

FUB-FUB-FB-130004-A06 FUB-FUB-FB-130004-A06 - Preheating system - V.5, VIN: A104499

ISTA system version	4.07.31.21115	Data version	R4.07.31	Programming data	-
VIN	A104499	Vehicle	3'/E91/Sports Wagon/320d/N47/MANUAL/ECE/LL/2007/09		
Int.lev.works	-	Int.lev.(cur.)	-	Int.lev.(tar.)	-
Mileage	-				

Preheating system

The glow system of the N47 and N57 diesel engines consists of the following components:

- DDE control unit
- Electronic preheating control unit
- Ceramic glow plugs
- LIN bus as interface between the DDE control unit and preheating control unit

The first time the preheating control unit is switched on, the electrical resistance of the heater plugs is evaluated at the start of the preheating process. A heater plug that is already hot has a significantly higher resistance than a heater plug that is cold. If the resistance leads to the detection of hot heater plugs, the heater plugs are supplied with less energy at the start of preheating. If, on the other hand, cold heater plugs are detected, the heater plugs are supplied with the maximum energy at the start of preheating. This function is referred to as **dynamic repeat preheating**. It prevents a heater plug that is already hot from being overheated by a second preheating process that follows shortly after the first preheating process, thus supplying too much energy.

To check the preheating system, there are two adapter leads:

- 1-pin, order number 13 6 470
- 12-pin, order number 13 6 460

Function

The required glow plug temperature is determined by the DDE control unit on the basis of the following operating values:

- Coolant temperature
- Engine speed
- Intake air temperature
- Injection rate
- Ambient pressure
- Vehicle voltage
- Status signal for starter enable

To activate glowing, the DDE sends the required glow plug temperature to the combustion preheating control unit. Across the LIN bus, the DDE also sends the following operating values to the preheating control unit:

- Coolant temperature
- Intake air temperature
- Ambient pressure
- Vehicle voltage
- Injection rate
- Engine speed
- Status signal for starter enable

The preheating control unit uses these three operating values to determine the required current for the heater plugs and supplies the heater plugs with current.

Types of preheating

Preheating is activated in various operating states:

- **Preglowing:**

Preheating is activated after switching on terminal 15. Preheating is terminated when:

- The engine speed threshold of 42 rpm is exceeded (starter motor is operated)
or
- The preheating time has elapsed. The preheating time depends on the coolant temperature and is specified in a characteristic curve as follows:

Coolant temperature [°C]	< --35	-25	-20	-5	0	5	30	>30
Preheating time [s]	3.5	2.8	2.8	2.1	1.6	1.1	1.1	0

- **Start standby glowing:**

When preheating has been terminated by the preheating time elapsing, start standby preheating is activated. Start standby preheating is terminated:

- After 10 s of start standby preheating
or
- When the engine speed threshold of 42 rpm is exceeded.

- **Start glowing:**

Start preheating is activated every time the engine is started at a coolant temperature below 75 °C. Start preheating starts after an engine speed threshold of 42 rpm has been exceeded.

Start preheating is terminated:

- After the maximum start preheating time of 60 s has elapsed
or
- After termination of the starting operation
or
- When the coolant temperature exceeds 75 °C.

- **Emergency glowing:**

In the event of a failure in the communication between the DDE and preheating control unit for more than 1 second, emergency preheating is triggered for 3 minutes. Here, the preheating control unit uses safe values to prevent damage to the preheating system.

- **Hidden glowing:**

Up to a coolant temperature of 30 °C, preheating and start standby preheating are activated as so-called hidden preheating. Hidden preheating is triggered by the following signals:

- Driver's seat occupancy
- Seatbelt buckle, driver
- Valid ignition key
- Terminal R
- Brake operated
- Clutch operated

Hidden preheating is triggered a maximum of four times and then only enabled again with the engine start.

- **Partial-load glowing:**

If the DDE detects that the combustion chambers cool down to much due to operation at low loads, partial-load preheating is activated.

Communication

The DDE control unit and preheating control unit communicate across the LIN bus.

The LIN bus is a bidirectional data interface based on the master-slave principle. The DDE control unit is the master controller.

Brief component description

The following components are described for the preheating system:

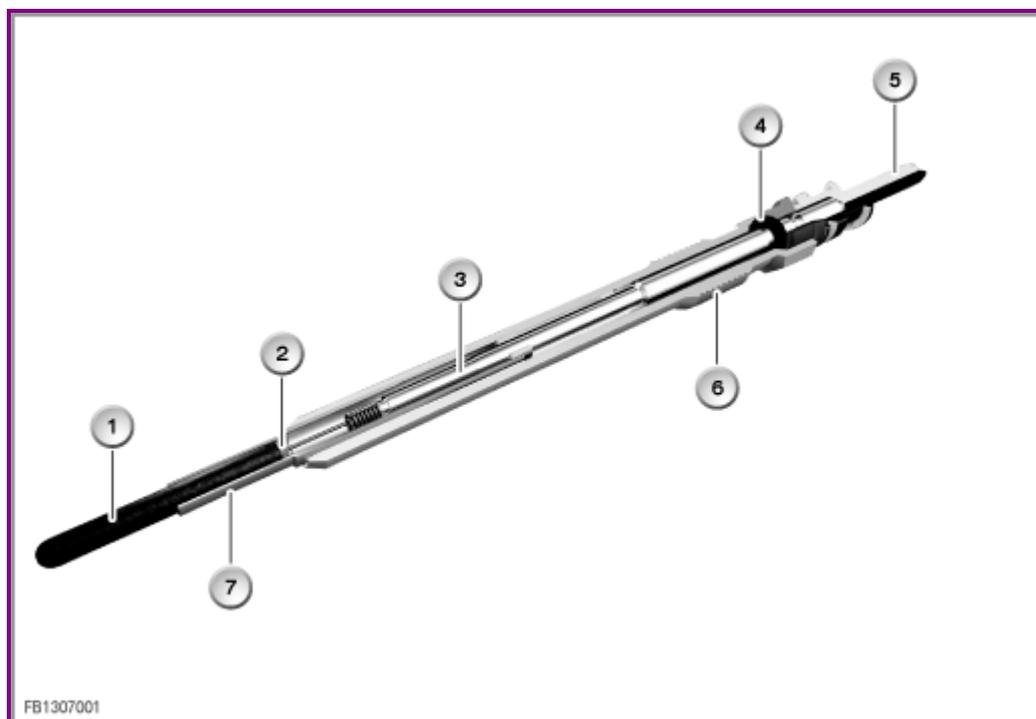
Preheating control unit

The preheating control unit contains the power output stages for activation of the heater plugs. The preheating control unit does not have its own fault memory. Faults in the preheating system that are detected by the preheating control unit are reported to the DDE by the preheating control unit across the LIN bus. The faults are then stored in the DDE fault memory.

If the permitted operating temperature of the preheating control unit is exceeded, the preheating control unit shuts down any preheating process to prevent damage.

Heater plugs

The ceramic heater plugs are designed for a voltage of 7.0 Volts in calm air. During preheating, effective on-board supply voltage of 10 Volts can be applied briefly for rapid heating up. To maintain the heater plug temperature, the heater plugs are supplied with a PWM signal. This sets an effective voltage at the heater plugs that is lower than the on-board supply voltage.



Graphic 1: sectional view of ceramic heater plug

1	Ceramic heating element	5	Round connector
2	Positive terminal connection	6	Thread
3	Connection bolt	7	Support tube
4	Seal		

Notes for Service department

General notes

Important!

The ceramic heater plugs are sensitive to impacts and bending. Heater plugs that are dropped can be damaged.