

7. Electric Temperature Gauge (dia. 52 mm)

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Installation instructions

999-161-010:	VDO cockpit vision	(for oil)
999-161-002:	VDO cockpit international	(for oil)
999-161-019:	VDO cockpit vision	(for engine coolant)
999-161-017:	VDO cockpit international	(for engine coolant)

See file 'Installation Instructions (MA)'.

7. Electric Temperature Gauge (dia. 52 mm)

7.1 General Informations

The electrical oil temperature gauge has been designed for land-bound vehicles or stationary systems only (exception: motorcycles).

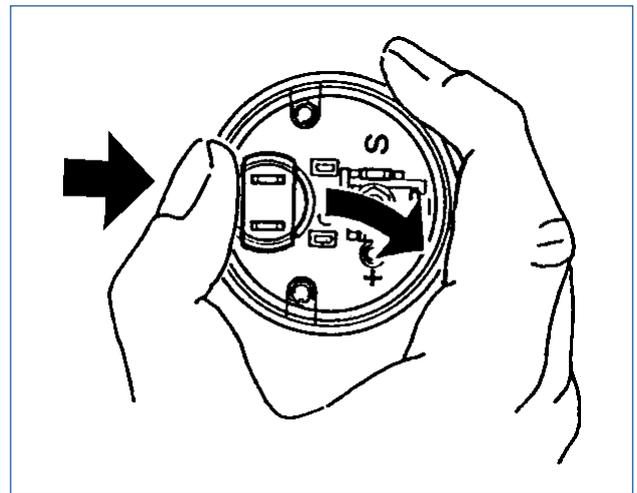
The instrument has an analog temperature display graduated in °C or °F.

Temperature sensors of the following types, adapted to the indicator temperature range, can be used:

- negative earth,
- insulated earth,
- negative earth with warning contact.



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



7. Electric Temperature Gauge (dia. 52 mm)

Designation of function

Movement: System Ke (90°)

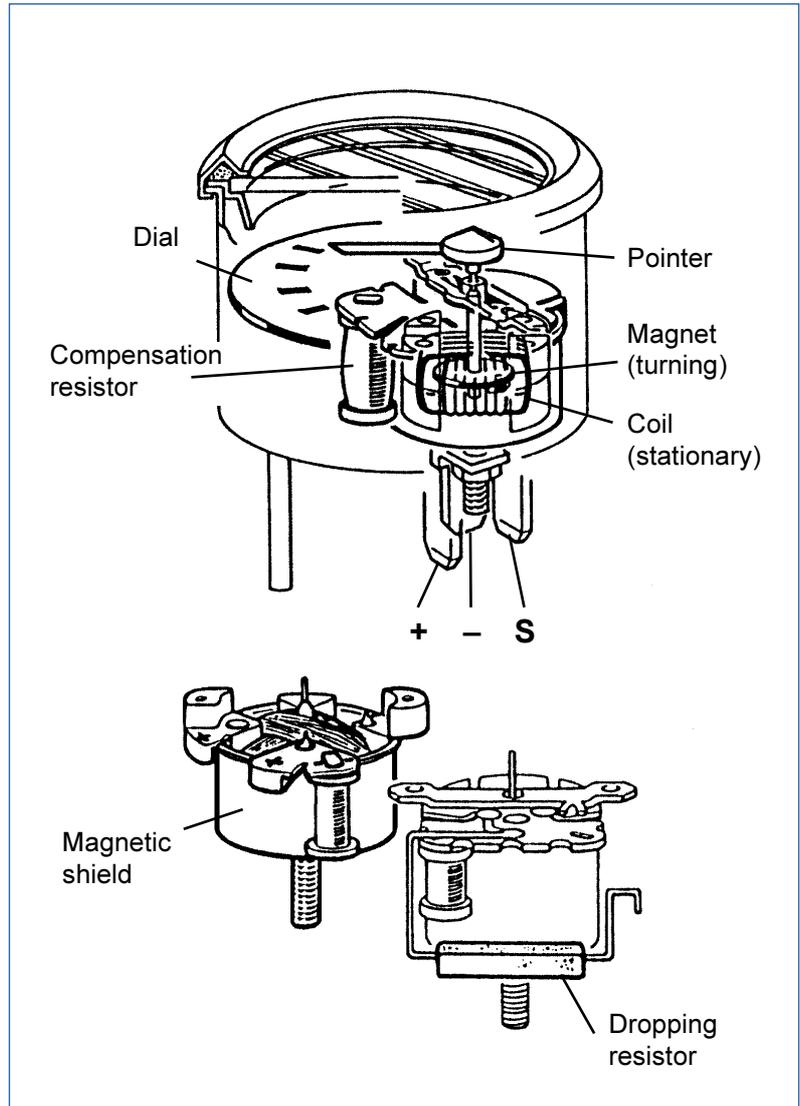
(Turning magnet movement for ratio indication, maximum pointer travel 90°)

The temperature indicator applies the resistance measurement principle. A sensor containing a resistor with strong temperature dependence (PTC) converts the temperature of the fluid to a corresponding resistance value.

