Service

VAS 5067

Exhaust-gas Analyser

EU **Operating Instructions**

Contents

1 Instructions for your personal safety and for the protection of equipment/vehicle components

1.1 Mains voltage High voltage

Hazardous voltages occur in both the lighting system and the electrical system of a motor vehicle. If contact is made with live parts (e.g. with the ignition coil), there is a risk of electric shock from flashover voltages caused by damaged insulation (e.g. ignition cables which have been attacked by martens). This applies to both the primary side and the secondary side of the ignition system, to the cable harness and the plug connections, to the lighting systems (Litronic) and to the tester connections.

Safety precautions:

⇒ All testers must be connected to properly grounded, shock-proof sockets.

⇒ Testers must always be connected using the power cables supplied with them.

⇒ All extension cables must be fitted with shock-proof contacts.

⇒ Any cables with damaged insulation must be replaced (e.g. power or ignition cables).

⇒ Connect testers to the lighting system and switch them on before connecting them to the vehicle.

⇒ Connect testers to the engine ground or to the battery (B-) before switching on the ignition.

⇒ Always switch off the ignition before performing any work on the electrical system of the vehicle. The term “work” includes connecting testers, replacing parts of the ignition system, removing assemblies (e.g. generators), connecting assemblies to a test bench, etc.

⇒ Wherever possible, tests and settings should always be carried out with the ignition switched off and the engine stationary.

⇒ If tests or settings are carried out with the ignition switched on or the engine running, care must be taken not to touch any live parts. This applies to all the connecting cables of the testers as well as to the connections of any assemblies at the test bench.

⇒ Test connections must always be made using suitable connectors (e.g. vehicle-specific adapter cables).

⇒ Make sure that all test connections are properly plugged in and secure.

1.2 Danger of acid burning in the respiratory system

With **exhaust gas measurements are taken, the sampling hose** which are used release a highly caustic gas (hydrogen fluoride) that can cause acid burning in the respiratory system when heated to temperatures in excess of 250 °C (482 °F) or in the event of fire.

Safety precautions:

⇒ Consult a doctor immediately after inhaling!

⇒ Always wear gloves made of neoprene or PVC when removing combustion residues.

⇒ Neutralize any residues left after a calcium hydroxide solution. This produces non-toxic calcium fluoride, which can be washed away.

1.3 Danger of acid burning

Acids and alkalis can cause severe burning on unprotected skin. Hydrogen fluoride forms hydrofluoric acid in combination with moisture (water).

The **condensate** which accumulates in the sampling hose and in the condensate container likewise contains acid.

When replacing the **O_2 sensor**, it should be remembered that it contains alkali.

Safety precautions:

⇒ Rinse any affected parts of the skin immediately in water, then consult a doctor!

If liquid crystal escapes from a damaged **liquid crystal display**, it is imperative to avoid direct contact between the liquid and the skin, as well as inhalation or swallowing!

Safety precautions:

⇒ Wash the skin and clothing thoroughly with soap and water if it comes into contact with liquid crystal.

⇒ Consult a docotor immediately after inhaling or swallowing liquid crystal.

1.4 Danger of asphyxiation

Car exhaust fumes contain carbon monoxide (CO)–a colorless, odorless gas. If inhaled, carbon monoxide causes an oxygen deficiency in the body. Extreme caution is therefore essential when working in a pit, as some of the components of the exhaust gas are heavier than air and settle at the bottom of the pit.

Caution is also necessary when working on LPG–driven vehicles.

Safety precautions:

⇒ Always ensure effective ventilation and suction (especially when working in a pit).

⇒ Always switch on and connect the suction plant in a closed area.

1.5 Danger of injury, danger of crushing

If the vehicle is not prevented from rolling away, there is a danger of people being crushed against a workbench, for example. Both running and stationary engines have rotating and moving parts (e.g. belt drives) which may cause injuries to fingers and arms. A special hazard is presented by electrically driven fans, in that they may be switched on without warning while the engine is stationary and the ignition is switched off.

Safety precautions:

⇒ Take steps to prevent the vehicle from rolling away while it is being tested. Select the park position if the vehicle has an automatic transmission and apply the handbrake or lock the wheels with chocks (wedges).

⇒ Keep well away from rotating/moving parts while the engine is running.

⇒ When working on or in the vicinity of electrically driven fans, allow the engine to cool down first, then disconnect the plug of the fan motor.

⇒ Keep the tester connecting cables well away from all rotating parts.

1.6 Danger of burning

When working on a hot engine, there is a risk of injury from burning if such components as the exhaust gas manifold, the turbocharger, the Lambda sensor, etc. are touched or if parts of the body come too close to them. These components may be heated to temperatures of several hundred degrees Celsius. Depending on the duration of the exhaust gas measurements, the sampling probe of the exhaust gas measuring instrument may also become extremely hot.

Safety precautions:

⇒ Always wear protective clothing, e.g. gloves.

⇒ Allow the engine to cool down first (this also applies to auxiliary heating systems).

⇒ Keep the tester connecting cables well away from all hot parts.

⇒ Do not leave the engine running any longer than necessary for the test or setting.

1.7 Noise

Noise levels in excess of 70 dB(A) can occur when measurements are carried out on a vehicle, especially at high engine speeds. Damage to hearing may result if human beings are exposed to noise at such levels over an extended period of time.

Safety precautions:

⇒ If necessary, noise protection facilities must be provided by the owner at all workplaces in the vicinity of the testing areas.

⇒ If necessary, suitable personal noise protection facilities must be used by the operator.

2 General information

2.1 Explanation of symbols used

The following pictographs are used in these Operating Instructions:

LED LED on VAS 5067
LED Flashing LED on VAS 5067 (in bold print)

2.2 Application

The VAS 5067 Exhaust-gas analyzer is used for measuring the concentration of car exhaust emissions, for monitoring or engine diagnostic purposes. The unit can be used on vehicles fitted with a 4-stroke spark-ignition and 4-stroke rotary-piston (Wankel) engine. Measurements can only performed on 2-stroke engines if the appropriate special accessories are used (see chapter 3.5).

The VAS 5067 can also be used for measuring the speed and oil temperature of an engine.

The VAS 5067 Exhaust-gas analyzer is suitable for carrying out emission tests on vehicles with spark-ignition engines, in accordance with EU Guideline 92/55 EC of the European Council dated June 22, 1992.

The VAS 5067 is subject to the laws requiring calibration for exhaust-gas analyzers and must as such be calibrated.

2.3 User groups

The VAS 5067 has been designed for use by trained expert personnel in the automotive industry. Read this Operating Instructions carefully for your own safety and to prevent the unit from being damaged through improper usage.

2.4 Operating software and scheduled data

Despite taking the greater possible care when programming, compiling and checking the software and data, we cannot guarantee for the correctness of the operating software.
We cannot accept any liability for consequential damage.

3 Description of the unit

3.1 Functional description

The VAS 5067 is used for measuring the exhaust-gas components CO, HC, CO_2 and O_2. The lambda air ratio is calculated on the basis of the emissions values measured. The VAS 5067 can also be used to measure the engine speed and oil temperature.

The following measurement ranges are covered:

CO	Carbon monoxide	0 ... 10.00 % vol
HC	Hydrocarbons (using hexane as a basis)	0 ... 9999 ppm
CO_2	Carbon dioxide	0 ... 18 % vol
O_2	Oxygen	0 ... 21 % vol
n	Engine speed	0 ... 9990 U/min
T	Oil temperature	0 ... 150 °C
λ	Lambda air ratio	0,500 ... 2,000
$CO_{corrected}$		0 ... 10 %

The non-dispersive, infrared process is used for measuring the CO, CO_2 and HC components (NDIR - non-dispersive infrared spectroscopy).
The oxygen content is measured using an electrochemically acting sensor.
The engine speed is measured by attaching an inductive clip-on pickup to a spark plug cable and the oil temperature by inserting a temperature sensor into the engine instead of the oil dipstick.

The measured values can be printed out on an integral or external protocol printer (special accessory).

3.2 Views and controls

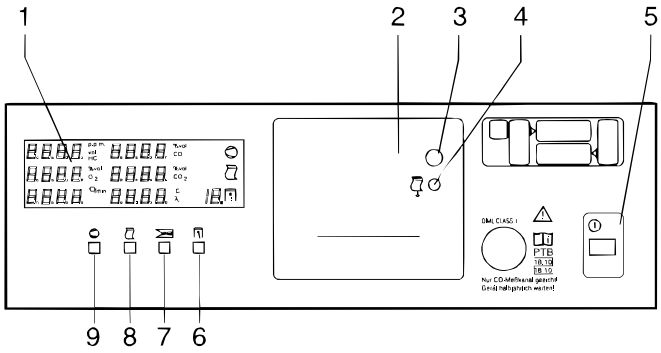


Figure 1, View from the front

1. Digital display
2. Protocol printer
3. Knob for opening the printer cover (to change the paper)
4. Printer paper feed button
5. Button for mains power supply on/off ⏻
6. Selector button for the pulse rate per 720° revolution (speed measurement)
7. Selector button for engine speed sensor and measuring point used
8. Printer button – generate a printout
9. Pump button – start/stop analysis

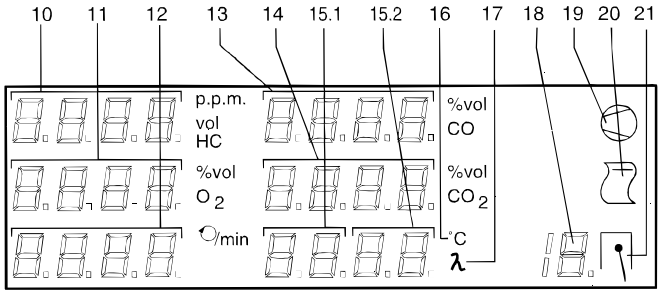


Figure 2, Digital display

10. HC digital display
11. O_2 digital display
12. Digital display for engine speed and CO_{corr}
13. CO digital display
14. CO_2 digital display
15.1 Digital display for entry function symbol and first 2 places for oil temperature and lambda
15.2 Digital display for entry function status and last 2 places for oil temperature and lambda
16. Oil temperature display indicator
17. Lambda display indicator
18. Display for pulse rate per 720° revolution of the crankshaft and for entry function number
19. Pump symbol
20. Printer symbol
21. Cylinder symbol

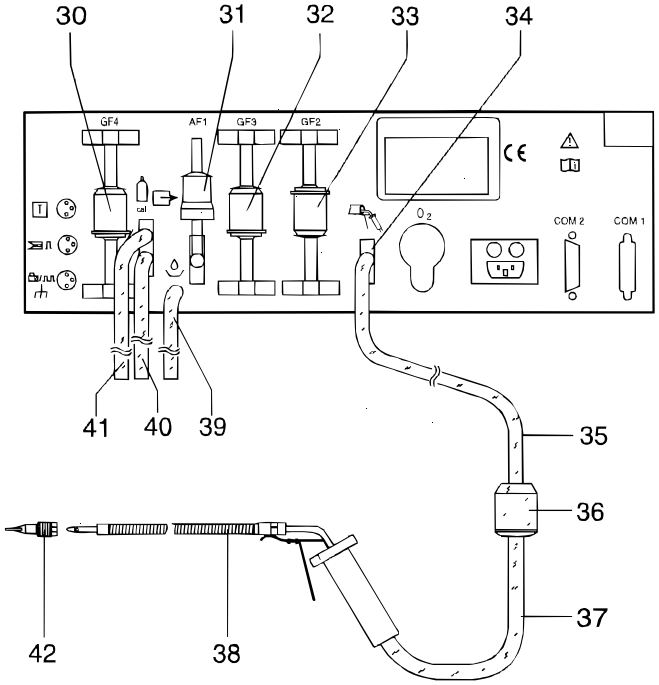


Figure 3, Hose connection plan

30. Protective pump filter GF4
31. Activated charcoal filter
32. Protective pump filter GF3
33. Intake filter GF2
34. Measurement gas intake
35. 8 m hose (black)
36. Coarse filter GF1
37 30 cm viton hose (black)
38. Sampling probe
39. Measurement gas and condensate outlet (70 cm PVC hose, transparent)
40. Gas and condensate outlet (70 cm PVC hose, transparent)
41. Test gas intake, condensate and gas outlet (70 cm PVC hose, transparent)
42. Sealing plug

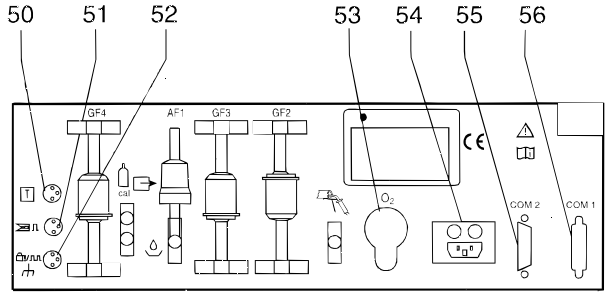


Figure 4, Back

50. Socket for oil temperature sensor
51. Socket for inductive clip-on pickup
52. Socket for connecting cable term. 1, TD/TN, B- or vehicle earth
53. Cap for O_2 sensor
54. Mains socket and mains fuse
55. Optional second serial port
56. Serial port

3.3 Operating method

3.3.1 Warming-up period

The warming-up period of the unit lasts 3 minutes. No analysis is possible during this period.

No warming-up period is required for entry mode (see chapter 5). Allowance must therefore be made for zero point drift when analysing in this mode.

3.3.2 Drift correction

The analyzer will automatically carry out a system test with ambient air 15 minutes after analysis has commenced. If analysis is being carried out at that time, the test will be postponed until its completion.

3.3.3 CAL system test

The analyzer switches a solenoid valve over to ambient air for the system test. Zero gas is used for flushing the unit for 30 seconds.

Hydrocarbons are removed from the inducted ambient air by an activated charcoal filter.

The drift of the oxygen measurement and the zero points of HC, CO and CO_2 measurements are monitored and adjusted.

3.3.4 Air ratio measurement

The analyzer calculates the lambda air ratio from the concentrations of HC, CO, CO_2 and oxygen measured. Precise oxygen measurement is important for the purposes of lambda calculation. If this is active, the oil temperature display will be switched over to lambda should a CO_2 concentration greater than 2 % be measured.

3.3.5 Corrected CO concentration ($CO_{corrected}$)

The analyzer will calculate the actual concentration of CO ($CO_{corrected}$) from the concentration of CO and CO_2.

VAS 5067:
Allowance is then made for leaks in the exhaust system. The corrected CO concentration is only printed out on the analysis protocol and if no engine speed is measured it is indicated in the digital display (12).

3.3.6 Oxygen measurement

The exhaust-gas analyzer is equipped with an O_2 sensor. This sensor is screwed to the rear of the analyzer in the socket provided (53).

