

Section 3 Electrical system

Group 31 Battery

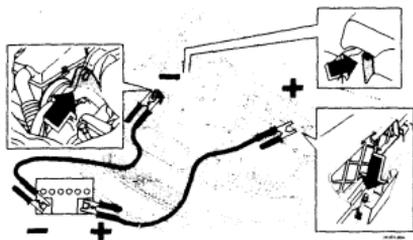
System voltage, with ignition off:	12.5 - 12.7 V
A newly charged battery may have a higher voltage.	

Battery capacity

Cold start current* CCA SAE	Capacity	Reserve capacity** RC SAE	Recommended charge current
600 A	65 Ah	115	6 A
800 A	90 Ah	170	9 A

* **Cold start current (CCA, SAE)** is the discharge current which a battery can provide for 30 seconds, at a temperature of -18°C (0°F) without the voltage dropping below 7.2 V.

** **Reserve capacity (RC, SAE)** is the time taken at a temperature of $+27^{\circ}\text{C}$ (81°F), and a discharge current of 25 A, to reduce the voltage of a fully charged battery to 10.5 V.

**Terminal for jump starting:**

The battery positive lead is routed to the terminal for jump starting located beside the engine compartment relay / fusebox.

Battery discharge protection:

To avoid involuntary battery discharge through the cargo compartment electrical outlet there is a control circuit in the rear electronic module (REM).

If the current in the circuit exceeds 60 mA the following occurs:

- 1) A text message is posted in the DIM when the key is turned from I to 0.
- 2) A short warning signal is heard when the ignition key is removed from the ignition switch.

XC90

Group 32 Generator/ Charge regulator

Group 32 Generator / Charge regulator

Generators, electrical and mechanical data:

Generator (GEN) Type:	BOSCH E140/8 14 V / 140 A BOSCH P10 14 V / 160 A
Generator (GEN) 140 A Volvo P/N	86 02 710
Generator (GEN), 6 cylinders 140 A Volvo P/N	86 02 712
Generator (GEN) 160 A Volvo P/N	86 02 714
Direction of rotation	Anticlockwise
Current strength at 13.5 V: E140/8 A P10 A Measured at a temperature of 25°C (77°F). Stabilised output voltage. Engine speed (RPM): 11.3rps/680rpm.	75 100
Current strength at 13.5 V: E140/8 A P10 A Measured at a temperature of 25°C (77°F). Stabilised output voltage. Engine speed (RPM): 38.3 rps/2300 rpm.	140 160
Nominal output: E140/8 W P10 W Maximum speed rps (rpm)	1960 2240 113 (6800)
Carbon brushes, minimum length	5.0 mm (0.197")
Tightening torques: Mounting screw for rear cover, use B+ terminal ... Nm / lbf ft. Mounting screw for rear cover, do not use B+ terminal ... Nm / lbf ft. Mounting screw for rear cover, fixing screw Nm / lbf ft. E140/8 Nm/lbf ft. Mounting screw for rear cover, ground screws ... Nm / lbf ft. E140/8 Nm/lbf ft.	30/22 12/9 4/3 2.6/1.9 1.7/1.2 2.4/1.7

Generator (GEN)	BOSCH E140/8	
Type:	14 V / 140 A	
Mounting screw for regulator, phase connector Nm / lbf ft.	0.8/0.6	
E140/8 Nm/lbf ft.	1.4/1.0	
Nut with left-hand thread for fixed pulley Nm / lbf ft.	65/48	
Nut with left-hand thread for freewheel pulley Nm / lbf ft.	80/60	
Test values:		
Resistance, rotor winding Ω	2.6	
Resistance, stator winding Ω /phase	0.06	
E140/8 Ω /phase	0.04	
NOTE: Measured with a low ohm voltmeter		

Charge regulators, electrical and mechanical data:

Charge regulator	BOSCH	
Type:		
Volvo P/N 140/160 A	86 37 851	
	Measured in the car	Measured at the test bench
Conditions:		
Battery charging	75%	100%
Air temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)	25 $^{\circ}$ (77 $^{\circ}$)	25 $^{\circ}$ (77 $^{\circ}$)
Temperature, regulator warm $^{\circ}\text{C}$ ($^{\circ}\text{F}$)	60 $^{\circ}$ - 80 $^{\circ}$ (140 $^{\circ}$ - 176 $^{\circ}$)	60 $^{\circ}$ - 80 $^{\circ}$ (140 $^{\circ}$ - 176 $^{\circ}$)
Test values:		
Generator (GEN) speed rps (rpm)	100 (6000)	
Engine speed (RPM) rps (rpm)	38.3 (2300)	
Generator (GEN) load A	25 - 45	25 - 45
Vehicle basic load		
Control voltage between the B+ connection and the generator housing. The voltage reading should be made at the earliest 10 seconds after starting.		
Generator:		
8602710, 8602712, 8602714 V	13.7 - 14.6	14.1 - 14.9