A turning magnet ratio measuring movement measures this resistance value. This value is displayed by a pointer moving over a dial graduated in temperature units. The turning magnet movement for ratio indication comprises three stationary coils wound at 90° against each other, and a rotating permanent magnet disk in these coils. The coils are connected to determine a ratio, so that the instrument is insensitive to on-board voltage fluctuations.

This means that the pointer travel is only determined by the magnitude of the current flowing through the measuring system.

A magnetic shield prevents effects of external magnetic fields, indication errors due to temperature changes are corrected by a compensating resistor. A dropping resistor is used to adapt the measuring movement to higher operating voltages (e. g. 24V).



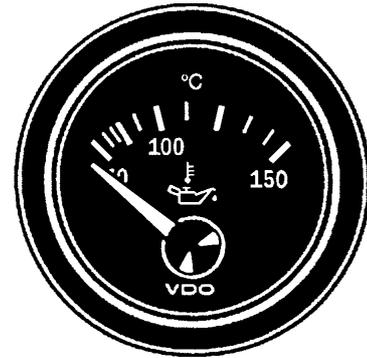
7. Electric Temperature Gauge (dia. 52 mm)

7.2 Technical Data

Operating voltage:	11 ... 16 V or 21.5 ... 30 V
Movement:	System Ke (90°)
Current consumption:	131 mA (without illumination)
Operating temp.:	- 30°C ... + 85°C
Storage temperature:	- 40°C ... + 90°C
Illumination:	1 light bulb 14 V, 3.4 W or 24 V, 3 W 2 colour caps, green and red (only at 12 V)
Protection:	IP64 DIN 40050 from the front reverse-polarity protection
Vibration resistance:	max. 1g eff., 25 ... 2000 Hz, duration 8h, f. 1 octave/min.
Nominal position:	NL 0 to NL 90, DIN 16257

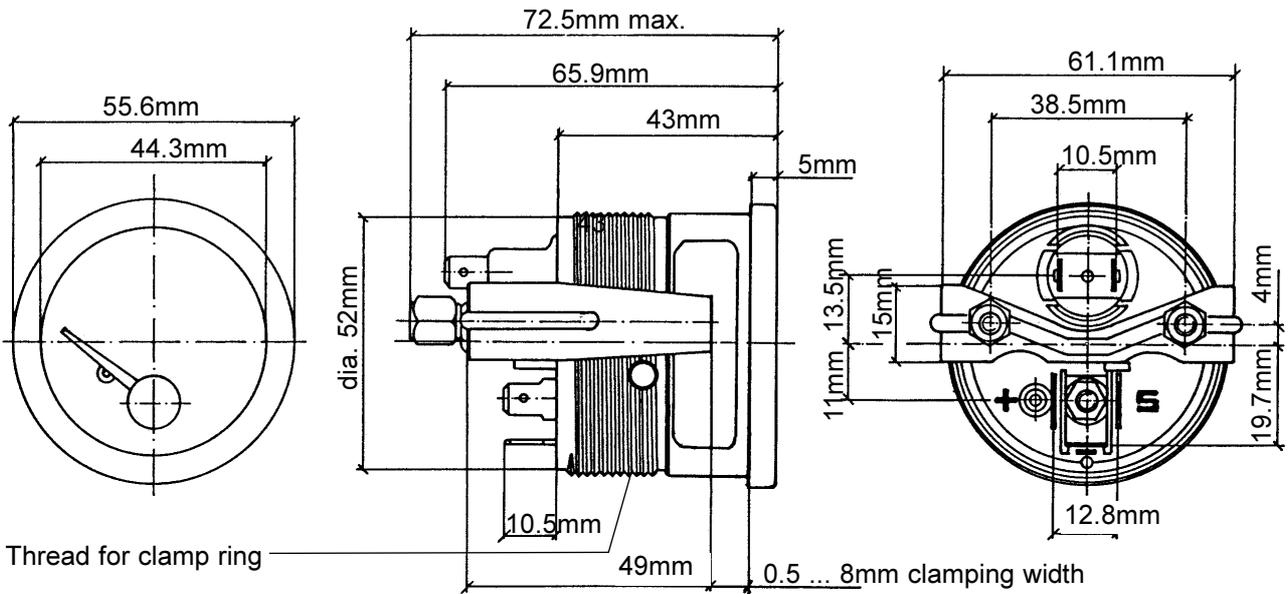
VDO cockpit vision
dia. 52 mm Backlight

Example: electric oil temperature gauge

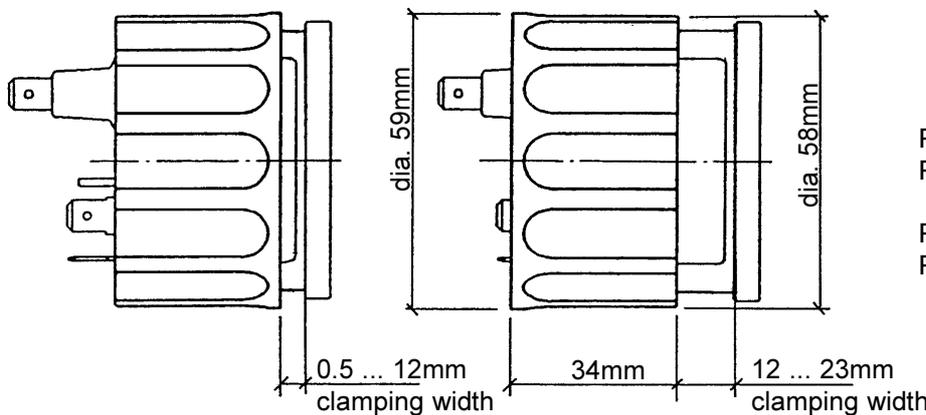


Sensor:
temperature sensor (thermistor),
not included.

