

## DPF OBC

### ONBOARD ELECTRONIC CONTROL & MONITORING

#### Specification of the OBC-Unit & Functional Requirements

##### Purpose of the electronic filter monitoring system

The filter system must be monitored with regard to overload (upper pressure limit, 200 mbar in accordance with VERT specification) and with regard to filter damage (lower pressure limit, manufacturer's instruction).

When the upper limit is approached, the machine operator must be given a two-stage warning signal. When the lower limit is approached, a warning signal must be triggered and further addition must be automatically prevented.

The monitoring system must be tamper-proof and designed for self-testing.

Damage reports must be recorded in such a way as to permit a subsequent time-based allocation of damage.

The OBC-monitor forms part of the filter system and must be tested together with it.

##### Data to be Measured and Transmitted

- Pressure  
Tapped as static pressure before filter.  
Measurement on the basis of the difference in pressure from atmospheric pressure.  
Measuring range 500 mbar.  
Overall accuracy including drift over 1 year:  $\pm 10$  mbar.  
Appropriate precautions against dirt and condensation in the pipes.
- Engine RPM  
The engine RPM signal is to be recorded in order to determine throughput-related alarm criteria for filter overload and filter damage.  
The speed signal may be taken from the AC output of the generator or from other signals so that no additional sensor is needed.
- Temperature  
The use of a temperature signal upstream of the filter for alarm purposes is recommended but not mandatory. Two temperature signals are also permitted and recommended (one upstream and one downstream the filter) to supervise regenerations with high exotherms.

## **Measurement interval and sampling frequency for long term storage:**

Measurement interval must be < 1 sec for recording alarm situations and permit failure interpretation. Use of high frequency data for failure interpretation is highly recommended but not mandatory

## **Data processing and data storage**

- Provision must be made for measured data storage and separate alarm storage.
- The store for measurement data must be sufficiently secure to ensure that, in the event of damage, all data remains recorded for an operating period of at least four weeks prior to the incident. Earlier data can be overwritten.
- The measurement data may be reduced for storage purposes after data recording and alarm interpretation. As far as pressure is concerned, the highest values within each one minute interval must be saved. Regarding temperatures the average within this minute should be saved.
- Values which exceed the upper limit (alarm data) for overloads or fall below the lower limit for filter damage are to be saved in the alarm memory as follows:
  1. real time for the upper limit respectively lower limit being exceeded (date, time)
  2. total time for the upper limit respectively lower limit being exceeded
  3. maximum respectively minimum value during the period in which the upper limit respectively lower limit is exceeded
- Tamper-proof: it must be impossible for third parties to delete or overwrite the alarm memory.
- Alarm memory must allow 10'000 datasets. After this roll-over is permitted
- RESET of memories is only permitted by the manufacturer and must be seriously saved by at least a 4 digit password.

## **Data output**

- The alarm data will be printed out in alphanumeric form from a PC. It must be impossible to edit, change or tamper with the printout.
- The printout will use the following units: mbar, °C and 1/min.
- It is recommended that the data be converted (e.g. into Excel) for further processing.
- The OBC must provide a GMS-tool to export data vial internet (telemetric function)
- Data evaluation tools for statistical evaluation and failure interpretations shall also be provided by the manufacturer

## **Alarms**

- If the upper or lower limit is approached, the machine operator must be given a clearly perceptible early warning signal (optical and/or acoustic). The level of the early warning must be so selected that the machine operator has at least 1 hour in reserve for normal operation of the machine.
- If the limit is exceeded for more than 30 seconds (cumulative), the machine operator must be giv-

en a clearly perceptible immediate warning signal. The machine must then be switched off to prevent damage.

- The immediate alarm must remain activated until it is acknowledged by a conscious action.
- A link with numeric information is recommended.
- Alarm outputs: 12-30 V / 100 mA
- A parallel alarm output acting directly on the engine control system is recommended and maybe used to limit engine power to a limp home level.

### **Self-checks / Plausibility checks**

- The OBC-monitoring unit must check itself in accordance with plausibility criteria.

Examples:

- If speed rises, pressure must rise at the same time and vice-versa.
- If there is pressure, there must also be speed.
- If there is zero speed, there must also be zero pressure.
- sensor signals outside the defined limits.  
For example: Is speed above the upper idling speed ?
- Is there a break in the signal conductor or a short-circuit ?
- Is the supply voltage within the pre-defined limits ?

- Any internal error detected by a self-check must trigger an error message (e.g. blinking red light), with the time and information being saved.

### **Sensor Specifications**

Sensor specifications must fulfil the above given absolute resolution and accuracy and no aging or drift is permitted exceeding this requirement.

Sensor specifications must be documented in the unit operation manual and no use of other sensors is permitted

### **Sensor connecting tubes, hoses, cables**

Vehicle operation is a hostile environment with respect to vibration, temperature, splash water and operational risks during operation and maintenance of the vehicles. All tubes, hoses, cables must be professionally protected and fixed according to rules given in the operation manual on how to avoid pollution, freezing, deformation and water condensation.

### **Safety**

Safety requirements must be fulfilled with respect to visibility, fire risk and others.

### **Case**

The case of the OBC monitor must be rigid and waterproof but easy to open and to fix it at the vehicle frame. Connections of sensor tubes and cables must be possible without opening the case.

### **Labeling and Identification**

The OBC case must have an identification plate in a manner that is durable, unambiguous and legible. It must show the manufacturer's name and address, the VERT certification identity, serial number and other manufacturing data.

In addition such an identification information shall be available inside the case and also clearly visible in the evaluation software.

### **Supply voltage**

- 8 - 30 V direct current.
- Connection to battery or ignition lock.
- In the case of a battery connection, it must be possible to switch off the supply within a selectable time after the engine has been switched off.
- Protection (e.g. against damage caused by welding work).

### **Operating conditions**

- -10°C to + 50°C.
- Oscillation level: 10 g at natural frequency.
- Splish Water
- High electromagnetic disturbance levels

**Fuses:** Depending on model, at least IP 54.

**Service life:** at least the service life of the filter.

**Maintenance interval:** same as the maintenance interval for the filter.

### **Operating instructions, installation instructions and imprint**

- Operating instructions in four languages: D / F / E / I.
- Imprint in English or as otherwise agreed with customer.
- The operating instructions must include detailed installation instructions.

**Dimensions, costs, scope of supply, measured data display, socket connections:**  
no specification.

**Guarantee:** minimum two years.

## **Testing the filter monitor unit**

**Testing body**

The testing body must be authorised by the testing authority for carrying out VERT qualification tests (Filter list - Annex 3)

**Conformity test**

Conformity with the specification will be tested on the basis of the documentation supplied by the manufacturer.

**Alarm cycle**

An automatic test cycle, using a computerised test installation, will determine whether the device correctly records, documents and externally signals any crossing of the upper or lower threshold values with the required degree of accuracy.

**Plausibility test**

- Checking of the stated plausibility criteria and the corresponding error messages.
- The test must be carried out on the new device and after 2000 hours of operation.
- The test report must show that the automatic filter monitoring system satisfies the requirements of the specification.

The test report forms an integral part of the VERT VFT1 and VFT3 reports.

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**Author**

Andreas Mayer, TTM

**Publisher**

VERT c/o JCA Treuhand AG • Aemetstrasse 3, CH-8166 Niederweningen, Switzerland  
[www.VERTE-certification.eu](http://www.VERTE-certification.eu)

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