8. Electric Fuel Level Gauge (dia. 52mm)
(Fuel Level Sensor, Lever-Type)

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Installation instructions

999-161-012: VDO cockpit vision
999-161-004: VDO cockpit international

See file ‘Installation Instructions (MA)’.

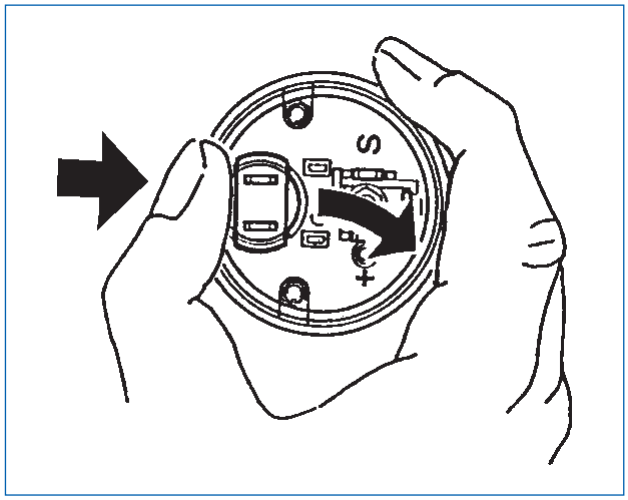
8. Electric Fuel Level Gauge (dia. 52mm)
(Fuel Level Sensor, Lever-Type)

8.1 General Informations

The electric fuel level gauge has been designed for land-bound vehicles or stationary systems only (exception: motorcycles).

The instrument has an analog tank fuel level display graduated in fuel levels.

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



8. Electric Fuel Level Gauge (dia. 52mm)
(Fuel Level Sensor, Lever-Type)

8.1 General Informations

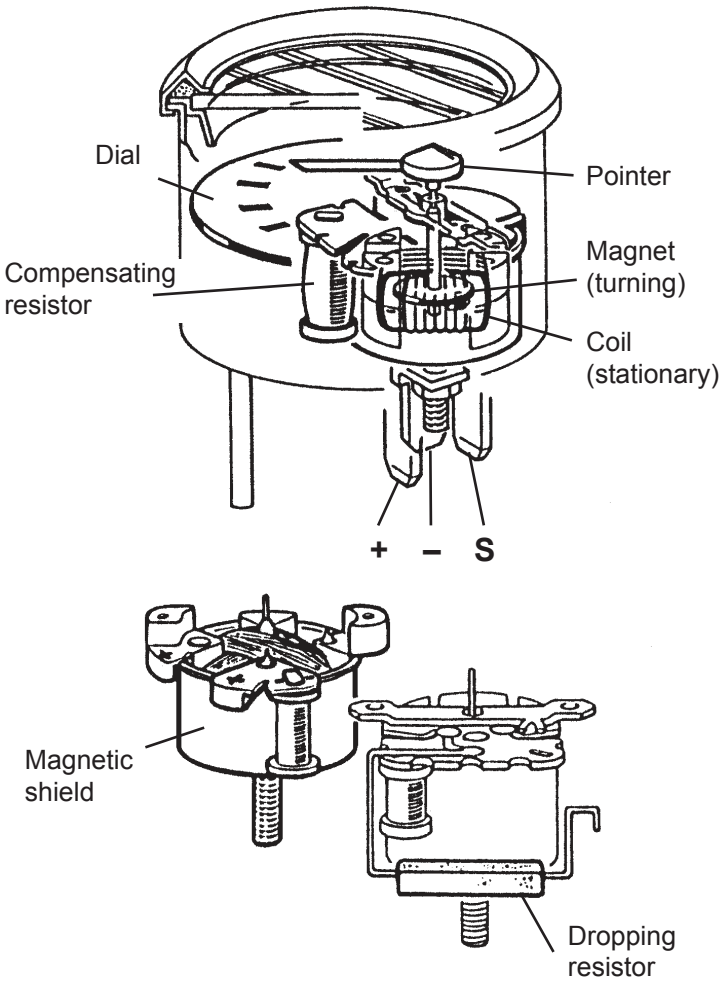
Designation of function
Movement: System Ke (90°)
(Turning magnet movement for ratio indication, maximum pointer travel 90°)

The fuel reserve indicator applies the resistance measurement principle.
A sensor (lever-type) in the liquid reserve to a corresponding
resistance value. A turning magnet ratio measuring movement measures this resistance value.

It 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 intensitive 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.

The pointer movement must be dampened when the liquid level is measured by a lever-type sensor; in this case the coil body is filled with dampening oil, the rotating magnet moves in this oil to obtain dampened pointer movements.

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 voltage (e. g. 24V).



8. Electric Fuel Level Gauge (dia. 52mm)
(Fuel Level Sensor, Lever-Type)

8.2 Technical Data

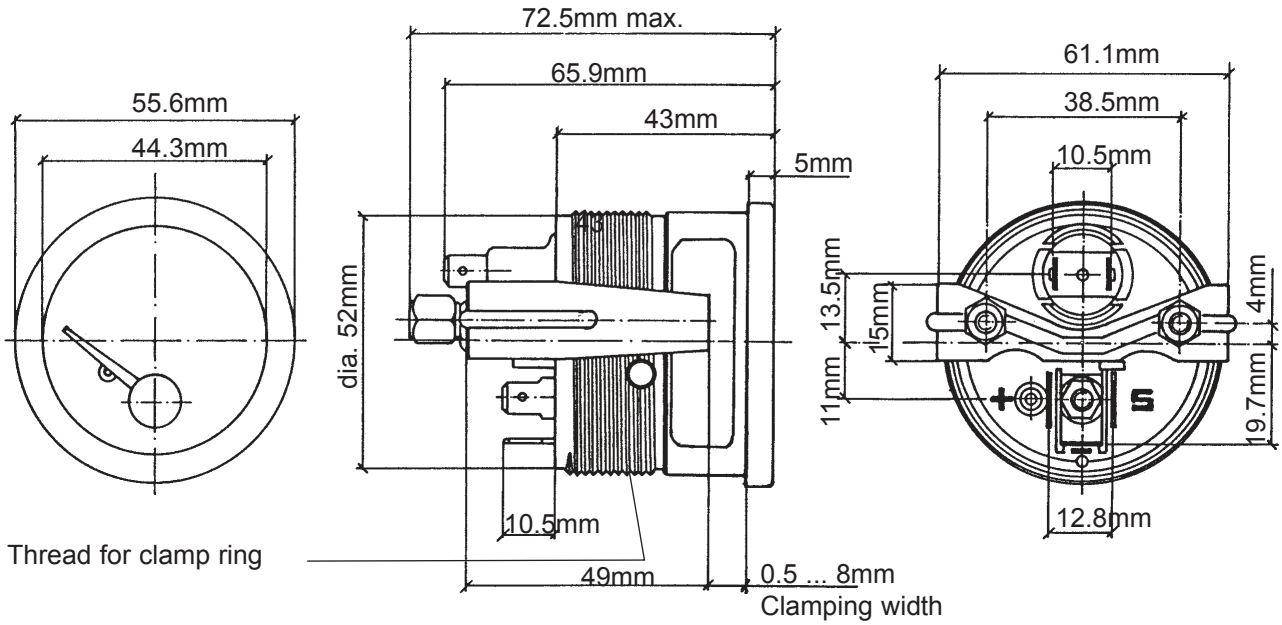
Operating voltage:	11 ... 16 V or 21.5 ... 30 V
Movement:	System Ke (90°)
Current consumption:	86 mA (without illumination)
Operating temp.:	– 30°C ... + 85°C
Storage temperature:	– 40°C ... + 90°C
Illumination:	1 light bulb 14 V, 3.4 W or 24 V, 3 W, 2 colour caps, green and red (only at 12 V)
Protection:	IP64 DIN 40050 from the front reverse-polarity protection
Vibration resistance:	max. 1g eff., 25 ... 2000 Hz, duration 8 h, f: 1 octave/min.
Nominal position:	NL 0 to NL 90, DIN 16257

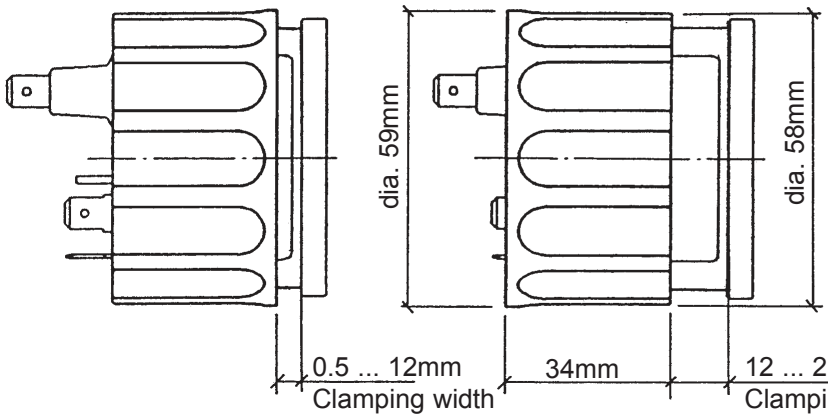
VDO cockpit vision

dia. 52 mm Backlight

Mounting hole: dia. 53mm

Sensor: lever-type sensor (not included)





Pin assignment:
Pin +: + 12 V or + 24 V terminal 15
Pin –: Ground, terminal 31
Pin S: Sensor