Mounting hole: dia. 53mm



Thread for clamp ring



Pin assignment:

Pin +: + 12 V or + 24 V,
terminal 15

Pin -: Ground, terminal 31

Pin S: Sensor

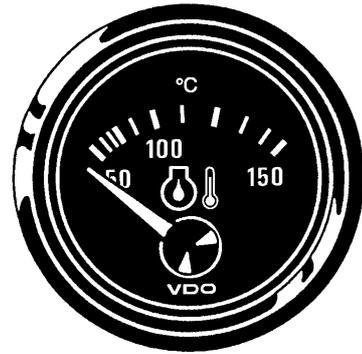
7. Electric Temperature Gauge (dia. 52 mm)

7.2 Technical Data

Operating voltage:	11 ... 16 V or 21.5 ... 30 V
Movement:	System Ke (90°)
Current consumption:	131mA (without illumination) 106mA = 60°C ... 200°C (without illumination)
Operating temp.:	- 30°C ... + 85°C
Storage temperature:	- 40°C ... + 90°C
Illumination:	1 light bulb 14 V, 3.4 W or 24 V, 3 W
Protection:	IP64 DIN 40050 from the front reverse-polarity protection
Vibration resistance:	max. 1g eff., 25 ... 2000 Hz, duration 8h, f. 1 octave/min.
Nominal position:	NL 0 to NL 90, DIN16 257

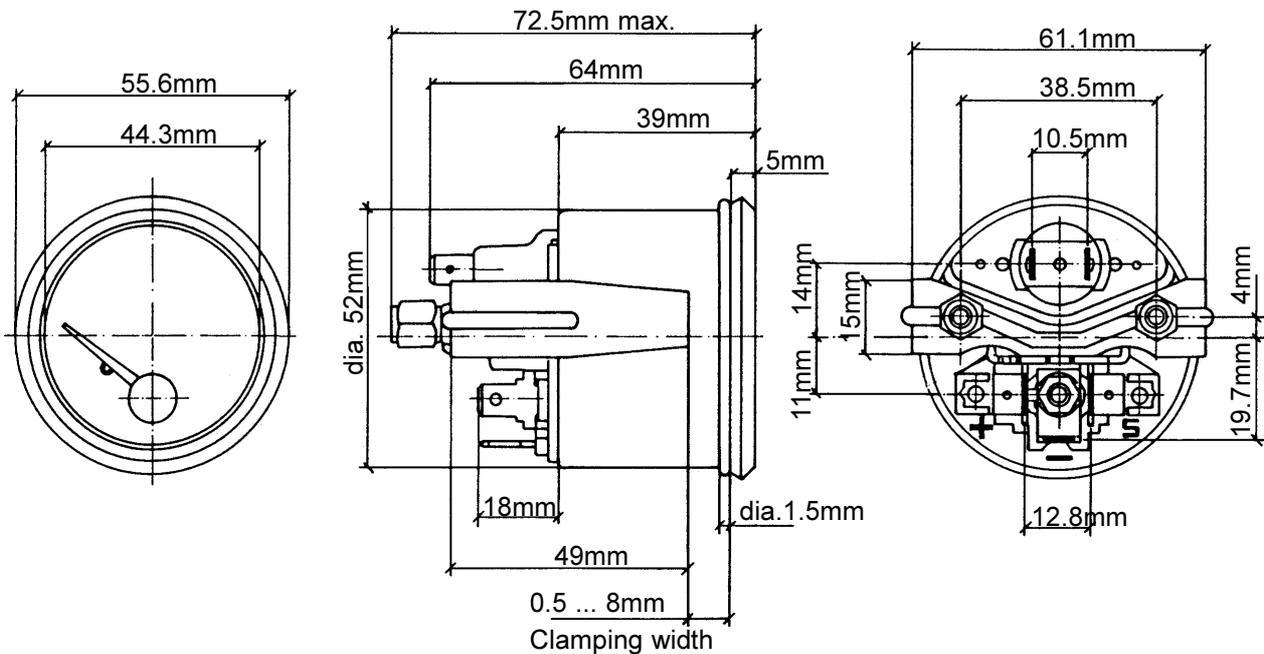
VDO cockpit international dia. 52 mm Floodlight

Example:
electric oil temperature gauge



Sensor:
temperature sensor (thermistor),
not included.

