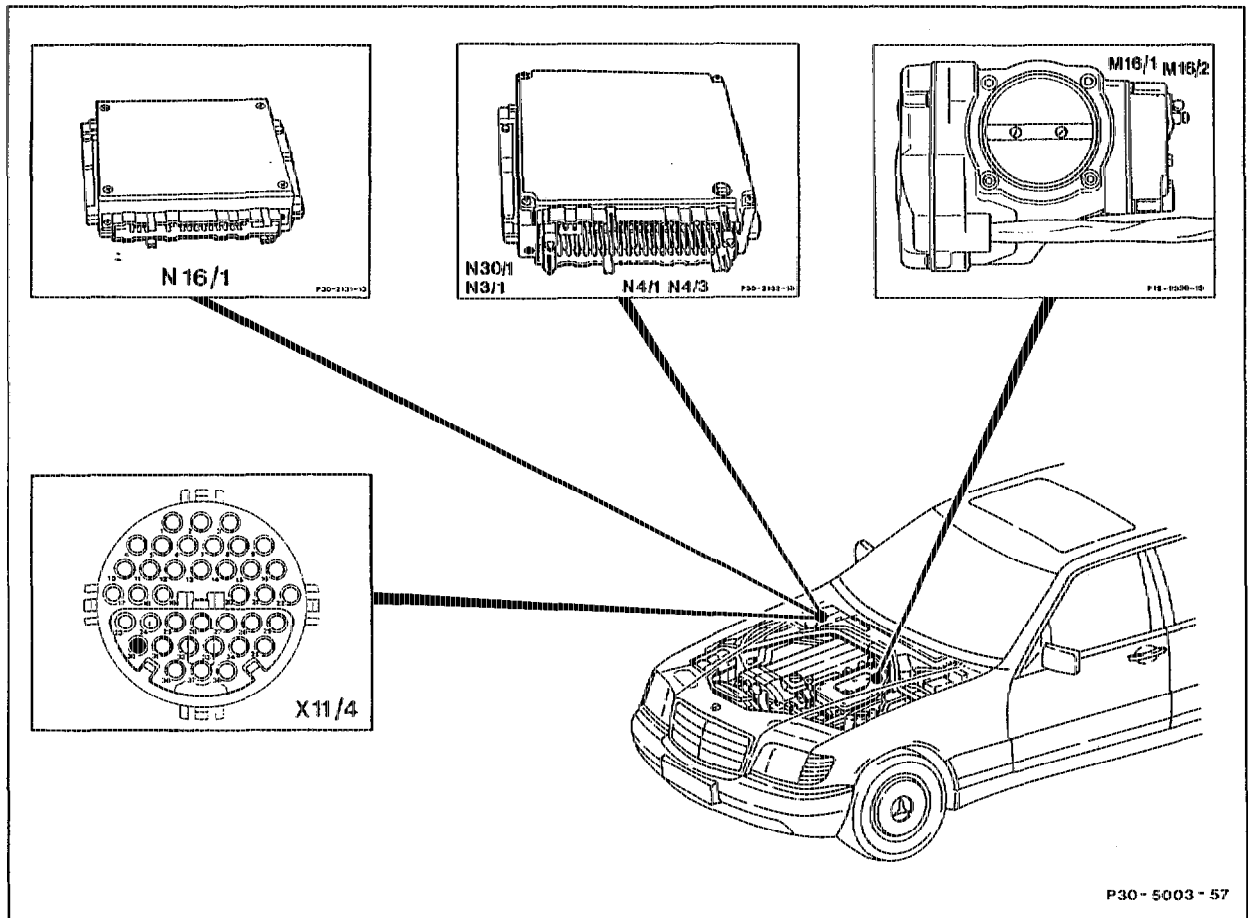


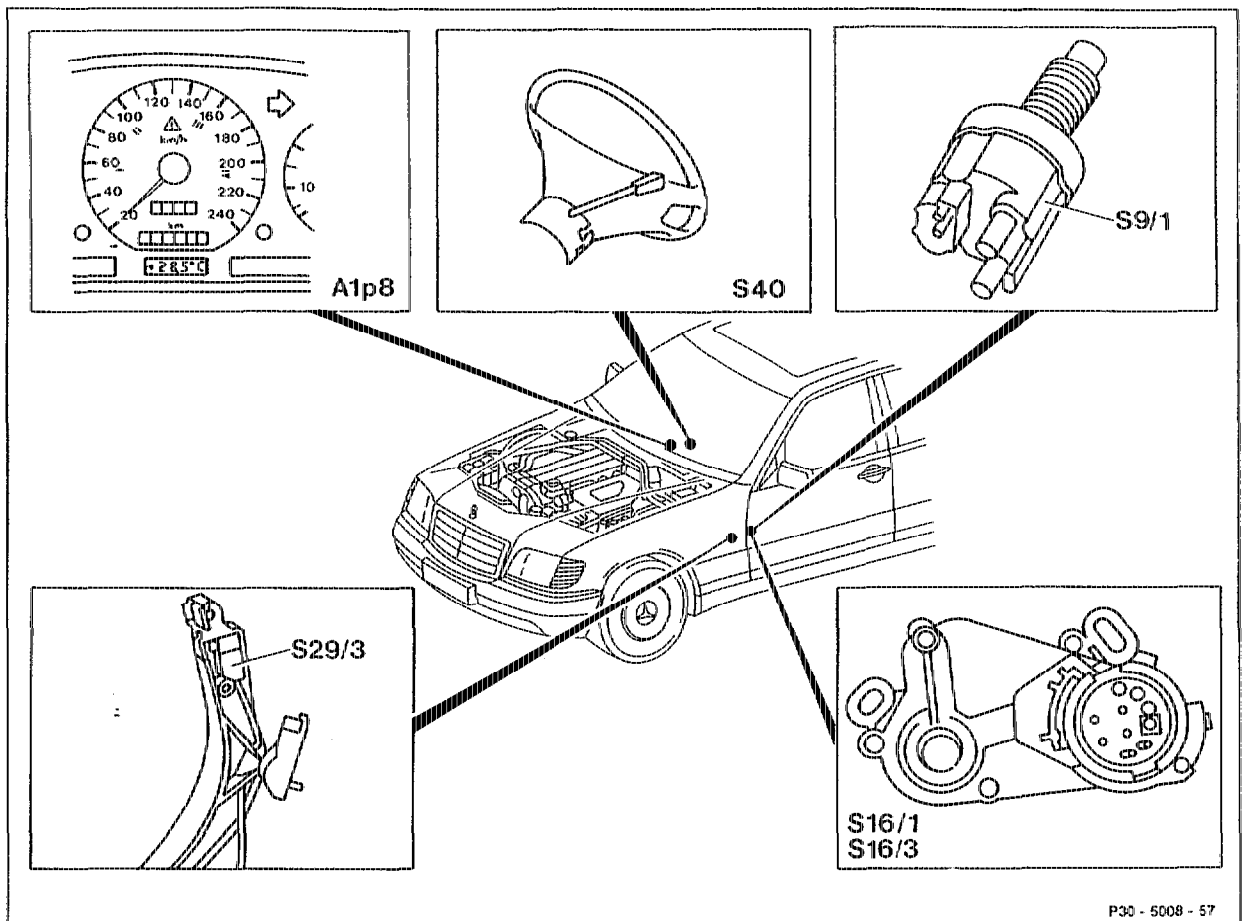
30-0010 Electronic accelerator pedal, Tempomat cruise control/idle speed control

