

Original Operating Instructions



Fig.: Handte Vortex Dual separator

Handte Vortex Dual For inflammable, dry metal types of dust

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Chapter 1

Safety

1.1. For your safety

As the manufacturer of the device, we wish to make you - the operator - aware of the possible risks and required safety measures in a comprehensive documentation section on safety.

Please note:

In addition to the information provided here, you must observe all generally valid safety and accident prevention regulations.

1.2. Definition of terms

Danger area	...is the area within and around the device where the safety and/or health of persons may be at risk due to their presence here.
User/operating company	...is the company on whose premises the device is installed and operated.
Operator/personnel	...are the individuals responsible for transportation, installation, commissioning, operation, maintenance, cleaning, and troubleshooting for the device.

1.3. Signs and symbols used in this operating manual

Bulleted lists

Items in bulleted lists are introduced by bullet points:

- Point 1
- Point 2

Instructions with a defined order

Instructions that must be carried out in a defined order are sequentially numbered like this:

- 1) Step 1
- 2) Step 2
- 3) Step 3

Instructions with no defined order

Instructions with only one step or that can be carried out in any order are introduced by triangles:

- ▶ Action

Result

The results of an action are indicated by a double arrow symbol:

- » Result of an action

Links

Links to further information in this operating manual or in other documents are indicated thus:



Depiction of warnings



See "Safety".

1.4. Operational safety

This device was constructed in accordance with the latest state of technology and is safe to operate. However, hazards can arise if it is used improperly or for a use which is not intended:

- Risks to the safety of the user
- Damage to the device and other property of the operator
- Impairment of the efficiency of the device

1.5. Intended use

The equipment is designed for the exhaust and separation of inflammable, dry metal types of dust such as aluminum and magnesium.

"Intended use" also includes the following:

- The operator and/or user must observe the installation requirements prescribed by the manufacturer and must comply with requirements for maintenance work.
- The device must be installed and operated in accordance with all valid national legislation in the country of use. The user is responsible for ensuring that such legislation is observed.

1.6. Improper use

The device must not be used to extract and separate potentially explosive gases, vapors, and/or hybrid mixes.

The device must never be used without water.

In addition, the following constitute improper user:

- Any unauthorized change or conversion of the device by the operator or user
- Any use that could impair safety

1.7. Warnings

Warnings in this operating manual are indicated by symbols.

The warnings are also introduced by signal words that indicate the extent of the hazard.

All warnings must be observed and the device must be used prudently in order to avoid accidents, injuries, and damage to property.

The warnings in this manual follow the conventions below.

Camfil APC assumes no liability for improper use!



Type of hazard and source

- Possible consequences for man and machine
 - Measures to avoid the hazard
-

Signal words

Warnings are introduced by one of the following signal words:

- Hazard
- Warning
- Caution

The signal words have the following meanings:



This indicates an immediate threat.

If the hazard is not avoided, severe (crippling) injury or even death may occur.



This indicates a dangerous situation.

If the dangerous situation is not averted, severe injury or even death may occur.



This indicates a possibly dangerous situation.

If the dangerous situation is not averted, severe injury may occur.



This indicates a possibly damaging situation.

If this situation is not averted, the product or something in the vicinity of the collector could be damaged.

Example:



Rotating fan impeller

- Risk of severe injury to limbs through contact with the part.
 - Wait until the fan has stopped (approximately 5 minutes).
-

Briefing of personnel

This device may only be used, maintained, and serviced by trained personnel.

Any work on electrical equipment may only be carried out by professionals with specific training.

The following measures must also be observed before anyone starts working on or with the device:

- The personnel must be briefed on the dangers of using the device.
- The operator must - where applicable - ensure that protective clothing, safety boots, and gloves are worn by all personnel.
- The responsibilities for operating, maintaining, and servicing the device must be clearly defined so that there is no safety-critical uncertainty regarding areas of competence.
- Read the technical documentation for the system. The operator is advised to ask each member of staff to confirm in writing that he or she has read and understood the technical documentation.

Proper handling of the device

Ensure that the device is in perfect working order.

- The operator and persons entrusted by the operator may only operate the device if it is in a fault-free state.
- The operator must install the device in accordance with the installation plan and requirements.
- The operator must use appropriate instructions and checks to ensure the cleanliness and tidiness of the workplace where the system is situated.
- The user must immediately inform the operator of any changes (including changes in operating behavior) on the device that might impair safety. To enable this, the device must be checked regularly - at least once each week - for externally visible defects and damage.

Observe shutdown procedures.