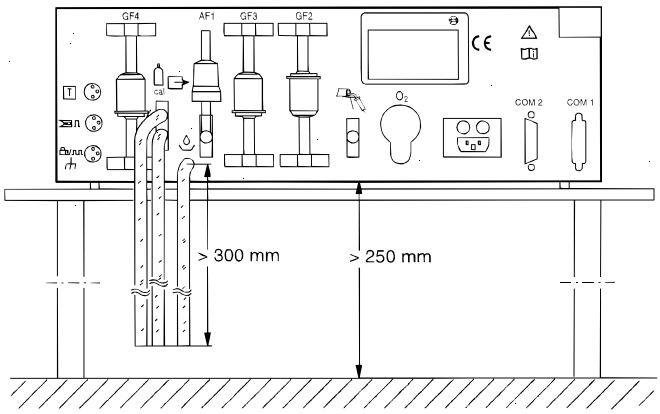
Oxygen measurement is automatically adjusted to an oxygen content of 20.9 % by volume of air. It can be switched off (see chapter 5.3.6).

The O_2 sensor is a part subject to wear.

3.4 Initial commissioning

Caution! Min. height of installation location: 250 mm from floor
Min. length of outlet hoses: 300 mm

Note: These specifications must be observed to ensure that the condensate generated constantly flows off, the accuracy of measurement is guaranteed and that the measuring system is adequately protected again contamination.



For a hose connection plan, see Figure 3.

⇒ Connect the exhaust sampling probe to the prefilter (36) using the 30 cm viton hose (37).

⇒ Connect the sampling hose (35) to the prefilter.

⇒ Connect the sampling hose to the gas intake (34) on the analyzer.

Caution! Connect 3 70 cm PVC hoses (39/40/41) to the gas outlets. Lead the hoses into an open container to collect condensation. Observe the voltage specifications shown on the rating plate!

⇒ Connect the analyzer to a properly earthed two-pole-and-earth socket outlet using the power lead supplied.

3.5 Exhaust analysis on 2-stroke engines

3.5.1 Technical background

Vehicles with 2-stroke engines emit higher levels of hydrocarbon (HC) emissions than 4-stroke engines and they also emit oil. Oil for the most part consists of hydrocarbons. If no measures are taken to prevent it from happening, this oil is deposited on the sides/walls of the external gas path (sensor, hose, filter).

These deposits lead to an HC concentration being indicated (residual value indication) even when exhaust analysis is not being carried out. This means, then, that the actual HC value measured during an HC measurement is distorted by the amount of this residual value (increased).

This effect, referred to by experts as ”hang-up”, manifests itself in all exhaust-gas analyzers that are capable of measuring the HC concentration and is not specific to any particular make.

These deposits can be prevented to the greatest possible extent through the use of activated charcoal filters. These filters bind and neutralise for the most part oil and volatile hydrocarbons. Filters of this kind have a limited service life. They are used on the sensor in the gas path downstream of the coarse filter.

Deposits can also occur in small quantities downstream of the activated charcoal filter on the sides of the hose. They must be purged by means of one or other of the two alternatives we offer.

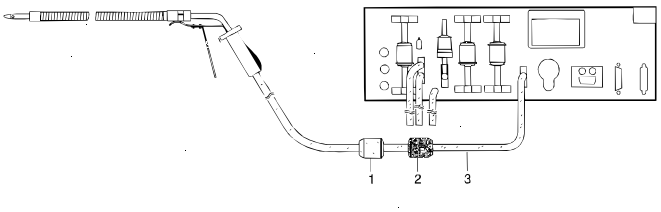
3.5.2 Solutions

- 1st alternative

Flushing using the integral pump in the analyzer.

The pump must be left switched on after each 2-stroke measurement until the HC value displayed has dropped to below 20 ppm. The flushing time depends on the magnitude of the residual value. It can take approx. 30 minutes, but it may also take considerably longer.

For this alternative, only the activated charcoal filter is additionally required for 2-stroke exhaust analysis. The filter must always be inserted in the gas path during these measurements.

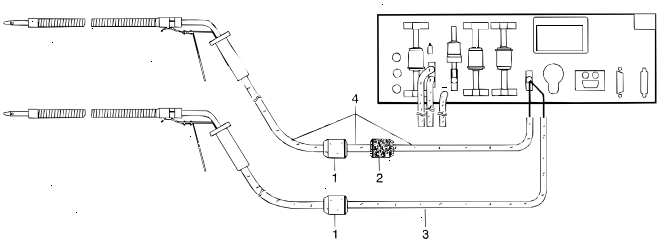


1. Coarse filter
2. Activated charcoal filter
3. Sampling hose, material viton

● 2nd alternative

In order to reduce the flushing times drastically, i.e. to increase the availability of the units after a 2-stroke analysis, we recommend that you use a second external gas path.

The HC deposits can then be purged quickly by blowing out the hose with compressed air.



1. Coarse filter
2. Activated charcoal filter
3. Sampling hose, viton
4. Sampling hose set viton (8 + 0,3 + 0,3) m long

3.5.3 Notes

- Activated charcoal filters bind hydrocarbons.
- The second sampling hose and activated charcoal filter must only be used for CO measurements, not for HC and lambda measurements.

4 Exhaust analysis

4.1 Commissioning

The instructions in chapter 3.4 must be carried out before the unit is switched on for the first time.

4.1.1 The following must be tested before exhaust analysis commences:

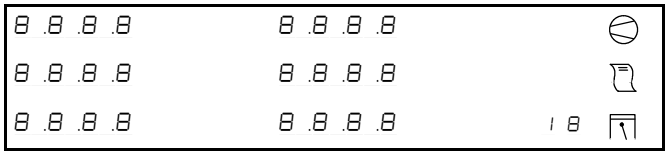
- the sampling probe (for damage and blockages);
- the coarse filter (for presence and damage);
- the sampling hose (for damage and blockages);
- filters GF2, GF3 and GF4

4.1.2 Switch on the unit

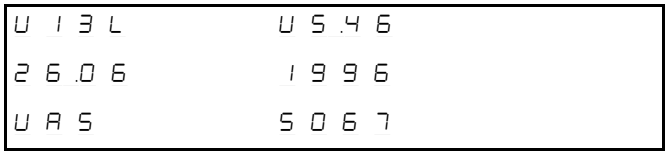
The warming-up sequence may run differently, depending on the parameterisation of the unit (see chapter 5).

⇒ Press the mains button ⏻ (5)

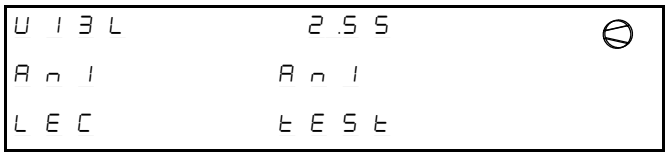
Segment test is carried out. Duration: 10 s.



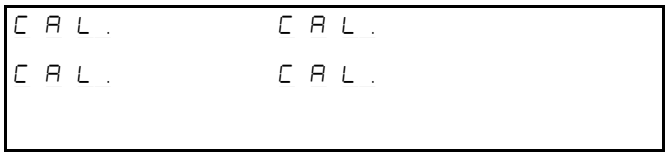
Unit version and the current date are displayed. Duration: 5 s, for example:



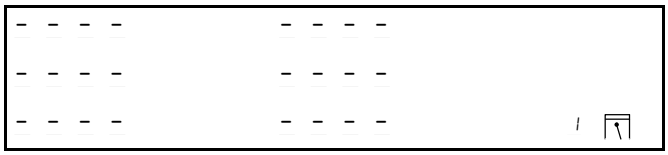
Startup with display of the remaining warming-up time. Opportunity to carry out a leak test. Pump symbol ⏻ (19) flashes. Duration: 3 min.



CAL. system check. Duration: 30 s.



Standby mode



4.1.3 Leak testing

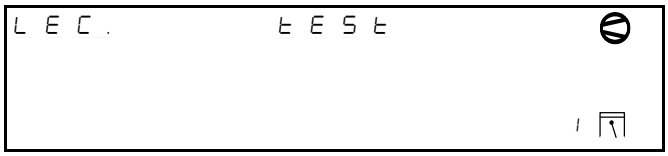
A leak test must be carried out every 24 hours. The exhaust-gas analyzer automatically prompts you to do so.

A leak test can be carried out on the sampling system during the warming-up period.

Warning! **Danger! Risk of burning yourself!**
Depending on how long exhaust-gas analysis takes, the sampling probe of the analyzer can be very hot.

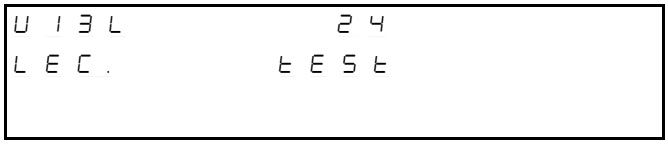
⇒ Activate the test by pressing the ⏻ pump button (9)

The ⏻ pump symbol (19) flashes.



⇒ The sampling probe (38) must then be sealed with the sealing plug (42).

⇒ Then start the leak test by pressing the ⏻ pump button (9).



The leak time is displayed in the display window (13).

⇒ Remove the sealing plug (42) immediately after the leak time has elapsed.

If the leak test is successful, the display will revert to warming up mode. Otherwise, a fault will be displayed!

4.2 Requirements for exhaust analysis

- The engine must be warm (oil temperature > 60 °C)
- No aids to starting (automatic or manual) must be operating.
- The exhaust pipe must not leak.
- The engine must have the ignition settings specified by the manufacturer (dwell angle, ignition timing and idling speed).

4.3 Preparation of exhaust analysis

Warning! **Danger: exhaust fumes are poisonous!**

Exhaust fumes must be extracted from confined spaces.
With exhaust systems with one silencer, but two tailpipes, both tailpipes must be fed into a common collector pipe.

It is possible when connecting the clip-on pickup that physical injury and/or damage to property may arise due to flashover if the ignition system is faulty. For this reason, always connect an earthing lead before operating the exhaust-gas analyzer.

Note: The sampling probe (38) may be inserted into the exhaust tailpipe only **after** conditioning has been performed or only **while a measurement is running** (see chapters 4.6, 4.7).

⇒ Switch off the engine and ignition.

⇒ When measuring the exhaust-gas emissions upstream of the catalytic converter, the full length of the sampling hose (8 m) must be used between the analyzer and the sampling point in the vehicle.
Observe the temperature limit for the viton hose (max. 200 °C).
The filter (36) must also be used.

⇒ Start analysis by pressing the ⊖ pump button (9).

When using the special "oil temperature sensor" and "inductive clip-on pickup":

⇒ Make an earthing connection between the exhaust-gas analyzer and the vehicle.

⇒ Clip the inductive clip-on pickup to an ignition cable in the engine compartment at such a point that it is as far away as possible from any other ignition cables.

⇒ Set the number of ignition pulses using the button (6) (see chapter 6.2.4).

⇒ Select the sensor and measuring point using the button (7) (see chapter 6.2.3).

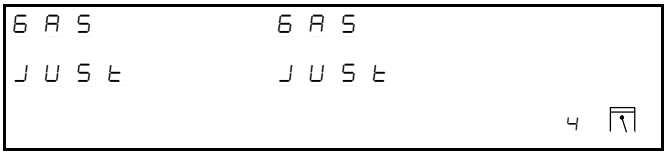
⇒ Adjust the oil temperature sensor to the length of the dipstick with the sealing cone.

⇒ Insert the oil temperature sensor into the cylinder block instead of the dipstick.

⇒ Start the engine.

4.4 Recalibration with test gas

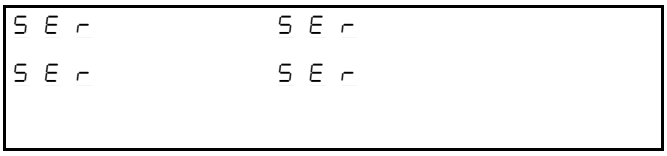
Particularly high long-term stability is a feature of the analyzer. Nevertheless, legal requirements may entail its recalibration at regular intervals. Service agencies set the requisite parameters. Before the calibration period has expired, the following warning is displayed:



The unit must then be recalibrated with test gas up to expiration of the calibration period, in accordance with chapter 8.10.

4.5 Maintenance

Regular maintenance will ensure that the unit will continue to operate reliably and accurately. If the appointed date for maintenance becomes overdue, the following message is displayed in standby mode to remind you that maintenance is necessary:

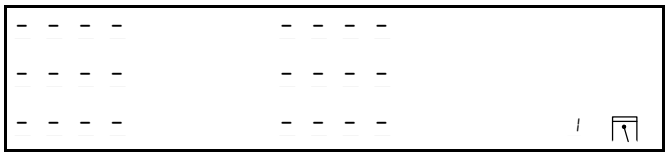


You have to update the maintanance date in entry mode (see chapter 5.3.5). Maintenance see chapter 8.

4.6 Diagnosis measurement

4.6.1 Diagnosis measurement without data terminal

Diagnosis measurement is started from standby mode.



⇒ Start diagnosis measurement by pressing the pump button (9).

Note: You can abort measurement at any time by pressing the pump button (9) again.

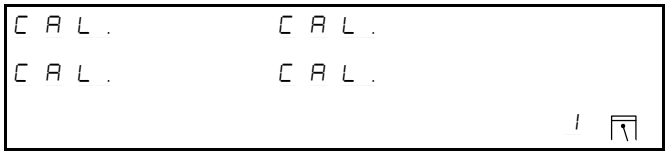
The type of fuel set is displayed.

The cylinder symbol (21) flashes.

You can switch between these fuel types within 6 seconds by pressing the button (6):

PEtr	Petrol
LPG	Liquid Petroleum Gas
CnG	Compressed Natural Gas
COH	Methanol

An automatic CAL system check is carried out depending on the status of the exhaust-gas analyzer. Duration: 30 s.

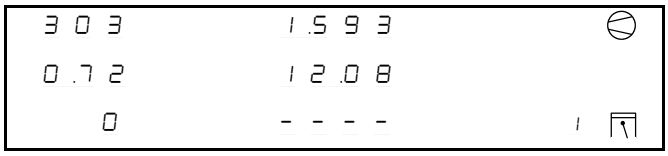


An automatic HC residue test is carried out. Duration: 6 s.

After this test, the instantaneous measured values for the ambient air are displayed.

⇒ Push the sampling probe (38) into the exhaust tailpipe or the common collector pipe as far as possible. Fasten the sampling probe to the tailpipe using the clip provided.

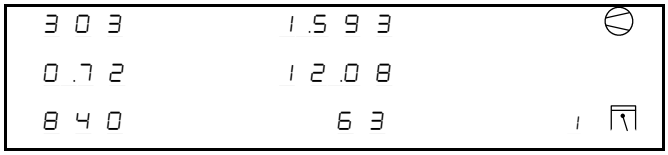
The instantaneous measured values of the exhaust gas are displayed.



Using the special accessories

- inductive clip-on pickup (/ min)
- oil temperature sensor (°C)

the relevant measured quantities are displayed.

