

G. Idle speed devices

The following idle speed devices are installed:

Idle speed device	Engine	Features
Idle speed stabilization	102.961 Std. (AUS) (CH) (S)	Auxiliary air valve and additional bypass valves with air conditioner and with automatic transmission
	102.962 Std. (CH) (S) without AC compressor	
Electronic idle speed control	102 except 102.961/962 Std. (see above)	Electronic idle speed control integrated in KE control unit Idle speed adjuster depending on version designed as double-winding rotary positioner (3-pin connection) or as single-winding rotary positioner (2-pin connection)
	103, 104	Electronic idle speed control integrated in KE control unit Single-winding rotary positioner (2-pin connection)
	116, 117	Electronic idle speed control in separate control unit Idle speed adjuster designed as impact plate positioner
	119	Electronic idle speed control integrated in KE control unit Idle speed adjuster designed as impact plate positioner

The idle air quantity is tapped via the idle air duct downstream of the air flow sensor plate.

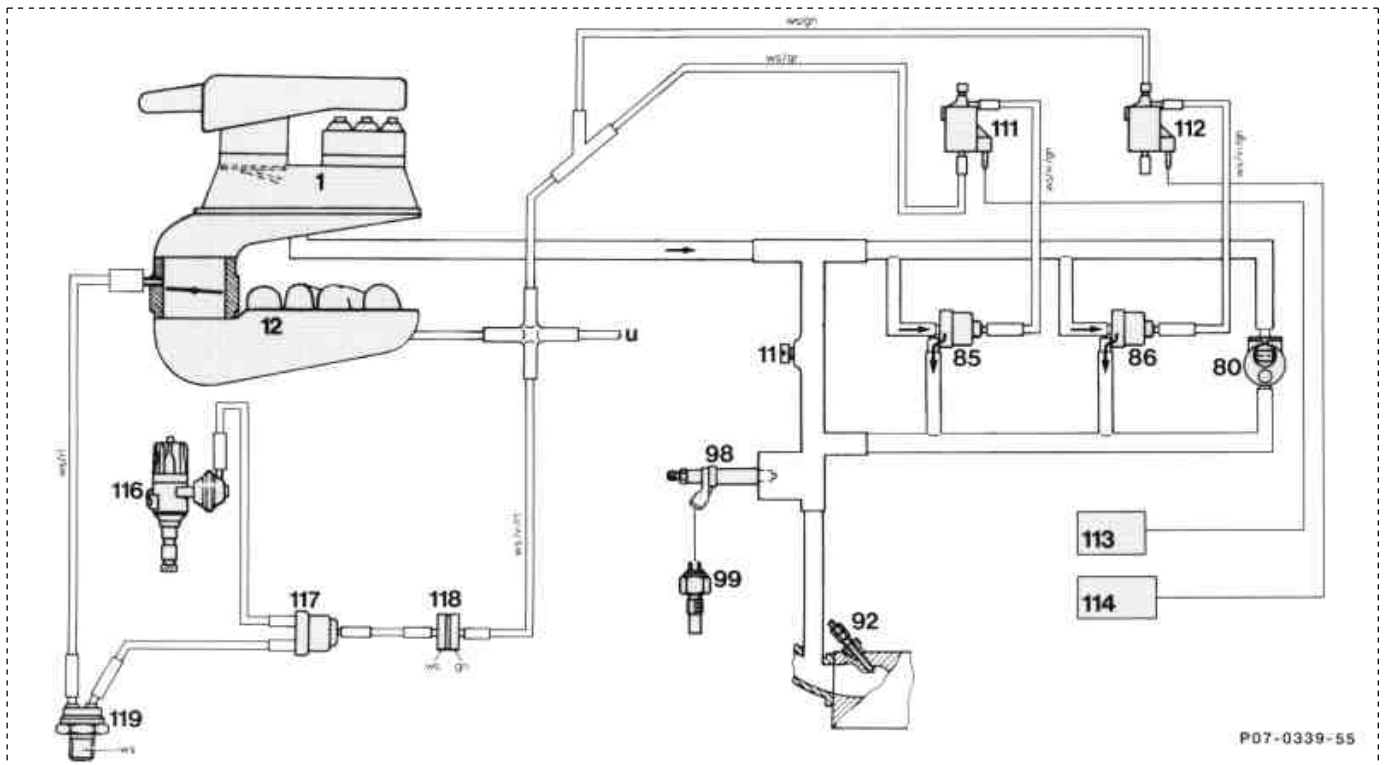
As a result of this layout, the idle air quantity is measured by the air flow sensor and the appropriate quantity of fuel metered by the fuel distributor.

Depending on the idle speed device, the idle speed adjuster or the auxiliary air valve with bypass valves are positioned in the idle air duct. The idle air quantity and thus the idling speeds are influenced by the cross-section of their opening.

The idle speed devices perform the following tasks:

- Enriching the mixture in order to achieve stable idling when engine cold. This overcomes the increased friction.
- Preventing uncontrolled changes in engine speed resulting from additional engine loads such as power steering at full lock, AC compressor switched on or Drive mode engaged with automatic transmission.
- Achieving minimal fuel consumption when engine idling.
- Warming up engine more rapidly by means of fast idling.
- The idle speed control prevents excessive engine speed, e.g. when engine warm.
- Idle speed control eliminates the need for adjusting idle speed. Compensates for changes to the engine which influence idle speed.
- On vehicles with catalytic converter, idle speed is increased after each engine start for about 30 seconds (heating speed for heating up catalytic converter).

a) Idle speed stabilization
(engine 102.961 Std. ^(AUS) ^(CH) ^(S) and
102.962 Std. ^(CH) ^(S) without AC compressor)



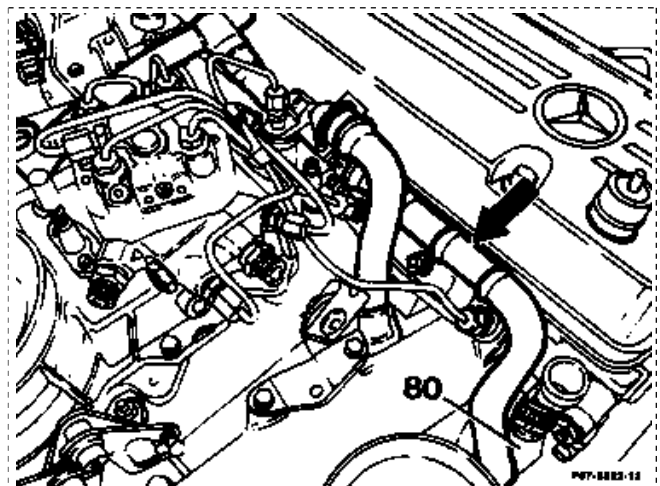
Function diagram of idle speed stabilization on engines with AC compressor and automatic transmission

1	Mixture control unit	113	Selector lever position (automatic transmission)
11	Idle speed air screw	114	Air conditioner temperature slide control
12	Intake manifold	117	Non-return valve
80	Auxiliary air valve	118	Restriction
85	Bypass valve (yellow), automatic transmission	119	Thermo valve (colour code white)
86	Bypass valve (white), AC compressor	U	Vacuum supply for further consumers
92	Injection valve		
98	Start valve		
99	Thermo time switch		
111	Electric switchover valve (engine speed increase, automatic transmission)		
112	Electric switchover valve (engine speed increase, AC compressor)		

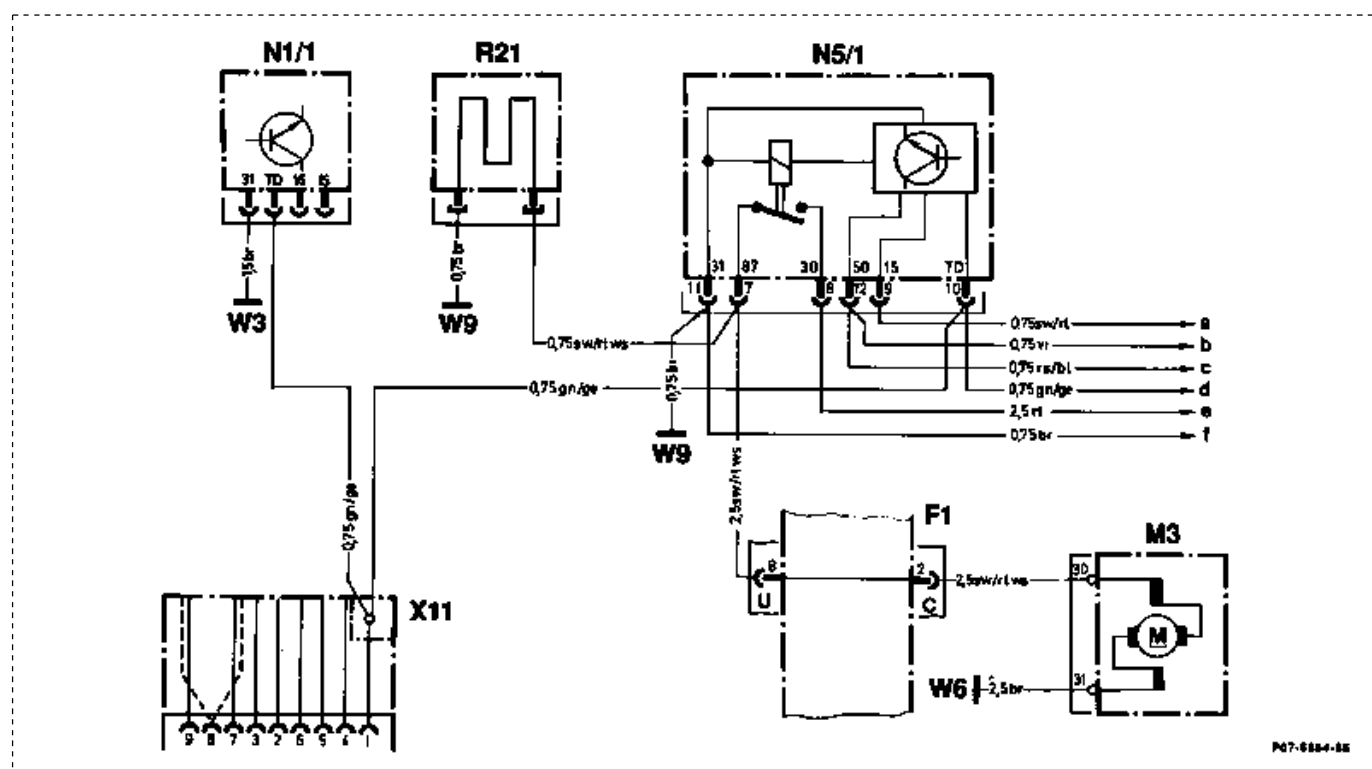
	Colours of cables
gn	green
gr	grey
rt	red
vi	violet
ws	white

Auxiliary air valve

The auxiliary air valve (80) is positioned on the left of the engine, below the intake manifold to cylinder 4.

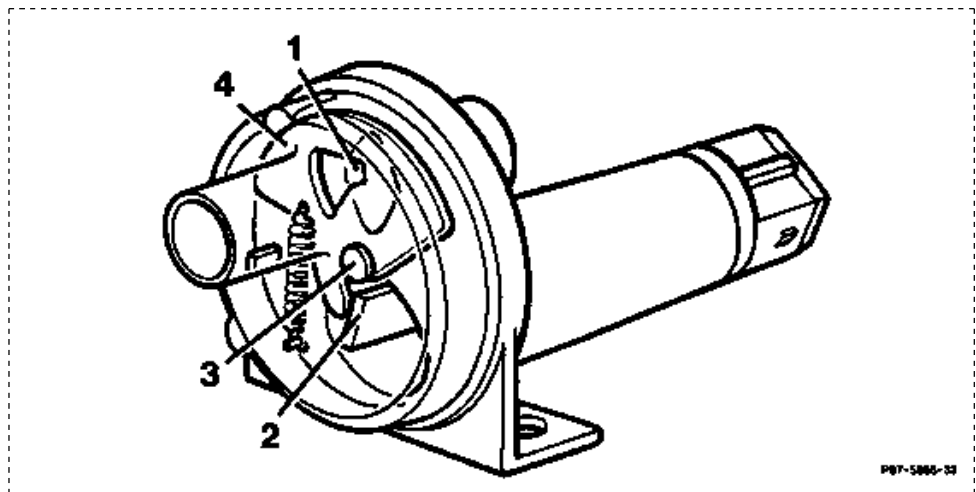


- 1 Air duct
- 2 Bimetal spring
- 3 Heating coil
- 4 Orifice plate



F1	Electrical centre	X11	Diagnostic socket/terminal block, terminal TD
M3	Fuel pump	a	Electrical centre, coupling U, contact 5
N1/1	TSZ ignition control unit		(terminal 15)
N5/1	Fuel pump relay	b	Cable connector, engine harness, terminal 50
R21	Auxiliary air valve heating coil	c	KE control unit, contact 24
W3	Ground, at front left wheelhouse (ignition coil)	d	KE control unit, contact 25
W6	Ground, left wheelhouse in trunk	e	Electrical centre, terminal 30
W9	Ground, at front left headlamp unit	f	Ground, nozzle heater windshield washer system

An orifice plate (4) controls the opening cross-section in the auxiliary air valve. The orifice plate (4) is operated by a bi-metal spring (2). The opening cross-section of the orifice plate adopts a position dependent on the temperature of the bimetal spring so that an appropriately large cross-section is open during cold start, which is constantly reduced as engine temperature rises. A slight quantity of leak air is permissible when the engine is at normal operating temperature.

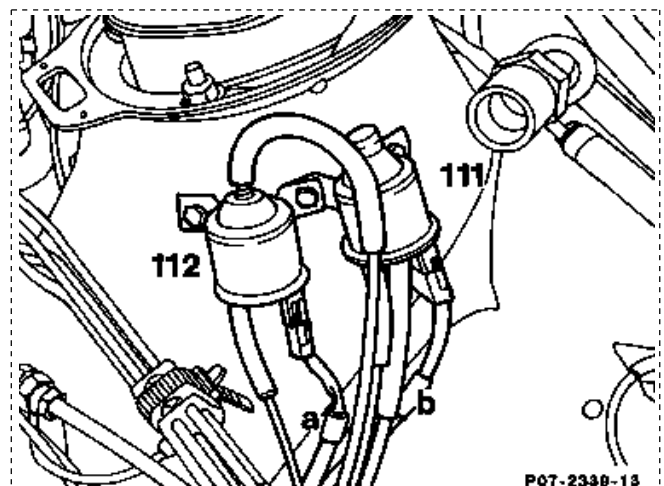


- 1 Air duct
- 2 Bimetal spring
- 3 Pivot shaft
- 4 Orifice plate

Idle speed stabilization with automatic transmission and AC compressor

Engines with automatic transmission

Idle speed stabilization is performed by means of the electric switchover valve (Y12) and the bypass valve (85). When the selector lever is in positions P or N, voltage is supplied to the electric switchover valve. When a Drive mode is engaged, the voltage at the electric switchover valve drops. The bypass valve (85) is supplied with vacuum from the intake manifold and opens. A greater quantity of metered air is inducted by the engine, bypass in the throttle valve, and idling speed is stabilized at approx. 50/min below idling speed.