A. Location of components

a) Engine 104



M16/1	Electronic accelerator pedal (EFP) actuator	N16/1	Base module (GM)
M16/2	Tempomat cruise control/idle speed control (TPM/LLR) actuator	N30/1	ABS/ASR control unit
N3/1	Hot wire (LH) control unit	X11/4	Test coupling for diagnosis, pulse signal (38-pin)
N4/1	Electronic accelerator pedal (EFP) control unit		
N4/3	Tempomat cruise control/idle speed control (TPM/LLR) control unit		

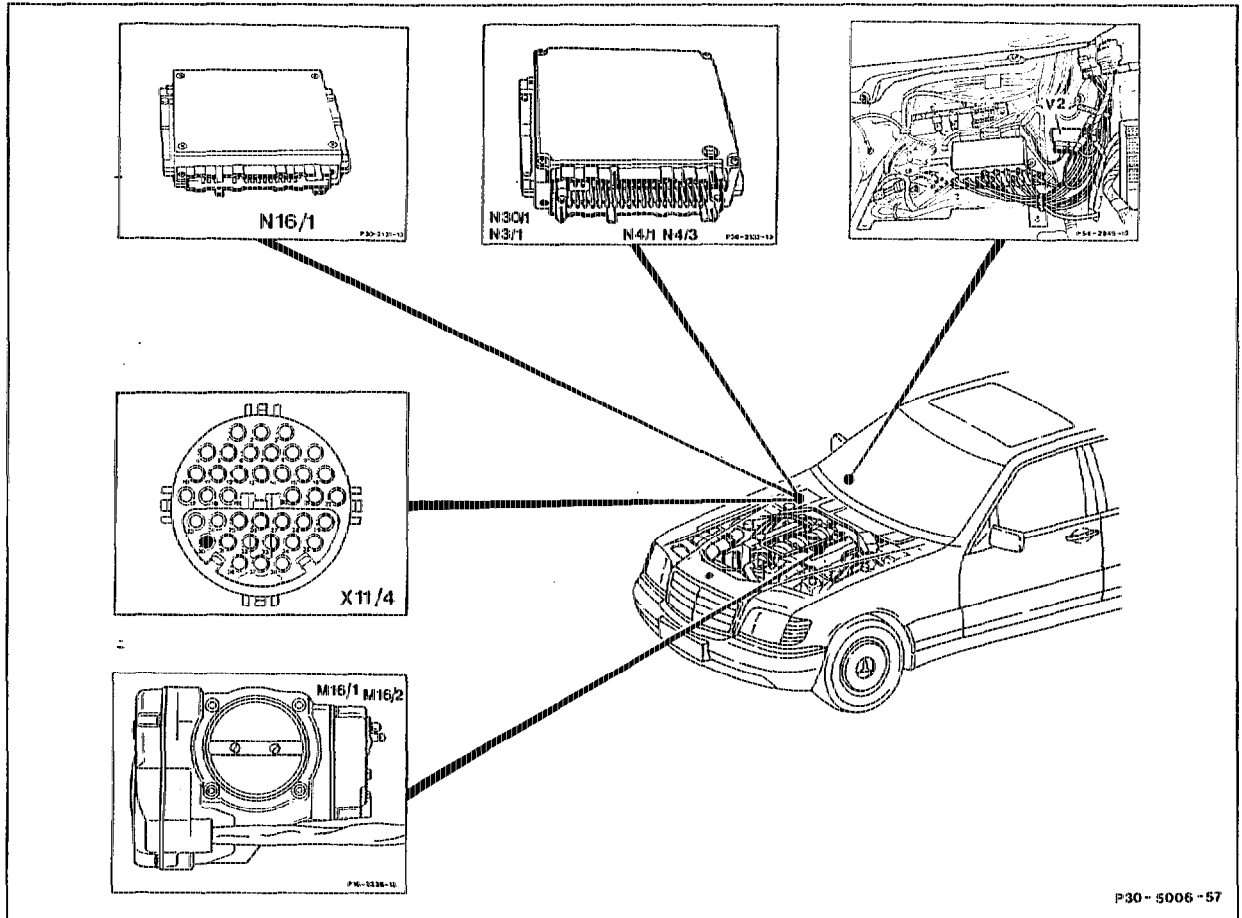


P30 - 5008 - 57

A1p8 Electronic speedometer
 S9/1 ASD/ASR stop lamp switch
 S16/1 Starter lockout and reversing lamp switch

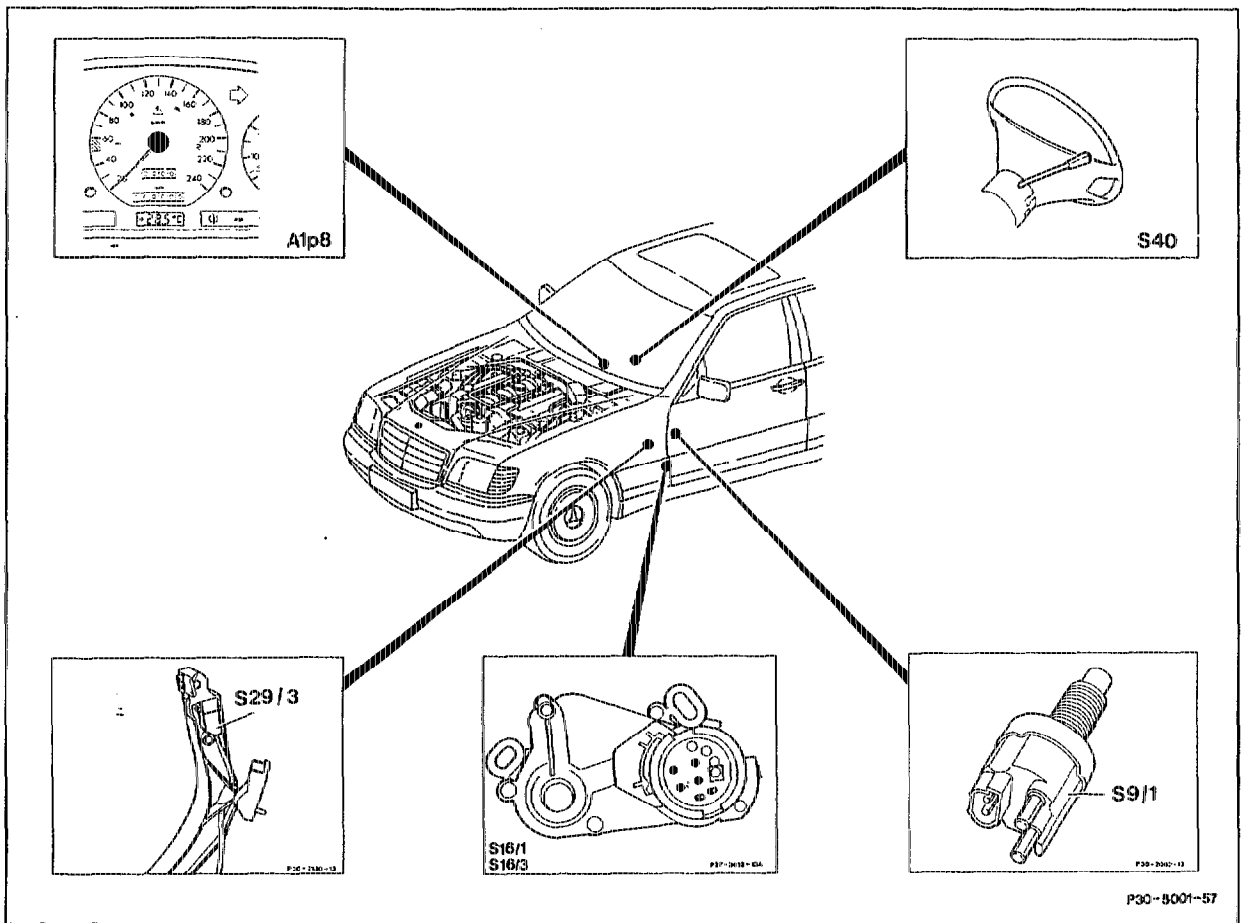
S16/3 Starter lockout and reversing lamp switch,
 selector lever position recognition (only with EFP)
 S29/3 Idle speed contact switch (only with EFP)
 S40 Tempomat cruise control switch

