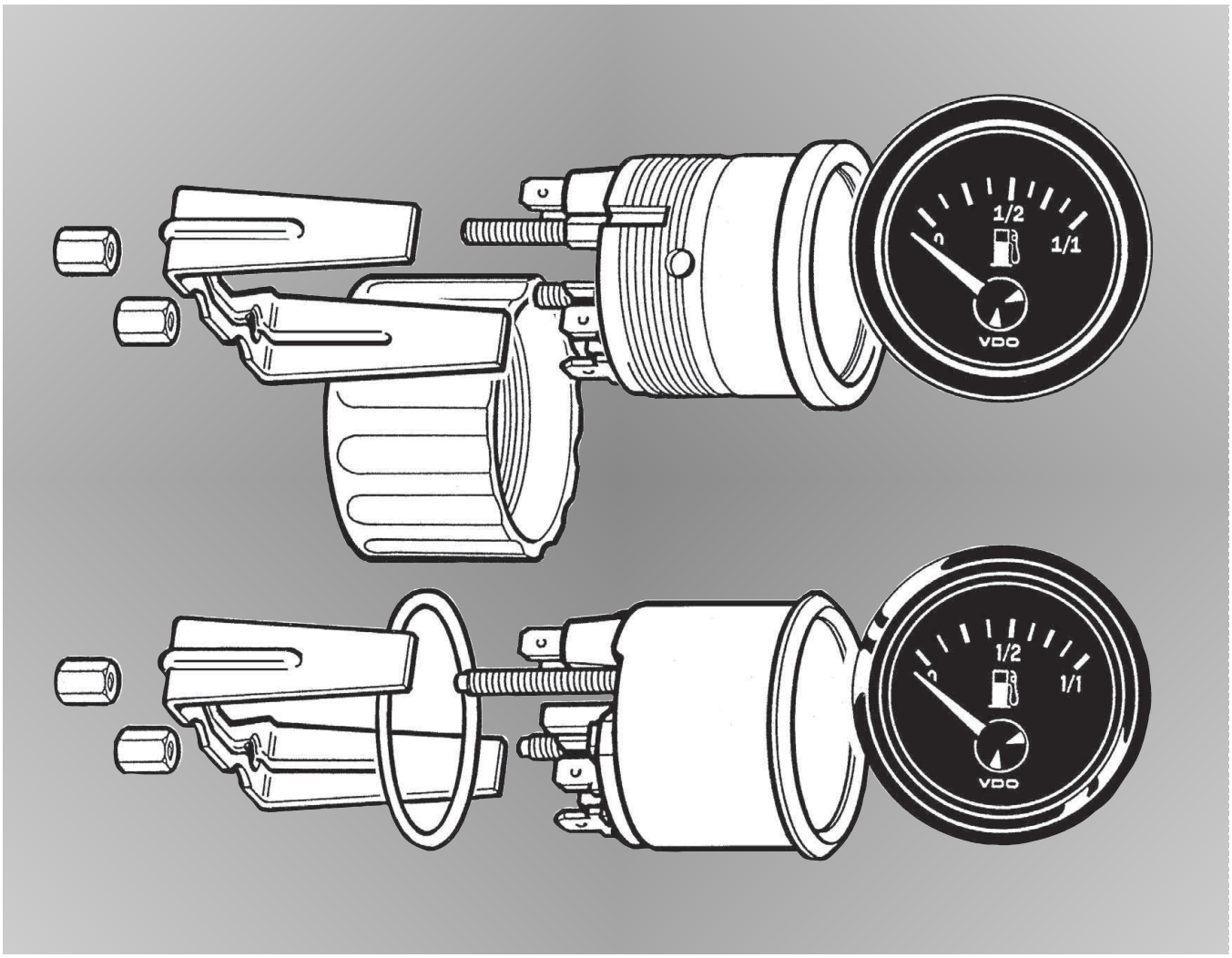
VDO cockpit vision / international

Instruments



www.siemensvdo.com

Technical Product Manual

TU00-0755-0000002 I 0607 I Technical details subject to change

SIEMENS VDO

3. Electronic Tachometer (dia. 80 mm / dia.100 mm)

Contents **Page**

Installation instructions

999-165-003: VDO cockpit international
999-165-004: VDO cockpit vision

See file ‘Installation Instructions (MA)’.

3. Electronic Tachometer (dia. 80 mm / dia.100 mm)

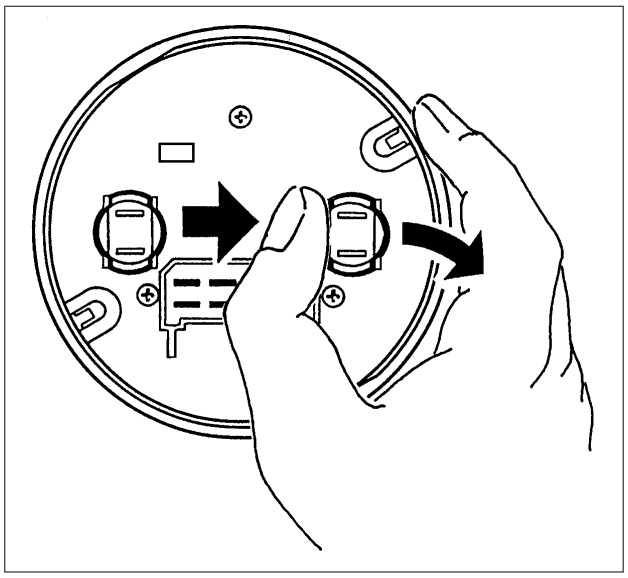
3.1 General Informations

The electronic tachometer has been designed for land-bound vehicles only (with the exception of motorcycles). The instrument has an analog engine speed display in RPM x 100.

The instrument is pulsed by terminal 1 of the ignition coil in the case of petrol engines (4, 6, 8 cylinders, four-stroke), by terminal W of the alternator in the case of diesel engines.

The instrument is set by 3 coding switches and a potentiometer at the back of the instrument.

The lamp sockets are clipped in.
To replace the light bulb, carefully, with the thumb, push the lamp holder out to the side.



3. Electronic Tachometer (dia. 80 mm / dia.100 mm)

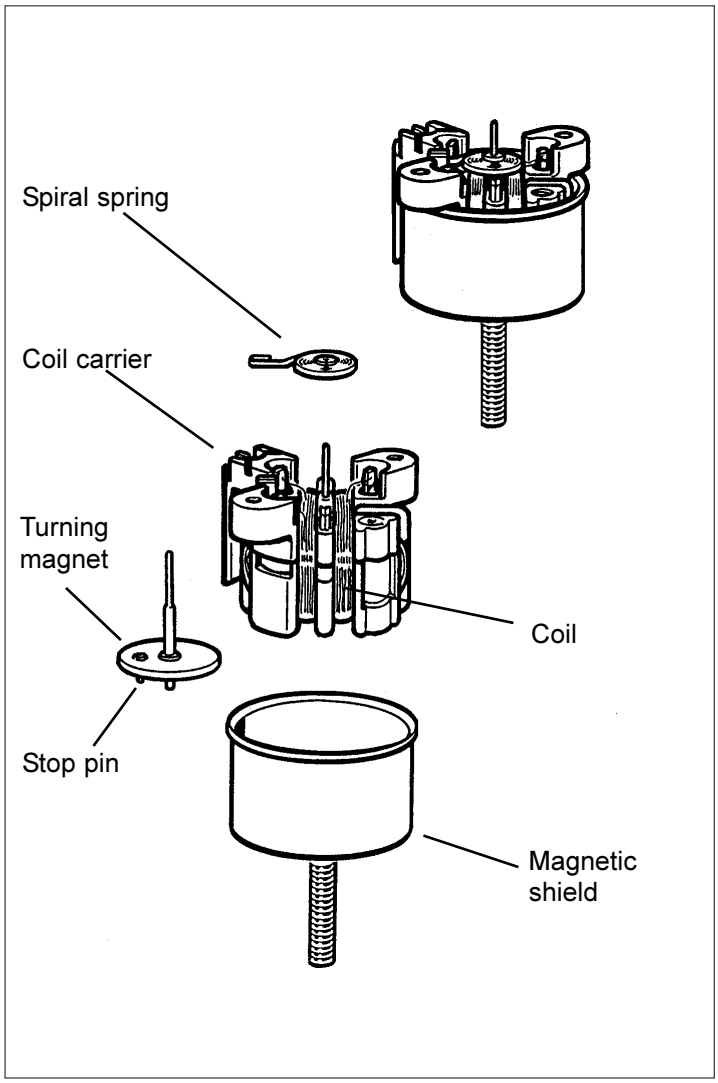
3.1 General Informations

Designation of function
Movement: System Ke (to 320°)
(Turning magnet ratio measuring movement, pointer deflection up to 320°)

A turning magnet ratio measuring movement is the main component of the tachometer.
It converts the current pulses from the sensor to an analog display on a dial. An electronic circuit converts varying current pulses to unified pulses, which are fed to the turning magnet movement. The turning magnet ratio measuring movement applies the principle of the current ratio of two separate coils. Two stationary coils generate a magnetic field as a function of the current flowing through them. The magnetic field resulting from these two fields moves a two-pole magnet disc carrying a pointer. The pointer deflection is a function of the ratio of the two currents flowing through the coils.

A shielding casing prevents the effect of external magnetic fields.

The special electtronic system controlling the movement permits a pointer deflection of 320°. The rotation is limited by a pin on the turning magnet moving in a groove of the coil carrier; the opposing force is generated by a spiral spring.

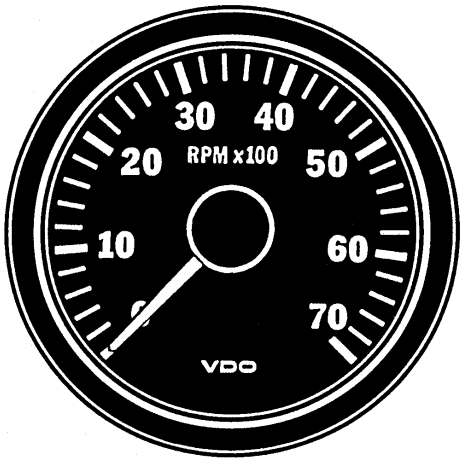


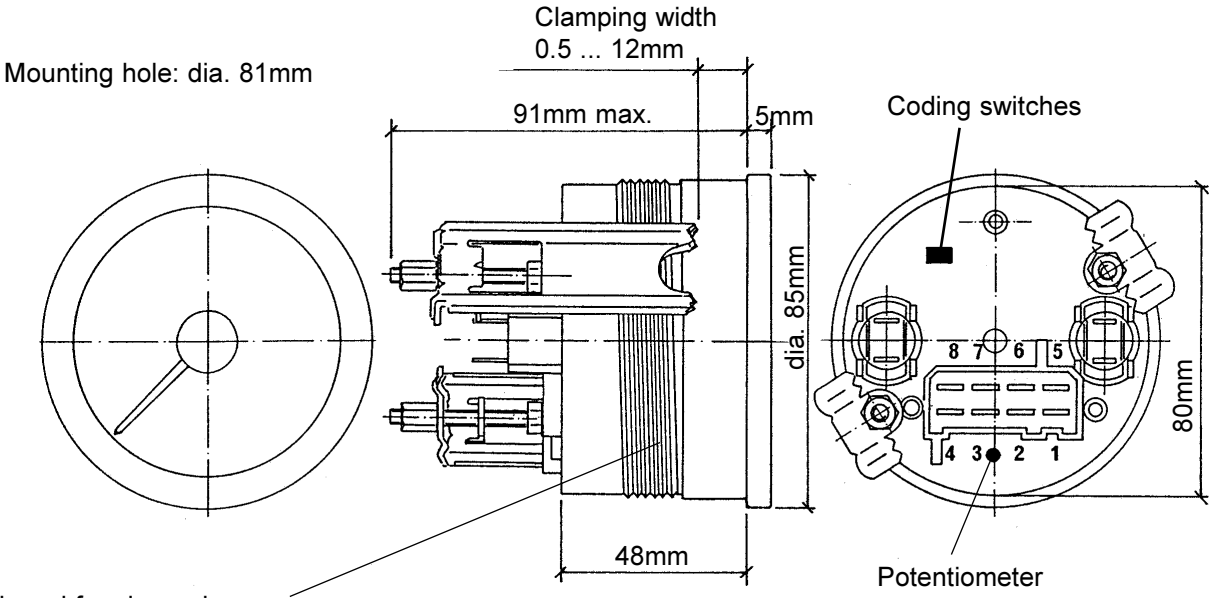
3. Electronic Tachometer (dia. 80 mm / dia.100 mm)

3.2 Technical Data

VDO cockpit vision
dia. 80 mm Backlight

Operating voltage:	10.8 ... 16 V
Input signal voltage:	U_{low}: max. 5 V U_{high}: min. 7,5 V
Movement:	System Ke (→ 320°)
Pickup:	terminal 1 ignition coil (fuel engine) terminal W alternator (diesel engine)
Current consumption:	< 100 mA (without illumination)
Operating temp.:	– 20°C ... + 70°C
Storage temperature:	– 30°C ... + 85°C
Illumination:	2 light bulbs 12 V, 2 W 4 colour caps, 2 green and 2 red
Protection:	IP64 DIN 40050 from the front housing 'ozon'-proof, 'UV'-proof CE approved, reverse-polarity protection
EMC test:	according to EN 13309 and ISO 13766
Vibration resistance:	max. 1g eff., 25 ... 500 Hz, duration 8h, f: 1 octave/min.
Nominal position:	NL 0 to NL 90, DIN 16257