Location of electric switchover valves

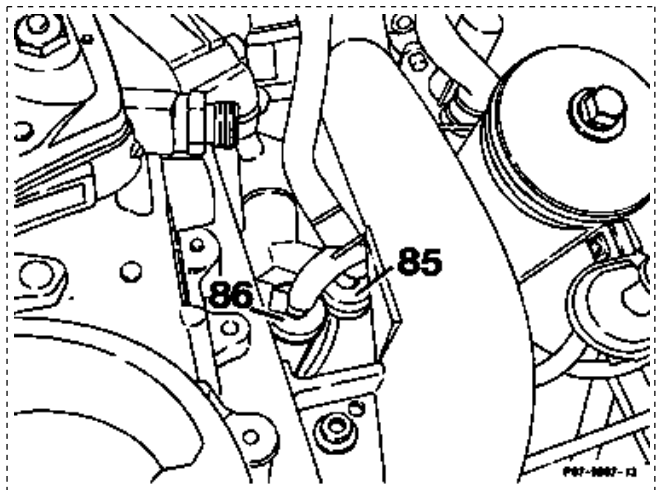
Y12 Automatic transmission switchover valve

Y14 AC compressor switchover valve

Identification on wiring harness:

a Air conditioner, red

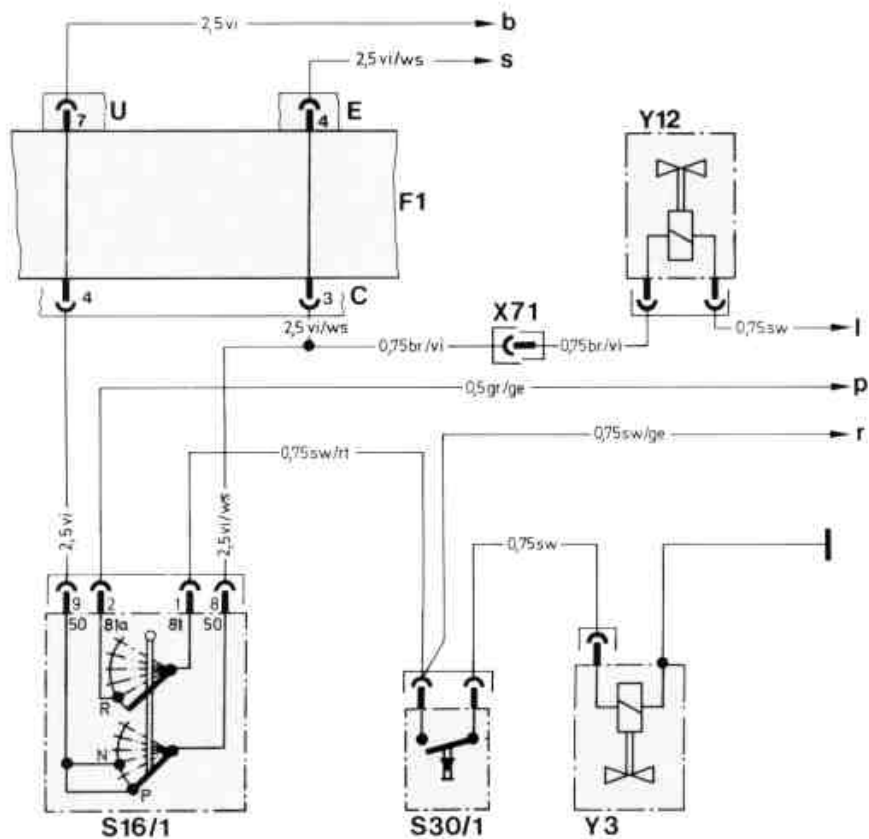
b Automatic transmission, yellow



Location of bypass valves below intake manifold to cylinder 4

85 Bypass valve (yellow), automatic transmission

86 Bypass valve (white), AC compressor



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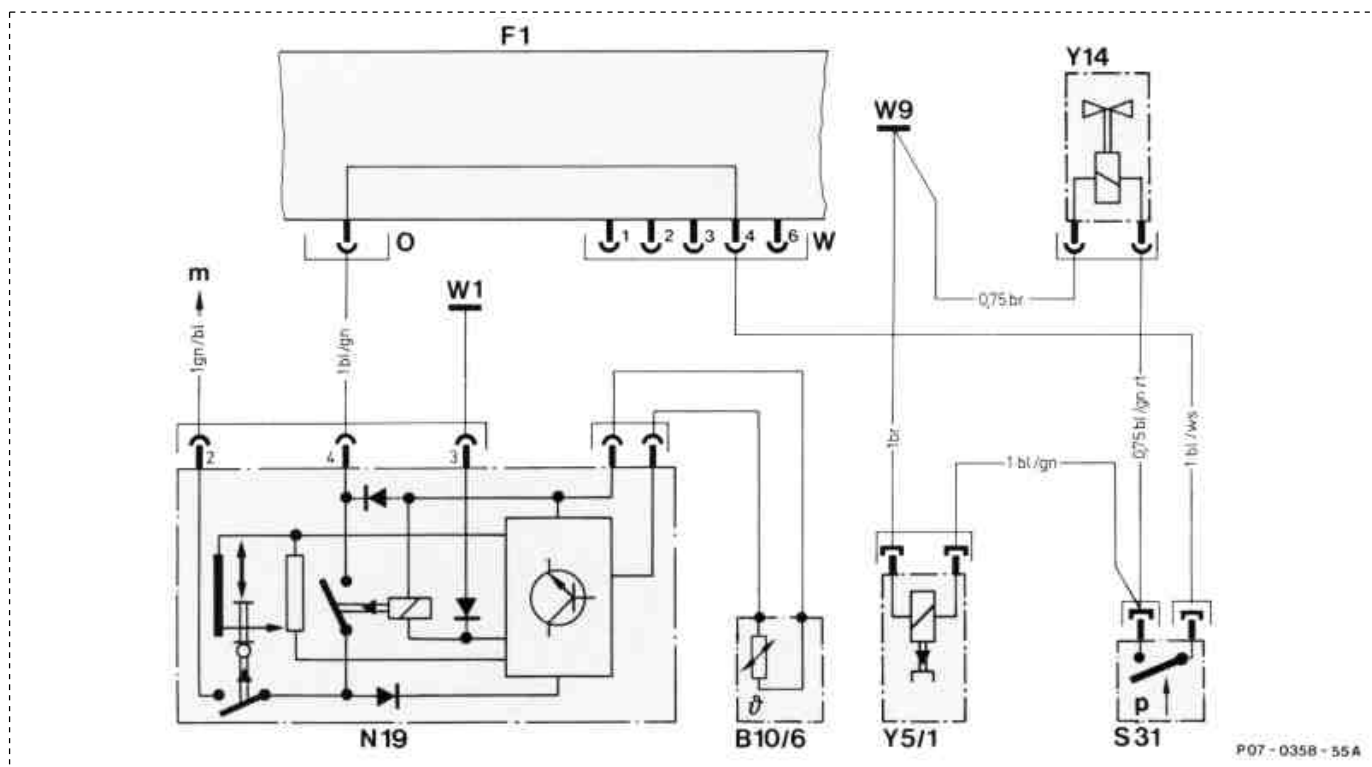
Actuation of automatic transmission

F1	Electrical centre	Y12	Engine speed increase switchover valve
M5	Engine ground	b	Terminal block, engine, terminal 50
S16/1	Starter lock-out and reversing lamp switch	I	Terminal block X5/1, terminal 15
S30/1	Kickdown switch	p	Reversing lamp, contact 4
X71	Plug connection, engine speed stabilization switchover valve	r	Stop lamp switch
Y3	Automatic transmission kickdown valve	s	Terminal 50 (ignition lock)

Engines with AC compressor

Idle speed stabilization is performed via the electric switchover valve (Y14) and the bypass valve (86). When the AC compressor is operating, voltage is also supplied to the electric switchover valve in parallel to the electromagnetic clutch of the AC compressor. The bypass valve (85) is supplied with vacuum from the intake manifold and opens.

A greater quantity of metered air is inducted by the engine, bypass in the throttle valve, and idling speed increases to approx. 30/min above idling speed.



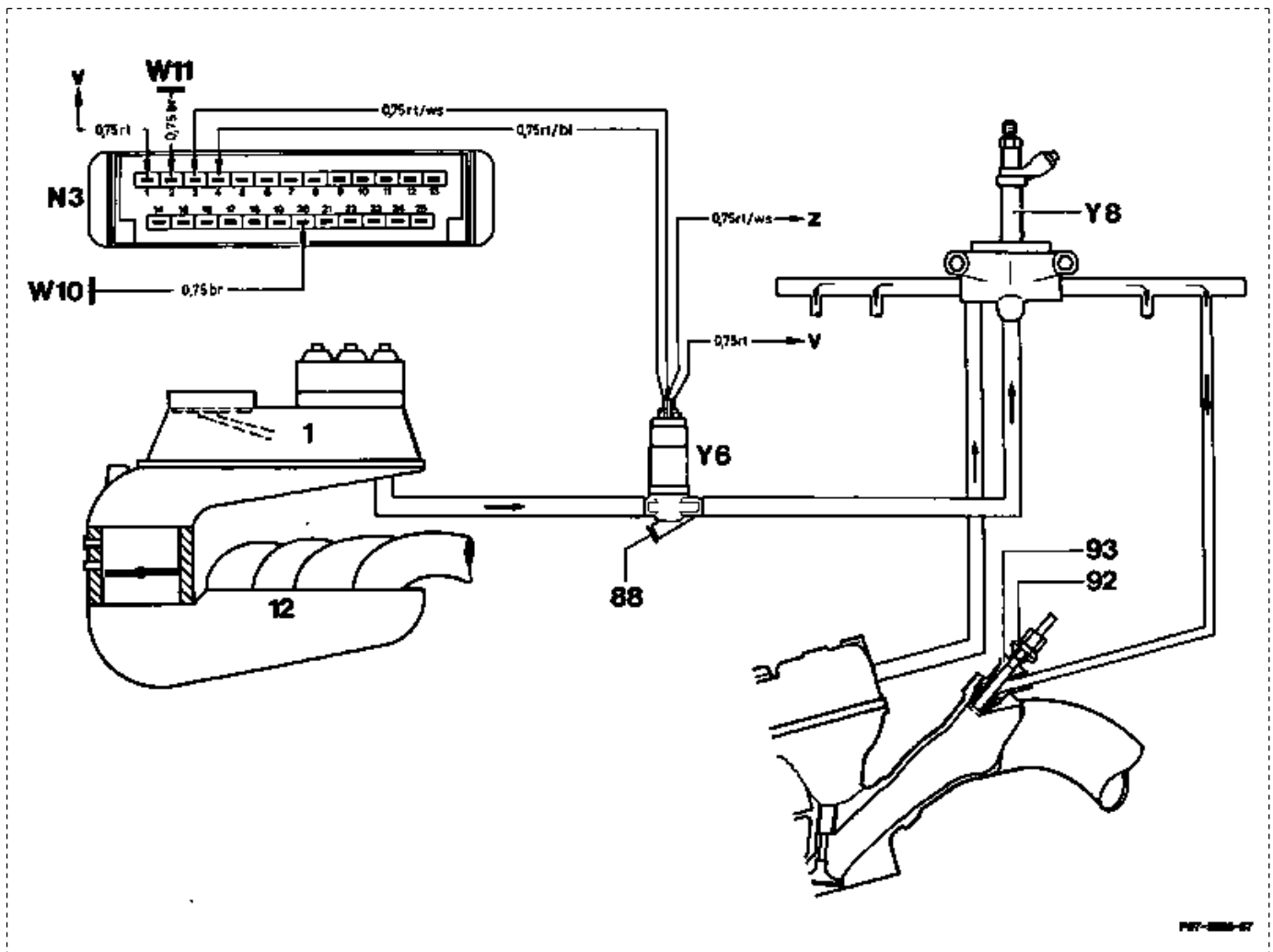
Actuation of AC compressor

B10/6	Evaporator temperature sensor
F1	Electrical centre
S31	AC compressor switch
N19	Temperature slide control
W1	Main ground point (instrument cluster)

W9	Ground, at front left headlamp unit
Y5/1	AC compressor electromagnetic clutch
Y14	Engine speed stabilization switchover valve
m	Blower switch, contact 3

b) Electronic idle speed control

- Engine 102.96/98 (KE 2) with double-winding rotary positioner



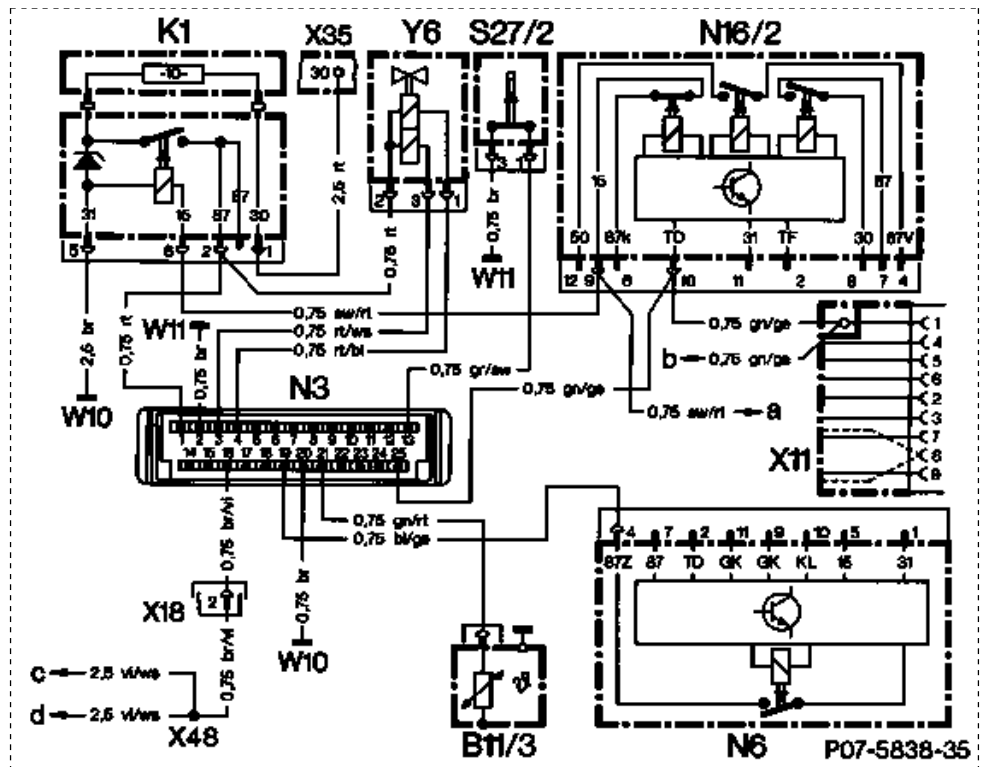
Function diagram of electronic idle speed control with double-winding rotary positioner

Example engine 102.983 Std.

N3	KE control unit	88	Adjusting screw
Y6	Idle speed adjuster (double-winding rotary positioner)	92	Injection valve
Y8	Start valve	93	Insulating sleeve
W10	Battery ground	v	Overvoltage protection relay, contact 2, terminal 87
W11	Engine ground (electric cable bolted on)	z	Idle speed adjuster test connection
1	Mixture control unit		
12	Intake manifold		

The idle speed control is integrated in the KE control unit but the operation is decoupled from the KE injection system.

The idle speed adjuster (46) is designed as a double-winding rotary positioner and is recognizable by the 3-pin connection.