Mounting hole: dia. 53mm



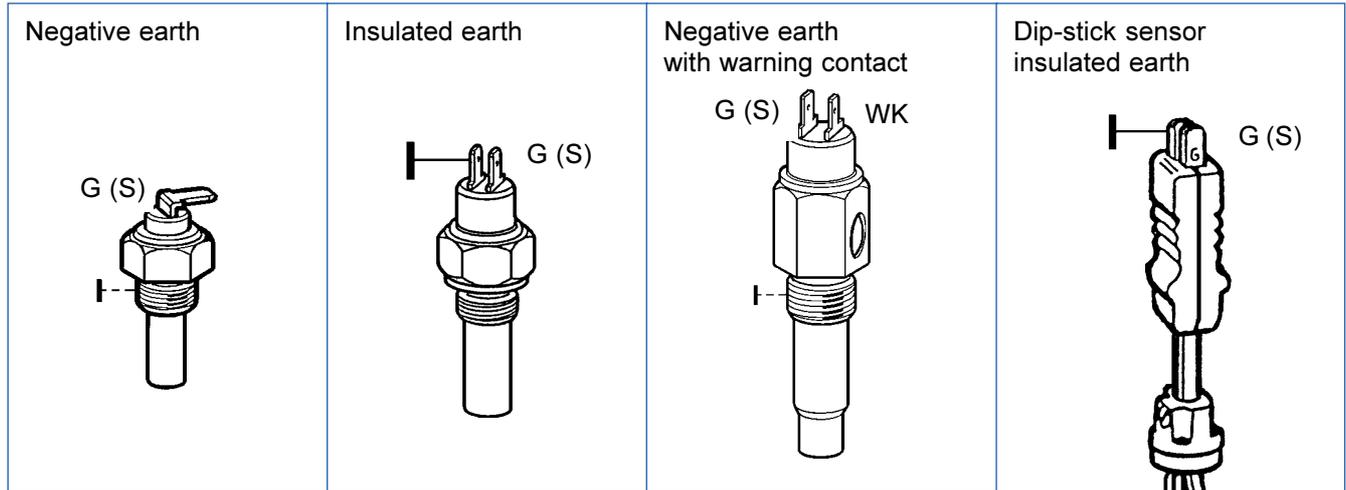
Pin assignment:
Pin +: + 12 V or + 24 V,
terminal 15
Pin -: ground, terminal 31
Pin S: Sensor

7. Electric Temperature Gauge (dia. 52 mm)

7.3 Temperature Sensors

The temperature sensor needed to operate the instrument is not included with the instrument.

The following temperature sensors (see data sheets for sensors), adapted to the instrument indicating range, can be used:



WK = Warning contact

Electric Oil Temperature Gauge

The sensor is installed in the oil circuit at a position specified by the vehicle manufacturer (e.g. oil drain plug).

A dip-stick sensor can be used instead of the standard dip-stick (original). The dip-stick sensor can be used for internal tube guide diameters from 6mm to 15mm.

Electric Engine Coolant Temperature Gauge

The sensor is installed in the engine coolant circuit at a position specified by the vehicle manufacturer (e.g. temperature warning switch) or in the coolant hose.

For installation in a coolant hose (28mm dia. to 35mm dia.) use installation kit, order No. X11-323-003-011.

Install in coolant hose just ahead of the radiator inlet opening.

7. Electric Temperature Gauge (dia. 52 mm)

7.3 Temperature Sensors

To mount the temperature sensor it is absolutely only to use the hexagon nut.

If the connection thread is cylindrical, a sealing washer or a sealing ring made of copper must be fitted.

The values mentioned in the following table for the maximum tightening torque (Nm max.) refer exclusively to the load-bearing capacity of temperature sensors.