XC90

Group 33 Starter motor

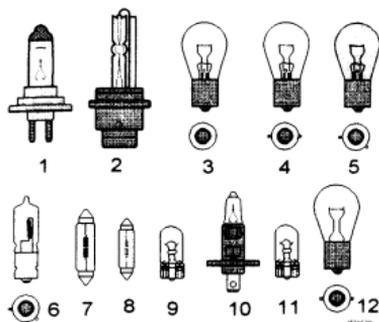
Group 33 Starter motor

P/N and test data:

Starter motor	Bosch 12 V	
Type / Test data		
1.4 kW Petrol	Volvo P/N.	81 11 302
1.7kW Petrol 6 cyl. man	Volvo P/N	81 11 007
1.7kW Petrol 6cyl. aut	Volvo P/N.	81 11 199
2.0 kW Diesel VW (S80, V70)	Volvo P/N.	86 02 360
2.2 kW Diesel new engine diesel	Volvo P/N.	86 02 355
Control solenoid:		
Lowest connection voltage	V	7.4

Starter motor, type	Bosch 12 V 1.4 kW	Bosch 12 V 2.0 kW	Bosch 12 V 2.2 kW
Direction of rotation	Clockwise	Clockwise	Clockwise
Test value, starter motor unloaded:			
11.3 V and maximum 70 A, min. rpm (rps)	2900 (48.3)		
11.3 V and maximum 140 A, min. rpm (rps)		4900 (81.6)	
11.4 V and maximum 125 A, min. rpm (rps)			4535
Test value, starter motor locked:			
4.0 V and 0 rpm	A 650-750		
4.0 V and 0 rpm	A	700 - 1000	
5.3 V and 0 rpm	A		1440
Control solenoid:			
Lowest connection voltage ...	V 7.4	7.0	7.4

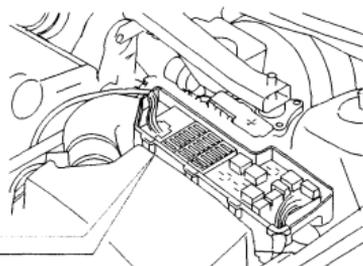
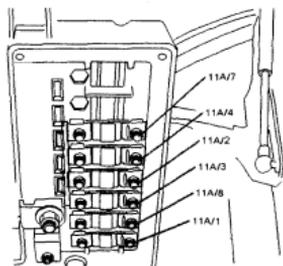
Group 35 Lighting



Bulbs (Market dependent)

Location:	Power W	Lamp type	Figure number
Headlamps, high beam, low beam	55	H7	1
Headlamp with Xenon bulb. Warning: High voltage!	35	D2R	2
Tail lamps	21	BA15	3
Stop (brake) lamps	21	BA15	4
Indicator lamp rear (yellow)	21	BA15	5
Indicator lamp front	21	BA9s	6
Courtesy lighting	5	SV8.5	7
Cargo compartment	5	SV8.5	7
Vanity mirror	1.2	SV5.5	8
Number plate lighting	5	2.1x9.5d	9
Position lamps, parking lamps, front	5	2.1x9.5d	9
Sidemarkers lamps	5	2.1x9.5d	9
Side indicator flasher	5	2.1x9.5d	9
Fog lamps	55	H1	10
Rear fog lamps	21/4	BA15	11
Parking lamps, rear	5	BA15	12