6 ... 25 pulses/revolution
(adjustable)

Pin assignment:
Pin 1: + 24 V (for 24 V instrument)
Terminal 15
Pin 2: + 12 V (for 12 V instrument)
Terminal 15
Pin 3: Ground
Pin 4: Signal input
Terminal 1 or W

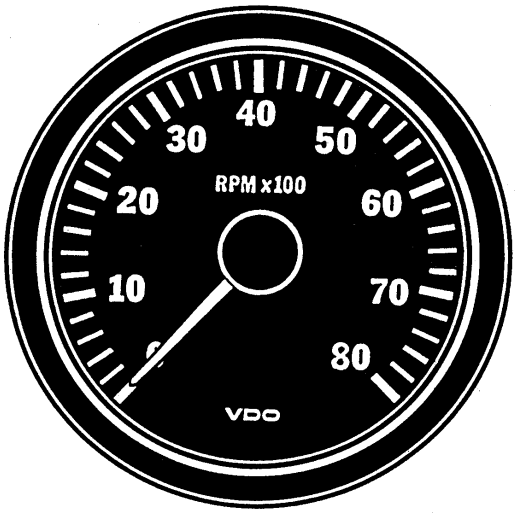
3. Electronic Tachometer (dia. 80 mm / dia.100 mm)

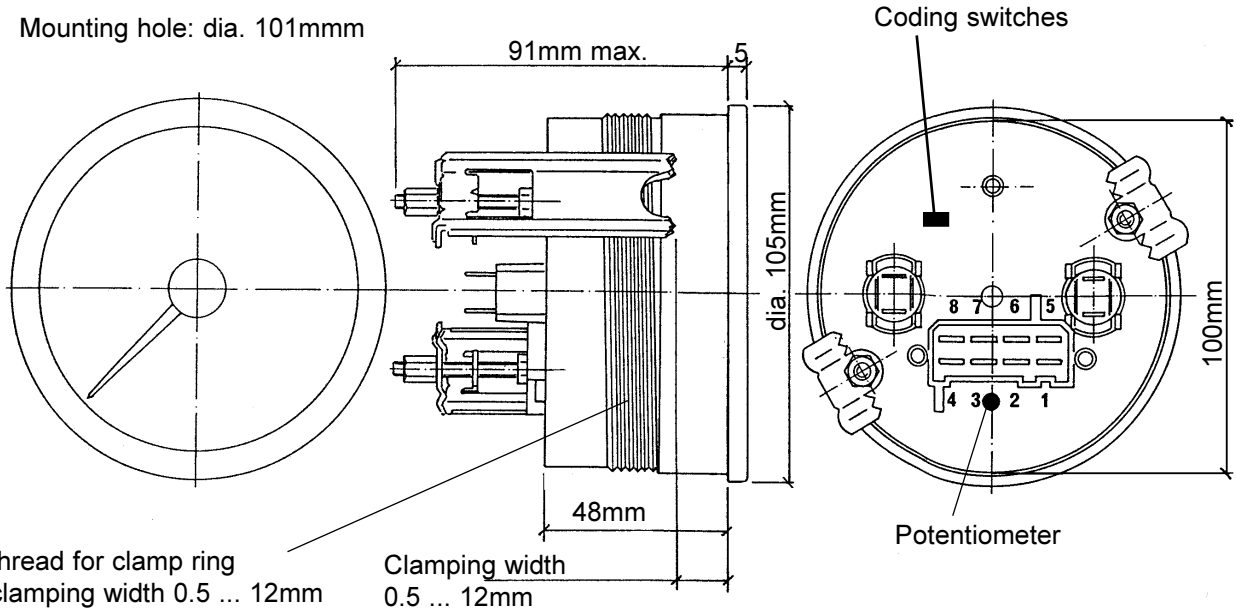
3.2 Technical Data

Operating voltage:	10.8 ... 16 V
Input signal voltage:	U_{low}: max. 5 V U_{high}: min. 7,5 V
Movement:	System Ke (→ 320°)
Pickup:	terminal 1 ignition coil (fuel engine) terminal W alternator (diesel engine)
Current consumption:	< 100 mA (without illumination)
Operating temp.:	– 20°C ... + 70°C
Storage temperature:	– 30°C ... + 85°C
Illumination:	2 light bulbs 12 V, 2 W 4 colour caps, 2 green and 2 red
Protection:	IP64 DIN 40050 from the front housing 'ozon'-proof, 'UV'-proof CE approved, reverse-polarity protection
EMC test:	according to EN 13309 and ISO 13766
Vibration resistance:	max. 1g eff., 25 ... 500 Hz, duration 8h, f: 1 octave/min.
Nominal position:	NL 0 to NL 90, DIN 16257

VDO cockpit vision

dia. 100 mm Backlight





6 ... 25 pulses/revolution
(adjustable)

Pin assignment:
Pin 1: + 24 V (for 24 V instrument)
Terminal 15
Pin 2: + 12 V (for 12 V instrument)
Terminal 15
Pin 3: Ground
Pin 4: Signal input
Terminal 1 or W

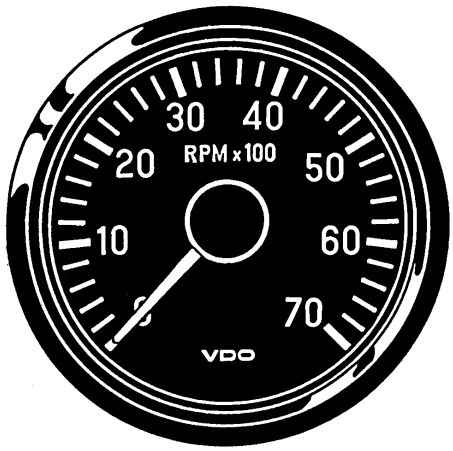
3. Electronic Tachometer (dia. 80 mm / dia.100 mm)

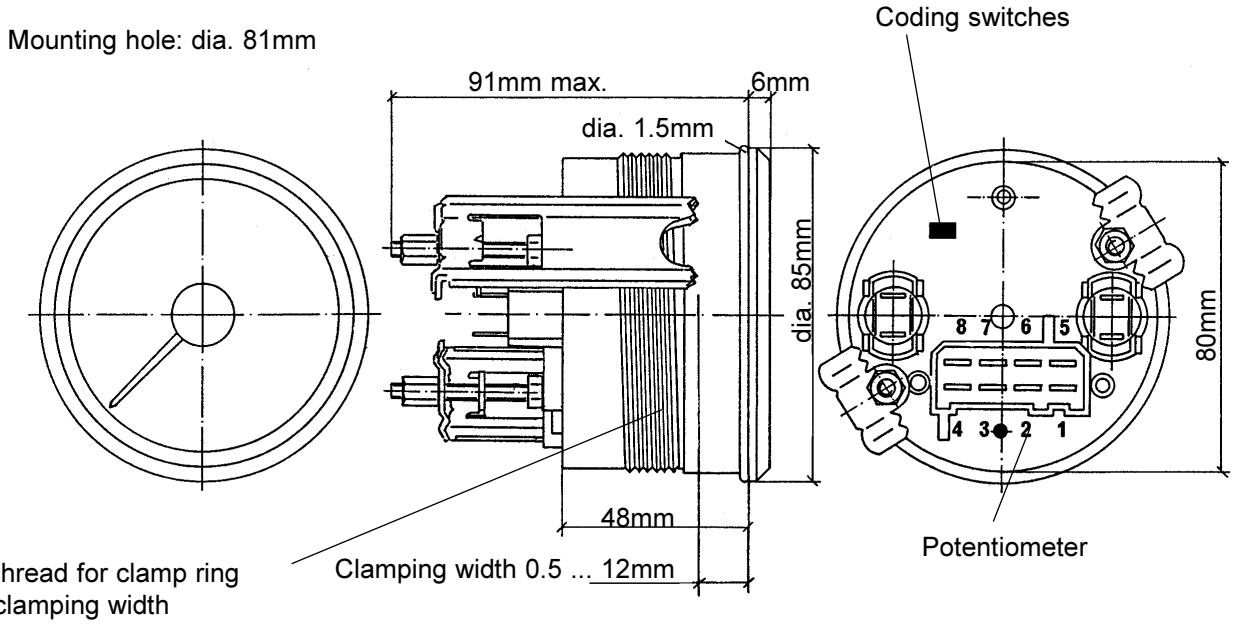
3.2 Technical Data

Operating voltage:	10.8 ... 16 V or 21 ... 32 V
Input signal voltage:	U_{low}: max. 5 V U_{high}: min. 7,5 V
Movement:	System Ke (→ 320°)
Pickup:	terminal 1 ignition coil (fuel engine) terminal W alternator (diesel engine)
Current consumption:	< 100 mA (without illumination)
Operating temp.:	– 20°C ... + 70°C
Storage temperature:	+ 30°C ... + 85°C
Illumination:	2 light bulbs 12 V, 2 W or 24 V, 2 W
Protection:	IP64 DIN 40050 from the front housing 'ozon'-proof, 'UV'-proof CE approved, reverse-polarity protection
EMC test:	according to EN 13309 and ISO 13766
Vibration resistance:	max. 1g eff., 25 ... 500 Hz, duration 8h, f: 1 octave/min.
Nominal position:	NL 0 to NL 90, DIN16 257

VDO cockpit international

dia. 80 mm Floodlight





6 ... 25 pulses/revolution
(adjustable)

Pin assignment:
Pin 1: + 24 V (for 24 V instrument)
Terminal 15
Pin 2: + 12 V (for 12 V instrument)
Terminal 15
Pin 3: Ground
Pin 4: Signal input
Terminal 1 or W

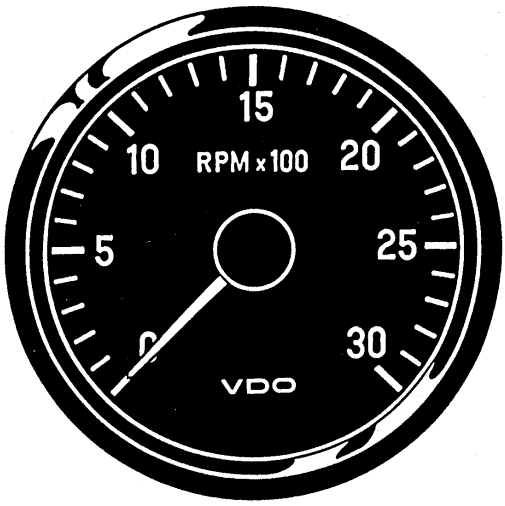
3. Electronic Tachometer (dia. 80 mm / dia.100 mm)

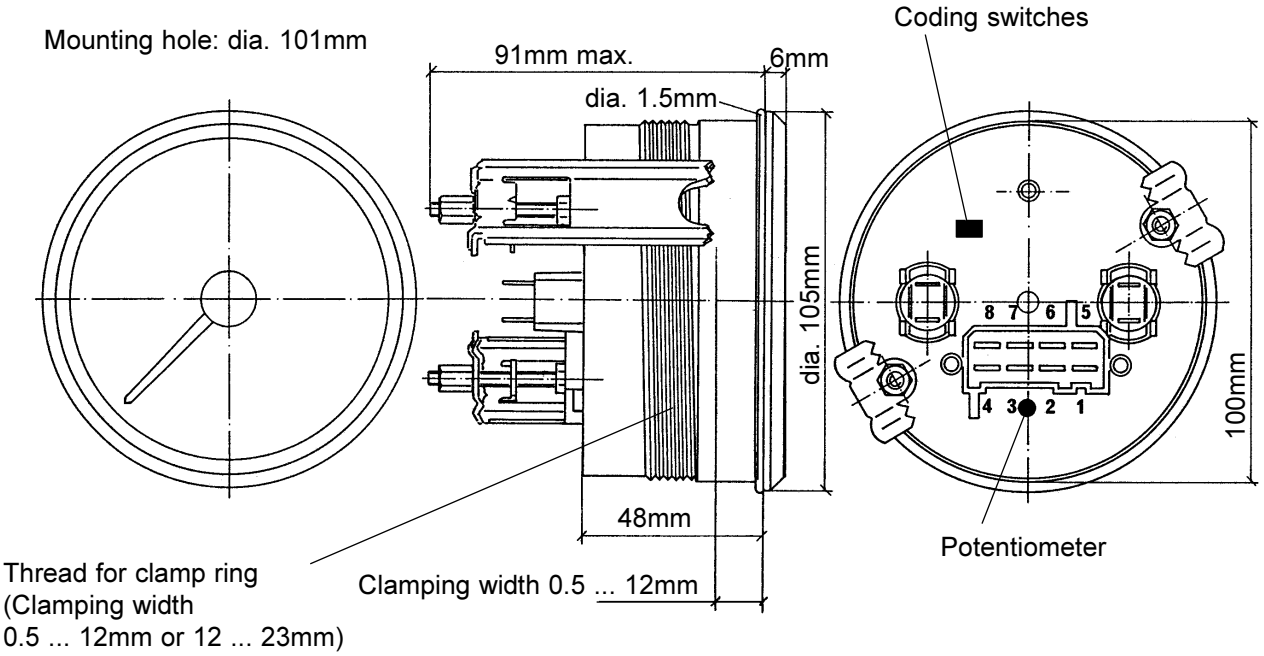
3.2 Technical Data

Operating voltage:	10.8 ... 16 V or 21 ... 32 V
Input signal voltage:	U_{low}: max. 5 V U_{high}: min. 7,5 V
Movement:	System Ke (→ 320°)
Pickup:	terminal 1 ignition coil (fuel engine) terminal W alternator (diesel engine)
Current consumption:	< 100 mA (without illumination)
Operating temp.:	– 20°C ... + 70°C
Storage temperature:	– 30°C ... + 85°C
Illumination:	2 light bulbs 12 V, 2 W or 24 V, 2 W
Protection:	IP64 DIN 40050 from the front housing 'ozon"-proof, 'UV'-proof CE approved, reverse-polarity protection
EMC test:	according to EN 13309 and ISO 13766
Vibration resistance:	max. 1g eff., 25 ... 500 Hz, duration 8h, f: 1 octave/min.
Nominal position:	NL 0 to NL 90, DIN 16257

