

test sections

Upstream, Downstream, Overall Efficiency & Scan Efficiency Test Sections



Provides for overall filter efficiency testing or scan testing of in-place air filters



Top: Demonstration of Accurate Scan Test Section (ASTS) filter evaluation.
Bottom: Upstream challenge introduction section.

Camfil Farr test sections provide a convenient section to allow in-place filter evaluation. One model is available for overall filter testing which evaluates the performance of an air filter for overall efficiency. For overall testing the operation is performed without section entry. A particle counter connection port is provided to attach users testing equipment. A unique cross-sampling of airflow is sampled providing overall filter efficiency. A scan-test model is also available to allow in-place testing for filter leaks.

Camfil Farr standard test sections:

- Mate directly to Camfil Farr containment modules ensuring complete system integrity from a single-source manufacturer
- Are manufactured from the same materials as the containment section
- Camfil Farr Accurate Scan Test sections have the following additional features:
 - Allow individual filter scanning while isolating the tester from the system airflow
 - Include an air sampling probe connected to flexible tubing to facilitate ease of movement of scanning probe across the face of the filter
 - Include scanning guides to ensure that every square inch of the filter surface is evaluated
 - Include a section floor fixture for probe storage between scans

When using the Accurate Scan Test Section, the section door is removed to allow the tester to view the process through the clear 8 mil PVC bag.

Test sections are available in modules up to three filters wide.



Camfil Farr	Product bulletin
Test Sections	3407 - 0606
Camfil Farr—clean air solutions	

Upstream/Downstream Overall Efficiency

The graphic at the bottom of this page notes the typical placement of test sections (blue) in a containment component train. The prefilter section shown is an upstream test section with an integral 4" deep prefilter accommodation. The downstream test section allows overall efficiency testing of installed filters.

After filter installation, the challenge agent is injected upstream of the HEPA filters or carbon adsorbers. An upstream and downstream concentration is determined and a system penetration value is calculated. The value is compared to acceptable performance criteria and the system passes for operation or fails and requires corrective action. In some cases an additional midstream test section is also installed that is a combination unit for sampling upstream filter challenges and injecting an additional challenge for downstream filters.

This type of system is designed for testing according to ASME N510, *Testing of Nuclear Air Treatment Systems*.

