

15-4000 Testing Preglow System

Preceding work:

Operation no. of operation texts and work units or standard texts and flat rates: 15-4000

A. Without afterglow

Engine 603.96, except (J) Model Year 1988

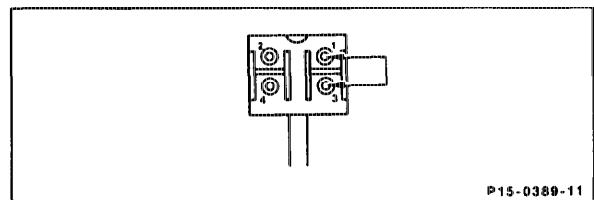
Testing

Testing Glow Lamp and Its Wiring

If the following complaint is received:

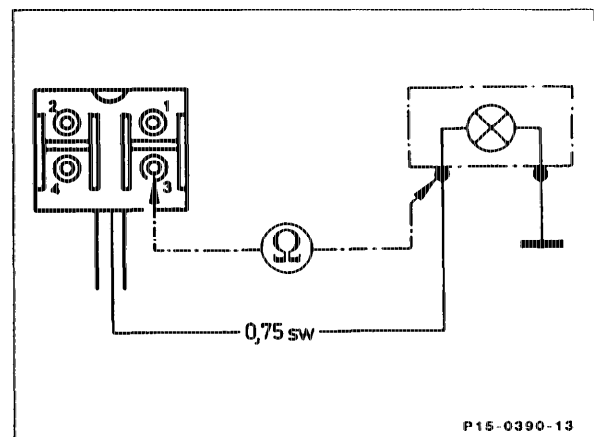
Preglow indicator lamp does not light up when preglow system switched on, despite it being possible to start engine.

Detach 4-pin connector from preglow time relay, turn key into position "2", bridge contacts 1 and 3 of the connector. If the preglow indicator lamp does not light up, test glow lamp or renew if necessary.



If the glow lamp is in order, test the black cable from connector contact 3 of the preglow time relay to the preglow indicator lamp for interruption. Rectify interruption.

If the preglow indicator lamp lights up, the preglow time relay is faulty. Renew preglow time relay.



Commercially available tester

Designation

e. g. make, order no.

Multimeter

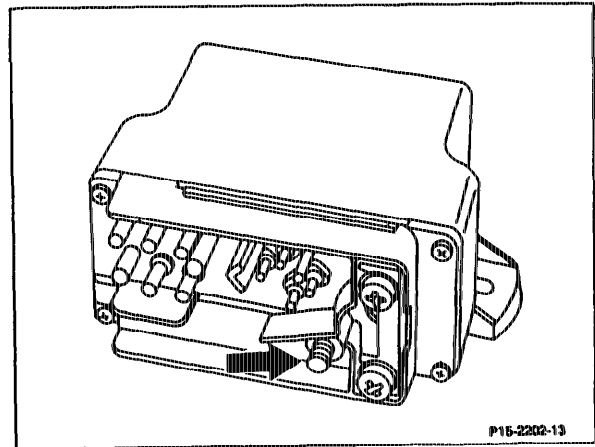
Sun, DMM-5

Testing Main Circuit of Preglow System for Interruption

If the following complaint is received:

Preglow indicator lamp does not light up, engine does not start.

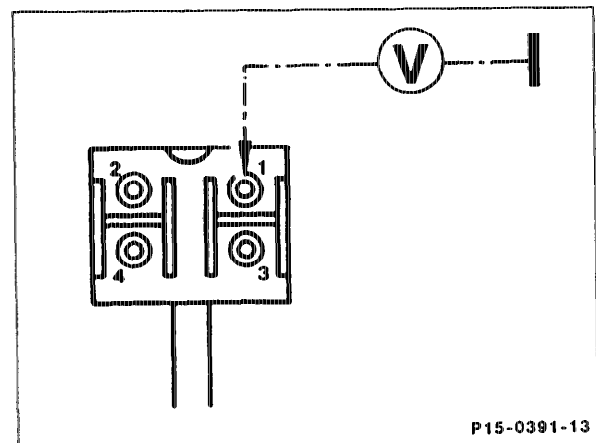
Use the multimeter set to the Volts range to test the voltage at terminal 30 of the preglow time relay to ground.



If no voltage is indicated, test red cable from starter, terminal 30, to the preglow time relay, terminal 30, for interruption. Rectify interruption.

If voltage is indicated (approx. 12 Volts), test 80 ampere fuse for tight fit or interruption; renew if necessary.

If no fault has been found so far, test voltage at contact 1 of the 4-pin connector of the preglow time relay to ground.

