

VortechPlus™ Series Powder Coating Booth System

Service Manual



MODEL
6K, 8K, 10K, 12K, 14K and 16K CFM

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Introduction

About This Manual

- Before operating, maintaining or servicing any ITW Gema electrostatic coating system, read and understand all of the technical and safety literature for your ITW Gema products. If you do not have the manuals and safety literature for your system, contact your local ITW Gema distributor or ITW Gema factory representative.
- All text references to diagrams or illustrations will appear as a circled number (as indicated in the Parts Identification Section), i.e.: Item number five in the Parts Identification will appear as ⑤ throughout the text and all diagrams and illustrations, except where otherwise indicated.
- In the manual, as in all ITW Gema technical and safety literature, the following advisories will be provided where appropriate:

DANGER! States a clear and present hazard to personnel safety!

WARNING! States information relevant to personal safety!

CAUTION! Is information relevant to safeguarding equipment!

NOTE is information about the procedure in progress.

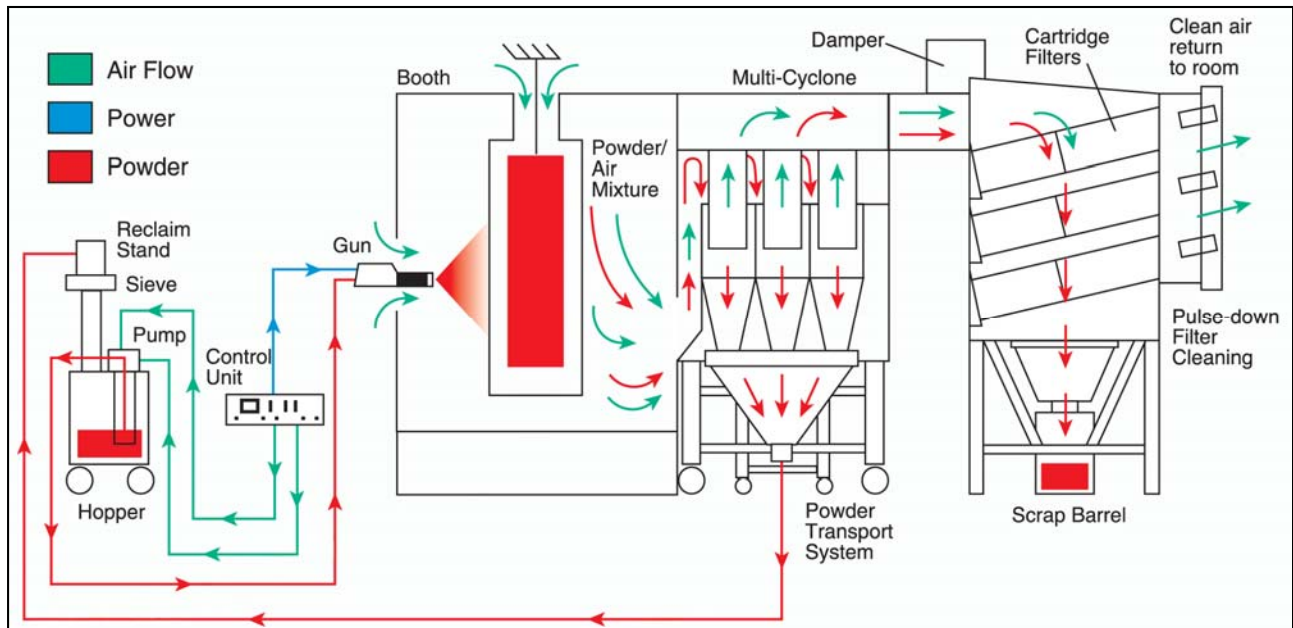
- The Information in this document is intended ONLY to indicate the components and their working relationship in typical use. These are NOT installation instructions. Each installation is unique and should be directed by a ITW Gema representative or made from the ITW Gema installation drawings provided for your particular installation.
- This manual provides information for the service and maintenance of the VortechPlus systems. While this book lists standard specifications and procedures, some minor deviations may be found between this literature and your equipment. Differences in local codes, plant requirements, and material delivery requirements, etc. make such variations inevitable. Compare this manual with your ITW Gema system Installation drawings and appropriate ITW Gema equipment manuals to reconcile such differences.
- Careful study and continued use of this manual will provide a better understanding of the equipment and the process, resulting in more efficient operation, longer trouble free service and faster, easier troubleshooting.
- Please conduct the specified tests and checks before requesting service assistance, and have this manual in hand for ready reference when requesting such assistance, We recommend that maintenance or operating personnel who are familiar with the service problem be authorized to contact us when service is required.
- For assistance, contact your local ITW Gema Distributor or the Technical Assistance Desk at (800) - 628 - 0648.