8. Electric Fuel Level Gauge (dia. 52mm)
(Fuel Level Sensor, Lever-Type)

8.2 Technical Data

Operating voltage:	11 ... 16 V or 21.5 ... 30 V
Movement:	System Ke (90°)
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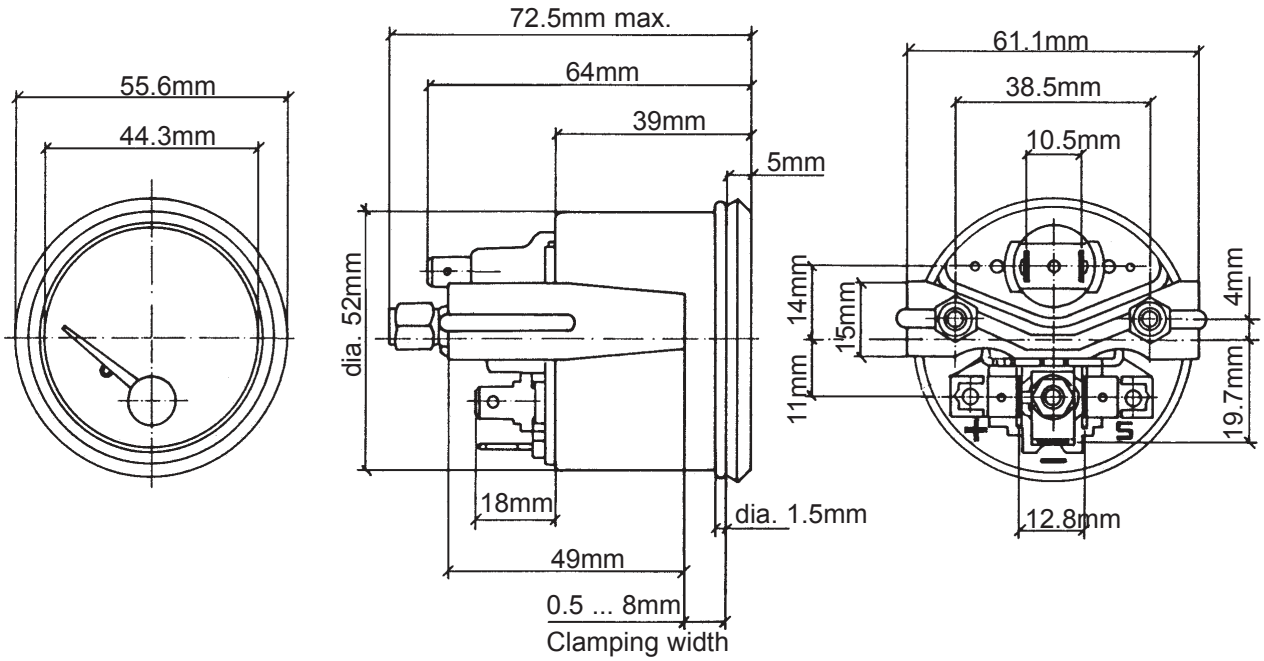
Illumination:	1 light bulb 14 V, 3.4 W or 24 V, 3 W
Protection:	IP64 DIN 40050 from the front reverse-polarity protection
Vibration resistance:	max. 1g eff., 25 ... 2000 Hz, duration 8 h, f: 1 octave/min.
Nominal position:	NL 0 to NL 90, DIN 16257

VDO cockpit international

dia. 52 mm Floodlight

Mounting hole: dia. 53mm

Sensor: lever-type sensor
(not included)



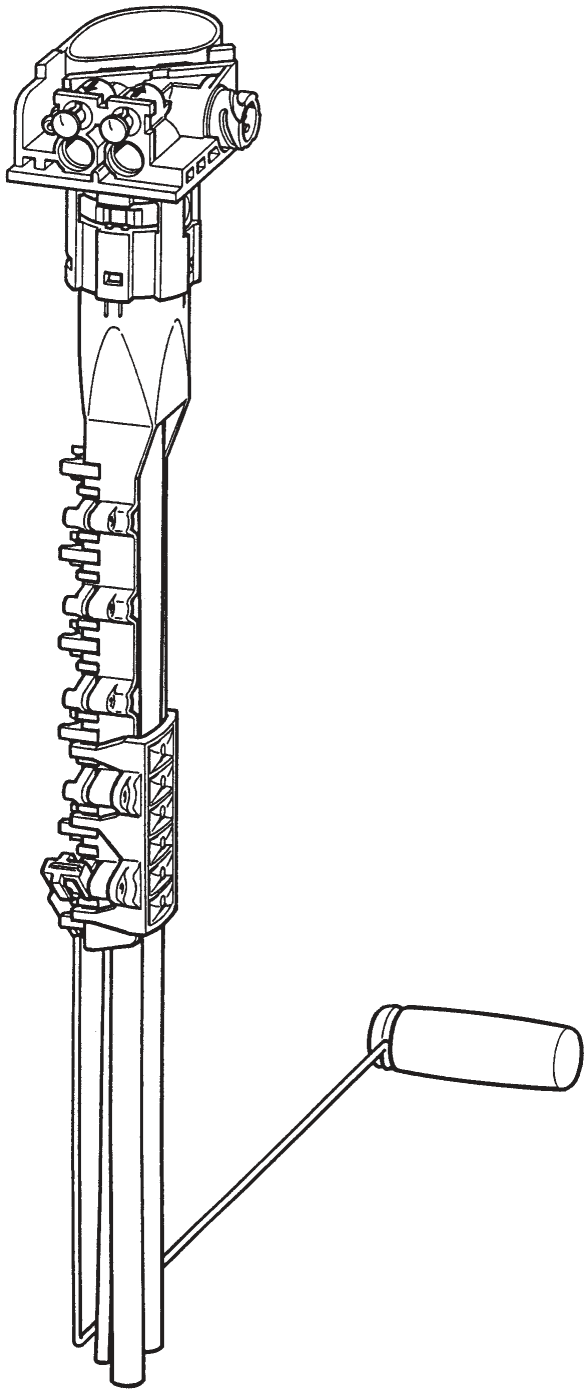
Pin assignment:
Pin +: + 12 V or + 24 V terminal 15
Pin –: Ground, terminal 31
Pin S: Sensor

8. Electric Fuel Level Gauge (dia. 52mm)
(Fuel Level Sensor, Lever-Type)

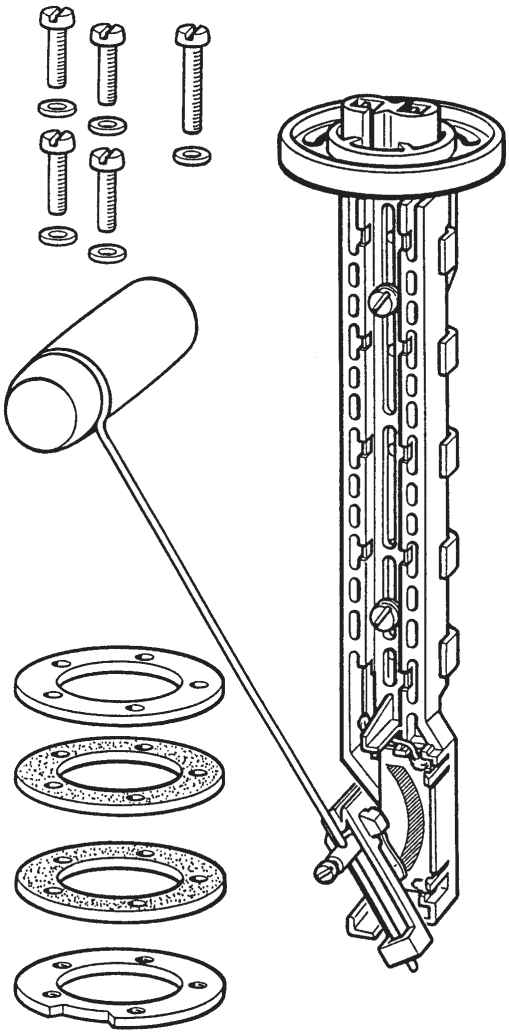
8.3 Lever-Type Fuel Level Sensors

The lever-type sensor needed to operate the instrument is not included with the instrument.
The following lever-type sensors (see data sheets for sensors) can be used:

I) Standard lever-type sensor



II) Lever-type sensor, adjustable



8. Electric Fuel Level Gauge (dia. 52mm)
(Fuel Level Sensor, Lever-Type)

8.3 Lever-Type Fuel Level Sensors

I) Standard lever-type sensor (6V to 24V, insulated earth), part No.: 221-824-054-. . .C

Version, variations:

- ❒ plastic lever-type sensor with bayonet flange for 1.5 mm or 2 mm tank sheet thickness
- ❒ is available in different lengths
- ❒ different lift of float arm
- ❒ different orientation of the lever arm to the connections on the flange
- ❒ integrated fuel feed and return
- ❒ DIN bayonet connector for electric supply
- ❒ easy connection of external heating
- ❒ integrated tank ventilation with suction and pressure relief values
- ❒ potentiometer designed as thick-film resistor
- ❒ pressure compensation possible in case of several tanks (twin-tank equipment)

Accessories

- ❒ Sealing: the sensor is sealed to the tank by a rubber O-ring (part No. 89-356-017).

  ⚠ With this sealing, compensation of different sheet thicknesses is not intended.

- ❒ Bayonet connector for electric supply:

  connector with 2 receptacles with sealings (DIN 72585), commercially available, e. g. AMP 964 613-1.

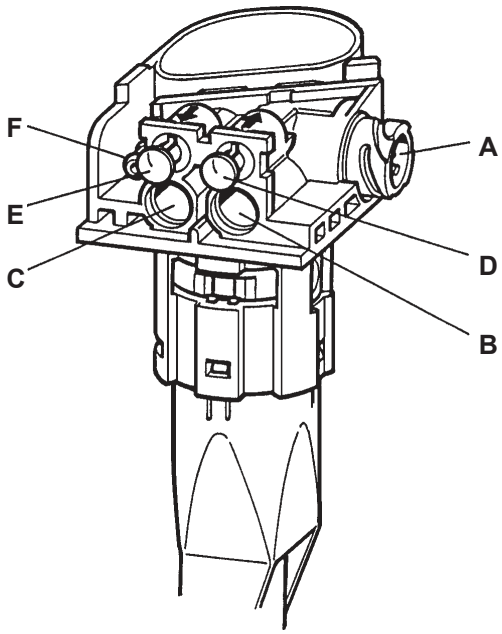
- ❒ Fuel supply fitting for connection of fuel feed and return

  Use of the integrated feed and return requires two fittings (part No. X11-221-001-002 = inside diameter 8mm).

