

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

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### 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

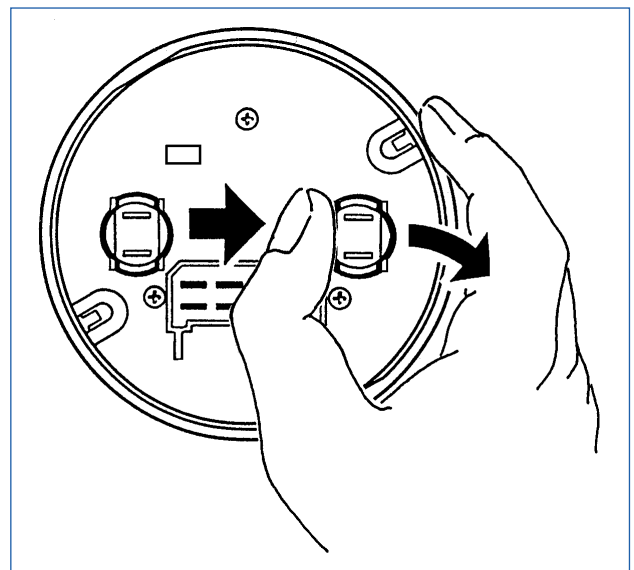
The electronic tachometer has been designed for land-bound vehicles only (with the exception of motorcycles). The instrument has an analog engine speed display in RPM x 100.

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

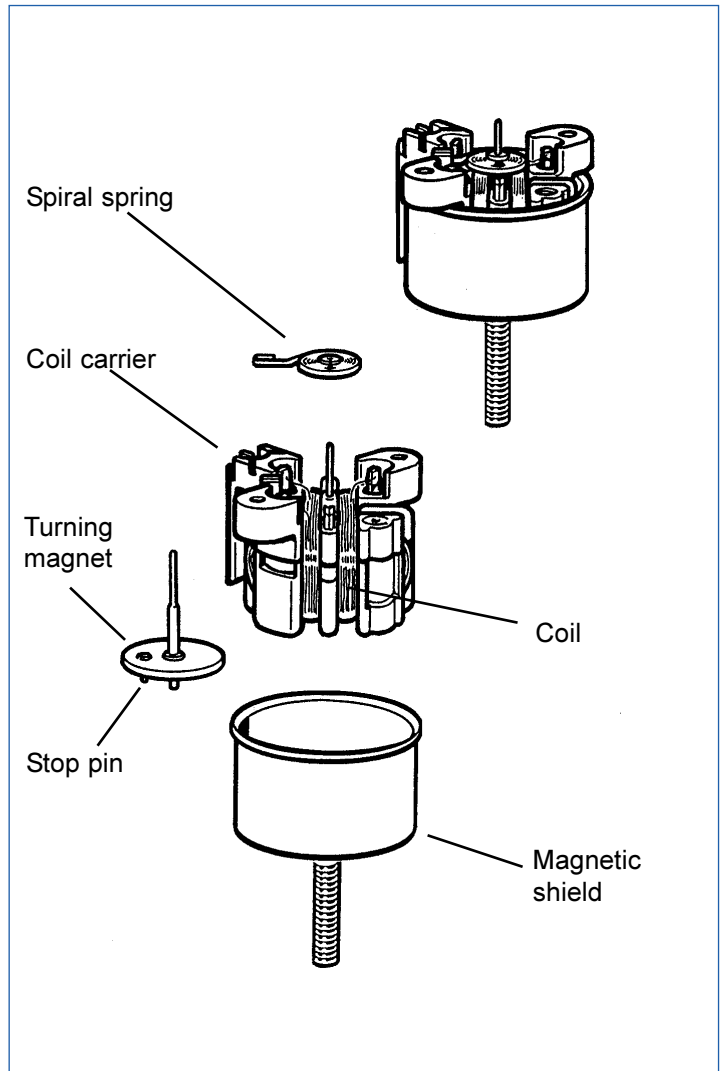
**Movement: System Ke (to 320°)**

**(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 electronic 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.