VDO cockpit international

dia. 100 mm Floodlight





6 ... 25 pulses/revolution
(adjustable)

Pin assignment:
Pin 1: + 24 V (for 24 V instrument)
Terminal 15
Pin 2: + 12 V (for 12 V instrument)
Terminal 15
Pin 3: Ground
Pin 4: Signal input
Terminal 1 or W

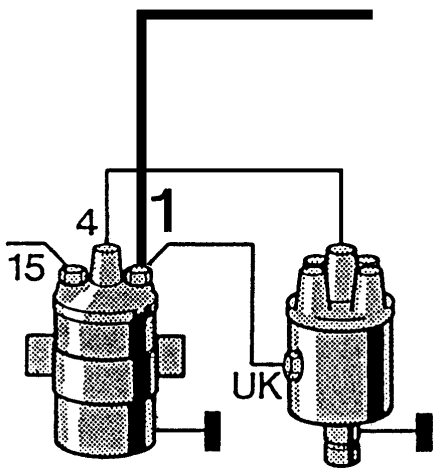
3. Electronic Tachometer (dia. 80 mm / dia.100 mm)

3.3 Pulsing

Tachometer connection: pin 4

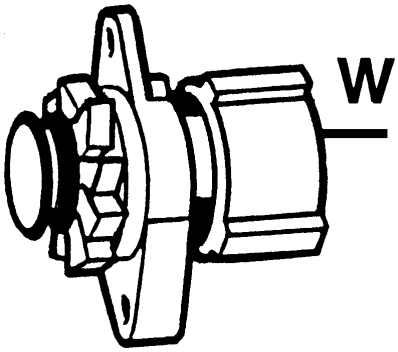
On vehicles with petrol engines the signal is obtained at terminal 1 of the ignition coil in the case of conventioal ignition systems (having one coil only) or an additional terminal on special ignition systems. In the case of special ignition systems (such as transistor/coil ignition systems, electronic and fully electronic ignitions) please ask the vehicle manufacturer or the ignition system manufacturer about the correct terminal.

Conventional ignition system



The signal on vehicles with diesel engine is obtained at alternator terminal W.

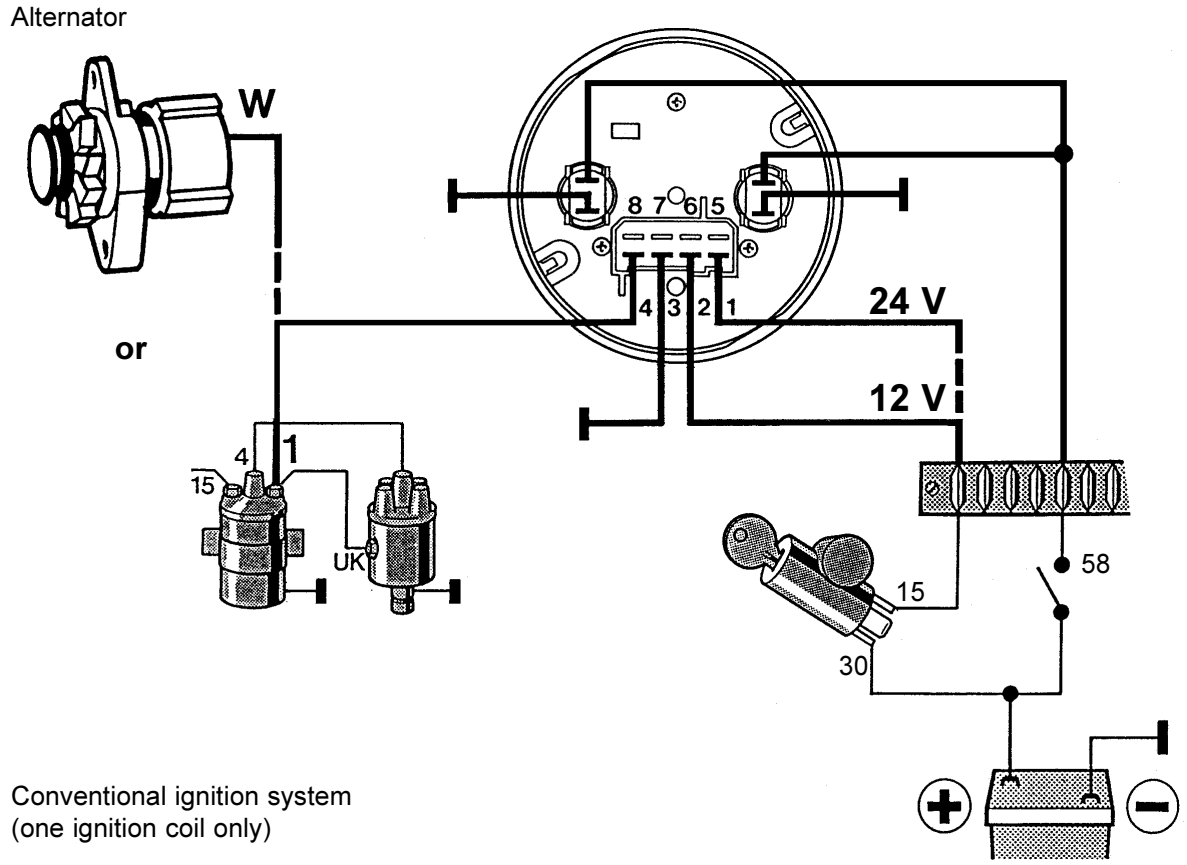
Alternator



The ignition must be off and the battery minus connection disconnected when connecting the cable.

3. Electronic Tachometer (dia. 80 mm / dia.100 mm)

3.4 Wiring Diagram



Conventional ignition system
(one ignition coil only)

3. Electronic Tachometer (dia. 80 mm / dia.100 mm)

3.5 Setting

Petrol engine setting

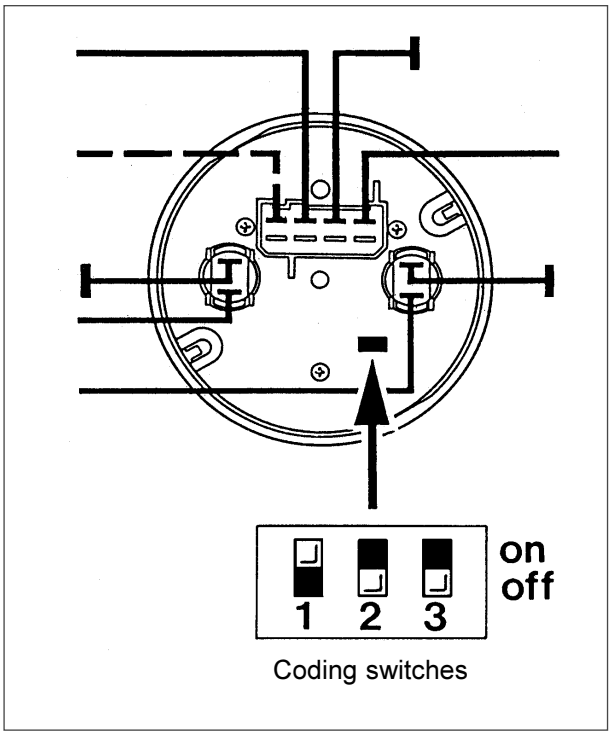
For petrol engines (4, 5, 6 or 8 cylinders) and connection to terminal 1 (only one ignition coil) either only use the coding switches for setting or use the coding switches (coarse setting) and use the potentiometer (fine adjustment: see page 3 - 13) for setting.
Possible settings per coding table.

Coding table

Petrol engine, terminal 1 (one ignition coil)					Only coding switches	Coding switches and potentiometer
Coding switches			Cylinders	Stroke	⚠ Do **not** change the potentiometer setting! Changing the potentiometer setting will cause wrong readings.	Use a reference tachometer to set the potentiometer ▼
1	2	3				
on	off	off	4	4	x	
on	off	off	5	4		x
on	off	on	6	4	x	
on	on	off	8	4	x	

▼ The adjustment must be made by two people, one of them adjusting the instrument, the other one using the hand-held tachometer (reference tachometer), see page 3 -13.

Example:
on, off, off
(4 cylinders, four-stroke)



Coding switches

3. Electronic Tachometer (dia. 80 mm / dia.100 mm)

3.5 Setting

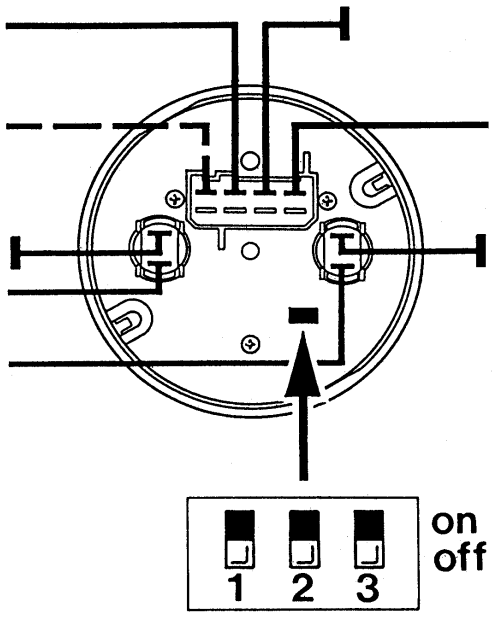
Diesel engine setting

For the diesel engine and connection to terminal W of the alternator use the coding switches (coarse setting) and the potentiometer (fine adjustment: see page 3 - 13) for setting.

Set the coding switches per coding table if the pulse ratio (pulses at the terminal W output of the alternator for one engine revolution) is known.

Coding table

Diesel engine, terminal W							
Switches			RPM				
1	2	3	3000	4000	6000	7000	8000
off	off	off	8-12	6-9	8-12	7-10	6-9
off	off	on	12-17	9-13	12-17	10-15	9-13
off	on	off	17-25	13-20	17-24	14-21	12-18
			Pulses per revolution				



Coding switches

Example: off, off, off (at 6000 RPM 10 pulses per revolution).

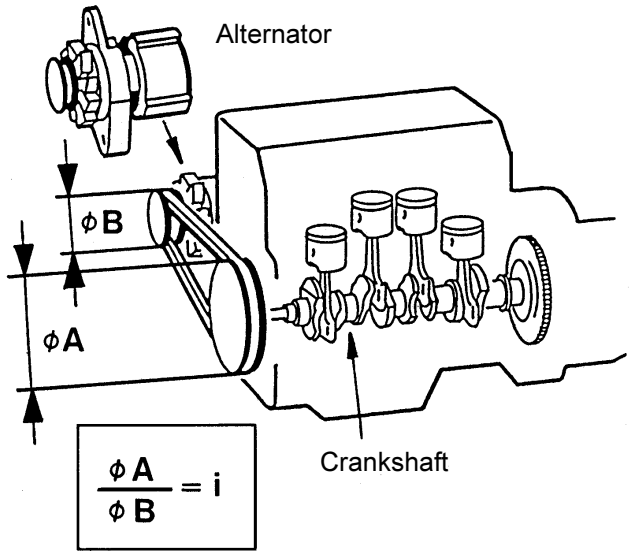
Make the fine adjustment with the potentiometer (see page 3 - 13).

3. Electronic Tachometer (dia. 80 mm / dia.100 mm)

3.5 Setting

Diesel engine setting

The following formula can be used to calculate an unknown pulse ratio, which is then set as described on page 3 - 11.



Example:
dia. A = 280 mm
dia. B = 132 mm

$i = \frac{280}{132} = 2.12$

i x 6 = the pulse ratio

Pulses per revolution
Number of the alternator pole pairs
2.12 x 6 = 12.72
= 13 pulses per revolution

Set the coding switches to 'off, off, off' first if the number of alternator pole pairs is not known. Make the fine adjustment with the potentiometer.
Select a different coding switches position and the potentiometer if the indication cannot be matched to the reference instrument indication.