b) Engine 119



Shown on model 140

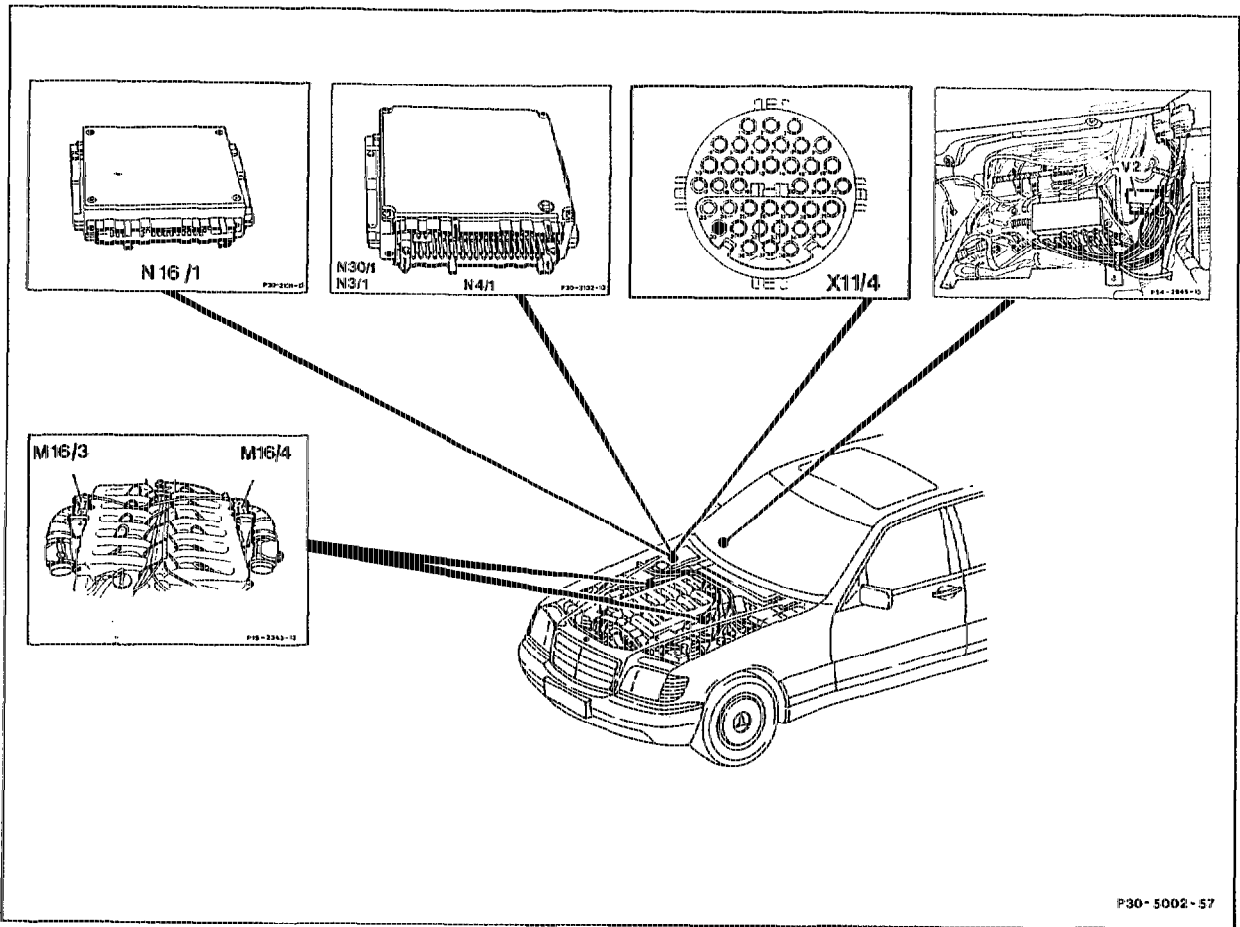
M16/1	Electronic accelerator pedal (EFP) actuator	N16/1	Base module (GM)
M16/2	Tempomat cruise control/idle speed control (TPM/LLR) actuator	N30/1	ABS/ASR control unit
N3/1	Hot wire (LH) control unit	V2	Diode matrix for engine speed increase
N4/1	Electronic accelerator pedal (EFP) control unit	X11/4	Test coupling for diagnosis, pulse signal (38-pin)
N4/3	Tempomat cruise control/idle speed control (TPM/LLR) control unit		



A1p8 Electronic speedometer
S9/1 ASD/ASR stop lamp switch
S16/1 Starter lockout and reversing lamp switch

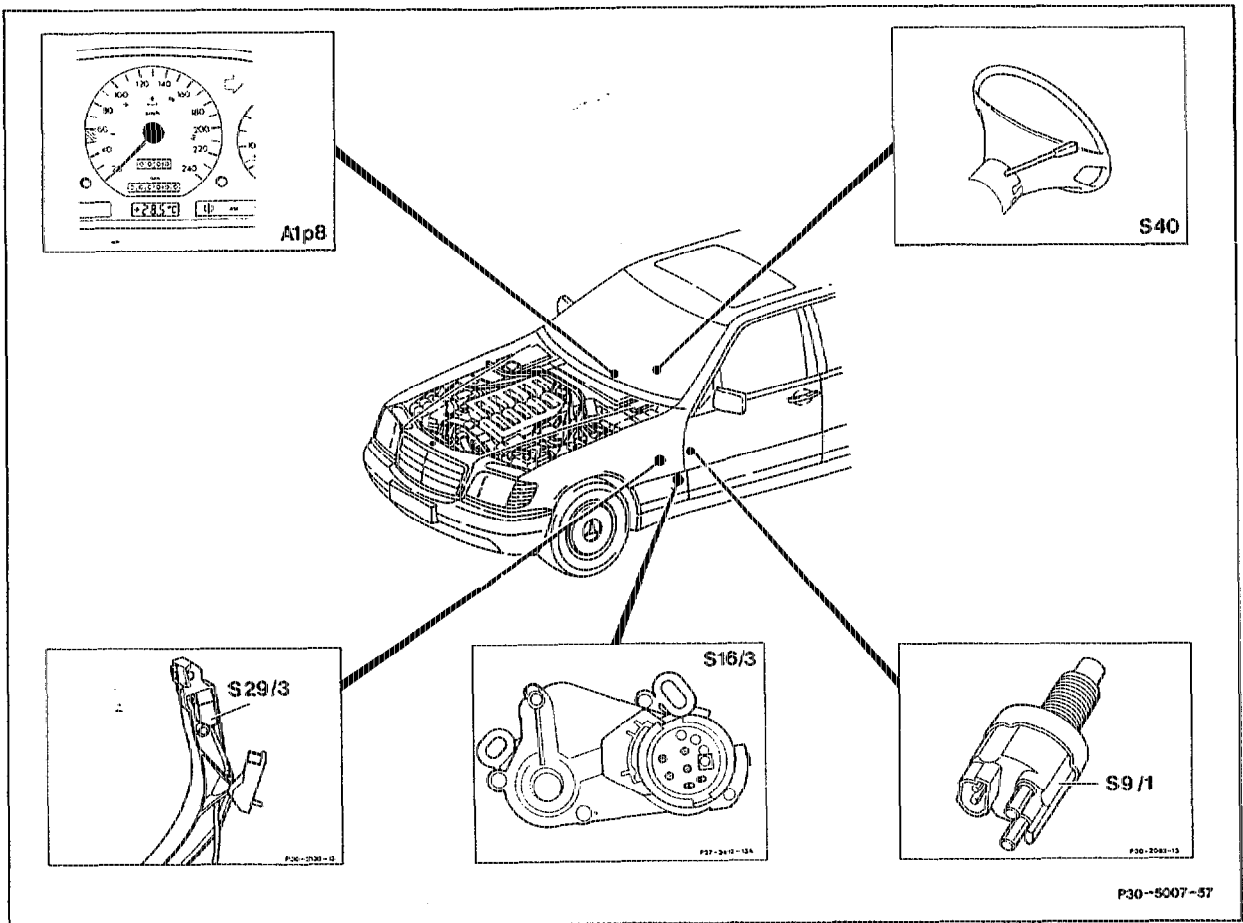
S16/3 Starter lockout and reversing lamp switch,
 selector lever position recognition (only with EFP)
S29/3 Idle speed contact switch (only with EFP)
S40 Tempomat cruise control switch