  This fitting is replaceable, so you can adjust the diameter of the feed pipe to individual requirements. Both fittings and any additional connections are protected against working loose or slipping off by means of the locking (part No. X11-221-001-003).

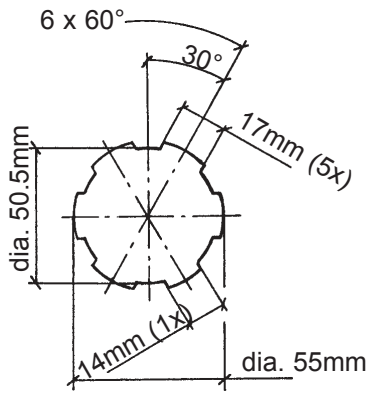
- ❒ Fitting for external heating

  A separate feed and return for operation of an additional heating is provided. The sensor will be delivered with both openings sealed with plastic plug. The return connection of the heating can also be used for pressure compensation with another tank. The fittings for the external heating are the part No. X11-221-001-004.



A Bayonet connector
DIN 72585 (A1-2.1 SN/K1)
B Fuel return
C Fuel feed
D Return for external heating or pressure compensation with other tanks
E Feed for external heating
F Ventilation by means of valves

Tank mounting hole:
(burr outside of the tank)



Sheet thickness 1.5mm or 2mm

8. Electric Fuel Level Gauge (dia. 52mm)
(Fuel Level Sensor, Lever-Type)

8.3 Lever-Type Fuel Level Sensors

I) Standard lever-type sensor (6V to 24V, insulated earth), part No.: 221.824/054/. . .C

Installation instructions

- ❒ The individual sensors are designed for tank bayonet sheet thickness of 1.5mm or 2mm.
  Tolerances: 1.5mm (1.25 ... 1.55mm), for part No. 221-824-054-049C, -050C, -051C, -054C, -056C, -056C
  2.0mm (1.85 ... 2.15mm), for part No. 221-824-054-052C, -053C
- ❒ With the sealings, compensation of different sheet thicknesses is not intended.
- ❒ To determine the required minimum tank-wall clearance, add 1/2 of the float diameter to the lever radius.
  The float diameter of all variants is 31mm.
- ❒ The customer may procure the fittings for fuel feed and return himself, so other fuel feed pipe diameters can be implemented.
- ❒ The bayonet connection principally allows mounting in just one defined direction.
  The mounting position has to be strictly observed.
- ❒ The lever-type sensor is equipped with several link points for the lever arm. These link points serve to adjust the lever-type sensor length in production. Later shortening of the sensor length may destroy the sensor. Therefore, it is not possible to adjust the length individually by the customer or the sales organisation.
- ❒ When fitting the lever-type sensor into the tank, it must not be overtightened in order to not to be stripped. The maximum torque of 18 Nm to 20 Nm has to be strictly observed.

8. Electric Fuel Level Gauge (dia. 52mm)
(Fuel Level Sensor, Lever-Type)

8.3 Lever-Type Fuel Level Sensors

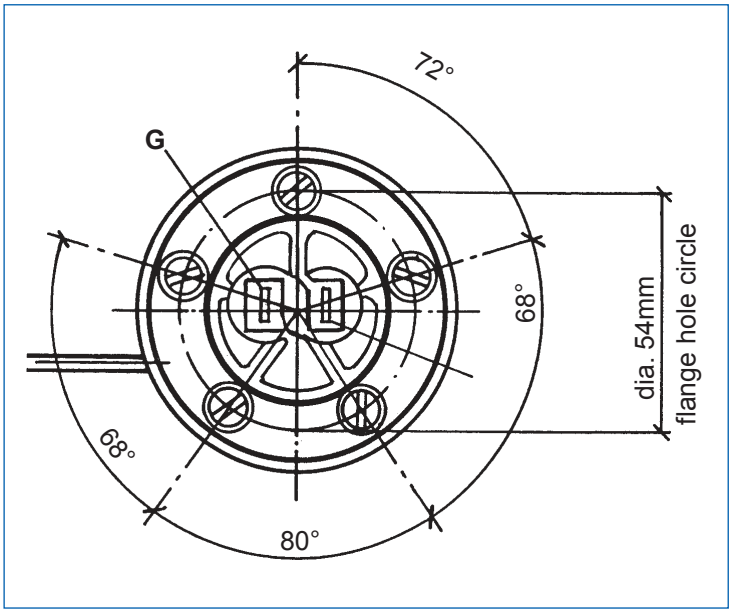
II) Lever-type sensor, adjustable (6V to 24V, insulated earth), part No.: 226-801-015-001G

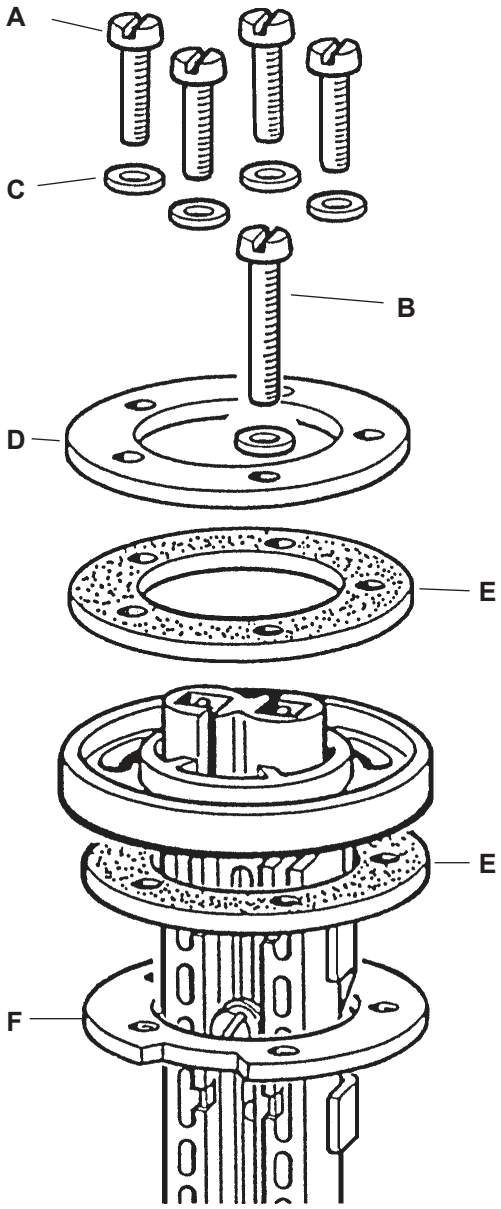
Version:

- ❒ adjustable lever-type sensor (plastic casing) with flange hole circle dia. 54 mm
- ❒ flanges,gaskets and small parts are included
- ❒ for fuel tanks having a height from 150mm to 605mm
- ❒ 2 blade terminals 6.3 x 0.8 mm

Sensor installation position

The sensor is installed in a mounting hole (dia. 60mm) made in the tank at a good position for fuel measurement, or on a mounting flange provided by the tank manufacturer, or in an existing mounting hole.





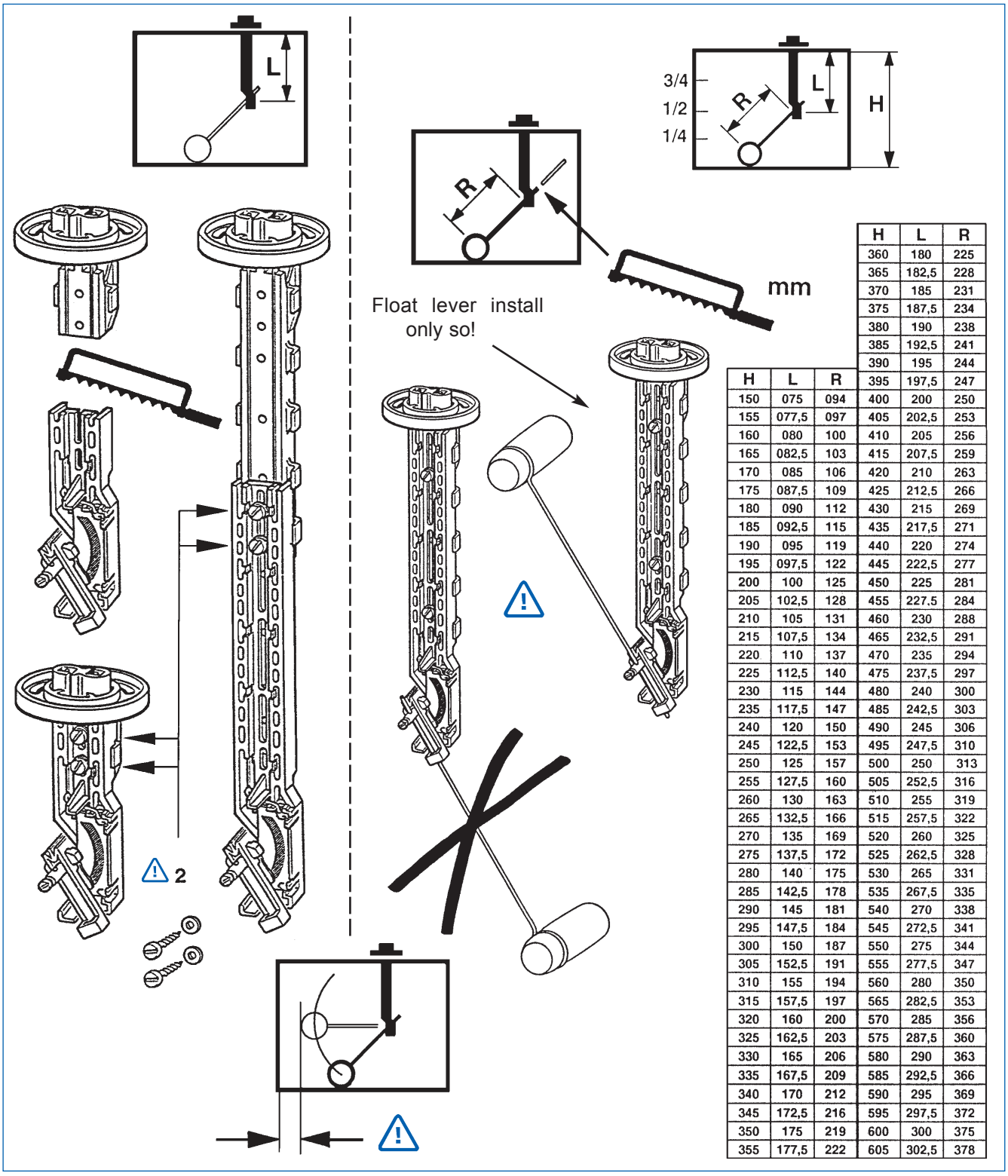
A	Screw M5 x 15	(4x)
B	Screw M5 x 30	(1x)
C	Sealing washer	(5x)
D	Flange	(1x)
E	Rubber gasket	(2x)
F	Flange with slit	(1x)

8. Electric Fuel Level Gauge (dia. 52mm)
(Fuel Level Sensor, Lever-Type)

8.3 Lever-Type Fuel Level Sensors

II) Lever-type sensor, adjustable (6V to 24V, insulated earth)

Adjustment
Adjust the length (L) of the sensor body and the radius (R) of the float lever according to the height (H) of the fuel tank.



