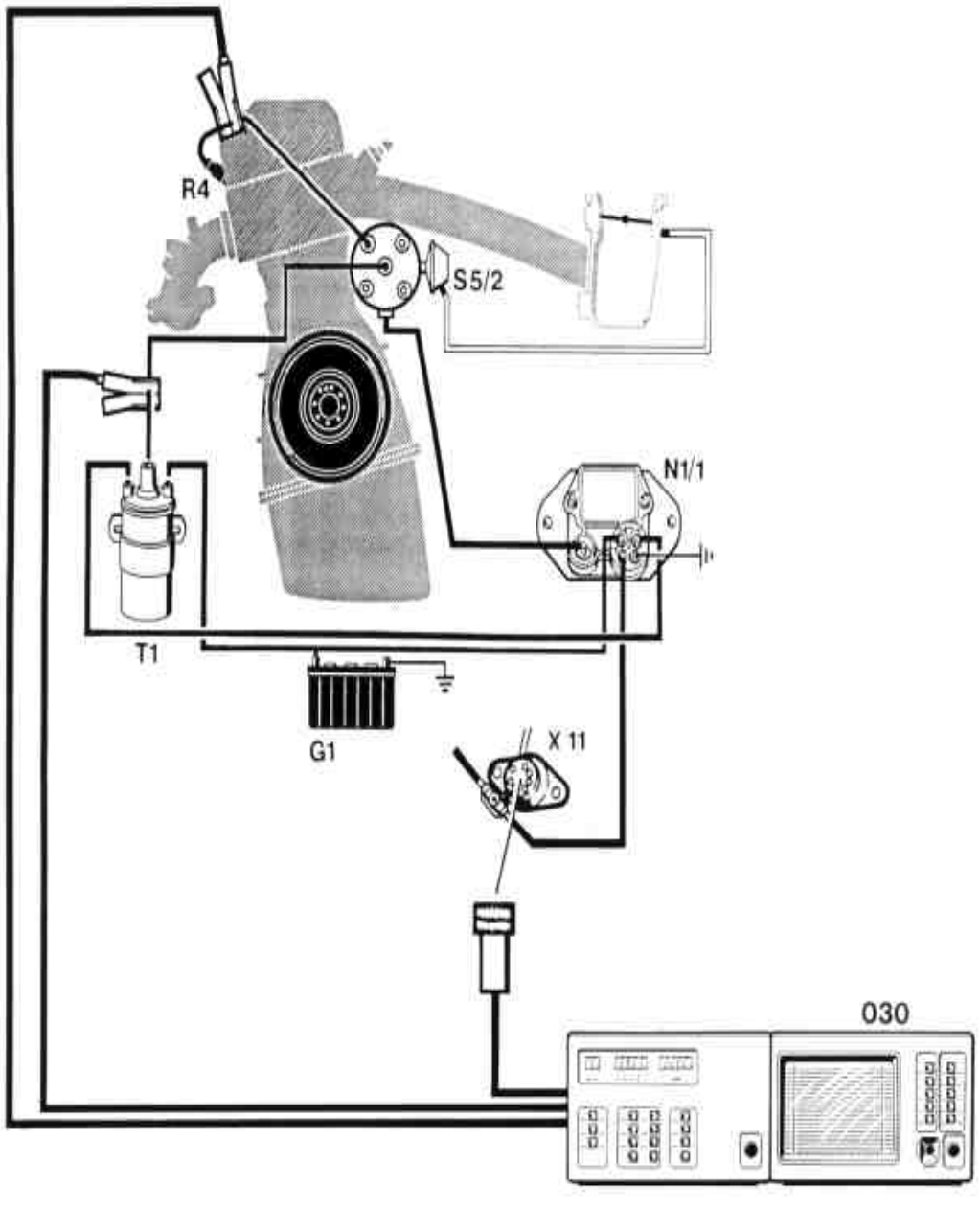
15-542 Testing breakerless transistorized ignition (TSZ)

Preceding work:
Testing, adjusting engine (07.3-110)

Operation No. of operation texts and work units or standard texts and flat rates:

Precondition for test
Spark plugs, ignition cables, distributor rotor and distributor cap in proper mechanical and electrical condition.

Test e. g. by visual inspection, measuring resistance and ignition oscilloscope.



