# ENGINE BLEED SYSTEM DESCRIPTION

**GENERAL**

The engine air bleed pressure is pneumatically regulated by the High Pressure (HP) Valve (VLV) when air is supplied by the HP stage, or by the Pressure Regulating Valve (PRV) when the air is supplied by the Intermediate Pressure (IP) stage. The pressure regulation system is monitored by two Bleed Monitoring Computers (BMCs).

**HP VALVE**

Switching between IP and HP is done pneumatically when the IP stage pressure is not sufficient (engine at low speed). The HP VLV pneumatically regulates the air supply between 8 and 36 psi. The HP VLV is forced to close when the PRV is closed via the PRV/HP VLV sense line. In flight, the Engine Electronic Controller (EEC) for IAE V2500-5A engines or the BMC for the A318/A319 fitted with CFM56 engines maintains the HP VLV closed. The solenoid is de-energized, opening of the HP VLV is no longer inhibited and the BMC or the EEC (depending on the engine type) vents the PRV/HP VLV sense line when:

- the engine is above idle, the pressure PS3 is greater than 80 psi for the single aisle family IAE V2500-5A engines, and for the A318/A319

CFM-56 engines,

- the Wing Anti-Ice (WAI) is OFF,

- the altitude is over 15,000 ft,

- the pack configuration is normal.

**IP CHECK VALVE**

The IP check valve protects the IP stage from reverse flow when the HP VLV is open.

**PRV/CONTROL SOLENOID**

The PRV pneumatically regulates the bleed pressure around 44 psi. A thermal fuse causes the valve to close in case of engine fire at 450°C (842°F). The PRV is pneumatically controlled by an external servo-control, the bleed pressure regulated valve control solenoid (CTL SOL), located downstream from the precooler. The control solenoid operates in two modes, pneumatic and electric, causing a partial or complete closure of the PRV.

NOTE: Note: for the A318, the control solenoid operates in two modes, pneumatic and electric, causing complete closure of the PRV.

The pneumatic mode is used for:

- reverse flow protection - the PRV is closed when a delta pressure between the precooler outlet and the PRV inlet is detected,

- temperature limitation downstream from the precooler, through the thermostat located in the control solenoid. When the temperature increases and reaches 235°C (455°F), the PRV downstream pressure is progressively reduced. When the temperature increases to more than 245 °C, the downstream pressure is reduced to a maximum of 17.5 psi.

NOTE: Note: for the A318, the thermostat of the control solenoid is no longer installed. The temperature limitation function is no longer available. When 235°C (455°F) is reached, the PRV no longer decreases the pressure to reduce the temperature downstream. The electrical mode with PRV shut-off function through energization of the control solenoid is used when:

- the Engine BLEED P/B is selected "OFF",

- the Engine FIRE P/B is selected "ON".

The solenoid is automatically energized by the BMC in the following cases:

- over-temperature downstream of the precooler - the heat exchanger outlet temperature sensor senses a temperature above 257°C (527°F),

- overpressure downstream of the PRV when the pressure-regulated transducer senses a pressure greater than 57 psi,

- leak detection in pylon/wing/fuselage ducts and surrounding areas,

- APU bleed valve not closed,

- corresponding starter valve not closed.

**OPV**

The Overpressure Valve (OPV), which is normally open, closes pneumatically. The OPV starts to close at 75 psi. It is fully closed at 85 psi and opens again at around 35 psi.

**REGULATED PRESSURE**

A transducer, connected to both BMCs, reads the regulated pressure downstream from the PRV. This pressure is indicated on the ECAM.

**TRANSFERRED PRESSURE**

A transducer, connected to the related BMC, reads the transferred pressure downstream from the High-Pressure Valve (HPV). This pressure is used to monitor the PRV and the HPV.

**FAV/CONTROL THERMOSTAT**

The Fan Air Valve (FAV) pneumatically regulates the fan airflow to the precooler for bleed air temperature regulation at 200°C (392°C). The FAV is pneumatically controlled by an external servo-control: the FAV control thermostat (CTL THERMST), located downstream from the precooler.

**PRECOOLER**

The precooler is an air-to-air heat exchanger.

NOTE: for the A318, the thermal efficiency is increased.

**HEAT EXCHANGER OUTLET TEMPERATURE SENSOR**

The heat exchanger outlet temperature sensor, connected to both BMCs, reads the regulated temperature downstream from the precooler. This temperature is shown on the ECAM and used to monitor the system.

NOTE: Note: for the A318, the high outlet temperature threshold is decreased. If the precooler exchanger outlet temperature reaches 240°C (464°F), the BMC generates a class 2 maintenance message - "AIR BLEED" - on the ECAM STATUS page. An associated maintenance message "Thermostat (THRMST), FAV or sense line" can be seen on the MCDU.