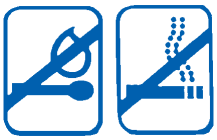
H	L	R
150	075	094
155	077,5	097
160	080	100
165	082,5	103
170	085	106
175	087,5	109
180	090	112
185	092,5	115
190	095	119
195	097,5	122
200	100	125
205	102,5	128
210	105	131
215	107,5	134
220	110	137
225	112,5	140
230	115	144
235	117,5	147
240	120	150
245	122,5	153
250	125	157
255	127,5	160
260	130	163
265	132,5	166
270	135	169
275	137,5	172
280	140	175
285	142,5	178
290	145	181
295	147,5	184
300	150	187
305	152,5	191
310	155	194
315	157,5	197
320	160	200
325	162,5	203
330	165	206
335	167,5	209
340	170	212
345	172,5	216
350	175	219
355	177,5	222
360	180	225
365	182,5	228
370	185	231
375	187,5	234
380	190	238
385	192,5	241
390	195	244
395	197,5	247
400	200	250
405	202,5	253
410	205	256
415	207,5	259
420	210	263
425	212,5	266
430	215	269
435	217,5	271
440	220	274
445	222,5	277
450	225	281
455	227,5	284
460	230	288
465	232,5	291
470	235	294
475	237,5	297
480	240	300
485	242,5	303
490	245	306
495	247,5	310
500	250	313
505	252,5	316
510	255	319
515	257,5	322
520	260	325
525	262,5	328
530	265	331
535	267,5	335
540	270	338
545	272,5	341
550	275	344
555	277,5	347
560	280	350
565	282,5	353
570	285	356
575	287,5	360
580	290	363
585	292,5	366
590	295	369
595	297,5	372
600	300	375
605	302,5	378

8. Electric Fuel Level Gauge (dia. 52mm)
(Fuel Level Sensor, Lever-Type)

8.3 Lever-Type Fuel Level Sensors

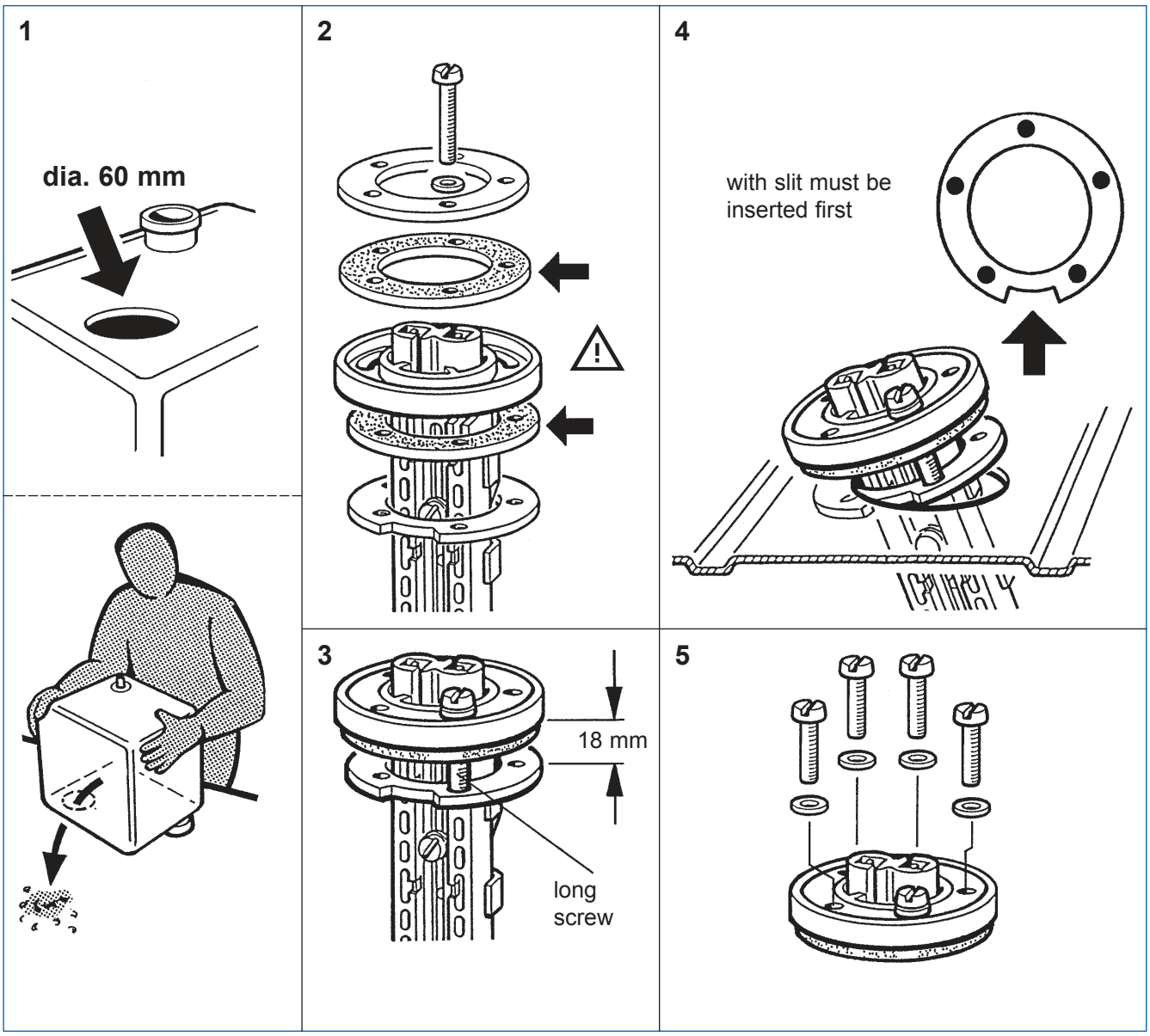
II) Lever-type sensor, adjustable (6V to 24V, insulated earth)

Installation informations
If an installation opening must be made, the tank must be completely drained first. Fill the fuel into an approved container. Remove the tank whenever possible. Comply with the safety instructions of the automobile manufacturer for any work performed under the automobile.



⚠ Risk of explosion exists due to presence of residual gases in the tank! Make sure that the tank is aired sufficiently (approx. 10 minutes).

Make a preliminary hole in the installation opening using a drill and then finish the hole using a compass saw or piercing saw. Comply with the safety instructions of the tool manufacturer. Clean the tank of residue from the drilling or sawing work.

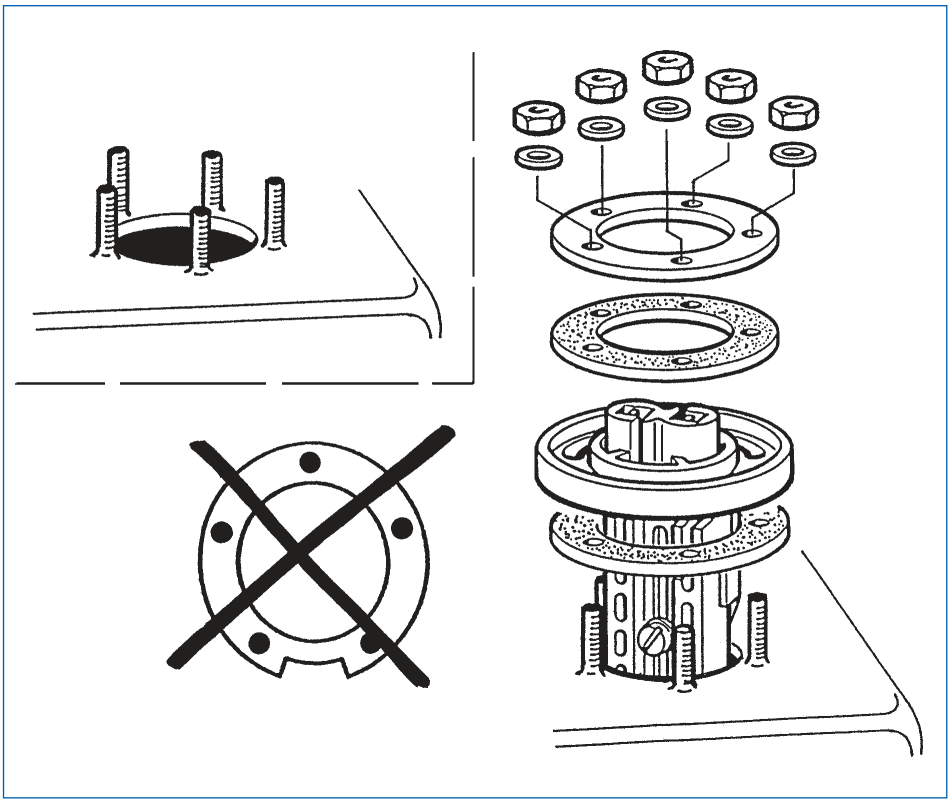


8. Electric Fuel Level Gauge (dia. 52mm)
(Fuel Level Sensor, Lever-Type)

8.3 Lever-Type Fuel Level Sensors

II) Lever-type sensor, adjustable (6V to 24V, insulated earth)