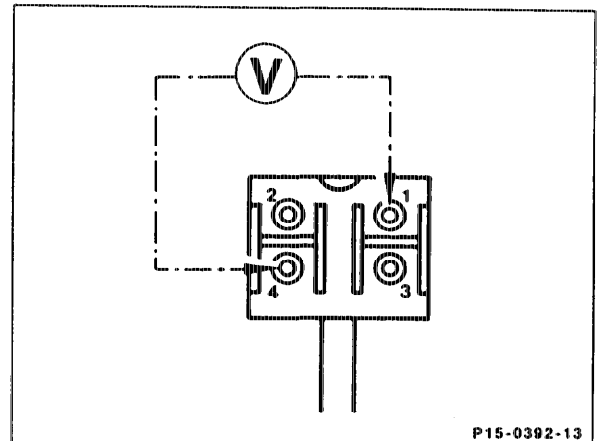


If voltage is indicated when preglow system is switched on, test pink/red cable from fuse 7 (unprotected side) through plug connection of engine wiring harness to contact 1 of the connector of the preglow time relay for interruption. Rectify interruption. Rectify interruption.

If voltage is indicated, connect contact 1 (terminal 15) and contact 4 (terminal 31) and test voltage.

If no voltage is indicated, test brown cable from contact 4 to ground for interruption. Rectify interruption.

If no fault has been detected so far, the preglow time relay is faulty. Renew preglow time relay.



Testing glow plugs and wiring

If the following complaint is received:

Preglow indicator lamp does not light up, engine does not start easily, there may be an interruption of one or several glow plugs or of the cables to the glow plugs.

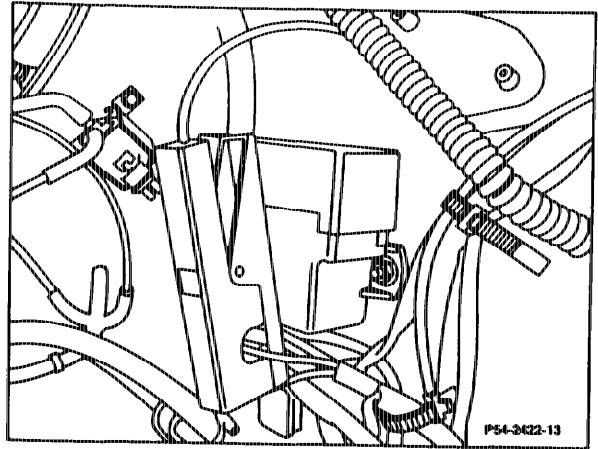
If the following complaint is received:

Preglow indicator lamp lights up, when ready to start condition is reached, engine does not start easily, there may be an interruption of a glow plug or of a cable to the glow plugs of cylinders 2-5, or the cause may be incorrect current consumption of the glow plugs in cylinders 1-6.

Use the multimeter set to the Ampere range and the D.C. clamp to test the current consumption of the glow plugs. This is done by placing the clamp over the individual cables at the preglow time relay.

- Cylinder 1 = 2.5 black/blue
- Cylinder 2 = 2.5 black/violet
- Cylinder 3 = 2.5 black/red
- Cylinder 4 = 2.5 black/yellow
- Cylinder 5 = 2.5 black/green
- Cylinder 6 = 2.5 black/white

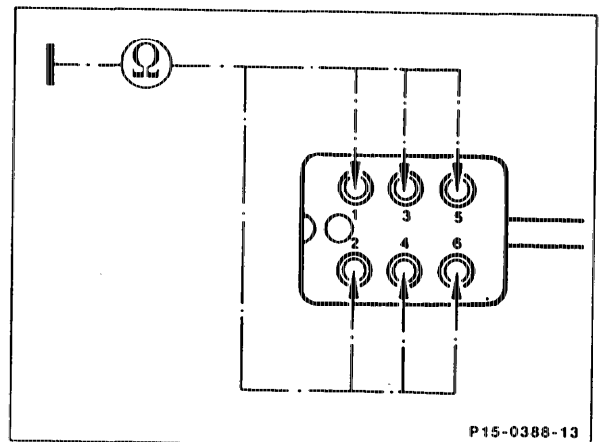
Turn the key in the steering lock to position "2"; the current consumption of each glow plug must be 8–15 amperes after 10–20 seconds. If the reading is higher than 15 amperes, renew the glow plug. If the reading is less than 8 amperes, test electric cable or plug for interruption.



Detach the 6-pin connector from the preglow time relay to test for interruption.

With the multimeter set to the Ohms range, measure in turn the resistance to ground (engine block) as follows:

- C 1 Connector = glow plug cylinder 1
- C 2 Connector = glow plug cylinder 2
- C 3 Connector = glow plug cylinder 3
- C 4 Connector = glow plug cylinder 4
- C 5 Connector = glow plug cylinder 5
- C 6 Connector = glow plug cylinder 6



If $\infty \Omega$ resistance is measured, there is an interruption of the respective glow plug or of the lead or of the connection. Rectify interruption in the lead or renew glow plug.

Note

It is possible that the indicator lamp does not indicate a fault (because of unfavourable tolerances) until 2 glow plugs in cylinders 2–5 have failed.

To check that the fault indication in the preglow time relay is not faulty, 2 glow plugs of cylinders 2–6 should be terminated in this case and the preglow operation repeated.

Additionally, on Engine 603, test the fault indication of No. 6 cylinder. This is done by terminating only the glow plug of No. 6 cylinder. If the indicator lamp now shows a fault (does not light up), the preglow time relay is in proper order.



