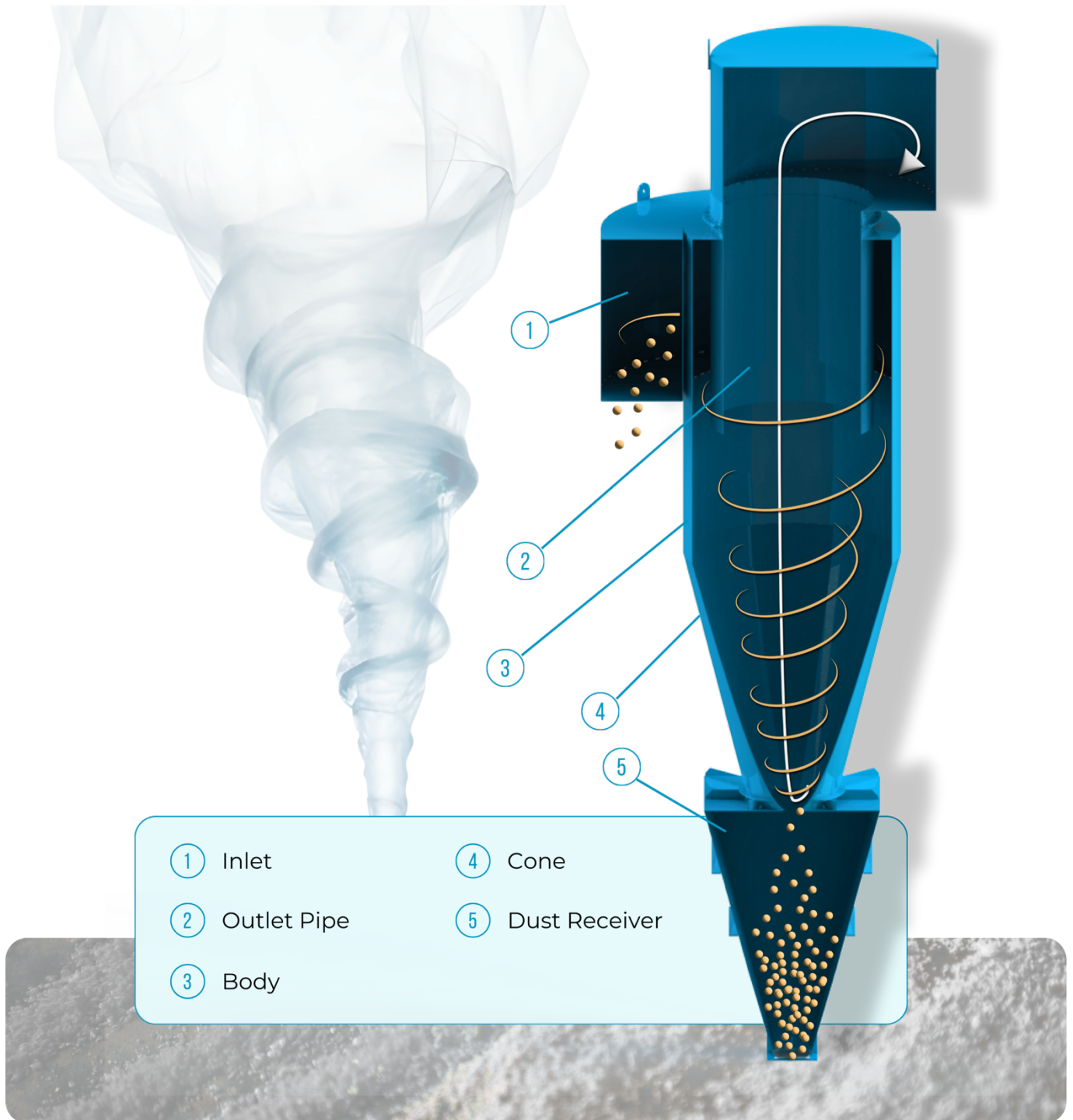




Heumann Environmental Company
4750 New Middle Road, Jeffersonville, IN 47130
Phone: (812) 280-1854
Website: heumannenviro.com

Cyclone Installation, Operation, and Maintenance Manual





Heumann Environmental Company
4750 New Middle Road, Jeffersonville, IN 47130
Phone: (812) 280-1854
Website: heumannenviro.com

Table of Contents

Section A – Considerations Before Installation	3
Section B – Installation.....	4
Section C – Operation	7
Section D – Startup Recommendations	7
Section E – Maintenance	8
Section F – Spare and Replacement Parts	9
Section G – Troubleshooting.....	9



Heumann Environmental Company
4750 New Middle Road, Jeffersonville, IN 47130
Phone: (812) 280-1854
Website: heumannenviro.com

Thank you for your purchase of a Heumann Environmental Company (HEC) cyclone separator. This manual is furnished for the purpose of identifying certain general procedures and precautions recommended for use in setting up, operating, and maintaining the equipment. Should you have questions, feel free to contact our staff for assistance related to the proper installation, use, and maintenance of your HEC cyclone separator.