Calculate the pulse ratio as follows if the frequency (Hz) is know, and not the pulse ratio:

$\frac{\text{Hz x 60 sec.}}{\text{full scale speed}}$ = pulses/revolution

Example 1733 Hz:

$\frac{1733 \times 60}{8000} = 12.99 = 13$ pulses/revolution

Formula for frequency (Hz):

$\frac{\text{pulses/revolution x full scale speed}}{\text{60 sec.}}$ = Hz

Example:

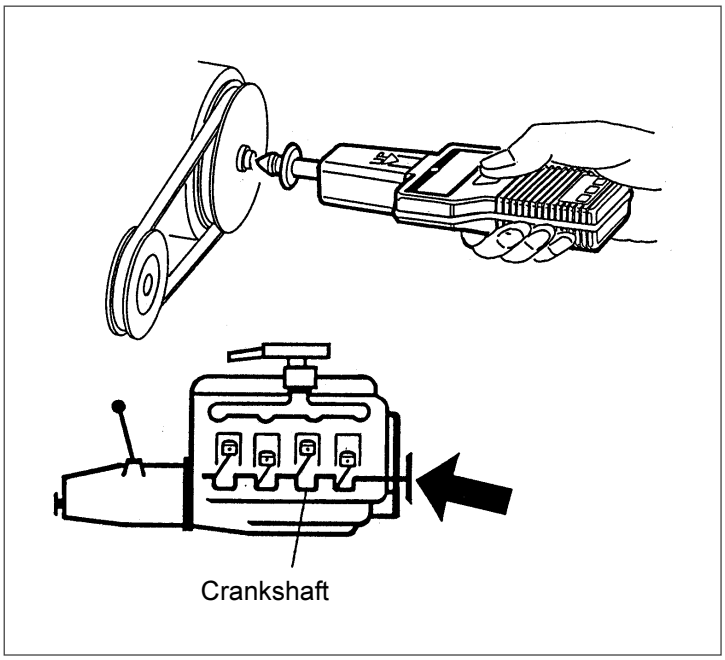
$\frac{13 \times 8000}{60} = 1733$ Hz

3. Electronic Tachometer (dia. 80 mm / dia.100 mm)

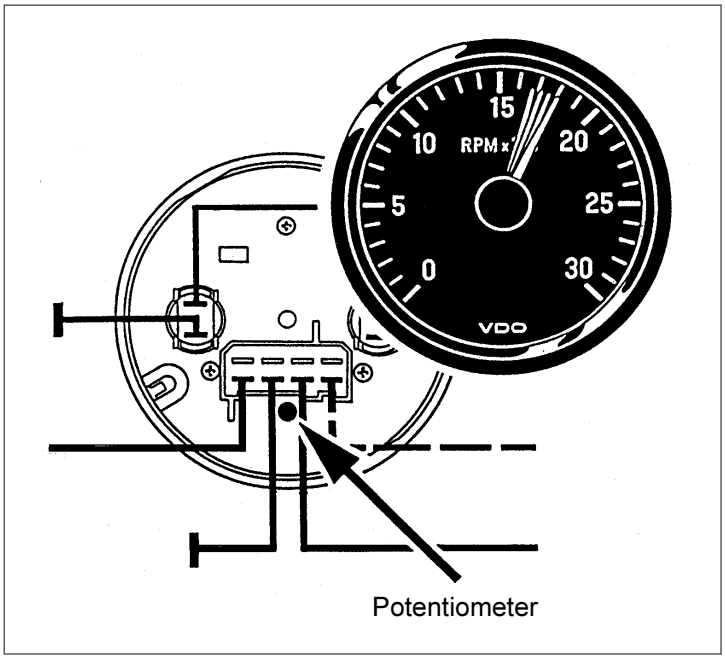
3.5 Setting

Fine adjustment with potentiometer

The fine adjustment using the potentiometer is only possible between 30% and 100% of the indicating range. Use a reference tachometer (hand-held tachometer) to compare the speed indications.
The adjustment must be made by two people, one of them adjusting the instrument, the other one using the hand-held tachometer.
Measure the engine speed at the crankshaft stub of the engine.
Be very careful! Do not wear loose clothing!



Adjust potentiometer with an insulated screwdriver to the speed indication of the hand-held tachometer.



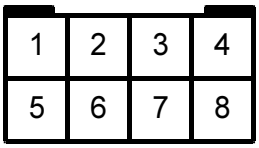
3. Electronic Tachometer (dia. 80 mm / dia.100 mm)

3.6 Testing Instructions

Test accessories

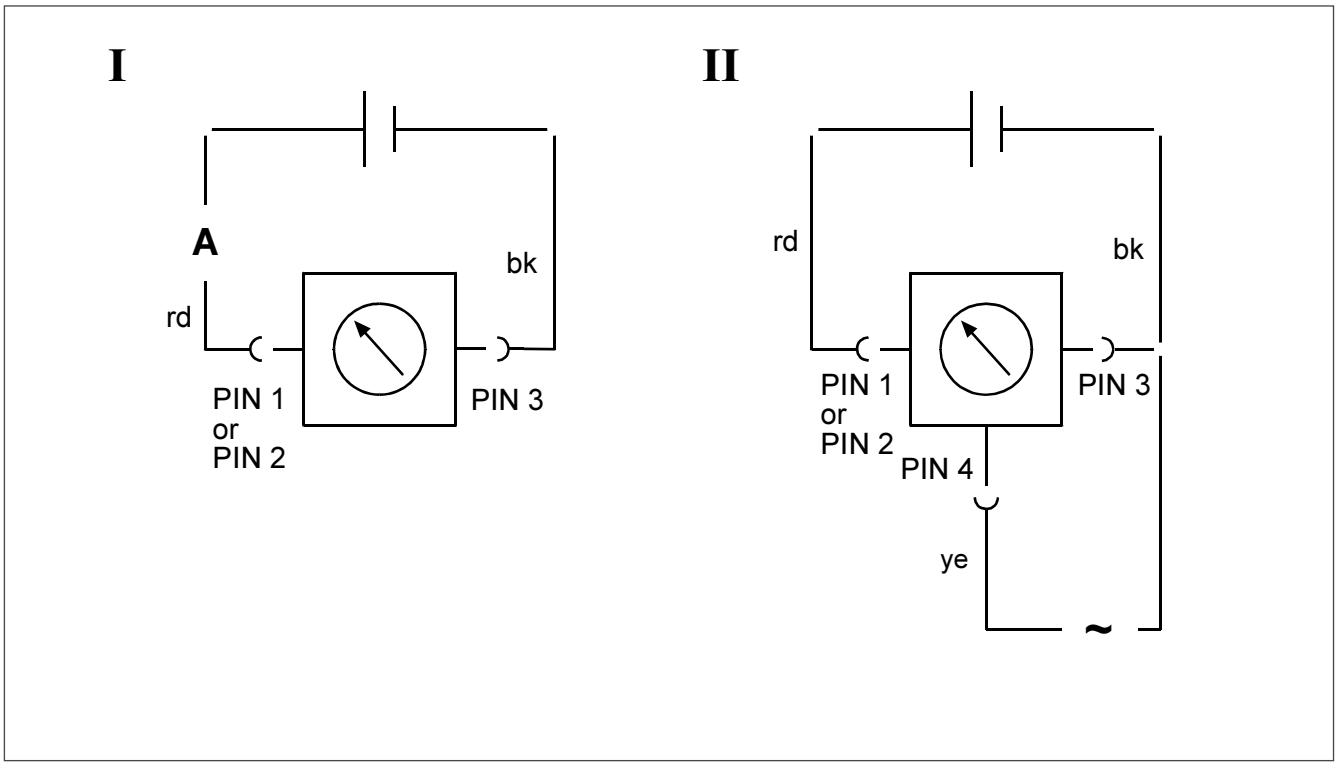
1x	Power supply	
1x	Test cable No. 1	contained in test cables kit
1x	Measuring cable	X12-019-101-001
1x	Frequency generator	
1x	Ammeter	

Connector pin allocation



Pin 1	+24V (for 24 V instrument)
Pin 2	+12V (for 12 V instrument)
Pin 3	Ground
Pin 4	Engine speed signal input

Test circuit diagram



3. Electronic Tachometer (dia. 80 mm / dia.100 mm)

3.6 Testing Instructions

Test method description

Basic setting:	12 V instruments	⇒	14V ± 0,2V
	24 V instruments	⇒	28V ± 0,4V

Set coding switches (at back of instrument) 1-on, 2-off, 3-off .

Current consumption measurement

Connect the instrument per test circuit diagram I with test cable No. 1.

Value range:	12 V instruments	⇒	I = 69 ± 10 mA
	24 V instruments	⇒	I = 78 ± 10 mA

Pointer position check

a) Check of zero position

Connect the instrument per test circuit diagram I with test cable No. 1.

Switch operating voltage on and check pointer deviation. The allowed deviation is ± 2 angular degrees.

b) Check of full range position

Connect the instrument per test circuit diagram II with test cable No. 1.

Connect a square wave signal with a frequency corresponding to full range to pin 4. The amplitude shall be at least 10 V.

Engine speed range	Frequency	Tolerance
3000 RPM	100 Hz	± 75 RPM
4000 RPM	133 Hz	± 100 RPM
6000 RPM	200 Hz	± 150 RPM
7000 RPM	233 Hz	± 175 RPM
8000 RPM	267 Hz	± 200 RPM
10000 RPM	333 Hz	± 250 RPM

3. Electronic Tachometer (dia. 80 mm / dia.100 mm)

3.7 Instruments Survey

VDO cockpit vision (Backlight) dia. 80 mm / dia. 100 mm **Part No. 333-015-. . .**

Dial		Special feature	Part No.
Range	Imprint		
0 ... 7000 min^{-1}	RPM x 100	12 V, dia. 80 mm	**001K**
0 ... 8000 min^{-1}	RPM x 100	12 V, dia. 100 mm	**005G**

3. Electronic Tachometer (dia. 80 mm / dia.100 mm)

3.7 Instruments Survey

VDO cockpit international (Floodlight) dia. 80 mm — Part No. 333-035-. . .

Dial		Special feature	Part No.
Range	Imprint		
0 ... 3000 min^{-1}	RPM x 100	12 V, dia. 80 mm	**001C** **001G**
0 ... 4000 min^{-1}	RPM x 100	12 V, dia. 80 mm	**002C *** **002G**
0 ... 7000 min^{-1}	RPM x 100	12 V, dia. 80 mm	**003C *** **003G**
0 ... 10000 min^{-1}	RPM x 100	12 V, dia. 80 mm	**022C**
0 ... 4000 min^{-1}	RPM x 100	12 V, dia. 80 mm ●	**027C**
● with clamp ring instead of bolts and brackets			

Part No. 333-045-. . .

Dial		Special feature	Part No.
Range	Imprint		
0 ... 3000 min^{-1}	RPM x 100	24 V, dia. 80 mm	**001C** **001G**
0 ... 4000 min^{-1}	RPM x 100	24 V, dia. 80 mm	**002C** **002G**

VDO cockpit international (Floodlight) dia. 100 mm — Part No. 333-055-. . .

Dial		Special feature	Part No.
Range	Imprint		
0 ... 3000 min^{-1}	RPM x 100	12 V, dia. 100 mm	**001C *** **001G**

Part No. 333-065-. . .

Dial		Special feature	Part No.
Range	Imprint		
0 ... 3000 min^{-1}	RPM x 100	24 V, dia. 100 mm	**001C *** **001G**

* Phase-out

4. Electronic Tachometer With Operating Hours Counter (dia. 80 mm / dia.100 mm) only for VDO cockpit international

Contents **Page**

Installation instructions

999-165-009: VDO cockpit international

See file ‘Installation Instructions (MA)’.

4. Electronic Tachometer With Operating Hours Counter (dia. 80 mm / dia.100 mm) only for VDO cockpit international

4.1 General Informations

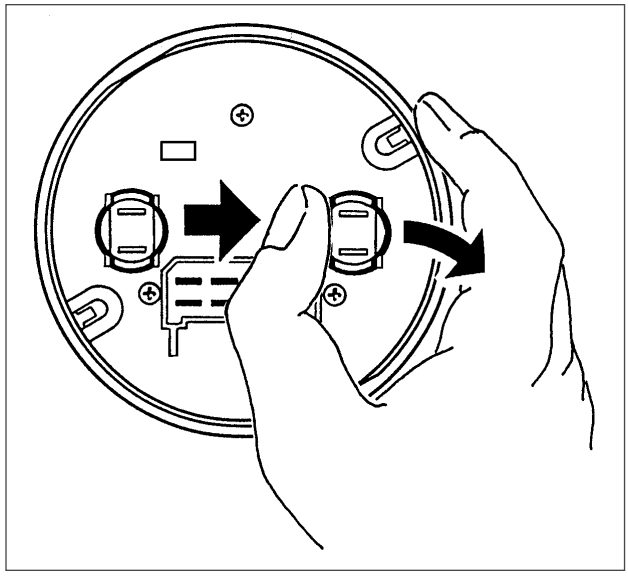
The electronic tachometer with operating hours counter has been designed for land-bound vehicles or stationary systems only (with the exception of motorcycles).

The instrument has an analog engine speed indication in RPM x 100 and a liquid crystal display for the operation hours count.

The electronic tachometer is pulsed by an inductive sensor or a generator sensor or by the terminal W of the alternator in the case of diesel engines, by terminal 1 of ignition coil in the case of petrol engines.

The instrument is set by a pushbutton at the back of the instrument.