The prescribed shutdown procedures must be observed for all work concerning the transportation, installation, commissioning, operation, maintenance, and servicing of the device.

For adjustment, maintenance, and servicing work, the device must be switched off using the main switch. The main switch must be padlocked and the key must be removed.

Troubleshooting during operation

For faults that require maintenance and/or servicing work:

1. Turn off the main switch.
 - Secure the main switch so that it cannot be switched back on.
 - Wait until the fan has stopped (approximately 5 minutes).

Spare parts and operating resources

Original parts and accessories

Spare parts for original parts and accessories that are not delivered by the manufacturer of the device are not checked or approved by the manufacturer. In certain circumstances, the installation and/or use of such products can change the design properties of the device and endanger safety.

Please note:

The manufacturer is not liable in any way for damage resulting from the use of non-original spare parts and accessories or the incorrect installation or replacement of original parts and accessories.

Operating resources and additives

When using the prescribed operating resources and additives, you must observe the usage instructions. If safety data sheets of the manufacturer for operating resources and additives are prescribed, the information stated there is binding and must be observed, e.g.:

- Chemical characterization
- Physical and technical safety specifications
- Transportation
- Regulations
- Protection measures, storage, and handling
- Measures for accidents and fires
- Toxicology specifications
- Ecological specifications

This is particularly true with regard to the proper disposal of operating resources and additives.

Residual risks

For residual risks arising from work with the device and measures to be implemented in order to avert danger, see the table.

Hazard point	Hazard	Measure
Transportation	Risk of injury from falling device	<ul style="list-style-type: none"> • Only lift the device with appropriate lifting gear.
Foundation/substructure	Risk of injury from overturning device	<ul style="list-style-type: none"> • Only install the device on a substructure with a sufficient load-bearing capacity. • After alignment, bolt the device to the substructure.
Maintenance doors	Risk of being crushed due to negative pressure	<ul style="list-style-type: none"> • Only open the doors when the machine is at a standstill.
	Squirting liquid	<ul style="list-style-type: none"> • Wait until the fan has stopped running.
	Risk of being caught up in the fan impeller	<ul style="list-style-type: none"> • Wait until the fan has stopped running.
Around the device	Risk of slipping on deposits of dirt	<ul style="list-style-type: none"> • Regularly clean the surroundings of the device.

Chapter 2

Description

Dispersed particles in the gas flow are brought into contact with a scrubbing liquid to bind them. To enable this, a phase boundary interface that is as large as possible must be generated between the gas (air) and liquid. The gas flow is deflected. Due to inertia, the particles move towards the surface of the liquid and are bound or accumulate there.

In the scrubber, the dust-carrying liquid particles and air are separated by means of centrifugal force.

The cleaned air is blown out through the clean gas port of the device.

The scrubbing liquid - containing the accumulated dust particles - flows downwards into the sludge tank where the separated dust sediments become sludge.

Chapter 3

Transportation

Check for transport damage

Immediately check the delivery for completeness and any transport damage. Visible damage must be reported immediately. Concealed damage must be reported within 1 week.

Transportation

The device is delivered in a vertical or horizontal position on a pallet. The device can be transported using a forklift (the transportation pallet remains under the device) or by means of ropes attached to the eye bolts or crane eyes.

CAUTION

Damage to protruding device parts

When placing the crate/pallet onto the forklift, pay attention to protruding parts of the device.

Lifting the device


When lifting the device out of the transportation packaging, it may only be suspended using the upper eye bolts or crane eyes.

Chapter 4 Installation

4.1. Place of installation

Ambient temperature	The ambient temperature must be between +41°F and +104°F in order to operate the device. When the system is switched off, the ambient temperature at the place of installation must not be below +41°F.
Substructure	The customer must provide a substructure with a sufficiently high load-bearing capacity. For the operating weight of the device and the dynamic bonus load, see the dimensional drawing.
Structural analysis	The load-bearing capacity of the substructure must be subjected to a structural analysis before the device is installed.
Lifting the device	When lifting the device out of the transportation packaging, it may only be suspended using the upper eye bolts or crane eyes.
Aligning the device	The device must be installed in a vertical position that enables it to work in a fault-free manner. Make sure that the air inlet and outlet ports are in the right place.
Device attachment	Following alignment, the device must be bolted to the substructure.
Floor drainage	The installation room should have a floor drainage system to allow escaping water to drain away safely. The operator must check whether the water can be directed into the sewage system.