WARNING!

- The user **MUST** read this manual and be familiar with the ITW Gema safety literature therein identified.
- This manual **MUST** be read and thoroughly understood by ALL personnel who operate, clean or maintain this equipment! Special care should be taken to insure that the WARNINGS and safety requirements for operating and servicing the equipment are followed. The user should be aware of and adhere to ALL local building and fire codes and ordinances as well as *NFPA STANDARD 33 AND THE OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970 (OSHA)* prior to installing, and/or servicing this equipment.

VortechPlus™ Series Powder Coating Booth System

The VortechPlus Series Powder Coating Booth System is designed to deliver the industries most versatile and flexible color changing and recovery system. The recovery unit attaches directly to the booth, minimizing space needs and diminishing potential contamination concerns by eliminating the need for ductwork. The VortechPlus works effectively for both manual and automatic spray operations.



Reclaim Mode

In reclaim mode, air/powder is drawn into the cyclone inlet portion of the unit. The powder is separated by cyclonic action that spins out the reclaim powder to a dropout hopper where it is transferred back to the spray hopper. The separated air and residual scrap powder is discharged to the cartridge collector where it is separated by cartridge filters and collected in the base of the unit.

VortechPlus™ Specifications

	6K	8K	10K	12K	14K	16K
Size	DFO 2-8	DFO 3-12	DFO 3-18	DFO 3-18	DFO 3-24	DFO 3-24
CFM	6000	8000	10,000	12,000	14,000	16,000
Static	15.1	16.0	17.5	14.5	16" w.g.	16" w.g.
Motor hp	20	30	40	40	50	50
RPM	3500	3500	3500	3500	2575	2629
Voltage	460	460	460	460	460	460
Manual Discharge Damper	Included	Included	Included	Included	Included	Included
Fan Silencer	Included	Included	Included	Included	Included	Included
Ultra-Web Filters included, qty	8	12	18	18	24	24
Timer Board	Included	Included	Included	Included	Included	Included
Explosion Vent (s) (top mounted)	1	1	1	1	1	1
Fan Mounted	On Floor in Box	On Floor in Box	On Floor in Box	On Floor in Box	On Floor without box	On Floor without box
Drum Cover with latches and gate	Included	Included	Included	Included	Included	Included
Afterfilter plenum includes 3" panel filters, qty and location =	4 on top	4 on top 1 on bottom	6 on top	6 on top 2 on bottom	6 on top 4 on bottom	8 on top 4 on bottom
Transition Duct (between collector and fan)	Included	Included	Included	Included	Included	Included
Orientation of afterfilter to collector	Flexible	Flexible	Flexible	Flexible	Limited	Limited

Static Pressure Readings

Cyclone Section

A barb is supplied on the cyclone section to take a static pressure reading across the cyclones. This is used for testing purposes only. The reading is taken by connecting tubing between the pressure tap and low side of a pressure-monitoring device, with the other side open to atmosphere. This reading may be taken at any time while running. The tap should be plugged when not in use.

NOTE: The extra low port should be plugged and the two high ports open on a magnehelic gauge.