Wiring diagram of electronic idle speed control

Example engine 102.962 Std. with AC compressor and automatic transmission

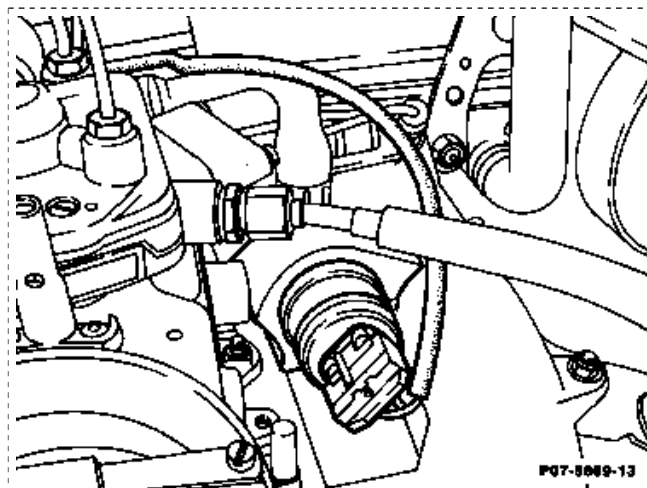
B11/3	Coolant temperature sensor	X18	Plug connection, tail lamp harness
K1	Overvoltage protection relay	X35	Terminal block, terminal 30/terminal 61 (battery)
N3	KE control unit	X48	Connector sleeve (soldered connector in harness)
N6	AC compressor cut-off control unit	Y6	Idle speed adjuster
N16/2	Fuel pump relay	a	Electrical centre (terminal 15)
S27/2	Deceleration cut-off microswitch	b	Ignition control unit (terminal TD)
W10	Battery ground	c	Electrical centre (terminal 50)
W11	Engine ground (electric cable bolted on)	d	Starter lock-out and reversing lamp switch
X11	Diagnostic socket/terminal block, terminal TD		

The idle speed control processes the following information:

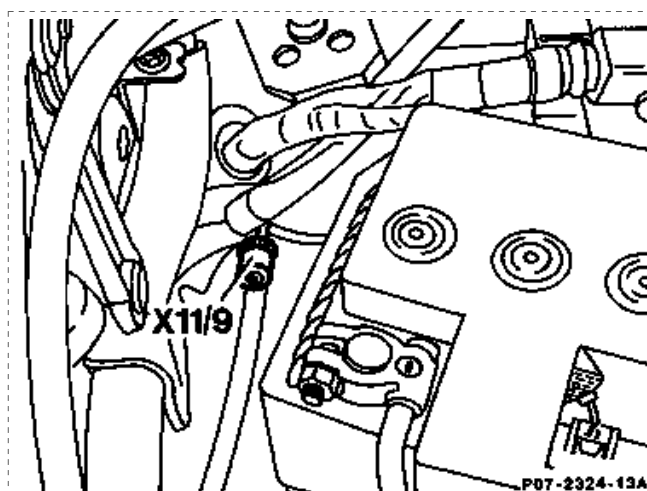
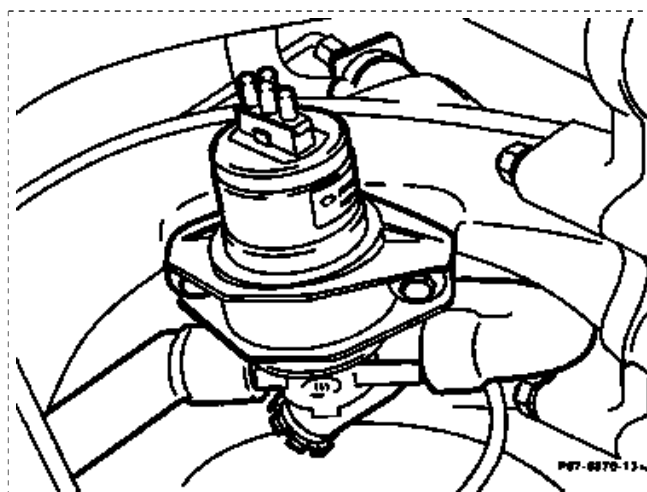
- Engine speed from terminal TD, necessary for set/actual speed comparison.
- Coolant temperature in order to control idle speed as a function of temperature.
Example engine 102.982 Std.:
approx. 1200/min at -30 °C
approx. 750/min at +70 °C
- Idle speed signal from the deceleration cut-off microswitch (S27/2) for idle speed recognition.
- Selector lever position in the case of automatic transmission. When engine running, engagement of Drive mode is recognized via terminal 50 and idle speed is lowered by approx. 100/min.
- AC compressor cut-in signal. The opening cross-section of the idle speed adjuster is enlarged shortly before the AC compressor is operated. Consequently, idle speed remains approximately constant.

Double-winding rotary positioner

The idle speed adjuster is located behind the mixture control unit on engines 102.96/982.



On engine 102.983 the idle speed adjuster is located below the intake manifold. As the idle speed adjuster is not easily accessible, a test connection (X11/9) is provided in the right of the component compartment for performing tests.

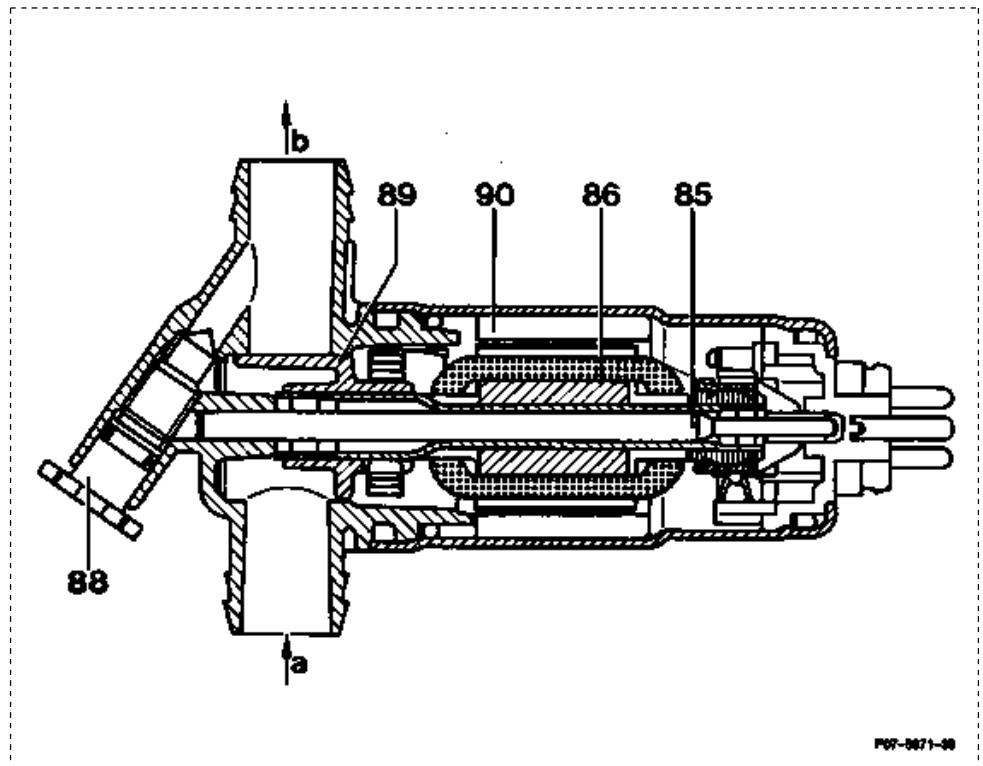


Engine 102.983

X11/9 Idle speed adjuster test connection

Double-winding rotary positioner

- 85 Shaft
- 86 Solenoid
- 88 Adjusting screw
- 89 Rotary valve
- 90 Permanent magnet
- a Air inlet
- b Air outlet



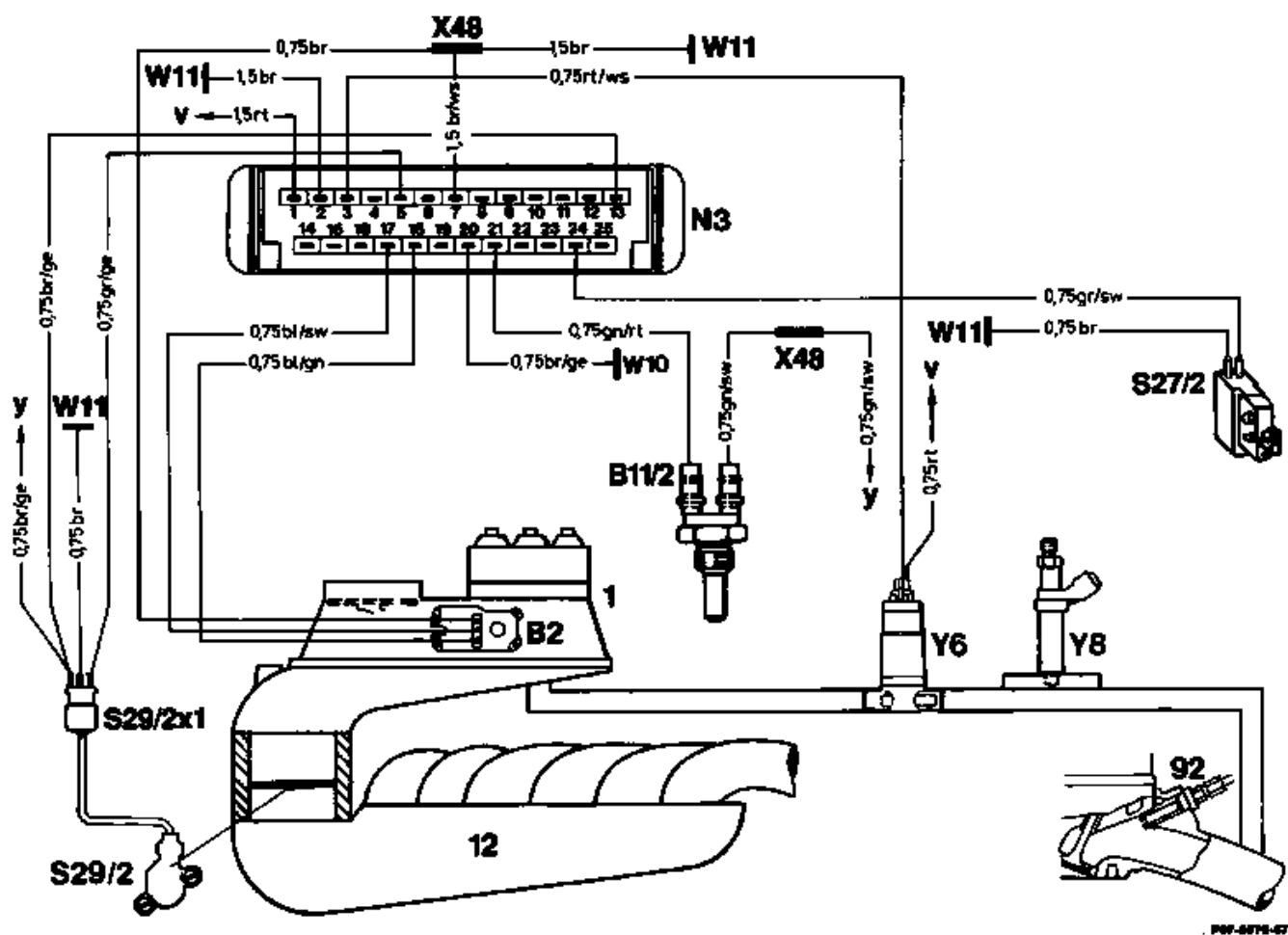
The idle speed adjuster has a rotary solenoid drive, consisting of two coils, the rotary armature, a torsion spring and a rotary valve. The position of the rotary valve attached to the armature shaft is determined by the two coils and the torsion spring.

The coils in the idle speed adjuster are actuated with a pulsed voltage signal. This produces at the armature a torque which counters the force of the torsion spring and opens a certain cross-section. The opening cross-section is altered by changing the dwell angle of the pulsed voltage.

The idle speed control compares the momentary actual engine speed with the stored set engine speed. If differences exist, the opening cross-section in the idle speed adjuster is altered until set and actual speed agree.

If the voltage supply of the idle speed adjuster is interrupted, the rotary valve is moved by the force of the torsion spring into a defined position and opens an emergency cross-section (fast idling). A slight correction can be performed with the adjusting screw (88) in the case of differences in idle speed (bypass air).

- Engines 102 (KE 3), 103, 104 with single-winding rotary positioner



Function diagram of electronic idle speed control with single-winding rotary positioner

Example engine 103

B2	Air flow sensor position indicator	Y6	Idle speed adjuster (single-winding rotary positioner)
B11/2	Coolant temperature sensor	Y8	Start valve
N3	KE control unit	1	Mixture control unit
S27/2	Deceleration cut-off microswitch	12	Intake manifold
S29/2	Throttle valve switch, idle speed/full load recognition	92	Injection valve
S29/2x1	Plug connection, throttle valve switch	v	Overvoltage protection relay, contact 2, terminal 87
W10	Battery ground	y	EZL ignition control unit
W11	Engine ground (electric cable bolted on)		
X48	Connector sleeve (soldered connector in harness)		

The idle speed control is integrated in the KE control unit, although operation is decoupled from the KE injection system. The idle speed adjuster is designed as a single-winding rotary positioner recognizable from the 2-pin connection.

The idle speed control processes the following information:

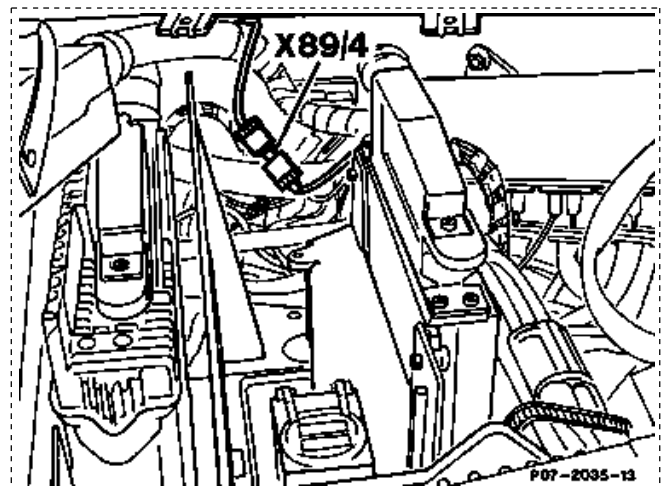
- Engine speed from terminal TD, necessary for set/actual engine speed comparison.
- Coolant temperature in order to control idle speed as a function of temperature.
Example engine 103 KAT/RÜF:
approx. 900/min at -30 °C
approx. 650/min from +70 °C
- Idle speed recognition.
Idle speed signal from the deceleration cut-off microswitch (S27/2) or, with ASR, from the electronic accelerator pedal control unit.
- Road speed signal.
Indefinite production breakpoint as of approx. 09/88 in the case of engine 102, as of approx. 09/87 for engine 103 or as of start of production for engine 104, a road speed signal is supplied to the KE control unit (see section "Functions in KE control unit"). As a result of this signal, the idle speed control is deactivated from a speed of approx. 1.4 km/h. This improves handling in the deceleration mode. The idle speed control is re-activated below 1.4 km/h.

