



HVAC Hybrid Filter, Particle and Odor

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. This specification defines the requirements, test conditions and test methods for function, material and static load tests on combi-filters for particle, odor and chemical separation.

1.2 Applicability. For all vehicle interior hybrid filters. The requirements indicated in this specification are coordinated for flowed through filter areas $> 5 \text{ dm}^2$. Filter areas of $< 5 \text{ dm}^2$ are not intended. In case of different requirements between GMW14780 and GMW14323, the stipulations contained in this specification shall apply to hybrid filters.

1.3 Remarks. Hybrid filters for interiors (also referred as combi-filters) serve to separate airborne particles and to reduce the odor entering the interior of the vehicle. They consist of a combination particle air filter and an odor and chemical filter (generally activated charcoal) in a shared housing.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

DIN 71460	ISO 17025	EN 10204	TRIAS 48
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2.2 GM Standards/Specifications.

GMW3059	GMW3172	GMW14323	GMW14780
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2.3 Additional References.

- fiatec GmbH, (fiatec.com/en/home).
- Filter box criteria.
- Housing drawing.
- Test report.
- Works test certificate.

3 Test Preparation and Evaluation

3.1 Resources. All technically comparable equipment may be used for the test, provided that its equivalence is documented and its use has been agreed between the supplier and the customer. Particular attention shall be paid to the dynamic characteristics of the gas analysis system. It shall be possible to trace back the measured values indicated in the initial sample test reports to an independent laboratory (e.g., fiatec GmbH) which is accredited according to ISO 17025.

3.1.1 Facilities.

3.1.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.1.2 Equipment. Test stand according to DIN 71460, general gas measuring technology (dosing system, analysis units, etc.)

3.1.2.1 Requirements on the Dynamic Characteristics of the Gas Analysis System Used. The time pattern of the break-through graphs on combi-filters concerns the measurement of dynamic processes, therefore a pilot test should be used to ensure and to prove that the analysis system shows the following characteristics.

If a direct, sudden change in the measured gas concentration occurs at the intake of the analysis unit (e.g., from (0 to 80) parts per million (ppm) for n-Butane) the display value shall show 90% minimum of the concentration value applied after 10 s, and 99% minimum after 20 s.

Dead times caused by the test stand between the gas tapping point in the test duct and arrival of the gas at the analyzer intake are to be minimized within the framework of the technically permissible limits and proved in the individual case. If necessary, these dead times shall be taken into account mathematically in the evaluation.

3.1.3 Test Vehicle/Test Piece. Not applicable.

3.1.4 Test Time.

Calendar time: See Table 7

Test hours: See Table 7

Coordination hours: See Table 7

3.1.5 Test Required Information. Not applicable.

3.1.6 Personnel/Skills. Not applicable.

3.2 Preparation. For initial sample approval and release according to this specification, 24 filters of the same type are required. The test samples shall be supplied with a works test certificate according to EN 10204. Twelve (12) of these filters are subjected to a complete test according to this specification. The remaining 12 samples are tested according to GMW14323 and shall fulfill the full content of these, if exceptions are not expressly specified for combi-filters in this specification.

3.3 Conditions. Unless otherwise specified, the tests shall be performed in the as-received condition at $(23 \pm 3) ^\circ\text{C}$ without pre-conditioning.

The filters are to be stored in their heat-sealed delivery bags or in equivalent packaging until the beginning of the test. This is to ensure that the filters have not already been exposed to gas concentrations which would affect the later results.

3.3.1 Environmental Conditions. Various different conditions are required for the test pieces within this specification. The terms used for this process are defined in 6.1.

3.3.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

3.4 Instructions. Samples of components or material released to this specification shall be tested for conformity with the requirements of this specification and approved by the responsible GM department prior to the start of delivery of production level components or materials.

Any change to the component or material e.g., design, function, properties, manufacturing process and/or location of manufacture requires a new release of the product. It is the sole responsibility of the supplier to provide the customer, unsolicited, with documentation of any change or modification to the product/process, and to apply for a new release.

If not otherwise agreed to the entire verification test shall be repeated and documented by the supplier prior to start of delivery of the modified or changed product. In some cases a shorter test can be agreed to between the responsible GM department and the supplier.

3.4.1 Test Results. With reference to this specification the measurement results shall be summarized in a test report.

3.4.2 Deviations from Test Procedure. Deviations from the requirements of the test procedures shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

3.5 Data. Plot according to Figure 1 and Figure 2.

3.6 Safety. This standard may involve hazardous materials, operations, and equipment. This standard does not propose to address all the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

3.7 Documentation. Samples of components or material released to this standard shall be tested for conformity with the requirements of this standard and approved by the responsible GM department prior to the start of delivery of production level components or materials.

Any change to the component or material, e.g., design, function, properties, manufacturing process and/or location of manufacture requires a new release of the product. It is the sole responsibility of the supplier to provide the customer, unsolicited, with documentation of any change or modification to the product/process, and to apply for a new release.

If not otherwise agreed to, the entire verification test shall be repeated and documented by the supplier prior to start of delivery of the modified or changed product. In some cases, a shorter test can be agreed to between the responsible GM department and the supplier.

3.7.1 Test Results. Not applicable.

4 Requirements and Procedure

Note: If a precise test sequence is required, this will be indicated in Appendix A, Table A1. Tests which are not included in this test sequence can be performed at any time.