The lamp sockets are clipped in.
To replace the light bulb, carefully, with the thumb, push the lamp holder out to the side.



4. Electronic Tachometer With Operating Hours Counter (dia. 80 mm / dia.100 mm) only for VDO cockpit international

4.1 General Informations

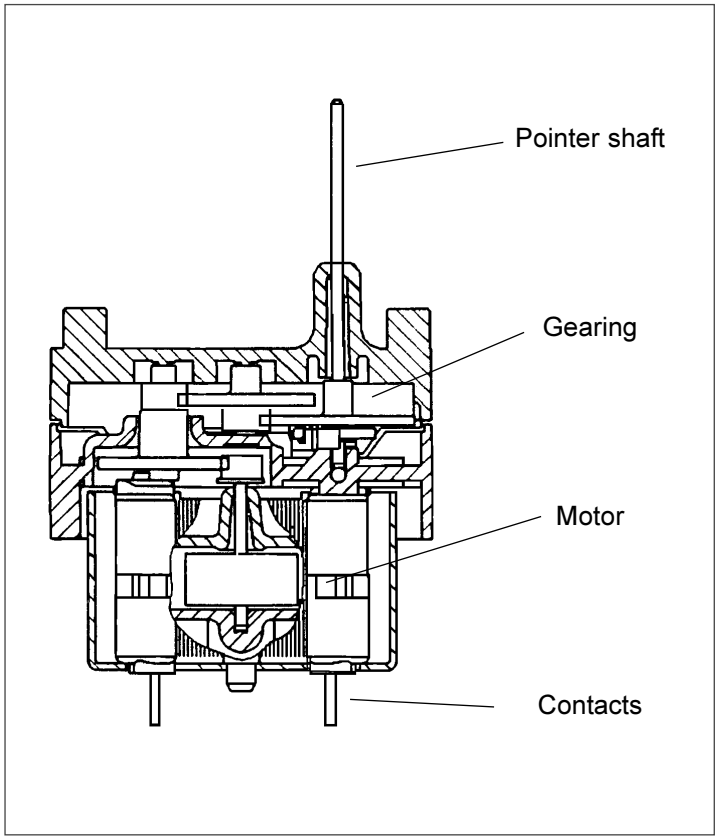
Designation of function
Stepper motor movement

The drive for this display system is a stepper motor, comprising a permanent magnet rotor within a crossed winding arrangement. A zero backlash gearbox at the output ensures a high drive torque and fine resolution. The gearbox has a reduction ratio of 43.2 : 1 and an internal mechanical stop. The stepper motor drive was developed specially by VDO for this product.

The drive produces a bipolar sinusodial variable voltage using digital pulse width modulation. There is a 90° phase difference (sine-cosine) between the voltages on the two motor coils. This rotates the electromagnetic field through equidistant angular steps with a constant length resultant vector ($\sin^2Ø + \cos^2Ø = 1$).

The motor torque is therefore constant at each step with zero cogging. At the pointer one motor step equals 0.065°.

The stepper motor parameters and the design of VDO control-driver electronics are carefully matched to ensure reliable operation of the system under all conditions. Optimised control algorithms ensure a visually smooth pointer motion.



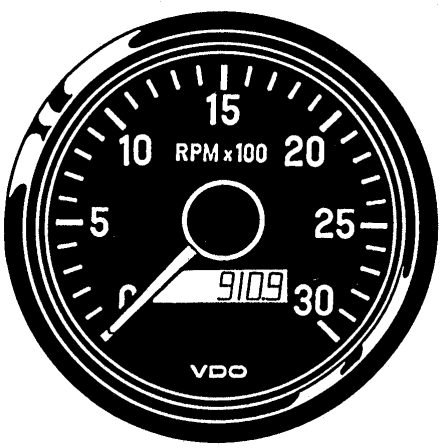
4. Electronic Tachometer With Operating Hours Counter (dia. 80 mm / dia.100 mm) only for VDO cockpit international

4.2 Technical Data

Operating voltage:	10 ... 31 V
Input signal voltage:	U_{low}: 0 V U_{high}: min. 1 V
Movement:	Stepper motor
Pickup:	Terminal 1 ignition coil (petrol engine)
or	Terminal W alternator (diesel engine)
	Inductive sensor
or	Generator sensor
Current consumption:	< 100 mA (120 mA with illumination) < 0,1 mA standby
Operating temp.:	– 20°C ... + 70°C
Storage temperature:	– 30°C ... + 85°C
Illumination:	2 light bulbs, 12 V, 2 W or 24 V, 2 W
Protection:	IP64 DIN 40050 from the front Housing 'ozon'-proof, 'UV'-proof CE approved, reverse-polarity protection
EMC test:	according to EN 13309 and ISO 13766
Vibration resistance:	max. 1g eff., 25 ... 500 Hz, duration 8h, f: 1 octave/min.
Nominal position:	NL 0 to NL 90, DIN 16257

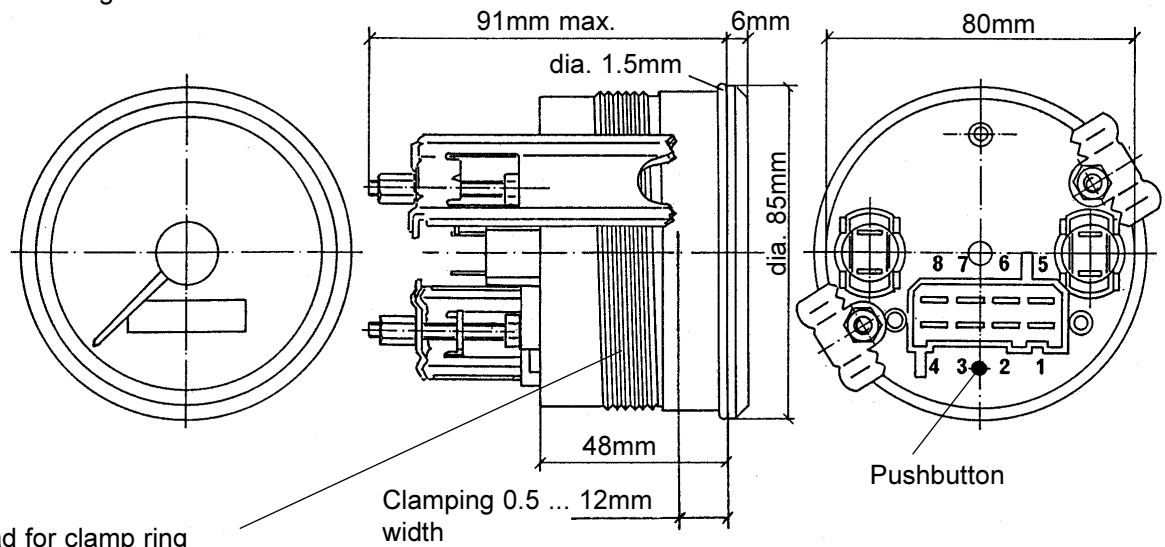
VDO cockpit international

dia. 80 mm Floodlight



Operating hours counter: 999999.9h

Mounting hole: dia. 81mm



Thread for clamp ring (clamping width 0.5 ... 12mm or 12 ... 23mm)

0.5 ... 399.99 pulses / revolution (adjustable)

Pin assignment:

Pin 3: ground, terminal 31
Pin 4: + 12 V or + 24 V, terminal 15
Pin 5*: permanent positive pole 12 V / 24 V, terminal 30
Pin 7: signal input inductive sensor, generator sensor (2 signal wires)
Pin 8: terminal 1 or W (1 signal wire) or inductive sensor, generator sensor (2 signal wires)

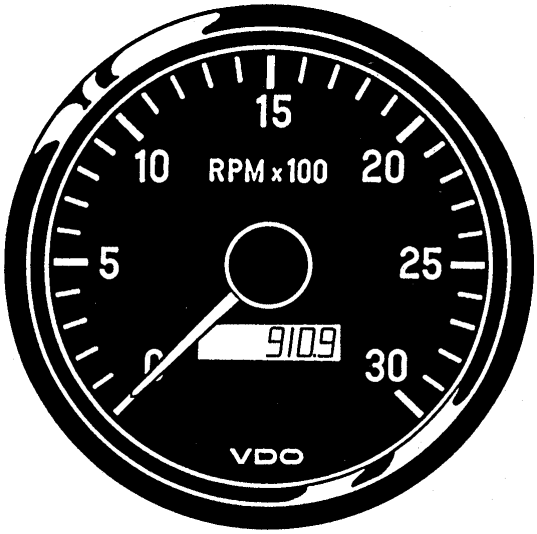
* Not available on some instruments.

4. Electronic Tachometer With Operating Hours Counter (dia. 80 mm / dia.100 mm) only for VDO cockpit international

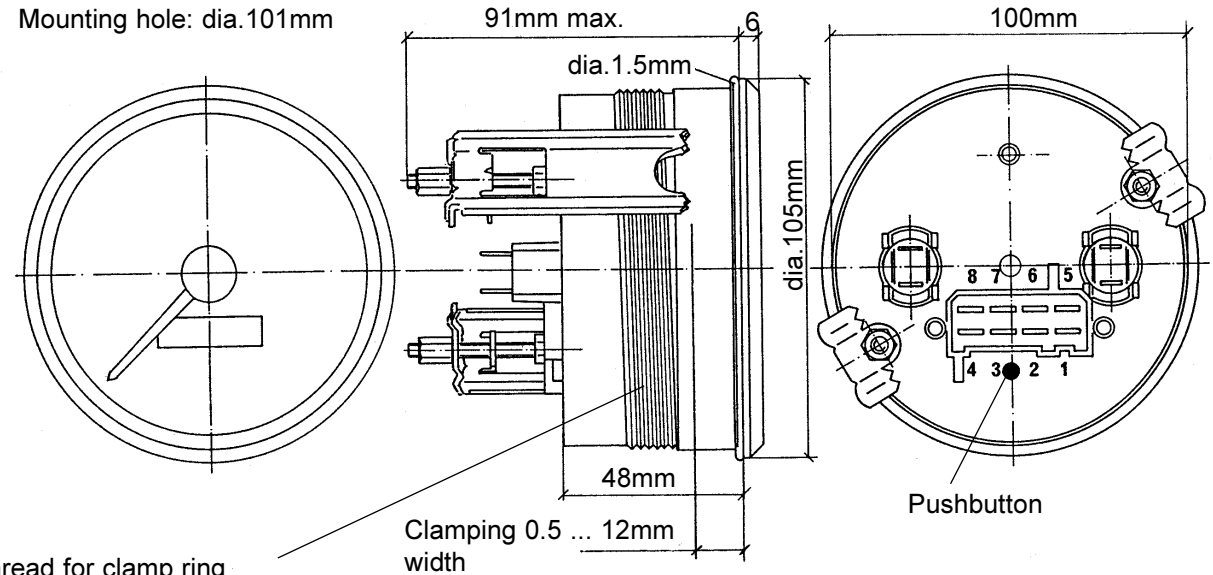
4.2 Technical Data

Operating voltage:	10 ... 31 V
Input signal voltage:	U_{low}: 0 V U_{high}: min. 1 V
Movement:	Stepper motor
Pickup:	Terminal 1 ignition coil (petrol engine)
or	Terminal W alternator (diesel engine) Inductive sensor
or	Generator sensor
Current consumption:	< 100 mA (120 mA with illumination) < 0.1 mA standby
Operating temp.:	– 20°C ... + 70°C
Storage temperature:	– 30°C ... + 85°C
Illumination:	2 light bulbs, 12 V, 2 W or 24 V, 2 W
Protection:	IP64 DIN 40050 from the front Housing 'ozon'-proof, 'UV'-proof CE approved, reverse-polarity protection
EMC test:	according to EN 13309 and ISO 13766
Vibration resistance:	max. 1g eff., 25 ... 500 Hz, duration 8h, f: 1 octave/min.
Nominal position:	NL 0 to NL 90, DIN 16257

VDO cockpit international
dia. 100 mm Floodlight



Operating hours counter: 999999.9 h



Thread for clamp ring
(clamping width 0.5 ... 12mm
or 12 ... 23mm)

0.5 ... 399.99 pulses /revolution
(adjustable)

Pin assignment:
Pin 3: ground, terminal 31
Pin 4: + 12 V or + 24 V, terminal 15
Pin 5*: permanent positive pole 12 V / 24 V, terminal 30
Pin 7: signal input
inductive sensor, generator sensor
(2 signal wires)
Pin 8: terminal 1 or W (1 signal wire)
or inductive sensor, generator sensor
(2 signal wires)

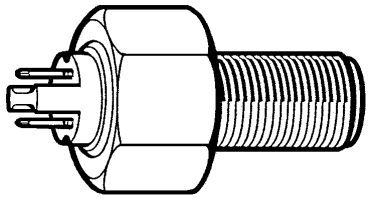
* Not available on some instruments.