4.2. Water connection

Water connection	<p>The connection point for the water supply is indicated on the dimensional drawing with the symbol shown on the left.</p>  <p>The water connection on the device can be a flexible or fixed pipe connection.</p>
Water quality	The device can only work optimally if the water quality is adequate. Please see our brochure on water as an operating resource.
Water pressure	The water pressure must not exceed 60 PSI. If the grid pressure is higher than this, you must install a pressure reduction valve.

4.3. Electrical connection

Installation	Electrical installation work may only be carried out by a skilled electrician
Electrical protection	<p>The wire cross-sections and switching/monitoring devices must be designed with due consideration of the startup type and maximum current. The customer must ensure that an appropriate motor protection relay is installed.</p> <p>In the case of the direct activation of the fan, the motor develops a high starting torque at a high starting current; this can be up to 5 to 8 times the nominal current depending on the impeller class. These values must be taken into consideration when choosing the fuses.</p>
Potential equalization	<p>For the extraction of non-conductive dusts, the device, each individual ductwork part, all dust collection elements, and flexible tubes must be grounded by means of potential equalization.</p> <p>The connection of multiple potential equalization systems to a single attachment point is not allowed. Each connection must be individually attached to a copper bar. This bar itself must be grounded with the switching system.</p>

4.4. Suction line

Dimensioning	The suction line should be dimensioned so that a flow speed of around 65 ft/s is ensured in all horizontal pipe sections. The maximum pipe diameter may not be larger than the air inlet port of the device.
Material	We recommend that you use ductwork made from galvanized sheet metal in order to prevent the formation of rust film. In the case of longitudinally slip-jointed pipes, the longitudinal seam should point upwards during assembly.
Fittings	Pipe bends must have an internal radius that is at least equal to the pipe diameter. Pipe outlets should be at an angle of 30°.
Device connection	The connection of the device must be flexible. A rigid connection is not allowed.
Cleaning openings	In horizontal pipe sections, a cleaning opening should be installed every 10 to 16 feet. Additional cleaning openings are recommended before and after pipe branches. If a sound absorber is installed in the ductwork, cleaning openings are required before and after it.
Shut-off valves	We recommend that you install vertical, manually operated shut-off valves directly on the individual collection points in order to adjust the air sub-flows.
Attachment of pipes	The ductwork must be secured using suitable means of attachment in accordance with the load. The ductwork must not be propped up by the device!
Potential equalization	For the extraction of non-conductive dusts, all dust collection elements and each individual pipe section (including flexible tubing) must be grounded by means of potential equalization. Seals must be electrically conductive. Otherwise, potential equalization systems must be used throughout the ductwork system. The connection of multiple potential equalization systems to a single attachment point is not allowed. Each connection must be individually attached to a copper bar. This bar itself must be grounded with the switching system.

4.5. Exhaust line

In the case of all types of dust that can be harmful to human health due to their particularly high content of fine dust or that are loaded with odorous substances or solvents, the clean air must be discharged outside.

In certain cases, a secondary filter may be required.

Material	We recommend that you use exhaust ductwork made from galvanized sheet metal in order to prevent the formation of rust film.
Connection to device	The connection of the device must be flexible. A rigid connection is not allowed.
Cleaning openings	In horizontal sections, a cleaning opening should be installed every 9.8 to 16.4 feet. They are also required in the vicinity of T-pieces. If a sound absorber is installed in the ductwork, cleaning openings are required before and after it.
Attachment	The exhaust line must be secured using suitable means of attachment in accordance with the load. The ductwork must not be propped up by the device!
Potential equalization	<p>In the case of the extraction of non-conductive dust, the exhaust line must be grounded by means of potential equalization.</p> <p>Seals must be electrically conductive. Otherwise, potential equalization systems must be used throughout the ductwork system.</p> <p>The connection of multiple potential equalization systems to a single attachment point is not allowed. Each connection must be individually attached to a copper bar. This bar itself must be grounded with the switching system.</p>
Max. pipe length	The exhaust line should be dimensioned for an air speed of 33 ft/s. A max. ductwork length of 33 ft should not be exceeded. The installation of two 90° bends is also possible.
Ventilation-openings	In exhausted pathways, which were not laid continuously increasing, but partly decreasing, there have to be necessary ventilation-openings as well. These Ventilation-openings must be installed as covered below: The Ventilation-openings have to be tightly closed while running the collector and they also have to be open by stagnation.

4.6. Recirculation of clean air into room

If the clean air is to be fed back into the working area, the Ordinance on Hazardous Substances and its technical rules must be observed.

We recommend that you feed the clean air back into the work room via a return air duct with integrated shutters to ensure draft-free air distribution. The exhaust air and return air flows can be distributed by means of a switch in the exhaust line.

