

### A. General

Combustion in the diesel engine is by way of self-ignited fuel injected into the highly compressed and consequently severely heated-up combustion air.

If the engine is cold, the self-igniting temperature is not reached by compression alone. A preglow system is therefore required whose duty it is to increase the temperature of the compressed air and to allow the engine to start by inflaming fuel particles on the glow plugs.

The duration of the preglowing process is dependent on the ambient temperature.

### **Construction of the quick-start pencil-type glow plugs**

The main components of the pencil-type glow plugs are a housing with screw-in thread M 12×1.25 and a heater pin pressed into the housing.

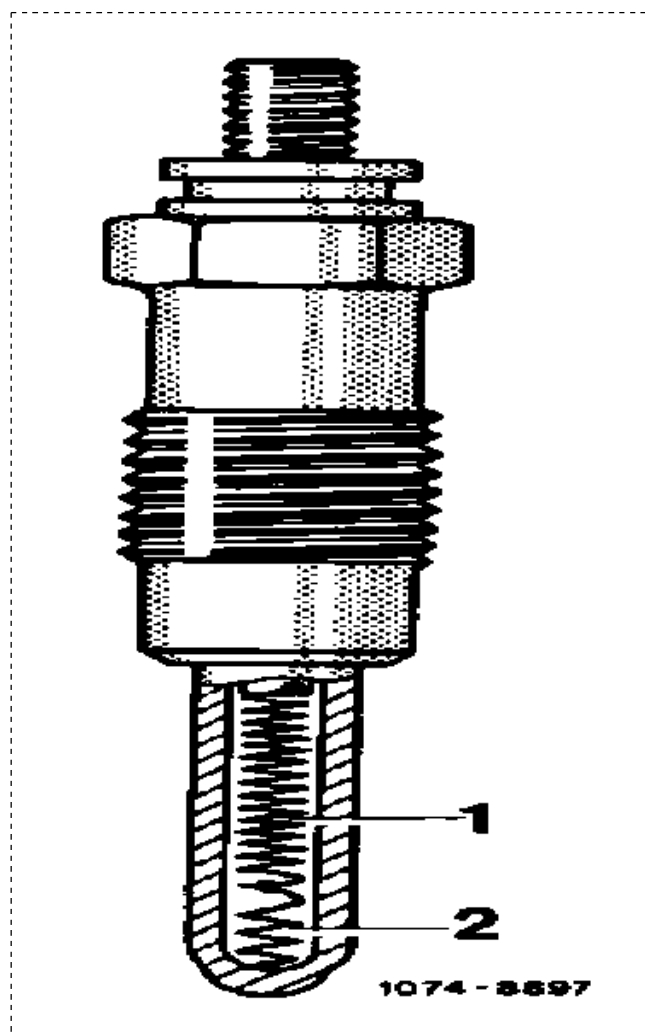


The single-pole connection pin is secured to the housing by means of a permanent brass round nut connection.

The pencil-type glow plugs are designed for a voltage of 11.5 V and are operated in parallel.

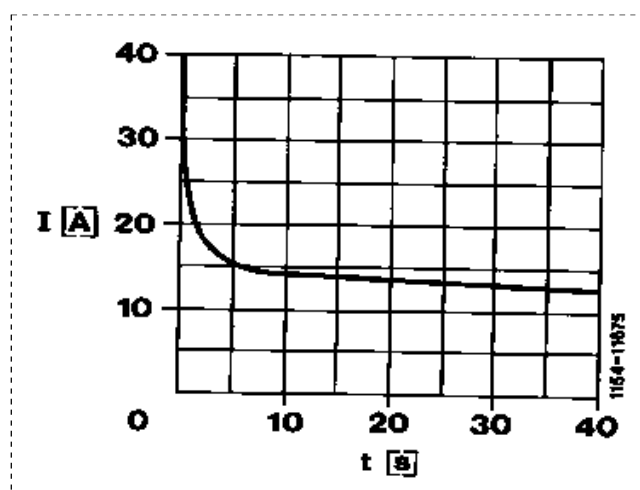
The heater element consists of a series-connected heater and control coil.