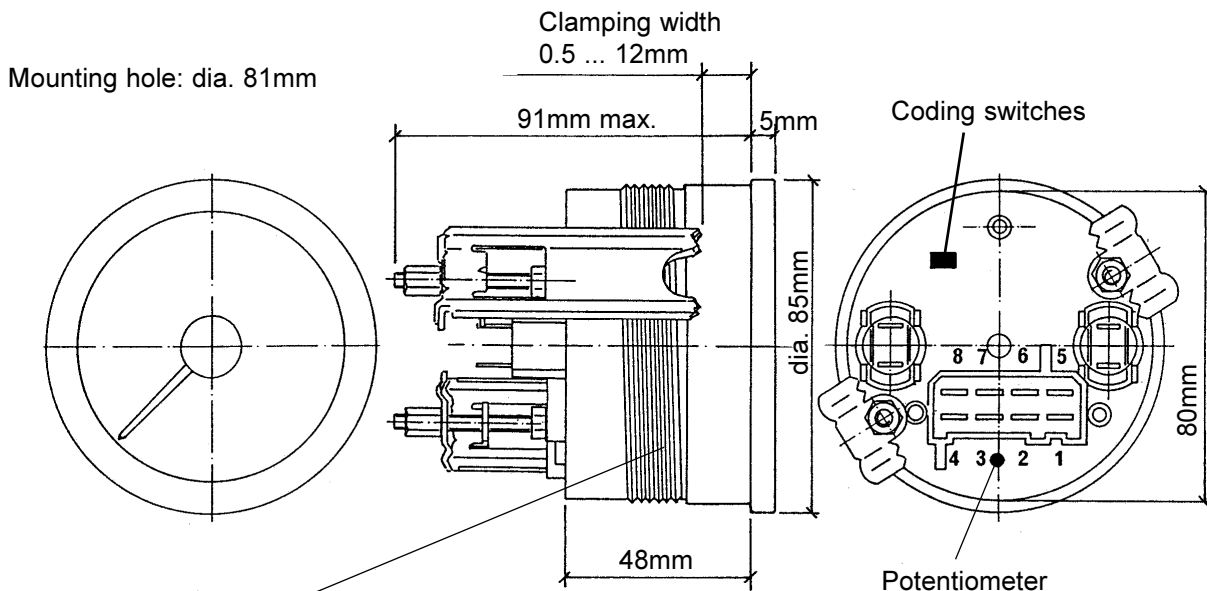
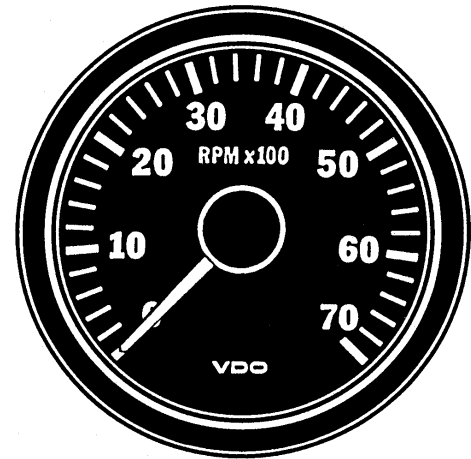


### 3. Electronic Tachometer (dia. 80 mm / dia.100 mm)

#### 3.2 Technical Data

Operating voltage:	10.8 ... 16 V
Input signal voltage:	$U_{low}$ : max. 5 V $U_{high}$ : min. 7,5 V
Movement:	System Ke ( $\rightarrow$ 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. 80 mm Backlight



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

6 ... 25 pulses/revolution  
(adjustable)

Pin assignment:

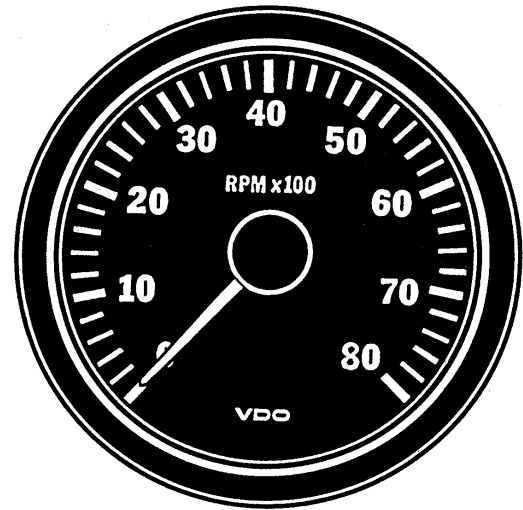
- Pin 1: + 24 V (for 24 V instrument)  
Terminal 15
- Pin 2: + 12 V (for 12 V instrument)  
Terminal 15
- Pin 3: Ground
- Pin 4: Signal input  
Terminal 1 or W