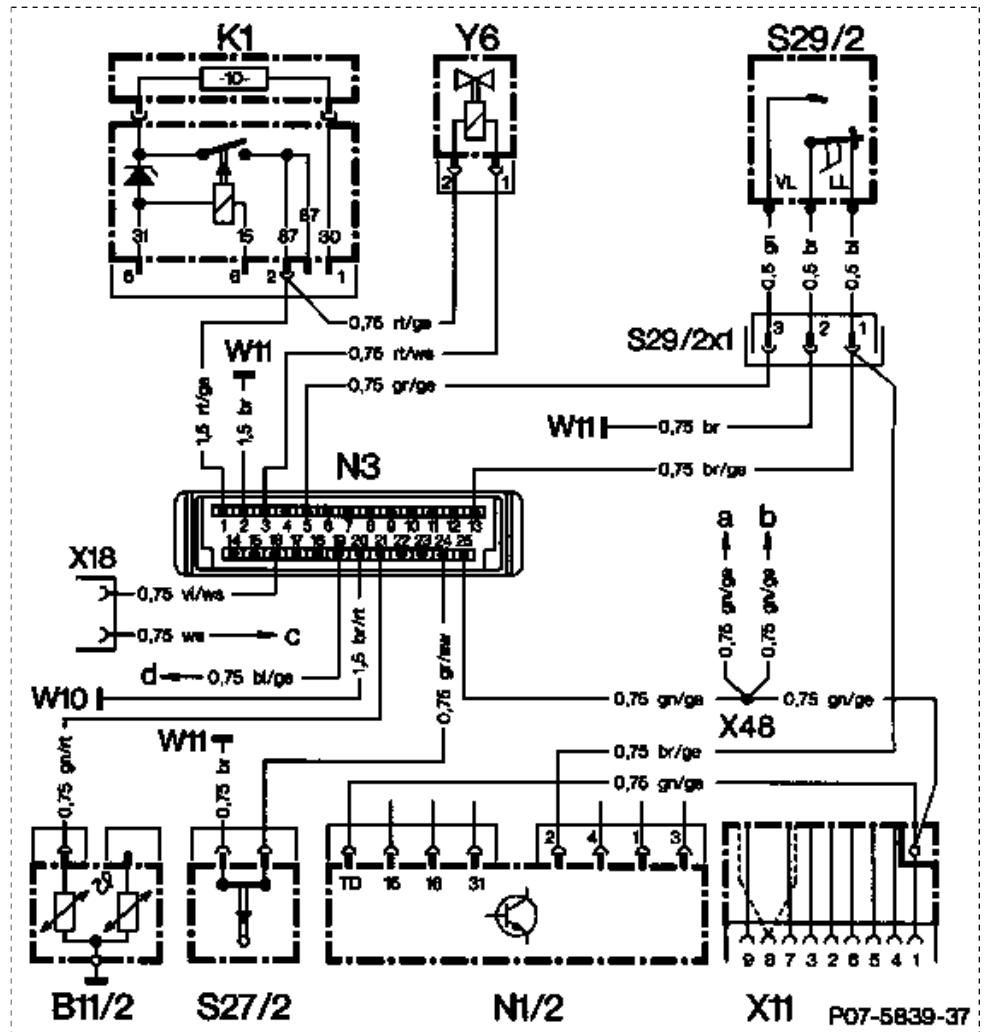
- Signal from air flow sensor position indicator in the case of engines 102, 103.
Necessary for recognizing the momentary air throughput. Idle speed is determined as a function of engine speed, idle speed recognition and coolant temperature.
- Selector lever position in the case of automatic transmission.
When the engine is running, engagement of a Drive mode is recognized via terminal 50 and idle speed reduced by approx. 100/min.
- AC compressor cut-in signal.
The opening cross-section of the idle speed adjuster is enlarged shortly before the AC compressor cuts in. Consequently, idle speed remains approximately constant.

Vehicles with ASR

The signal for deceleration cut-off/idle speed recognition is formed by the position sensor (R25) and input to the KE control unit via the electronic accelerator pedal control unit. The separation point between the control units is the plug connection (X89/4).

On vehicles with ASR, the deceleration cut-off microswitch (S27/2) is not fitted. The cable is tied back in the harness.

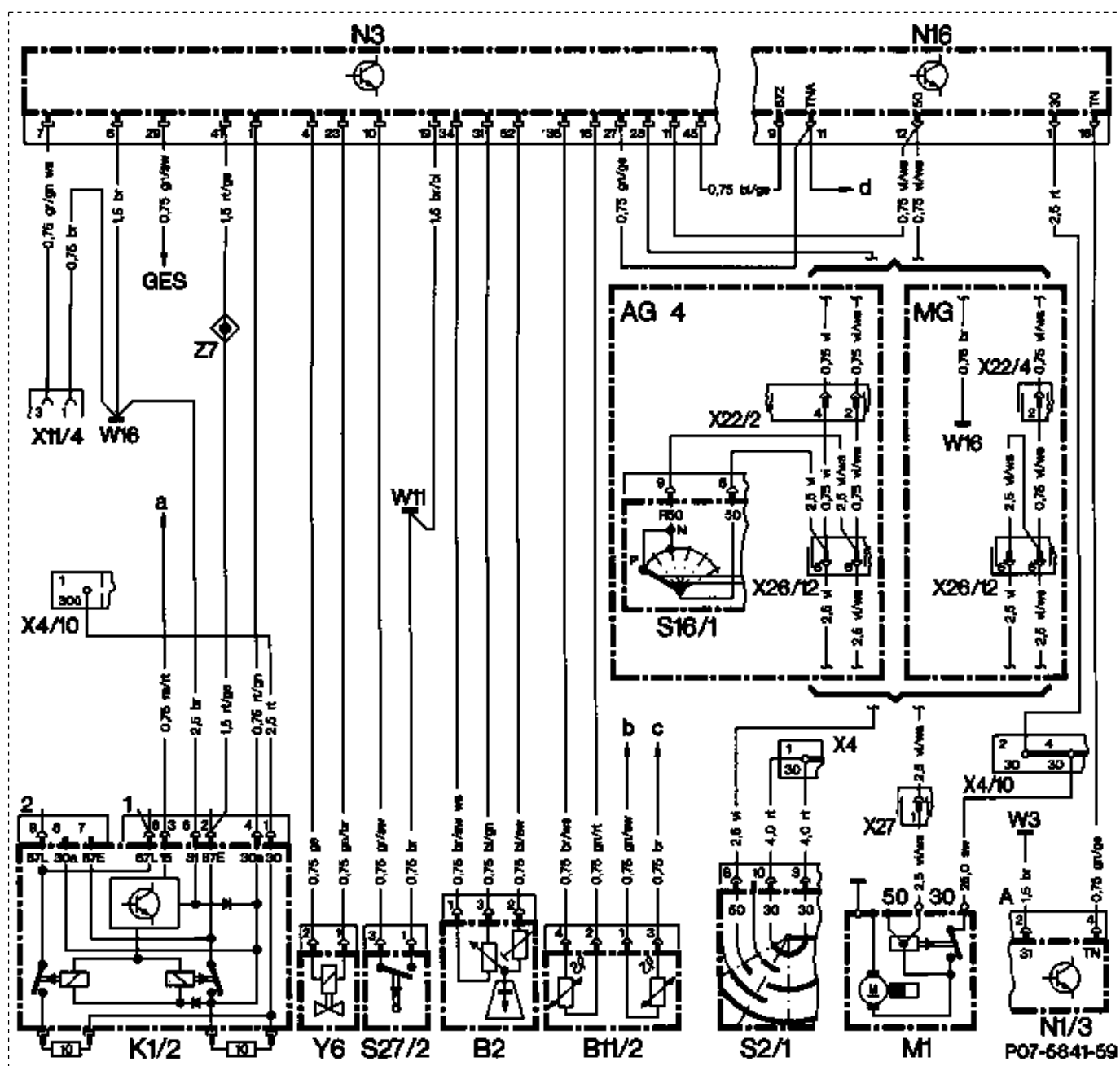




Wiring diagram of electronic idle speed control

Example engine 102.962 KAT/RÜF with AC compressor and automatic transmission

B11/2	Coolant temperature sensor	X11	Diagnostic socket/terminal block, terminal TD
K1	Overvoltage protection relay	X18	Plug connection, tail lamp harness
N1/2	EZL ignition control unit	X48	Connector sleeve (soldered connector in harness)
N3	KE control unit	Y6	Idle speed adjuster
S27/2	Deceleration cut-off microswitch	a	Fuel pump relay, contact 10, terminal TD
S29/2	Throttle valve switch, idle speed/full load recognition	b	AC compressor relay, contact 2, terminal TD
S29/2x1	Plug connection, throttle valve switch	c	Fuel pump relay, contact 6, terminal 87 k
W10	Battery ground	d	AC compressor cut-off control unit, contact 4, terminal 87Z
W11	Engine ground (electric cable bolted on)		



Wiring diagram of electronic idle speed control
Example engine 104.981 with AC compressor

B2	Air flow sensor position indicator
B11/2	Coolant temperature sensor
K1/2	Overvoltage protection relay
M1	Starter
N1/3	EZL ignition control unit
N3	KE control unit
N16	Engine systems control unit
S2/1	Ignition starter switch
S16/1	Starter lock-out and reversing lamp switch
S27/2	Deceleration cut-off microswitch
X4	Terminal block, terminal 30, fuse and relay box/interior (2-pin)
X4/10	Terminal block, terminal 30/30Ü/61e/87L (5-pin)
X11/4	Test coupling for diagnosis, pulse readout

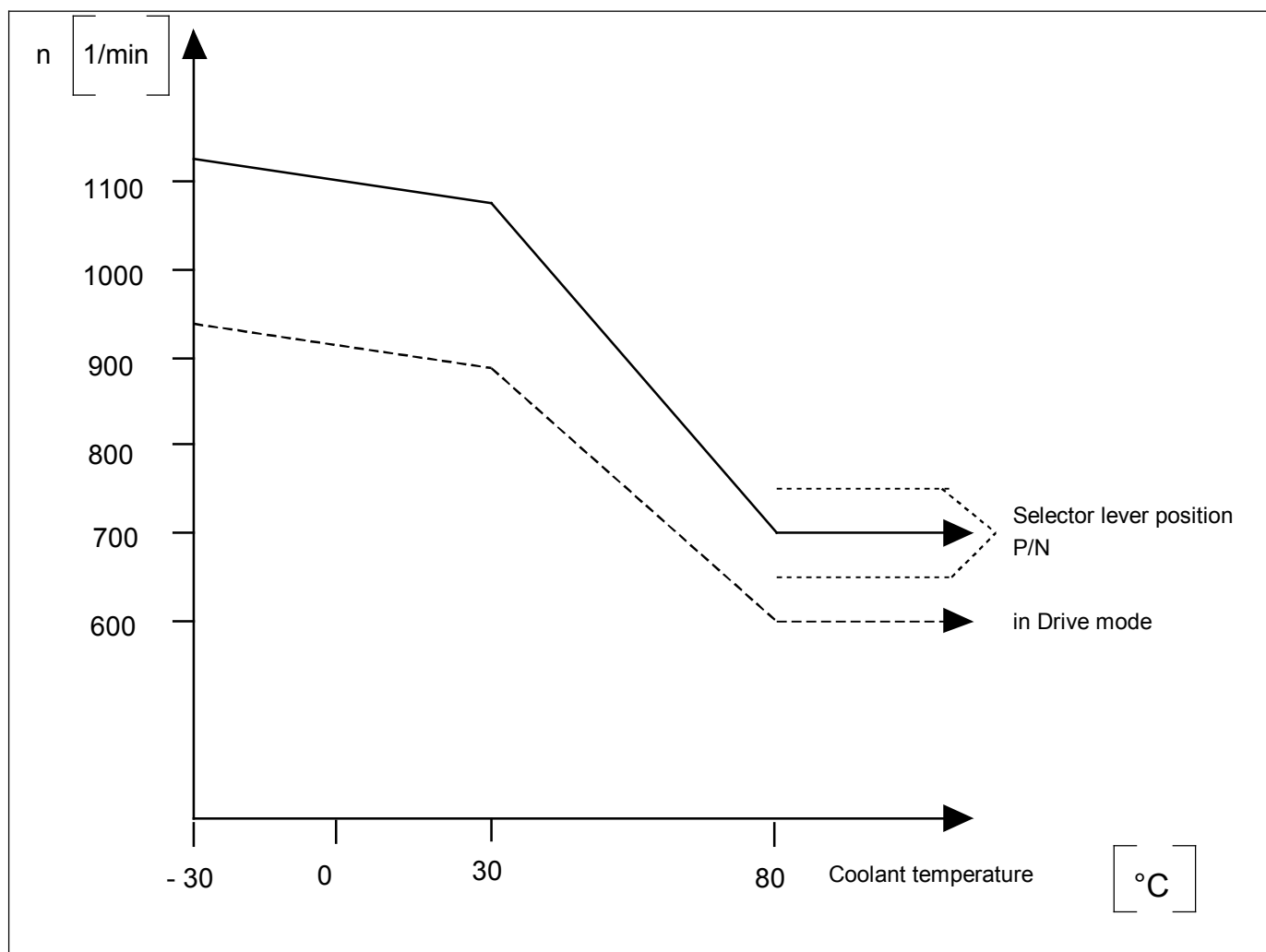
X26/12	Plug connection, interior/transmission (6-pin)
X27	Plug connection, starter harness (5-pin)
W3	Ground, at front left wheelhouse (ignition coil)
W11	Engine ground (electric cable bolted on)
W16	Component compartment ground
Y6	Idle speed adjuster
Z7	Connector sleeve, terminal 87E
AG 4	Automatic 4-speed transmission
MG	Manual transmission
GES	Road speed signal from multifunction block
a	To ignition switch, terminal 15
b	To EZL ignition control unit
c	Ground, via connector sleeve, camshaft shielding

X22/2 (16-pin)
Plug connection, automatic transmission/engine
(8-pin)
X22/4 Plug connection, manual transmission/engine
(4-pin)

d

To instrument cluster (tachometer)