c) Engine 120



M16/3 Electronic accelerator pedal (EFP) actuator, left cylinder block
 M16/4 Electronic accelerator pedal (EFP) actuator, right cylinder block
 N3/1 Hot wire (LH) control unit

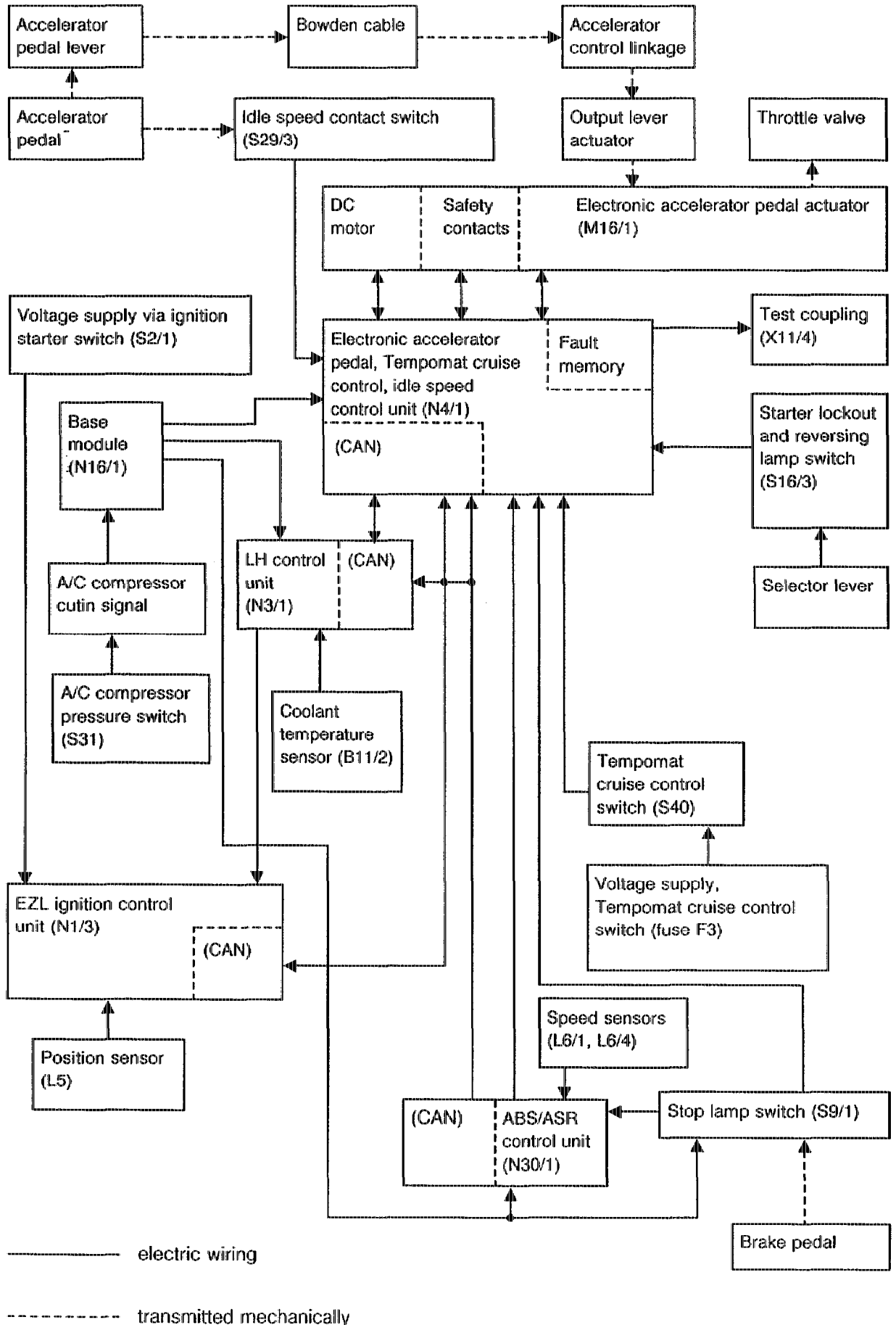
N4/1 Electronic accelerator pedal (EFP) control unit
 N16/1 Base module (GM)
 N30/1 ABS/ASR control unit
 V2 Diode matrix for engine speed increase
 X11/4 Test coupling for diagnosis, pulse signal (38-pin)



