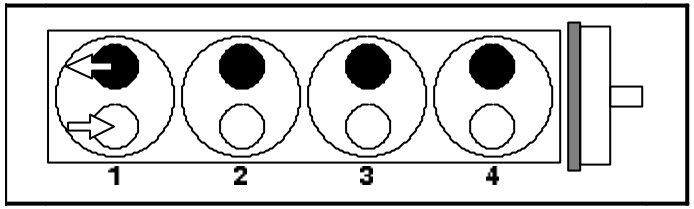
Ignition/fuel system

– Engines with carburettor

Ignition

– Bosch TSZ



firing order	1 - 3 - 4 - 2

This is a transistorized ignition without contact breaker points with a hybrid ignition module and a diagnostic connector. Cold engine: ignition timing correction.

The components are located in the engine compartment on the inner wing panel LH.

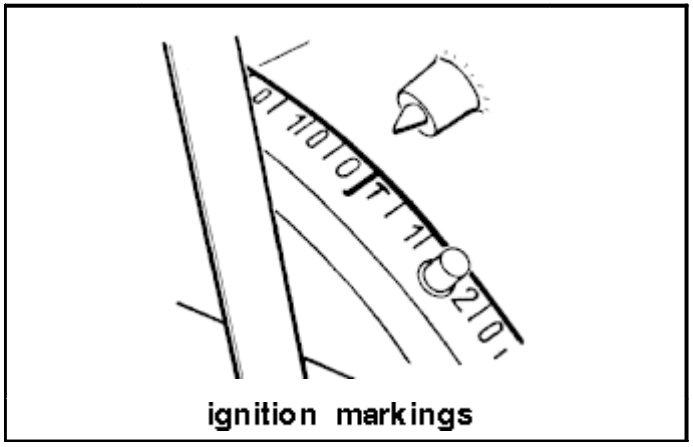
Note: With engine running (also at cranking speed): it is not allowed to disconnect or connect any electrical components.

Note: When working with engine running or starting with connections previously broken; the hybrid switch unit green coaxial lead (pick-up spool signal) must be disconnected.

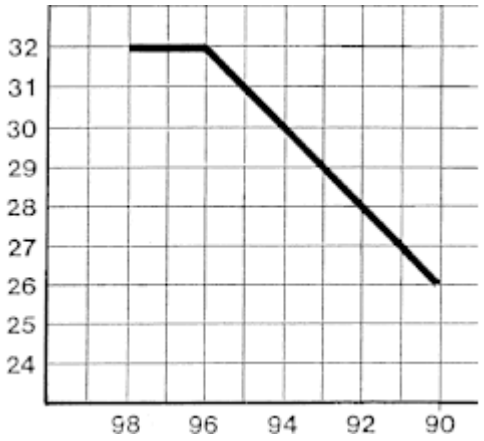
technical specifications	
dynamic ignition timing; vacuum hose disconnected	3 2° ±1°; at 4500/min
spark plug gap	0,8 mm
dwell angle at cranking rpm	7 - 34°; TD pin
primary coil resistance	0,5 - 0,9 Ω
secondary coil resistance	6000 - 16000 Ω; pins 1 and 4
pick-up element resistance	600 ± 100 Ω; pins 7 and 31d

Adjustments

Ignition timing



ignition markings



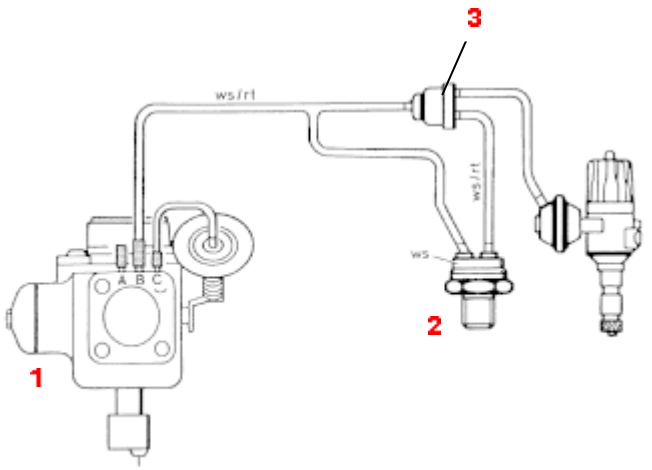
ignition timing correction for low octane fuel

Check with a rev. counter: via terminal TD of the ignition module or pin 1 of the diagnostic connector. Use a timing light or Bosch MOT 001.03 tester. Markings on crankshaft pulley; see illustration

Adjust by turning the distributor.