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

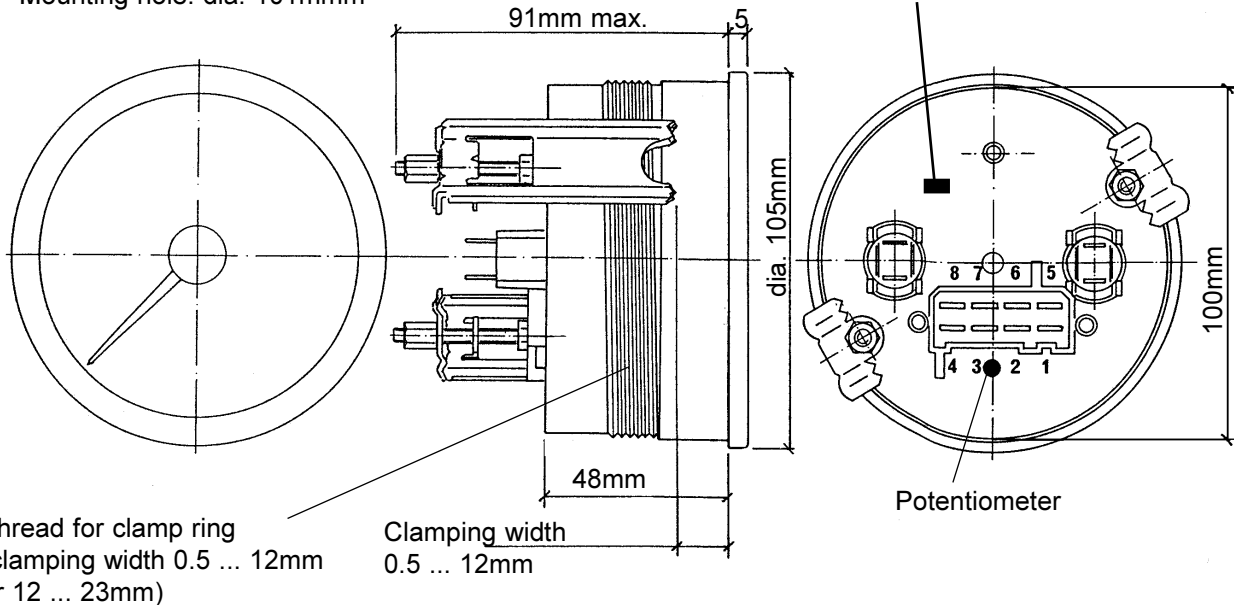
#### 3.2 Technical Data

Operating voltage:	10.8 ... 16 V
Input signal voltage:	$U_{low}$ : max. 5 V $U_{high}$ : min. 7,5 V
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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



Mounting hole: dia. 101mm



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

Clamping width  
0.5 ... 12mm

6 ... 25 pulses/revolution  
(adjustable)

Pin assignment:

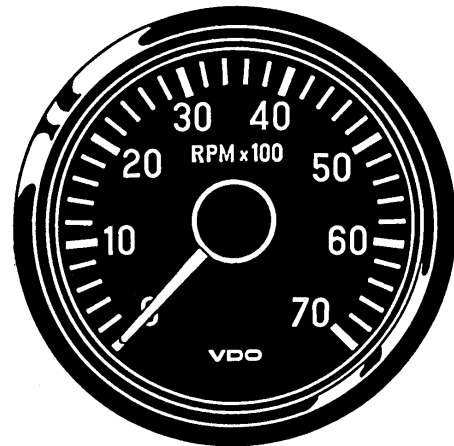
- Pin 1: + 24 V (for 24 V instrument)  
Terminal 15
- Pin 2: + 12 V (for 12 V instrument)  
Terminal 15
- Pin 3: Ground
- Pin 4: Signal input  
Terminal 1 or W

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

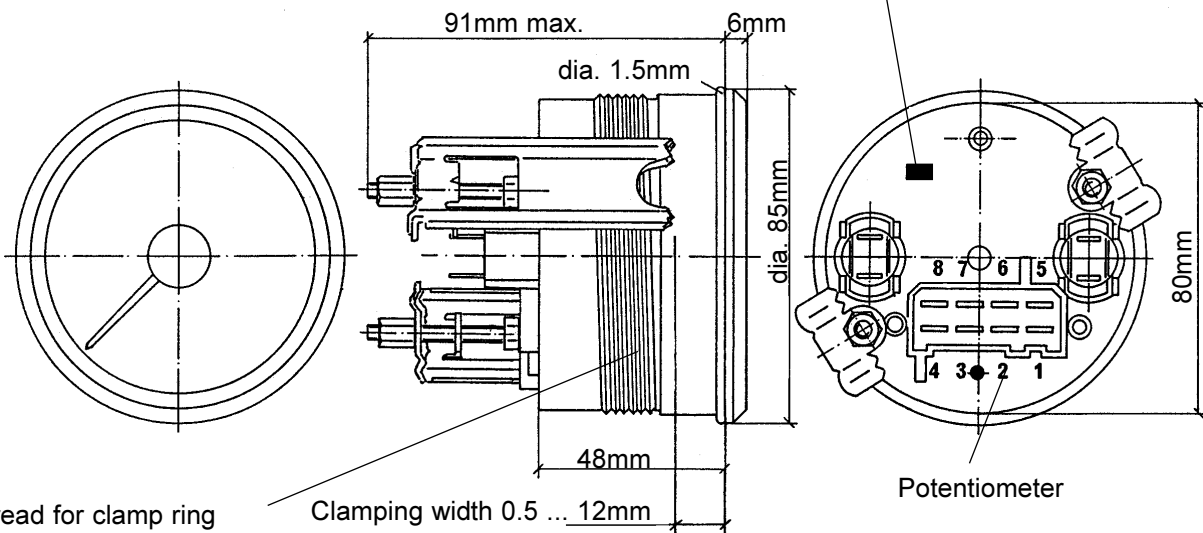
#### 3.2 Technical Data

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 ( $\rightarrow$ 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