4.7. Humidification of air

Formation of condensate

The exhaust air will probably require humidification depending on the temperature and relative humidity of the exhaust air. You should assume humidification of the exhaust air of around 90% in the device.

The air volume of the work room should be at least $\frac{1}{4}$ of the air quantity recirculated by the device per hour so that when the device is working at full return air level, excessive humidification of the ambient air along with the formation of condensation does not occur.

This prevents a relative humidity of 75% being exceeded.

Example

Device air power of 2354 ft³/min = minimum room volume of 35315 ft³

Chapter 5

Commissioning

General

The following tasks must be carried out before commissioning:

- Install the suction and exhaust line.
- Install the fresh water supply line.
- Fill the device with water up to the idle water level.
- Add a corrosion protection agent.
- Install the switching system.
- Connect the electrical consumers.
- Open hand valve 2 on the valve block.

Main switch

The main switch may only be switched on by the commissioning personnel during the commissioning procedure.

Cold commissioning

Cold commissioning is carried out in MANUAL MODE.

- Check the direction of rotation of the drives.
- Check the power consumption of the drives.
- Check the setting values of the motor protection relay.
- Carry out a functional test of the individual components.
- Adjust the ductwork system. Make sure that the suction levels at the individual collection points are equal.

Make sure that the flow speed in horizontal pipe sections is around 60-65 ft/s.

- Adjust the level regulator in line with the operational water level.
- Switch on the fan.

 See "Fan".

CAUTION

Too many startup cycles per hour

Our motors are in Class S1 and are designed for continuous operation. Too many start-up cycles can cause the motor winding to overheat.

Therefore we recommend that the fans not be cycled on/off more than two times per hour

Commissioning

Commissioning is carried out in AUTOMATIC MODE.

- Start the device/system.
- Check the function of the level regulator.
- Check the device/system to ensure leak-tightness.
- Check the device/system for water escaping from the air outlet.

Briefing of personnel

If the commissioning procedure is carried out by Camfil APC, a short personnel briefing session takes place immediately afterwards.

Chapter 6

Fan

6.1. Commissioning

Commissioning may only be carried out by trained professionals. The trained professional in question must assure him- or herself that the fan is in perfect working order. The commissioning regulations for electrical machines must be observed.

- Check the safety devices.
- Turn on the main switch.
- Switch on the fan.

The fan may only be switched on once the relevant ductwork has been connected. This ensures that there is sufficient system resistance during the run-up phase.

- When commissioning the fan for the first time, check the direction of rotation of the motor.

CAUTION

The fan must turn in the direction indicated by the arrow.

The direction of rotation can be checked using a field of rotation tester.

- Check the power consumption. The permitted power consumption of the motor must not be exceeded.

6.2. Shutdown

- Switch off the fan.
- Turn the main switch to the "OFF" position and secure so that it cannot be turned back on by an unauthorized person.

6.3. Startup behavior of fans

There must be a sufficient acceleration torque over the entire startup range up to the nominal speed to enable the run-up of the fan. This is not always the case for medium- and high-pressure fans. In such cases, the fan can be run up against a closed throttle device.

Power supply units, switching devices, monitoring devices (if present), and cable cross-sections must be dimensioned and checked by the customer with regard to their startup type and time and their current peaks.

6.4. Startup for direct activation

In the case of the direct activation of the fan, the motor develops a high torque at a high starting current.

The starting current during the startup phase is between 5 and 8 times the nominal current depending on the impeller class.

This high power consumption must be taken into account when choosing the fuses.

Chapter 7

Operation

General

Only use the device/system in AUTOMATIC MODE!
We recommend that the device, ductwork system, and water supply system be subjected to a regular visual inspection during operations.

Water level

When the device/system is in use, water evaporates constantly. The water level must therefore be checked regularly. The automatic refilling of water should then take place.
If the level regulator was delivered by Camfil APC, please observe the provided operating manual.

Water supply

When the device/system is in use, the water supply should be checked regularly.

CAUTION

Malfunction due to closed water supply

If the water supply is switched off during operations, this results in a water shortage in the case of a mechanical level regulator. This is not signaled.

As a result, the dust separation process is significantly reduced and dust may escape from the air outlet.

Suction performance

We recommend that you regularly check the suction performance and dust collection at the individual collection points during operations and keep a record of the results.

Chapter 8 Decommissioning

General

If the device/system needs to be removed from service, appropriate measures must be implemented depending on the length of the planned standstill period.