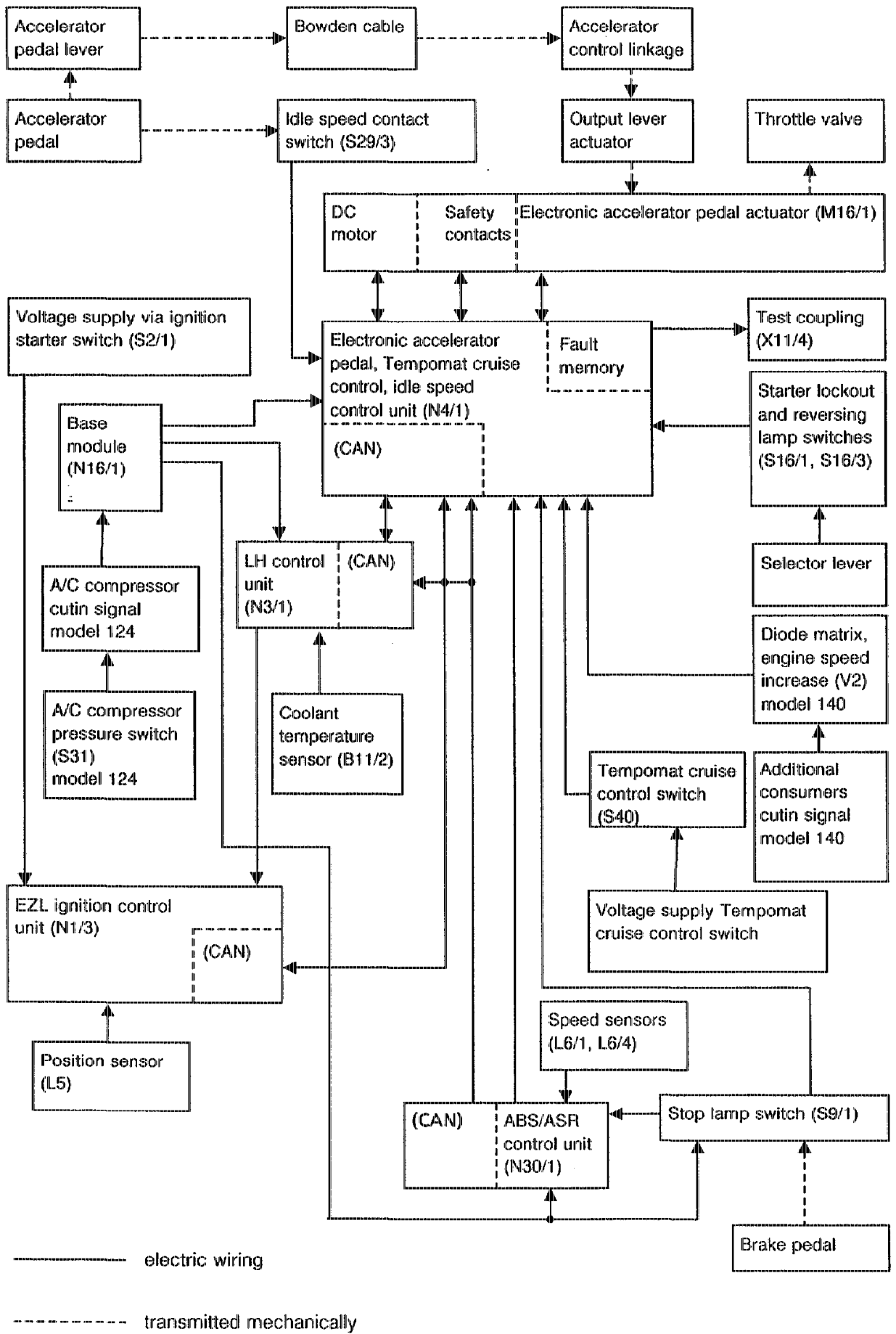
- | | | | |
|-------|---|-------|--------------------------------|
| A1p8 | Electronic speedometer | S29/3 | Idle speed contact switch |
| S9/1 | ASD/ASR stop lamp switch | S40 | Tempomat cruise control switch |
| S16/3 | Starter lockout and reversing lamp switch,
selector lever position recognition | | |

B. Block diagram electronic accelerator pedal

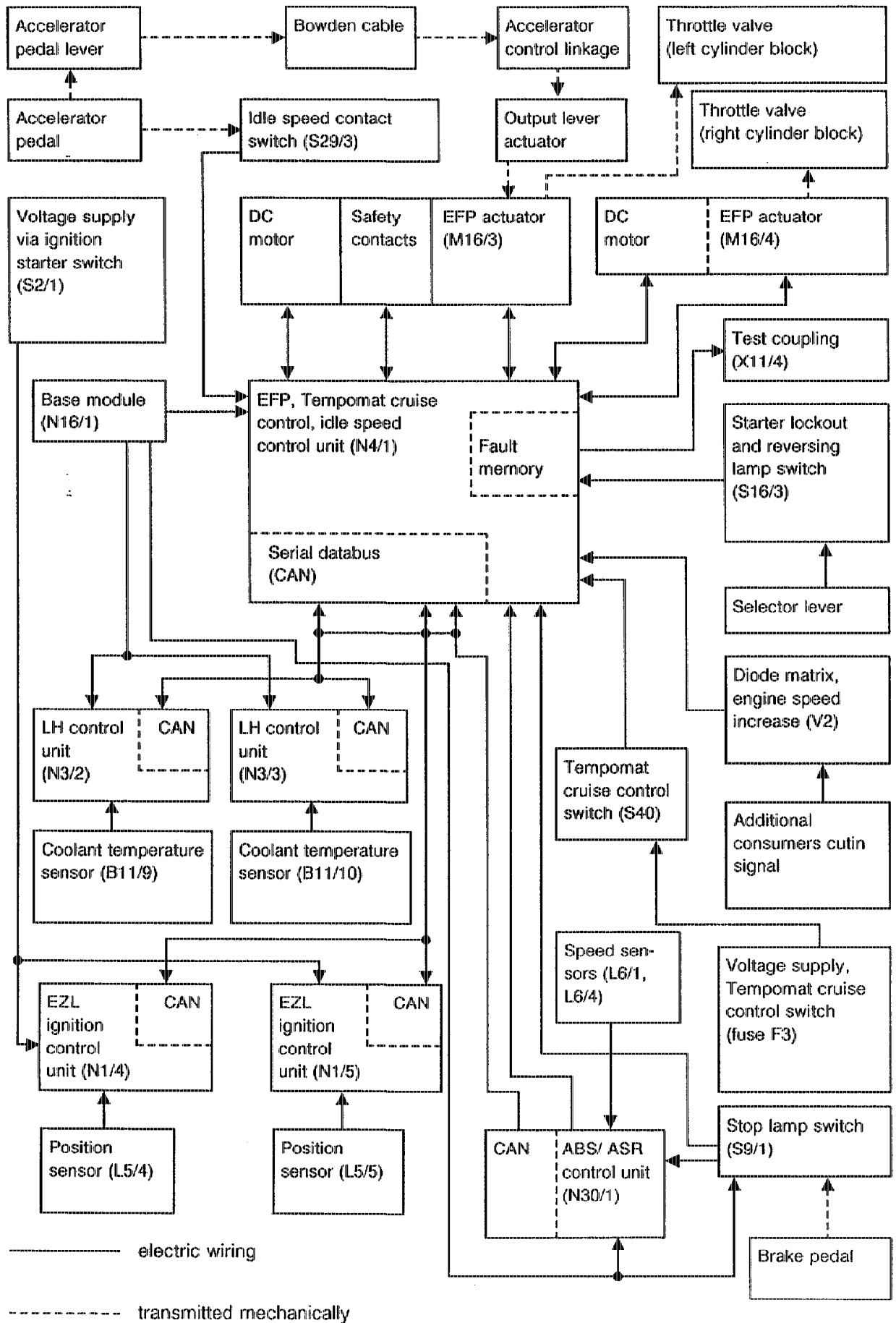
a) Engine 104



b) Engine 119



c) Engine 120



C. Function of electronic accelerator pedal

a) General

The following functions are integrated in the electronic accelerator pedal control unit

- idle speed control
- Tempomat cruise control
- electrical, electronic engine control (electronic accelerator pedal).

All the control processes as well as the mechanical positioning movements are performed with the electrical/electronic components in conjunction with the mechanical components. The electrical/electronic components are provided with the necessary voltage by the base module through the unfused terminal 87.