Mounting hole: dia. 81mm



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

6 ... 25 pulses/revolution  
(adjustable)

Pin assignment:

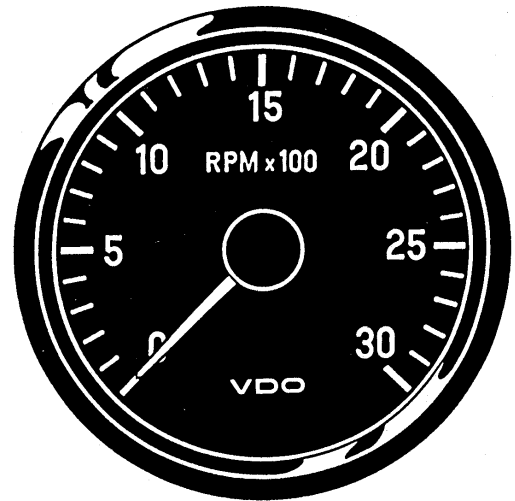
- Pin 1: + 24 V (for 24 V instrument)  
Terminal 15
- Pin 2: + 12 V (for 12 V instrument)  
Terminal 15
- Pin 3: Ground
- Pin 4: Signal input  
Terminal 1 or W

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

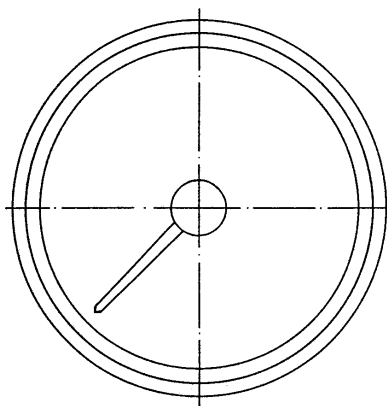
#### 3.2 Technical Data

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Vibration resistance:	max. 1g eff., 25 ... 500 Hz, duration 8h, f. 1 octave/min.
Nominal position:	NL 0 to NL 90, DIN 16257

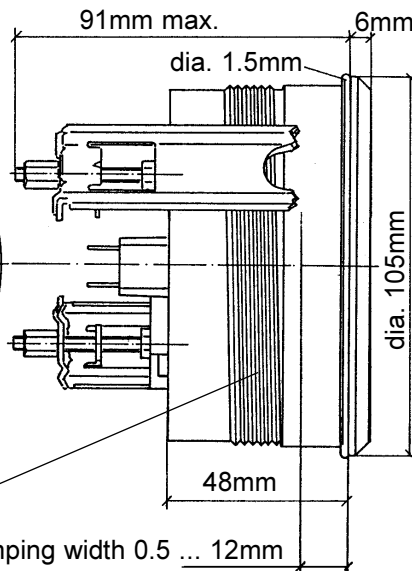
VDO cockpit international  
dia. 100 mm Floodlight



Mounting hole: dia. 101mm

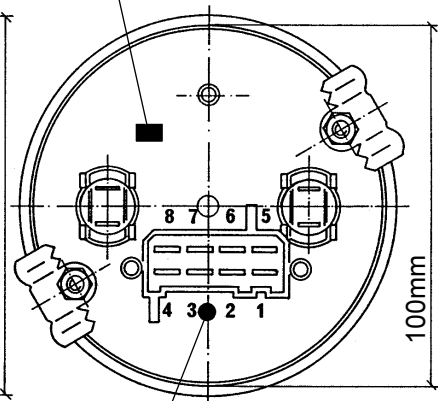


Thread for clamp ring  
(Clamping width  
0.5 ... 12mm or 12 ... 23mm)



Clamping width 0.5 ... 12mm

Coding switches



Potentiometer

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

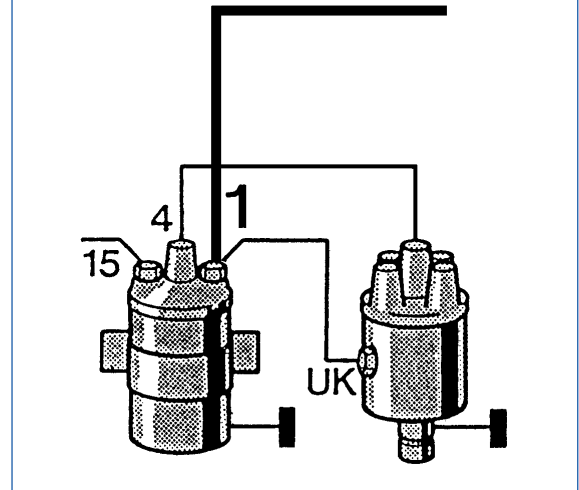
### 3. Electronic Tachometer (dia. 80 mm / dia.100 mm)