Collector Section

Magnehelic / Transducer – This device measures the difference in static pressure between the clean side and the dirty side of the cartridge collector. This is the static pressure on the cartridge filters or the pressure drop across the filters. The pressure tap on the **clean side** is connected to the **low port** on the magnehelic or the **P1 port** on the transducer. The **dirty side** pressure tap is connected to the **high port** on the magnehelic or the **P2 port** on the transducer.

NOTE: On the magnehelic gauge the extra high and low ports should be plugged

To take the reading on a different gauge the lines **can not** be removed while the booth is running. The booth must be turned off and both lines removed, then restarted to take the reading. The same thing applies when the lines are reconnected. This is because the difference is read between the clean and dirty side and if a line is removed then a high static pressure is sensed causing the booth to shut down.

Final Filter

Magnehelic / Transducer – This device measures the static pressure in the final filter plenum. This is a back-pressure reading caused by the restriction of air passing through the final filters. The pressure tap on the final filter plenum is connected to the **high** port of the magnehelic or the **P2 port** on the transducer.

NOTE: The extra high port should be plugged and the two low ports should be unplugged on the magnehelic gauge.

Transfer Pumps

For cyclone transfer pumps and vibrator, a plate is welded to the leg of the cyclone drop out hopper. From there the lines will also tee and run to the individual pumps and vibrator. Placement of this coupling was done so that main air lines to the cyclone transfer pumps and vibrator could be disconnected, and the cyclone transfer section unit rolled away during color change. Another possibility is to have a single cyclone unit and multiple dropout sections with dedicated transfer pumps.

VortechPlus™ Booth Airflow Calculation Sheet

This sheet contains formulas for calculating system airflow. It also contains places to note booth airflows and formulas for calculating CFM based on the total square footage of all the openings in the booth. Readings should be taken at each opening from top to bottom and left to right. Average each opening airflow velocities and then average the total airflow velocities together. The opening square ft. can be measured or supplied from a ITW Gema Engineer. Multiply the total sq. ft. by the average opening velocity to get the booth CFM. This number should be consistent with the CFM volume from the data sheet within +/- 500 CFM.

NOTE: Care should be used so that readings are taken at a consistent distance from all openings.

VESTIBULE ENTRANCE	
A	
B	
C	
D	
E	
F	
AVG	

VESTIBULE EXIT	
A	
B	
C	
D	
E	
F	
AVG.	

OP.	SQ. FT.	AVG. VEL.
V. entrance		
V. exit		
OP. 1		
OP. 2		
GS 1		
GS 2		
GS 3		
GS 4		
CS		
AVG.		

OPERATOR OPENING	
A	
B	
C	
D	
AVG.	

OPERATOR OPENING	
A	
B	
C	
D	
AVG.	

GUNSLOT 1	
A	
B	
C	
AVG.	

GUNSLOT 2	
A	
B	
C	
AVG.	

CONVEYOR SLOT		
Entrance	A	
	B	
	C	
	D	
	E	
Exit	F	
AVG.		

GUNSLOT 3	
A	
B	
C	
AVG.	

GUNSLOT 4	
A	
B	
C	
AVG.	

<p>BOOTH CFM FORMULA:</p> <p style="text-align: center;">Total Square Footage _____ X Average Velocity _____ = Booth CFM _____</p>

VortechPlus™ Color Change Process

These process steps are a guideline and can be modified for specific applications. Several of these color change processes may be conducted at the same time; however, there are several processes that must occur in the proper order to avoid redundant cleaning:

1. Color change process should begin at the Chameleon: First clean the lift tubes, pumps, powder hoses and guns so all the powder in these lines can be purged into the booth.
2. Once the Chameleon cleaning cycle is complete, the gun exteriors can be cleaned automatically from the electrical panel.
3. After gun exterior cleaning is complete, clean the interior of the booth while the recovery is operating.
4. Following booth cleaning procedure, clean the multi-cyclone.

After running a single color for an extended period of time, a complete system clean may be required where the pumps and gun nozzles are cleaned. Regular pump and gun maintenance should be followed based on procedures outlined in those manuals.

NOTE: All procedures, unless otherwise indicated, are performed with the booth blower in operation and application equipment turned off.