The following components supply signals to the electronic accelerator pedal control unit:

- base module
- ABS/ASR control unit
- LH control unit
- EZL ignition control unit
- idle speed contact switch
- electronic accelerator pedal actuator (with throttle valve body)
- stop lamp switch
- starter lockout and reversing lamp switch
- Tempomat cruise control switch
- A/C compressor cutin signal
- Data interchange via serial databus (CAN)
- Engine speed sensor
- Engine speed increase diode matrix (only on engines M119 and M120 in model 140)

The input signals are processed and monitored in the electronic accelerator pedal control unit. The following components are actuated with the output signals:

- electronic accelerator pedal actuator (with throttle valve body)
- ABS/ASR control unit
- LH control unit
- EZL ignition control unit
- pulse output (fault memory) via 38-pin diagnostic socket
- Data interchange via the serial databus (CAN)

The electronic accelerator pedal facility as well as the integrated idle speed control are activated when the ignition is switched on. The control unit recognizes the position of the accelerator pedal through the set point potentiometer in the actuator (M16/1, engine 120: M16/3 left bank of cylinders). The position of the throttle valve is signalled by the actual value potentiometer in the actuator.

On engine 120 the position of the throttle valve is signalled simultaneously by the actual value potentiometer in the actuator (M16/4, right bank of cylinders) to the control unit.

The control unit checks the signals and determines the position of the throttle valve by means of the output signal.

If the accelerator pedal is not depressed, the position of the throttle valve is specified before starting as a function of the coolant temperature (signal from LH control unit via the serial databus).

The opening angle of the throttle valve is limited over the entire control range (from idle speed stop to full throttle stop) by the electronic accelerator pedal control unit for idle speed control.

The position of the accelerator pedal (set point) is signalled from the actuator via the set point potentiometer to the control unit for the electronic accelerator pedal facility.

The control unit assigns an output signal to this set point for controlling the actuator. The actuator and thus also the throttle valve hereby adopt a position corresponding to the set point. The accelerator control linkage is connected to the output lever and to the internal spring capsule by a loose connection with the throttle valve. On engine 120 the actuator (M16/4) does not have any connection to the accelerator control linkage. The throttle valve is adjusted in this case only by the electrical/electronic actuation.

The opening angle of the throttle valve corresponds to the entered set point as a result of which a certain torque is transmitted by the engine to the driving wheels. If the set point entered (accelerator pedal deflection) is higher than the driving torque which can be transmitted to the road, this means that the wheels spin (slip). This slip is detected by the ABS/ASR control unit and passed as a signal (throttle valve reduction) via the serial databus to the electronic accelerator pedal control unit. In addition, in order to immediately reduce engine torque, the ignition timing is retarded by means of a signal from the serial databus to the ignition control unit.

The driving torque is continuously reduced at excessive throttle until the slip at the driving wheel drops below a specified level.

If slip occurs at the driving wheels when the throttle is eased back, this is likewise detected by the ABS/ASR control unit.

The signal (throttle valve increase) is likewise passed via the serial databus to the electronic accelerator pedal control unit. With this information, the driving torque can be varied so that no slip occurs at the driving wheels (engine drag torque control = MSR) and thus stabilizes the lateral control of the vehicle.

All in all, the electronic accelerator pedal facility enables the throttle valve to be varied between idle speed and full throttle or by means of ASR closed in idle speed direction or by means of MSR briefly opened slightly.

If excessive driving torque exists at the driving wheels (ABS control), the spiral spring in the spring capsule enables the actuator to move the throttle valve against the accelerator pedal position.

With an MSR control, the accelerator control (Bowden cable) permits an adjustment in the direction of the accelerator pedal to a slight extent.

The idle travel in the actuator (between spring capsule and control lever) is an emergency driving facility which allows the car to be driven with reduced engine output in the event of the electronics failing.

Features:

- Throttle valve always adjusted by the electrical/electronic facility.
- Tempomat cruise control is integrated in the electronic accelerator pedal control unit.
- Idle speed control is integrated in the electronic accelerator pedal control unit.
- Car can still be driven at reduced engine output in the event of the electrics/electronics failing.

b) Heating speed

Engine speed is increased each time it is started within a certain temperature range when the engine is idling (idle speed recognition) and selector lever is in position P or N (see table).

Engine	Temperature	Time	Engine speed
M104	< +20 °C	approx. 20 seconds	1100 ± 100/min
M119	+20 °C – +30 °C	approx. 20 seconds	1000 ± 100/min
M120	+20 °C – +30 °C	approx. 25 seconds	850 $\begin{matrix} + 100 \\ - 50 \end{matrix}$

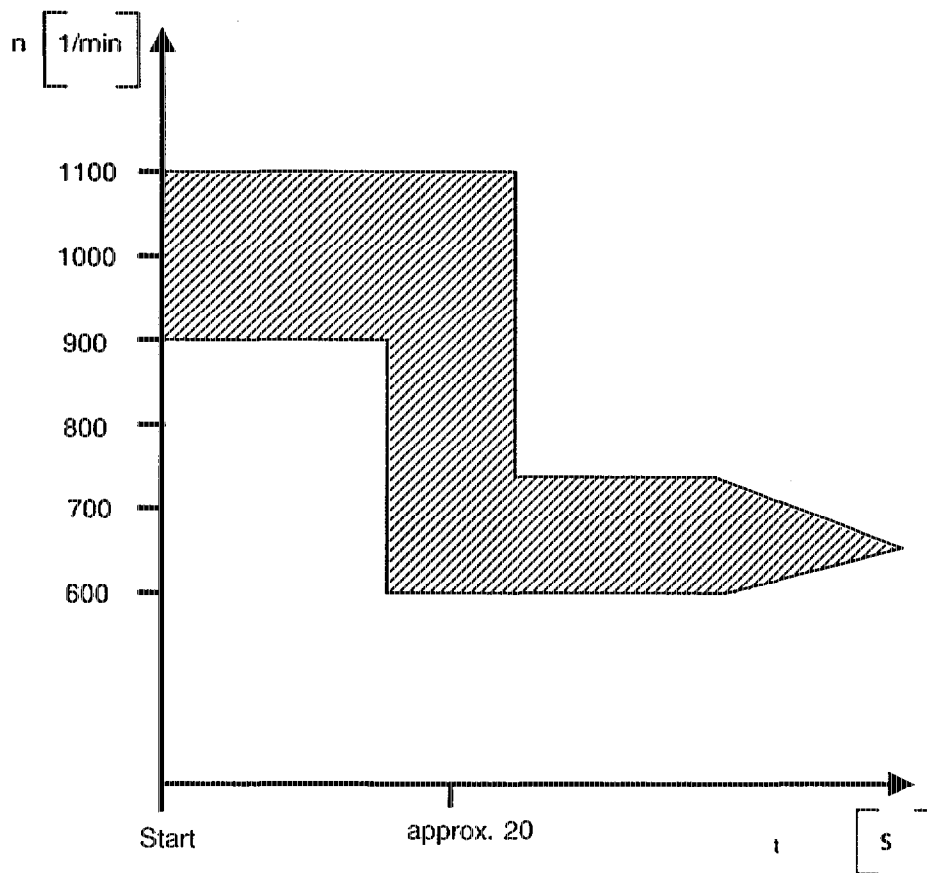


Diagram refers to 20 °C coolant temperature (simulated) and selector lever position P/N.
Shown on engine 119 in model 140

c) Engine speed increase/engine speed stabilization

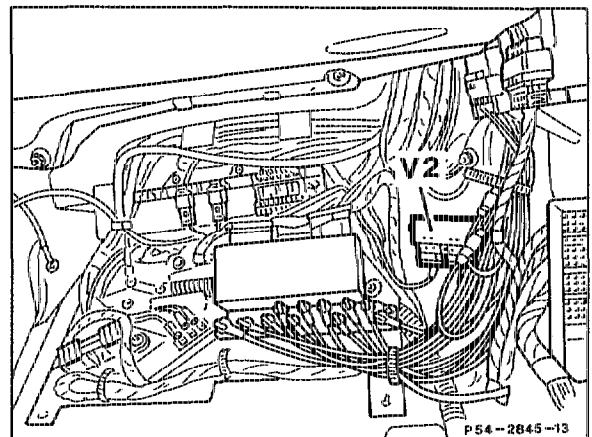
Engine 104 and engine 119 in model 124 on vehicles with A/C compressor have an engine speed stabilizer for the A/C compressor. Engine 119 in model 140 and engine 120 have an engine speed increase diode matrix for various electrical components (e. g. A/C compressor, seat heaters, heated rear screen).