B. With afterglow
Engine 602.96, 603.96/97

Note

Safeguarding preglow circuit


An electronic short-circuit safeguard is installed in the preglow time relay. The circuit is interrupted if a short-circuit develops in the glow plugs or in the cables.

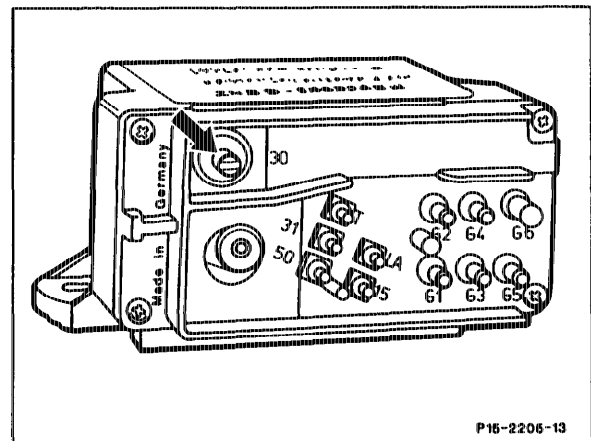
The relay is again operational

- once the short-circuit has been rectified and
- the key is turned back to position "0".

Symbols which are used for the two 6-pin couplings:

Coupling with the pins T, 31, 50, 15, LA: 


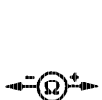


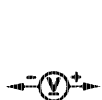

Coupling with the pins G1-G6: 

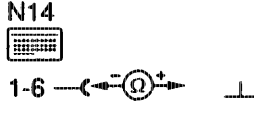
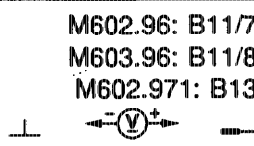
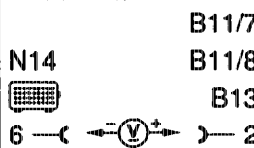


Commercially available tester

Designation	e. g. make, order no.
Multimeter	Sun, DMM-5

Test program

Complaint	Test step/ Test scope	Test connection	Operation/ Requirement	Specifi- cation	Possible cause/ Remedy
1 Preglow indicator lamp does not light up when preglow system switched on although engine can be started	1.0 Glow lamp		Ignition: ON	Preglow indicator lamp lights up	Glow lamp Wiring
	1.1 Glow lamp wiring		Ignition: OFF	< 1 Ω	Open circuit in wiring
2 Glow lamp lights up constantly	-	-	-	-	Preglow time relay sticking Replace preglow time relay
3 Preglow indicator lamp does not light up, engine cannot be started	3.0 Preglow time relay		Ignition: ON	> 12 V	Preglow time relay Wiring
	3.1 Power supply preglow time relay terminal 30			> 12 V	Open circuit in wiring
	3.2 Power supply preglow time relay terminal 15 (contact 1)		Ignition: ON	> 12 V	Open circuit between coupling contact 1 and: Model 124: fuse 7 (unfused side), colour pink/red Model 140: fuse 19 (unfused side), colour pink/green black Model 201: electrical center coupling S contact, colour red/black
	3.3 Ground preglow time relay (terminal 31)		Ignition: OFF	< 1 Ω	Open circuit in wiring

Complaint	Test step/ Test scope	Test connection	Operation/ Requirement	Specifi- cation	Possible cause/ Remedy
4 Preglow indicator lamp does not light up when switched on or lights up for about 1 minute when driving. Engine does not start easily.	4.0 Power consumption of glow plugs	Place DC clamp of multimeter (amperes range) once over all cables	Ignition: OFF , Switch on ignition position 2	M 602.96 > 50A ¹⁾ M 603.96 M 603.97 > 60A ¹⁾	Glow plugs, wiring of glow plugs Test step 4.1
	4.1 Open circuit in wiring	N14 	Ignition: OFF	< 1 Ω	Replace glow plug affected Cable
5 Preglow time until indicator lamp goes out too short or too long	5.0 Coolant temperature sensor	M602.96: B11/7 M603.96: B11/8 M602.971: B13 	Ignition: OFF	³⁾	Replace temperature sensor
	5.1 Wiring	N14  B11/7 B11/8 B13	Ignition: OFF	< 1 Ω	Open circuit in wiring

¹⁾ For a few seconds after switching on ignition, see also tables P15-0397-13 and P15-0398-13, chapter 15-0705.

²⁾ Table P15-0397-13, chapter 15-0705.

³⁾ See table of coolant and intake air temperature sensors.

Coolant and Intake air temperature sensors

Temperature in °C	Resistance (± 10 %)	Voltage in V (± 10 %)
20	2.5 kΩ	3.85
30	1.7 kΩ	3.47
40	1.18 kΩ	3.05
50	833 Ω	2.63
60	600 Ω	2.22
70	440 Ω	1.85
80	327 Ω	1.5
90	243 Ω	1.22
100	185 Ω	0.99