Connection diagram for engine tester with oscilloscope

G1	Battery	S5/2	Breakerless distributor
N1/1	Transistorized ignition (TSZ) control unit	T1	Ignition coil
R4	Spark plugs	X11	Diagnosis socket/terminal block terminal TD
		030	Engine tester with oscilloscope

Note
Pay attention to the safety precautions (15-0505) when performing work on the ignition system. Switch off ignition when unplugging and plugging in the contacters at the TSZ control unit.

Special tool

Commercially available testers

Multimeter	e. g.	Sun, DMM-5 Fluke, Multimeter 23 Hermann, Avometer 2003
Engine tester	e. g.	Hermann, Datascope 9800 Bosch, MOT 301/400 Sun, 2110 BEAR, D AC E

Test data

Resistances (test values at approx. 20 °C)

Ignition coil	primary (terminals 1 and 15)	Ω	0.5-0.9
Ignition coil	secondary (terminals 1 and 4)	kΩ	6-16
Induction sensor	Coil resistance (terminals 7 and 31d)		600±100 ≥200 Ω
	Insulation (terminal 7 and ground)	kΩ	
Distributor cap per terminal, distributor rotor, spark plug connector		Ω	700-1300

Dwell angle

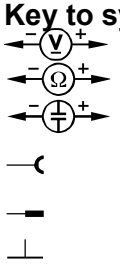
At starter speed	7-34°

Voltages, engine not running, ignition switched off

Terminals 15 and 31 (contacts 5 and 2 diagnosis socket)	V	Battery voltage
Between terminals 15 and 1 (contacts 5 and 4 diagnosis socket)	V	0

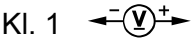
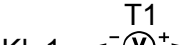
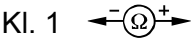
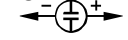
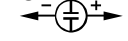
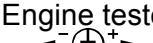
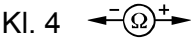
Note
If the specified value of a test step, e.g. test step 1.0, is in order, continue immediately with test step 2.0.
If the specified value of step 1.0 is not in order, it is then necessary to continue with step 1.1.

Key to symbols:

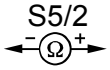
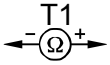
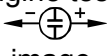
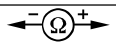


Multimeter direct voltage mode
Multimeter resistance mode
Oscilloscope
Contact
Connector
Ground

On/off ratio readout	Test step/ Test scope	Test connection	Operation/ Requirement	Specification	Possible cause/Remedy
-	1.0 Voltage supply	N1/1 31 — 15	Ignition: **ON**	Battery voltage	Test cables and contacts according to wiring diagram (from battery via ignition lock to TSZ control unit), ground connection (W3).
-	2.0 Induction sensor	Connector 31d	Ignition: **OFF** Detach induction sensor connector at TSZ control unit (green cable).	600 Ω ±100 Ω	Replace induction sensor. Test cables and contacts from TSZ control unit to distributor.
-	2.1 Insulation of sensor coil	Sensor coil	Detach induction sensor cable connector at distributor.	≥200 kΩ	Replace induction sensor.
-	3.0 Dwell angle of (TD signal)	Engine tester	Engine: **Start**	7-34°	Dwell angle not to tolerance: replace TSZ control unit. No dwell angle: test stall current cutoff. Pay attention to notes on TD signal

On/off ratio readout	Test step/ Test scope	Test connection	Operation/ Requirement	Specifi-cation	Possible cause/Remedy
-	4.0 Stall current cutoff	T1 Kl. 1  Kl. 15 T1 Kl. 1  Kl. 15	Ignition: **ON** Engine: **Start**	0V 0V >0V	Replace TSZ control unit and ignition coil. Test cables and contacts from TSZ control unit to ignition coil or replace TSZ control unit. Replace ignition coil.
-	4.1 Ignition coil primary T1	T1 Kl. 1  Kl. 15	Ignition: **OFF** Unscrew cables at ignition coil.	0.5-0.9 Ω	Replace ignition coil.
-	5.0 Primary voltage	Engine tester  Scope image Primary parade	Engine: **Start**	>200 V	Replace TSZ control unit.
-	6.0 Primary current limiting	Engine tester  Scope image Secondary overlap	Engine: **Start**	see diagram	Replace TSZ control unit.
-	7.0 Ignition voltage at terminal 4 ignition coil	Engine tester  Scope image Secondary parade	Engine: **Start**	≥8 kV	Test ignition cable terminal 4, distributor rotor, distributor cap and ignition coil.
-	7.1 Ignition cable terminal 4	T1 S5/2 Kl. 4  Kl. 4	Ignition: **OFF** Detach ignition cable terminal 4 at ignition coil and distributor cap.	<1 Ω	Replace ignition cable terminal 4.