Note: With short term use of low octane petrol; the ignition timing can be adapted. See the relevant graph.

Advance



1. carburettor
2. thermo valve; white mark
3. check valve

ignition correction

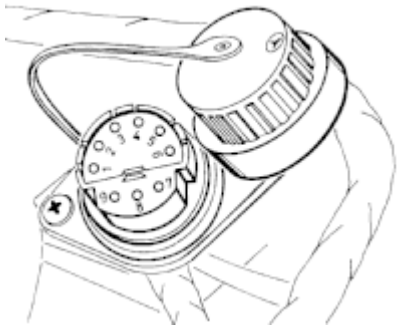
centrifugal advance	
at idle speed	13 ± 3°
at 1500/min	14 - 18°
at 3000/min	24 - 28°

vacuum advance	
at idle speed	0°
at 4500/min	8 - 12°

Note: Engine cold; coolant temperature below: 60 °C; the ignition **permanently** 8 - 12° vacuum advanced.

Fault finding

Test measurements



diagnostic connector

Note: **pin** = diagnostic connection, unless otherwise indicated.

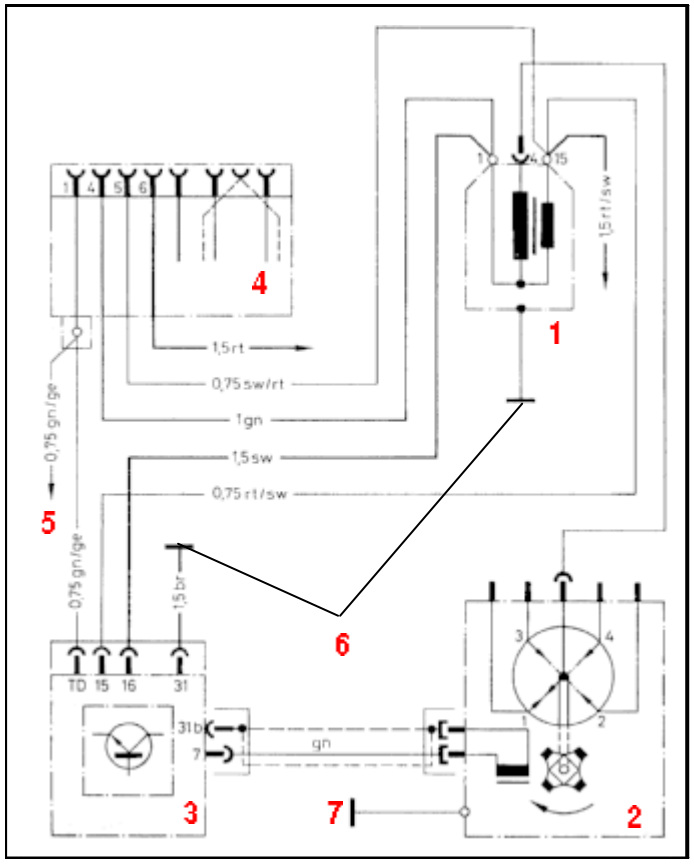
ignition module		
location: on LH firewall		
feed signal; ignition on		
connection	*to pin*	*test value*
black/red; V+	5	battery voltage
battery negative terminal; V-		

dwell angle; measure with dwell angle tester and engine running		
connection	*to pin*	*test value*
green/yellow; V+	1	7 - 34°
negative terminal battery		
resistance; ignition off		
connection	*test value*	
pin 31b; on the ignition module	min. 200 kΩ	
negative terminal battery		

ignition coil		
location: on LH firewall		
feed signal; ignition on		
connection	*to pin*	*test value*
black/red; V+	5	max. 0,1 V
green; V-	4	

pick-up element	
location: connector on distributor	
resistance; ignition off	
connection	*test value*
measure on the coaxial lead	600 ± 100 Ω

resistance; ignition off	
connection	*test value*
coax	min. 200 kΩ
negative terminal battery	