VortechPlus™ Color Change Process Chart

Man A	Man B	Location	Process
	1	Booth	With booth running, shut all doors
2		Electrical Panel	Set Trigger Mode, Reclaim Enable, and Fresh Feed to OFF
3		Electrical Panel	Turn ON Cleaning Mode
4		Chameleon	Disconnect the sieve vibrator power cable
5		Chameleon	Remove the vibratory sieve discharge hose from box of powder
6		Chameleon	Blow off the outside of the vibratory sieve and hoses
7		Chameleon	Remove the vibratory sieve
	4	Chameleon Screen	COATING menu select STOP (F2)
	5	Chameleon Screen	Pump lift assy. lifts out of the box of powder or hopper
	6	Chameleon	Blow off the outside of the powder box or hopper
	7	Chameleon	Remove the box of powder or hopper (disconnect fluidization air line)
	8	Chameleon	Roughly clean Chameleon interior with blow-off gun
8		Chameleon Screen	COATING menu select ESC (F5)
9		Chameleon Screen	MAIN menu select CLEANING (F3)
10		Chameleon Screen	CLEANING menu select GUNS CLEAN (F1)
	11	Chameleon	Blow off the exterior of the pumps and hoses
	12	Chameleon Screen	Once pulsing is complete, select FILTER CLEANING (F3) to clean cartridge filters
	13	Chameleon Screen	Select ESC (F5) and pump lift assy. lifts from cleaning position
14		Electrical Panel	Start external gun cleaning by pressing the Gun Blowoff #1, #2, and #3
	15	Chameleon	Finish cleaning the pump lift assembly
	16	Chameleon	Wipe off pump lift assy. with rag while blowing off
	17	Chameleon	Place new box of powder or hopper (connect fluidization air line)
	18	Chameleon	Replace the vibratory sieve
	19	Chameleon	Replace the transfer hose
	20	Chameleon	Reconnect the sieve vibrator power
	21	Transfer Container	Disconnect the compressed air connections for the transfer pumps and vibrator
	22	Transfer Container	Remove multi-cyclone transfer container
15		Booth	Blow off powder from interior surfaces of booth from the access door towards multi-cyclone
	23	Multi-Cyclone	Blow off the lower surface of the multi-cyclone
24		Multi-Cyclone	Open multi-cyclone access doors
25		Multi-Cyclone	Blow off inlet plenum with compressed air using wand attachment
26		Multi-Cyclone	Manually raise the inlet vane ring on each cyclone and clean with compressed air
	26	Multi-Cyclone	Open and Blow out the lower portion of the cyclone interior
27		Multi-Cyclone	Close the multi-cyclone access doors
	27	Transfer Container	Replace the multi-cyclone transfer container and verify a proper seal
	28	Transfer Container	Reconnect the container compressed air connections for the transfer pumps and vibrator
	29	Transfer Container	Replace the transfer pumps hoses for the new color
30		Booth	Open all doors
31		Electrical Panel	Turn OFF Cleaning Mode
32		Electrical Panel	Set Trigger Mode to Auto and Reclaim Enable and Fresh Feed to ON
	33	Chameleon Screen	MAIN menu select COATING (F1)
	34	Chameleon Screen	Select COATING (F1) to return pump lift assembly to coating position
	35	Chameleon	Adjust fluidization in the box of powder if necessary
	36	Chameleon	Run vibratory sieve outlet to waste container for approx. 2 min. to reduce contamination risk
	Man C	Transfer Container	Clean recovery transfer container & baffle offline (Disregard if used as a dedicated color container)
	Man C	Transfer Container	Remove and clean transfer pumps & hoses offline (Disregard if used as a dedicated color container)

VortechPlus™ Color Change Process, continued

Application Equipment Cleaning:

- Force compressed air through hoses and powder guns to remove powder.
- Clean gun nozzle, muzzle nut and powder hose connection with compressed air.
- Wipe off any remaining powder on the surface of the guns.
- If possible, withdraw guns from booth.
- If sieve is to be cleaned, do so now.