- 1 Control coil
- 2 Heater coil



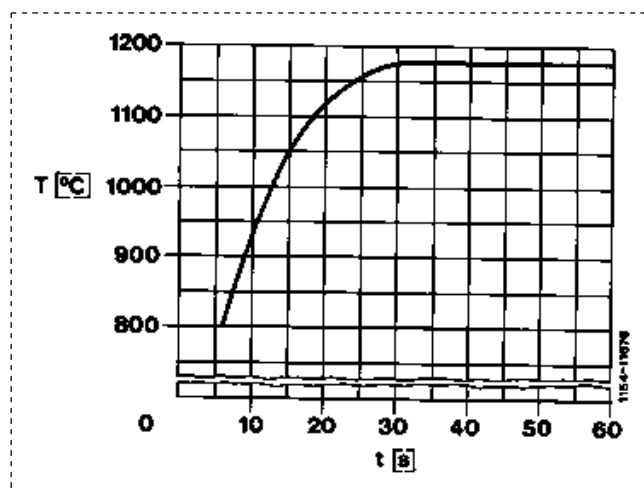
When the glow system is switched on, a current of approx. 30 A flows for each glow plug. The heater coil heats up the glow plug very rapidly. The control coil resistance increases with rising temperature, limiting the current to approx. 8-16 A. This serves as an overload protection for the glow plug.

Current curve of the quick-start pencil-type glow plug



A heater pencil temperature of 900 °C is reached after a glowing period of 9 seconds, while the maximum temperature of 1180 °C is reached after 30 seconds.

Temperature curve of the quick-start pencil-type glow plug



### Cable harness for preglow system engine 601.911 with mechanical transmission

Plastic intake manifold necessitates lengthening ground cable and routing from intake manifold to fuel filter.

#### Production breakpoint: September - October 1990

Model	Engine	Engine end no. Manual transmission from to
201.122	601.911	347517 - 348400

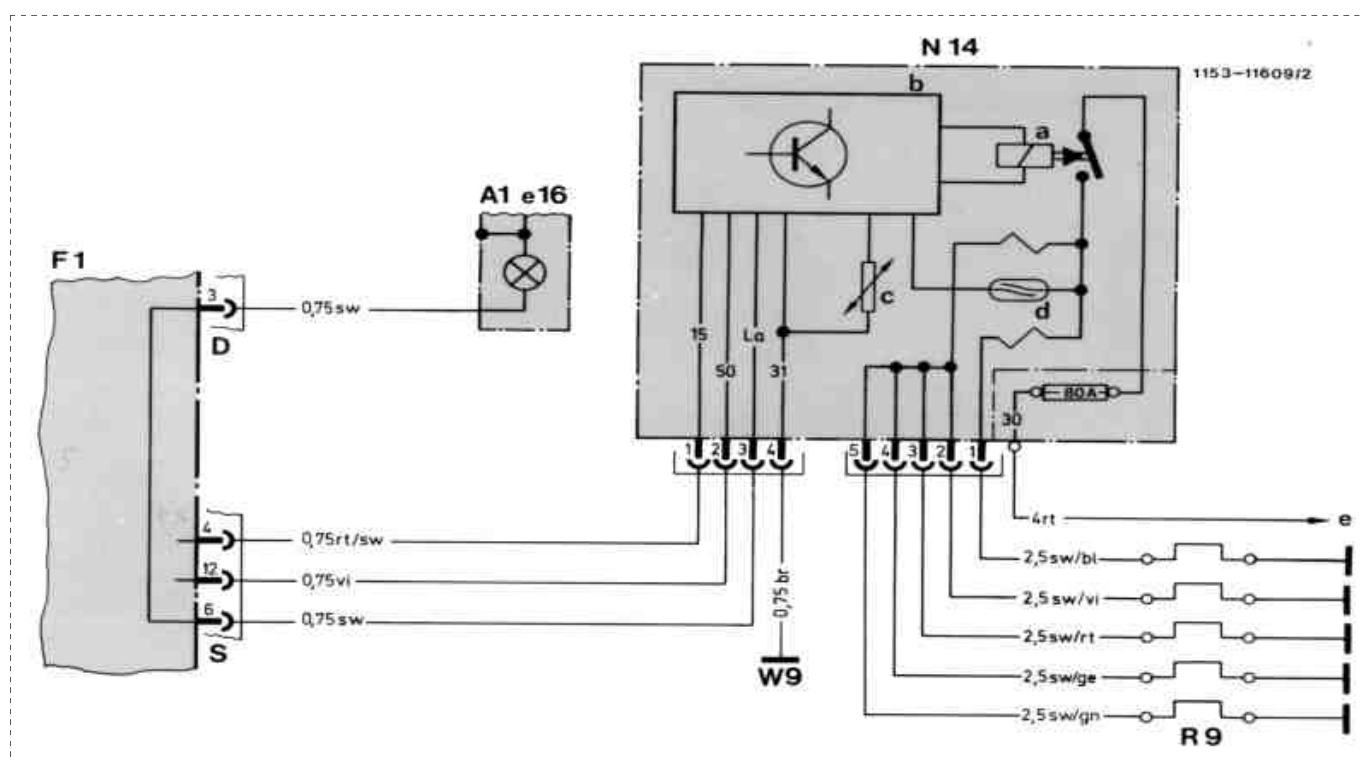
#### Production breakpoint: March - October 1991