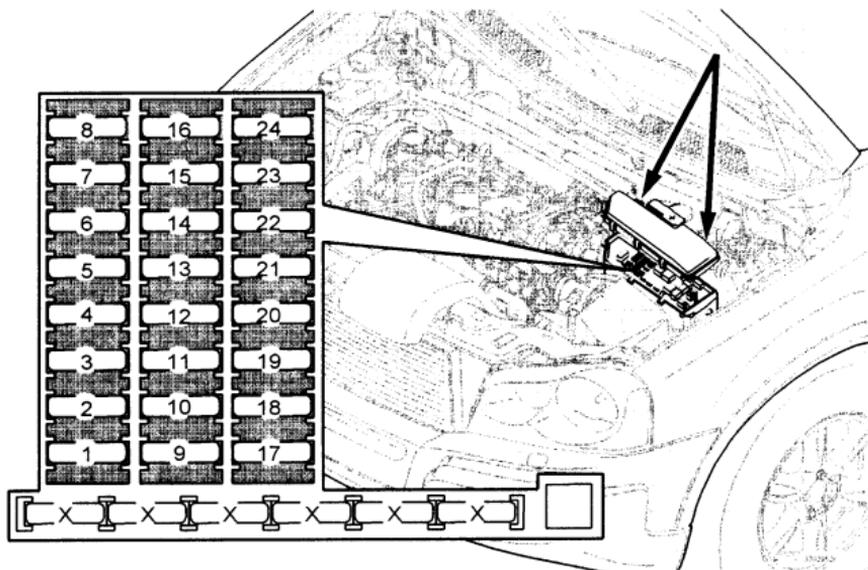
Group 37 Fuses



R3703080

11A**Main fuses in the engine compartment**

Fuse number:	Function	A
1	Glow plugs via 2/14	60
2	Fusing for 11C: 5-7, 25-27, 32-33 via 2/61	60
3	Fusing for 11C: 2-4, 8-11 via 2/30, 16-19 via 2/31 34-38	60
4	Fusing 11C: 1, 12-15, 20-24	60
5	-	
6	-	
7	-	60
8	Engine cooling fan (FC)	80



R3702992

11B

Fuses in the engine compartment

Fuse number:	Function	A
1	Control module, additional heater,	25
2	Accessories, auxiliary lamps	20
3	–	
4	Heated oxygen sensors (HO2S), solenoid valve Diesel	20
5	Pump fuel leakage	10
6	Canister purge (CP) valve, camshaft position sensor, EVAP canister shut-off valve	
6	PTC resistor air preheating, turbocharger (TC) control valve	
6	Fuel rail Bi-fuel	
6	Engine control module (ECM), mass air flow (MAF) sensor, injectors	15
6	Mass air flow (MAF) sensor Diesel	5
7	–	-
8	Fan electronic box engine compartment. Sensor accelerator pedal (AP). Magnetic clutch climate control.	10
9	Horn	15
10	Rear windscreen washer motor	10

XC90

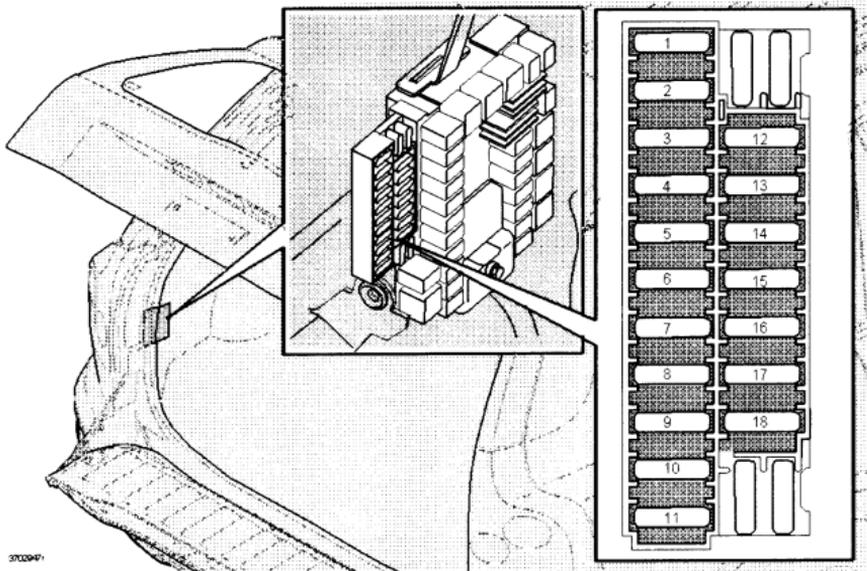
Group 37 Fuses

11B		
Fuses in the engine compartment		
Fuse number:	Function	A
11	Automatic glow plug. Spark plugs with ignition coils. Climate control unit. Engine pad solenoid valve. Air preheating, Diesel. Variable turbo geometry	20
12	Brake lamp switch	5
13	Windscreen wipers	25
14	Brake control module (BCM)	30
15	High-pressure cleaning headlamps	25
16	Windscreen washer motor, headlight wipers	15
17	Low beam right. Bi-Xenon right	10
18	Low beam left. Bi-Xenon left	10
19	Brake control module (BCM)	30
20	Left high beam	15
21	High beam right	15
22	Starter motor	25
23	Engine control module (ECM)	5