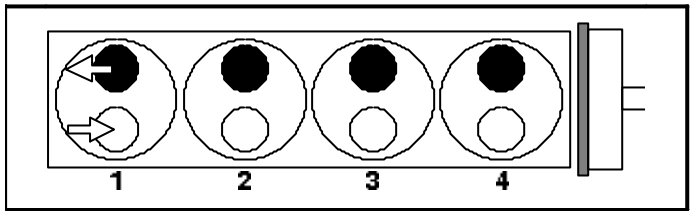


br = brown; **ge** = yellow; **gn** =green; **rt** = red; **sw** =black

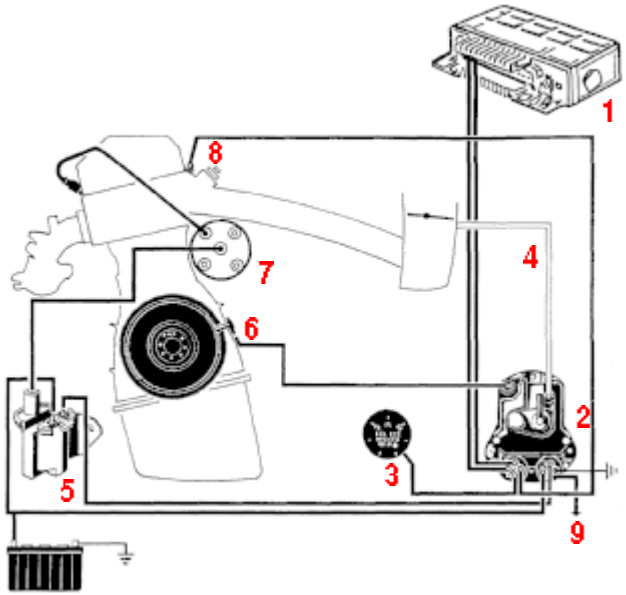
1. ignition coil
2. distributor with pick-up element
3. hybrid ignition module
4. diagnostic connector
5. to fuel cut-off valve relay or engine speed limiter connection TD
6. ignition coil earth
7. engine earth

wiring diagram: Bosch TSZ

– Bosch EZL

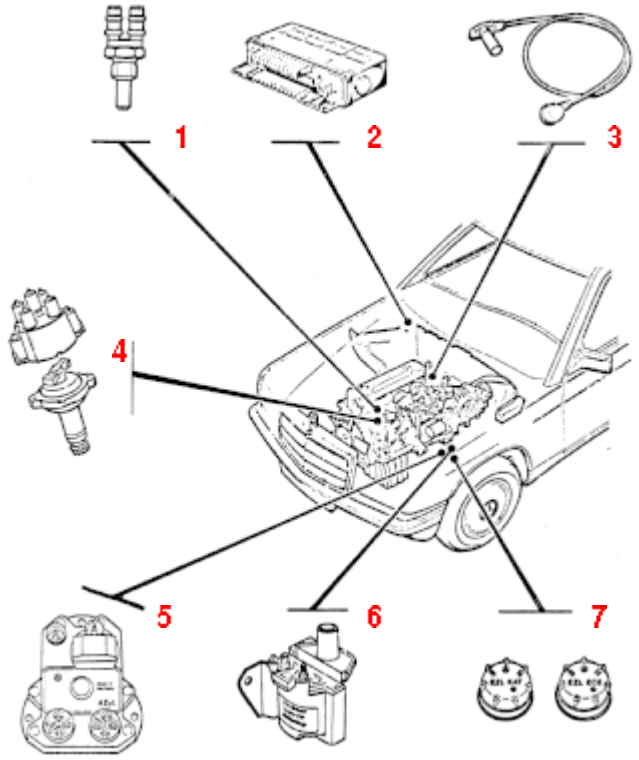


firing order	1 - 3 - 4 - 2



1. control unit: 2E-E
2. control unit: EZL
3. ignition correction switch
4. vacuum hose
5. ignition coil
6. crankshaft position sensor
7. distributor
8. coolant temperature sensor
9. to pin TD of diagnostic connector

working diagram



1. coolant temperature sensor
2. control unit: 2E-E
3. crankshaft position sensor
4. distributor
5. control unit: EZL
6. ignition coil
7. ignition correction switch

component location

This is an electronically controlled ignition with a control unit and diagnostic connector.

- Control during warm-up

  Up to 60 °C: control of the ignition timing at idle speed depends on coolant temperature.

  With engine at idle: the 2E-E carburettor control unit sends a signal to the ignition control unit. Above 60 °C: fixed ignition timing advance at idle speed.

  No signal of coolant temperature sensor (resistance ∞Ω); the control units 004 545 79 32, 006 545 40 32 and 006 545 52 32 choose a fixed ignition timing instead off the idling advance curve; this changes the ignition timing advance at all engine speeds.