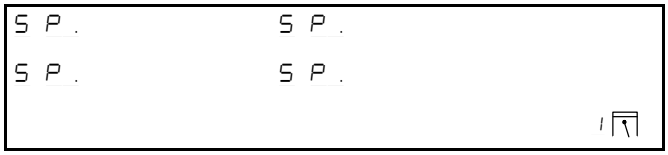


Note: Select the speed sensor and measuring point by pressing the button (7) (see chapter 6.2.3). The number of pulses is set using the button (6) (see chapter 6.2.4).

⇒ Print out a protocol by pressing the button (8)

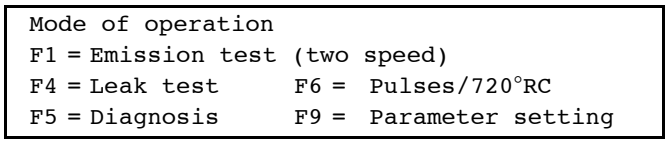
Note: If you press the button (8) again while a measurement is in progress, the instantaneous measured values are printed out without a protocol header each time you press the button.

⇒ To end measurement and scavenge the analyzer, press the pump button (9).



4.6.2 Diagnosis measurement with data terminal (special accessory)

Diagnosis measurement is started from the main menu.



⇒ Start diagnosis measurement by pressing function key **F5**.

Note: You can abort measurement at any time by pressing key **F10**.

The type of fuel set is displayed.

```
Type of fuel:(P/L/C/M)P

Petrol, LPG, CNG, Methanol
                          Enter = Continue
```

⇒ Input: initial letter **P**, **L**, **C**, **M.**
Default setting is **P** (petrol)

LPG Liquid Petroleum Gas
CNG Compressed Natural Gas

⇒ Confirm your setting by pressing the **ENTER** key.

An automatic CAL system check is carried out depending on the status of the exhaust-gas analyzer. Duration: 30 s.

```
Diagnosis measurement


System check                  F10 = Finish
```

An automatic HC residue test is carried out. Duration: 6 s.

```
ppm vol HC   max  20     real 210*

System check                F10 = Finish
```

After this test, the instantaneous measured values for the ambient air are displayed.

⇒ Push the sampling probe (38) into the exhaust tailpipe or the common collector pipe as far as possible. Fasten the sampling probe to the tailpipe using the clip provided.

The instantaneous measured values of the exhaust gas are displayed.

```
ppm vol HC  210           %vol CO   0.235
% vol 02   1.95           %vol CO2   12.5
n[/min]       0  --- °C         λ    1.002
F6 = Pulses/720°RC  F3 = Print   F10= Finish
```

Using the special accessories

- inductive clip-on pickup (⟲/ min)
- oil temperature sensor (°C)

the relevant measured quantities are displayed.

```
ppm vol HC  210           %vol CO   0.235
% vol 02   1.95           %vol CO2   12.5
n[/min]    2500   100 °C         λ    1.002
F6 = Pulses/720°RC  F3 = Print   F10= Finish
```

Note: Select the speed sensor, the measuring point and the number of pulses by pressing **F6** (see chapter 4.8.1).

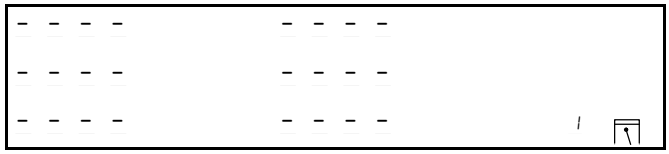
⇒ Print out a protocol by pressing the **F3** key.

Note: If you press **F3** again while a measurement is in progress, the instantaneous measured values are printed out without a protocol header each time you press the button.

⇒ To end measurement and scavenge the analyzer, press **F10**.

4.7 Emission test without data terminal

The emission test is started from standby mode.



⇒ Start the test by pressing the button (8).

Note: You can abort measurement at any time by pressing the pump button (9) again.

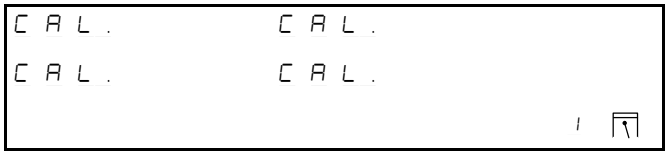
The type of fuel set is displayed.

The cylinder symbol (21) flashes.

You can switch between these fuel types by pressing the button (6):

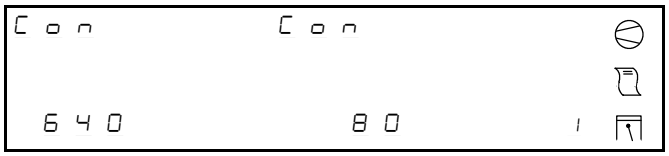
PEtr Petrol
LPG Liquid Petroleum Gas
CnG Compressed Natural Gas
COH Methanol

By pressing the button (8) or automatically after 6 s, an automatic CAL system check is carried out.
Duration: 30 s.



An automatic HC residue test is carried out. Duration: 6 s.

The conditioning phase is started automatically.



Note: Select the speed sensor and measuring point by pressing the button (7) (see chapter 6.2.3). The number of pulses is set using the button (6) (see chapter 6.2.4).

Wait until the printer symbol (20) flashes.

When the normal operating oil temperature has been reached (see manufacturer's specifications):

⇒ push the sampling probe (38) into the exhaust tailpipe or the common collector pipe as far as possible. Fasten the sampling probe to the tailpipe using the clip provided.

⇒ end conditioning by pressing the printer button (8) and begin measurement.

Depending on how the analyzer has been parameterised (see chapter 5.3.15, **Parameterisation of the sequence test**), the measurement can be carried out following 2 different sequences:

- Measurement in which measurement taken at high idle speed comes second in sequence. Default parameterisation. Switchover from measurement at idle speed to measurement at high idle speed is performed manually.
- Measurement in which measurement taken at high idle speed comes first in sequence. Switchover from measurement at high idle speed to measurement at idle speed is performed automatically.

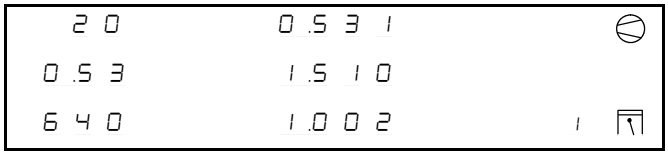
4.7.1 Measurement in which measurement taken at high idle speed comes second in sequence (closed-loop cat., open-loop cat., no cat.)

● Measurement at idle speed

The actual engine speed (12) and maximum permissible idle speed (15) are displayed.

Note: If the actual engine speed is higher than the maximum permissible value, the speed indicator (12) flashes and automatic switchover to the gas analysis time does not take place.

If the actual engine speed is correct or if the speed override is activated (see chapter 5.3.15, Parameterisation of the test sequence, setting EU.EO, parameter drbr.), the gas analysis time lasting 30 s begins after you press the button (8).



Once the gas analysis time has expired, the printer symbol (20) flashes

⇒ Press the button (8).

The measured values taken during measurement at idle speed are stored and measurement at high idle speed is automatically started.

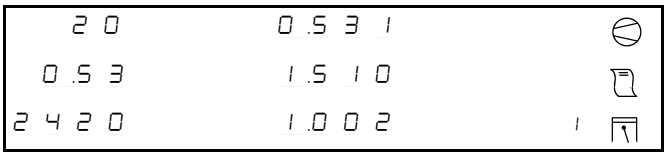
Note: If measurement at high idle speed is not be carried out (e.g. for a vehicle without a catalytic converter (cat.), the button (8) must be pressed once more within the space of 3 s. A protocol is printed out with the header, the results of the first measurement and the protocol footer as parameterised. The exhaust-gas analyzer is then scavenged.

● Measurement at high idle speed

The actual engine speed (12) and required speed (15) are displayed.

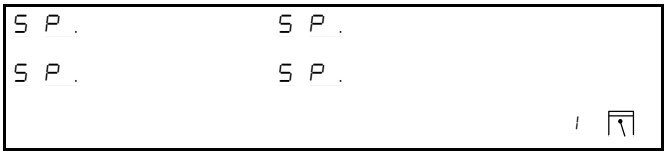
Note: The value in the speed window can be increased by pressing the button (6) (100 rpm per press of the button; setting range: 1500 – 3300 rpm + 400 rpm). When the maximum settable value is reached, the value automatically jumps to the lowest value.
If the actual speed does not agree with the value in the speed window, the speed indicator (12) flashes and automatic switchover to the gas analysis time does not take place.

If the actual engine speed is correct or if the speed override is activated (see chapter 5.3.15, Parameterisation of the test sequence, setting EU.EO, parameter drbr.), the gas analysis time lasting 30 s begins after you press the button (8).



Once the gas analysis time has expired, the measured values taken during the second measurement are automatically stored, the protocol printed out and measurement terminated.

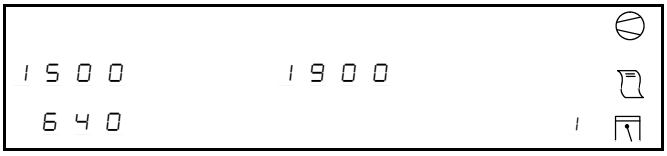
The exhaust-gas analyzer is then scavenged.



4.7.2 Measurement in which measurement taken at high idle speed comes first in sequence (closed-loop cat. only)

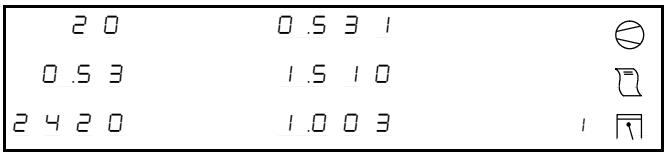
- Measurement at high idle speed

The actual engine speed (12) and speed window (min. and max. of required speed (11 + 14)) are displayed.



Note: The value in the speed window can be increased by pressing the button (6)(100 rpm per press of the button; setting range: 1500 – 3300 rpm + 400 rpm). When the maximum settable value is reached, the value automatically jumps to the lowest value.
If the actual speed does not agree with the value in the speed window, the speed indicator (12) flashes and automatic switchover to the gas analysis time does not take place.

If the actual engine speed is correct, the gas analysis time lasting 30 s begins.



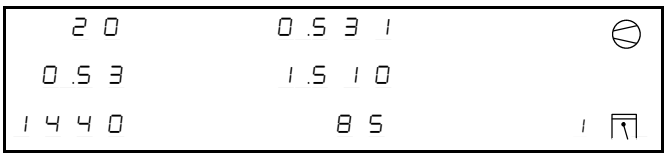
Once the gas analysis time for measurement at high idle speed has expired, the analyzer **automatically** switches over to measurement at idle speed.

- Measurement at idle speed

The actual engine speed (12) and maximum permissible idle speed (15) are displayed.

Note: If the actual engine speed is higher than the maximum permissible value, the speed indicator (12) flashes and automatic switchover to the gas analysis time does not take place.

If the actual engine speed is correct or if the speed override is activated (see chapter 5.3.15, Parameterisation of the test sequence, setting EU.EO, parameter drbr.), the gas analysis time lasting 30 s begins after you press the button (8).

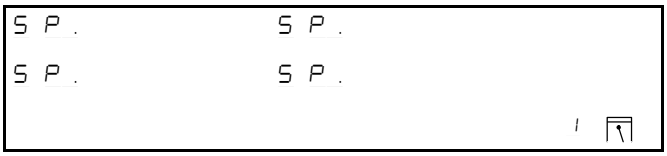


Once the gas analysis time has expired, the printer symbol (8) flashes.

⇒ Press the button (8).

The measured values taken are stored, the protocol printed out and measurement terminated.

The exhaust-gas analyzer is then scavenged.



4.8 Emission test with data terminal (special accessory)

The following basic menu is displayed on the data terminal:

```
Mode of operation
F1 = Emission test (two speed)
F4 = Leak test      F6 =  Pulses/720°RC
F5 = Diagnosis      F9 =  Parameter setting
```

4.8.1 Function keys on the data terminal

F1 Emission test

Official test for vehicles with spark-ignition engines with closed-loop-controlled fuel management system, other exhaust emission control systems and without exhaust emission control system.

F3 Print

Leads to a printout on the integral or externally connected printer.

- In the diagnosis measurement and emission test sequences, the instantaneous measured values are printed out.
- In the emission test sequences, function key **F3** is not required since the printouts are made automatically.

F4 Leak test

Warning! Risk of burning yourself!
The sampling hose of the exhaust-gas analyzer may still be very hot after the previous measurement.

- The sampling probe (38) must be sealed with the sealing plug (42).

```
Leak test
Sampling sensor sealing with
checking bush
Sampling sensor sealed?          (Y)
```

- The unit now measures the pressure drop over a period of 50 s. The time is counted down from 50 s to zero.
- The message "Leak test OK" and prompt "Remove checking bush" are displayed.
- If a leak has been detected in the system, an appropriate fault message will be displayed.

F5 Diagnosis measurement

After calibration, the following mask is displayed:

```
Type of fuel:(P/L/C/M)P

Petrol, LPG, CNG, Methanol
                          Enter = Continue
```

For further description of diagnosis measurement see chapter 4.6.2.

F6 Entering the engine speed measuring point and number of pulses

To enable universal engine speed measurement on different ignition systems (single-/dual-spark, RUV), the system offers the ability to choose an engine speed (RPM) measuring point and RPM sensor (trigger clip-on pickup, secondary, primary/connecting cable term. 1/B-) and to set the number of pulses picked up every 2 revolutions of the crankshaft.

The setting can be changed in standby mode, during diagnosis measurement and during the first step of the emission test by carrying out an engine speed measurement.

- Entering the RPM measuring point

```
RPM sensors measuring point       EFS
n[/min]   0          at pulses/720°RC = 1


RPM sensors measuring point OK?     (Y/N)Y
```

⇒ Enter **Y** (yes) to move on to entering the number of pulses

⇒ After entering **N** (no), you can change the RPM measuring point

```
Selecting the rpm sensors measuring point
n[/min]   0           at pulses/720°RC = 1
EFS, DFS, I-Prim, Prim.-L    (E/D/I/P) ? E
```

⇒ Enter the initial letter: **E**, **D**, **I** or **P**
Default: **E** (EFS)

⇒ Continue by pressing **ENTER**

```
RPM sensors measuring point         EFS
n[/min] 2500          at pulses/720°RC = 1

RPM sensors measuring point OK?     (Y/N)Y
```

⇒ Enter **Y** (yes) to move on to entering the number of pulses

⇒ After entering **N** (no), the program returns to changing the RPM measuring point

● Entering the number of pulses

```
Number of pulses/720° rev. of crankshaft
n[/min] 2500          at pulses/720°RC = 1
Measuring point                       EFS
Number of pulses  OK?                (Y/N)Y
```

⇒ Enter **Y** (yes) to end input of the RPM measuring point and number of pulses

⇒ After entering **N** (no), you can change the number of pulses

```
Setting the pulse rate/720°rev. of crank
n[/min] 2500          at pulses/720°RC = 1
```

⇒ Enter a number: **1**...**6**, **8**, **10** or **12**
Standard is **1**

⇒ Continue by pressing **ENTER**

```
Number of pulses/7200° rev. of crankshaft
n[/min] 2500          at pulses/720°RC = 4
Measuring point                       EFS
Number of pulses  OK?                (Y/N)Y
```

⇒ Enter **Y** (yes) to end input of the RPM measuring point and number of pulses

⇒ After entering **N** (no), the program returns to changing the number of pulses

F9 Entering the workshop address, unit ID and date

The display of the data terminal displays the input mask for the protocol header (workshop address), registration (number) plate, signature, date and time, and final (advertising) text. In addition, the version number and the next maintenance date are displayed.

```
P  = Protocol head    VERS:
N  = Number plate     Maintenance: 15.01.97
S  = Signature        A = Advertising
D  = Date / time              F10 = Finish
```

F10 Finish

This key enables you to abort a measuring procedure at any time. The program returns to the main menu.