Installation informations for a tank mounting hole with threaded bolts:

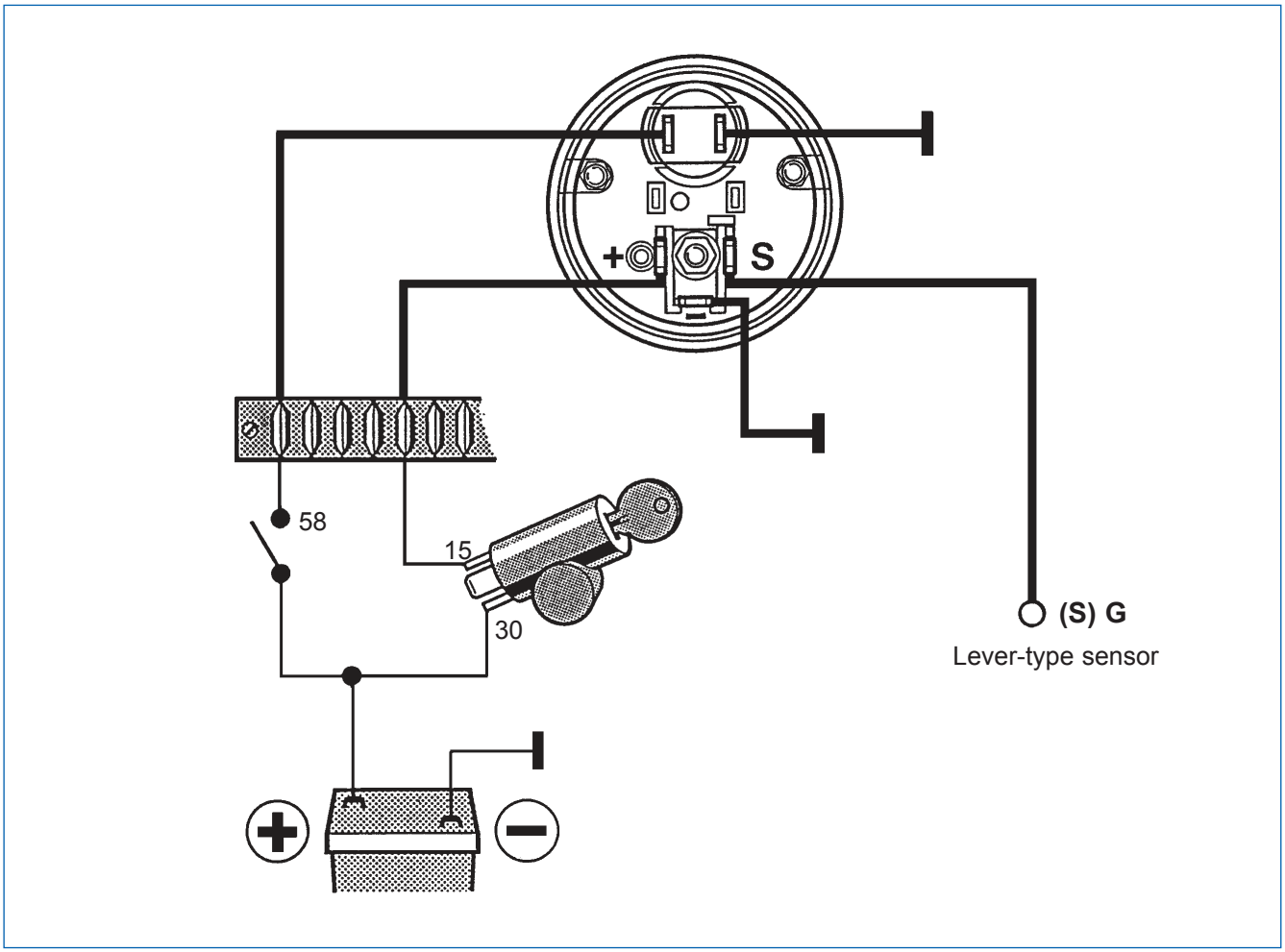


III) Lever-type sensor, special versions

See data sheets for sensors.

8. Electric Fuel Level Gauge (dia. 52mm)
(Fuel Level Sensor, Lever-Type)

8.4 Wiring Diagram



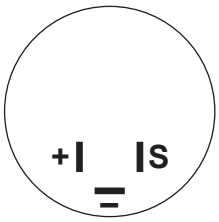
8. Electric Fuel Level Gauge (dia. 52mm)
(Fuel Level Sensor, Lever-Type)

8.5 Testing Instructions

Test accessories

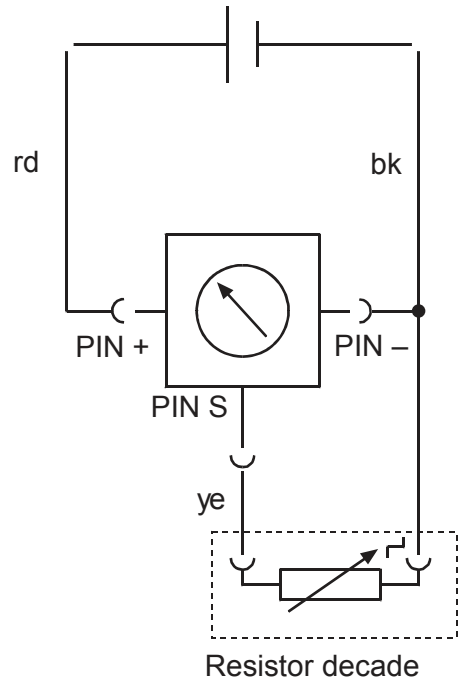
1x power supply
1x test cable No. 3 } contained in test kit
1x measuring cable } X12-019-101-001
1x resistor decade

Connector pin allocation



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

Test circuit diagram



Test method description

Basic setting:	12 V instruments	➡	14 V
	24 V instruments	➡	28 V

Start the pointer position test with the highest resistance value!

8. Electric Fuel Level Gauge (dia. 52mm)
(Fuel Level Sensor, Lever-Type)

8.5 Testing Instructions

Test of the movement

Connect the instrument according to the test circuit diagram, using test cable 3.

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

The pointer moves to full scale deflection if the resistor decade is not connected.

The following table shows the resistance values and the permissible indicatio tolerances in angular degrees.

Indication	0	1/4	1/2	3/4	1/1
Resistance (Ω)	3	45	85	138	180
Deflection (°∠)	0	17.2	41.2	73.8	88.8
Tolerance (°∠)	+ 3.6 - 3.6	± 3.6	± 3.6	± 3.6	+ 3.6 - 3.6

8. Electric Fuel Level Gauge (dia. 52mm)
(Fuel Level Sensor, Lever-Type)

8.6 Instruments Survey

VDO cockpit vision (Backlight) dia. 52 mm **Part No. 301-010-. . .**

Dial		Special feature	No.
Range	Imprint		
0 ... 1/1	0 - 1/2 - 1/1	Clamp ring 12 V Lever-type	**002K**
0 ... 1/1	0 - 1/2 - 1/1	Stud bolts 12 V Lever-type	**008K**

Part No. 301-020-. . .

Dial		Special feature	No.
Range	Imprint		
0 ... 1/1	0 - 1/2 - 1/1	Clamp ring,lever-type 24 V without colour caps	**001C**

VDO cockpit international (Floodlight) dia. 52 mm **Part No. 301-030-. . .**

Dial		Special feature	No.
Range	Imprint		
0 ... 1/1	0 - 1/2 - 1/1	Lever-type 12 V	**001C 001G**

Part No. 301-040-. . .

Dial		Special feature	No.
Range	Imprint		
0 ... 1/1	0 - 1/2 - 1/1	Lever-type 24 V	**001C 001G**

9. Electric Fuel Level Gauge (dia. 52 mm)
(Fuel Level Sensor, Tubular Type)

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Installation instructions

999-161-020: VDO cockpit vision
999-161-018: VDO cockpit international

See file ‘Installation Instructions (MA)’.

9. Electric Fuel Level Gauge (dia. 52 mm)
(Fuel Level Sensor, Tubular Type)

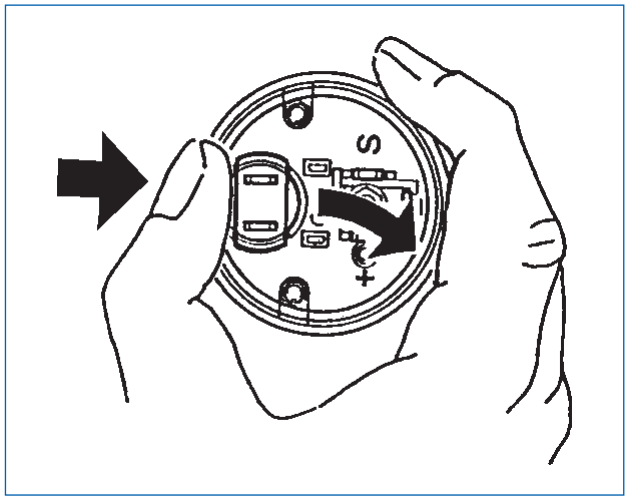
9.1 General Informations

The electric fuel level gauge has been designed for land-bound vehicles or stationary systems only (exception: motorcycles).

The instrument has an analog tank fuel level display graduated in fuel levels.
Tubular type sensors of various types can be used as sensors.

The instrument is adjusted by a potentiometer on the side of the instrument housing (see chapter 9.5).