- Ignition timing retardation at high engine temperatures

control unit	*temperature*	*retardation*
004 545 79 32 004 545 81 32	100 - 105 °C	4°
006 545 40 32 006 545 41 32 006 545 52 32 006 545 53 32	90 - 100 °C	6°

Some control units retard the ignition timing at high engine temperatures. This prevents the engine temperature from becoming too high:

- Full load control

  At full load the ignition is controlled by the full load advance curve. This advances the ignition timing. Full load is recognized by the control unit by using the engine speed signal and inlet manifold vacuum signal.

- Limp home mode

  Versions from 09/1988 onwards: connection of pin 15 of the 2 E-E control unit to pin 4 of the EZL control unit; this is an earth signal.

  The limp home mode functions when:

  – throttle valve adjuster faulty.
  – open circuit between pin 15 of the 2 E-E control unit and pin 4 of the EZL control unit.

  In the limp home mode there is no earth signal from the 2 E-E control unit. The advance curve is retarded to max.: 12° after TDC; depending on: coolant temperature, engine speed and throttle valve position.

Note: With engine running (also at cranking speed): it is not allowed to disconnect or connect any electrical components.

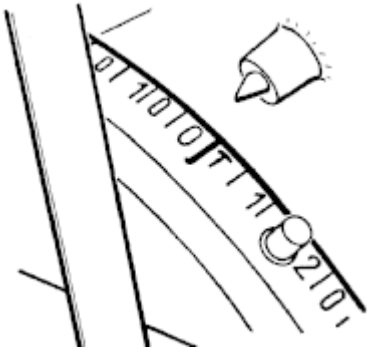
Note: During procedures with previously disconnected connections (for example a spark plug) also disconnect the green coaxial lead of the control unit (crankshaft position).

Note: Resistance in high tension section at least: 2 kΩ (distributor rotor 1 kΩ, distributor cap 1 kΩ). Do not use a 5 kΩ rotor.

technical specifications	
spark plug gap	0,8 mm
dwell angle	at cranking rpm: 9 - 49° at 3200/min: 27 - 54°
coil resistance, primary	0,3 - 0,6 Ω; pin 1 and 15
coil resistance, secondary	8000 - 13000 Ω; pin 1 and 4
resistance: pickup-element	680 - 1200 Ω; pin 7 and 31d
resistance: isolation pickup-element	≥200 kΩ; pin 7 and earth
resistance: rotor, spark plug connector, distributor cap per connection	700 - 1300 Ω

Adjustments

Ignition timing



ignition marking

ignition timing	
at idle speed; vacuum hose disconnected or connected	11 - 15°
at 3200/min; vacuum hose connected	38 - 42°
at 3200/min; vacuum hose disconnected	
to 09/88 (versions 006 545 52 32 or 53 32)	fuel 98 RON; position S: 19 - 23° fuel 92 RON; position N: 14 - 18°
from 09/88; (versions 004 545 79 32 or 81 32, 006 545 40 32 or 41 32);	fuel 98 RON; position S: 22 - 26° fuel 92 RON; position N: 15 - 19°

Check with rev. counter and a timing light; on terminal TD of the control unit or pin 1 of the diagnostic connector. The use of an engine tester with oscilloscope is also possible.

Coolant temperature between: 75 and 90 °C. Or replace the coolant temperature sensor by a resistor of: 320 Ω.. This represents a coolant temperature of: approx. 80 °C.

The ignition timing is non-adjustable. Check the relevant components if the ignition timing is not correct; see *Fault finding*.

Depending on the fuel used the ignition timing can be adapted with the ignition correction switch.

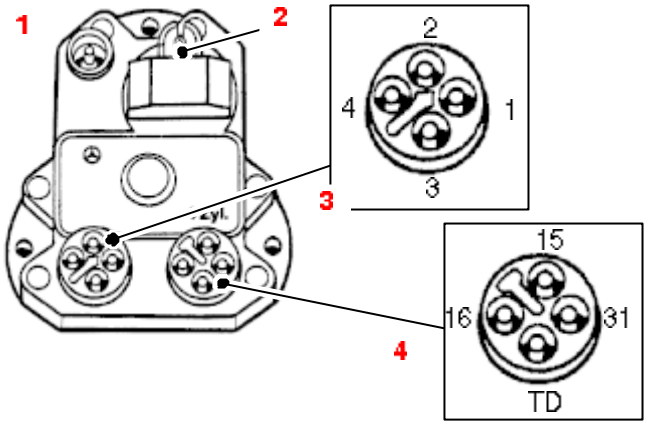
RÜF *KAT*

ignition correction switch

ignition adjustment	
RÜF-engines	
S	leaded or unleaded fuel; min. 95 RON
N	leaded or unleaded fuel; min. 91 RON
2	3° later than "S"; poor quality fuel