On/off ratio readout	Test step/ Test scope	Test connection	Operation/ Requirement	Specifi-cation	Possible cause/Remedy
-	7.2 Distributor rotor	Distributor rotor  Middle Peak	Ignition: **OFF** Remove distributor cap	700-1300 Ω and visual inspection	Replace distributor rotor.

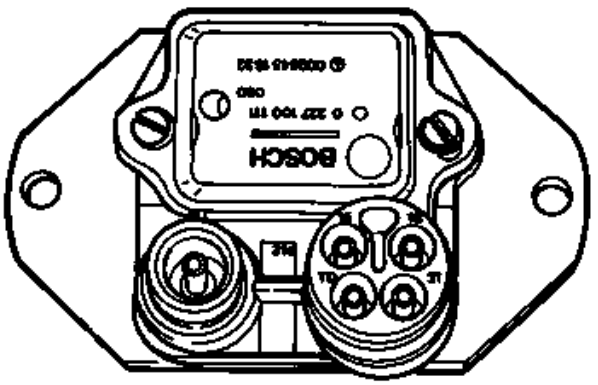
-	7.3 Distributor cap	S5/2 Kl. 4  Car-bon	Ignition: **OFF** Distributor cap removed and detach ignition cable terminal 4.	700-1300 Ω per terminal and visual inspection	Replace distributor cap.
-	7.4 Distributor cap/rotor	Visual inspection	Ignition: **OFF** Remove distributor cap.	-	Distributor cap, distributor rotor has cracks.
-	7.5 Ignition coil secondary T1	T1 Kl. 4  Kl. 1	Ignition: **OFF** Unscrew cables at ignition coil.	6-16 kΩ	Replace ignition coil.
-	8.0 Ignition voltage at single cylinder	Engine tester  Scope image Secondary parade High voltage clamp at cylinder ignition cable (e. g. cylinder 3)	Engine: **Start**	>6 kV	Test distributor cap, distributor rotor, ignition cables with spark plugs.
-	8.1 Ignition cable with spark plug connector	 Ignition cable Spark plug connector	Ignition: **OFF** Detach ignition cable with spark plug connector at spark plug and distributor.	700-1300 Ω	Replace ignition cable with spark plug connector.