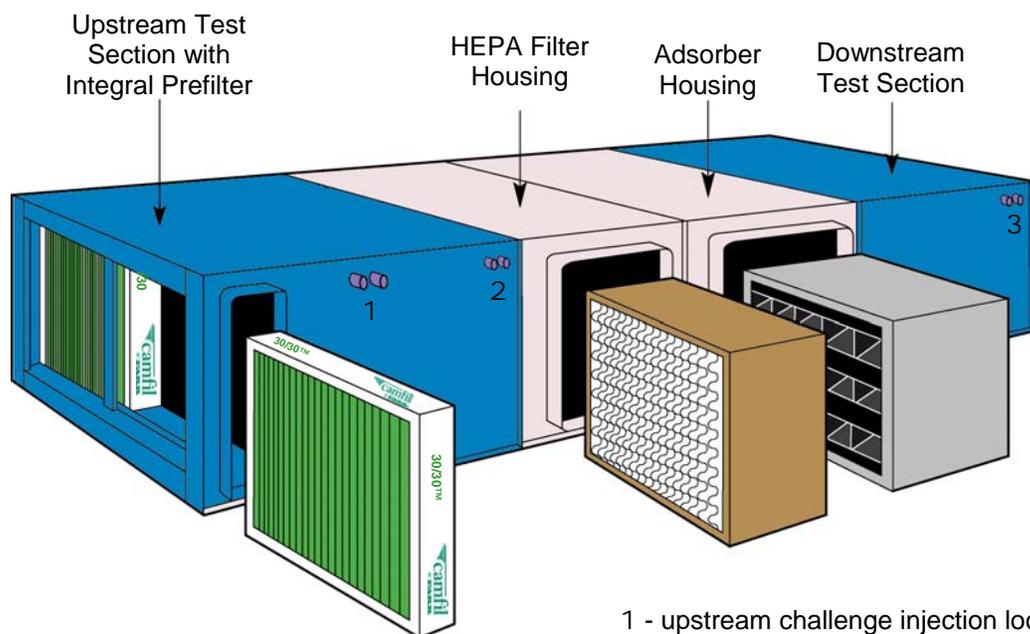
Downstream Accurate Scan Test Sections

In some systems, assurance of overall filter performance is not enough. The contaminants in the application may be so dangerous that even a pinhole leak would jeopardize the application's integrity.

Accurate Scan Test Sections allow scan testing of individual filters to ensure that the filter is leak free. Typically this type of system incorporates an upstream test section (for introducing the appropriate challenge), a primary filter section, and a downstream scan test section with an internal filter scanning assembly.

The Camfil Farr Accurate Scan Test Section includes a door that is removed during the scanning procedure, a door flange with a bagging ring, and a clear PVC bag to allow the tester to maneuver the scan assembly across the entire surface of the filter. Scanning guides ensure that prescribed paths for the scan assembly are followed.

An Accurate Scan Section is usually applied in systems where the primary filter for testing is a HEPA filter. The scanning assembly allows evaluation of the face of the filter and any airflow paths associated with the integrity of a filter to section seal.



The above system shows an upstream test section with integral prefilter track (P4TSU), containment components including a HEPA filter housing and an adsorber housing, and a downstream overall testing section (TSD).

1.0 – General

1.1 - Test sections shall be Camfil Farr (TSU, TSC, P2TSU, P4TSU, P6TSU) and Camfil Farr (TSD, ASTS) test sections.

1.2 – Sizes shall be noted on enclosed drawings or other supporting materials.

2.0 – Construction

2.1 – Test section shall be constructed of 14 gauge and 11 gauge T-304 stainless steel metal. All pressure retaining joints and seams shall be continuously welded with no porosities. Joints and seams requiring intermittent welds, such as reinforcement members, shall be intermittently welded. Test section shall be free of burrs and sharp edges. All welded joints and seams shall be wire brushed to remove heat discoloration. The section shall be reinforced to withstand a positive or negative pressure of 15" w.g. The upstream and downstream ductwork connections shall have 1 1/2" outward-turned flanges.

Please select from the following two upstream test section items

For standard upstream test section, TSU. A TSC may be applied downstream as an intermediary test section for dual stage filter testing, example: HEPA section followed by an adsorber section.

(2.2 - Upstream test section shall include integral injection ports (2) for introduction of aerosol or gaseous filter challenge. The injection ports shall be connected to an internal assembly that adequately disperses the challenge to ensure the entire surface of the filters under test are exposed.)

For upstream test sections with prefilter track, P2TSU, P4TSU, P6TSU. A TSC may be applied downstream as an intermediary test section for dual stage filter testing, example: HEPA section followed by an adsorber section.

(2.2 - Upstream test section shall include integral injection ports (2) for introduction of aerosol or gaseous filter challenge. The injection ports shall be connected to an internal assembly that adequately disperses the challenge to ensure the entire surface of the filters under test are exposed. Section shall also accommodate a (2", 4" or 6") nominal depth prefilter. The section shall accommodate standard size filters that do not require any special attachments or devices to function properly in the section.)

Please select the following for intermediary downstream test sections for overall filter efficiency testing, TSC.

(2.3 - Test section shall include integral injection ports (2) for introduction of aerosol or gaseous filter challenge. The injection ports shall be connected to an internal assembly that adequately disperses the challenge to ensure the entire surface of the filters under test are exposed. The section shall also include integral sampling ports (2) for sampling of aerosol or gaseous filter challenge. The internal sampling assembly shall be located so that a representative sampling of the filter face is possible.)