If the device/system is installed in an unheated room or outside, you must observe the stipulations in Chapter 3.8 - "Winter operation".

Decommissioning over the weekend

In the case of the decommissioning of the device for the weekend, the following measures must be implemented:

- Switch-off the working machinery.
- Allow the device to run for another 10 seconds to remove any accumulations of dust from the ductwork system.
- Place the main switch into the "OFF" position.
- Clean the inside of the device thoroughly.

Decommissioning for a longer period of time

In the case of the decommissioning of the device for a longer period of time, the following measures must be implemented:

- Switch-off the working machinery.
- Allow the device to run for another 10 seconds to remove any accumulations of dust from the ductwork system.
- Place the main switch into the "OFF" position.
- Close hand valve 2 on the valve block.
- Clean the inside of the device thoroughly.
- Check the inside of the device for signs of corrosion. Rectify any defects.
- Only close the doors of the device once the inside of the device has dried out.

Chapter 9

Malfunctions

Before starting troubleshooting:

- Turn off the main switch.
- Secure the main switch so that it cannot be switched back on.

 **CAUTION**

Rotating fan impeller

- Risk of severe injury to limbs through contact with the part.
- Wait until the fan has stopped (approximately 5 minutes).

Malfunction	Possible cause	Troubleshooting
01 Extraction power too low	Suction line clogged	Remove the blockage.
	Suction line not leak-tight	Seal the leak.
	Pipe sections excessively throttled	Check the valve position.
	Inspection hatch open	Close the inspection hatch.
	Exhaust line clogged	Remove the blockage.
	Heavy soiling inside device	Clean the device with a high-pressure cleaner.
	Water level too high	Lower the water level and check the level regulator.
	Soiling of ventilator impeller	Clean and rebalance if necessary.
	Fan running in wrong direction	Reverse the motor.
	Defective compensator	Replace the compensator.
02 Dust escaping from air outlet port	Heavily reduced suction performance	Check the valve positions; the air quantity must not be excessively throttled.
	Water level too low	Check the discharge valve, level regulator, and water supply. Raise the water level.
	Water too concentrated	Drain the water trap, clean it, and fill it with fresh water.
	Dust poorly wettable	Add wetting agent FC54 by WAFORIT to the water.
03 Water escaping from air outlet port	Heavily increased air performance	Check the valve positions, throttle the air quantity, and check the suction line and device for leaks and/or open inspection hatches.
	Water level too high	Check the level regulator. Lower the water level.
	Heavy soiling inside device	Clean the device with a high-pressure cleaner.

Malfunction	Possible cause	Troubleshooting
04 Loud fan	Buildup of deposits on impeller	Clean the impeller.
	Impeller worn	Replace the impeller.
	Impeller deformed by thermal influences	Replace the impeller.
	Defective motor roller bearings due to relatively long-term impeller imbalance	Replace the roller bearings and re-balance the impeller.
05 Power consumption of motor too high or thermal overload on motor	Ductwork resistance too low	Check the valve positions, throttle the air quantity, and check the suction line and device for leaks and/or open inspection hatches.
	Water level too high	Check the level regulator. Lower the water level.
	Defective compensator	Replace the compensator.
	Fan running in wrong direction	Reverse the motor.
	Relatively high impeller speed (60 Hz grid)	Check the frequency and replace the impeller if necessary.
	Clogged air supply pipe of motor cooling system	Remove the blockage.
	Clogged exhaust pipes of motor cooling system	Remove the blockage.
	Loose or defective connection collars on exhaust pipes	Tighten the hose clips and replace the defective collars.
	Water level too high	Check the level regulator. Lower the water level.
	Motor surface heavily soiled; insufficient heat dissipation	Clean the motor surface; make sure that the cooling fins are clean.
06 Fan does not start running	Drive motor connected up wrongly	Check the connection and reverse the direction if necessary.
	No switch from star to D-connection. Only one third of the starting torque is applied for the star connection. From a certain speed, the load torque of the impeller is as large as the motor torque. If no switch to delta takes place, the motor never reaches its final speed.	Ensure a star-delta startup.
	Insufficient motor protection	Check the cable cross-section/protection features and replace them if necessary.
	Start from a warm operating state	Excessively high starting frequency; allow the motor to run.
	Starting current too high	Ensure a star-delta startup or soft startup
	Drive motor defective	Check the motor and replace it if necessary.
Phase defect	Check the electricians.	

Chapter 10

Maintenance

General

Before starting troubleshooting:

- Turn off the main switch.
- Secure the main switch so that it cannot be switched back on.