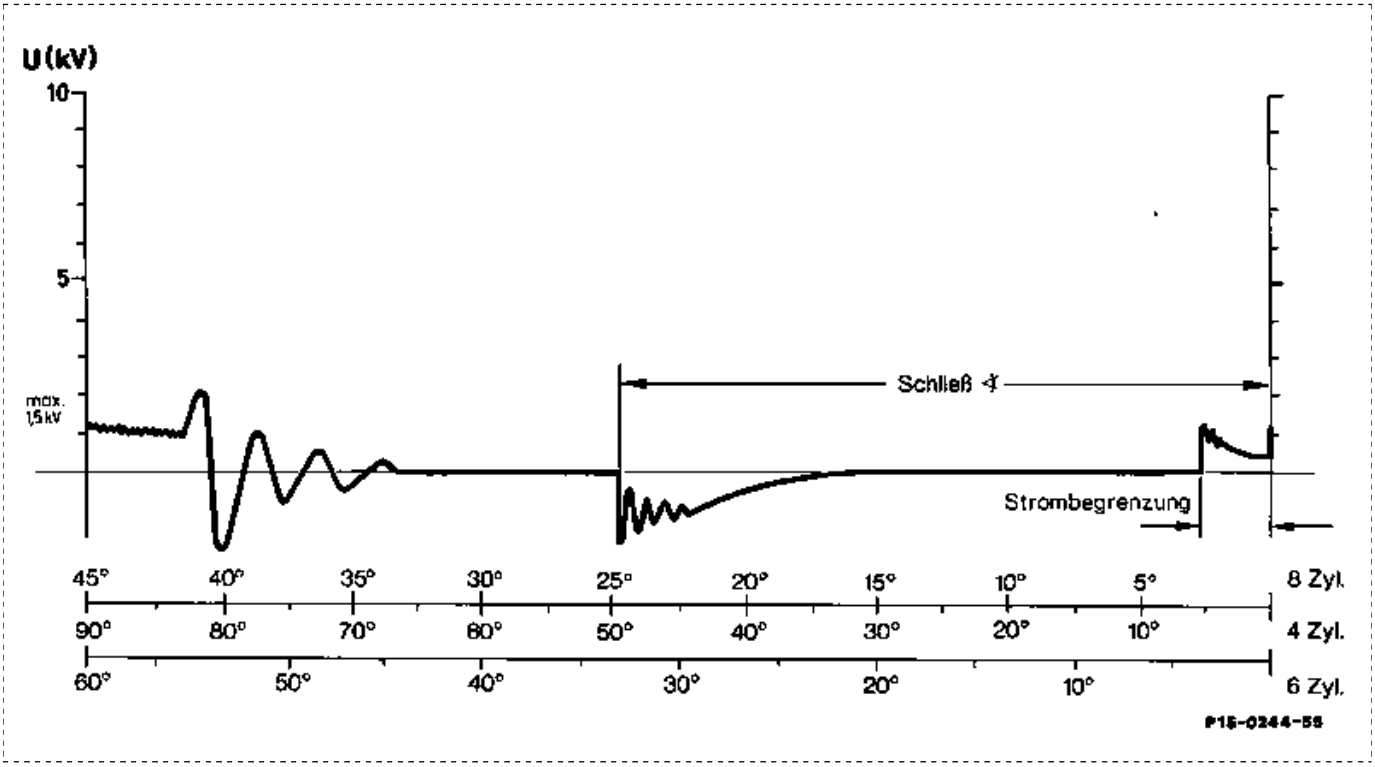
On/off ratio readout	Test step/ Test scope	Test connection	Operation/ Requirement	Specifi-cation	Possible cause/Remedy
-	8.2 Spark plugs	Visual inspection	Ignition: **OFF** Remove spark plugs.	Electrode gap 0.8 mm	Replace according to condition.
-	9.0 Ignition point	Engine tester	Engine: Test at normal operating temperature at specified speeds and with/without vacuum.	see table 15-515	Setting of vacuum advance Ignition advance in warming-up phase (15-543).

-	9.1 Vacuum advance	Engine tester	Engine: Normal operating temperature, speed approx. 1500/min. Detach vacuum hose. Fit on vacuum hose.	Ignition point retarded Ignition point advanced	Vacuum hose leaking Connection at intake manifold blocked. Vacuum unit faulty. Distributor faulty.

Assignment of TSZ ignition control unit (N1/1)

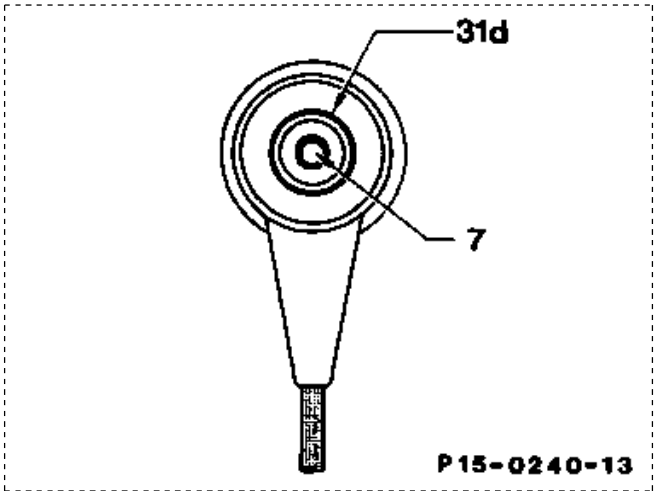
- Green control cable from inductive sensor in distributor (coaxial connector).
- 4-pin round connector with the terminals 15, 31, 16 and TD.