Examples of idle speed control, engine 103.984 and 104.981



Warming-up phase, engine 104.981

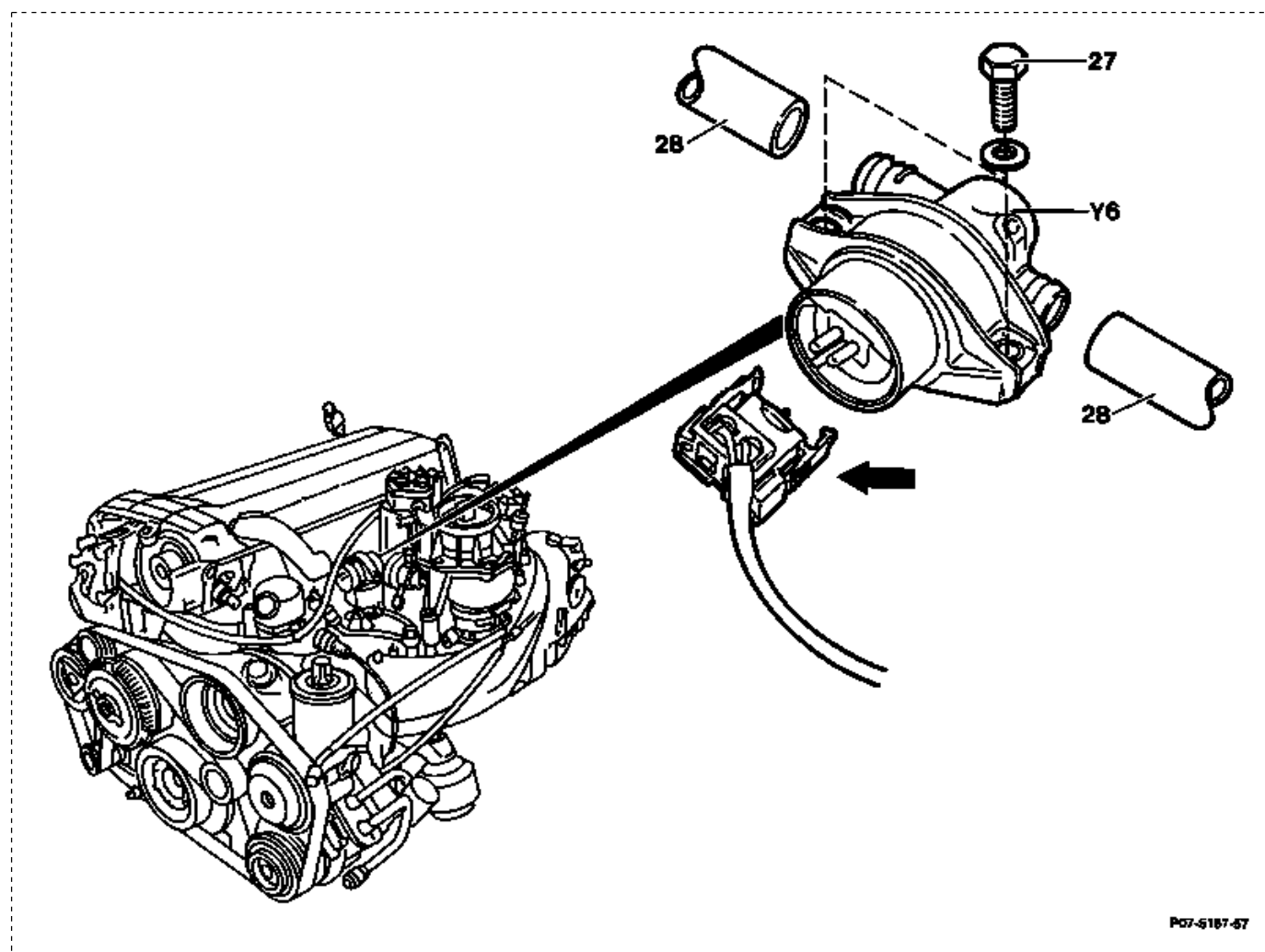
Coolant temperature	1/min
-30 $^{\circ}\text{C}$ up to +30 $^{\circ}\text{C}$ (+20 $^{\circ}\text{C}$)	1100 \pm 30
>+30 $^{\circ}\text{C}$ up to +80 $^{\circ}\text{C}$ (>+20 $^{\circ}\text{C}$ up to +80 $^{\circ}\text{C}$)	Dropping continuously to 700 \pm 50

Figures in parentheses for engine 103.984

Engine at normal operating temperature

Selector lever position	1/min
Drive mode	600 \pm 50
P/N	700 \pm 50

Single-winding rotary positioner



Location of idle speed adjuster, example engine 104

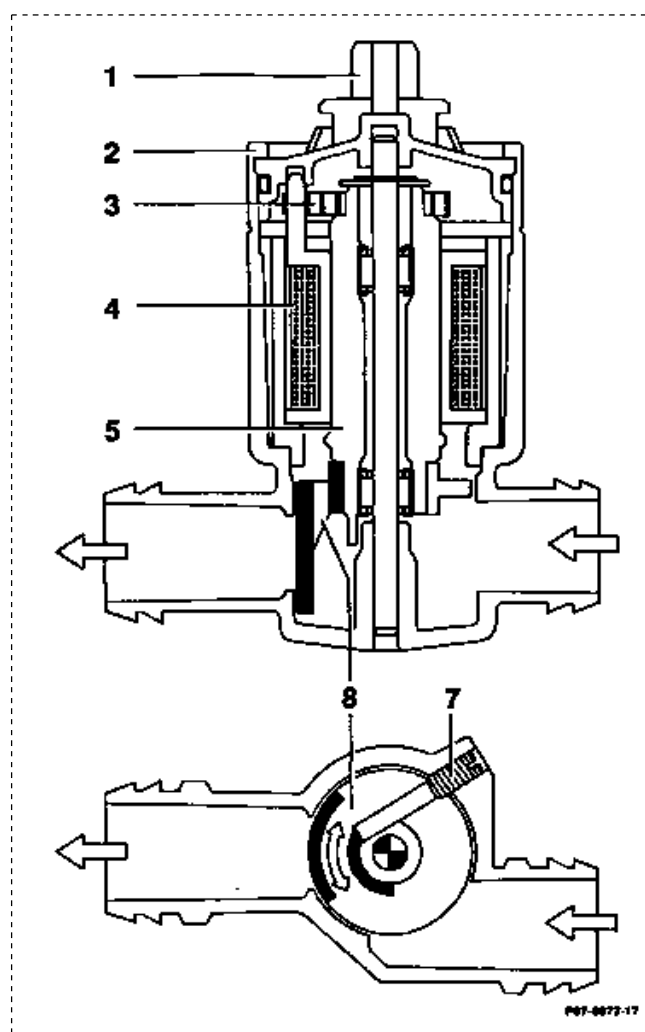
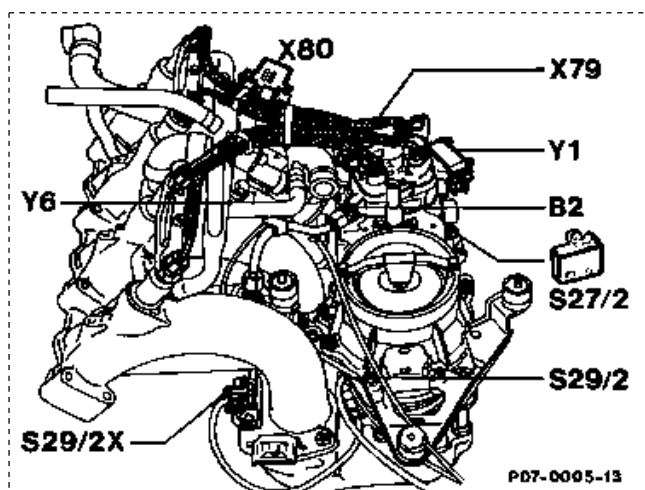
Y6 Idle speed adjuster
27 Bolt

28 Shaped hose
Arrow Plug connection

On engines 103, 104 the idle speed adjuster (Y6) is positioned in front of the mixture control unit, on engines 102.91/96/98 behind the mixture control unit at the intake manifold.

On engines 102.983/99 the idle speed adjuster is located below the intake manifold.

In view of the difficult access for testing the idle speed adjuster, the idle speed adjuster plug connection extension (X80) is positioned at the rear intake manifold.



Idle speed adjuster (single-winding rotary positioner)

- 1 Electrical connection
- 2 Housing
- 3 Torsion spring
- 4 Coil
- 5 Rotary armature
- 6 Air duct as bypass to throttle valve
- 7 Stop
- 8 Rotary valve

The idle speed adjuster has a rotary solenoid drive, consisting of a coil and a rotary armature. The position of the rotary valve attached to the armature shaft is determined by the coil and the torsion spring.

The coil in the idle speed adjuster is actuated with a pulsed voltage signal. This produces at the armature a torque which acts against the force of the spring and opens a certain cross-section. The opening cross-section is altered by changing the dwell angle of the pulsed voltage.

Test note:

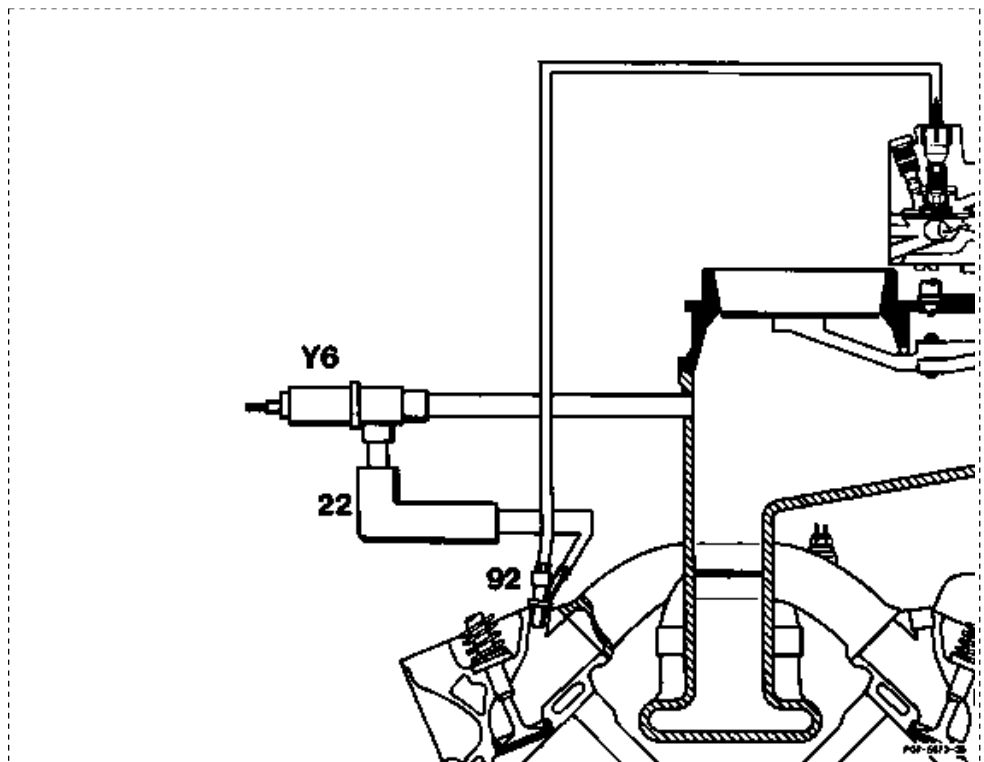
The pulsed voltage signal to the idle speed adjuster is measured in mA (instead of % or ° ↯) on engines 102.91, 102.96/98 as of 09/89 and on engine 104.

The idle speed control compares the momentary actual engine speed with the stored set engine speed. If differences exist, the opening cross-section in the idle speed adjuster is altered until set and actual speed agree. If the voltage supply of the idle speed adjuster is interrupted, the rotary valve is pushed by the force of the torsion spring against a stop and opens an emergency running cross-section (fast idling).

- Engines 116, 117, 119 with impact plate positioner

Idle air routing
Engines 116, 117, 119

Y6	Idle speed adjuster
22	Idle air distributor
92	Injection valve



The idle speed adjuster is designed as an impact plate positioner.

On engines 116, 117 the idle speed control is housed in a separate control unit (N8). On engine 119 it is integrated in the KE control unit, although operation is decoupled from the KE injection system.

The idle speed control processes the following information:

- Idle speed recognition
via the closed idle speed contact in the throttle valve switch.
- Road speed signal
idle speed control performed when vehicle stationary (road speed signal=0).
- Engine speed from terminal TD/TN
necessary for set/actual speed comparison.
- Selector lever position
when engine running, engagement of Drive mode is recognized via terminal 50 and idling speed of engine at operating temperature is lowered by approx. 100 - 150/min. In addition, idle speed in the warming-up phase is dependent on the selector lever position.

On engines 116, 117 with increased output, start recognition is performed via terminal 50 in order to activate brief fast idling after engine starts.

- Coolant temperature; idle speed is controlled in stages until normal operating temperature is reached.

Example:

Coolant temperature	Idle speed P or N	Drive mode
below 0 °C	800/min	780/min
0 °C to 30 °C	700/min	700/min
30 °C to 40 °C	650/min	600/min
above 40 °C	650/min	500/min

- AC compressor cut-in signal

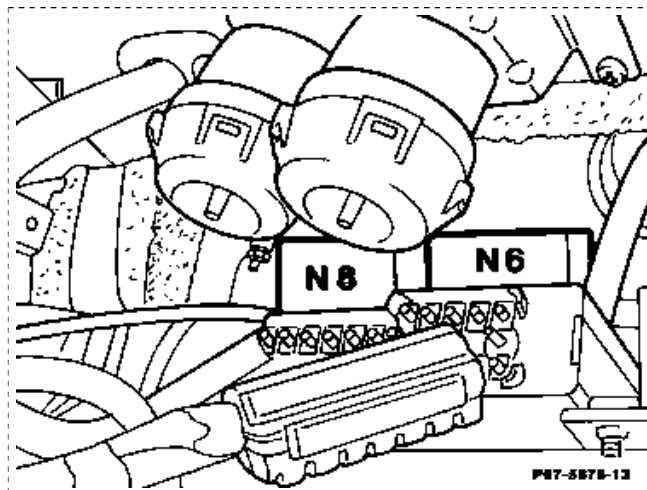
When the AC compressor cuts in, the idle speed control is supplied with a voltage signal from the AC compressor cut-off control unit (N6) or engine systems control unit (N16) (terminal 87Z). The AC compressor cuts in with a time delay (350 ms), however. The idle speed control processes the voltage signal and actuates the idle speed adjuster (current reduction approx. 60 mA). Consequently, the opening cross-section at the idle speed adjuster becomes greater before the AC compressor cuts in so that idling speed remains approximately constant.