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



9. Electric Fuel Level Gauge (dia. 52 mm)
(Fuel Level Sensor, Tubular Type)

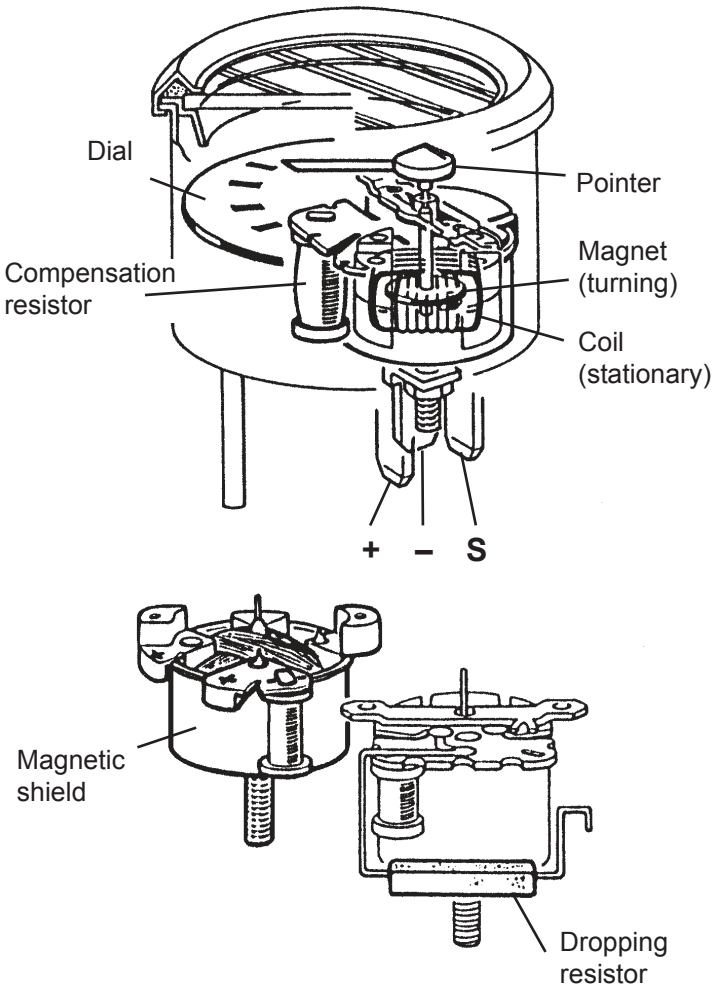
9.1 General Informations

Designation of function
Movement: System Ke (90°)
(Turning magnet movement for ratio indication, maximum pointer travel 90°)

The fuel reserve indicator applies the resistance measurement principle.
A sensor (tubular type) in the liquid at the measuring point converts the liquid reserve to a corresponding resistance value.
A turning magnet ratio measuring movement measures this resistance value.

If 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).



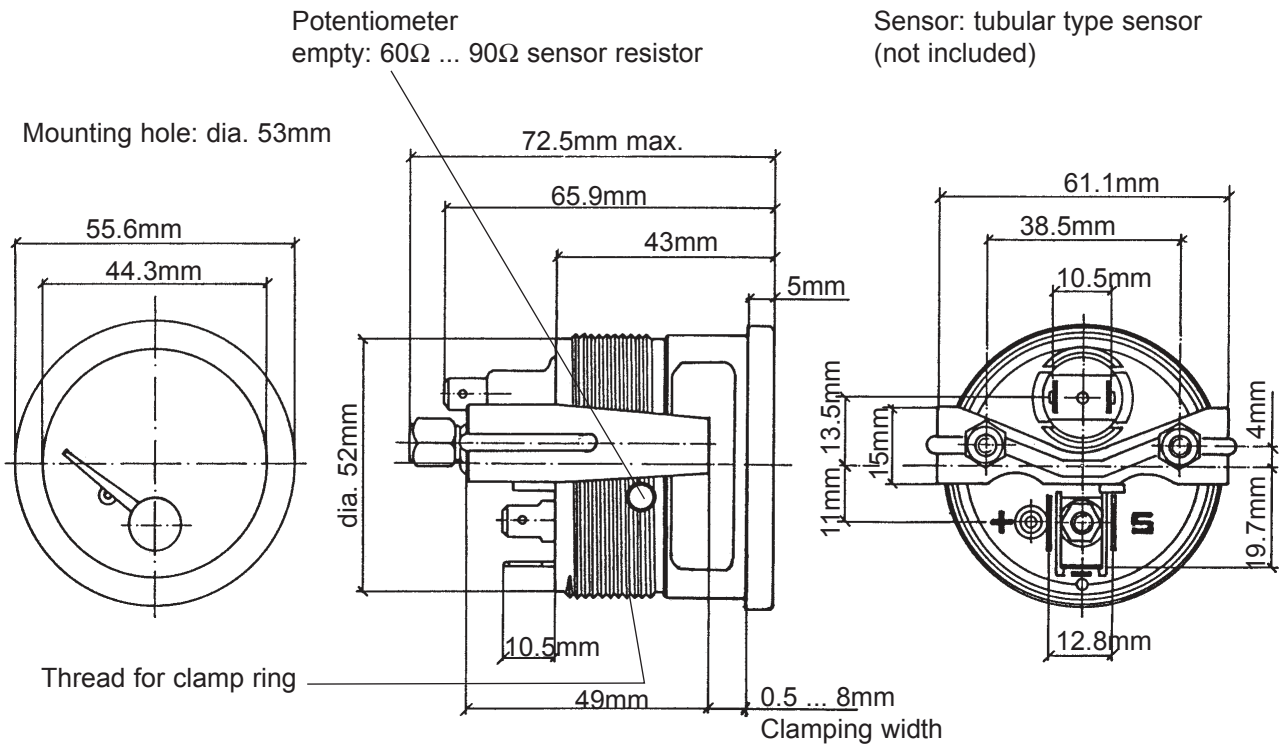
9. Electric Fuel Level Gauge (dia. 52 mm)
(Fuel Level Sensor, Tubular Type)

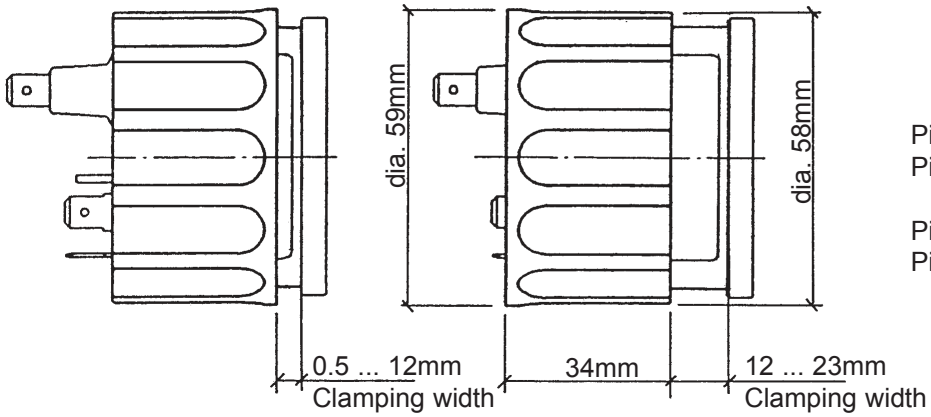
9.2 Technical Data

Operating voltage:	11 ... 16 V or 21.5 ... 30 V
Movement:	System Ke (90°)
Current consumption:	96 mA (without illumination)
Operating temp.:	– 30°C ... + 85°C
Storage temperature:	– 40°C ... + 90°C
Illuminanation:	1 light bulb 14 V, 3.4 W or 24 V, 3 W, 2 coloured 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 8 h, f: 1 octave/min.
Nominal position:	NL 0 to NL 90, DIN 16257

VDO cockpit vision

dia. 52 mm Backlight





Pin assignment:
Pin +: + 12 V or + 24 V terminal 15
Pin –: Ground, terminal 31
Pin S: Sensor

9. Electric Fuel Level Gauge (dia. 52 mm)
(Fuel Level Sensor, Tubular Type)

9.2 Technical Data

Operating voltage:	11 ... 16 V or 21.5 ... 30 V
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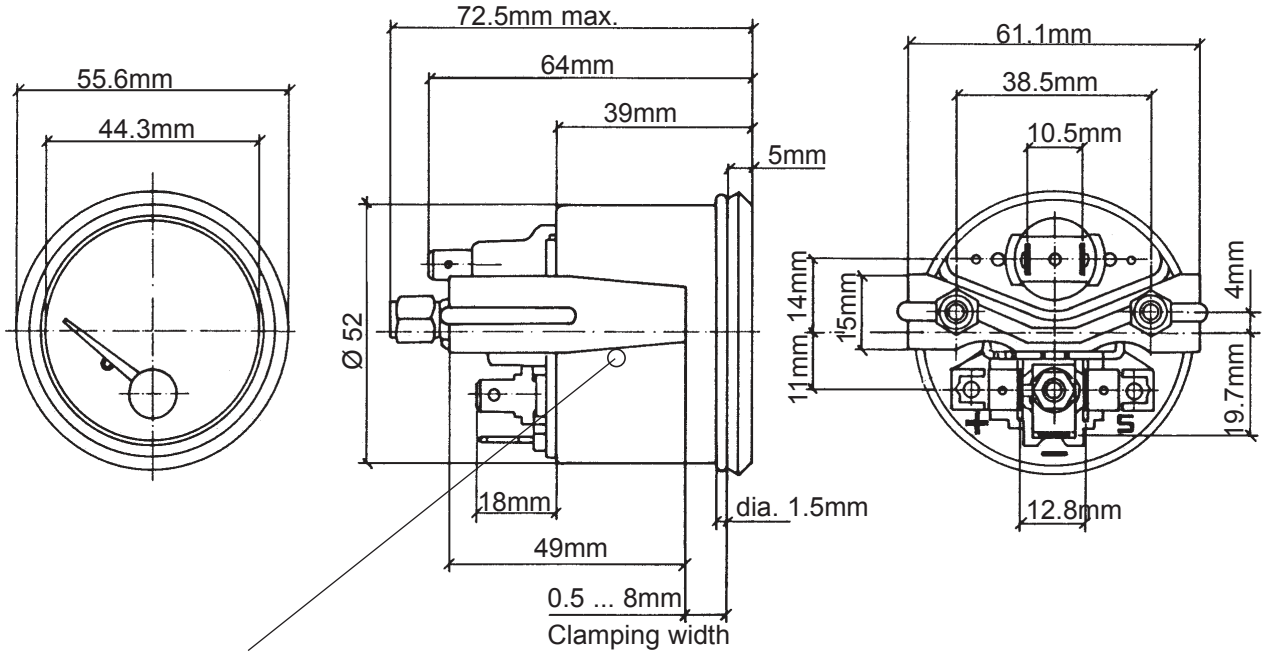
Illumination:	1 light bulb 14 V, 3.4 W oder 24 V, 3 W
Protection:	IP64 DIN 40050 from the front reverse-polarity protection
Vibration resistance:	max. 1g eff., 25 ... 2000 Hz, duration 8 h, f: 1 octave/min.
Nominal position:	NL 0 to NL 90, DIN 16257