Model	Engine	Engine end no. Manual transmission from to
201.122	601.911	362537 - 381504

#### Standard production breakpoint: as of January 1992

Model	Engine	Engine end no. Manual transmission
201.122	601.911	389421

## B. Quick-start preglow system



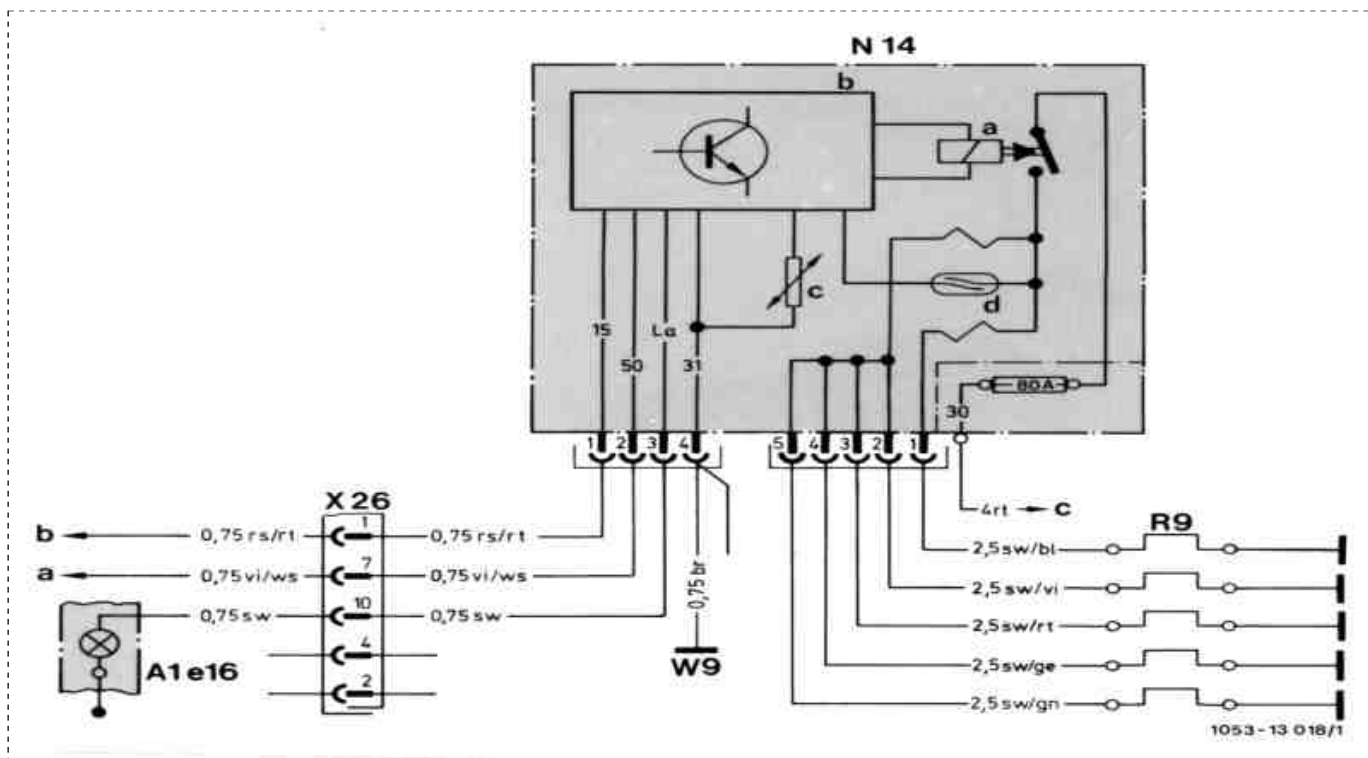
### Wiring diagram model 201.122/126

A1e16 Preglow indicator in instrument cluster  
 N14 Preglow time-delay relay  
 a Power relay  
 b Electronic unit  
 c Temperature sensor (NTC resistor)  
 d Reed relay