#### 3.3 Pulsing

Tachometer connection: pin 4

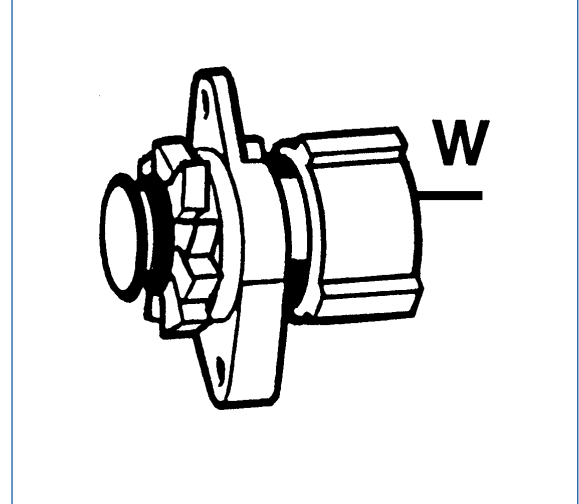
On vehicles with petrol engines the signal is obtained at terminal 1 of the ignition coil in the case of conventional ignition systems (having one coil only) or an additional terminal on special ignition systems. In the case of special ignition systems (such as transistor/coil ignition systems, electronic 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

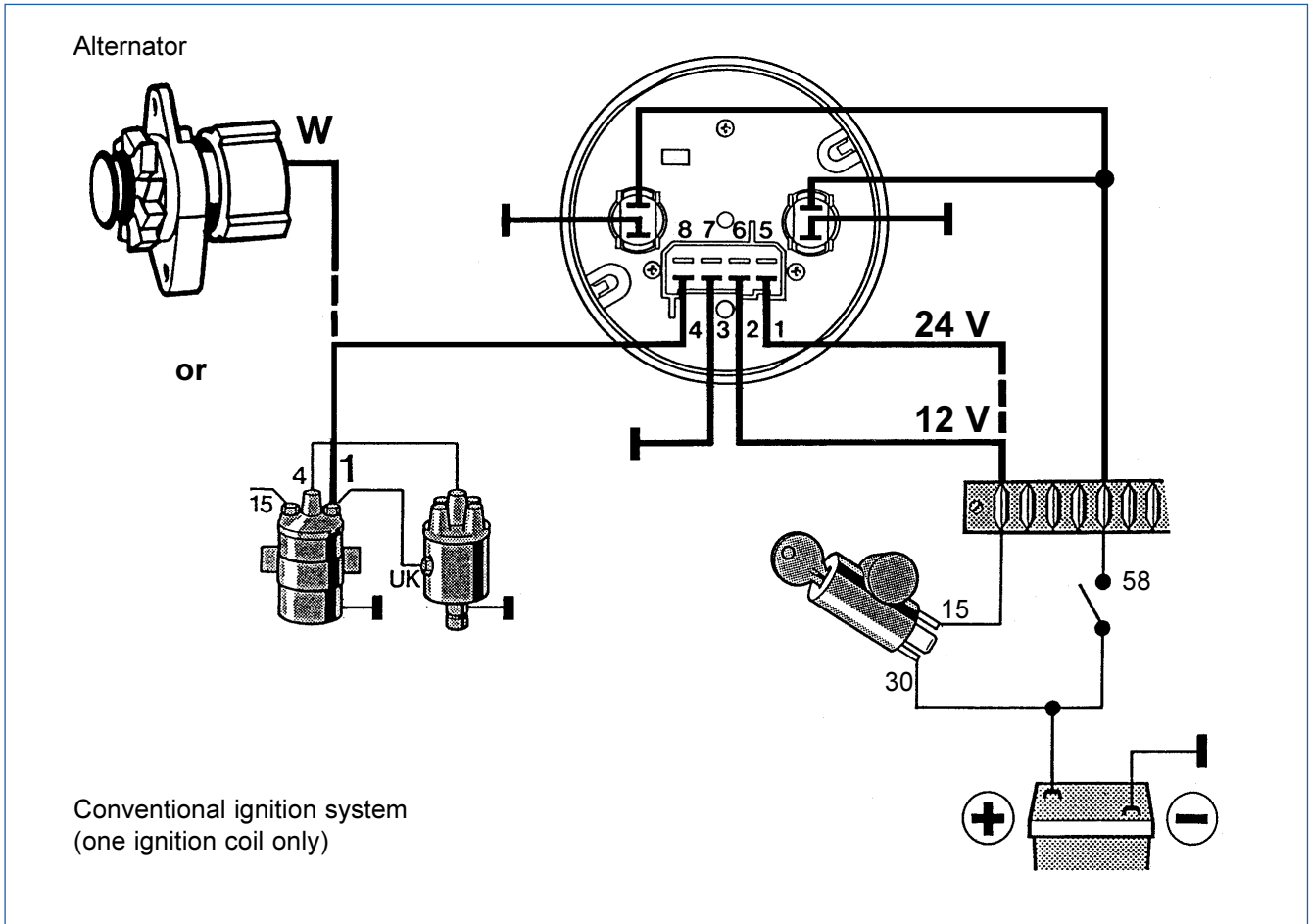


The ignition must be off and the battery minus connection disconnected when connecting the cable.