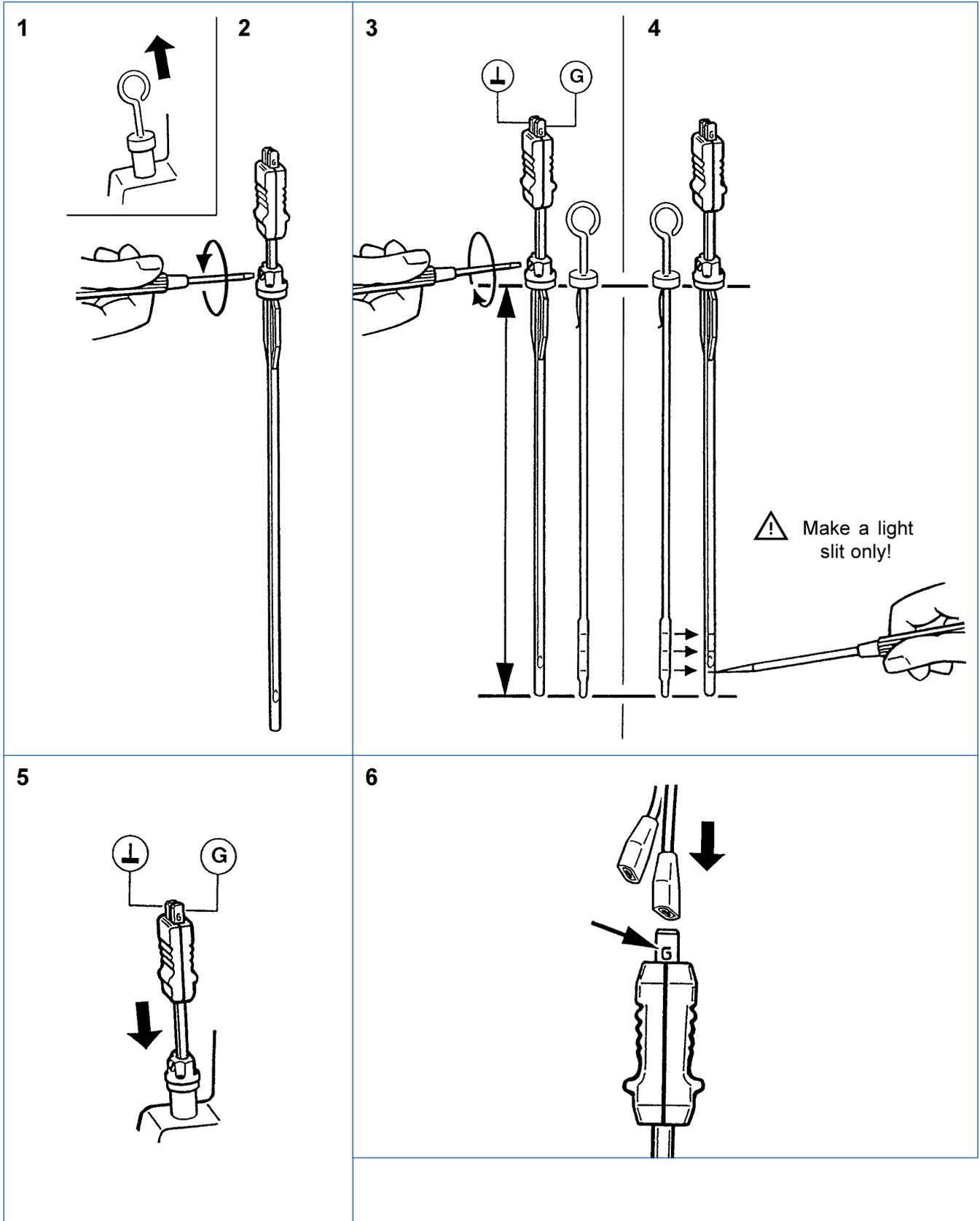
Prior to using the temperature sensor, it is important to ask the manufacturer of the vehicle, equipment system or engine in each instance for the maximum torque [? Nm max.] value for the threaded hole into which the temperature sensor is to be screwed. Non-observance of the maximum tightening torque specified for the threaded hole in each instance can result in damage to the vehicle, engine or equipment system.

Thread	max.
M 10 x 1	10 Nm
M 10 x 1	10 Nm
1/8 - 27 NPTF	10 Nm
M 12 x 1.5	15 Nm
1/2 - 20 Gang	15 Nm
M 14 x 1.25	20 Nm
M14 x 1.5	20 Nm
5/8 - 18 UNF - 3A	20 Nm
1/2 in. 20 Whit. S	20 Nm
1/4 - 18 NPTF	20 Nm
M 16 x 1.5	30 Nm
M 18 x 1.5	30 Nm
M 20 x 1.5	30 Nm
M 22 x 1.5	30 Nm
M 24 x 1.5	30 Nm
M 26 x 1.5	30 Nm
1/2 - 14 NPTF	30 Nm
3/8 - 18 NPTF	30 Nm
R 1/2	30 Nm
R 3/8	30 Nm
3/8 - 18 Dryseal NPTF	30 Nm
3/4-16 UNF-3A	30 Nm