Engine speed increase diode matrix

When additional electrical components are switched on, the on signal is also passed to the engine speed increase diode matrix. The signal is then passed on to the electronic accelerator pedal control unit. This signal is analyzed in the idle speed control assembly. The signal for increasing idle speed is only active if no idle speed recognition exists from the set point potentiometer and a given specified speed has been exceeded. When the vehicle next stops, the engine then idles at a slightly increased speed. The engine speed increase is only cancelled once the input signal from the diode matrix no longer exists and no idle speed recognition is detected. Engine speed increase is not active when selector lever is in position P and N.

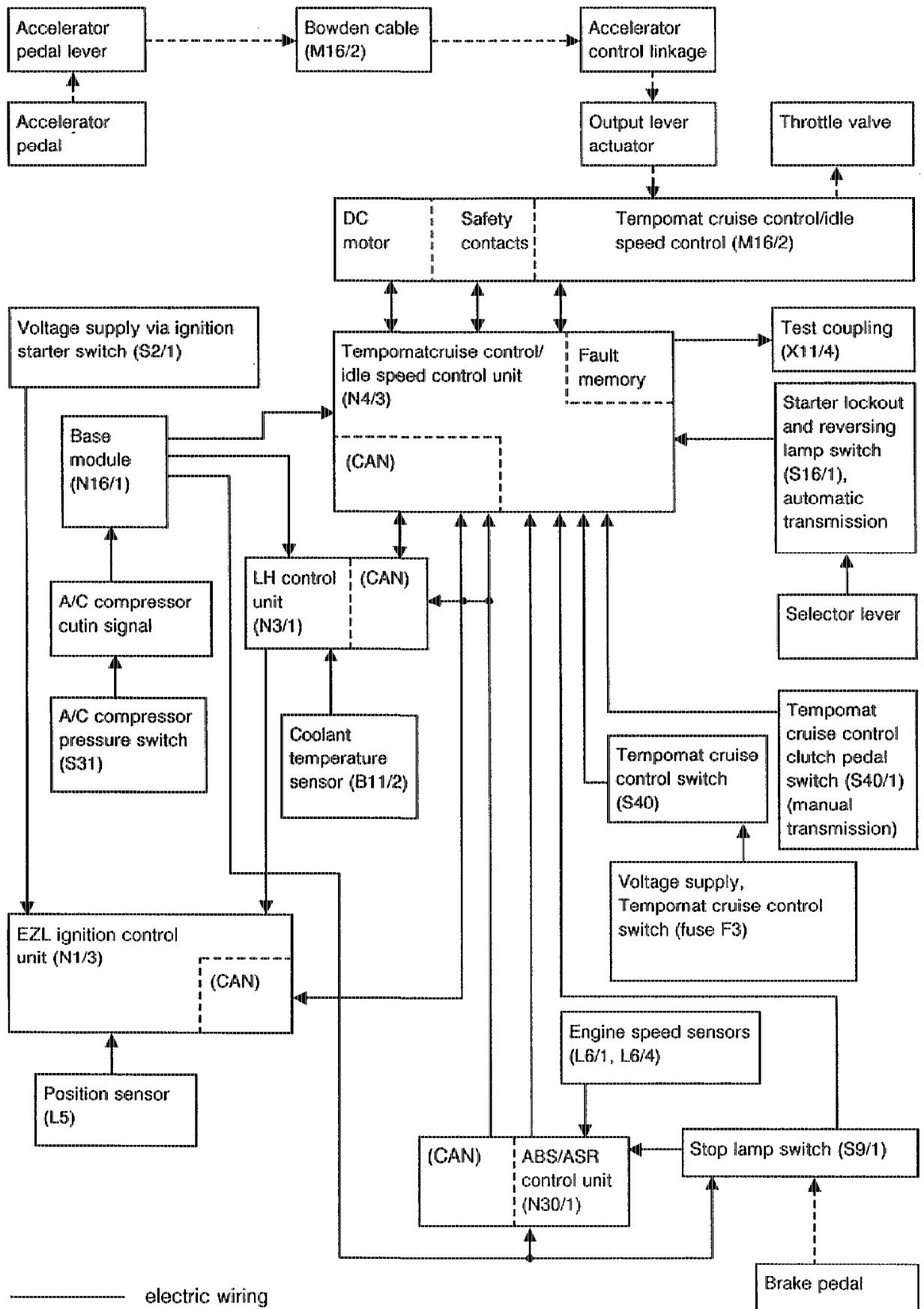
Engine speed stabilization on engines with A/C compressor

When A/C compressor cuts in, voltage is supplied to the electronic accelerator pedal control unit or at the Tempomat cruise control/idle speed control unit. In this case, the cutin signal is fed via the base module (approx. 350 ms) into the electronic accelerator pedal or Tempomat cruise control/idle speed control unit. The control unit processes the voltage supplied and passes an appropriate signal to the set point selector. The opening cross section is enlarged before the A/C compressor cuts in so that idling speed remains at an approximately constant level.