Timeout

If no entry is made or an operator prompt is not replied to within 10 minutes, the analyzer automatically aborts measurement (a statutory requirement).
Message: "Emission test was interrupted"

4.8.2 Measurement in which measurement taken at high idle speed comes second in sequence (closed-loop cat.,open loop cat.,no cat.)

Note: Measurement at high idle speed is only performed on vehicles fitted with a closed-loop catalytic converter (see chapter 5.3.15, Parameterisation of the sequence test).

The emission test is started from the main menu.

```
Mode of operation
F1 = Emission test (two speed)
F4 = Leak test      F6 =  Pulses/720°RC
F5 = Diagnosis      F9 =  Parameter setting
```

⇒ Start the emission test by pressing key **F1**.

Note: You can abort the emission test at any time by pressing key **F10**.

The type of fuel set is displayed.

```
Type of fuel:(P/L/C/M)P

Petrol, LPG, CNG, Methanol
                              Enter = Continue
```

⇒ Input: initial letter **P**, **L**, **C**, **M**
Standard is **P** (petrol)

LPG Liquid Petroleum Gas
CNG Compressed Natural Gas

⇒ Confirm your setting by pressing the **ENTER** key.An automatic CAL system check is carried out for 30 s.

```
Emission test


System check                  F10 = Finish
```

An automatic HC residue test is carried out. Duration: 6 s.

```

ppm vol HC      max  20      real 210*

System check                  F10 = Finish
```

The conditioning phase is started.

```
Type of fuel: Petrol
Oil temperatur [°C]: 82
Real engine running speed n[min]: 800
F6= Pulses/720°RC          Enter = Continue
```

Note: Select the speed sensor, the measuring point and the number of pulses by pressing **F6** (see chapter 4.8.1).

⇒ Push the sampling probe (38) into the exhaust tailpipe or the common collector pipe as far as possible. Fasten the sampling probe to the tailpipe using the clip provided.

⇒ Continue by pressing **ENTER**

● Measurement at idle speed

```
Maximum engine running speed n[/min]:1300
Real engine running speed n[/min]: 2550
Is sampling probe in exhaust pipe ?
F3= Continue F6=Pulses/720°RC  Change RPM!
```

Note: If the actual engine speed is lower than the maximum permissible value, automatic switchover to the gas analysis time does not take place.

⇒ Bring the engine up to idle speed.

If the actual engine speed is correct or if the speed override is activated (see chapter 5.3.15, Parameterisation of the test sequence, setting EU.EO , parameter drbr.), the gas analysis time lasting 30 s begins after you press **F3**.

```
ppm vol HC  214            %vol CO   0.156
% vol O2   21.09           %vol CO2  13.04
n[/min]    1400                 λ    -.---
F6 = Pulses/720°RC    Gas running time: 29
```

Once the gas analysis time has expired, the following mask is displayed:

```
ppm vol HC  214            %vol CO   0.156
% vol O2   21.09           %vol CO2  13.04
n[/min]     800                 λ    -.---
F6= Pulses/720°RC          Enter = Continue
```

⇒ Continue by pressing **ENTER**

The measured values taken during measurement at idle speed are stored.

```
ppm vol HC  214            %vol CO   0.156
% vol O2   21.09           %vol CO2  13.04
n[/min]     800                 λ    -.---
F3 = Quit/Print            Enter = Continue
```

Note: If measurement at high idle speed is not be carried out (e.g. for a vehicle without a catalytic converter (cat.), the **F3** key must be pressed once more within the space of 5 s.
A protocol is printed out in accordance with the parameters set. The exhaust-gas analyzer is then scavenged.

⇒ Switch directly to measurement at high idle speed by pressing **ENTER** or wait for 5 s for this second measurement to be started automatically.

● Measurement at high idle speed

```
Required engine running speed
n[/min] 2500 +/- 200
Real engine running speed n[/min]: 800
Speed range 1700-3500 rpm  ENTER = Change
```

Note: The required engine speed can be increased by pressing the **ENTER** key (100 rpm per press of the key; setting range: 1700 - 3500 rpm ± 200 rpm). When the maximum settable value is reached, the value automatically jumps to the lowest value.

If the actual speed does not agree with the required speed by ± 200 rpm, automatic switchover to the gas analysis time does not take place.

⇒ Bring the engine up to required speed and hold it there.

If the actual engine speed is correct, the gas analysis time lasting 30 s begins.

```
ppm vol HC  214            %vol CO   0.156
% vol O2   21.09           %vol CO2  13.04
n[/min]     800                 λ    -.---
F6 = Pulses/720°RC    Gas running time: 29
```

Once the gas analysis time has expired, measurement is terminated automatically, the measured values taken during measurement at high idle speed are stored and a protocol is printed out in accordance with the parameters set.

The exhaust-gas analyzer is then scavenged.

```
Emission test


Flush
```

4.8.3 Measurement in which measurement taken at high idle speed comes first in sequence (closed-loop cat. only)

Measurement in which measurement taken at high idle speed comes first in the sequence is performed along the same lines as described in chapter 4.8.2. This mode of measurement is, however, not suitable for vehicles not fitted with a catalytic converter.

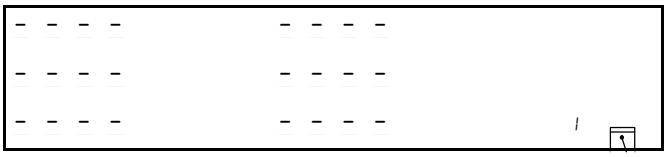
The switchover from measurement at high idle speed to measurement at idle speed takes place automatically.

Measurement is terminated manually.

4.9 Copy of the protocol of an exhaust-emission measurement

When the exhaust-gas analyzer is in standby mode after an exhaust-emission measurement, you can print out a copy of the protocol printout of the last measurement.

Note: If during this procedure you do not press a button during any period of 6 s, the program will automatically return to standby mode.



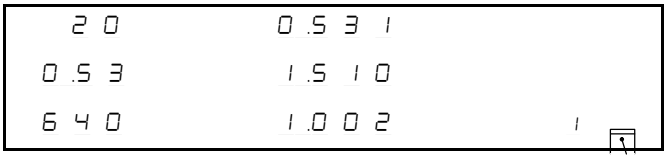
The exhaust-gas analyzer is in standby mode.

⇒ Press the ⊳⊲ (7) and ⇦ (6) buttons at the same time.

The values from the last measurement at idle speed are displayed:

⇒ Press the ⇦ button (6).

The values from the last measurement at high idle speed are displayed:



⇒ Press the ⇦ button (6) once again.

A copy of the protocol printout from the last exhaust-emission measurement is printed out.

Note: This printout is marked with the word **Copy** above the protocol header.

4.10 Protocol printouts

Different protocols are printed out depending on the test procedure performed.

Note: The content of the protocol printouts depends on the parameters set.

- Protocol printout of a diagnosis measurement

---------- >VAS 5067 V5.72 < ----------	Unit ID
Car Gold Garage Hattenham Drive 4 New Hasletown Tel.: 01234/567-0 Fax : 01234/567-99 ----------	Protocol header (6 lines)
---------- 27.06.96 14:01 27.06.96 14:01 ----------	Date/time
PEtr	Type of fuel
°C 80 1/min 600 % vol CO 0.098 % vol CO2 14.33 % vol O2 0.53 ppm vol HC 20	Measurement results in acc. with parameters sets*

If you press the button (8) again while a measurement is in progress, the instantaneous measured values are printed out without a protocol header.

```
----------

27.06.96           14:04
----------

PEtr
°C                   80
1/min               600
% vol CO          0.098
% vol CO2         14.33
% vol O2           0.53
ppm vol HC           20
```

* See chapter 5.3, Entry mode functions, entry function nos. 2, 3 and 6.

- Protocol printout of an emission measurement, 1st and 2nd measurements

---------- >VAS 5067 V5.72 < ----------	Unit ID
Car Gold Garage Hattenham Drive 4 New Hasletown Tel.: 01234/567-0 Fax : 01234/567-99 ----------	Protocol header * (6 lines), freely assignable
27.06.96 14:11 ----------	Date/time *
PEtr ----------	Type of fuel
Results 1st measurement °C 80 1/min 600 % vol CO 0.098 % vol CO2 14.33 % vol O2 0.53 ppm vol HC 20 ----------	Mesurement results in acc. with parameters sets *
Results 2nd measurement °C 80 1/min 2480 % vol CO 0.098 % vol CO2 14.33 % vol O2 0.53 ppm vol HC 20 ----------	Measurement results in acc. with parameters sets *
Number plate ..... ----------	Freely assignable text (number plate)*
Signature ..... ----------	Freely assignable text*
<<< Have a nice day >>>	Freely assignable advertising text*

Note: If you request a copy of the protocol printout, this copy is marked with the word **Copy** above the protocol header.

* See chapter 5.3, Entry mode functions, entry function no. 15.

- Protocol printout of an emission measurement, 1st measurement only

```
------------------------
>VAS 5067        V5.72 <
------------------------
Car Gold Garage
Hattenham Drive 4
New Hasletown
Tel.: 01234/567-0
Fax : 01234/567-99

------------------------
27.06.96           14:11
------------------------

PEtr
------------------------
Results without cat.

°C                     80
1/min                 600
% vol CO            0.098
% vol CO2           14.33
% vol O2             0.53
ppm vol HC             20
------------------------
Number plate

  ..................
------------------------
Signature

  ..................
------------------------
<<< Have a nice day  >>>
```

5 Functions of parameterisation and test functions

Various unit parameters are set in entry mode.

There is no warming-up time in entry mode. If measurements are carried out in this mode, the zero point drift has to be observed.

Note: A flashing LED is shown here in **bold** print.

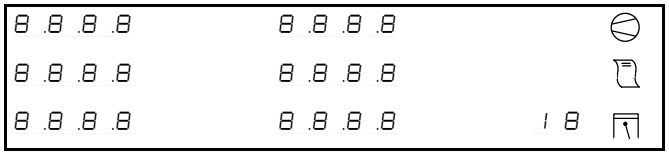
LEd Display normal
LEd Display flashing

5.1 Accessing entry mode

Entry mode is accessed in the following way:

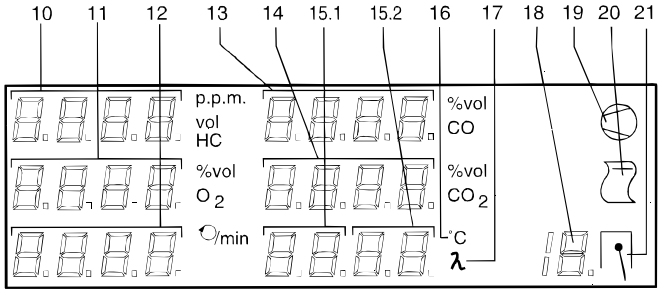
⇒ Press the mains switch ⏻ (5).

The following display (1) will appear:



Hold down the printer button (8) for as long as this display is present.

5.2 Operation in entry mode



Digital displays 10 – 14 display values or symbols which can be viewed or changed.

The symbols of the entry function are displayed in digital display 15.1.
The status of the entry function is displayed in digital display 15.2:

- An. Function display
- Ei. Entry
- Ab. Routine running

The number of the entry function is displayed in digital display 18.

Meaning of the buttons

Button (9)
- Pressing the button **will reduce** the number of the entry function.
- **Selection** of the **lower** setting within an application (if possible).
- **Reduction** of the level set.

Button (8)
- Pressing the button **will implement** adjustment of a selected application.
  Example: the display ”An” will change to ”Ei” or ”Ab” in the display field for the oil temperature.
- **Activation** of a setting in a setting application.
- **Adoption** of a setting and **exit** from the application.

Button (7)
- Pressing the button **will increase** the number of the entry function
- **Selection** of the **higher** setting within an application (if possible).
- **Increase** of the level set.

Example:

Select an application by pressing the

⇒ button (9) or button (7)

Activate an application by pressing the

⇒ button (8)

Select a setting within an application by pressing the

⇒

Activate a setting by pressing the

⇒ button (8)

5.3 Entry mode functions

Number of the entry function	Symbol	Function
0	AJ An	Recalibration with test gas (AJ function)
1	Uh An	Entry of date and time
2	LA An	Lambda calculation on/off
3	CO An	$CO_{correction}$ calculation on/off
4	Sr An	Updating the maintenance date
5	Pt An	Parameter printout
6	O5 An	O_2 measurement on/off
7	2P An	Number of printouts
8	LP An	Printer selection
9	St An	Configuration of the analog current interface
10	O2 An	Analysis mode, oxygen measurement
11	Pu An	Pump in entry mode on/off
12	An An	Analysis mode, infrared channels
13	SS An	Configuration of serial ports
14	nt An	Switchover between old and new MOT protocol
15	EU An	Parameterisation of the test sequence
17	Jd An	Calibration data
18	Gd An	Unit data
19	EndE	Exit from entry mode

5.3.1 Calibration with certificated test gas

Note: The relevant EU directive stipulates that exhaust-gas analyzers must be recalibrated with certificated test gas at regular intervals by expert personnel. See chapter 8.10 for the relevant procedure.

Select the AJ function by pressing

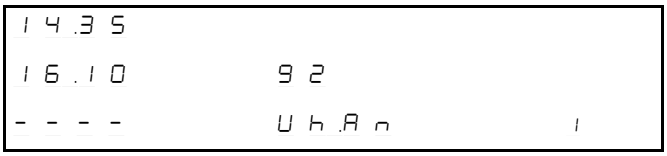
⇒ the ⊖ button (9) or ⊳ button (7).

See chapter 8.10 for the relevant procedure.

5.3.2 Setting the clock

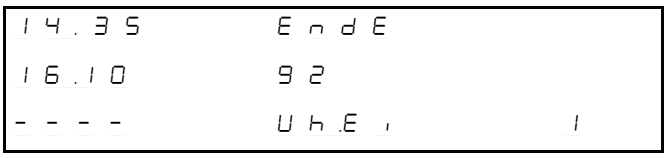
Select the ”set clock” function by pressing

⇒ the ⊖ button (9) or ⊳ button (7).