Please select from the following two downstream test section items:

For downstream test sections for overall filter efficiency testing, TSD.

(2.4 - Downstream test section shall include integral sampling ports (2) for sampling of aerosol or gaseous filter challenge. The internal sampling assembly shall be located so that a representative sampling of the filter face is possible.)

Test sections for scanned filter efficiency testing, ASTS.

(2.4 - The downstream test section shall have a bagging ring around each testing access port that is sealed by a gasketed filter access door. The access door gasket shall be silicone and shall be replaceable, if necessary. The bagging ring shall have two (2) continuous formed raised ridges to secure the clear PVC scan service bag. The bagging ring shall be hemmed on the outer edge to prevent the change-out bag from tearing. An elastic shock cord hemmed into the bag opening shall fit firmly around the bag-out port. A nylon safety strap shall be provided at each bag-out port for the purpose of securing the bag to the port. The port shall have two continuous ribs to hold the bag and the safety strap in place. The section shall incorporate a track for the installation, movement, and control of the scanning probe assembly. The probe assembly shall provide the ability to effectively scan test the adjacent upstream filters in the system. The probe assembly shall be connected to an interior flexible tube. The interior connection shall penetrate the pressure boundary via pipe, which shall in turn join an exterior-mounted 1/4" ball valve with plug. The ball valve functions as the exterior tube connection leading to the test instrument. Sections that are two and three filters wide shall require an extension rod that will allow the test technician to position the probe assembly when testing the interior filters. Ancillary hardware including door handles, door studs and labels shall be 300 series stainless steel. Filter access door knobs shall be cast aluminum and designed to prevent galling of threads.

One (1) Camfil Farr manufactured clear PVC change-out bag shall be furnished with each filter access port. Service bags shall be 8-mil thick and shall include a 1/4" diameter elastic shock cord hemmed into the opening of the bag so when stretched around the section bagging ring flange, a secure fit is created. The bag shall include two integral glove ports to assist in filter evaluation. One (1) nylon security strap shall be included per filter access port to prevent the bag from sliding off the bagging flange during the change-out process. Design of components shall be such that all change-out operations shall be within the bag so there is a barrier between the worker and the filter at all times. Filter bags shall be capable of continuous operation to temperature extremes of 0° F to 150° F.)

3.0 – Performance

3.1 - All welding procedures, welders, and welder operators shall be qualified in accordance with *ASME Boiler and Pressure Vessel Code, Section IX*. All production welds shall be visually inspected by qualified personnel, per Camfil Farr standard procedure number *CFW-10001, Visual Inspection of Welds¹*, which incorporates the workmanship acceptance criteria described in *Section 5 & 6 of AWS D9.1-1990, Specification for Welding of Sheet Metal*.

3.2 -The test sections shall be manufactured under a Camfil Farr Quality Assurance Program (see Note 1 below). The sections shall be tested in the at +10" w.g. per the "pressure decay method" in accordance with ASME N-510-1995 REAFFIRMED, *Testing of Nuclear Air Cleaning Systems*.

3.3 - Manufacturer shall provide evidence of facility certification to ISO 9001:2000.

Note 1 (to specifying engineer): Camfil Farr manufacturers all of its containment products using more than one Quality Assurance Program. Our *product-wide* Quality Assurance Program is a stringent process that ensures the equipment is produced in conformance with our understanding of the intended application. However, this *product-wide* program does not address all the items specified in ASME-NQA-1. If this product must be manufactured under an ASME NQA-1 Quality Assurance Program, please add the following to this statement "including the basic requirements of ASME NQA-1." Please contact the factory if specific clarifications are required.

Multiple items in () parenthesis require selection. For assistance please contact factory.

