1. Acceptable Manufacturers
	1. AAF Flanders
	2. Other Approved Manufacturer
2. Quality and Environmental Management Systems
	1. The manufacturer shall have an ISO 9001 or ASME NQA-1 quality-based system at the manufacturing facility. The manufacturer shall make available documentation showing independent third-party certification or acceptable audit approvals and adherence to these systems.
	2. If requested, manufacturer shall make available a copy of their Corporate Quality Manual and references from clients of similarly sized projects or scope within the last 5 years.
3. AstroFan Construction
4. FFU size is to be based on nominal 2x2, 2x3, 2x4, 3x4, and 4x4.
5. Housing material to be sheet Aluminum with mill finish or 304 Stainless Steel or Powder Coated White Housing.
6. Fan Powered Terminal modules shall produce HEPA- or ULPA-filtered air at a velocity of 90 FPM +/- 10% at six inches below the filter face. The sound level 30 inches from the filter face is approximately 50 dBa at 90 FPM face velocity and produces an ambient sound level of 25 dBa.
7. The integral fan motor assembly shall consist of a backward-curved 5VA plastic fan wheel with maintenance-free sealed bearing and a direct drive ECM continuous-duty thermally protected motor that is accessible and removable from the room side on RSR units. Units shall be available in 100-130V or 200-277V.
8. The motor/fan assembly shall be compatible with MODBUS RTU and BACnet through a gateway.
9. Unit comes standard with an AAF EC control box with on/off switch, 3-pin terminal blocks, LED power indicator, and 2 LAN ports.
10. Network connection via CAT5e cable with RJ45 connectors communicating via MODBUS RTU protocol. BACnet compatibility option via a gateway.
11. Unit available with AAF Flanders AstroDrive Controls Package.
12. FFU software must be compatible with, and running on, the same Windows 10 OS computer as BMS/FMS (using separate Ethernet card).
13. Controls shall minimally include:
	* 1. Starting and stopping
		2. Alarm status
		3. Ethernet-based system to allow access via internet (dependent on authorization levels allowed)
		4. Adjusting speed set point
		5. Controller capable of infinitely adjustable speed control, monitor fan on-off and fault status.
		6. Optional controls include the AstroDrive 100 (handheld control tool) and AstroDrive 200 (wall-mounted control panel)

h. Entire assembly shall be UL507 listed.

1. MEGAcel II HEPA/ULPA Filters
	1. Filter construction shall be extruded anodized aluminum for use in Open Plenum, Ducted Terminal, or Fan-Powered Systems. Frame style will be determined by filter application. The term “HEPA” shall be used generically to describe all high-efficiency filters that meet the following specifications. If possible, the filter and housing shall be from the same manufacturer to ensure form, fit, and function are maximized.
	2. Construction Criteria;
		1. The filter shall be constructed in accordance with the recommended construction requirements of IEST-RP-CC001, latest version.
		2. The media shall be of MEGAcel II eFRM (FlouroResin) technology for Life Science applications or MEGAcel II ePTFE (PolyTetraFlouroEthylene) technology for Microelectronic applications and shall be produced by the filter manufacturer to ensure quality requirements and traceability are maintained. eFRM media shall consist of two membrane layers supported on each side with spun bonded synthetic scrim to eliminate media damage; ePTFE media shall consist of one membrane layer supported on each side with spun bonded synthetic scrim; glass fiber media is not allowed. The pleats shall be equally spaced using polyolefin hot melt glue beads for eFRM media and polyamide hot melt for ePTFE media. eFRM media shall be compatible with industry-standard testing methodologies using 4cS PAO and shall have equal or better tolerance for PAO compared to conventional fiberglass HEPA media.
		3. The media pack shall be affixed permanently to the filter frame assembly by means of a solid, continuous, fire-retardant, phosphorous-free polyurethane sealant, forming a leak-free bond between the filter pack and filter frame. The sealant will be uniform off-white in color; will not exhibit any form of leaching, and no more than ¼” of wicking into the media. The sealant will be qualified at incoming inspection as well as point of dispensing to ensure homogenization and adequate curing and adhesion properties.
		4. The filter frame shall be of minimum of 0.060” thick webbing anodized extruded aluminum. Filter Frame shall be designed for use in Gasket Seal or Fluid Seal systems. The filter frame shall have a perpendicularity specification of no more than 1% to ensure tight miter corners and a leak-free design. Corners must contain no cracks or uneven areas.
		5. Gasket system filters shall have:
			1. Factory installed ¼” thick by ¾” wide dovetailed, close-celled neoprene, COHRlastic® sponge or EPDM poured-in-place style gasket affixed to the filter frame sealing surface.
			2. Filter Frame sealing surface to have a flatness tolerance of +/-1/32”.
		6. Fluid Seal system filters shall have:

			1. A continuous trough around the perimeter of the filter with continuous, integral indication of acceptable fluid seal fill level. The fluid seal trough shall be filled at the factory.
			2. Filter fluid seal must be comprised of a two-component, polysiloxane or polyurethane elastomeric sealant and be self-leveling.
				1. Fluid seal material shall be characterized for all salient mechanical, physical, and chemical properties, such as Hardness/Penetration, Tack, and Migration of free silicone (i.e., Blot Plot testing).
				2. Fluid seal material shall be characterized for chemical resistance to known industry accepted decontamination agents, cleaning agents, and filter testing reagents, if required.
				3. Fluid seal material shall be tested for chemical compatibility with all materials in contact during manufacturing, including gloves, tools, mixing equipment, dispensing equipment, and packaging materials, as well as potential airborne contaminants & poisons.
				4. Fluid seal material shall demonstrate resistance to accelerated life cycle testing.
				5. Fluid Seal shall withstand knife edge insertion to partial depth without complete depth cutting or full-length splitting.
		7. Each filter shall have a unique label indicating filter size, lot number, unique serial number, model number, tested efficiency, pressure drop at volumetric test airflow, and UL compliance.
		8. Manufacturing shall take place in an ISO 7 cleanroom as determined by ISO 14644. Packaging shall be in a minimum ISO 6 cleanroom as determined by ISO 14644.
2. Shipping, Storage, and Handling of HEPA/ULPA Filters
	1. Filter Assemblies are to be packaged discretely in sealed polyethylene bag and double-wall corrugated carton of sufficient strength.
		1. Manufacturer shall characterize packaging against industry standards for:
			1. Drop
			2. Compression (i.e., stacking of cartons)
			3. Vibration
	2. The carton shall be labeled with the manufacturer’s part number, serial number, and test performance data.
	3. Palletized cartons shall be protected with corner posts and retained via stretch wrap.
	4. Filter Assemblies shall be shipped in fully enclosed trailers and in original, unopened packaging.
	5. Appropriate care must be exercised in handling cartons to avoid dropping, vibration, and rough handling to prevent potential for damage.
	6. HEPA Filter Assemblies shall be stored per manufacturer’s instructions for proper orientation, stacking configuration, and limitations, and they must remain in unopened cartons to prevent damage and exposure to potential contaminants.
	7. Cartons stored longer than one week shall remain unopened and in climate-controlled environment of 60-80° F and 30-70% RH.
	8. Filter Assemblies shall remain in the sealed, unopened carton until inspection, testing, and installation.
3. Filter Performance Criteria/Factory testing:
	1. Factory Efficiency and Resistance Test:
		1. The filter shall have a minimum overall efficiency of 99.99% on 0.3 micron particles, or 99.995% on 0.12 micron, or 99.99995% on 0.12 micron and shall be tested and constructed in accordance with IEST-RP-CC001, latest version.
			1. For eFRM media filters, the efficiency will be determined using a thermal condensation aerosol generator and photometer, which will measure gross downstream penetration as compared to the upstream concentration.
		2. Each Filter shall be tested for initial (clean) pressure drop at rated flow.

			1. All cleanroom style filters are tested at 100 FPM, +/- 10% and are based on the net filter media area (excludes frame, center partitions, etc.). The nominal initial pressure drop per overall efficiency rating is as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **Media Type** | **Nom. Pack Depth** | **Efficiency** | **Max. Initial ΔP** |
| eFRM | 2 in. | 99.99% on 0.3µm | 0.25” w.g. |
| eFRM | 2 in. | 99.995% on 0.12µm | 0.30” w.g. |
| ePTFE | 2 in. | 99.9995% on 0.12µm | 0.26” w.g. |
| ePTFE | 1.5 in. | 99.9995% on 0.12µm | 0.44” w.g. |

* 1. Factory Scan Test:
		1. eFRM Filters shall be factory-scanned in accordance with IEST-RP-CC034, latest version, to either 0.010% maximum penetration for a Type C/J, or 0.008% for a Type K, over the entire filter face, including glue lines and frame joints. ePTFE Filters shall be factory-scanned using an automated scan system. Autoscan testing shall take place in an ISO 4 cleanroom as determined by ISO 14644.
		2. The scanning shall be accomplished by passing the probe with overlapping strokes, so the entire filter face area is sampled. Scanning shall be performed in accordance with IES-RP-CC034, latest revision.
		3. eFRM media challenge aerosol for factory scan testing is 4 cSt PAO (Poly Alpha Olefin). The two acceptable aerosol generation techniques are either the use of a Laskin nozzle generator or thermal condensation aerosol generator; oil thread testing for local leaks using polyfunctional alcohol is an acceptable alternative. ePTFE media challenge aerosol for factory scan testing is solid PSL (PolyStyreneLatex) spheres; oil thread testing for local leaks using polyfunctional alcohol is an acceptable alternative for filter that is too small or for the autoscan equipment.
	2. Underwriters’ Laboratories (UL):
		1. Filter Assemblies shall be UL Standard 900 classified.
	3. Labeling and Reporting:
		1. Each filter shall have a unique labeling indicating filter size, lot number, unique serial number, model number, tested efficiency, pressure drop at volumetric test airflow, and UL compliance.
		2. A test certificate shall be provided for each filter indicating filter-specific test data including the lot and serial number, along with the pressure drop and efficiency. A test certificate at a minimum should contain filter size, lot number, the filter’s unique serial number, model number, tested efficiency, tested pressure drop at volumetric test airflow, and scan test results. The challenge aerosol for both the efficiency and scan test must be outlined.