Activate the setting function by pressing

⇒ the ⊡ button (8).



The number block for the hours flashes.

- Block selection

Move the flashing number block to the next block by pressing

⇒ the ⊳ button (7).

Move the flashing number block to the previous block by pressing

⇒ the ⊖ button (9).

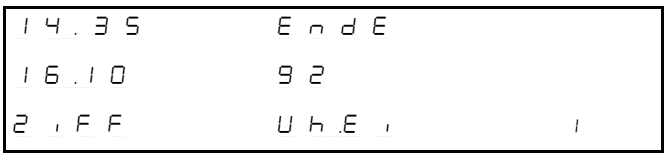
Activate the selected block by pressing

⇒ the ⊡ button (8).

Activate ”End” to exit the setting function.

- Number selection

The first number in the block selected will flash.



Move the selected number to the next one by pressing

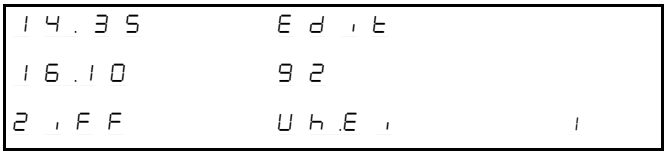
⇒ the ⊳ button (7).

Move the selected number to the previous one by pressing

⇒ the ⊖ button (9).

Activate the selected numbers by pressing

⇒ the ⊡ button (8).



⇒ The numbers can be changed.

Activate EndE: to return to block selection.

Increase the selected number by pressing

⇒ the ⊳ button (7).

Reduce the selected number by pressing

⇒ the ⊖ button (9).

Adopt the numbers set and return to number selection by pressing

⇒ the ⏎ button (8).

5.3.3 Lambda calculation on/off

An oxygen sensor is installed for calculating lambda.

YES: Lambda will be calculated and displayed when exhaust analysis is carried out.

no Lambda will not be calculated.

5.3.4 $CO_{corrected}$ calculation on/off

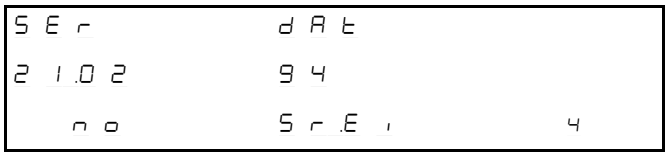
This change of setting is only possible if the $CO_{corrected}$ switch is set to YES in calibration mode.

YES $CO_{corrected}$ will be calculated and printed out on the protocol.

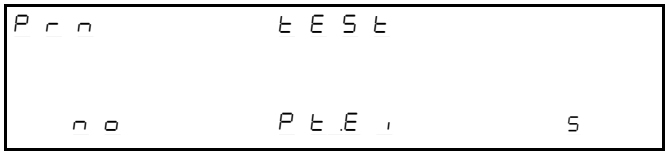
no $CO_{corrected}$ will not be calculated.

5.3.5 Updating the maintenance date

This switch must be set to YES and activated when routine maintenance is carried out. This deletes the prompt in the display telling you that maintenance must now be carried out. The date on which the next maintenance work must be carried out is now displayed.



5.3.6 Parameter printout



YES Pressing the printer button will produce a parameter printout

no No printout of parameter

5.3.7 O_2 sensor on/off

YES: Oxygen measurement is switched on.

no: Oxygen measurement is switched off.

5.3.8 Duplicate printout on/off

1 Pressing the printer button will produce a single printout.

2 Pressing the printer button will produce two printouts.

5.3.9 Printer selection

no: No printer installed
SEr Printer connected to serial port
Int Integral printer

Afterwards, check the configuration serial interface (see chapter 5.3.13).

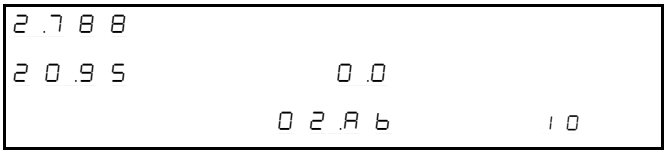
5.3.10 Setting the analogue current output (option)

no No analogue current interface installed
0-20 Output range 0 to 20 mA for each measurement channel
4-20 Output range 4 to 20 mA for each measurement channel

Afterwards, check the configuration serial interface (see chapter 5.3.13).

5.3.11 Oxygen measurement

The sensor voltage of the O_2 sensor will be displayed in the HC display field. The O_2 concentration measured will be displayed in the oxygen display field. The flow measured will be displayed in the CO_2 display field.



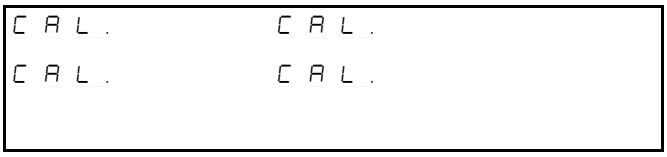
5.3.12 Pump in entry mode on/off

The pump can be switched on (YES) or off (no).

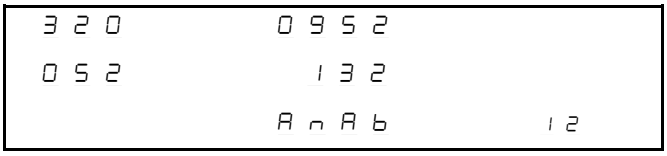
5.3.13 Analysis mode

In this mode, measurements can be viewed with the pump switched off.

First, a system test with zero gas is carried out.



The gas measurements are then displayed.

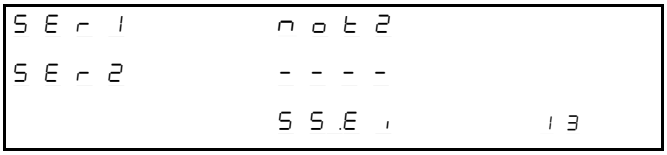


Caution! Drift correction does not operate in this mode, so the zero levels may drift, leading to errors.

5.3.14 Configuring the serial port

Serial ports SEr1 and SEr2 can be configured as follows:

---- No unit connected
dru External printer
tEr Data terminal
not2 2400 baud serial protocol
not9 9600 baud serial protocol



Afterwards, check the printer selection (see chapter 5.3.8) and setting of the analogue current output (see chapter 5.3.9).

5.3.15 Switchover of the serial protocol

nEU: Serial protocol A
ALt: Serial protocol B

The serial protocol B supports the communication with a computer. Protocol A is reserved for special applications.

5.3.16 Parameterisation of the test sequence

Note: The parameter of the test sequence can only be changed if the switch CC is set to YES in calibration mode. The barring function can only be deactivated by a service technician.

Select the "Parameterisation of the test sequence" function by pressing

⇒ the ⊖ button (9) or ⊳ button (7).

Activate the function by pressing

⇒ the ⌐ button (8).

Select the settings under this function by pressing

⇒ the ⊖ button (9) or ⊳ button (7).

You use the settings to parameterise the exhaust-gas analyzer.

The following settings are available:

0	EU.E0	Parameterising the environment
1	EU.E1	Parameterising meas. values of 1st measurement
2	EU.E2	Parameterising meas. values of 2nd measurement
3	EU.E3	Parameterising the language
4	EndE	End and exiting the function

● Setting EU.E0 "Parameterising the environment"

Activate the function by pressing

⇒ the ⌐ button (8).

Select the settings under this function by pressing

⇒ the ⊖ button (9) or ⊳ button (7).

The following parameters can be changed:

0	dAt	Date and time (YES/no)
1	Adr	Protocol header (YES/no)
2	SIG	Signature (YES/no)
3	PL	Number plate (YES/no)
4	ELL	Timing of measurement at high idle speed (E1/E2)
5	Adv.	Advertising line
6	drbr.	Speed override
7	EndE	Exit the parameter

Example of how to set a parameter:

The current setting is always displayed for each parameter (example in this case **Date and time**).

Activate the parameter by pressing

⇒ the ⌐ button (8).

Set the parameter by pressing

⇒ the ⊖ button (9) or ⊳ button (7).

Adopt the setting and deactivate the parameter by pressing

⇒ the ⌐ button (8).

- "Date and time" parameter

This parameter defines whether or not the current date and time will be printed on the protocol.

no Date and time are **not** printed
YES Date and time are printed

– ”Protocol header” parameter

This parameter defines whether or not the protocol header with workshop address will be printed on the protocol.

Note: The protocol header must be entered using the data terminal.

no Protocol header is **not** printed
YES Protocol header is printed

– ”Signature” parameter

This parameter defines whether or not the protocol will contain a line in which the operators can write their name or signature by hand. The text ”Signature” is entered by the service agent using the data terminal.

no Signature is **not** printed
YES Signature is printed

– ”Number plate” parameter

This parameter defines whether or not the protocol will contain a line in which the operators can write the chassis number of the vehicle tested. The text ”Chassis No.” is entered by the service agent using the data terminal.

no Is **not** printed
YES Is printed

– ”Timing of measurement at high idle speed” parameter

This parameter defines whether the **measurement at high idle speed** will come before (first in the sequence) or after the **measurement at idle speed** (second in the sequence).

E1 Measurement at high idle speed first in sequence
E2 Measurement at high idle speed first in sequence

– ”Advertising line” parameter

This parameter defines whether or not the protocol will contain a line with an advertising text.
The advertising text is entered by the service agent using the data terminal.

no Advertising text is **not** printed
YES Advertising text is printed.

– ”Speed override” parameter

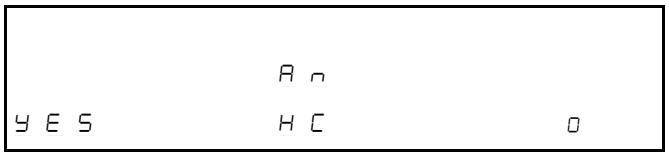
This parameter defines whether or not the minimum engine speed for the idle speed measurement and the preselected speed for the measurement at high idle speed will be able to be overridden by pressing a button.

no Speed is **not** overridden.
YES Speed is overridden.

- Setting EU.EI ”Parameterising meas. values of 1st measurement”

Activate the function by pressing

⇒ the button (8).



Select the settings under this function by pressing

⇒ the ⊖ button (9) or ⊳ button (7).

The following parameters can be changed:

0	HC	Printout of HC value (YES/no)
1	CO	Printout of CO value (YES/no)
2	CO2	Printout of CO_2 value (YES/no)
3	O2	Printout of O_2 value (YES/no)
4	n	Printout of engine speed (YES/no)
5	t	Printout of oil temperature (YES/no)
6	L	Printout of lambda value (YES/no)
7	COFr	Printout of lambda value (YES/no)
8	EndE	Exiting the function

Activate the parameter by pressing

⇒ the ⊡ button (8).

Set the parameter by pressing

⇒ the ⊖ button (9) or ⊳ button (7).

Adopt the setting and deactivate the parameter by pressing

⇒ the ⊡ button (8).

– ”Printout of HC value” parameter

This parameter defines whether or not the HC value will be printed out on the protocol.

no HC value is **not** printed
YES HC value is printed

– ”Printout of CO value” parameter

This parameter defines whether or not the CO value will be printed out on the protocol.

no CO value is **not** printed
YES CO value is printed

– ”Printout of CO_2 value” parameter

This parameter defines whether or not the CO_2 value will be printed out on the protocol.

no CO_2 value is **not** printed
YES CO_2 value is printed

– ”Printout of O_2 value” parameter

This parameter defines whether or not the HC value will be printed out on the protocol.

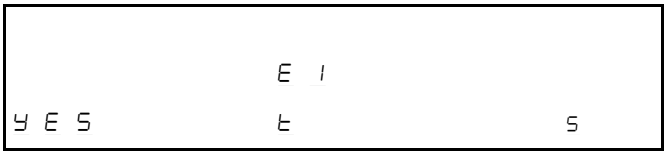
no O_2 value is **not** printed
YES O_2 value is printed

– ”Printout of engine speed” parameter

This parameter defines whether or not the engine speed will be printed out on the protocol.

no Engine speed is **not** printed
YES Engine speed is printed

– ”Printout of oil temperature” parameter”



This parameter defines whether or not the oil temperature will be printed out on the protocol.

no Oil temperature is **not** printed
YES Oil temperature is printed

– "Printout of lambda value" parameter

This parameter defines whether or not the lambda value will be printed out on the protocol.

no Lambda value is **not** printed
YES Lambda value is printed

– "Printout of $CO_{corrected}$ value" parameter

This parameter defines whether or not the $CO_{corrected}$ value will be printed out on the protocol.

no $CO_{corrected}$ value is **not** printed
YES $CO_{corrected}$ value is printed

- Setting EU.E2 "Parameterising meas. values of 2nd measurement"

The parameters for the 2nd measurement are set in the same way as those for the parameters for the 1st measurement.

- Setting EU.E3 "Language / country selection"

Activate the function by pressing

⇒ the button (8).

Select the setting by pressing

⇒ the button (8).

The following language settings are available:

0	d	German
1	d.Sb1	Danish
2	Gb	English
3	CH-d	Swiss German
4	CH-I	Swiss Italian
5	CH-F	Swiss French
6	nL	Dutch
7	PL	Polish
8	P	Portuguese
9	E	Spanish
10	H	Hungarian
11	J	Japanese
12	ALLG	General

Select the language you want to use by pressing

⇒ the button (9) or button (7).

Adopt the setting by pressing

⇒ the button (8).

Note: When the language/country setting is changed, the basic parameters are also changed accordingly.

5.3.17 Displaying the calibration data

Activate the function by pressing

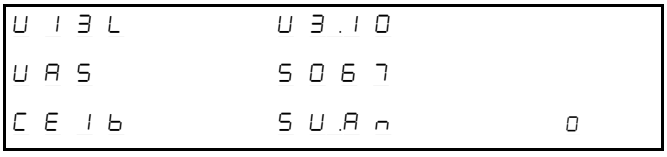
⇒ the button (8).

Select the settings by pressing

⇒ the button (9) or button (7).

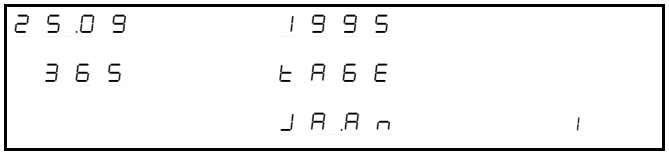
The settings can be used to query calibration data.

- Software version and checksum



Displayed above are, e.g., software version U3.10 and checksum CE16.

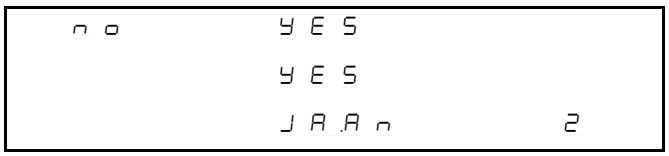
● Date for next recalibration and calibration interval



● Gases required (HC, CO, CO_2) for recalibration

YES Gas required for recalibration
no Gas not required

The text is shown in the displays of the relevant gases.