PERFORMANCE DATA

Test Sections

Standard Sizes	Number of injection, sampling ports ¹	TSU/TSC Upstream Test Sections ¹				P_TSU Upstream Test Sections ^{1 2}				TSD Test Sections ³				ASTS Accurate Scan Test Sections				
		Dimension A (inches)	Dimension B (inches)	Dimension C (inches)	Shipping weight (lbs)	Dimension A (inches)	Dimension B (inches)	Dimension C (inches)	Shipping weight (lbs)	Number of sampling ports ³	Dimension A (inches)	Dimension B (inches)	Dimension C (inches)	Shipping weight (lbs)	Dimension A (inches)	Dimension B (inches)	Dimension C (inches)	Shipping weight (lbs)
1 x 1	1,1	30	27	28	215	30	27	40	310	1	30	27	22	165	30	27	26	185
1 x 2	2,2		51		360		515		2	51		270						
1 x 3	3,3		75		505		710		3	75		375						
2 x 1	2,2	60	27	28	380	60	27	40	555	2	60	27	22	285	60	27	26	330
2 x 2	4,4		51		645		915		4	51		480						
2 x 3	6,6		75		900		1265		6	75		660						
3 x 1	3,3	90	27	28	545	90	27	40	800	3	90	27	22	410	90	27	26	470
3 x 2	6,6		51		930		1320		6	51		685						
3 x 3	9,9		75		1295		1825		9	75		945						
4 x 1	4,4	120	27	28	710	120	27	40	1040	4	120	27	22	535	120	27	26	610
4 x 2	8,8		51		1210		1720		8	51		895						
4 x 3	12,12		75		1690		2380		12	75		1230						

¹ Corresponding sampling ports, use TSU, TSC & PTSU second column of chart.

² Requires selection of 2", 4" or 6" deep prefilter, example: P2TSU is prefilter section with 2" prefilter.

³ Corresponding sampling ports, for TSD use column within section.

MODEL NUMBER DATA

CF - 2 X 2 - TSC - SS

Number of test sections high
(height of section)

- 1/2 - One test section high (1/2 size)
- 1 - One test section high
- 2 - Two test sections high
- 3 - Three test sections high
- 4 - Four test sections high
- 5 - Five test sections high

Number of test sections wide
(width of section)

- 1/2 - One test section wide (1/2 size)
- 1 - One test section wide
- 2 - Two test sections wide
- 3 - Three test sections wide
- 4 - Four test sections wide
- 5 - Five test sections wide

Damper sheet metal material

- SS - T-304 stainless steel
- 304L - T-304L stainless steel
- 316 - T-316 stainless steel
- 316L - T-316L stainless steel

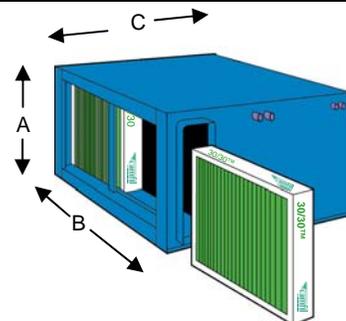
Test section type

- TSU - Test section upstream¹
- P2TSU - Test section upstream with 2" prefilter¹
- P4TSU - Test section upstream with 4" prefilter¹
- P6TSU - Test section upstream with 6" prefilter¹
- TSC - Test section combination²
- TSD - Test section downstream³
- ASTS - Camfil Farr Accurate Scan Test Section

¹ Provides injection ports and sampling ports for aerosol or gas concentrations

² Provides injection ports and sampling ports for upstream and downstream aerosol or gas concentrations

³ Provides sampling ports for downstream aerosol or gas concentrations



Example above is P4TSU

Data notes:

Upstream test sections provide one port for injection, and one port for upstream concentration, for each filter wide.

Combination test sections provide one port for injection, and one port for concentration sampling, for each filter wide.

(sampling port used for upstream and downstream concentrations, depending on which filter is being tested.)

Downstream test sections provide one port for downstream concentrations, for each filter wide.

Camfil Farr has a policy of uninterrupted research, development and product improvement. We reserve the right to change designs and specifications without notice.

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