Reclaim Stand - Sieve and Hopper:

If sieves dedicated to specific colors are used, connect the vent assist lines to the appropriate sieve and transfer hose.

NOTE: We recommend that all hoses be color dedicated.

Sieve Cleaning:

- Turn reclaim off.
- Disconnect transfer hoses at sieve inlet.
- Remove upper section of sieve body by removing retainer bolts and clean.
- Remove sieve screens and clean.
- Clean lower body of sieve.
- Remove hose connecting sieve to hopper.
- Clean hopper.
- Reassemble sieve body.
- Ensure that ground wire is in place.
- Replace hose connecting sieve to hopper.

Recovery Transfer Container:

- Shut down system.
- Remove doors and recovery transfer container. Restart system.
- Clean recovery transfer bin baffle and the doors with compressed air, using the wand attachment.
- Push powder on the slanted side-walls of the container into the lower section. Vacuum powder from the bottom of the container. Then wipe clean the inner surfaces of the recovery transfer container and baffle. (**NOTE: If container is dedicated to one color disregard this step.**)
- Disconnect the pneumatic quick disconnects and the pneumatic vibrator. Remove and clean the transfer pumps with a vacuum or compressed air. Disconnect transfer hoses from the transfer pumps and clean.



Multi-Cyclone:

- Blow off entrance plenum with compressed air using wand attachment.
- Manually raise the inlet vane ring on each mini-cyclone and clean with compressed air. Access to these vanes is available from the interior of the booth, as well as from a door in the rear of the multi-cyclone.
- Vacuum the tube sheet, or lower surface of the multi-cyclone module. The lower six inches of the mini-cyclones are accessible from the tube sheet for cleaning.
- Polish all surfaces with damp, lint free cloth.
- Replace transfer container baffles and inspect gasket.



- Shut system down.
- Replace doors.
- Reclamp the transfer container and ensure a proper seal.
- Restart system.
- Reconnect the pneumatic quick disconnects to the supply lines. They should be numbered to ensure that the air-lines are not misconnected.
- Install transfer hoses and pumps for the new color.
- System Components for New Color
- Put new hopper and/or hopper and sieve in place.
- Ensure that transfer hoses from the VortechPlus transfer container and fresh powder feed unit (if used) are in place.
- Re-connect vent hoses, pump control air lines, and pneumatic quick disconnects.
- Connect powder gun supply hoses from the gun to the pump.

NOTE: Remember, the gun controller, pump, red and blue pneumatic quick disconnects, powder hose and gun all have the same number - they form a set.

System Performance Variables

Cyclone:

- Dropout hopper seal - Must maintain a seal to prevent air leakage which drops cyclone efficiency.
- Cyclone dropout diffuser plate alignment - Must be aligned correctly for cyclone efficiency. Plate at the top causes powder to fall into the hopper and not be entrained into the air stream.
- Transfer pumps - Need to run continually so powder does not build up in the hopper and get entrained into the air stream and sent to scrap.
- Vibrators working correctly - Helps keep the powder from building up on the side walls and from bridging at the transfer pump exit ports.
- Seal between Cyclone and Collector - Must be sealed so that air does not leak past and decrease cyclone performance.

Collector:

- Cartridge filters are tightened - Must be tightened or powder will pass through and blind final filters.
- Yokes are adjusted and tightened - Powder could pass around the gaskets and blind the final filters.
- Pulse down timing and pressure set correctly (10 sec off / 0.1sec on, 60 psi).
- Verify cartridge filter and final filter static pressure readings are correct.

Blower:

- Damper operating correctly.

Cyclone Efficiency:

Cyclone efficiency is based on the separation of a known amount of powder /air mixture that enters the cyclone vs. the amount of powder reclaimed over a certain time. The amount reclaimed divided by the amount that enters the cyclone multiplied by 100 will give the cyclone efficiency. Variables that effect cyclone efficiency include:

- Inlet vane placement. (Must be even with or slightly below the entrance to the cyclone body. The vanes are provided with a slot for the vane to drop in.)
- Drop out hopper seal against the tube sheet.
- Drop out baffle plate alignment.
- Powder filling up the drop out hopper.