F1 Central electrics  
 R9 Glow plugs  
 W9 Ground, front left (near headlamp unit)  
 e X35 Terminal block terminal 30/terminal 61 (battery)

### Note

1 pencil-type glow plug line 2.5 sw/gn omitted on engine 601



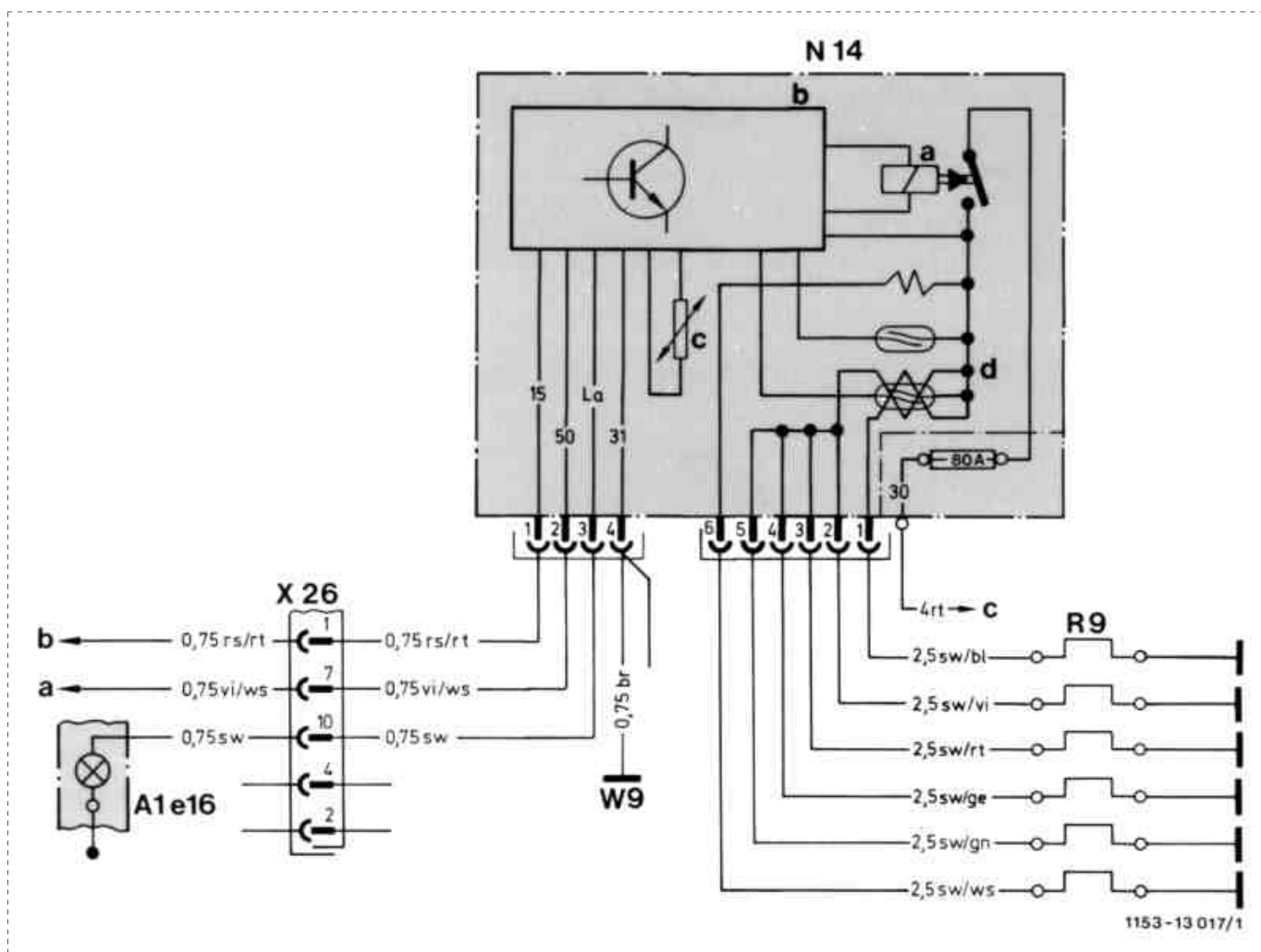
#### Wiring diagram models 124.120/125/180/185