Rotating fan impeller

- Risk of severe injury to limbs through contact with the part.
 - Wait until the fan has stopped (approximately 5 minutes).
-

Maintenance intervals

Depending on the usage case of the scrubber, factors such as the water quality, dust type and quantity, temperatures, additives used in processing procedures, and number of shifts influence the intervals between the maintenance cycles.

The maintenance intervals listed here are therefore merely recommendations for normal single-shift operations.

The intervals might vary depending on the usage scenario and must be calculated and defined for the scenario at hand.

An important factor for defining maintenance intervals is the water replacement cycle. As water contamination increases, the ability of the water to hold dust decreases, the separation performance drops, and there are greater deposits of dirt in the scrubber.

Disposal of sludge

As the operator, you must check - on a case-to-case basis - how the dust that is separated by the device and accumulates as sludge is to be stored and disposed of.

Regulations on the storage of specific types of dust must be observed in particular.

Changing the water

It is vital to ensure the regular replacement of the water in the device.

There are the following types of water change:

- Discontinuous water change
- Continuous water change

For relevant information on the required water quality, please see our brochure on water as an operating source.

Build up of dust deposits

Any accumulations of dust must be removed promptly; otherwise, they can be very hard to eliminate. Any deposits of dust on the surface of the device must also be removed. Ignition risks must be avoided during cleaning and maintenance work.

Tools

Use brooms and brushes made from materials that do not cause sparks. Only approved industrial vacuum cleaners of type B1 may be used.

Dust turbulence

Dust turbulence is to be avoided. The blowing out of compressed air is forbidden during cleaning work.

Soiling around the cooling air outlet

Any dry soiling above or below the cooling air openings results from heavily contaminated cooling air sucked in by the motor from the installation room.

Safety screws on upper maintenance door

Following the completion of maintenance work, reattach the safety screws to the door latches in order to prevent unauthorized access to the fan impeller.

Maintenance schedule

Intervals: **D** = daily, **W** = weekly, **M** = monthly, **3M** = every 3 months, **6M** = every 6 months, **Y** = yearly

Item	Maintenance point	Interval	Type of check/maintenance task	Comments
1	Wet scrubber			<u>Before starting</u> cleaning work, drain or pump out the content of the water trap.
1.1	Air inlet area	W	CLEANING: 1. Remove deposits of dirt in the vicinity of the air inlet using a high-pressure cleaner.	Access via the lower maintenance door
1.2	Suction pipe/funnel	W	CLEANING: 2. Remove deposits of dirt on the inside and outside of the suction pipe and below the suction pipe funnel. 3. Clean the walls of the scrubber using a high-pressure cleaner.	Access via the lower maintenance door Separated dust forms a growing layer of dirt in the wet and dry zones. If prompt action is taken, these deposits can be brushed or sprayed off; later on they can only be scraped off with a scraper.
1.3	Separation zone	W	CLEANING: 4. Remove any deposits of dirt on the motor chamber, blade cage, and walls of the scrubber with a high-pressure cleaner.	
1.4	Motor ventilation lines	M	VISUAL INSPECTION: 5. Check the state of the collar.	IF NECESSARY: 1. Replace the collar.
1.5	Water return hose	M	VISUAL INSPECTION: 2. Check the state of the hose.	IF NECESSARY: 3. Replace the hose.
1.6	Water return pipe (for size 7)	M	CLEANING: 4. Remove any dirt in the pipe.	The lid must be removed to enable cleaning.
2	Integrated fan			
2.1	Entire fan	W	VISUAL INSPECTION: 1. Check for operating noises; make sure it is running smoothly.	IF NECESSARY: 2. Service it; rectify faults.
2.2	Fan impeller	W	VISUAL INSPECTION: 3. Completely remove any deposits of dirt on the impeller. 4. Check the impeller and check for changes (cracks, geometric changes, balance, and wear).	Access via the upper maintenance door If imbalance is still present following impeller cleaning, the impeller must be rebalanced. The check can be made by means of a non-destructive crack test, for example. An impeller inspection is required immediately if: - The permitted limit values are exceeded - Changes to running noise occur
2.3	Fan motor	W	ACOUSTIC CHECK: 5. Check for operating noises; make sure it is running smoothly. VISUAL INSPECTION: 6. Check the motor mounting.	This check can only be made during ongoing operations. This check must be carried out when the system is at a standstill. Check this by shaking the impeller.