4. Electronic Tachometer With Operating Hours Counter (dia. 80 mm / dia.100 mm) only for VDO cockpit international

4.3 Pulsing

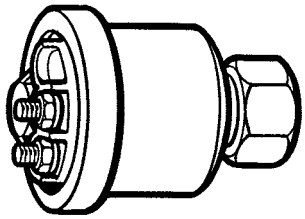
The sensor needed for the pulsing of the tachometer with operating hours counter is not included in the shipment.
The following sensors (see data sheets for sensors) can be used:

Inductive sensor



Tachometer connections: pin 7 and pin 8

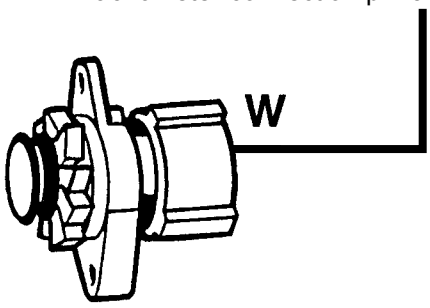
Generator sensor



The pulsing can also be obtaimed from:

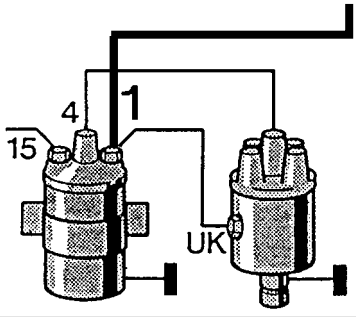
- Terminal W of the alternator of diesel-engine equipped vehicles.

Alternator
Tachometer connection pin 8



- Terminal 1 of the ignition coil in the case of conventional ignition systems (with one or more ignition coils), or a special terminal for special ignition systems of petrol engines. In the case of special ignition systems (such as transistor-coil ignitions, electronic and fully electronic ignition systems) please ask the vehicle manufacturer or the ignition system manufacturer for the correct terminal.

Conventional ignition system
Tachometer connection pin 8



⚠ Ignition must be off and minus battery connection disconnected when connecting the cable.

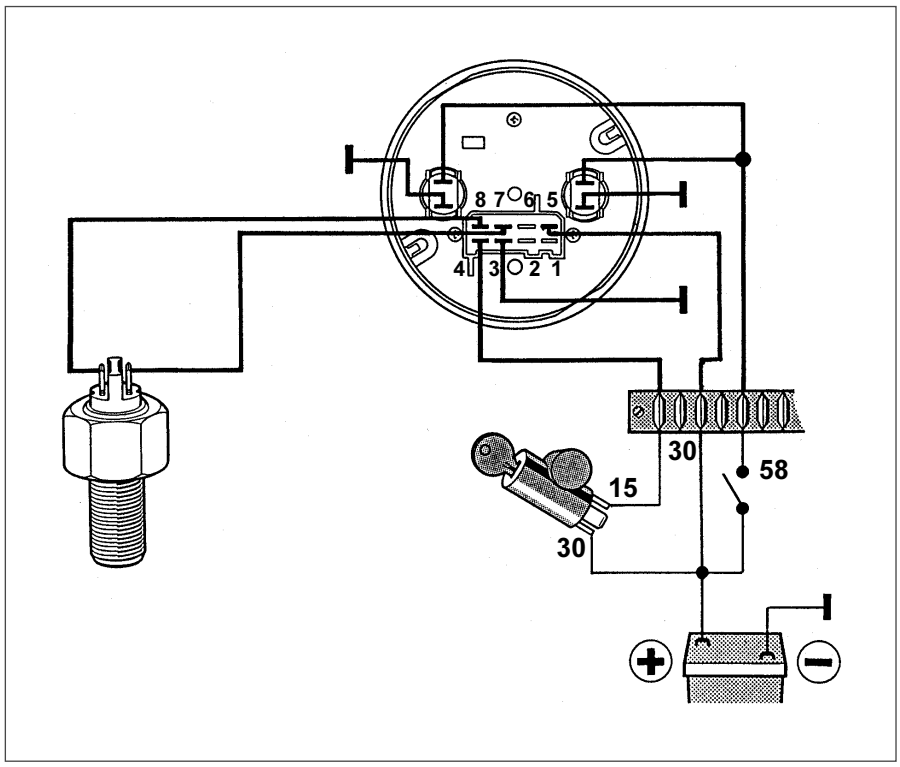
4. Electronic Tachometer With Operating Hours Counter (dia. 80 mm / dia.100 mm) only for VDO cockpit international

4.4 Wiring Diagrams

Inductive sensor (2 signal wires)

Note:

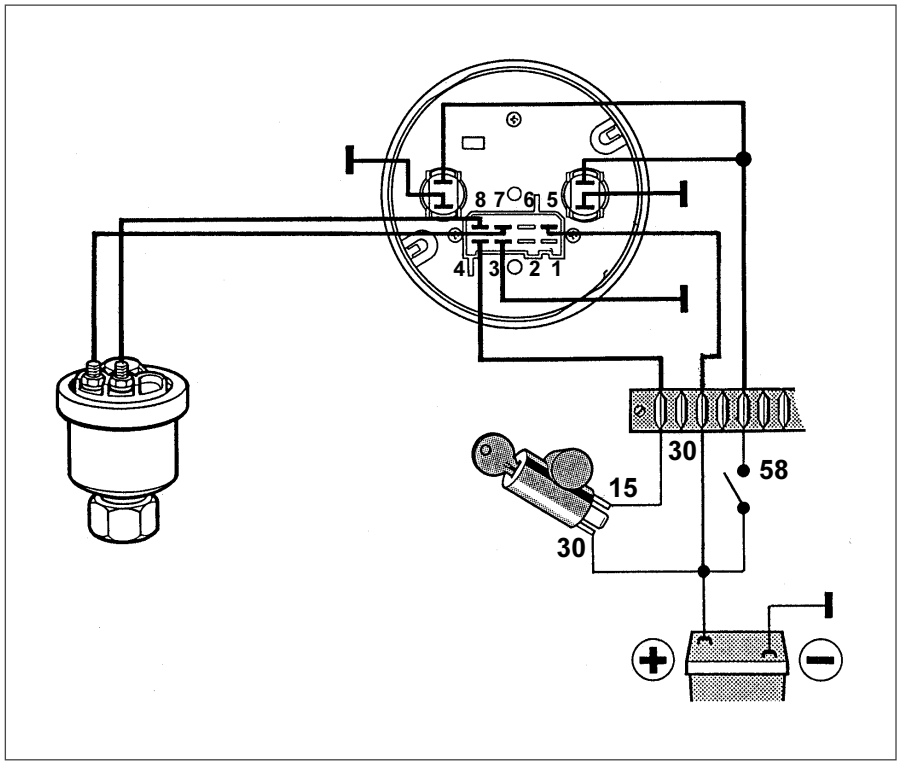
Pin 5 is not available on instruments produced before week 18/99.



Generator sensor (2 signal wires)

Note:

Pin 5 is not available on instruments produced before week 18/99.



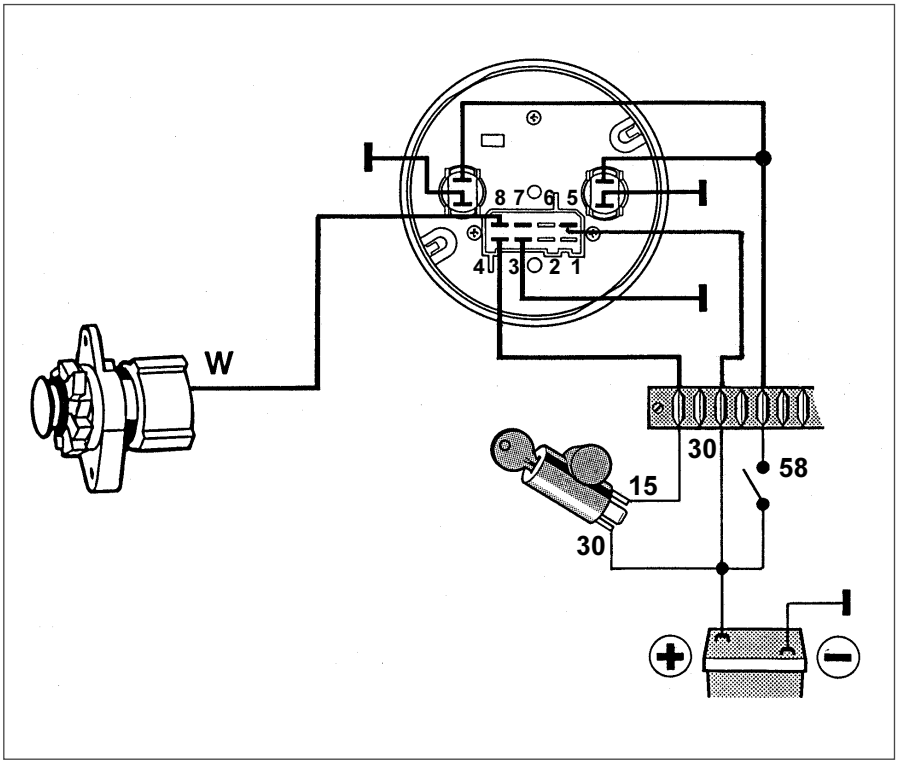
4. Electronic Tachometer With Operating Hours Counter (dia. 80 mm / dia.100 mm) only for VDO cockpit international

4.4 Wiring Diagrams

Alternator

Note:

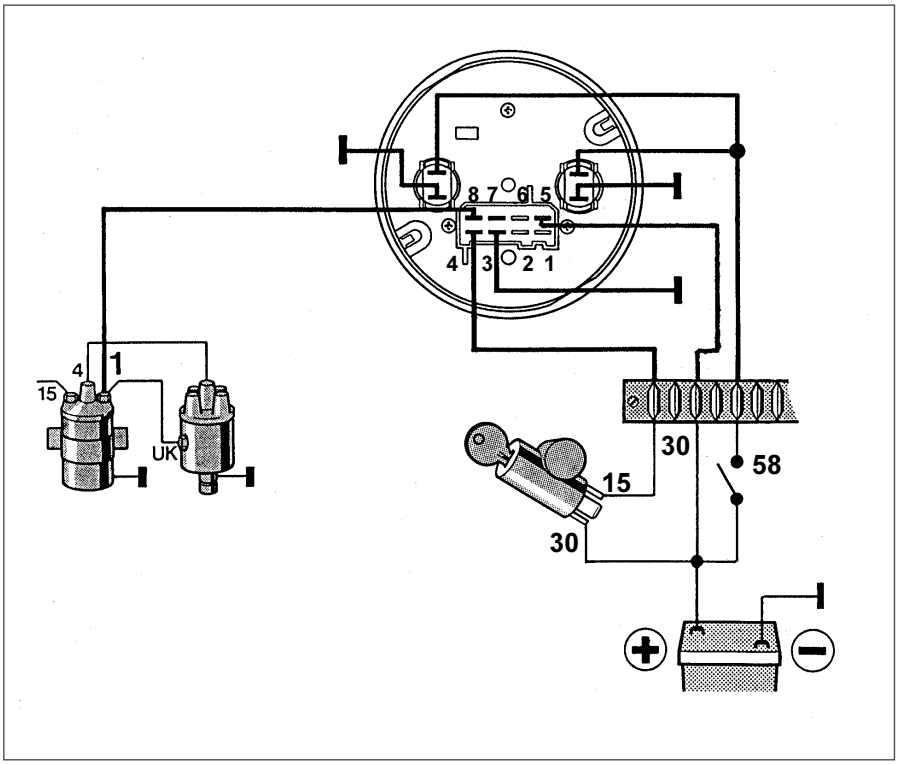
Pin 5 is not available on instruments produced before week 18/99.



Conventional ignition system (one or more ignition coils)

Note:

Pin 5 is not available on instruments produced before week 18/99.



4. Electronic Tachometer With Operating Hours Counter (dia. 80 mm / dia.100 mm) only for VDO cockpit international

4.5 Setting

Four possible settings are available for the electronic tachometer with operating hours counter.

Two possible calibrations:

Function 'SELECt' - Enter the stroke number and the number of cylinders for vehicles with petrol engine(two-stroke or four-stroke) when connecting to terminal 1 of the ignition coil (ignition systems having only one ignition coil).

Not apply for vehicles with diesel engine.

Function 'PULSE' - Enter a know number of pulses per revolution for:

inductive sensor,

generator sensor,

connection to terminal W of the alternator on vehicles with diesel engines,

connection to terminal 1 of ignition coil (ignition systems having one or more ignition coils) for vehicles with petrol engine (two-stroke or four-stroke).