Section A – Considerations Before Installation

Explosion Risk

Owners must be aware of their responsibilities related to the risk of combustible dust hazards in the workplace. Inform HEC immediately if the cyclone will be used to capture combustible dust. All process components used to collect combustible dust should be designed per NFPA requirements for explosion venting, suppression, or containment. Do not operate the cyclone if your process contains combustible dust and HEC has not specifically designed the equipment for this purpose. HEC recommends that owners of plants handling combustible dust consult with an expert to implement strategies to minimize the risk of an explosion in their facility.

Safety

It is the owner's responsibility to train employees in the proper and safe use of the cyclone and any provided accessories. Written safety programs and formal instruction are essential. Special care must be taken to ensure that all employees and outside contractors are informed of the potential hazards when working in the plant.

Support System

The structure or concrete pad and soil must be sufficient to handle the maximum operating loads of the cyclone. In addition, proper drainage of the area surrounding the cyclone must be considered. HEC recommends that a structural engineering firm is hired for foundation and/or structure design to ensure safety of personnel and prevent damage to equipment. Consult appropriate jurisdictional authorities to ensure compliance with all national and local codes regarding the installation.

HEC cyclones typically include mounting lugs to sit on support steel designed and supplied by others. In some cases, HEC may have designed and supplied a complete support structure to accompany the cyclone. The equipment general arrangement drawing(s) will list the loads that form the basis of the mounting lugs and/or support structure design. Unless otherwise noted on the drawings, the cyclone has not been designed to accommodate loads other than the dead weight (empty and full weight) and the local wind and seismic conditions.

Additional loads caused by any attaching ducting and/or piping to the cyclone, system pressure fluctuations, thermal expansion, or temperature changes must be considered when designing the cyclone support structure. HEC recommends inlet, outlet, and discharge ductwork or piping be



Heumann Environmental Company
4750 New Middle Road, Jeffersonville, IN 47130
Phone: (812) 280-1854
Website: heumannenviro.com

supported independently and that vibration isolation be used to prevent transfer of vibration to the cyclone. Any additional loads should be determined and supplied to HEC prior to installation to ensure a problem does not occur during operation. Additional costs may be incurred to modify the cyclone to handle additional loads.

Shipment

HEC factory personnel have ensured that the cyclone was loaded and secured properly onto the carrier using cradles, blocks, straps, and chains as required. Inspect the equipment upon arrival and report any damage which may have occurred during transit. All claims for damage should be filed promptly with the freight company.

Packing lists should be checked at delivery to ensure items have not been lost in transit. Contact HEC immediately should you believe any items are missing.

Offloading

HEC recommends that qualified and experienced personnel handle the equipment. Extreme care should be used in unloading the cyclone from the truck. Cyclone surfaces should be protected if a forklift is used. On larger units, lifting lugs will be welded to the equipment to aid in offloading. Use these lugs to prevent damage to the equipment.

Section B – Installation

Setting the Unit

The support structure should be installed, leveled, and anchored into place prior to setting the cyclone.

Failure to lift the cyclone correctly can result in personal injury and/or damage to the equipment. Use appropriate lifting equipment and follow all safety precautions needed for handling the cyclone. A crane or forklift is typically required for lifting, assembly, and installation. Use lifting lugs provided on the cyclone. Clevis connectors should be used instead of hooks on lifting slings. Spreader bars may be required to prevent damage to the cyclone. All applicable OSHA regulations and local codes should be followed when using cranes, forklifts, or other lifting equipment.

The cyclone should be placed in the support structure correctly oriented with respect to the inlet and outlet ductwork and securely anchored with proper hardware. Tighten any hardware on the cyclone that may have loosened during transit.

Contact HEC if you have any questions or problems installing the cyclone.



Heumann Environmental Company
4750 New Middle Road, Jeffersonville, IN 47130
Phone: (812) 280-1854
Website: heumannenviro.com

Temporary Braces

Remove any temporary internal braces that may have been added for support during shipment. These braces will normally be painted yellow for visibility. The HEC drawings will also normally highlight any temporary braces that must be removed.

Conveying Duct

HEC recommends inlet, outlet, and discharge ductwork are supported independently and that vibration isolation is used to prevent transfer of vibration to the cyclone. Unless noted on the equipment drawing, HEC has not designed the mounting lugs or support structure to accommodate additional loads caused by the duct. Ductwork on the inlet side of the cyclone should be sized to ensure solids stay entrained in the air and do not drop out prior to reaching the cyclone. Velocities should not be so high as to reduce the service life of duct and duct elbows. To ensure proper cyclone performance, HEC recommends that four to six equivalent diameters of straight duct be installed at the inlet of the cyclone. For cyclones in multiple arrangements, the recommended length of straight duct on the inlet is six to eight equivalent diameters. Any elbows in the inlet or outlet duct must turn in the same direction as the cyclone separator to prevent a reduction in collection efficiency. In addition, any transitions on the cyclone inlet and outlet should be gradual. HEC recommends transitions no greater than 15° to prevent any impact on cyclone performance.