Intervals: **D** = daily, **W** = weekly, **M** = monthly, **3M** = every 3 months, **6M** = every 6 months, **Y** = yearly

Item	Maintenance point	Interval	Type of check/maintenance task	Comments
3	Water tank			Drain or pump out the contents of the water tank.
3.1	Sealing band	W	CLEANING: 7. Clean the sealing faces and then degrease them using acid-free grease.	IF NECESSARY: 8. Replace the rubber band if it is defective. 9. If necessary, adjust the clamp fastener.
3.2	Water tank	D/W	CLEANING: 10. Drain or pump out the sludge/dirty water. 11. Shovel out any remaining sludge and clean the tank with a high-pressure cleaner. 12. Fill with clean water.	IF NECESSARY: 13. Replace the rubber band if it is defective. 14. Retouch the paintwork. Water quality Regularly replace the scrubbing water. Please observe the instructions in our brochure on water as an operating resource.
3.3	Drain ball valve	M	FUNCTIONAL INSPECTION: 15. Check the mobility of the ball.	IF NECESSARY: 1. Replace the defective ball valve.
4	Level regulation equipment			
4.1	Control box	W	CLEANING: 2. Clean the control box.	Once cleaning has been completed and the scrubber has been filled with water again, the level regulator setting must be checked. The regulator must be adjusted if necessary.
4.2	Float	W	CLEANING: 3. Clean the float.	
4.3	Floater rod (mech. LR)	W	FUNCTIONAL INSPECTION: 4. Check the mobility of the floater rod.	
4.4	Magnetic switch	W	FUNCTIONAL INSPECTION: 5. Check the switch function of the magnetic switch.	
4.5	Solenoid valve	W	FUNCTIONAL INSPECTION: 6. Check the switch function of the solenoid valve.	
4.6	Valve block	W	FUNCTIONAL INSPECTION: 7. Check the mobility of the valves.	
4.7	Surface cleaner (optional)	W	VISUAL INSPECTION: 8. Check the position of the sliding plate.	

Intervals: **D** = daily, **W** = weekly, **M** = monthly, **3M** = every 3 months, **6M** = every 6 months, **Y** = yearly

Item	Maintenance point	Interval	Type of check/maintenance task	Comments
5	Differential pressure measurement equipment (optional)			
5.1	Measuring lines	3M	VISUAL INSPECTION: 9. Check the hoses on the measurement instrument and scrubber to make sure that they are firmly attached. 10. Check the hoses for any deposits of dust.	IF NECESSARY: 11. Service them; rectify faults. 12. Clean!
		6M	MAINTENANCE WORK: 13. Remove both hoses from the measurement instrument and blow out with <u>oil-free</u> compressed air in the direction of the scrubber.	CAUTION Do not blow into the measurement instrument itself! This would destroy the membrane in the instrument!
		Y	MAINTENANCE WORK: 14. Replace the sintered filter.	
6	Ductwork system			
6.1	Duct suspension system	6M	VISUAL INSPECTION: 15. State of pipe suspension system	IF NECESSARY: 1. Service it; rectify faults.
6.2	Suction ductwork	3M	VISUAL INSPECTION: 2. Check the inside and outside for corrosion. 3. Check the ductwork for dust deposits.	IF NECESSARY: 4. Rectify any corrosion damage. 5. Eliminate any deposits of dust.
		6M	MAINTENANCE WORK: 6. Remove any deposits of dust.	CAUTION Deposits of dust in the suction line reduce the extraction power of the system. The overall weight can increase to the extent that the suspension system breaks and the ductwork falls down.
6.3	Flange connections	M	VISUAL INSPECTION: 7. Check the screw seat and tighten if necessary.	IF NECESSARY: 8. Service it; rectify faults.
6.4	Hoses	3M	VISUAL INSPECTION: 9. Check the hoses for damage. 10. Check the attachment and position of the hoses.	
6.5	Compensators	3M	VISUAL INSPECTION: 11. Carry out a leak-tightness test.	IF NECESSARY: 12. Replace defective compensators.
6.6	Shut-off valves	M	VISUAL INSPECTION: 13. Check the valve positions. 14. Check the valves for mobility.	CAUTION To ensure the required air speed in the ductwork system, a certain number of valves should be open at all times (basic commissioning position).
6.7	Exhaust line	6M	VISUAL INSPECTION: 15. Check for deposits of dirt.	CAUTION Deposits of dirt can cause the suspension system to break.