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

### 3.4 Wiring Diagram



### 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.

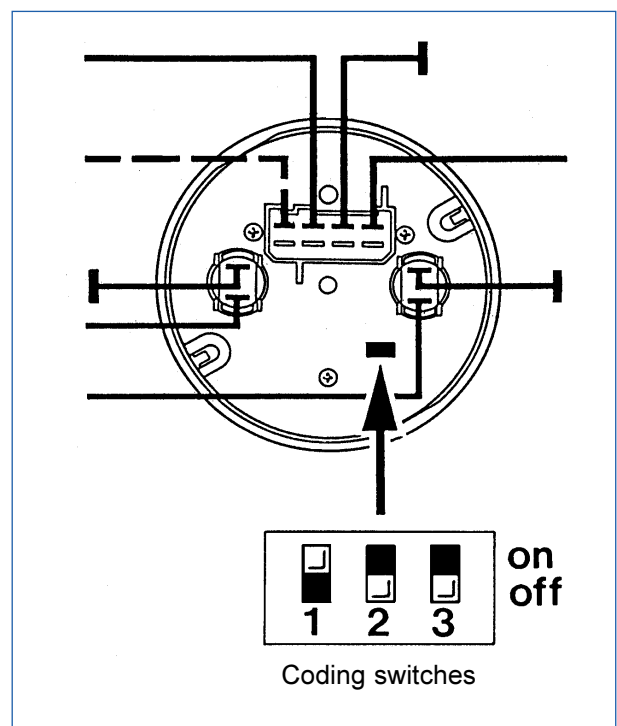
Possible settings per coding table.

##### Coding table

Petrol engine, terminal 1 (one ignition coil)				Only coding switches		Coding switches and potentiometer	
Coding switches			Cylinders	Stroke	⚠ Do <b>not</b> 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)



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

### 3.5 Setting

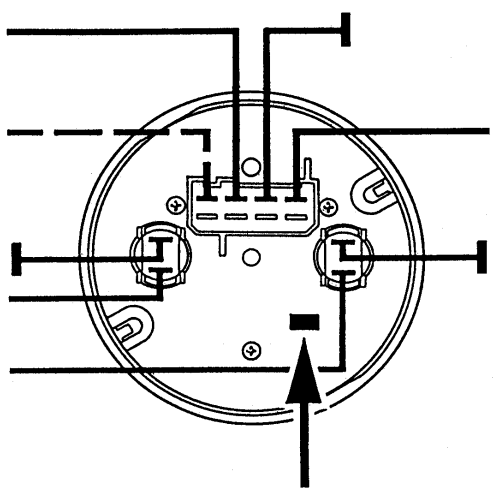
#### Diesel engine setting

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				



**on**  
**off**

**1 2 3**

Coding switches

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

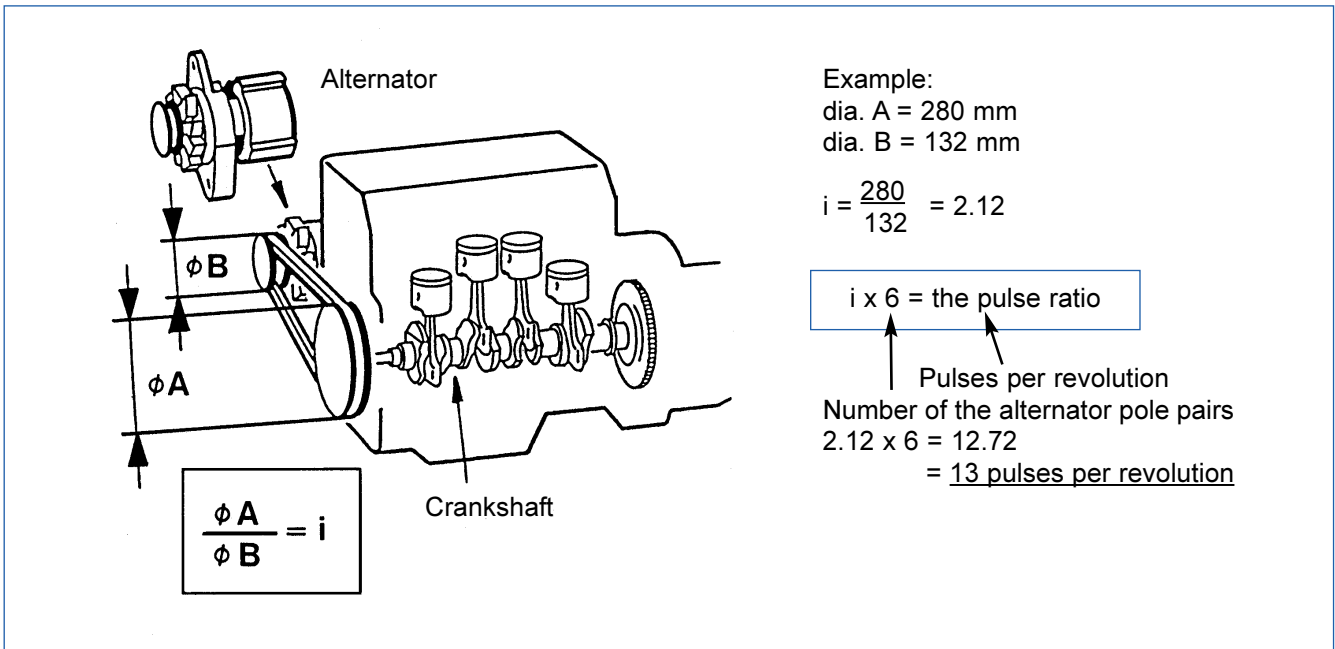
Make the fine adjustment with the potentiometer (see page 3 - 13).