CAT engines	
S	unleaded fuel; min. 95 RON
N	leaded fuel; min. 91 RON
5	3° later than "S"; for poor quality fuel
7	3° later than "N"; for poor quality fuel

Fault finding



1. coaxial lead of crankshaft position sensor
2. vacuum connection
3. 4-pin connector input signals:
   pin 1: coolant temperature sensor;
   pin 2: 2 E-E control unit connection 6;
   pin 3: ignition correction switch;
   pin 4: from 09/1988 onwards: 2 E-E control unit; terminal 15
4. 4-pin connector ignition signals:
   pin 15: battery voltage; terminal 15;
   pin 16: terminal 1 ignition coil;
   pin TD: TD-signal;
   pin 31: earth

control unit connections

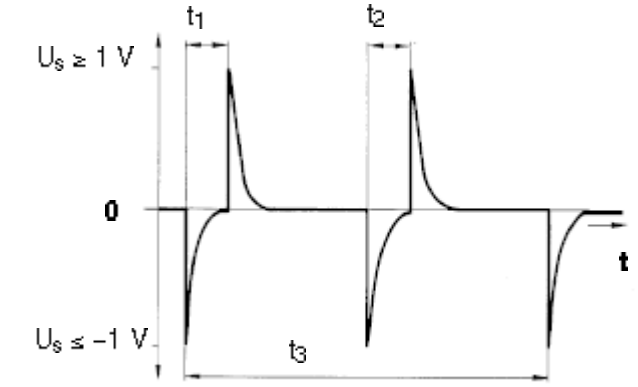
Note: **pin** = connectors of ECU multiplug; unless otherwise indicated.

control unit		
location: on firewall LH		
feed; ignition on		
connection	*to pin*	*test value*
red/black; V+	15	battery voltage
battery negative; V-		
control signal; measure with dwell angle tester and engine running		
connection	*to pin*	*test value*
diagnostic connector: pin 1; V+	TD	9 - 49°
battery negative terminal		
resistance; ignition off		
connection	*test value*	
pin 31d	min. 200 kΩ	
battery negative terminal		

ignition coil		
location: on firewall LH		
feed signal; ignition on; engine off		
connection	*to pin*	*test value*
black/red; V+	15	max. 0,1 V
green/black; V-	1	

engine speed/position sensor	
location: on the flywheel	
resistance; ignition off	
connection	*test value*
pin 7	680 - 1200 Ω
pin 31d	
resistance; ignition off	
connection	*test value*
pin 7	min. 200 kΩ
battery negative terminal	

sensor signal; cranking rpm; measure with oscilloscope		
connection	*to pin*	*test value*
coaxial lead	7	value min. 1 V; see illustration
	31d	
Note: With an irregular signal: check segments on flywheel		



t_1 = pulse signal first segment
t_2 = pulse signal second segment
t_3 = one crankshaft revolution

signal crankshaft position sensor

ignition adjustment	
location: switch on firewall LH	
resistance; ignition off; measure on switch	
connection	*test value*
centre pin	see table below
pins according to table	

position ECE	*position CAT*	*resistance*
S	1	∞ Ω
2	2	2400 Ω
N	3	1300 Ω
4	S	750 Ω
5	5	470 Ω
6	N	220 Ω
7	7	0 Ω