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7.3 Temperature Sensors

Dip-stick sensor: installation information



7. Electric Temperature Gauge (dia. 52 mm)

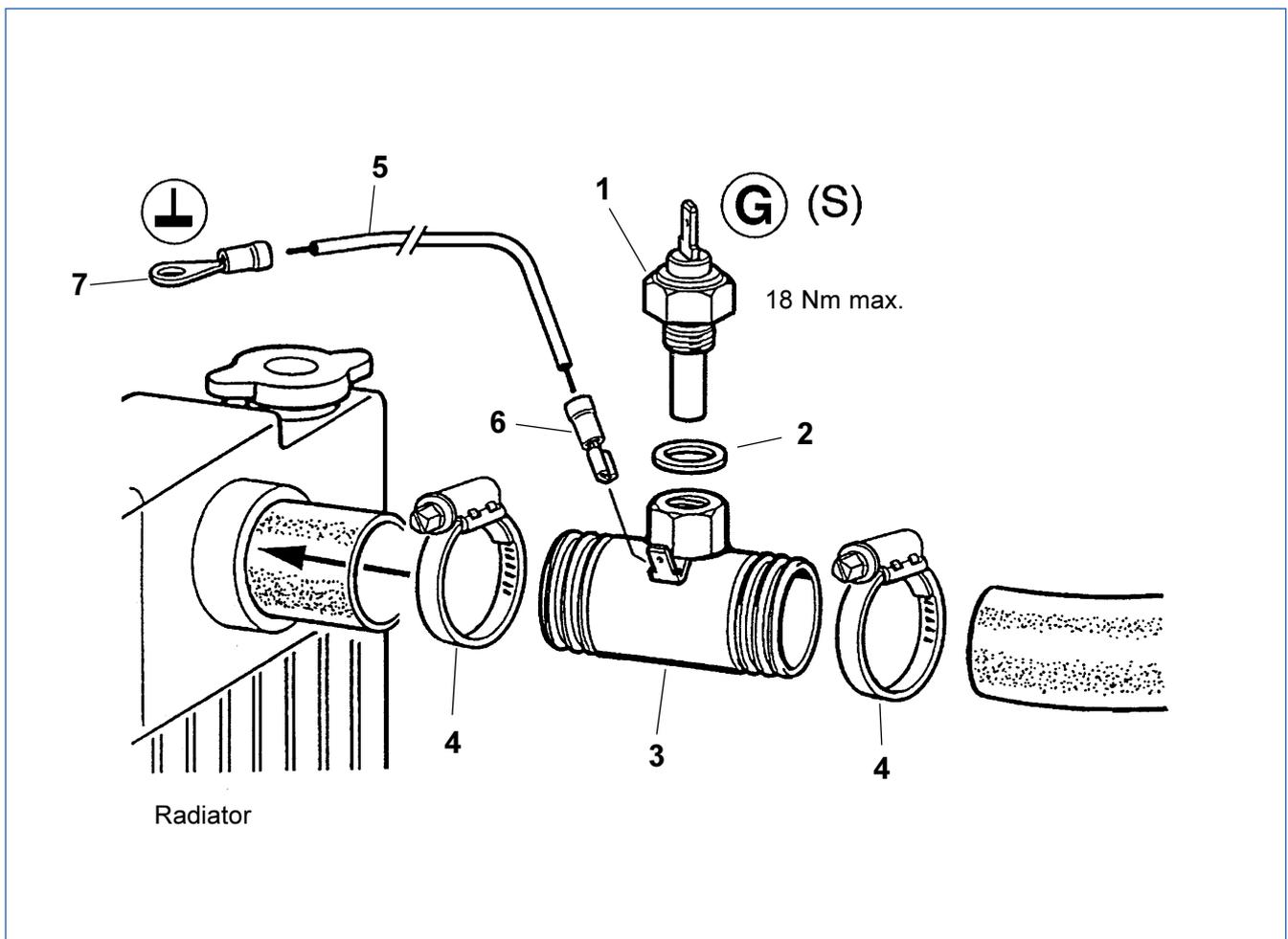
7.3 Temperature Sensors

Installation kit for fitting into
28mm to 35mm diameter cooling water hoses

Part No. X11-323-003-011

Installation kit includes:

- 1 Temperature sensor (M14 x 1.5, 120°C max.)
- 2 Sealing washer
- 3 T-piece (inside dia. 32 mm, outside dia. 35 mm, 70 mm long, threaded connection M14 x 1.5, blade terminal 6.3 x 0.8 mm)
- 4 Hose clamp (2x)
- 5 Cable, brown (500 mm long)
- 6 Blade connector (6.3 x 0.8 mm)
- 7 Ring tongue