- Seal between the cyclone and the cartridge collector.
- Low airflow through the cyclones.
- Door seals on the cartridge collector.
- Amount of powder sprayed.
- Amount of time the powder was sprayed within reason should not effect cyclone efficiency
- The scale resolution.

Cyclone Efficiency Test Procedure:

- Clean the Cyclone section.
- Turn system off.
- Remove the drop out hopper from the cyclone section and clean. (**NOTE: The transfer pumps need removed and the holes plugged.**)
- Weigh the drop out hopper empty. (DOE)
- Weigh the powder to be sprayed (100 lbs. or more is recommended). (HF)
- Place powder hoses directly in front of the cyclone section opening.
- Turn the system on.
- Spray the powder and record the time it takes to empty the box or hopper.
- Turn system off.
- Remove the drop out hopper and record the weight with the powder. (DOF)
- Weigh the hopper from which the powder was sprayed. (HE)
- Calculations: $(HF) - (HE) = (PS)$, $(DOF) - (DOE) = (PR)$
- Divide the weight of the powder reclaimed (PR) by the amount of powder sprayed (PS) and multiply by 100 to get the cyclone efficiency percentage.

VortechPlus™ Troubleshooting Guide

Problems	Solutions
Final filter static pressure raises to shutdown level. Powder leaking past the Cartridge filters causing the final filters to blind.	Verify the reading is correct with another gauge. Inspect the airline running from the pressure tap to the magnehelic gauge. Remove the cartridge filters and adjust filter yokes so they have a slight upward angle. Adjust the top two nuts on the dirty side of the collector all the way in on the thread. Put the bottom nut on the dirty side half way in on the threads. Tighten all nuts on the clean side. Cartridge filter cover plates should be tightened down until the knob bottoms out on the threads.
Cartridge filter magnehelic gauge does not read correctly.	Verify that the reading is good by using another gauge. If readings are different, powder may be plugging up the pressure "T" tube inside the collector. Blow out the lines and inspect the "T" tube. Move the pressure tap to a higher location on the collector.
Powder not transferring from cyclone dropout hopper.	Verify the reclaim switch is on. Verify the cyclone transfer airline from the collector is connected to the QD on the dropout leg. Check to see if transfer lines and pumps are clogged or plugged. Verify the inside of the dropout is not plugged by gloves, rags, etc. Verify the vibrator on the hopper is on.
Motor overloads trip on initial startup.	New systems have no resistance to airflow from dirty filters. Motor overloads are preset according to motor and voltage specifications. Increase the overload set-point higher to allow the system to startup. Once the system has run and built up static on the filters the overload set-point should be set back to the original setting.

VortechPlus™ Spare Parts List

6K, 8K, 10K, 12K, 14K and 16K - CYCLONE MODULE

127008	Cyclone inlet vane
127009	Cyclone body
125928	Locking toggle clamp
118784	Caster, swivel, 6" diameter

6K, 8K, 10K, 12K, 14K and 16K - TRANSFER HOPPER

119927	Gasket, neoprene, 1.0" x .25 " (be sure to specify the CFM when ordering)
127013	Caster, swivel, 3" with out brake
127433	Clamp, toggle locking, VortechPlus hopper

PULSEDOWN / TRANSFER CONTROLS

125188	Valve, solenoid, 1/4", continuous duty
110765	PCB, timer, pulse-down, 6-pin (6K and 8K CFM units)
125340	PCB, timer, pulse-down, 10 pin (10K, 12K, 14K and 16K CFM units)
122960	Regulator, pressure, 125 psi, 0.5" npt
110540	Gauge, air, 0-100 psi 0.25npt, 2.5" dia., panel mount
105820	Regulator, pressure, 0.375 npt, 0-60 psi

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Documentation VortechPlus™ System

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