In this case, CO and CO_2 are required for recalibration.

● Consequences when recalibration due

no Recalibration not required
nEId "Recalibration required" message
SPEr Unit is disabled.

● Setting leak test interval

Stnd Standard (default) setting. A leak test is required each time the unit is switched on.
no Leak test not required.
tAGE Number of days after which a leak test is required.

or

● Setting HC residue test

YES HC residue test is carried out.
no HC residue test is not carried out.

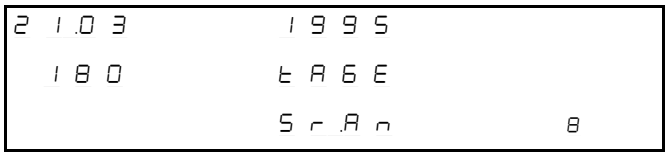
● Display of "official test" (country-specific regulations fulfilled)

YES All calibration data according to regulations
no Not all calibration data according to regulations

● "Change of settings" parameter

YES "Change of settings" in entry mode enabled
no "Change of settings" in entry mode disabled

● Date for next service (maintenance) and service interval (in days)



● Display of HC_V-, OC_V- and sum factors

These types of fuel and their factors can be displayed in a submenu:

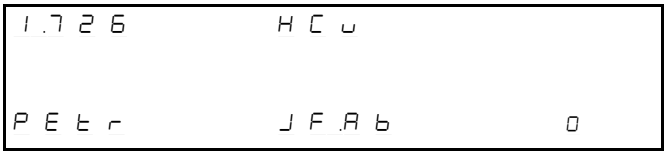
PEtr Petrol
LPG Liquid Petroleum Gas
CnG Compressed Natural Gas
COH Methanol

Open the submenu by pressing

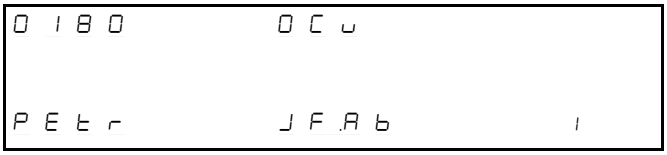
⇒ the button (8).

Display the factors by pressing

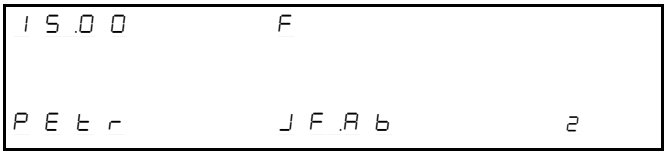
⇒ the button (8).



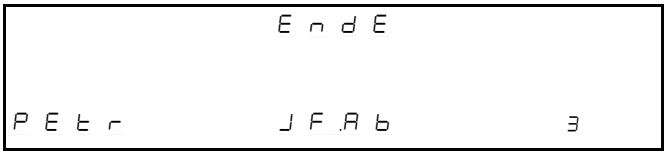
⇒ Press the button (7).



⇒ Press the button (7).



⇒ Press the button (7).



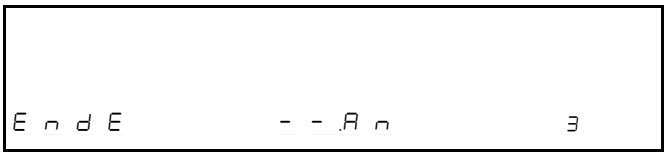
⇒ Press the button (8).

Move to the next type of fuel by pressing

⇒ the button (7).

The factors of all the other types of fuel are displayed in the same way

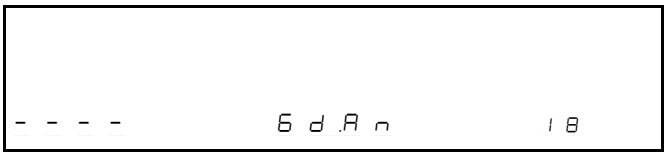
- End of the ”Calibration data” submenu



5.3.18 Unit data

Activate the function by pressing

⇒ the button (8)



Select the settings by pressing

⇒ the button (9) or button (7).

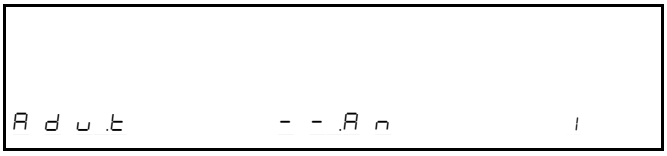
Activate the settings by pressing

⇒ the button (8)

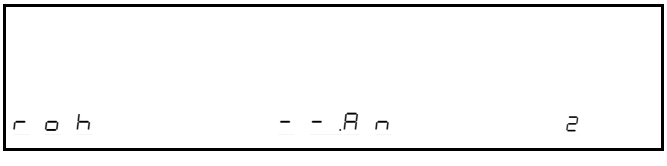
The settings can be used to query specific pieces of information about the unit.

- Measurements from the infrared channels on the analogue/digital converter and temperature of the analysis chapter.

- Temperature-corrected analogue/digital converter levels and temperature.



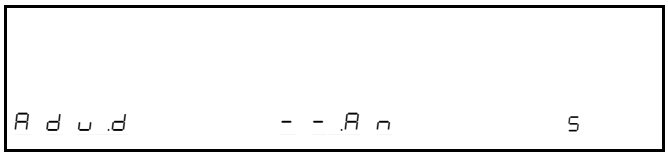
- Raw data



- Power supply voltage as a percentage of nominal voltage

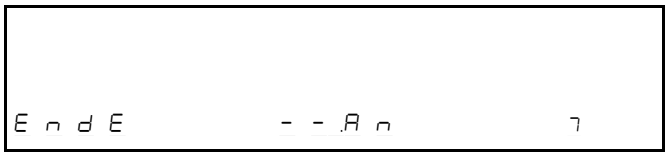
- Information on the installation date and the voltage of the O_2 sensor at the time of installation. Amendment of the date and sensor voltage.

- Flow sensor voltage and display.



- Air pressure sensor voltage and display.

- End of the ”Unit data” submenu.



5.3.19 End of entry mode

The entry mode is exited. The unit is restarted.

6 Special accessories

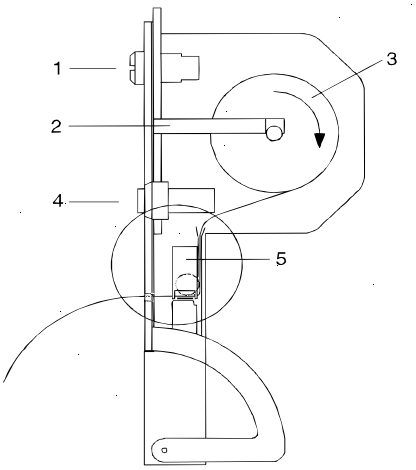
6.1 Protocol printer

When the analyzer gas is switched on, a protocol can be printed out on the protocol printer (2) (if installed),

- showing the following details corresponding to the parameterisation (see chapter 5.3.15)
- All the measurements at the time the button is pressed

Programming is carried out during commissioning by the service agency, using a data terminal. An external printer can be connected to the serial port (RS 232) (56). Parameterisation takes place in entry mode (see chapters 5.3.8 and 5.3.13).

6.1.1 Changing the paper



⇒ Turn the knurled knob (1) and open the flap downwards.

⇒ Remove the retaining bar (2), lift the empty paper roll (3) slightly and remove it.

⇒ Push the new roll on to the spindle and lay it in the printer casing. Observe the direction of unrolling shown in the figure.

⇒ Cut off the end of the paper to leave a straight edge with right angles and feed it through the printer mechanism (5).

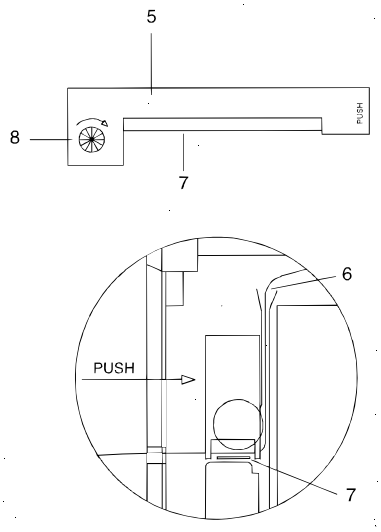
⇒ Press the feed button (4) until the paper protrudes about 5 cm from the printing mechanism.

⇒ Feed the paper through the opening with the cutter bar.

⇒ Replace the retaining bar.

⇒ Close the flap and press in the knurled knob.

6.1.2 Changing the printer ribbon



⇒ Tear off the paper.

⇒ Turn the knurled knob and open the flap downwards.

⇒ The ribbon can be removed by pressing the point marked PUSH on the ribbon cassette (5).

⇒ Insert the ribbon cassette:
place the drive wheel (8) on the drive shaft. Then press the ribbon cassette in gently, applying slight pressure at the point marked PUSH. The ribbon (7) must be underneath the paper (6).

⇒ Align the ribbon and place it under slight tension by turning the drive wheel (in the direction shown by the arrow).

⇒ Press the feed button (4) until the paper protrudes about 5 cm from the printer mechanism.

⇒ Feed the paper through the opening with the cutter bar.

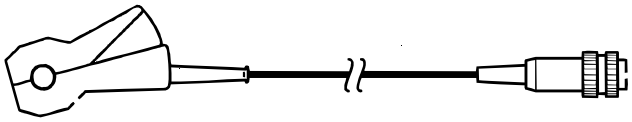
⇒ Close the flap and press in the knurled knob.

6.2 Engine-speed measurement

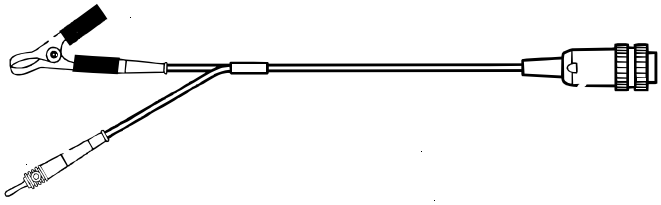
6.2.1 Connecting the sensors to the exhaust-gas analyzer

On the rear of the unit are 2 sockets that can be used for onnecting various sensors for measuring the engine speed.

⇒ Inductive clip-on pickup
Connect to socket (51)



⇒ Connecting cable to term. 1, TD/TN, EST, B- or earth
Connect to socket 52.



6.2.2 Performing engine-speed measurement

Warning! Always switch off the engine and ignition before carrying out any type of work on the ignition system.

⇒ Connect clamp B- of connecting cable term. 1, TD/TN, EST and B- to the negative battery terminal or an vehicle earthing-point.

Warning! This connection must always be made, even if the measurement is being taken using the clip-on pickup. It is possible when connecting the clip-on pickup that physical injury and/or damage to property may arise due to flashover if the ignition system is faulty. For this reason, always connect an earthing lead before operating the exhaust-gas analyzer.

⇒ Clip the trigger clip-on pickup on to the spark-plug cable on which the measuring point is most easily accessible
or

⇒ Pick off the engine-speed signal at the most accessible measuring point using the banana plug of the connecting cable.

6.2.3 Selecting the sensor and measuring point

The origin of the engine-speed signal must be set by means of the selector button (7). When you press the button once, the symbol for the current setting appears for approx. 6 s. in the oil temperature display field (15.1/15.2). The speed display field (12) displays the engine speed. Each press of the button now switches you to the next possible setting.

The following settings are possible:

EFS Measurement using the trigger clamp-on pickup on the secondary side of ignition systems with rotating ignition distribution (ROV and 2 × ROV) and ignition systems with single-spark coils and crankshaft and camshaft sensors (EFS with NW) (NW = camshaft)

dFS Measurement using the trigger clamp-on pickup on the secondary side (ignition cable) of ignition systems with dual-spark coils (DFS) and ignition systems with single-spark coils without camshaft sensor (EFS)

I-Pr Measurement using the trigger clamp-on pickup on the primary side, term. 1 or 15 of one or all ignition circuits

Pr.-L Measurement using the connecting cable (term. 1, TD/TN, EST and B-) on term. 1, TD/TN or EST signals

6.2.4 Setting the pulse rate

The pulse rate must be set at the exhaust-gas analyzer using the button (6). The setting mode is activated through a single pressing. Every supplementary pressing switches to the next pulse rate.

During engine-speed measurement, the number of pulses for two revolutions of the crankshaft (720°) is evaluated. These pulses can be secondary signals (ignition pulses), primary signals (term. 1 or term. 15 pulses / currents or voltages) or pulses (voltages) that supply a signal that corresponds to the engine speed (e.g. TD or TN signal).

It is therefore necessary to set the number of pulses.

Possible pulse rates are: 1, 2, 3, 4, 5, 6, 8, 10 and 12.