VDO cockpit international

dia. 52 mm Floodlight

Mounting hole: dia. 53mm

Sensor: tubular type
(not included)



Potentiometer
empty: 60Ω ... 90Ω sensor resistor

Pin assignment:
Pin +: + 12 V or + 24 V terminal 15
Pin –: Ground, terminal 31
Pin S: Sensor

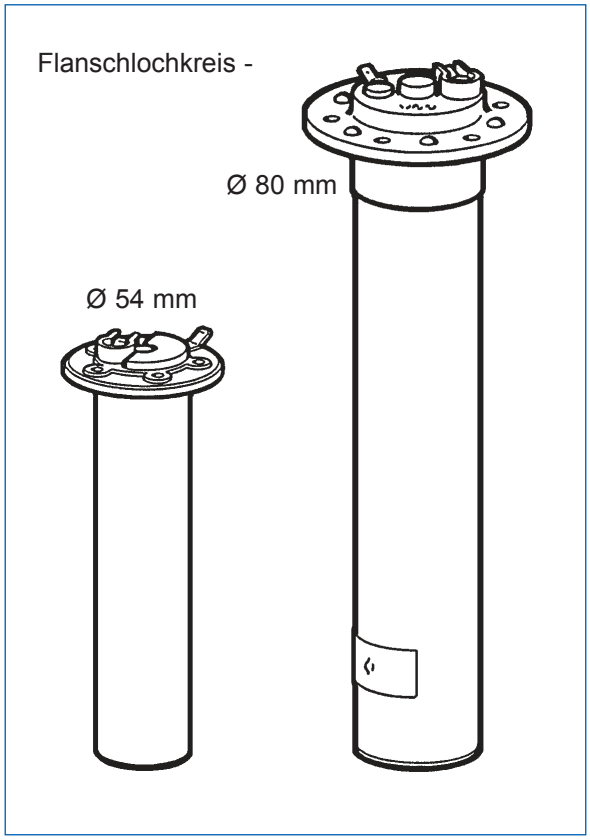
9. Electric Fuel Level Gauge (dia. 52 mm)
(Fuel Level Sensor, Tubular Type)

9.3 Tubular Type Fuel Level Sensors

The tubular type fuel level sensor needed to operate the instrument is not included with the instrument.

Tubular type fuel level sensors with flange, hole circle dia. 54mm or 80mm, or special flange (see data sheets for sensors) can be used.

The sensor is installed in a mounting hole made in the tank at a good position for fuel measurement, or on a mounting flange provided by the tank manufacturer, or in an existing mounting hole.



Tubular type fuel level sensor with flange, hole circle dia. 54 mm

This metal sensor (6 V to 24 V, negative earth) is available in different lengths.

Accessories:
screw-fixation tank flange with sealing and mounting parts
or
weld-type tank flange,
sealing,
mounting parts.

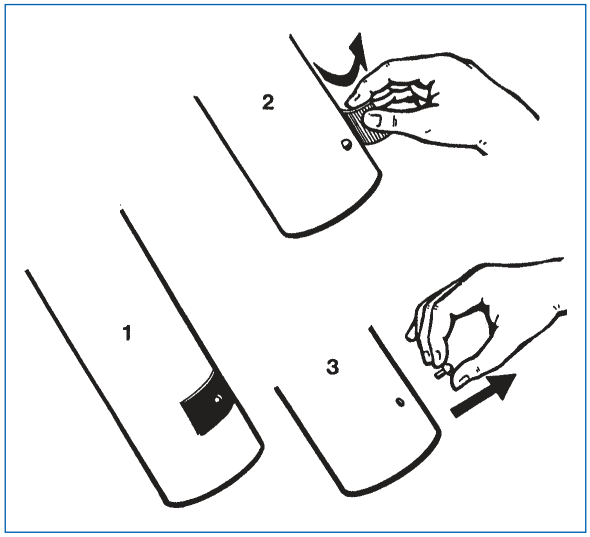
Tubular type fuel level sensor with flange, hole circle dia. 80 mm

This metal sensor (6 V to 24 V, negative earth or insulated earth) is available in different lengths.

Accessories:
weld-type tank flange,
sealings,
mounting parts.

Tubular type fuel level sensor with special flange

This metal sensor (6 V to 24 V, negative earth or insulated earth) with special flange (bayonet flange, thread flange or special type flange) is available in different lengths.

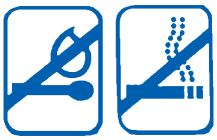


Prior to installation remove the adhesive tape on the dip tube and the float retaining pin.

9. Electric Fuel Level Gauge (dia. 52 mm)
(Fuel Level Sensor, Tubular Type)

9.3 Tubular Type Fuel Level Sensors

Installation informations for tubular type sensor (flange hole circle dia. 54 mm) with a tank flange for screw fixation

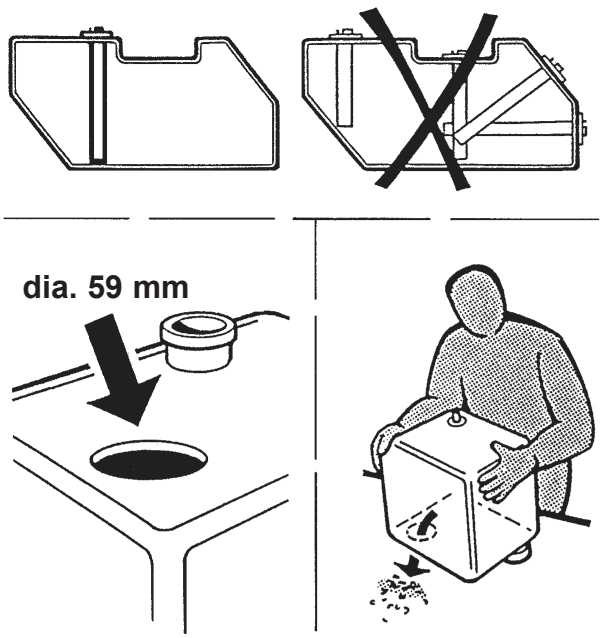


If an installation opening must be made, the tank must be completely drained first.
Fill the fuel into an approved container.
Comply with the safety instructions of the automobile manufacturer for any work performed under the automobile.

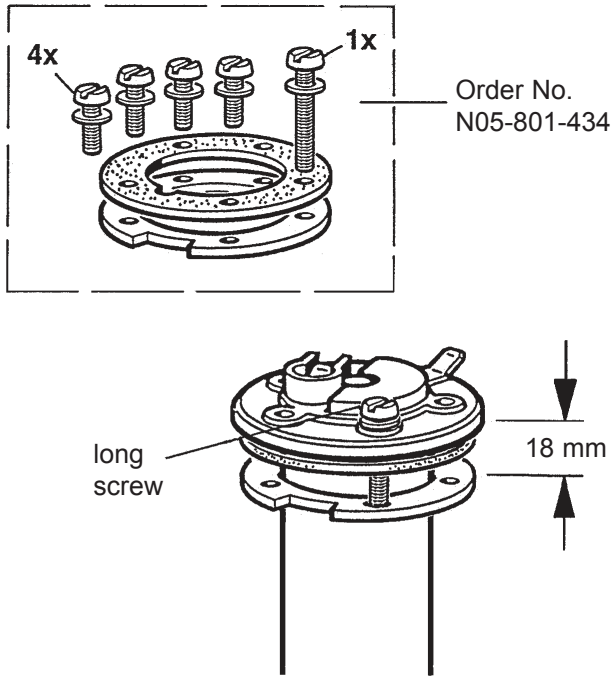
⚠ Risk of explosion exists due to presence of residual gases in the tank!
Make sure that the tank is aired sufficiently (approx. 10 minutes).

Make a preliminary hole in the installation opening using a drill and then finish the hole using a compass saw or piercing saw. Comply with the safety instructions of the tool manufacturer. Clean the tank of residue from the drilling or sawing work.