A1e16	Preglow indicator in instrument cluster
N14	Preglow time-delay relay
a	Power relay
b	Electronic unit
c	Temperature sensor (NTC resistor)
d	Reed relay
R9	Glow plugs
X26	Connector interior/engine 12-pole

W9	Ground, front left (near headlamp unit)
a	X49/1 Connector backup light switch
b	Fuse 7, terminal 15 (unprotected)
c	X4 Terminal block terminal 30 (fuse/relay box)

#### Note

1 pencil-type glow plug line 2.5 sw/gn omitted on engine 601.



### Wiring diagram models 124.130/330/190/393

A1e16 Preglow indicator in instrument cluster

N14 Preglow time-delay relay

a Power relay

b Electronic unit

c Temperature sensor (NTC resistor)

d Reed relay

R9 Glow plugs

X26 Connector interior/engine 12-pole

W9

Ground, front left (near headlamp unit)

a X49/1 Connector backup light switch

b Fuse 7, terminal 15 (unprotected)

c X4 Terminal block terminal 30 (fuse/relay box)

### Preglow time-delay relay

The preglow time-delay relay is installed in the engine compartment on the left wheel arch.

After removing the protective cap the electrical connections and the 80-A fuse are accessible.

Model 201



An NTC resistor in the preglow time-delay relay registers the relay ambient temperature.

### Functions of the preglow time-delay relay

The preglow time-delay relay has the following functions:

- Switching the glow current
- Ready-for-starting indication
- Safety cut-out
- Fault indication

### Note

With unfavorable tolerances of the pencil-type glow plugs or the Reed relay (d) it is permissible that the fault indication responds only if two pencil-type glow plugs R9 are defective.

The fault indication (monitoring of pencil-type glow plugs) is effected by comparing the current of the 1st pencil-type glow plug with the current of the 2nd to 5th pencil-type glow plugs connected in parallel.



With identical current flow in both windings the magnetic fields cancel each other, the Reed contact does not respond.

The preglow indicator lamp switches off immediately, consequently no longer lighting up at the start of the preglowing process.

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## Glow current control

When actuating the key in position "2" (preglowing, driving) the preglow time-delay relay (voltage) on terminal 15 is switched on. The power relay (a) closes the power circuit from terminal 30 (plus) via the fuse to the pencil-type glow plugs.

If the key is turned to position "3" (start), the power relay (a) remains attracted, activated by terminal 50. The glowing process is continued until the key is returned to position "2".

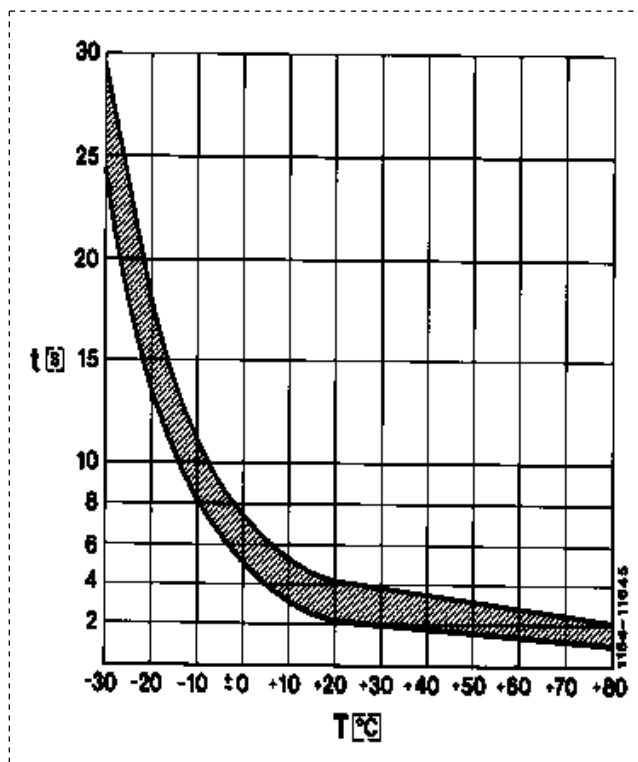
### Ready-for-starting indication

A temperature sensor installed in the preglow time-delay relay determines the glow period.