The number of pulses per 720° revolution of the crankshaft depends on various factors:

Type of engine: 4-stroke, 2-stroke or rotary piston (Wankel)

No. of cylinders 1, 2, 3, 4, 5, 6, 8, 10, 12

Type of ignition: Rotating ignition distribution with one ignition distributor (ROV)
rotating ignition distribution with twoignition distributors (2 × ROV)
Ignition system with single-spark coil and crankshaft sensor (EFS)
Ignition system with single-spark coil, crankshaft and camshaft sensor (EFS with NW)
Ignition system with dual-spark coils (DFS)

Measuring point see chapter 6.2.5

The pulse rate present in the type of vehicle being tested must be taken from the table below and set at the exhaust-gas analyzer:

Ignition system	Engine	Trigger clamp-on pickup					Connecting cable term 1 TD/TN, EST and B-	
		Display on VAS 5067 in l/°C - display fields (15.1/15.2)						
		I-PrR		dFS	EFS		Pr.-L	
		Measuring points as depicted in figures						
		Item 3, 4	Item 5	Item 6	Item 1	Item 2	Item 3	No figure
		Term. 1/15 one ignition circuit	Term. 1/15 common cable of allign. circuits	Spark-plug cable		Cable betw. coil and dis-tri-butor	Term. 1 of an ignition circuit	Control signals e.g. TN, TK, EST
ROV	4T	Z	Z	-	1	Z	Z	Z
ROV	2T/Wankel	2 × Z	2 × Z	-	2	2 × Z	2 × Z	Z
2-ROV	4T	Z/2	Z/2	-	1	Z/2	Z/2	Z
EFS	4T	2	Z	2	-	-	2	Z
EFS	2T/Wankel	4	2 × Z	4	-	-	4	Z
EFS with NW	4T	1	Z	-	1	-	1	Z
EFS with NW	2T/Wankel	2	2 × Z	-	2	-	2	Z
DFS	4T	2	Z	2	-	-	2	Z
DFS	2T/Wankel	4	2 × Z	4	-	-	4	Z

Z = No. of cylinders, ROV = Rotating high-tension distribution, EFS = Single-spark coil,
DFS = Dual-spark coil, NW = Camshaft

6.2.5 Measuring point

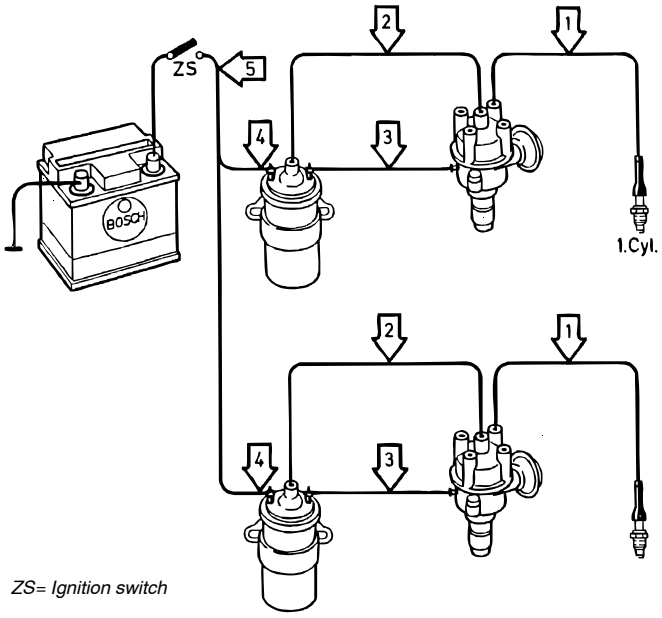
(Item 1):
Secondary side, ignition cable between distributor and spark plug of any cylinder

(Item 2):
Secondary side, ignition cable between ignition coil and distributor (terminal 4)

(Item 3 or 4):
Primary side, term. 1 or term. 15 current or voltage of **"one"** ignition circuit

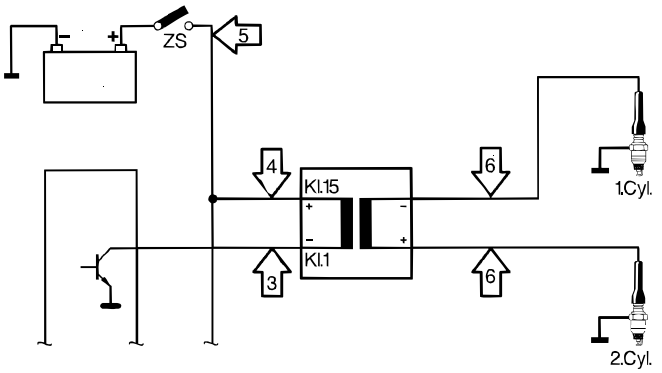
(Item 5):
Primary side, term. 1 or term. 15 current or voltage of **"all"** ignition circuits

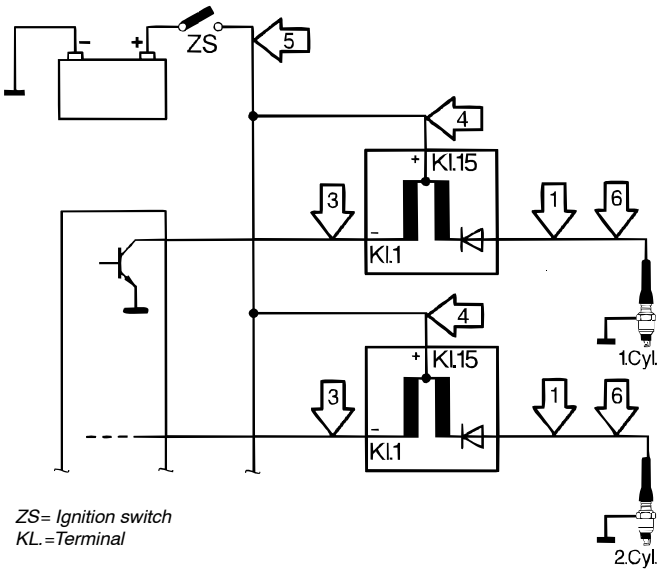
TD (engine speed) or TN signal, e.g. at the diagnostic socket



ZS= Ignition switch

* In modern ignition systems, a trigger box is often connected in series at this point. Adaptation then takes place between the trigger box and the ignition coil.





ZS= Ignition switch
KL.=Terminal

6.3 Oil temperature measurement

The temperature sensor (special accessory) is connected to socket (50) on the back of the unit and inserted into the engine instead of the dipstick. The oil temperature is display in the oil temperature display field. When air ratio measurement (see chapter 5.3.3) and oxygen measurement (see chapter 5.3.6) are activated, the display will switch to the air ratio if a CO_2 content greater than 2 % is measured.

7 Fault messages

Faults are indicated by fault displays. Err followed by a code number appears in the hydrocarbon (HC) display (10).

he fault display is erased by pressing the pump button ⊖ (9). However, it will appear again if the fault is not rectified.

If several faults are present at the same time, the code number of the next fault will appear the next time that the pump button ⊖ (9) is pressed. Standby mode will not be obtained again until all the code numbers have been displayed.

Example: E rr 8

Err 1 No flow

Remedy:

⇒ Blow out the sampling hose and sensor with compressed air

⇒ Change the coarse filter

⇒ Change the intake filter

⇒ Restart analysis

If this does not rectify the fault, contact the service agent quoting the code number.

Err2 Leak test failed

Remedy:

⇒ Seal and re-run leak test

⇒ Test sampling probe for leaks or replace it

⇒ Test sampling hose for leaks or replace it

⇒ Replace the coarse filter and ensure that its mounting is not leaking

⇒ Replace intake filter GF2 and ensure that its seat is not leaking

⇒ Ensure that the mountings of filters GF3 and GF4 are not leaking

If this does not rectify the fault, contact the service agent quoting the code number.

Err 3 HC residues in the gas sampling system or gaseous hydrocarbons in the ambient air (e.g. petrol fumes).

Remedy:

⇒ Restart analysis

⇒ Pull off the sampling hose and blow it out with compressed air against the direction of intake. Blow out the sampling probe

⇒ Replace the GF1 filter

⇒ Replace the intake filter GF2

⇒ Hold the sampling probe in fresh air and restart analysis

If this does not rectify the fault, contact the service agent quoting the code number.

Err4 Activated charcoal filter contaminated by HC residue

Remedy:

⇒ Restart analysis

⇒ Replace activated charcoal filter (31)

If this does not rectify the fault, contact the service agent quoting the code number.

Err5 Fault at serial port 2 or error in parameterisation

Remedy:

⇒ Test interface cable

⇒ Make entry in entry mode

If this does not rectify the fault, contact the service agent quoting the code number.

Err6 Fault in the analogue current interface or error in parameterisation.

Remedy:

⇒ Make entry in entry modeIf this does not rectify the fault, contact the service agent quoting the code number.

Err7 EEPROM error

Remedy:

⇒ Make entry in entry mode

Err9 Recalibration with test gas required

Remedy:

⇒ Recalibration in accordance with chapter 5.3.1

If this does not rectify the fault, contact the service agent quoting the code number.

Err 10 Wrong type of printer set

Remedy:

⇒ Set type of printer (see chapter 5.3.8)

If this does not rectify the fault, contact the service agent quotingthe code number.

Err 11 HC signal equalisation exceeds tolerances

Remedy:

⇒ Press pump button ⊜ (9) and start system test

If this does not rectify the fault, contact the service agent quoting the code number.

Err 12 CO signal equalisation exceeds tolerances.

Remedy:

⇒ Press pump button ⊜ (9) and start system test

If this does not rectify the fault, contact the service agent quoting the code number.

Err 13 CO_2 signal equalisation exceeds tolerances

Remedy:

⇒ Press pump button ⊜ (9) and start system test

If this does not rectify the fault, contact the service agent quoting the code number.

Err14 O_2 sensor equalisation faulty

Remedy:

⇒ Check oxygen sensor plug and carry out equalisation (see chapter 8.7.1).

⇒ Replace oxygen sensor

If this does not rectify the fault, contact the service agent quoting the code number.

Err 15 Analogue-digital converter overflow

Remedy:

⇒ Restart analysis

If this does not rectify the fault, contact the service agent quoting the code number.

Err 16 Minimum voltage for O_2 sensor undercut.

Remedy:

⇒ Check oxygen sensor plug and carry out equalisation (see chapter 8.7.1)

⇒ Replace oxygen sensor

If this does not rectify the fault, contact the service agent quoting the code number.

Err 17 Air pressure measurement faulty.

Remedy:
Contact the service agent quoting the code number.

Err 18 Flow sensor faulty

Remedy:
Contact the service agent quoting the code number.

Err 19 Clock faulty

Remedy:
Contact the service agent quoting the code number.

Err20 Batterie verbraucht.

Remedy:
Contact the service agent quoting the code number.

Err21 Channel allocation wrong

Remedy:
Contact the service agent quoting the code number.

Err22 Power supply voltage exceeds tolerances

Remedy:

⇒ Check voltage of power supply

If this does not rectify the fault, contact the service agent quoting the code number.

Err23 Temperature measurement of the analyzer faulty

Remedy:
Contact the service agent quoting the code number.

Err24 EEPROM fault

Remedy:
Contact the service agent quoting the code number.

Err25 EEPROM fault

Remedy:
Contact the service agent quoting the code number.

Err26 HC channel not calibrated

Remedy:
Contact the service agent quoting the code number.

Err27 CO channel not calibrated

Remedy:
Contact the service agent quoting the code number.

Err28 CO_2 channel not calibrated

Remedy:
Contact the service agent quoting the code number.

Err29 Temperature compensation not carried out

Remedy:
Contact the service agent quoting the code number.

Err30 HC, CO and CO_2 signal equalisation exceeds tolerances

Remedy:

⇒ Press pump button ⊜ (9) and start system test

If this does not rectify the fault, contact the service agent quoting the code number.

Fault message in engine-speed display field (12)

The engine is running but the display reads 0.

Remedy:

⇒ Check that B- connecting cable is connected properly.

⇒ Check that connecting cable for TD/TN/term. 1 signal is connected properly.

⇒ Is the trigger clamp-on pickup attached to the ignition cable of cylinder 1?

⇒ Is the trigger clamp-on pickup properly closed?
There must not be a gap between the contact surfaces of the ferrite core.
If swarf has accumulated on the ferrite core of the pickup, carefully blow it out with oil-free compressed air.
Oily residues on the contact surfaces of the ferrite core can be wiped off with a clean, soft cloth.
Always clip the clip-on pickup on to clean ignition cables to avoid getting the pickup dirty.

If this does not rectify the fault, contact the service agent quoting the code number.

Err If Err is displayed in this display field, contact the service agent quoting the fault message.

8 Maintenance

Routine maintenance will ensure that the unit is ready for operation.

The analyzers must be serviced at 6-month intervals. The maintenance work can be carried out by a servicing agency or by an appropriately trained member of staff from the workshop. Each service carried out must be logged and indicated on the analyzer itself.

The six-monthly and annual services must be logged in the form of a test protocol and indicated on the analyzer itself by affixing the maintenance sticker to the unit. We recommend that you file the documents that prove the performance of required maintenance procedures in the Maintenance Manual.

Necessary repairs to the unit (opening, adjusting, repairing the unit etc.) must only be carried out by staff from an authorised service agent.

The following periods must be observed:

- Every six months

- Replace the coarse filter GF1 (36)
- Replace the intake filter GF2 (33), see chapter 8.5
- Check whether all three PVC hoses are connected to the gas outlets (39/40/41)
- Visual inspection of the sampling probe (38)
- Leak test in accordance with chapter 4.3
- Confirm the carried out maintenance (see chapter 5.3.5).

- Annual maintenance

This maintenance must be carried out by a qualified service agency. It comprises six-monthly maintenance and the following additional points:

- Checking the measurement accuracy of the analyzer with a test gas
- Replacing the activated charcoal filter (31) in the zero gas path
- Replacing the protective pump filters GF3 (32) and GF4 (30)

The calibration requirements of the responsible (local) authority must be observed.

8.1 Hermetic sealing of the sampling system

A hermetically sealed sampling system is an absolute necessity for accurate exhaust analysis. Testing it for leaks every day is recommended (see chapter 4.3).

8.2 Sampling probe (38)

Keep the aperture at the tip of the sensor clean. If any condensation or HC residue is present, remove the sampling probe from the hose and blow it out with compressed air against the direction of intake.

8.3 Coarse filter GF1 (36)

If very dirty (fault message Err1 for no flow), replace the coarse filter. The same applies if HC residue is present.

8.4 Sampling hose (35/37)

Check for damage. If any HC residue or condensation is present, pull the hose off the analyzer and blow it out with compressed air against the direction of intake.

8.5 Intake filter GF2 (33)

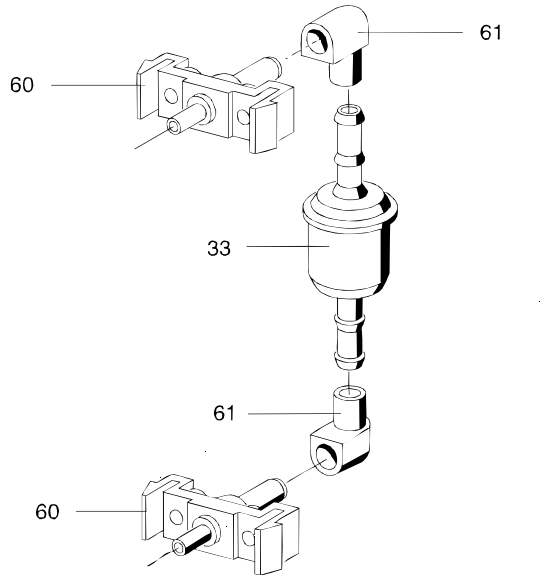
Replace the filter is very dirty (fault message Err1 for no flow) or if HC residue is present.

Caution! Do not pull out the fastening pieces (60) of the unit back panel!

Remove filter (33) and angle hose pieces (61) from upper and lower fastening pieces (60).

Pull off both angle hose pieces from filter with small rotation and fix them to the new filter.

Put on the new filter and angle hose pieces on the fastening pieces; observe the fitting position in accordance with the print on the unit back panel.



8.6 Checking the stability of indications

⇒ Disconnect the sampling hose from the measurement gas intake of the exhaust-gas analyzer.

Caution! There must be no exhaust-gas, petrol or cleaning-agent vapours in the ambient air in the vicinity of the exhaust-gas analyzer.

⇒ Switch on the pump by pressing the p button (9) on the analyzer.

After the ”CAL” system check has been completed (approx. 30 s), the analyzer displays the instantaneous measured values.

Watch the indications of the gas measurement channels for approx. 2 min. to determine the limit values and whether the values are stable.

Limits of error for fluctuations (noise) in the indications of the gas measurement channels:

CO indication	0	%vol	±0,005	%vol
CO_2 indicatio n	0	%vol	±0,2	%vol
O_2 indication	20,0	%vol	±0,4	%vol
HC indication	0	ppmvol	±12	ppmvol

The HC indication must stabilise at a value < 12 ppm by vol. after approx. 2 minutes. End measurement by pressing the ⊖ button.