D. Block diagram Tempomat cruise control/idle speed control

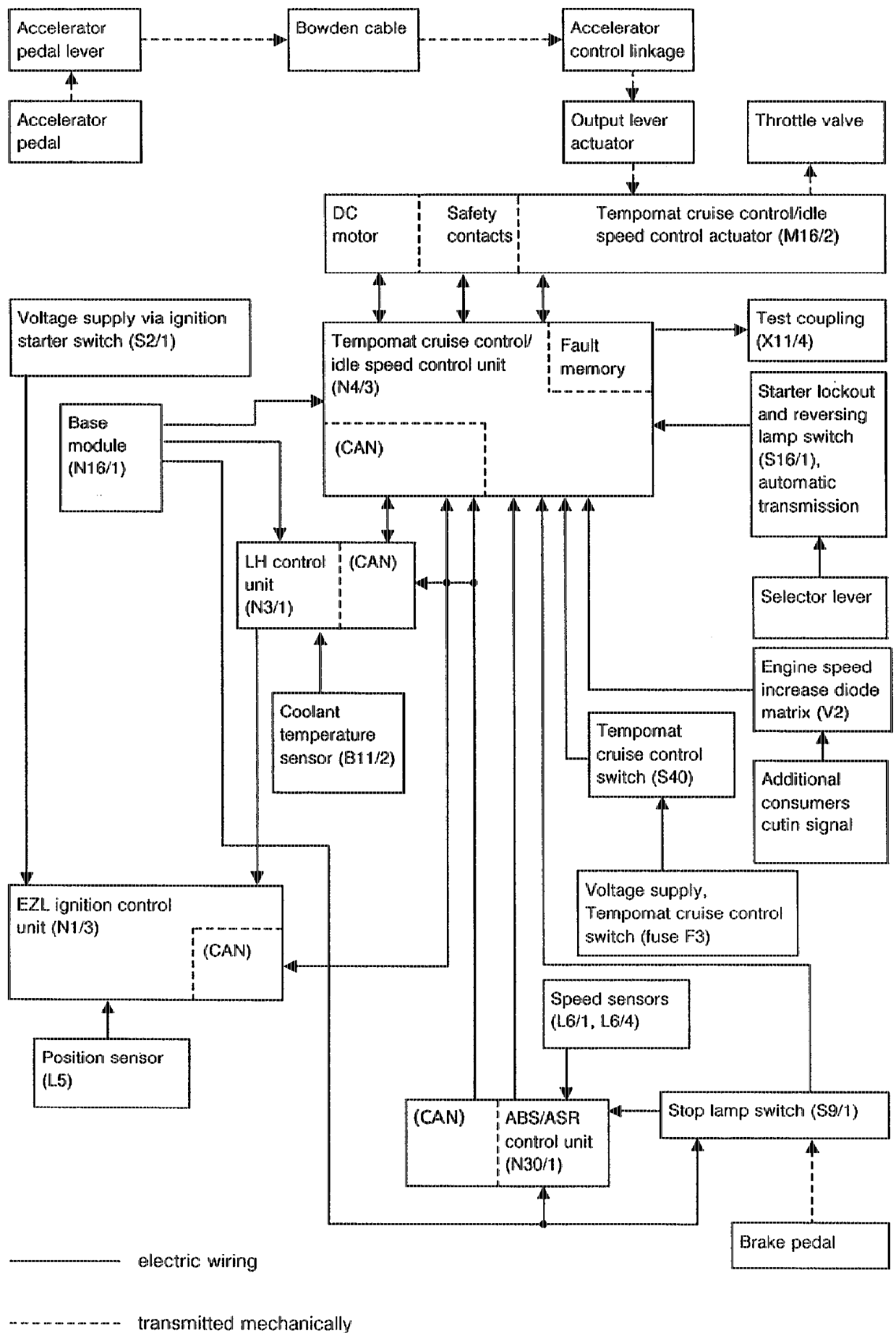
a) Engine 104



————— electric wiring

- - - - - transmitted mechanically

b) Engine 119 in model 140



E. Function of Tempomat cruise control/idle speed control (engines 104, 119 in model 140)

The functions of

- idle speed control
- Tempomat cruise control

are integrated in the control unit.

The control processes for idle speed control and Tempomat cruise control are performed with the electrical/electronic components in conjunction with the mechanical components.

The electrical/electronic components are supplied with the necessary voltage by the base module through unfused terminal 87.

The following components supply signals to the electronic accelerator pedal control unit:

- base module
- ABS/ASR control unit
- LH control unit
- EZL ignition control unit
- Tempomat cruise control/idle speed control actuator (with throttle valve body)
- Stop lamp switch
- starter lockout and reversing lamp switch (automatic transmission only)
- clutch pedal switch (manual transmission only)
- Tempomat cruise control switch
- A/C compressor cutin signal
- data interchange via the serial databus (CAN)
- engine speed sensor

The input signals are processed and monitored in the Tempomat cruise control/idle speed control unit. The following components are actuated with the output signals:

- Tempomat cruise control/idle speed control actuator (with throttle valve body)
- LH control unit
- EZL ignition control unit
- pulse output (fault memory) via 38-pin diagnostic socket
- data interchange via the serial databus (CAN)

The idle speed control facility is activated when the ignition is switched on. The position of the throttle valve for idle speed is fixed via the drive potentiometer by the control unit. The position of the throttle valve is signalled by the actual value potentiometer.

The Tempomat cruise control/idle speed control unit checks the signals and determines the position of the throttle valve by means of the output signal. The position of the throttle valve is specified before starting as a function of coolant temperature (signal from LH control unit via the serial databus). The control range of the throttle valve for idle speed control (i. e. opening angle) is limited by the Tempomat cruise control/idle speed control unit.

F. Function of idle speed control

Idle speed is controlled by the electronic accelerator pedal control unit or by the Tempomat cruise control/idle speed control unit. The following information is required for this process:

- engine speed (TNA)
- coolant temperature
- road speed signal
- automatic transmission selector lever position
- A/C compressor cutin signal
- clutch signal (only M104 with manual transmission)
- additional consumers cutin signal (engine speed increase diode matrix)

An output signal is passed to the set point selector in the idle speed control assembly as a function of the input signal supplied. The set point selector analyzes the idle speed signal in conjunction with the other signals received. The position controller and the serial databus (CAN) are actuated with the output signals. The signals are checked by the monitoring device and the output stage is actuated via the release/shutoff device and the position of the throttle valve thus determined.

An information exchange takes place via the serial databus between the electronic accelerator pedal control units or Tempomat cruise control/idle speed control unit, LH control unit and EZL ignition control unit.

The electronic accelerator pedal control unit or Tempomat cruise control/idle speed control unit fixes the set speed.

If a control deviation exists, the idle speed control is assisted by the ignition control unit by altering the ignition timing. The ignition timing can be retarded as a result up to approx. 20°.

In addition, the LH control unit is supplied with information by means of the signal from the databus from which the LH control unit determines the required injection time. At idle speed and when the vehicle is stationary (road speed signal = 0), the control unit automatically calculates the air throughput in line with the operating state of the engine (e. g. coolant temperature, selector lever position).


This ensures that optimal idling speed stability is maintained in all operating conditions.

Idling speed is controlled continuously as a function of the coolant temperature (see table as reference point).

Coolant temperature °C	Drive position without gear 1/min			Drive position with gear 1/min		
	Engine 104	Engine 119	Engine 120	Engine 104	Engine 119	Engine 120
< 0	900–1000	800–900	800–1000	800–900	750–850	700–900
> 0 ≤ 30	900–1000	700–800	750–900	800–900	650–750	650–800
> 30 ≤ 40	--	650–700	750–900	--	550–650	650–800
> 40	--	650	600–750	--	500	500–650
45	750–850	--	--	650–750	--	--
60	700–800	--	--	600–700	--	--
≥ 75	650–700	--	--	550–650	--	--

The idling speeds with and without gear differ. They are determined by the electronic accelerator pedal control unit or Tempomat cruise control/idle speed control unit in line with the selector lever position.

G. Notes regarding towing vehicle, test and repair work

- Pay attention to the following points in respective vehicles with ABS/ASR for the operation item "Testing engine output and emissions":
 - Ignition off.
 - Bridge between contacts 6 and 1 at test coupling (X11/4). ABS/ASR control unit thus in diagnostic mode.
 - Ignition on, test engine output and emissions. The ABS/ASR indicator lamps light up so long as the diagnostic mode is activated.
 - Switch off ignition. Remove bridge.
- Actuator plug connection watertight. It must **only be opened** for the test operations specified in the test programme.
- Cleaner or contact spray must **not** be used on the actuator plug connection.
- Electronic accelerator pedal control unit or Tempomat cruise control/idle speed control unit is **not** fused.
- Pay attention to the following points when performing welding work with electrical welding torch:
 - Disconnect negative terminal of battery.
 - Connect ground terminal of welding equipment **directly** to the part to be welded.
- Should it be necessary to increase engine speed when performing test and adjustment operations on the engine, this should be done directly at the accelerator pedal. If engine speed is increased at the accelerator control linkage in the engine compartment, the system will switch to emergency running and a fault will be stored in the fault memory.
 - 
 - With ignition ON, engine running and vehicle stationary, the processor in the control unit performs programming to the special throttle valve angle (idle speed position) of the engine. The correction variables are thus calculated and re-stored. It is not possible to install control units from other vehicles as a check.