The preglow indicator lamp in the instrument cluster lights up when the glow system is switched on.

If the required glow time, dependent on the ambient temperature of the preglow time-delay relay, has been reached, the preglow indicator lamp goes out, in this way indicating readiness for starting.

Preglowing time

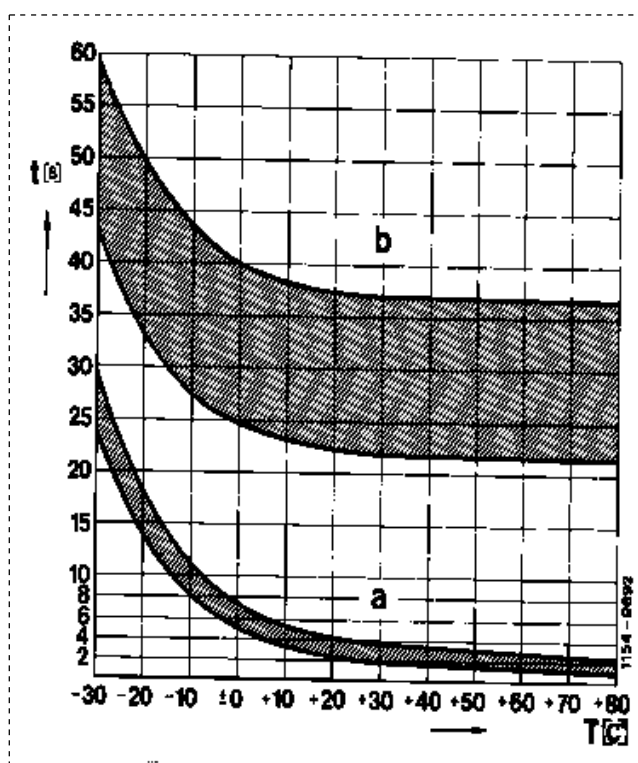


### Safety cut-out

If a start fails to take place within 20-25 seconds after the readiness for starting has been indicated, the glow current is interrupted by the safety cut-out. If the engine is started thereafter, the glow system is again switched on for the duration of the starting process.

The safety cut-out is no longer fixed. It is determined from the time up to readiness for starting (the preglow indicator lamp goes out) plus 20-35 seconds.

- a Preglowing time
- b Safety cut-out



### Fault display

A fault in the preglow system is indicated by failure to light up of the preglow indicator lamp when actuating the key in position "2".

The following faults are registered:

- Interruption of the line to the connection terminal 30.
- 80-A fuse defective.
- Power relay in the preglow time-delay relay defective.
- Interruption of one or several lines to the pencil-type glow plugs.
- Interruption of one or several pencil-type glow plugs.

## C. Preglow system with afterglowing

The preglow system has been changed with regard to the previous system in the following points:

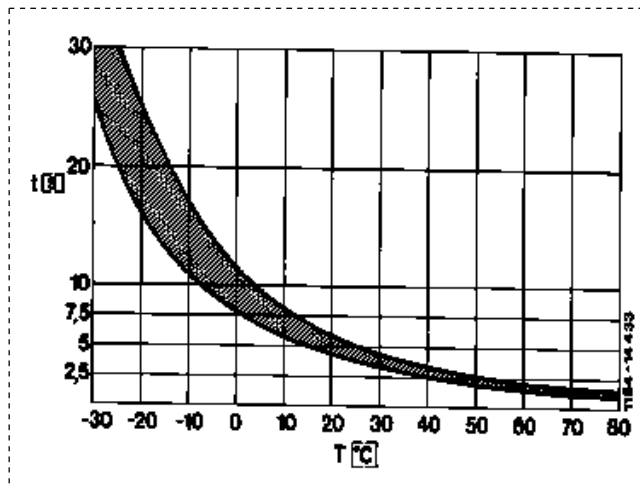
- Preglow time-delay relay
- Coolant temperature sensor
- Pencil-type glow plugs

### Preglow time-delay relay

#### Preglowing time

The preglowing time until the preglow indicator lamp goes out is dependent on the coolant temperature (see diagram).