8.7 Checking flow monitoring

⇒ Hold your finger over the zero gas intake (activated charcoal filter) at the rear of the analyzer to seal it off.

⇒ Press the ⊖ pump button.

After the CAL”system check has been completed, the error message Err1 must appear (inadequate flow).

⇒ Remove your finger from the zero gas intake and seal off the measurement gas intake (using the sealing plug at the sampling probe).

⇒ Press the ⊖ pump button.

After the CAL”system check has been completed, the following indication

CAL.	CAL.
dFL	dFL

must be displayed first, followed by the error message Err1 (inadequate flow).

If these error messages cannot be displayed in this way, there is an error in the flow monitoring function. Contact your service agent who must perform appropriate troubleshooting.

8.8 Before switching the analyzer off

Before you switch off the analyzer, you must scavenge it (flush it out) with ambient air. This reduces the degree of contamination and prevents premature aging.

To do this:

⇒ Make sure that the sampling probe is in fresh air (not in the exhaust pipe).

⇒ Press the ⊖ button and leave the pump running for a minute.

⇒ End scavenging by pressing the ⊖ button again.

⇒ Acknowledge the maintenance message (see chapter 5.3.5).

⇒ Press the mains switch to switch off the analyzer.

8.9 O_2 sensor

The O_2 sensor will wear out with time. The zero point of oxygen analysis is monitored permanently. If it deviates, the fault message Err14 "O_2 sensor equalisation faulty" is displayed and the O_2 sensor must be replaced.

Note: Only use the genuine O_2 sensor with the designation CLASS R-17A SIE or W79085-G4003-X.

Warning! The O_2 sensor contains a caustic alkaline solution.

Caution! The O_2 sensor is an industrial refuse. It must be eliminated according to the rules in force.

8.9.1 O_2 sensor installation and equalisation

Note: After being unpacked, the O_2 sensor may require up to 30 minutes to reach the state in which it provides the necessary measuring accuracy.
After unpacking the O_2 sensor, always wait 30 minutes before installing it.

- Installation

⇒ Disconnect the analyzer from the mains.

⇒ Remove the cap (53) from the O_2 sensor.

⇒ Remove the pawl-type plug from the O_2 sensor located on the back of the unit and unscrew the O_2 sensor.

⇒ Screw in the new O_2 sensor by hand without using a tool and reconnect the pawl-type plug.

⇒ Refit the cap (53).

⇒ Reconnect the analyzer to the mains.

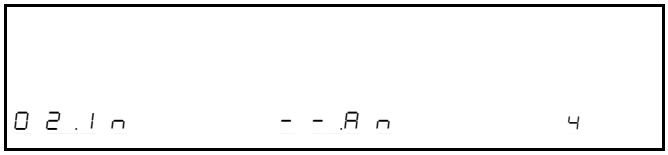
- Equalisation

Access entry mode as described in chapter 5.

⇒ Select the "Unit data" function.

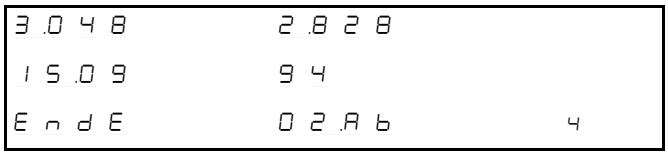
⇒ Select the "Installation date and voltage of O_2 sensor" submenu.

The following appears in display field (1):



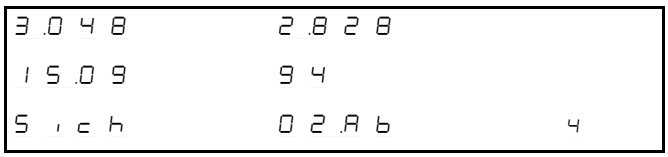
⇒ Press the button (8).

The calibration data of the old O_2 sensor are then displayed automatically.



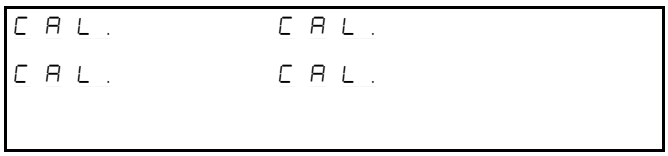
Sensor voltage from the last equalisation in display 10.
Instantaneous sensor voltage in display 13.
Date of the last O_2 sensor equalisation in displays 11 and 14.

⇒ Press the button (7).

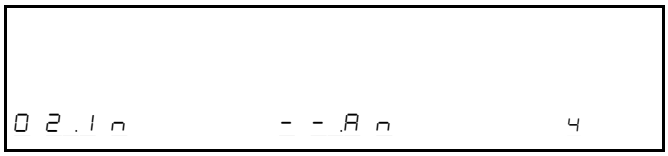


⇒ Press the button (8).

Equalisation is carried out. Duration: 30 s.



Once equalisation has been completed, the following display appears:



The sensor voltage and the installation date have been updated.

⇒ Exit the "Unit data" submenu.

⇒ Exit entry mode.

8.10 Recalibration with certificated test gas

The annual maintenance procedures cover the scope of the six-monthly procedures plus calibration with test gas. We recommend that you conclude a maintenance agreement with your service agent.

When you conduct the annual inspection of the analyzer using test gas, you must use e.g. a cylinder of test gas that contains the certificated gas mixture of 3.5 % CO + 14 % CO_2 + 2000 ppm C_3H_8 (propane) in N_2.

Warning! **The test gas is odourless, combustible and toxic!**
If you use a test gas cylinder with a cylinder pressure of greater than 0.7 bar, you must attach a pressure-reducing valve (per DIN 477 for test gas under a pressure of ≤ 4 bar) to the gas cylinder in order to prevent the analyzer from possible damage.

Caution! After a certain length of time (see the certificate of the test gas), the test gas loses its accuracy. The test gas can no longer be used for calibration purposes once the date specified has expired.

The service agency will parameterise the analyzer in accordance with local regulations. To recalibrate the analyzer, a test gas mixture is required that contains the following concentrations (depending on requirements):

HC: 400 to 4000 ppm vol C_3H_8 (Propan)
CO: 1 % vol to 10 % by volume of CO
CO_2: 6 % vol to 18 % by volume of CO_2

The test gas must be fed into the test gas intake/gas outlet (41) via a viton hose at a rate of approximately 1 l/min. The flow will be displayed.

Caution! The test gas hose must not be connected to the analyzer until the analyzer indicates that it is ready.

Select the AJ function as described in chapter 5.1 by pressing

⇒ the ⊖ button (9) or ⊕ button (7).

Activate the AJ function by pressing

⇒ the ⏎ button (8).

Select the gas constituents to be set, e.g. target HC level, by pressing

⇒ the ⊖ button (9) or ⊕ button (7).

Activate the selected numbers for the HC target level by pressing

⇒ the ⏎ button (8).

Display value in ppm of C_3H_8 (propane).

Select the numbers to be set by pressing

⇒ the ⊖ button (9) or ⊕ button (7).

Activate the numbers by pressing

⇒ the ⏎ button (8).

Amend the numbers by pressing

⇒ the ⊖ button (9) or ⊕ button (7).

Store the numbers set and return to number selection by pressing

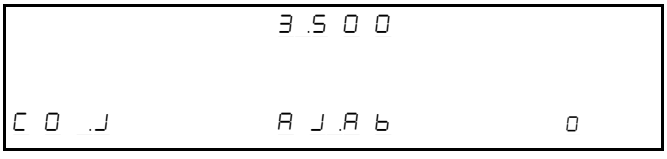
⇒ the ⏎ button (8).

Once all the numbers have been set correctly, select the "End" function by pressing

⇒ the ⊖ button (9) or ⊕ button (7).

Exit HC target level entry by pressing

⇒ the ⏎ button (8).

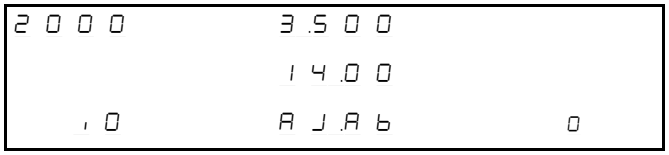


Select the next target level:
proceed as for ”HC” above.

Once all the levels have been set correctly, select ”i.0” from the menu by pressing

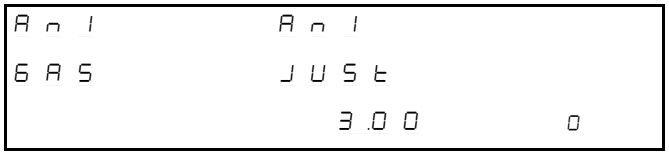
⇒ the ⊖ button (9) or ⊳⊲ button (7).

All the target levels entered will be redisplayed.



Note: If you then press the ⎘ button (8) to acknowledge the settings, recalibration will start, for which you must use test gas.

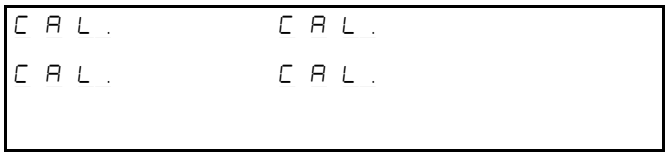
⇒ Press the ⎘ button (8).

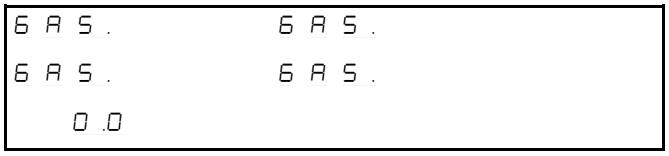


The analyzer starts the warming-up period for test gas calibration.

Note: The test gas hose must not yet be connected.

System equalisation takes place at the end of the warming-up period.





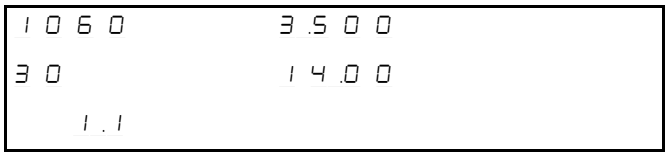
⇒ Disconnect the gas outlet hose (41).

⇒ Connect the test gas hose.

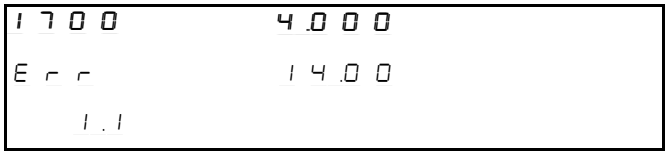
⇒ Feed in the test gas.

⇒ The flow is displayed in the speed display field (12). Set the flow to about 1 l/min.

When the flow is sufficient, the measurements will be displayed and the flow will last 30 seconds.



If one or more constituents of the gas deviate greatly from the target level set, the appropriate gas display will flash and ”Err” will appear in the oxygen display field. Calibration will be rejected.



When calibration has been properly completed, the analyzer will return to entry mode.

⇒ Close off the test gas cylinder.

⇒ Disconnect the test gas hose.

⇒ Reconnect the gas outlet hose (41).

8.11 Standard parameterisation of the VAS 5067

The following parameters must be activated:

Entry mode parameters

- Language 66 (English)
- Printer Int
- Serial interface S r1 ----
  S r2 ----
- Serial protocol ALt

Calibration parameters

- HC test before every measurement
- Leak test interval 1 day
- Maintenance interval 183 days
- Calibration interval 365 days
- Calibration (test) gas mixture CO, HC, CO_2
- Change of settings parameter (CC = YES)

8.12 Service report

Service work

VAS 5067

Date	Kind of work	Company	Name	Signature

Date	Kind of work	Company	Name	Signature

9 Scope of delivery

The scope of delivery of the VAS 5067 comprises the following:

- VAS 5067 basic unit
- Sampling probe, 400 mm long
- Sealing plug for leak test
- Gas sampling hose, 8 m Viton 5 x 1.5
- 3 PVC hoses, 0.7 m
- Filters
- Inductive clip-on pick up for engine-speed measurement
- Mains supply cable
- 2 time-lag fuses, 0.8 A 250 V (spare)
- O_2 sensor (integral)
- Operating instructions manual
- Connecting cable TD

10 Spare parts, parts subject to wear and special accessories

Designation	Part number
Sampling probe, 600 mm long	C74211 A102 B55
Sealing plug for leak test - O-ring seal for sealing plug	C79451 A3301 B345 C71121 Z100 A60
Gas sampling hose, 8 m Viton 5 x 1.5	C79451 A3407 C250
PVC hose set 0.7 m 5 x 1.5	C79451 A3407 C252
Filter (e.g. GF1/2/3)	C79127 Z400 A1
Activated charcoal filter	C79127 Z1473 A1
O_2 sensor CLASS R-17A SIE	W79085 64003 X
Oil temperature sensor - Rubber cap with retaining spring	7MB1156 7AA08
Inductive trigger clamp-on pickup	7MB1156 7AA10
Connecting cable TD	7MB1156 7AA02
Internal protocol printer - Paper roll - Ribbon cassette	 C75452 Z1 C1 C79451 A3444 B312
Upgrade kit, second serial port	C79451 A3407 D141

11 Technical data

Analysis	Measurement range	Resolution
CO meas. range	0,000-10.00 % vol CO	0,001 % vol
HC meas. range	0-9999 ppm vol HC	1 ppm vol
CO_2 meas. range	0,00-18,00 % vol CO_2	0,01 % vol
O_2 meas. range	0,00-22,00 % vol O_2	0,01 % vol
Lambda display	0,500-2,000	0,001
Speed measurement	0-9990 U/min	10 U/min
Oil temperature	0-150 °C	1 °C

Mains power supply	100 V, 120 V, 230 V, 240 V selectable with bridges, 50 or 60 Hz (setting by after-sales service only)
Power input	110 V A
Electromagnetic compatibility	Class A as per EN 55 022
Permissible ambient temperature	+2 °C bis +45 °C
Permissible relative humidity	5 % to 90 % without dew
Air pressure	700 hPa up to 1100 hPa (-300 m up to 2500 m altitude)
Normal position	horizontal ± 5°
Height of installation location	min. 250 mm from floor
(length of outlet hoses)	min. 300 mm
Warming-up time	3 minutes
System equalisation	30 s, automatic, if required
Measurement gas flow	4 l/min (min. 2 l/min, max. 6 l/min)
Display delay	< 15 s for 95 % measurement accuracy
Weight	10 kg

11.1 Temperature limits

Storing temperature	-20 °C bis +65 °C
Continuous load for viton hose and sampling probe	200 °C max.
Peak load for sampling probe	250 °C max. für < 3 min

11.2 Sound power level to DIN 45 635 (in print mode)

Sound power level L_{WA} 70,2 dBA
Emission value
L_{pA} at workplace 59,1 dBA

12 Guarantee

If any modifications are made to or non-genuine accessories used with our products, all rights under guarantee shall be invalidated.

13 Service address

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Centre Service Client
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F-67506 Haguenau

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