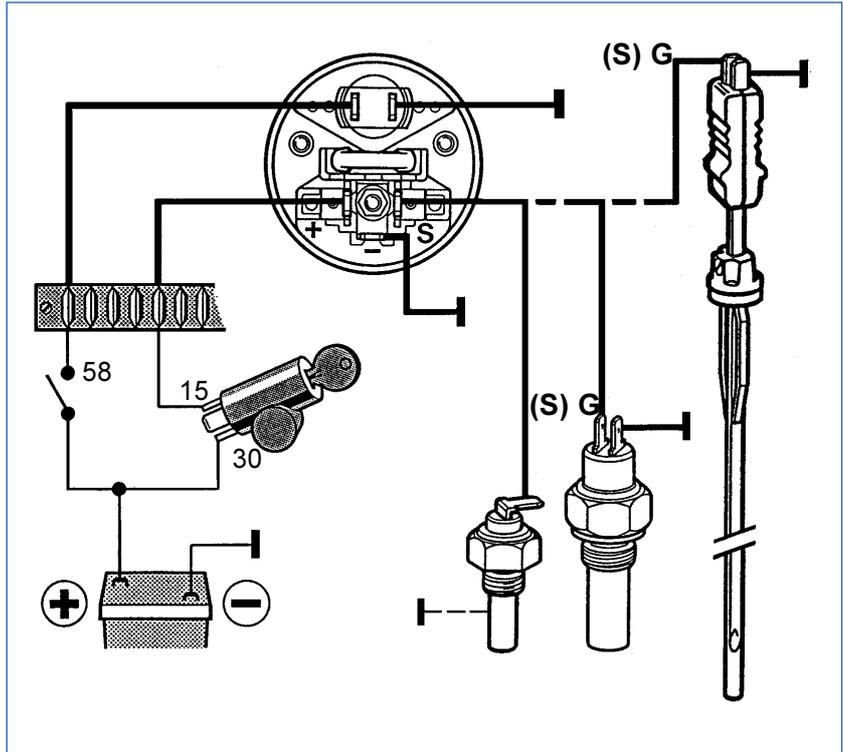


7. Electric Temperature Gauge (dia. 52 mm)

7.4 Wiring Diagrams

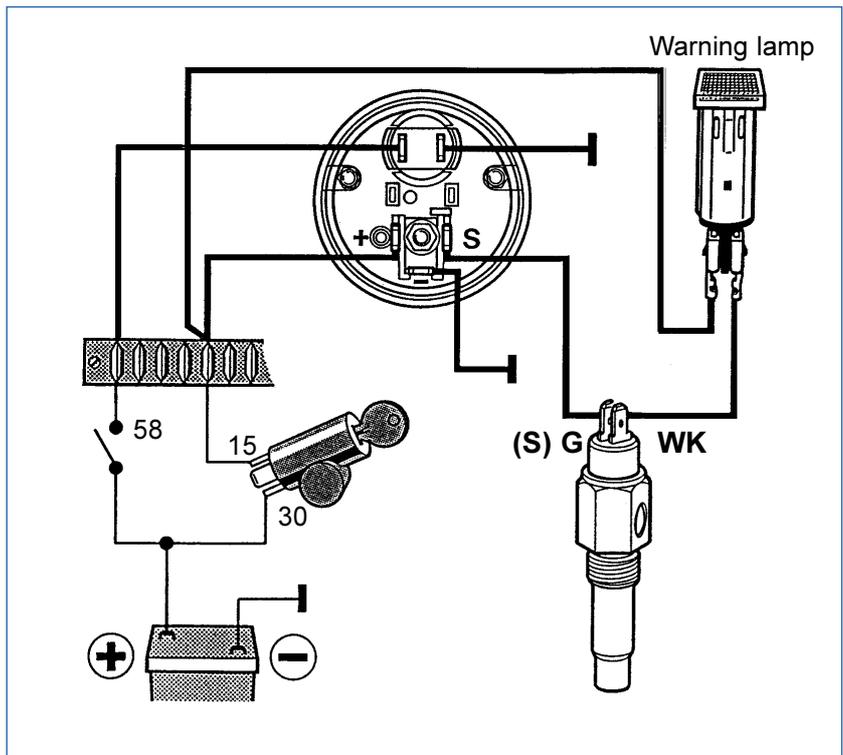
Temperature sensor:

- negative earth
- or
- insulated earth
- or
- dip-stick sensor insulated earth



Temperature sensor:

- negative earth with warning contact



WK = Warning contact

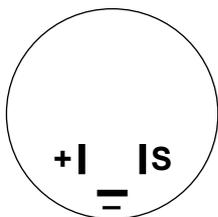
7. Electric Temperature Gauge (dia. 52 mm)

7.5 Testing Instructions

Test accessories

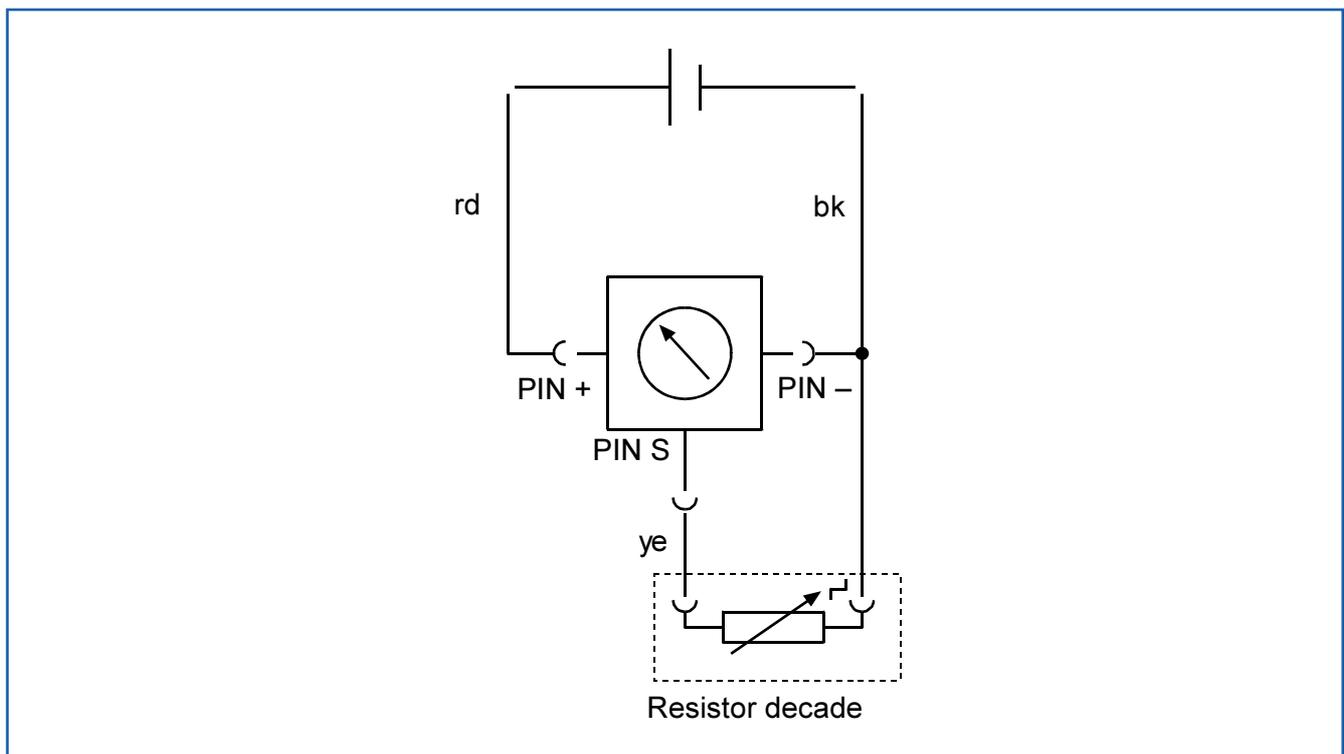
1x Power supply	} contained in test cables kit X12-019-101-001
1x Test cable No. 3	
1x Measuring cable	
1x Resistor decade	

