Ball	Solvent cement socket metric, D32		
16	1	7805205	0	Reduction Short, PN16	d32, 1" - d20, 1/2", spig x soc	PVC	
17	2		0	Pipe Ø20x1,5, 1/2", PN16	L=50	PVC	
18	1	7804656	0	Elbow 90°, PN16	d20, 1/2", soc x soc	PVC	
19	1	161 355 002	0	Valve, Ball, Type 355	Solvent cement socket metric, D20		
20	1	7801454	0	Hose Nozzle, PN16	d20, 1/2", spigot	PVC	

Content of this drawing (including but not limited to all confidential & copyrighted material, patented or patent pending designs) is proprietary and remains the property of Pure Air Solutions and subsidiary. It is sent to you subject to return upon demand and for the sole purpose as expressed in writing in this transmittal. It is not to be copied, reproduced or used in any way, directly or indirectly, detrimental to our interest.			
DRAWN	NAME	DATE	TITLE
CHECKED	PAS Eng	06/18/13	Actus
ENG APPR			SUBJECT
MFG APPR			Combi Panel
PURE AIR SOLUTIONS		SCALE	Weight: 0 kg SHEET 1 OF 1



More Pure Air Solutions

Pure Air Solutions believes that the industry as whole must advance solutions that will meet today's and tomorrow's demands of the market and the society. Through innovation and out-of-the-box thinking we endeavor every single day to make this possible. It is our purpose to improve to the global needs of a better environment and a sustainable world: no waste of money, no waste of time and no waste of energy and consumables.



SULPHUS

One of the flagships from our current product range is the SULPHUS technology, a compact bio-trickling filter with synthetic media, the so-called OdourPack. The SULPHUS is designed to eliminate organic and inorganic odours from waste water treatment processes. The principle of its design is based on the requirements of the market when it comes to the future of odour control: cheaper, greener, smarter and less stress!



ORGUS

Our experience in Industrial Odour Control is based on 30 years of practise in odour abatement at various industries. Consequently our detailed engineered ORGUS biofilters (built since the 1990's) have provided significant footprint reductions, reliable operations, low running costs and removal efficiencies of 90% and more. Small and very large airflows (> 200.000 m³/h) can be treated. Our modular ORGUS biofilters has a modular design and is available in single, dual and triple stage units

Pure Air Solutions

P.O. Box 135
8440 AC Heerenveen
The Netherlands

tel +31(0)521 520 682

info@pureairsolutions.nl
www.pureairsolutions.nl



Note: All data and suggestions regarding the use of our products are believed to be reliable and given in good faith. However, they are given without guarantee, as the use of our products is beyond our control, and are not to be construed as recommendation or instigation to violate any existing patent. Any product quality information given was valid at the time of issuance of the publication. However, we maintain a policy of continuous development and reserve the right to amend product quality aspects without notice.