XC90

Group 37 Fuses

11C		
Passenger compartment fuses		
Fuse number:	Function	A
12	Starter motor. Engine control module (ECM). Central electronic module (CEM). Supplementary restraint system (SRS). Antenna ring / ignition switch illumination. Connector accessory	10
13	–	–
14	Upper electronic module (UEM). Control unit roof lamp, reading lamps, vanity mirror lighting.	10
15	Phone module (PHM)	10
16	Power steering, Vacuum pump	5
17	Brake control module (BCM). Steering wheel angle sensor (SAS)	30
18	Seat heater left	15
19	Seat heater right	15
20	Audio module (AUD). Multimedia display. MD module (MP1). CD module (MP2). Multimedia Module (MMM). Infotainment Control Module (ICM)	10
21	Driver information module(DIM). Power seat module (PSM) driver's seat. Control unit climate control module (CCM). Combustion Preheater Module (CPM)	10
22	Data Link Connector (DLC). Lighting control unit. Control unit climate control module (CCM). Control unit control stalks steering wheel module (SWM)	5
23	Indicator lamps	20
24	Gear selector module (GSM). Geartronic. Gearbox control module (TCM). Gear change inhibitor (shift lock)	10
25	Fuel pump	15
26	Sun roof motor	15
27	Central electronic module (CEM)	10
28	Siren control module	10
29	–	–
30	Lamp housing front left. Daytime running lamps	10
31	Lamp housing front right. Daytime running lamps	10
32	Parking lamps front, left. Tail lamp left	7.5
33	Parking lamps front right. Tail lamp right. Number plate lighting	10
34	Front fog lamps	15
35		—
36	Fuses in fusebox engine compartment	20
37	Multimedia display. MD module (MP1). CD module (MP2), Accessory wiring infotainment	10
38	Fuses in fusebox passenger compartment	15



3700947

R3702947

11D

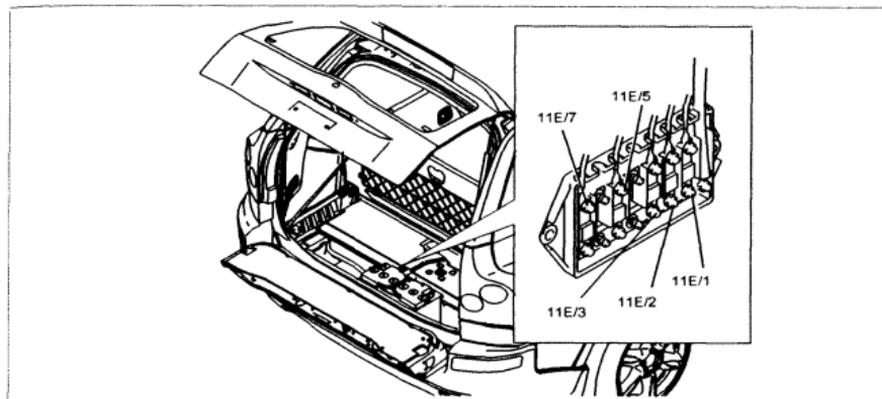
Fuses, cargo compartment

Fuse number:	Function	A
1	Cargo compartment lighting tailgate.	10
2	Rear fog lamps	10
3	Stop (brake) lamps	15
4	Reversing lamps	10
5	Rear demist, relay 15l supply, Fuel filter	5
6	Lock tailgate	10
7	Electrical outlet cargo compartment	15
8	Central locking rear doors, fuel tank filler flap	20
9	Tow hitch wiring 30+	15
10	Antenna module (ATM)	5
11	Accessory electronic module (AEM)	15
12	Motor rear window wiper	15
13	Bass speakers cargo compartment. Climate control system rear	15
14	Stop (brake) lamps	7.5
15	Parking assistance module (PAM). Tow hitch for trailer, 15 +	20
16	-	-

XC90

Group 37 Fuses

11D Fuses, cargo compartment		
Fuse number:	Function	A
17	Fuel filter preheater. Differential electronic module (DEM)	7.5
18	Electronically heated fuel filter, Temperature switch fuel filter	15