### 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.



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:

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

Example 1733 Hz:

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

Formula for frequency (Hz):

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

Example:

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

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

#### 3.5 Setting

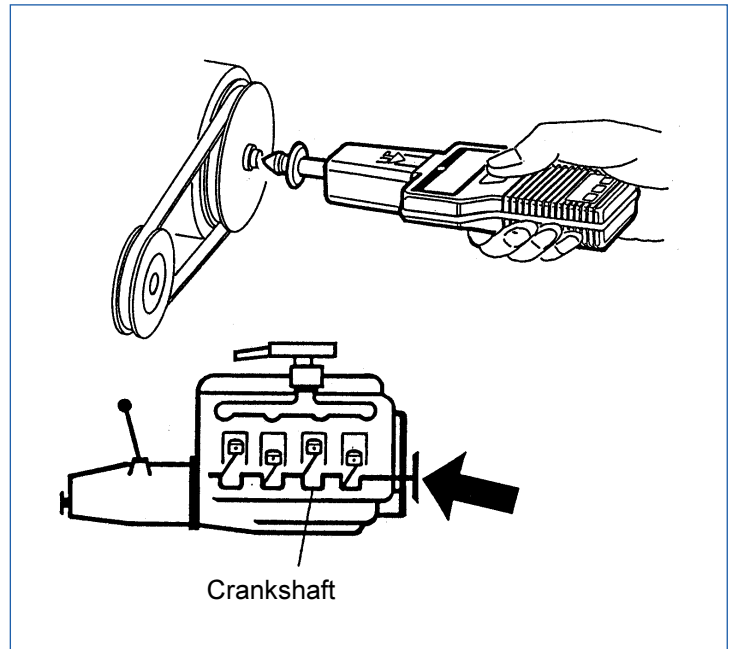
##### Fine adjustment with potentiometer

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.

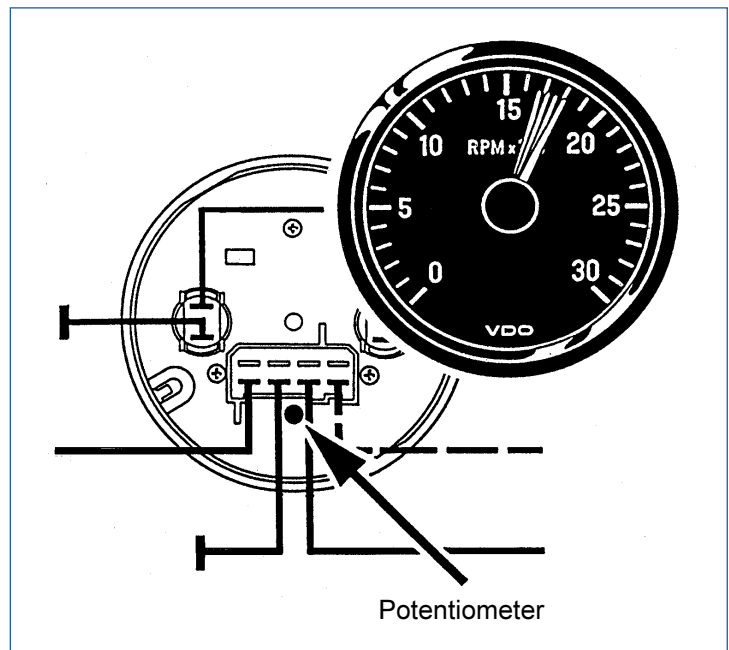
The adjustment must be made by two people, one of them adjusting the instrument, the other one using the hand-held tachometer.