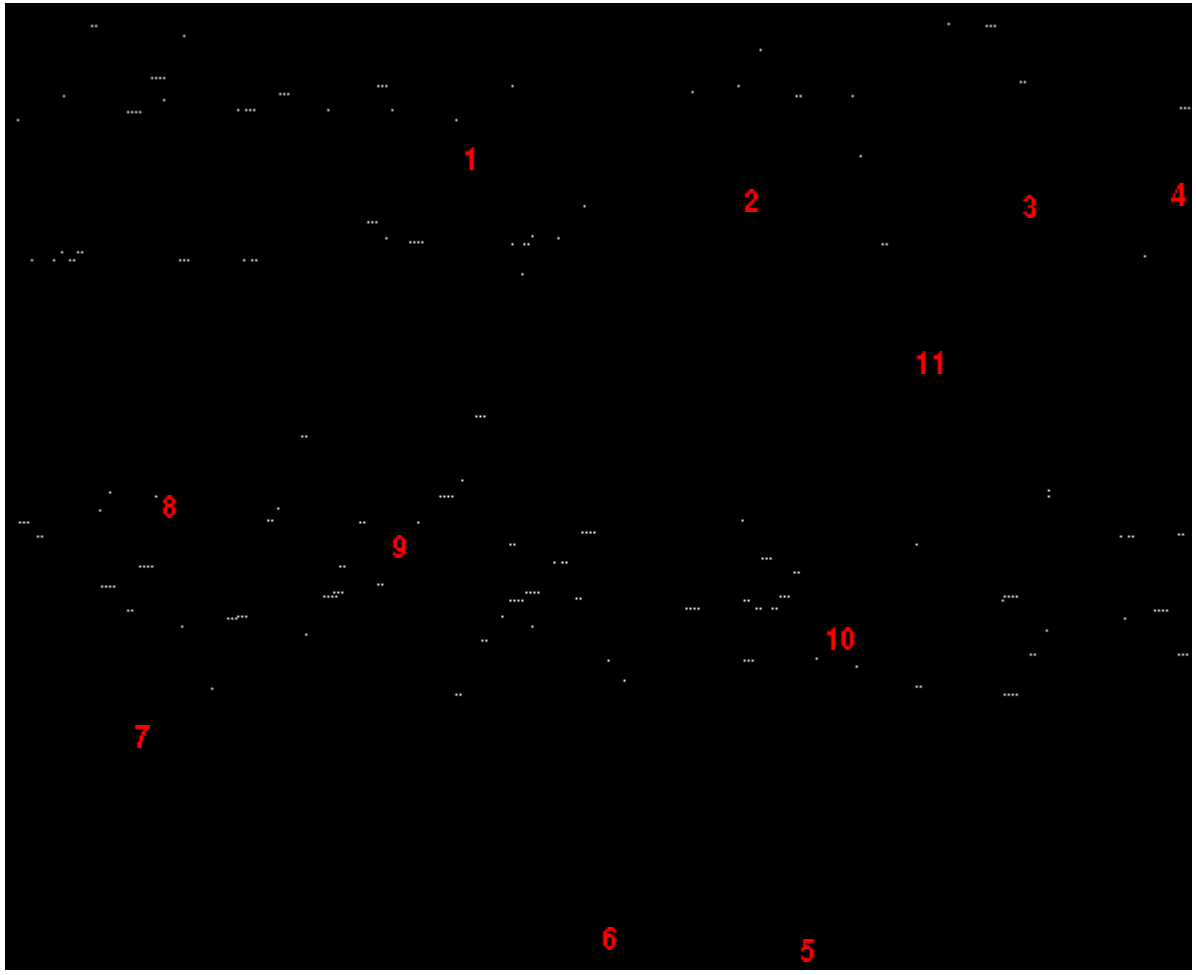
coolant temperature sensor	
resistance; ignition off	
connection	*test value*
pin 1	see table below
battery negative terminal	

temperature	*resistance*
-20 °C	15700 Ω
-10 °C	9200 Ω
0 °C	5900 Ω
10 °C	3700 Ω
20 °C	2500 Ω
30 °C	1700 Ω
40 °C	1180 Ω
50 °C	840 Ω

60 °C	600 Ω
70°C	435 Ω
80 °C	325 Ω
90 °C	247 Ω

zero load switch		
location: on carburettor; signal from 2E-E carburettor control unit		
sensor signal; measure on the 4-pin connector of the control unit		
connection	*to pin*	*test value*
brown/yellow; V+	2	at idle speed: 0 V at part load: battery voltage
battery negative terminal		

limp home mode		
location: signal from the 2E-E carburettor control unit		
sensor signal; measure on the 4-pin connector of the control unit		
connection	*to pin*	*test value*
battery positive terminal; V+		battery voltage
brown/red; V-	4	
Note: Limp home mode is activated by disconnecting the lower vacuum hose of the throttle valve adjuster		



1. ignition coil
2. distributor
3. 2 E-E control unit
4. coolant temperature sensor
5. ignition correction switch
6. control unit: EZL
7. crankshaft position sensor
8. diagnostic connector
9. earth connection front inner wing panel LH
10. battery negative
11. not connected up to: 09/1988

bl = blue; br = brown; el = ivory; ge = yellow; gn = green; gr = grey; nf = natural; rs = pink; rt = red; sw = black; vi = lilac; ws = white

wiring diagram: Bosch EZL