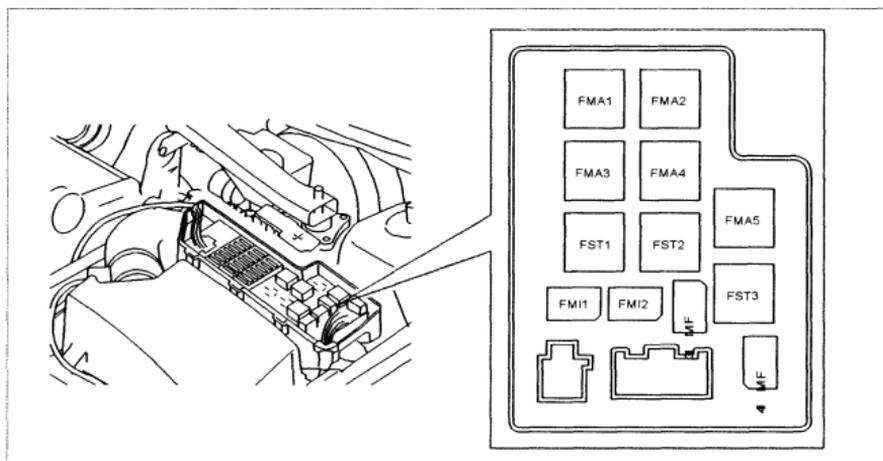
R3703076

11E
Main fuses at battery

Fuse number:	Function	A
1	Fusing for 11D: 15-18 via 2/52	40
2	Fusing for 11D: 12-14	40
3	Heated rear window	40
4	-	-
5	Fusing for 11D: 6-11	40
6	-	-
7	Fusing for 11D: 1-5	40

XC90

Group 37 Fuses

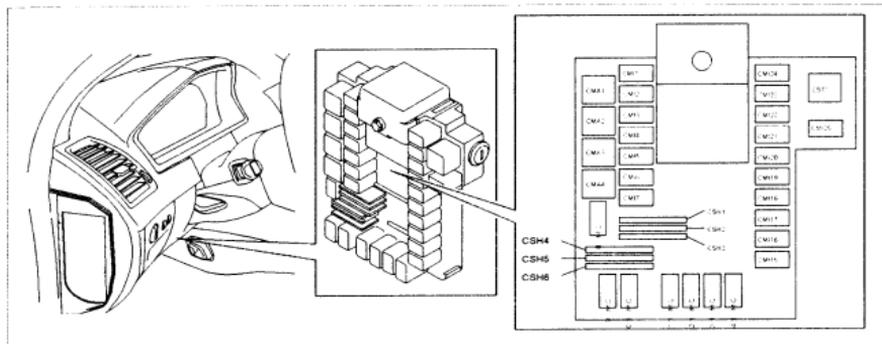


R3703081

Relays / Shunts

Located in engine compartment

Position	Function
FMA2	Main relay for the engine management system 2/32
FMA3	Glow plug relay (diesels) 2/14
FMA4	Relay for the starter motor 2/35
FMI1	Relay climate control system 2/22
FMI2	Horn relay 2/17
FMI3	Relay windscreen washer motor 2/92
FMI4	Relay washer pump rear windscreen 2/93
FST1	Intermittent windscreen wiper relay 2/91
FST2	Relay high-pressure cleaning
FST3	Relay windscreen wiper low / high speed 2/90