If a fan will be installed on the exhaust of the cyclone, HEC recommends that gas rotation be eliminated prior to entering the fan inlet via a scroll outlet, straightening vanes within the ducting, or a fan inlet box. If rotational gases must enter the fan, the fan manufacturer should be consulted to verify the fan's performance with rotational system effects.

Explosion Venting

If combustible dust is being handled, the cyclone may include vents to ensure the equipment remains intact should a deflagration occur. Do not operate the cyclone if combustible dust will be collected and HEC has not specifically designed the equipment for this purpose. HEC recommends that owners of plants handling combustible dusts consult with an expert to implement strategies to minimize the risk of an explosion in their facility. The size and quantity of the explosion vents and the design pressure of the cyclone have been determined by the specific dust explosivity data (usually expressed in P_{max} and K_{st} values) provided by the owner in the specification. HEC assumes no responsibility for the accuracy of the explosivity data supplied and highly recommends that the owner test the dust's properties prior to issuing a cyclone purchase specification.

Any explosion vents will be shipped loose to ensure they are not damaged in transit. Vents should be installed as outlined in the supplier's installation manual to make sure they will perform as desired during an explosion. If accessible by maintenance platforms, guards or other measures should be installed to prevent plant personnel from the danger of an explosion when exiting the vents.



Heumann Environmental Company
4750 New Middle Road, Jeffersonville, IN 47130
Phone: (812) 280-1854
Website: heumannenviro.com

HEC must be notified if any ducting is to be installed on the vents. Unless noted on the HEC general arrangement drawing(s), the vents are designed specifically to open directly to the outside atmosphere. Any additional ducting connected by the owner to the outlet side of the explosion vent may lead to an unsafe and potentially dangerous situation.

Cyclone Solids Discharge

To maximize the performance of a cyclone, it is essential that the discharge be properly designed to prevent the re-entrainment of collected solids. A dust receiver section is normally used to allow the collected solids to escape the spinning gas and reduce the possibility of re-entrainment. The discharge of the cyclone must be sealed so that excess air cannot enter from below and carry collected solids up to the gas outlet.

The discharge should be sealed by discharging into an air-tight container, submerging a dipleg into a fluidized bed, or by installing an airlock device designed to allow the continuous flow of solids through it. The airlock device must be correctly sized to prevent buildup of discharged material. A qualified airlock manufacturer should be consulted to ensure that features specific to your solids type are included in the design. The chosen airlock device is usually dictated by the type of solids being captured and the system design and may be one of the following: rotary airlock feeder, double dump valve, double slide gate valves, rotary plug valve, or pinch valve.

Airlock devices should be installed, operated, and maintained as outlined in the manufacturer's IOM manual. Owner/operator should pay particular attention to all safety warnings to prevent injury from moving parts. Though the cyclone has no moving parts, an airlock device may be dangerous to personnel working on or around the cyclone.

If desired, HEC can include a properly designed airlock device in its scope of supply to ensure that the cyclone purchased will operate at a maximum performance level.

Insulation

Operation near the gas dew point can result in condensation appearing on the interior surfaces of the cyclone. Building and plugging may occur if condensation is present. For this reason, HEC recommends that exterior insulation is installed on all cyclones operating near the gas dew point.

Differential Pressure Gauge

A differential pressure gauge is often used to monitor the pressure difference between the inlet and outlet of the cyclone. If supplied by HEC, the gauge is normally shipped loose, requiring field installation of the gauge and the tubing between the pressure taps and the gauge. Flexible tubing should be connected between the tap on the cyclone inlet and the high-pressure port on the gauge. The pressure tap on the cyclone outlet should similarly be connected to the low-pressure port on the gauge.



Heumann Environmental Company
4750 New Middle Road, Jeffersonville, IN 47130
Phone: (812) 280-1854
Website: heumannenviro.com

Equipment Grounding

A proper electrical ground is mandatory when installing any particulate collection system. HEC recommends that the equipment be grounded to an earth ground source. Grounding wires should also be installed across gasketed surfaces.

Section C – Operation

Cyclones separate substances by taking advantage of their different responses to centripetal acceleration. While most frequently used to separate particulate from gas, cyclones can be used to separate any two substances with significantly different inertial properties.