Preglowing time  $t$  in seconds  
Coolant temperature  $T$  in  $^{\circ}\text{C}$



In order to improve the warming-up characteristics the glowing process is continued with running engine as a function of the coolant temperature.

Afterglowing time up to a maximum of 17 s (see diagram)

Graph showing time  $t$  [s] versus temperature  $T$  [°C]. The curve is constant at 15 s for  $T$  from -30 °C to 20 °C, then decreases linearly to 0 s at 60 °C. A shaded area is present between 15 s and approximately 17 s from -30 °C to 25 °C.

The graph shows a cooling process. The temperature  $t$  in  $^{\circ}\text{C}$  is plotted against time  $\tau$  in seconds. The temperature remains constant at  $60^{\circ}\text{C}$  from  $\tau = -30$  to  $\tau = 0$ . After  $\tau = 0$ , the temperature decreases linearly, reaching  $0^{\circ}\text{C}$  at  $\tau = 30$ . The area under the curve is shaded.

Afterglowing time  $t$  in seconds  
Coolant temperature  $T$  in  $^{\circ}\text{C}$

Model	Engine	Engine end no. manual transmission	Engine end no. automatic transmission
124.120 124.180	601.912	119226	009930
124.125 124.185	602.912	127975	019037
124.130 124.190	603.912	048192	031795
124.133 124.193	603.960	--	017932
124.330	603.913	000563	000573
124.333 124.393	603.963	--	000847
201.122 201.126	601.911 602.911	292358 073017	023518 014820
460.3	602.930	001556	--

## **Monitoring of glow plugs**

The glow plugs are monitored individually by a microprocessor in the preglow time-delay relay.

In addition, the glow plugs are constantly monitored during vehicle operation by a low test current. Failure of one or several glow plugs is indicated if the preglow indicator lamp lights up for approx. 1 minute with the engine running.

## **Fault indication by preglow indicator lamp**

- Lamp fails to light up even during preglowing, lights up for approx. 1 minute while driving.  
Fault: One or several glow plugs defective.
- Lamp fails to light up during preglowing and also while driving.  
Fault: Indicator lamp defective, line interruption to the indicator lamp, preglow time-delay relay defective.
- Lamp lights up permanently.  
Fault: Preglow time-delay relay defective (relay sticking).
- Lamp fails to light up, engine is hard to start or fails to start altogether.  
Fault: Short circuit on one or several glow plugs, line interruption, preglow time-delay relay defective.

## **Protection of preglow current circuit**




Instead of the 80-A fuse an electronic cut-out has been installed. If a short circuit occurs the power circuit is interrupted. After the short circuit has been eliminated, the fuse of the relay is restored to the operational state by turning the key in the steering lock back to "0".

A coolant temperature sensor (B20) or (B11/8) is installed to control the preglow and afterglow times.

**B11/8**

115-35103

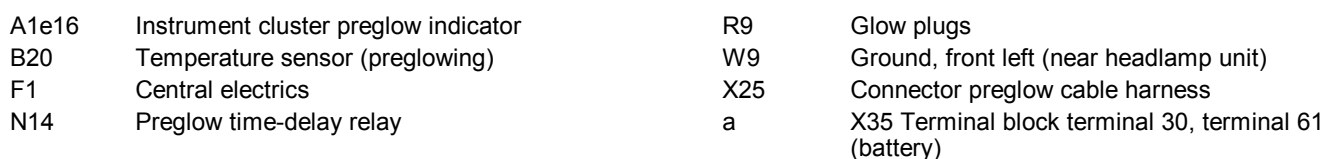
For afterglowing, pencil-type glow plugs with three different heater tube lengths are installed (see Checking preglowing 15-711).

**Wiring diagram engine 601.911** Model year 1988   
Model year 1989   code 830



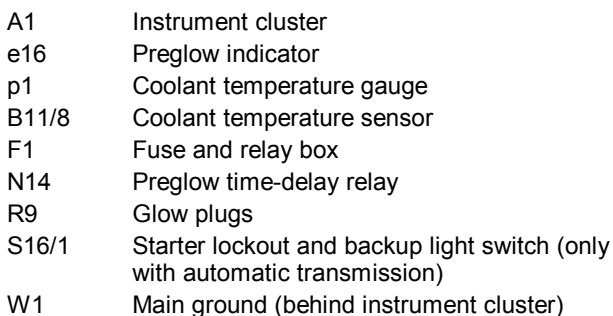






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