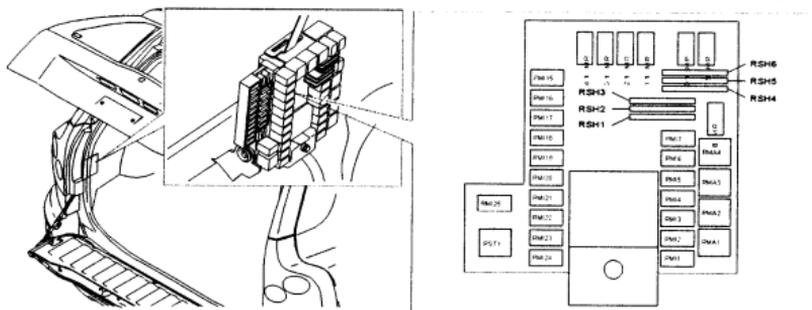


R3703077

Relays / Shunts

Located in the passenger compartment

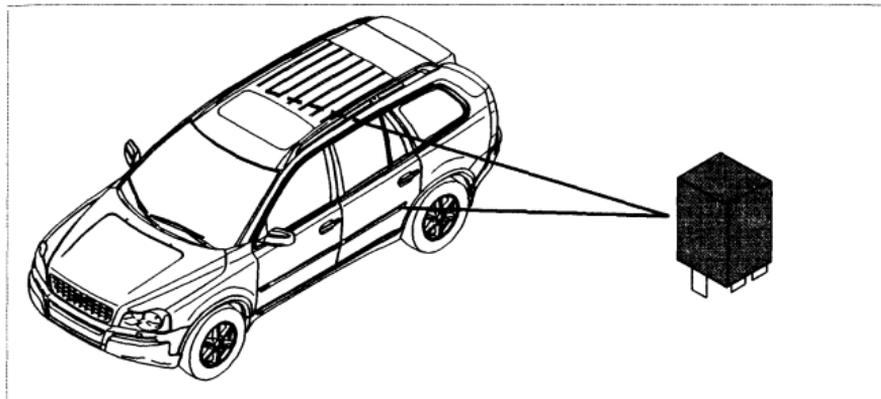
Position	Function
CMA2	X-supply overload relay 2/30
CMA3	15-supply overload relay (2/31)
CMI1	Left rear power window up relay 2/116
CMI2	Left rear power window down relay 2/118
CMI3	Power window child safety block relay rear doors 2/120
CMI4	High beam relay 2/63
CMI5	Parking lamp relay 2/61
CMI6	Relay daytime running lamps 2/152
CMI7	Low beam relay 2/62
CMI11	Fog lamp relay, front 2/34
CMI12	Fuel pump (FP) relay 2/23
CMI14	Relay fuel leakage check 2/143
CMI16	Relay infotainment 2/159
CMI21	Real extended D2 supply automatic gearbox 2/101
CMI22	Relay extended D1-supply 2/29
CMI23	Right rear power window down relay 2/119
CMI24	Power window up relay right rear 2/117
CSH1	Left indicator lamp shunt in CEM 20/32
CSH2	Right indicator lamp shunt in CEM 20/34
CSH4	Low beam shunt in CEM 20/27



R3703078

Relays / Shunts Located in cargo compartment

Position	Function
RMA1	Relay 15l-supply rear 2/52
RMA2	Relay subwoofer module (SUB) 2/157
RMA3	Relay rear demist 2/82
RM11	Relay locking rear doors, fuel tank filler cover 2/158
RM12	(2/112) Left rear central unlocking relay
RM13	Relay rear door deadlocking 2/115
RM14	Reversing lamp relay 2/80
RM15	Brake lamp relay 2/79
RM16	Fog tail lamp relay 2/49
RM17	Trailer fog lamp relay 2/83
RM18	Relay fuel filter preheater 2/142
RM13	Tailgate wiper relay 2/72
RM16	Relay on/off intermittent tailgate wiper 2/16
RM18	Relay climate control system rear
RM19	Relay unlocking tailgate 2/87
RM121	Relay unlocking fuel tank filler cover 2/59
RM123	Relay unlocking right rear door 2/114
RSH2	Rear fog lamp shunt 20/29
RSH3	Shunt power socket cargo compartment 20/39
RSH6	Shunt brake lamp 20/31



R3703079

Other relays Located by the right, left rear door

Position	Function
Left	Relay deadlocking left rear 2/138
Right	Relay deadlocking right rear 2/139

Group 38 Instruments, sensors

Fuel level sensor:	Fuel tank unit, left-hand side: Measured across the terminal pin 5 and 6. Resistance Ω	Fuel tank unit, right-hand side: Measured across the terminal pin 6 and 7. Resistance Ω
Empty fuel tank	374	393
Half tank	133 - 136	129 - 133
Full fuel tank	12	12

Note! During installation the left level sensor must have a resistance in excess of 125 Ω .

Engine coolant temperature (ECT) sensor:

Temperature: °C (°F)	0° (32°)	10° (50°)	20° (68°)	40° (104°)	80° (176°)	100° (212°)
Resistance	5740	3700	2450	1150	318	184
Voltage	2.65	2.10	1.62	0.92	0.29	0.17

Speedometer

Speedometer, resistance in sensor	Cannot be measured. Check using a VADIS station.
---	---