Two possible fine adjustments of the engine speed indication:

Function 'AdJUSt' - Fine adjustment of engine speed indication (continuous pointer adjustment)

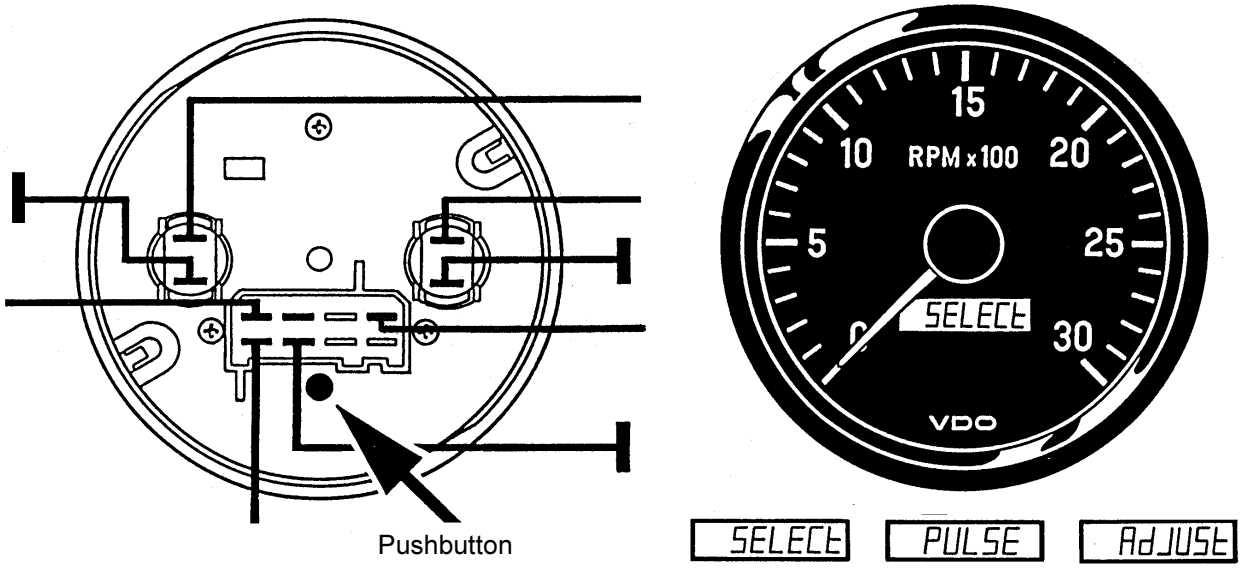
or

Function 'A' - Fine adjustment of engine speed indication (pointer adjustment in percentage steps).

4. Electronic Tachometer With Operating Hours Counter (dia. 80 mm / dia.100 mm) only for VDO cockpit international

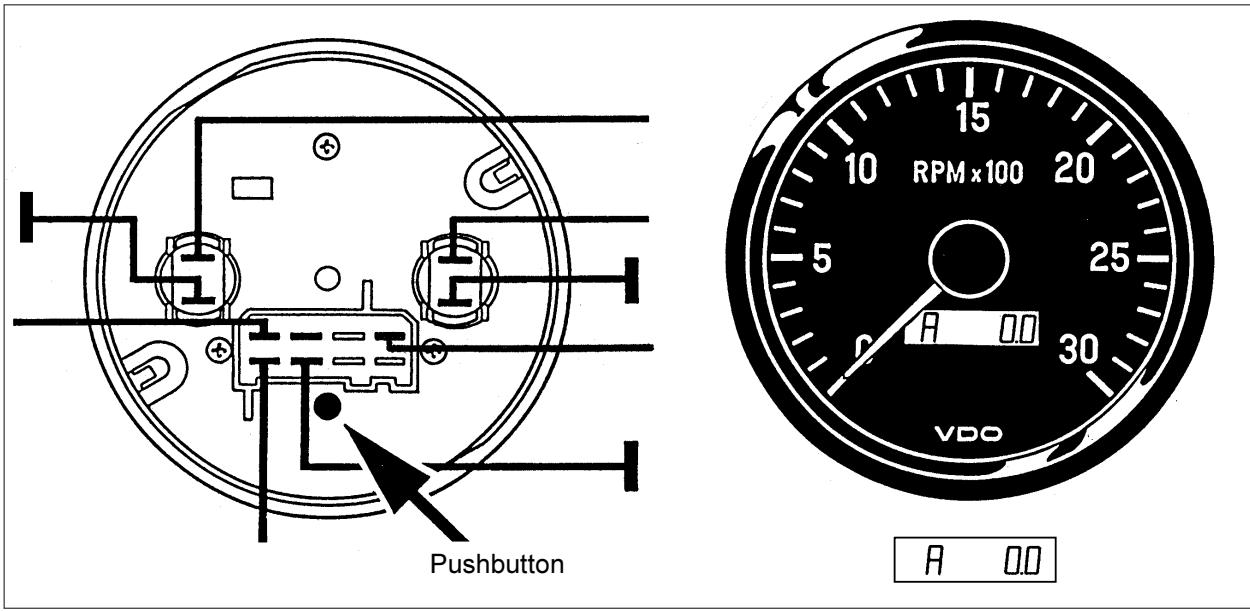
4.5 Setting

Selection of the functions: 'SELECt', 'PULSE' or 'AdJUSt'



Push the button on the back of the instrument and hold, then switch the ignition on. The display alternates between 'SELECt', 'PULSE' and 'AdJUSt'. A function is selected by releasing the pushbutton at the corresponding display.

Selection of the function: 'A'



Switch ignition on, then push the button at the back of the instrument. The display shows 'A 0.0'.

4. Electronic Tachometer With Operating Hours Counter (dia. 80 mm / dia.100 mm) only for VDO cockpit international

4.5 Setting

Function 'SELECt'

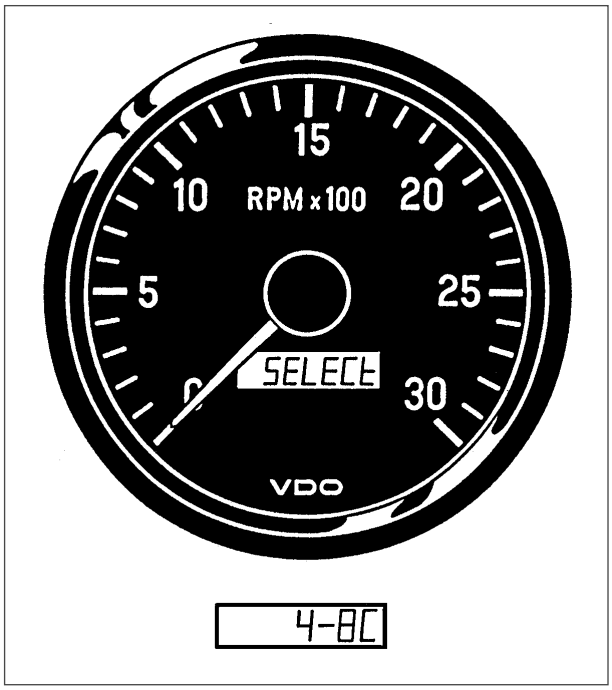
After selection of the function 'SELECt' the display shows '4 - 8 C' (four-stroke, 8 cylinders) for instance after about 3 seconds.

Push the button in and hold. The display shows the possible settings for:

four-stroke, 1, 2, 3, 4, 5, 6, 8, 12 cylinders
(example: '4 - 8 C' = four-stroke, 8 cylinders),

two-stroke, 1, 2, 3, 4 cylinders
(example: '2 - 3 C' = two-stroke, 3 cylinders).

Release the pushbutton when the corresponding stroke and cylinder numbers are attained. The calibration is completed if the display thereafter changes to operating hours counter.

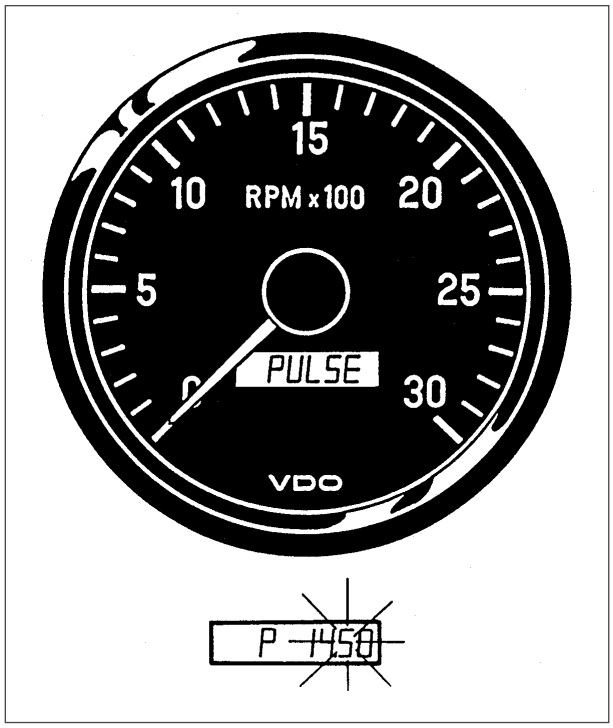


4. Electronic Tachometer With Operating Hours Counter (dia. 80 mm / dia.100 mm) only for VDO cockpit international

4.5 Setting

Function 'PULSE'

After selection of the function 'PULSE' the display shows 'P 14.50' for instance (14.50 pulses per revolution) after about three seconds, with the digit before the last flashing. Start entering the know pulse number per revolution. The flashing digit is changed by pushing the button (adjustable number of pulses revolution: 0.50 to 399.99). After entry of the number of pulses per revolution the display changes to operating hours counter mode. The calibration is completed.



Selecting the function 'PULSE' again displays the entered number of pulses per revolution for checking. The display shows the number of pulses per revolution, and the last digits, starting with the digit, start flashing in a sequence.

The number of pulses per revolution can be calculated with follwing formula if it is not know:

Conventional ignition system:

$$\frac{\text{pulses}}{\text{revolution}} = \frac{2 \times \text{number of cylinders}}{\text{number of strokes} \times \text{number of ignition coils}}$$

↓

(two-stroke or four-stroke)

or it can be obtained from the engine manufacturer.

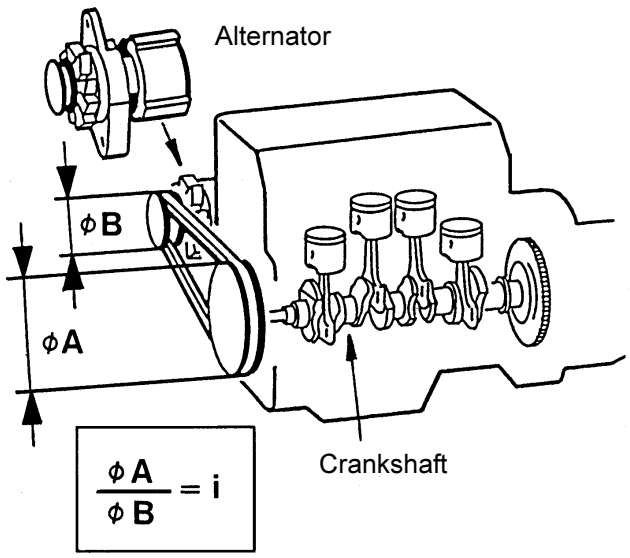
4. Electronic Tachometer With Operating Hours Counter (dia. 80 mm / dia.100 mm) only for VDO cockpit international

4.5 Setting

Function 'PULSE'

Diesel engine

The following formula can be used to calculate an unknown pulse ratio, which is then set described on page 4 - 12.



Example:
dia. A = 280 mm
dia. B = 132 mm

$i = \frac{280}{132} = 2.12$

i x 6 = the pulse ratio

Pulses per revolution
Number of alternator pole pairs
2.12 x 6 = 12.72
= 13 pulses per revolution

Calculate the pulse ratio as follows if the frequency (Hz) is know, and not the pulse ratio:

$\frac{\text{Hz x 60 sec.}}{\text{full scale speed}}$ = pulses per revolution

Example 1733 Hz:

$\frac{1733 \times 60}{8000} = 12.99 = 13$ pulses per revolution

Formula for frequency (Hz):

$\frac{\text{pulses per revolution x full scale speed}}{\text{60 sec.}}$ = Hz

Example:

$\frac{13 \times 8000}{60} = 1733$ Hz

4. Electronic Tachometer With Operating Hours Counter (dia. 80 mm / dia.100 mm) only for VDO cockpit international

4.5 Setting

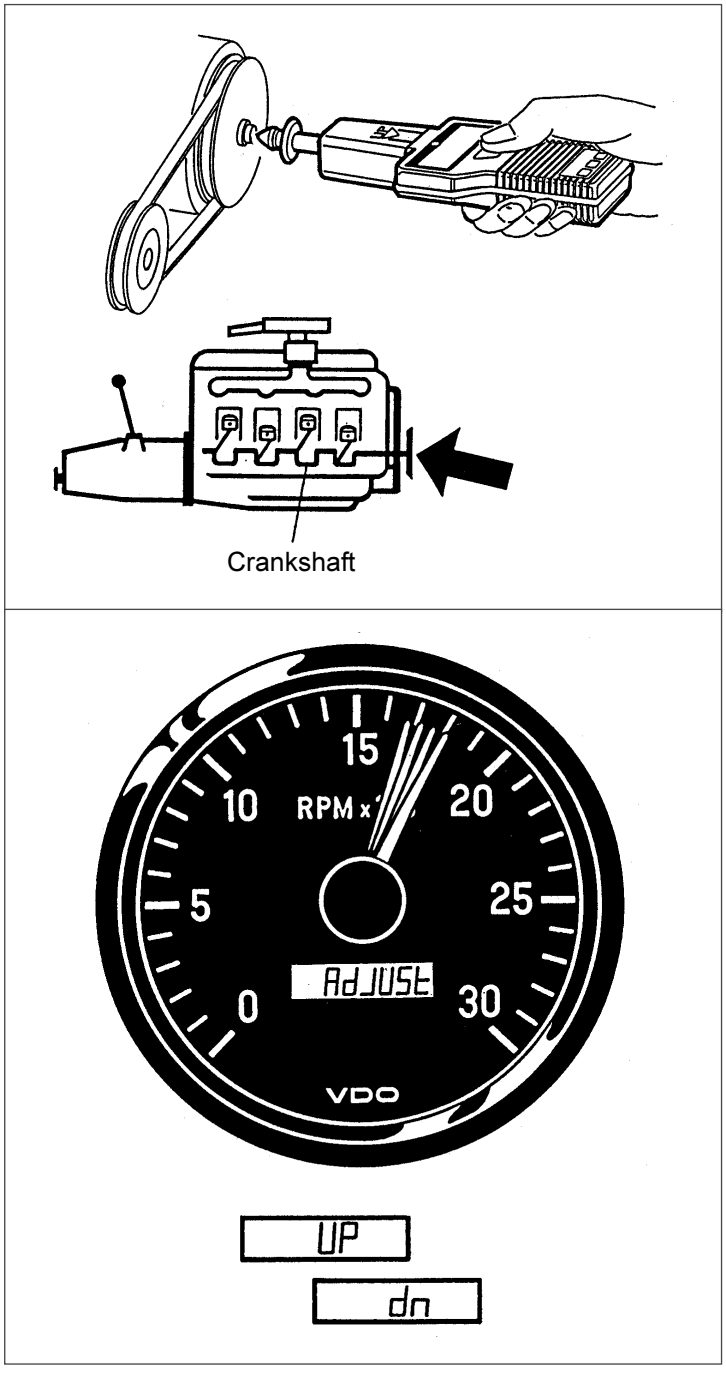
Function 'AdJUSt' – fine adjustment of engine speed indication (continuous pointer adjustment)

This function permits fine engine speed indication adjustment between 30% and 100% of the indicating range only. Use a reference tachometer (hand-held tachometer) to compare the speed indications.