Engines 116, 117

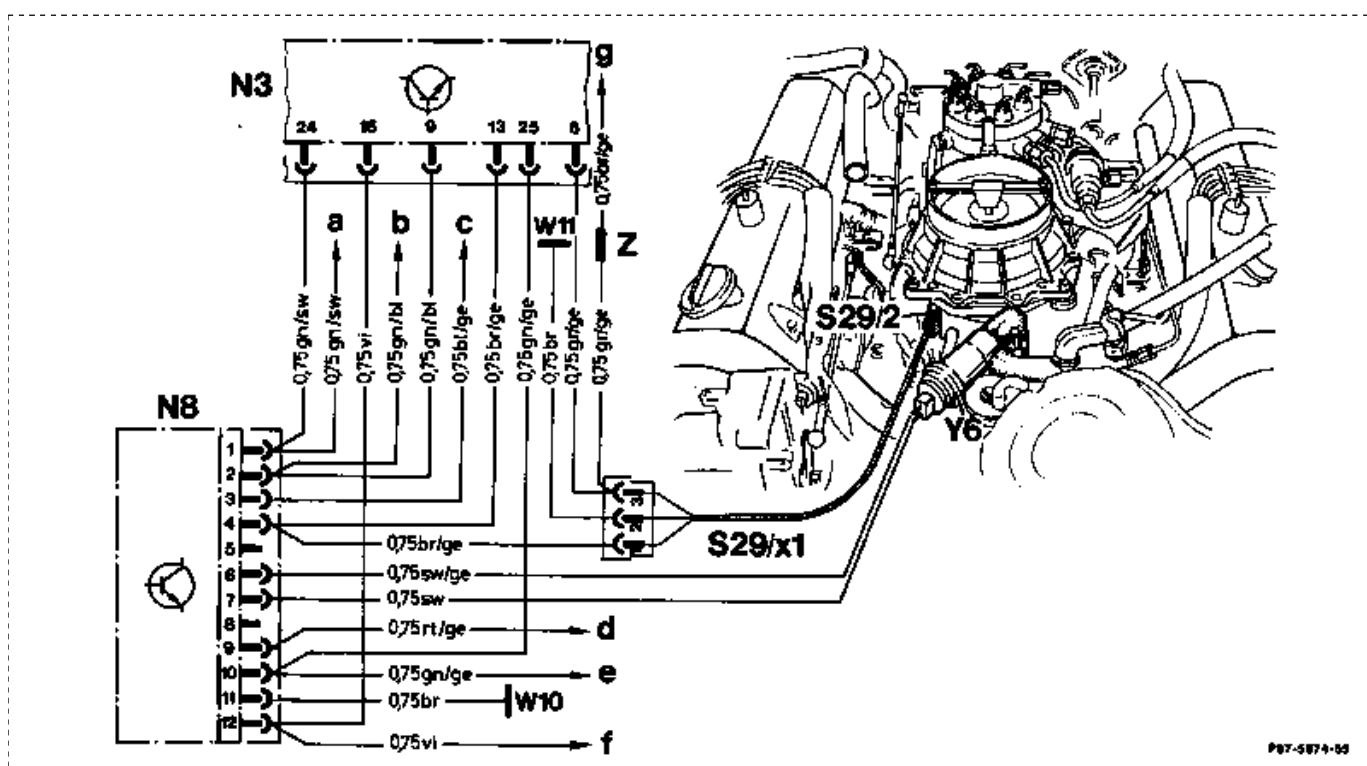
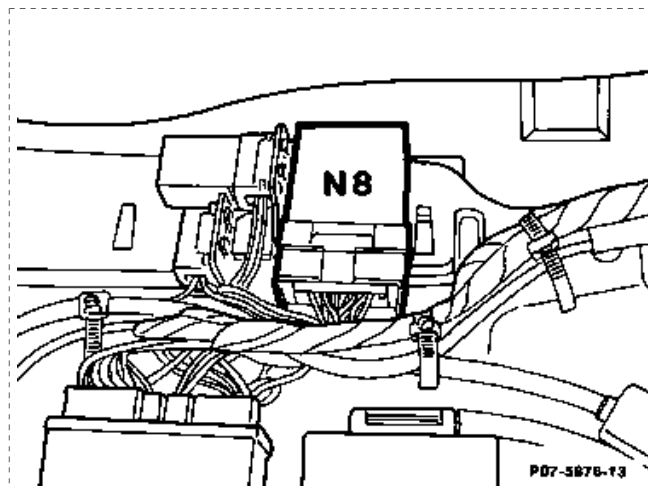
The idle speed control is housed in a separate control unit (N8). On the output-increased engines 116.965, 117.965/968 as of 09/87, fast idling of approx. 1000/min is specified for a maximum of 40 seconds when the engine is started at a coolant temperature between 0 °C and 50 °C. This is followed by idle speed control.

Location of idle speed control unit (N8)

Model 107: behind glove box.



Model 126: in right footwell below floor panel.

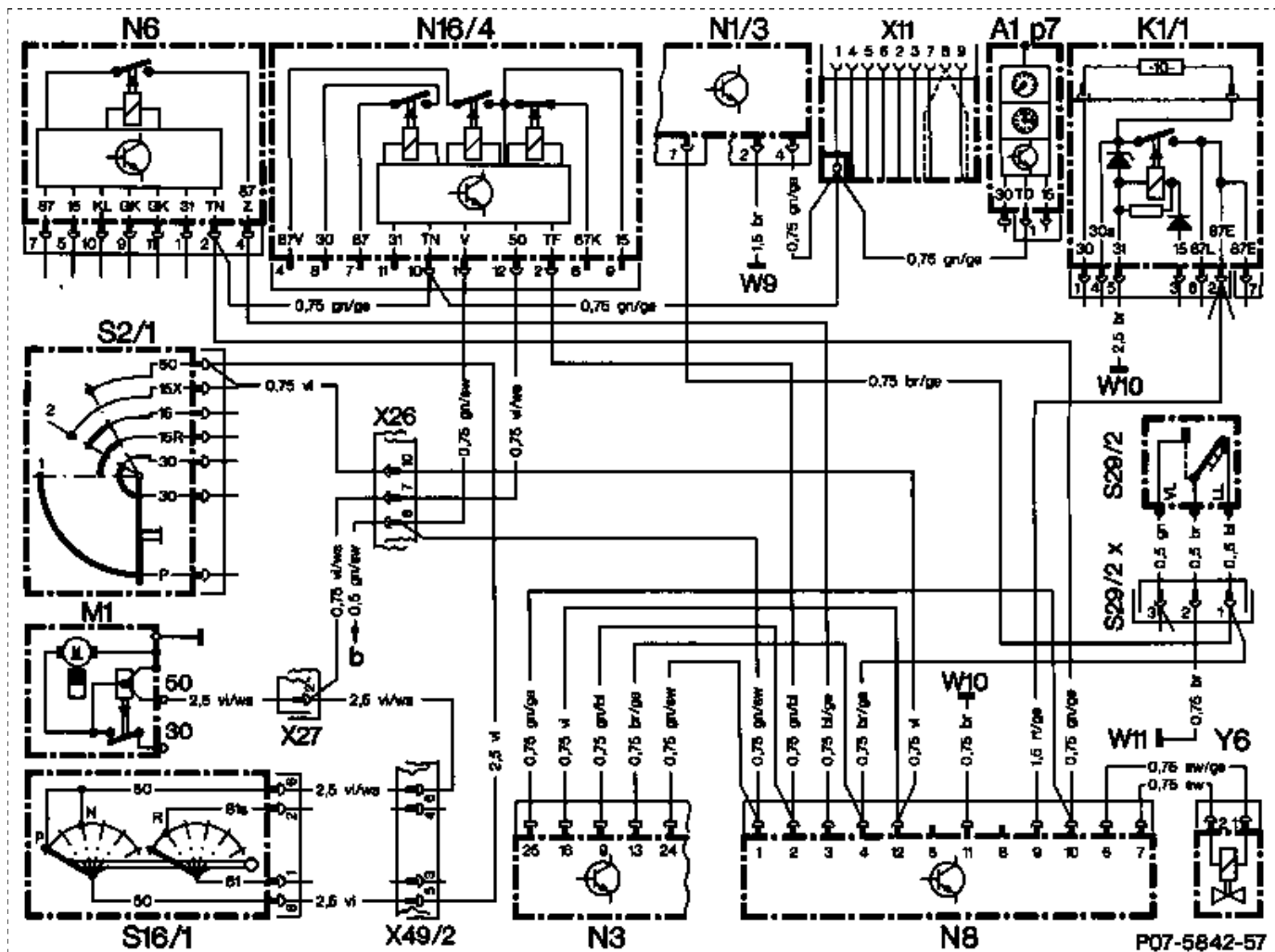
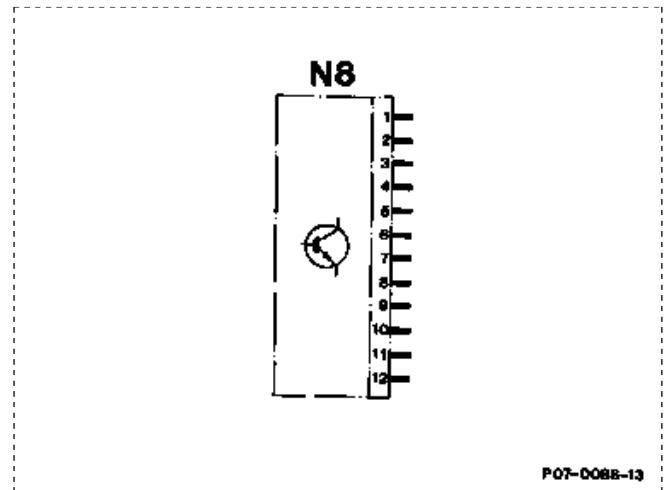


Function diagram of idle speed control, engines 116, 117

N3	KE control unit	a	Plug connection, engine harness, contact 6
N8	Idle speed control unit	b	Fuel pump relay, contact 2, terminal TF
S29/2	Throttle valve switch, idle speed/full load recognition	c	AC compressor cut-off control unit, contact 4
S29/2x1	Plug connection, throttle valve switch	d	Overvoltage protection relay, contact 2
Y6	Idle speed adjuster	e	AC compressor cut-off control unit, contact 2
Z	Connector sleeve (soldered connector in harness)	f	Plug connection, engine harness, contact 10
		g	EZL ignition control unit (N1/2)

Contact assignment of idle speed control unit (N8)

- 1 Electronic speedometer (A1p8),
road speed signal
- 2 KE control unit (N3), contact 9, temperature signal
(TF)
- 3 AC compressor cut-off control unit (N6), contact 4
- 4 Throttle valve switch, full load/idle speed recognition,
contact 1 (idle speed recognition)
- 5 When connected to ground, idle speed increases by
50/min when Drive mode engaged with certain
control units (see RI Engine 116/117)
- 6 Idle speed adjuster (Y6)
- 7 Idle speed adjuster (Y6)
- 8 Not assigned
- 9 Overvoltage protection relay (K1, K1/1) contact 2,
voltage supply terminal 15
- 10 EZL ignition control unit (N1/2, N1/3) TD/TN signal
- 11 Model 107: Engine ground (W11)
Model 126: Battery ground (W10)
- 12 Starter lock-out and reversing lamp switch (S16/1),
gear recognition



Wiring diagram of electronic idle speed control

Example engines 116, 117 with AC compressor

A1p7	Electronic clock/tachometer	S29/2x	Plug connection, throttle valve switch
K1/1	Overvoltage protection relay	W9	Ground, front left
M1	Starter	W10	Battery ground
N1/3	EZL/AKR ignition control unit	W11	Engine ground (electric cable bolted on)
N3	KE control unit	X11	Diagnostic socket/terminal block, terminal TD
N6	AC compressor cut-off control unit	X26	Plug connection, interior/engine (12-pin)
N8	Idle speed recognition control unit	X27	Plug connection, starter harness
N16/4	Fuel pump relay	X49/2	Plug connection, starter lock-out and reversing lamp switch
S2/1	Ignition starter switch	Y6	Idle speed adjuster
S16/1	Starter lock-out and reversing lamp switch	b	Electronic speedometer
S29/2	Throttle valve switch, idle speed/full load recognition		

Engine 119

On engine 119 the idle speed control is integrated in the KE control unit.

Example of idle speed control, engine 119.960

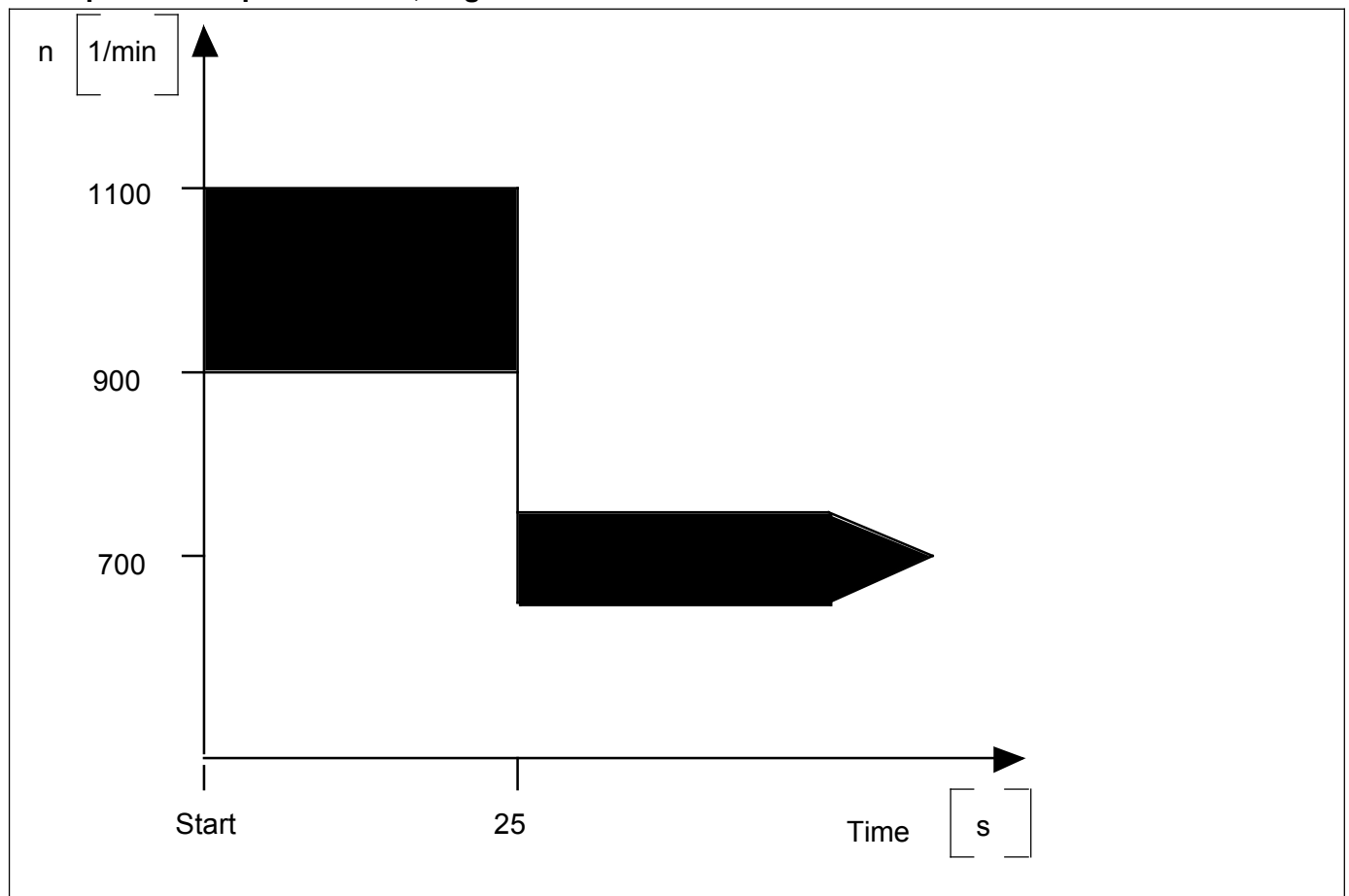
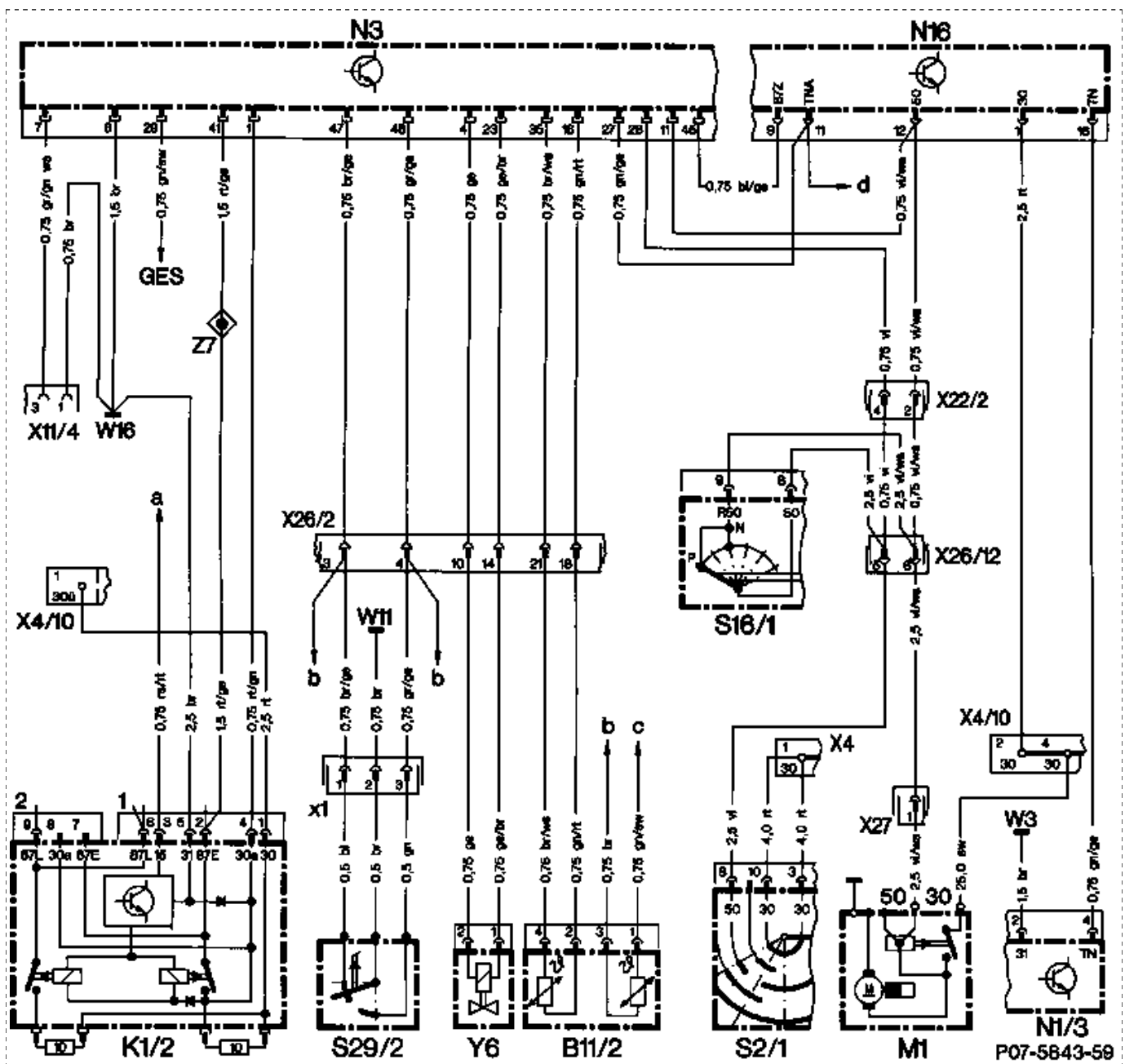