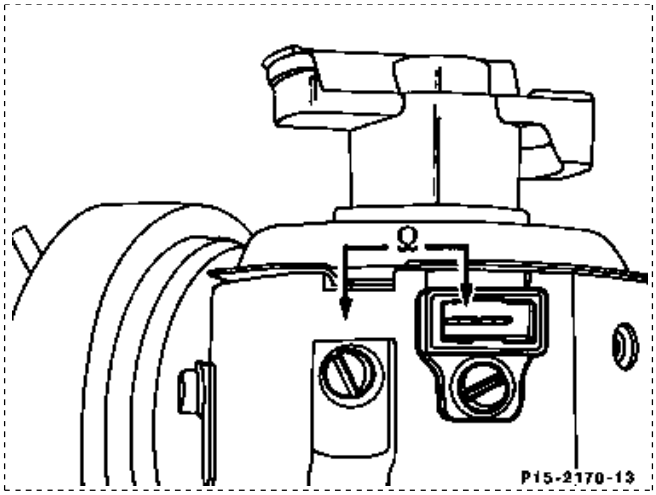


Current limiting

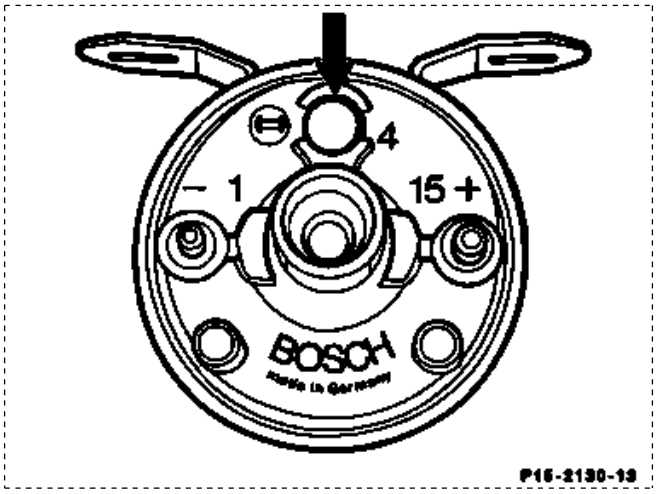
Induction sensor connector
Test resistance between connections 7 and 31d.



Test insulation of induction sensor coil to ground (≥200 kΩ).

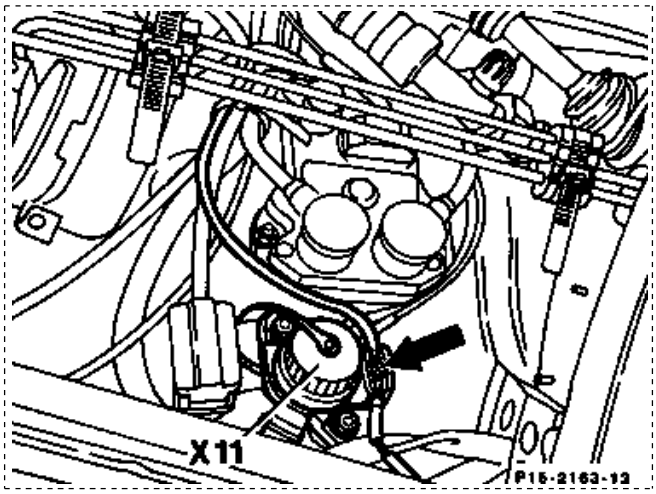


Ignition coil (T1)
If plug (arrow) pressed out, replace.



Note re TD signal

In the event of a short-to-ground at the connected equipment (e.g. tachometer, KE control unit, fuel pump relay and compressor cut-off control unit) or at the diagnostic socket/ terminal block terminal TD (X11), the TD signal is no longer available. For locating fault, detach cable connection (arrow). Rectify short-to-ground in the relevant circuit.



TSZ wiring diagram

N1/1 Transistorized ignition control unit
S5/2 Distributor
T1 Ignition coil
W3 Ground, front left wheelhouse (ignition coil)
X11 Diagnosis socket/terminal block terminal TD
a Equipment with terminal TD
(e. g. tachometer, fuel pump relay, KE control unit, compressor cutout control unit)
b Voltage supply terminal 30
Model 124: to fuse 9 via engine plug connection (X26), contact 3
Model 201: to fuse 13 via electrical center coupling S, contact 11
c Voltage supply terminal 15, unfused
Model 124: engine plug connection (X26), contact 1
Model 201: electrical center coupling S, contact 4