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

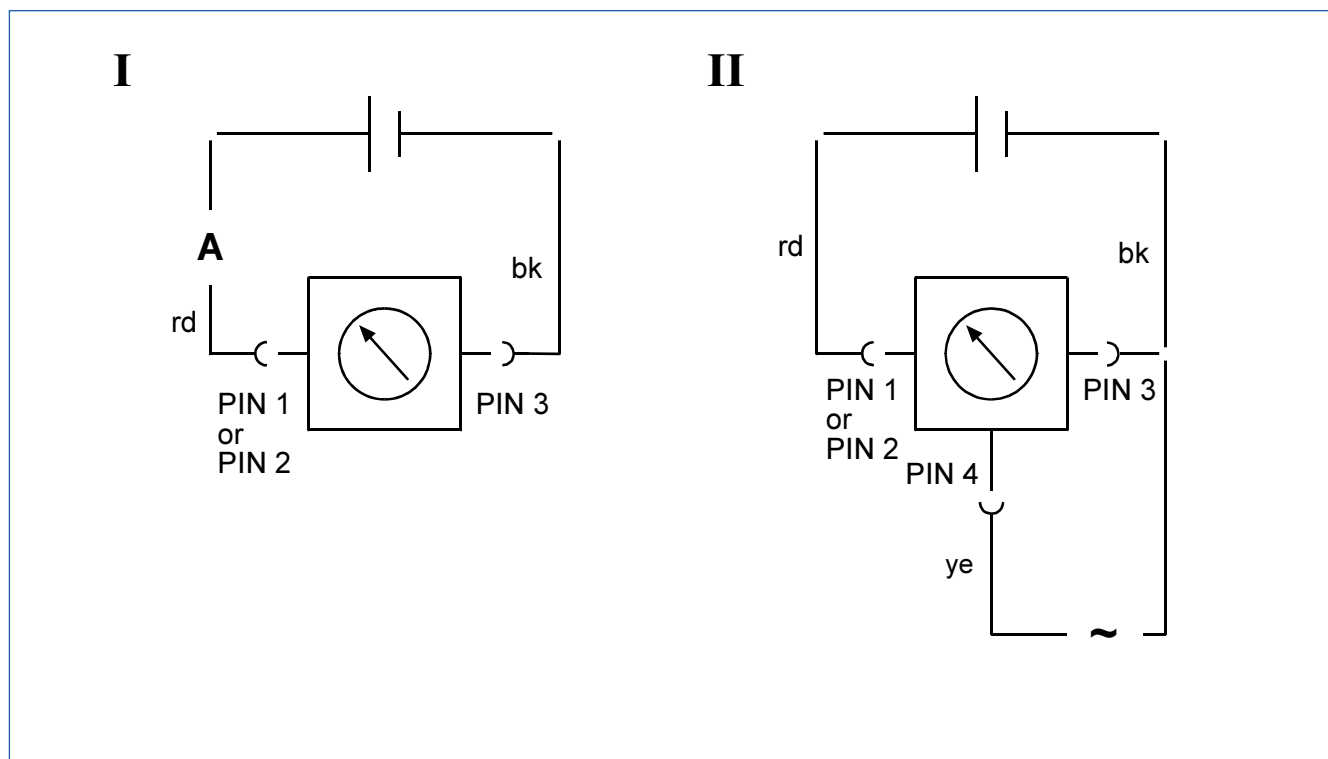
- 1x Power supply
- 1x Test cable No. 1 } contained in test cables kit
- 1x Measuring cable } X12-019-101-001
- 1x Frequency generator
- 1x Ammeter

#### Connector pin allocation

1	2	3	4
5	6	7	8

- 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 international (Floodlight) dia. 80 mm

Part No. 333-035-...

Dial		Special feature	Part No.
Range	Imprint		
0 ... 3000 min <sup>-1</sup>	RPM x 100	12 V, dia. 80 mm	<b>001C</b> <b>001G</b>
0 ... 4000 min <sup>-1</sup>	RPM x 100	12 V, dia. 80 mm	<b>002C *</b> <b>002G</b>
0 ... 7000 min <sup>-1</sup>	RPM x 100	12 V, dia. 80 mm	<b>003C *</b> <b>003G</b>
0 ... 10000 min <sup>-1</sup>	RPM x 100	12 V, dia. 80 mm	<b>022C</b>
0 ... 4000 min <sup>-1</sup>	RPM x 100	12 V, dia. 80 mm ●	<b>027C</b>

● with clamp ring instead of bolts and brackets

Part No. 333-045-...

Dial		Special feature	Part No.
Range	Imprint		
0 ... 3000 min <sup>-1</sup>	RPM x 100	24 V, dia. 80 mm	<b>001C</b> <b>001G</b>
0 ... 4000 min <sup>-1</sup>	RPM x 100	24 V, dia. 80 mm	<b>002C</b> <b>002G</b>

#### VDO cockpit international (Floodlight) dia. 100 mm

Part No. 333-055-...

Dial		Special feature	Part No.
Range	Imprint		
0 ... 3000 min <sup>-1</sup>	RPM x 100	12 V, dia. 100 mm	<b>001C *</b> <b>001G</b>

Part No. 333-065-...

Dial		Special feature	Part No.
Range	Imprint		
0 ... 3000 min <sup>-1</sup>	RPM x 100	24 V, dia. 100 mm	<b>001C *</b> <b>001G</b>

\* Phase-out