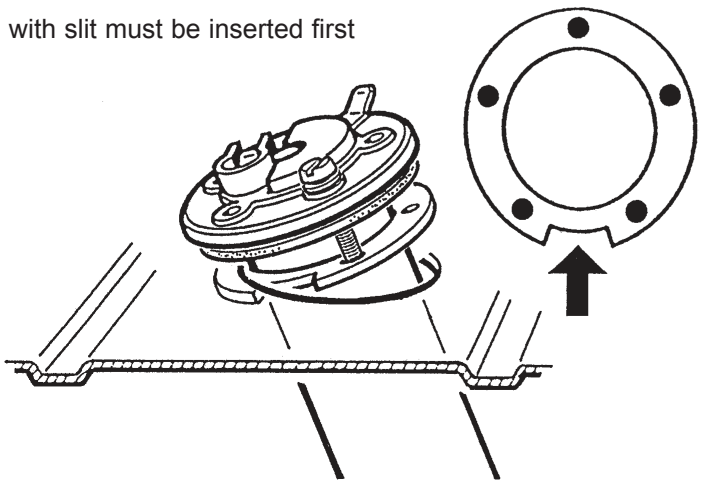
1



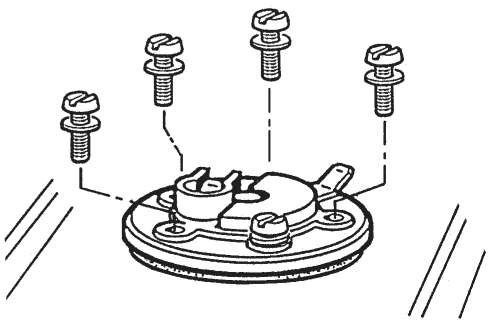
2



3 with slit must be inserted first

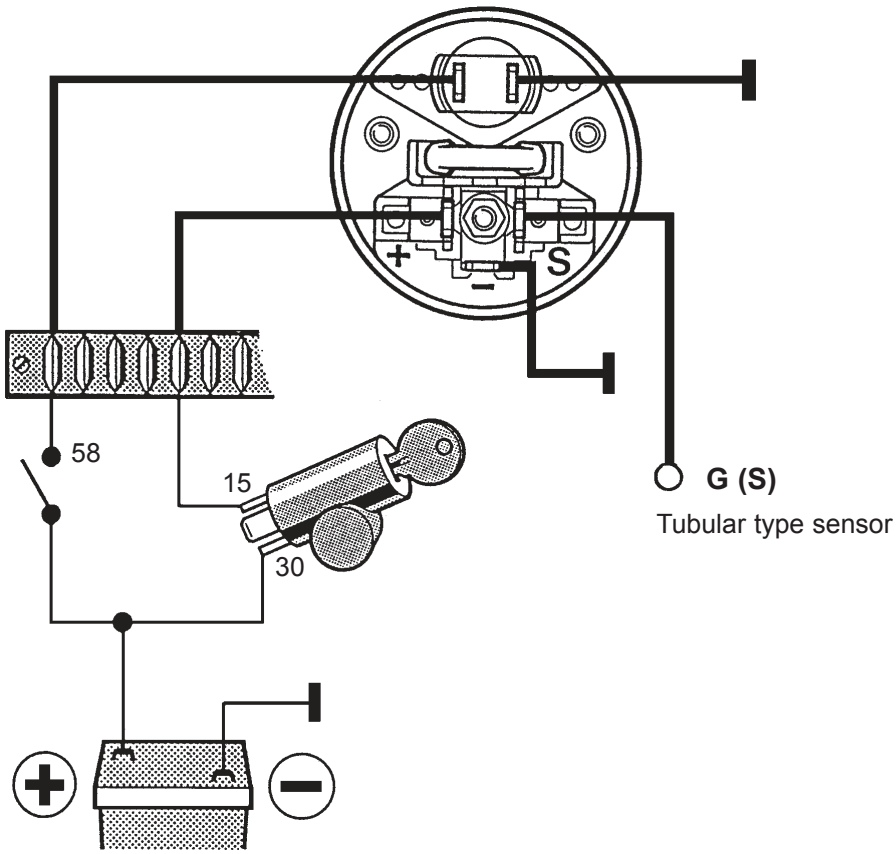


4



9. Electric Fuel Level Gauge (dia. 52 mm)
(Fuel Level Sensor, Tubular Type)

9.4 Wiring Diagram



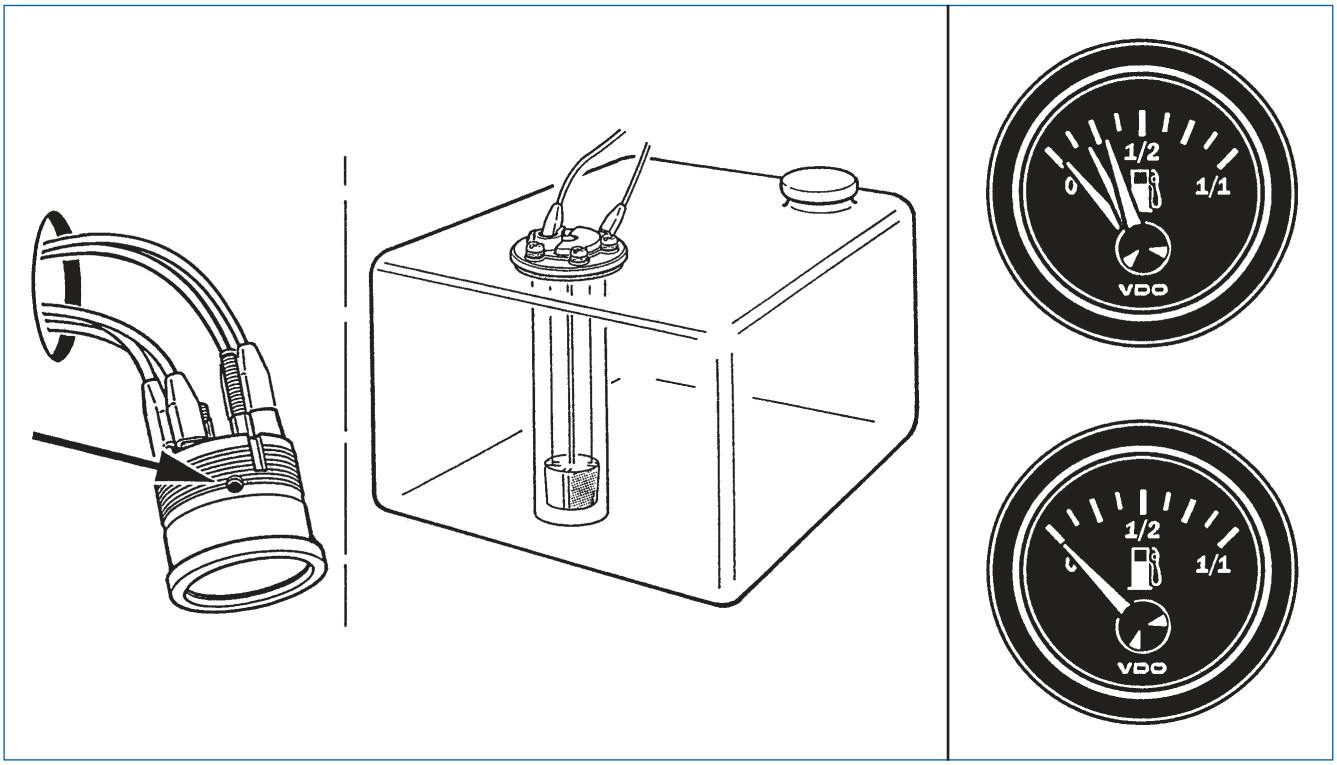
9. Electric Fuel Level Gauge (dia. 52 mm)
(Fuel Level Sensor, Tubular Type)

9.5 Adjustment

Indicating instrument and sensor must be adjust as a matched pair (in the sensor resistor range from 60Ω to 90Ω).

⚠ Make adjustment with empty tank.

Adjust indicating instrument by potentiometer on the side of the instrument housing to set the pointer to zero. Use an insulated screwdriver.



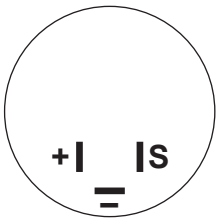
9. Electric Fuel Level Gauge (dia. 52 mm)
(Fuel Level Sensor, Tubular Type)

9.6 Testing Instructions

Test accessories

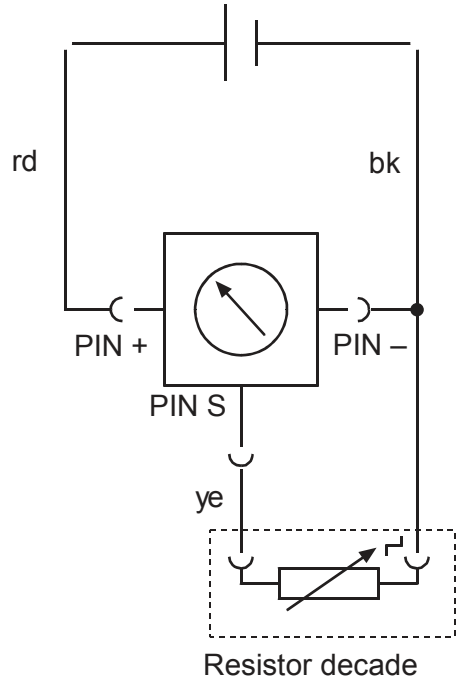
1x power supply
1x test cable No. 3 } contained in test cables kit
1x measuring cable } X12-019-101-001
1x resistor decade

Pin allocation



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

Test circuit diagram



Test metho description

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

Start the pointer position test with the lowest resistance value!

9. Electric Fuel Level Gauge (dia. 52 mm)
(Fuel Level Sensor, Tubular Type)

9.6 Testing Instructions

Test of the movement

Connect the instrument according to the test circuit diagram, using test cable 3.

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

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

Indication	0	¼	½	¾	1/1
Resistance (Ω)	60 ... 90				0.5
Deflection (∡°)	0	24	48	67	87.5
Tolerance (∡°)	+ 3.6 – 3.6				+ 3.6 – 3.6

9. Electric Fuel Level Gauge (dia. 52 mm)
(Fuel Level Sensor, Tubular Type)

9.7 Instrument Survey

VDO cockpit vision (Backlight) dia. 52 mm **Part No. 301-010-. . .**

Dial		Special feature	Part No.
Range	Imprint		
0 ... 1/1	0 - 1/2 - 1/1	adjustable, clamp ring tubular type 12 V	**001K**
0 ... 1/1	0 - 1/2 - 1/1	adjustable, stud bolts tubular type 12 V	**007K**

Part No. 301-020-. . .

Dial		Special feature	Part No.
Range	Imprint		
0 ... 1/1	0 - 1/2 - 1/1	adjustable, clamp ring, 24 V tubular type, w ithout colour caps	**002C**

VDO cockpit international (Floodlight) dia. 52 mm **Part No. 301-030-. . .**

Dial		Special feature	Part No.
Range	Imprint		
0 ... 1/1	0 - 1/2 - 1/1	adjustable tubular type 12 V	**002C** **002G**

Part No. 301-040-. . .

Dial		Special feature	Part No.
Range	Imprint		
0 ... 1/1	0 - 1/2 - 1/1	adjustable tubular type 24 V	**002C** **002G**