Pin allocation



Pin + + 12V or + 24V
 Pin - Ground
 Pin S Sensor signal input

Test circuit diagram



Test method description

Basic settings:	12 V instruments	»»»»	14 V
	24 V instruments	»»»»	28 V

Start the pointer position test with the highest resistance value!

7. Electric Temperature Gauge (dia. 52 mm)

7.5 Testing Instructions

Test of the movement

Connect the instrument as shown in the test circuit diagram, using test cable 3.

The indication can be tested with the resistor decade 'sensor simulator'.

The following tables shows the resistance values and the permissible indication tolerances in angular degrees.

20 to 100 °C

Indication (°C)	20	40	60	80	100
Resistance (Ω)	700	287.4	134	69.1	38.5
Deflection (°∠)	0	27	60.5	80.5	90
Tolerance (°∠)	± 2.7	± 2.7	± 2.7	± 2.7	± 2.7

40 to 120 °C

Indication (°C)	40	50	60	70	80	90	100	110	120
Resistance (Ω)	287.4	193.3	134	95.2	69.1	51.3	38.6	29.4	22.7
Deflection (°∠)	0	3.3	8.3	15.5	25.8	40	58	75.2	88.2
Tolerance (°∠)	± 3.6	± 3.6	± 3.6	± 3.6	± 3.6	± 3.6	± 3.6	± 3.6	± 3.6

50 to 150 °C

Indication (°C)	50	80	90	100	110	120	130	140	150
Resistance (Ω)	322.8	112.5	83	62.2	47.5	36.5	28.9	23.1	18.6
Deflection (°∠)	0	12.4	19.8	29.6	42	56.8	69.7	80.2	88.1
Tolerance (°∠)	± 3.6	± 3.6	± 3.6	± 3.6	± 3.6	± 3.6	± 3.6	± 3.6	± 3.6

60 to 200 °C

Indication (°C)	60	100	140	180	200
Resistance (Ω)	482	165	50.8	25.7	14.3
Deflection (°∠)	0	11.9	43.9	78.9	88.9
Tolerance (°∠)	± 3.6	± 3.6	± 3.6	± 3.6	± 3.6

7. Electric Temperature Gauge (dia. 52 mm)

7.6 Instruments Survey

VDO cockpit vision (Backlight) dia. 52 mm

Part No. 310-010-...

Dial		Special feature	Part No.
Range	Imprint		
50 ... 150 °C	°C 	Clamp ring 12 V	003K
50 ... 150 °C	°C 	Stud bolts 12 V	013K
40 ... 120 °C	°C 	Clamp ring 12 V	002K
40 ... 120 °C	°C 	Stud bolts 12 V	012K

VDO cockpit vision (Backlight) dia. 52 mm

Part No. 310-020-...

Dial		Special feature	Part No.
Range	Imprint		
50 ... 150 °C	°C 	Clamp ring 24 V without colour caps	002C
40 ... 120 °C	°C 	Clamp ring 24 V without colour caps	001C

7. Electric Temperature Gauge (dia. 52 mm)

7.6 Instruments Survey

VDO cockpit international (Floodlight) dia. 52 mm

Part No. 310-030-...

Dial		Imprint	Special feature	Part No.
Range				
50 ... 150 °C	°C		12 V	003C 003G
60 ... 200 °C	°C		12 V	004C 004G
40 ... 120 °C	°C		12 V	013C 013G
50 ... 150 °C	°C		12 V	015C 015G
20 ... 100 °C	°C		12 V	022C
40 ... 120 °C	°C		12 V	002C 002G
100 ... 250 °F 40 ... 120 °C	°F °C		12 V Dual scale	020C

VDO cockpit international (Floodlight) dia. 52 mm

Part No. 310-040-...

Dial		Imprint	Special feature	Part No.
Range				
50 ... 150 °C	°C		24 V	003C 003G
60 ... 200 °C	°C		24 V	004C 004G
40 ... 120 °C	°C		24 V	013C 013G
50 ... 150 °C	°C		24 V	015C 015G
120 ... 300 °F 50 ... 150 °C	°F °C		24 V Dual scale	021C
20 ... 100 °C	°C		24 V	022C
40 ... 120 °C	°C		24 V	002C 002G
100 ... 250 °F 40 ... 120 °C	°F °C		24 V Dual scale	020C
40 ... 120 °C	°C		24 V	025C