Diagram applies to coolant temperature of 20 °C (simulated) and selector lever in position P/N.

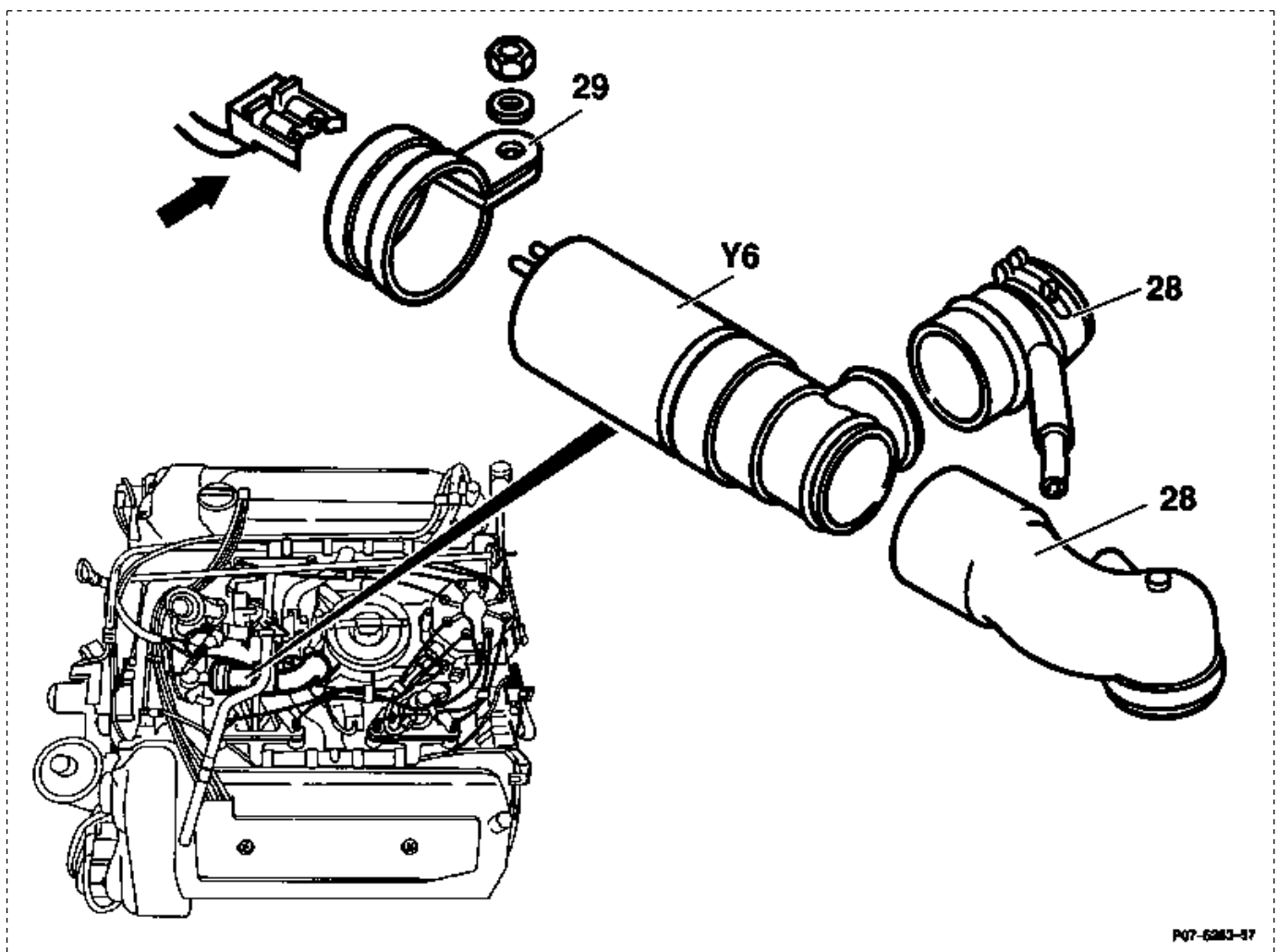
In the warming-up phase (up to coolant temperature of 65 °C when starting) the idle speed after start is a constant 1000 ± 100 /min for a maximum of 25 seconds at a coolant temperature of 20 °C. Following this, idling speed is limited dependent on coolant temperature (700 ± 50 /min at coolant temperature of 20 °C). In normal operation, idling speed is limited in stages as coolant temperature rises to $650 +100 -50$ /min (with selector lever in position P/N).

The idling speed after start of 1000 ± 100 /min is lowered immediately when a Drive mode is engaged or the idle speed contact opens. This function remains inhibited if a subsequent engine start is performed within the next 20 minutes after switching off the engine. Exception: Battery has been disconnected or KE control unit unplugged in the meantime.



Wiring diagram of electronic idle speed control
Example engine 119 with AC compressor

B11/2	Coolant temperature sensor	X11/4	Test coupling for diagnosis, pulse readout (16-pin)
K1/2	Overvoltage protection relay	X22/2	Plug connection, automatic transmission/engine (8-pin)
M1	Starter	X26/2	Plug connection, engine separation point (30-pin)
N1/3	EZL ignition control unit	X27	Plug connection, starter harness (5-pin)
N3	KE control unit	Y6	Idle speed adjuster
N16	Engine systems control unit	Z7	Connector sleeve, terminal 87E
S2/1	Ignition starter switch	GES	Road speed signal from multifunction block
S16/1	Starter lock-out and reversing lamp switch	a	To ignition starter switch, terminal 15
S29/2	Throttle valve switch, idle speed/full load recognition	b	To EZL/AKR ignition control unit
S29/2x1	Plug connection, throttle valve switch	c	Ground, via connector sleeve, camshaft shielding
W3	Ground, at front left wheelhouse (ignition coil)	d	To instrument cluster (tachometer)
W11	Engine ground (electric cable bolted on)		
W16	Component compartment ground		
X4	Terminal block, terminal 30, fuse and relay box/interior (2-pin)		
X4/10	Terminal block, terminal 30/30Ü/61e/87L (5-pin)		

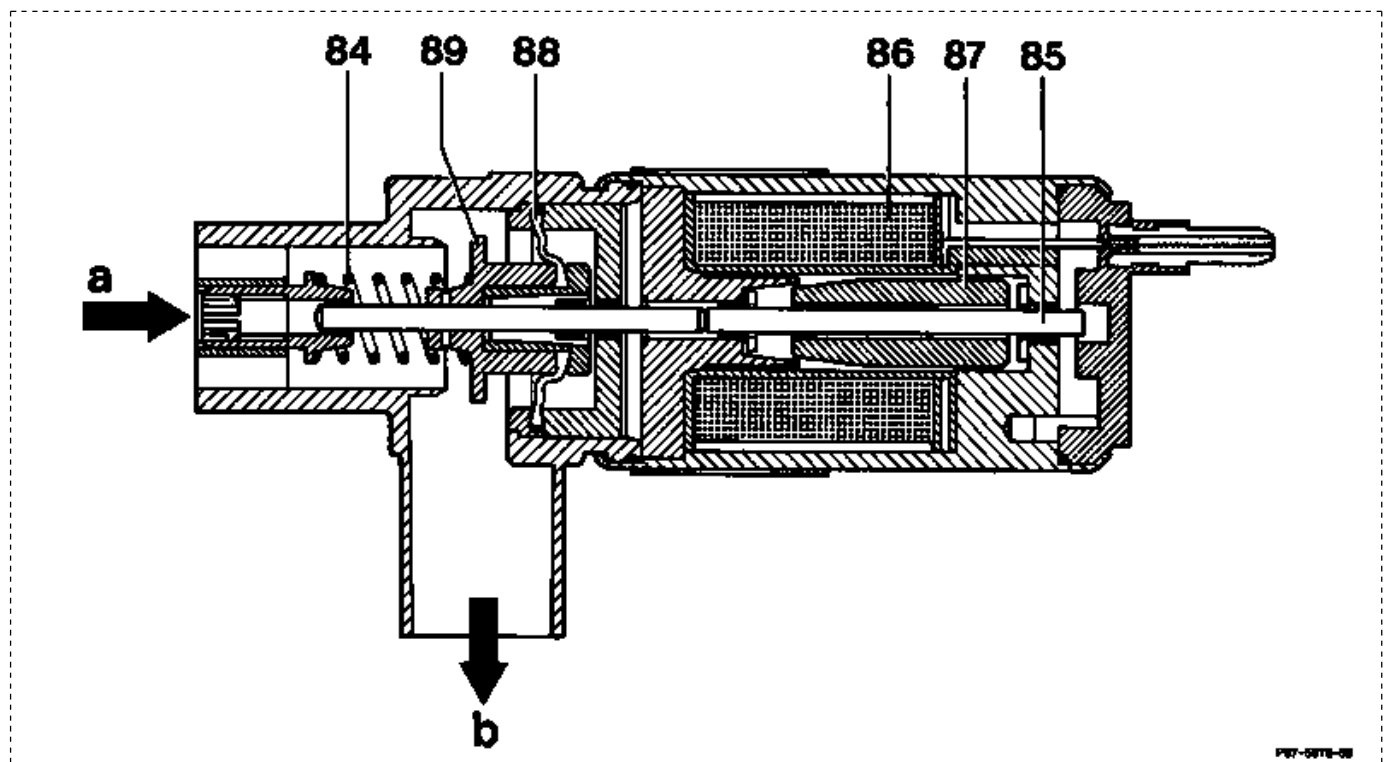
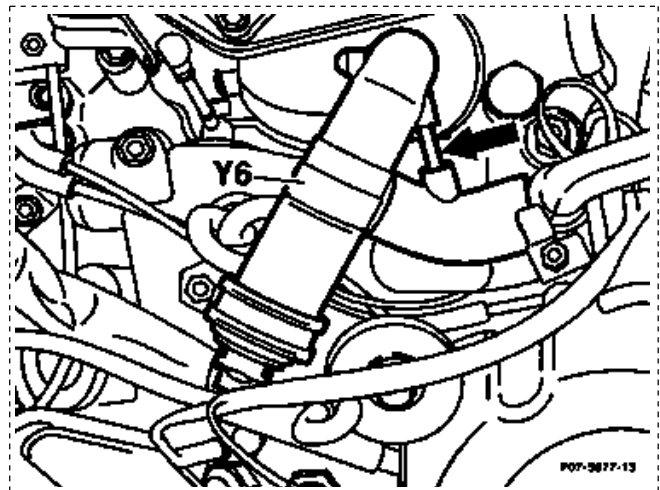


Location of idle speed adjuster, example engine 119

Y6	Idle speed adjuster
28	Shaped hose
29	Bracket

Engine 117.968

The bypass between the shaped hoses (arrow) is open on engine 117.968 (approx. 4 mm).



Idle speed adjuster

84	Spring	88	Diaphragm
85	Armature shaft	89	Impact plate
86	Solenoid	a	Air inlet
87	Armature	b	Air outlet

The impact plate (89) is opened to the maximum by the spring (84) in the absence of power supply to the solenoid and with the ignition switched on. When the engine is running, a current of 700 - 1000 mA flows through the solenoid (86). This produces a magnetic field and the armature (87) is pulled into the solenoid (86) to such an extent until the air throughput at the impact plate produces the correct idle speed.

If the load on the engine is increased as the result of an additional consumer (e.g. power steering at full lock), idle speed drops. This is recognized by the idle speed control via the TD/TN engine speed signal. The current through the solenoid is reduced and the magnetic field thus weakened. The impact plate opens sufficiently until the air throughput again produces the specified idling speed.

The current consumption may drop below 700 mA at altitudes above 2000 m as the idle speed adjuster has to provide a significantly greater opening cross-section at such altitudes.