HEC cyclones are a type of reverse flow cyclone in which the process fluid flows through the inlet and spirals down toward the bottom before reversing direction in a tight vortex that exits the cyclone outlet at the top. When designed properly, a cyclone will concentrate the particulate along the wall of the device and then transport it to a collection area at the bottom where it is separated from the returning gas flow. For more information on the science behind cyclone design, visit our website and download our free cyclone resources here: <https://heumannenviro.com/products/cyclones/>.

Section D – Startup Recommendations

- 1) **The cyclone and all components should be checked to ensure mechanical and electrical installation is complete.**
- 2) **Check all duct flanges and cyclone flanges for leaks.** Silicone caulk can be used to seal joints in most applications. The HEC general arrangement drawing(s) will indicate the type of gasket required and supplied with the cyclone. If possible, it is recommended that the system be started without any solids in the gas stream to allow for a safe check of all seals without the risk of product loss.
- 3) **Ensure that the airlock device is running properly prior to allowing solids into the system.** The cyclone cannot perform properly if the airlock device is not operating.
- 4) **Start the system fan.** Follow any startup recommendations from the fan supplier. If dampers are installed on the system fan, check the cyclone pressure drop against the design value to ensure the damper is set properly.
- 5) **Monitor all instrumentation to ensure steady readings.** Visually inspect the exhaust gas to confirm particulate is not bypassing the cyclone. Contact HEC engineers if any problems arise.



Heumann Environmental Company
4750 New Middle Road, Jeffersonville, IN 47130
Phone: (812) 280-1854
Website: heumannenviro.com

- 6) **Do not allow foreign objects to enter the cyclone during startup or normal operation.** That may cause plugging, reducing the performance of the cyclone. In cases where the solids are combustible or flammable, plugging may also cause an explosive event because the solids are unable to exit the cyclone properly.

Section E – Maintenance

General

Periodic inspections by the owner can help prolong the life expectancy of the cyclone system. HEC recommends that a formal program be adopted by the owner for equipment inspections. Inspection of external components such as airlock devices, fans, gauges, ductwork, piping, and gaskets can often be done without requiring much downtime. Internal surfaces should also be closely inspected on a regular basis during normal plant shutdowns. An effective preventative maintenance program is important to maximize the equipment performance and reduce downtime.

Interior Surfaces

The interior surfaces of the cyclone should be kept free of buildup to prevent plugging/bridging, maximizing performance. The interior surfaces should be periodically inspected and cleaned if necessary. A dust mask should always be worn when inspecting or cleaning the interior of a cyclone.

Access doors should not be opened while power is supplied to the system blower or the airlock device. Serious injury can result if the equipment is entered during operation. HEC recommends that a lock/tag system be followed to ensure doors cannot be entered while power is supplied to the system.

In addition, look for signs of erosion and/or corrosion. Deterioration of the equipment shell can result in dangerous conditions for employees and can dramatically affect the performance of the equipment. Contact HEC to discuss alternative materials of construction or linings to reduce the effects of erosion and/or corrosion.

Airlock Devices

The recommendations from the manufacturer's IOM manual should be strictly followed to ensure proper operation and optimal cyclone performance.

Protective Linings/Coatings

Depending on the application requirements, your cyclone may have an interior lining or coating to reduce the effects of erosion and/or corrosion. The HEC general arrangement drawing(s) will note what lining or coating is installed on the interior of the cyclone separator.



Heumann Environmental Company
4750 New Middle Road, Jeffersonville, IN 47130
Phone: (812) 280-1854
Website: heumannenviro.com

If a refractory lining is installed, it must either be heat cured prior to startup or be slowly brought online with a specified temperature rise schedule to prevent damage to the lining. Ceramic tile linings also should not be heated too quickly or damage may occur. Please refer to your HEC general arrangement drawing(s) to determine if a lining is installed and contact HEC for required startup measures.

Corrosion resistant or nonstick coatings should not be cleaned with harsh chemical cleaners. Special care should be taken to prevent hard or rough objects from making contact or scratching the coated surfaces as well.

Pressure Vessel Construction

If your HEC cyclone is designed to hold high pressure, it may be designed, fabricated, and stamped as a pressure vessel per Section VIII of the ASME Boiler and Pressure Vessel Code. Repairs or alterations on an ASME-certified pressure vessel require special procedures and approval from your local authority. Please inform HEC if you have any questions about repairs needed for your ASME-certified equipment. An ASME U-stamp nameplate will be secured to the cyclone if it is a registered pressure vessel. The HEC drawings will also provide information regarding the design conditions of your cyclone.

Section F – Spare and Replacement Parts

Contact HEC directly regarding price and availability of spare and/or replacement parts for your cyclone. Refer to the part numbers on the general arrangement drawing(s) when speaking with an HEC representative.

Section G – Troubleshooting

Refer to HEC's cyclone troubleshooting guide, downloadable from the Resources tab of the website here: <https://heumannenviro.com/products/cyclones/>. Feel free to contact an HEC engineer for additional assistance.