The adjustment must be made by two people, one of them adjusting the instrument, the other one using the hand-held tachometer.
Measure the engine speed at the crankshaft stub of the engine with the hand-held tachometer.
Be very careful! Do not wear loose clothing!

The selection of function 'AdJUSt' alternately displays 'UP' or 'dn' (down).

Holding the button down with the 'UP' display increments the pointer position (in the same way it will decrement if 'dn' is displayed). Initially the rate of change is quite low, permitting a very precise adjustment. Shortly releasing the button will repeat the process. The rate of pointer position change increases when the button is held down. Release the button when the pointer indication matches the reference indication. The display changes to operation hours count, fine adjustment is completed.



4. Electronic Tachometer With Operating Hours Counter (dia. 80 mm / dia.100 mm) only for VDO cockpit international

4.5 Setting

Function 'A' – fine adjustment of engine speed indication (pointer adjustment in percentage steps)

This function can be used for fine adjustment of the engine speed indication over the entire indicating range in angular steps of 0.5 degrees. Use a reference tachometer (hand-held tachometer) to compare the speed indications.

The display shows 'A 0.0' when the function 'A' is selected.

Push and hold the button to change the pointer deflection in a range of - 20 % to + 20 % in steps of 0.5 %.
These steps are shown by the display:
example in the plus range: 'A 10.5',
example in the minus range: 'A - 10.5'.
Plus and minus change if the pushbutton is briefly released.
Release the pushbutton when the desired percentage is attained. The display returns to the operating hours counter mode. Fine adjustment has been completed.

Calculation of the percentage value:
Find the difference between the tachometer display and the reference speed indication. Calculate the percentage and enter the corresponding value.

Percentage formula:

$$\pm\ \% = \frac{\text{difference between tachometer reading and reference reading}}{\text{tachometer reading}} \times 100$$

Example for the plus range:
tachometer reading = 1800 RPM
reference speed reading = 2000 RPM
difference = + 200 RPM

$$+\ \% = \frac{200 \times 100}{1800} = +\ 11.11\ \%$$

Percentage for fine adjustment: 'A 11.0'

Example for minus range:
tachometer reading = 2200 RPM
Reference speed reading = 2000 RPM
difference = – 200 RPM

$$-\ \% = \frac{200 \times 100}{2200} = -\ 9.09\ \%$$

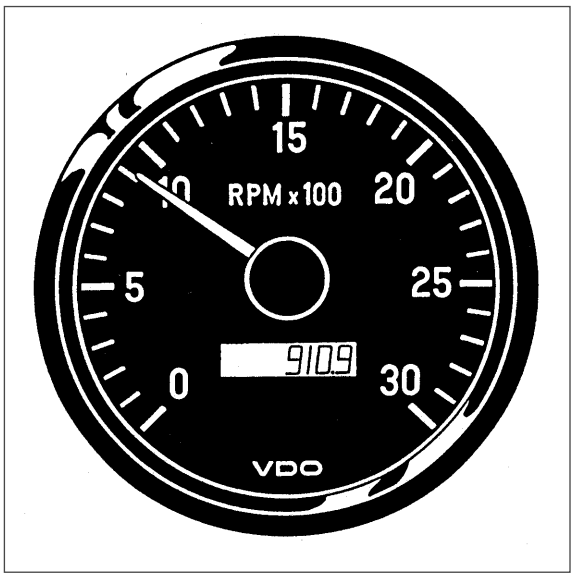
Percentage for fine adjustment: 'A – 9.0'

4. Electronic Tachometer With Operating Hours Counter (dia. 80 mm / dia.100 mm) only for VDO cockpit international

4.6 Display

Engine speed display

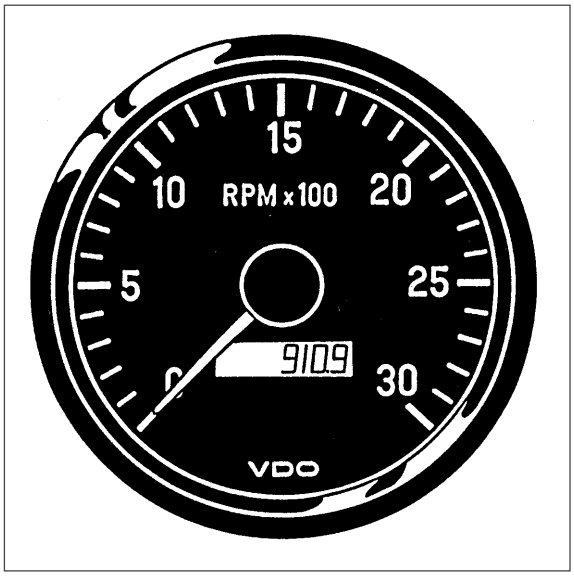
Tachometer **without** pin 5 (permanent positive pole 12 V/ 24 V)
Only produced before week 18/99.



Note:

When the ignition is switched off, the pointer remains at the last engine speed indicated, until the ignition is switched on again, without starting the engine, the pointer will then return to the zero position.

Tachometer **with** pin 5 (permanent positive pole 12 V/ 24 V)



Note:

When the ignition is switched off, the pointer will return to the zero position.
Then the instrument will automatically get turned off.

Operating hours display

The display shows operating hours up to ‘999999.9’ max..
This display cannot be adjusted.

Operating hours remain stored after the operating voltage is switched off.

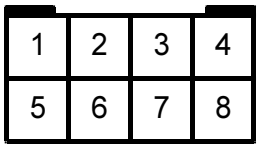
4. Electronic Tachometer With Operating Hours Counter (dia. 80 mm / dia.100 mm) only for VDO cockpit international

4.7 Testing Instuctions

Test accessories

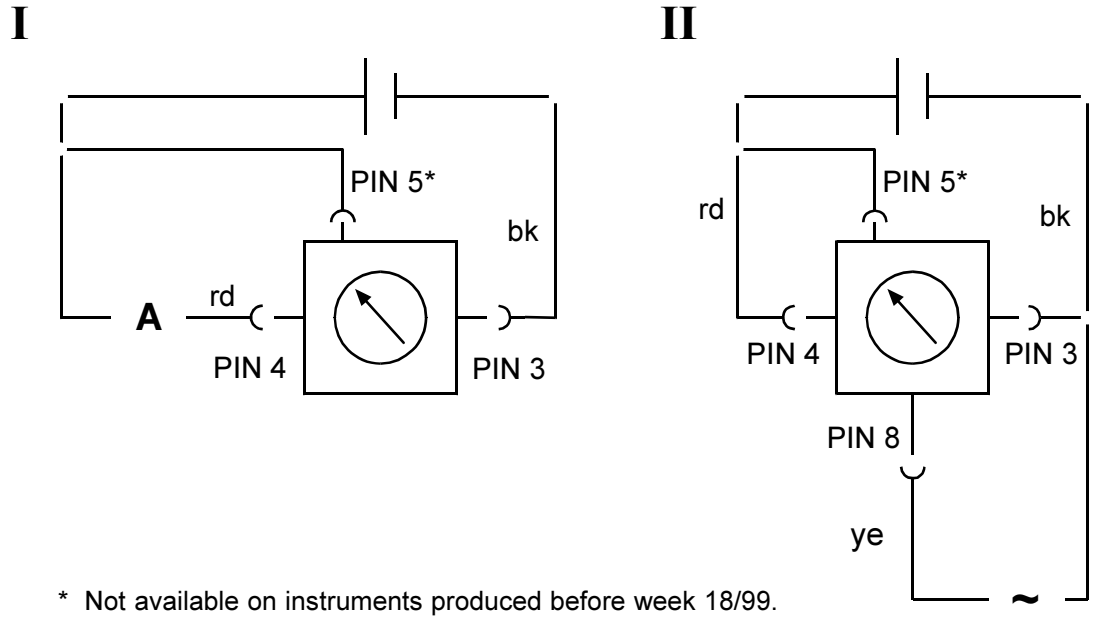
1x Power supply
1x Test cable No. 2 } contained in test cables kit
1x Measuring cable } X12-019-101-001
1x Frequency generator
1x Ammeter
1x Wire for pin 5 of the test cable No. 2 (see chapter 18.2.5)

Connector pin allocation



Pin 3 Ground
Pin 4 +10 V to + 31 V
Pin 5* Permanent positive pole 12 V / 24 V
Pin 8 Sensor signal input

Test circuit diagram



* Not available on instruments produced before week 18/99.

Test method description

Basic setting:	12 V to 24 V instruments	⇒	U = 18 V ± 2 V
	strokes + cylinders	⇒	4 - 4 C
	function ‘A’	⇒	A 0.0

Current consumption measurement

Connect the instrument per test circuit diagram II with test cable No. 2.

Value range: 12V to 24 V instruments ⇒ I = 52 ± 5.2 mA

4. Electronic Tachometer With Operating Hours Counter (dia. 80 mm / dia.100 mm) only for VDO cockpit international

4.7 Testing Instructions

Operating hours counter test

Connect instrument with test cable No. 2 as shown in test circuit diagram II.

After connection of the operating voltage the display shows the operating hours. After connection of the engine speed signal of the operating hours are counted and the engine speed is displayed.

The comma flashes with a 1Hz frequency at speeds exceeding 400 rpm.

It is only possible to reset the operating hours with software (see chapter 18.2.6).

Pointer position test

a) Zero point test

Connect instrument with test cable No. 2 as shown in test circuit diagram I.
Connect the operating voltage and check pointer deviation. The allowed deviation is ± 1degree of angle.

b) Full scale indication test

Connect instrument with test cable No. 2 as shown in test circuit diagram II.
Connect a square wave signal to connector pin 4. The frequency can be calculated with the following formula, the amplitude being between 1 V and 10 V.

Formula for number of pulses per revolution:

$$\left(\frac{\text{pulses}}{\text{revolution}}\right) = \frac{\text{2 x number of cylinders}}{\text{stroke type x number of ignition coil}}$$

Formula for the frequency:

$$f_{max} = \frac{\left(\frac{\text{pulses}}{\text{revolution}}\right) \text{ x full-scale value}}{60} \; [Hz]$$

Example:

Tachometer with 3000 rpm full-scale, 4 cylinders, four-stroke, 1 ignition coil.

$$\frac{\text{pulses}}{\text{revolution}} = \frac{2 \times 4}{4 \times 1} = 2$$

$$f_{max} = \frac{2 \times 3000}{60} = 100 \text{ Hz}$$

4. Electronic Tachometer With Operating Hours Counter (dia. 80 mm / dia.100 mm) only for VDO cockpit international

4.8 Instruments Survey

VDO cockpit international (Floodlight) dia. 80 mm **Part No. 333-035-. . .**

Dial		Special feature	Part No.
Range	Imprint		
0 ... 3000 min^{-1}	RPM x 100	12 V - 24 V, dia. 80 mm 12 V illumination	**010C** **010G**
0 ... 4000 min^{-1}	RPM x 100	12 V - 24 V, dia. 80 mm 12 V illumination	**011C** **011G**
0 ... 6000 min^{-1}	RPM x 100	12 V - 24 V, dia. 80 mm 12 V ill., with warning contact	**014C**

VDO cockpit international (Floodlight) dia. 100 mm **Part No. 333-055-. . .**

Dial		Special feature	Part No.
Range	Imprint		
0 ... 3000 min^{-1}	RPM x 100	12 V - 24 V, dia.100 mm 12 V illumination	**002C** **002G**
0 ... 3000 min^{-1}	RPM x 100 23 - 30 red warning field	12 V - 24 V, dia.100 mm 24 V illumination	**004C**
0 ... 3000 min^{-1}	RPM x 100 25 - 30 red warning field	12 V - 24 V, dia.100 mm 24 V illumination	**010C**