4.1 General.

4.1.1 Materials. All the materials used shall correspond to the data specified in the part drawing. The full contents of the conditions and requirements specified in GMW14323 also apply to the entire combi-filter.

4.1.1.1 Freedom from Cellulose. In principle, the material of the filter element shall be free from cellulose. In case of any deviations, the microbiological harmlessness shall be proved in an individual procedure to be agreed between the supplier and customer.

4.1.1.2 Volatility of Organic Constituents. Must comply with GMW14780.

4.1.1.3 Flammability. Must comply with GMW14780. Additional documentation according to TRIAS 48 is obligatory.

4.1.1.4 Odor Characteristics. Test according to GMW14323.

During the test it is to be ensured that the results are not influenced by organic substances adsorbed in the activated charcoal or by the activated charcoal itself.

4.1.1.5 Resistance to Chemicals. The filter shall be resistant to all the chemicals occurring in the vehicle at the installation point. Further test media shall be specified in individual regulations.

4.1.2 Temperature Resistance. All the materials used shall be fully fit for purpose within the temperature range of (-40 to +100) °C.

4.2 Pressure Loss. The pressure loss curve for the filters is determined as pressure difference before and after the filter on a test stand according to DIN 71460 in a volumetric flow range of (0 to 165) L/s. The line formed from the values in Table 1 may not be exceeded in any test condition.

Table 1: Permissible Values of the Pressure Loss Curves

Volumetric Flow (m ³ /h)	Pressure Loss (Pa)
0	0
100	30
200	60
300	100
400	150
500	200
600	260

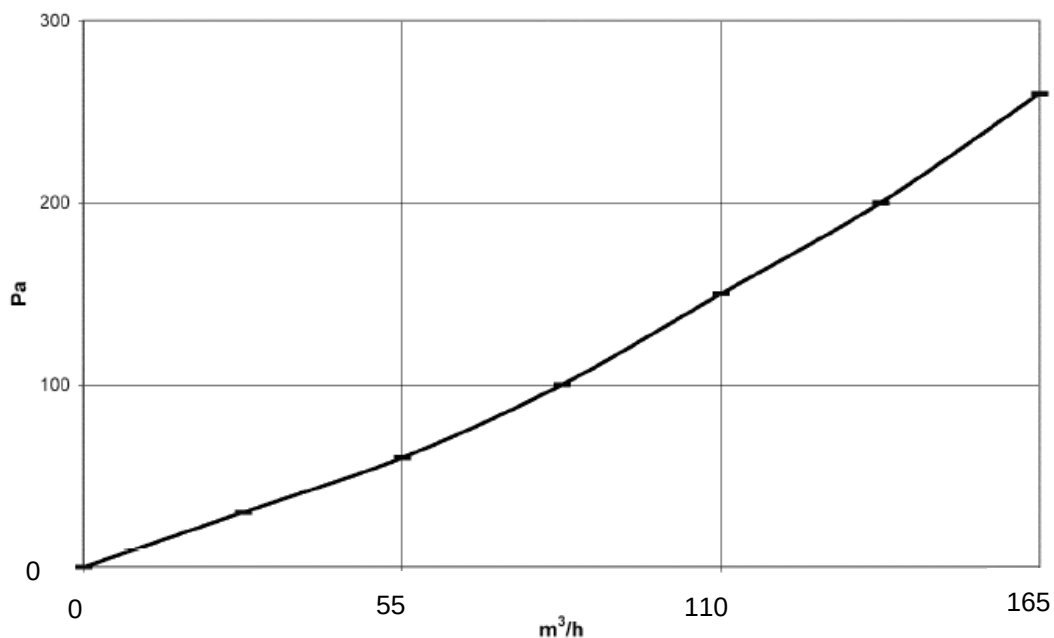


Figure 1: Pressure Loss (Pa)

These modified pressure loss curves are also to be considered and used as a basis in the measurement of the combi-filters according to GMW14323.

4.3 Further Requirements. Separation Capacity (Adsorption Capacity). The separation capacity of the combi-filters is principally characterized by the three dimensions "immediate break-through", "efficiency over time" and "storage capacity". In principle, the break-through graph is determined for each filter. The break-through graph shows the pattern of the gas concentration before the filter to the gas concentration after the filter (expressed in %) as a function of the measuring time. The concentration, of the gas flowing in, is kept constant during this. All the relevant characteristics of the filter can be read off or calculated from this break-through graph.

All the measurements or series of measurements of the adsorption characteristics of the combi-filter are to be performed on new filters in each case (with particular attention given to chemically unloaded status). Filters loaded with pollutants may no longer be used for dust measurements.

Table 2 and Table 3 define the required limiting curves of fractional collection rates for various states of the filter:

Table 2: Limiting Curves of Fractional Collection Rates for Large Particles

Particle Diameter Aerodynamically in μm	Limiting Curve G1 in %	Limiting Curve G2 in %	Limiting Curve G3 in %
0.6	≥ 70	≥ 70	≥ 55
1	≥ 75	≥ 80	≥ 60
1.5	≥ 85	≥ 90	≥ 70
> 3	≥ 95	≥ 95	≥ 95
Condition:	New	Any	After Aging
Loading:	unloaded/+50 Pa	+200 Pa	unloaded/+50 Pa