- Engines with automatic transmission

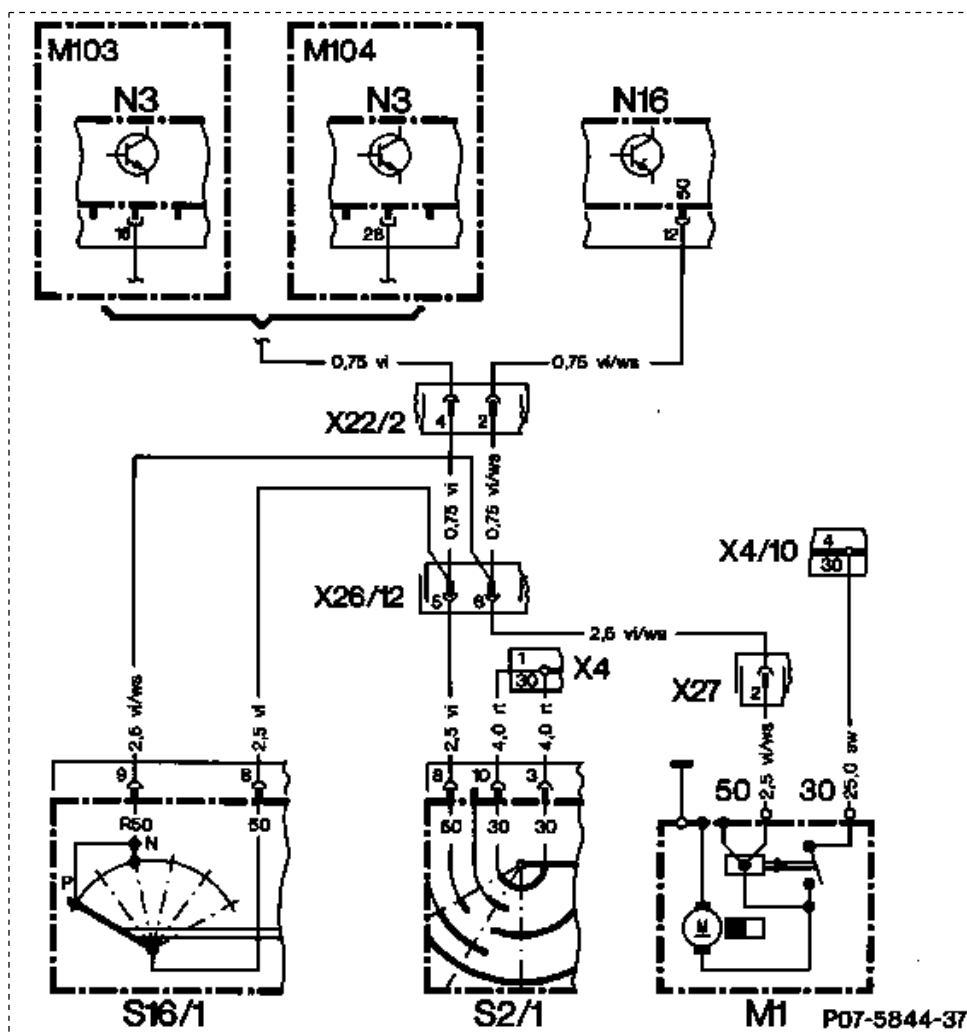
The idle speed control recognizes the engagement of a Drive mode (gear recognition) when the engine is running via terminal 50. When the engine is at normal operating temperature, idling speed is reduced by approx. 100- 150/min in order to reduce the creeping tendency with a Drive position engaged. On a number of engines idle speed in the warming-up phase is dependent on selector lever position.

Engine	Gear recognition by
102, 103	KE control unit (N3), 25-pin, contact 16
104, 119	KE control unit (N3), 55-pin, contact 28
116, 117	Idle speed control unit (N8), contact 12

With selector lever in position P and N, the contact in the starter lock-out and reversing lamp switch (S16/1) is closed. The idle speed control recognizes ground via the starter (switch coil). When a Drive mode is engaged, the contact in the starter lock-out and reversing lamp switch opens. The idle speed control recognizes the change in signal and actuates the idle speed adjuster accordingly.

Note

With manual transmission, the connection to gear recognition at the KE control unit is constantly connected to ground.



Wiring diagram gear recognition

Example engine 103.984/104.980

M1	Starter	X4	Terminal block, terminal 30, fuse and relay box/interior (2-pin)
N3	KE control unit Engine 103: 25-pin Engine 104: 55-pin	X4/10	Terminal block, terminal 30/30Ü/61e/87L (5-pin)
N16	Engine systems control unit	X22/2	Plug connection, automatic transmission/engine (8-pin)
S2/1	Ignition starter switch	X26/12	Plug connection, interior/transmission (6-pin)
S16/1	Starter lock-out and reversing lamp switch	X27	Plug connection, starter harness (5-pin)

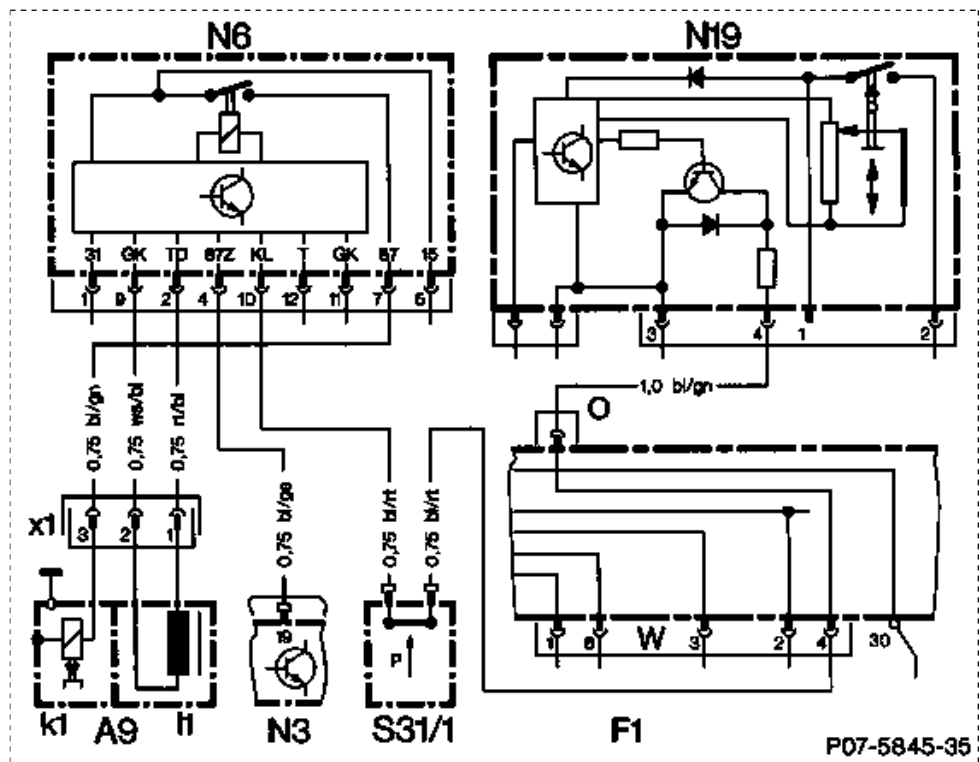
- Engines with AC compressor

When the AC compressor cuts in, the idle speed control is supplied with a voltage signal. The idle speed control processes the voltage signal and actuates the idle speed adjuster. Consequently, the opening cross-section at the idle speed adjuster becomes larger before the compressor cuts in (time lag approx. 350 ms) so that idle speed remains approximately constant.

Engine	AC compressor cut-in signal
102 103	from AC compressor cut-off relay (N6), contact 4 (terminal 87Z) to the KE control unit (N3), 25-pin, contact 19
103.984	from the engine systems control unit (N16), contact 9 (terminal 87Z) to the KE control unit (N3), 25-pin, contact 19
104 119	from the engine systems control unit (N16), contact 9 (terminal 87Z) to the KE control unit (N3), 55-pin, contact 45
116 117	from the AC compressor cut-off relay (N6), contact 4 (terminal 87Z) to the idle speed control unit (N8), contact 3

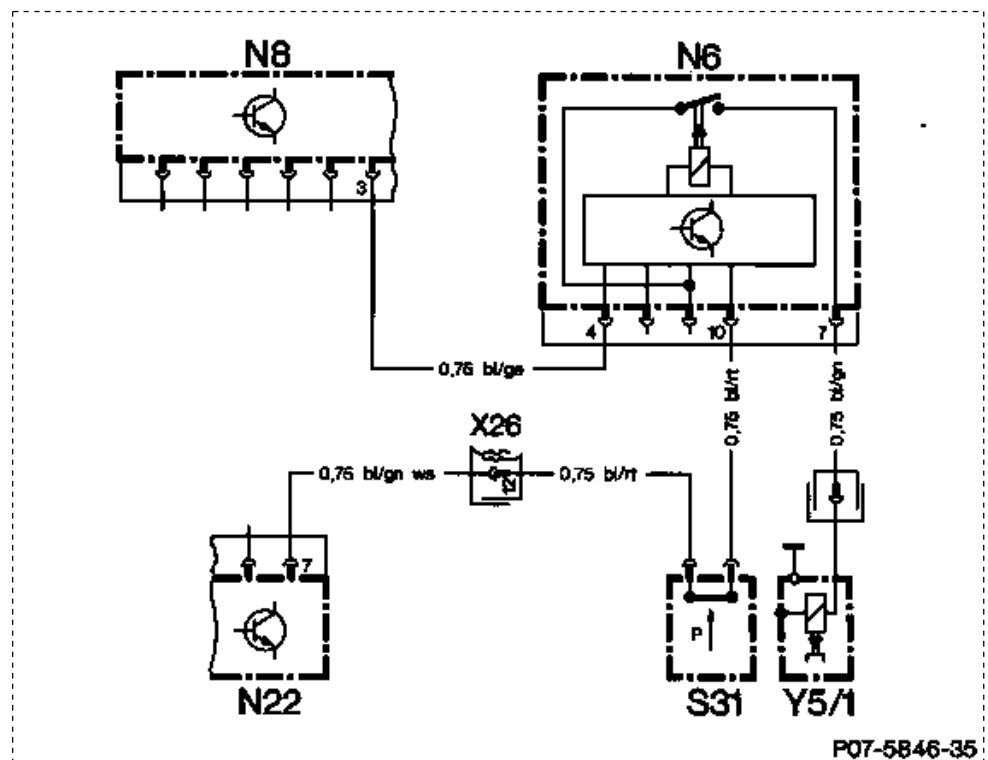
Wiring diagram of AC
compressor cut-in signal
example engine 102.985
KAT/RÜF

- A9 AC compressor
- A9k1 Electromagnetic clutch
- A9l1 Engine speed sensor
- A9x1 Plug connection, AC compressor
- F1 Electrical centre
- N3 KE control unit
- N6 AC compressor cut-off relay
- N19 Air conditioner temperature slide control
- S31/1 AC compressor switch with 2 switching points

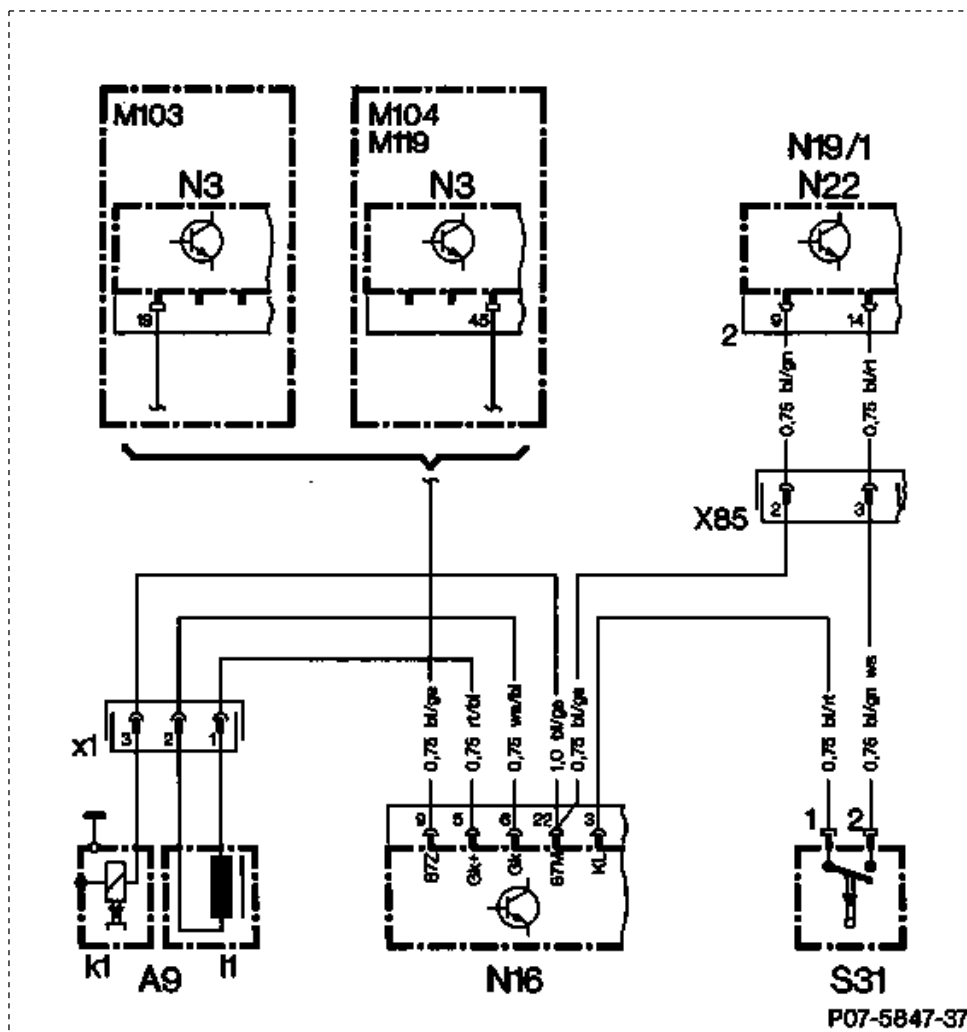


Wiring diagram of AC
compressor cut-in signal
example engine 117.968

- N6 AC compressor cut-off relay
- N8 Idle speed control unit
- N22 Automatic climate control push-button control unit
- S31 AC compressor switch
- X26 Plug connection, engine harness
- Y5/1 AC compressor electromagnetic clutch



A9	AC compressor
A9k1	Electromagnetic clutch
A9I1	Engine speed sensor
A9x1	Plug connection, AC compressor
N3	KE control unit Engine 103: 25-pin Engines 104, 119: 55-pin
N16	Engine systems control unit
N19/1	Automatic temperature control push-button control unit
N22	Automatic climate control push-button control unit
S31	AC compressor switch
X85	Plug connection, automatic heater and automatic temperature control



On engines 102.96/98 as of 09/89 and on engine 102.910 KAT the idle speed control is supplemented by the heating speed for heating up the catalytic converter. It is activated for a maximum of 28 seconds after each engine start. The level of the heating speed is additionally dependent on the coolant temperature (see table).

- Idle speed contact closed.
- Selector lever in position "P" or "N".

Heating speed is deactivated if the idle speed contact opens before 28 seconds have elapsed after engine start or if a Drive mode is engaged.

Coolant temperature °C	Heating speed 1/min	Warming-up speed 1/min	Idle speed 1/min
+20	1200±50 ¹⁾	800±50	-
+80	1000±50 ¹⁾	-	770±50

¹⁾ Maximum 28 seconds

d) Engines 104, 119: monitoring actuation to idle speed adjuster

Actuation to the idle speed adjuster is switched off if an open circuit in the wiring, a short circuit or a mechanical fault of the idle speed adjuster or an interruption in the

KE ↔ EZL/AKR data line is recognized.

The idle speed adjuster opens as the result of spring force and opens the emergency running cross-section (fast idling). In order to prevent the idling speed rising, the ignition timing is retarded in such a way that idle speed increases only to an insignificant extent.

e) Engine 119: battery voltage-dependent idle speed increase

Engine speed is raised by approx. 100/min depending on the battery voltage when the Drive mode is engaged in order to boost the charging capacity of the alternator.

Function

The idle speed increase is activated provided the following conditions exist:

- Coolant temperature between 60 °C and 110 °C
- Selector lever in Drive position
- Battery voltage <12.5 volts for at least 20 seconds.
- Engine speed once above 900/min.

The idle speed increase is switched off once:

- Selector lever is moved to position "N" or "P".
- Coolant temperature exceeds 110 °C.
- Ignition is switched off.

Once the activation conditions have been met, they remain stored in the KE control unit until the ignition is switched off even if the battery voltage has meanwhile risen to more than 12.5 volts.