Intervals: **D** = daily, **W** = weekly, **M** = monthly, **3M** = every 3 months, **6M** = every 6 months, **Y** = yearly

Item	Maintenance point	Interval	Type of check/maintenance task	Comments
6.8	Sound absorber	6M	VISUAL INSPECTION: 16. Check for deposits of dirt.	IF NECESSARY: 17. Remove any really dirty splitters and brush them off while dry.
7	Work room			
7.1	Workbench	D	CLEANING: 18. Remove any deposits of dust.	
7.2	Extraction hoods	M	CLEANING: 19. Clean the inside and outside of the hoods. 20. Clean the integrated intake grate (optional).	CAUTION Integrated intake grates can gradually become clogged due to sucked-in particles. This reduces the amount of air that is sucked in. The air speed in the ductwork system drops and dust accumulates in the suction pipe system.
7.3	Work room	M/Y	CLEANING: 21. All surfaces where dust can deposit.	Carry out cleaning at least once a year.
8	System grounding			
8.1	Grounding straps	Y	VISUAL INSPECTION: 22. Check that the grounding straps are firmly attached.	

Chapter 11

Disposal

- Drain and thoroughly clean the system.
- Dispose of the system in an environmentally friendly way.
- Send components for recycling or dispose of them in the proper manner.

Housing (cleaned)	Steel recycling
Ductwork/duct parts	Steel recycling
Fittings	Steel recycling
Seals	Waste management company
Motor	Specialist company
Electrical components	Electronic scrap/specialist company
Scrubbing liquid	Waste management company

Chapter 12 Technical data

Device size:		2/1	2	3/2	3	4	5	6	7
Technical air-related data									
Volume flow	ft ³ /min	353	706	706	1059	1413	2119	3178	4238
Operating temperature	°F	+50 - 104	+50 - 104	+50 - 104	+50 - 104	+50 - 104	+50 - 104	+50 - 104	+50 - 104
Ambient temperature	°F	+41 - 104	+41 - 104	+41 - 104	+41 - 104	+41 - 104	+41 - 104	+41 - 104	+41 - 104
Overall pressure	"W.C.	7.2	7.2	10.0	8.4 (10.0)	8.4 (10.0)	8.4 (11.2)	8.8 (11.2)	10.0 (12.0)
Freely available pressure	"W.C.	2.0	2.0	4.4	2.8 (4.4)	2.8 (4.4)	2.8 (5.6)	3.2 (5.6)	4.4 (6.4)
Motor data									
Motor power	hp	3.0	3.0	5.0	5.0	5.0	7.5	10.0	15.0
Motor voltage	V	230/400	230/400	400/690	400/690	400/690	400/690	400/690	400/690
Nominal current	A	5.0/2.9	5.0/2.9	5.7/3.3	5.7/3.3	7.45/4.3	10.0/5.8	14.5/8.4	18.8/10.9
Frequency	Hz	60	60	60	60	60	60	60	60
Protection class		IP 65	IP 65	IP 65	IP 65	IP 65	IP 65	IP 65	IP 65
ISO class		F	F	F	F	F	F	F	F
Winding protection		MP	MP	MP	MP	3 PTCs	3 PTCs	3 PTCs	3 PTCs
Dimensions									
Scrubber Ø	in	19.7	19.7	24.8	24.8	28.3	31.5	43.3	53.1
Scrubber height	in	67.7	67.7	75.6	75.6	78.4	88.1	108.2	119.4
Air inlet port height	in	29.3	29.3	34.3	34.3	34.8	36.0	37.8	47.8
Water tank Ø	in	19.7	19.7	24.8	24.8	28.3	31.5	43.3	43.3
Container height with rollers	in	22.4	22.4	22.4	22.4	23.0	23.0	27.9	27.9
Connections									
Air inlet	in	4.7	6.3	6.7	7.1	7.9	9.8	12.4	13.9
Air outlet	in	11.0	11.0	11.0	11.0	13.9	15.7	17.7	22.0
Water connection		1"	1"	1"	1"	1"	1"	1"	1"
Wastewater connection		2"	2"	2"	2"	2"	2"	2"	2"
Weights									
Empty weight	lb	397	419	507	551	728	948	1808	2425
Water content	gal	21	21	32	32	42	53	106	106
Emission values									
Crude gas charge	mg/Nm ³	< 200	< 200	< 200	< 200	< 200	< 200	< 200	< 200
Clean gas emission	mg/Nm ³	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Reference surface sound pressure level *	dB(A)	65	65 (68)	69	69 (70)	69 (71)	71 (73)	72 (74)	74 (76)
Sound pressure level*	dB(A)	79	80 (83)	86	84 (85)	86 (87)	89 (91)	92 (94)	94 (96)

(x) Values at increased overall pressure

* as per DIN EN ISO 3744 at a distance of 3.3 ft

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