Signal specification

General

All values given below are between the terminals stated in column 1 and breakout box terminal in the terminal) and terminal #B1 (#C1) unless otherwise indicated in column 6 (Miscellaneous).

Control module terminals:

- #A1-#A60 correspond to adapter connector A (breakout box #A1-#A60)
- #A61-#A96 correspond to adapter connector B (breakout box #B1-#B36)
- #B1-#B58 correspond to adapter connector C (breakout box #C1-#C58).

Note! It is important to connect the breakout box and check the ground terminals before taking readings.

U= DC voltage in volts (V)

U_{bat} = Battery voltage (V)

U_{low} = Voltage approximately 0 V

Connector A					
Contr modu termi	Break box termi	Signal type	Ignition on	Idle	Other
#A1	#A1	Injector no. 1, control signal	U = U_{bat}	t= 1-3 ms	t increases with engine speed (RPM) and load
#A2	#A2	Injector no. 3, control signal	U = U_{bat}	t= 1-3 ms	t increases with engine speed (RPM) and load
#A3	#A3	Injector no. 5, control signal	U = U_{bat}	t= 1-3 ms	t increases with engine speed (RPM) and load
#A4	#A4	-	-	-	
#A5	#A5	-	-	-	
#A6	#A6	-	-	-	
#A7	#A7	-	-	-	
#A8	#A8	-	-	-	
#A9	#A9	-	-	-	

#A10	#A10	-	-	-	
#A11	#A11	-	-	-	
#A12	#A12	-	-	-	
#A13	#A13	Camshaft position (CMP) sensor, exhaust, power supply 5 V	U =5 V	-	
#A14	#A14	-	-	-	
#A15	#A15	Fuel pressure sensor, signal ground	U=U_{low}	U = Ulow	See relevant wiring diagram for information about connected sensors.
#A16	#A16	Intake camshaft position (CMP) sensor, power supply 5 V	U =5 V	-	
#A17	#A17	Sensor, power supply 5 V	U =5 V	-	See relevant wiring diagram for information about connected sensors.
#A18	#A18	Sensor, power supply 5 V	U =5 V	-	See relevant wiring diagram for information about connected sensors.
#A19	#A19	Throttle position (TP) sensor, power supply 5 V	U =5 V	-	
#A20	#A20	-	-	-	
#A21	#A21	LIN bus (Local Interconnect Network)	-	-	Alternator control module (ACM) 2005-.
#A22	#A22	-	-	-	
#A23	#A23	-	-	-	
#A24	#A24	-	-	-	
#A25	#A25	Injector no. 2, control signal	U = U_{bat}	t= 1-3 ms	t increases with engine speed (RPM) and load
#A26	#A26	Injector no. 4, control signal	U = U_{bat}	t= 1-3 ms	t increases with engine speed (RPM) and load
#A27	#A27	-	-	-	
#A28	#A28	-	-	-	
#A29	#A29	-	-	-	
#A30	#A30	-	-	-	
#A31	#A31	-	-	-	
#A32	#A32	-	-	-	

#A33	#A33	Oil pressure sensor	-	-	Supplied with U_{bat} from the engine control module (ECM). Closed switch (oil pressure): U_{low} Switch open-circuit (no/low oil pressure):Ubat.
#A34	#A34	-	-	-	
#A35	#A35	Ignition coil cyl 3, control signal	$U=U_{low}$	-	The frequency increases with engine speed (RPM).
#A36	#A36	Intake camshaft position (CMP) sensor, signal ground	$U=U_{low}$	$U=U_{low}$	
#A37	#A37	Exhaust camshaft position (CMP) sensor, signal ground	$U=U_{low}$	$U=U_{low}$	
#A38	#A38	Boost pressure sensor (T-MAP), signal air pressure intake manifold	$U\approx 2$ V	$U\approx 2$ V	U increases with higher air pressure.
#A39	#A39	Boost pressure sensor (T-MAP), signal ground	$U=U_{low}$	$U=U_{low}$	
#A40	#A40	Throttle position (TP), signal ground	$U=U_{low}$	$U=U_{low}$	
#A41	#A41	Sensor, signal ground	$U=U_{low}$	$U=U_{low}$	See relevant wiring diagram for information about connected sensors.
#A42	#A42	Engine coolant temperature (ECT) sensor, signal ground	$U=U_{low}$	$U=U_{low}$	
#A43	#A43	Rear heated oxygen sensor (HO2S), signal (-)	$U=U_{low}$	$U=U_{low}$	
#A44	#A44	Fuel pressure sensor, power supply 5 V	$U=5$ V	$U=5$ V	
#A45	#A45	-	-	-	
#A46	#A46	-	-	-	
#A47	#A47	-	-	-	
#A48	#A48	-	-	-	
#A49	#A49	Rear heated oxygen sensor (HO2S) preheating, control signal	$U = U_{bat}$	Preheating off: $U=U_{bat}$ Preheating on:	Pulsed signal.

				$U=U_{low}$	
#A50	#A50	Evaporative emission system (EVAP) valve, control signal	$U = U_{bat}$		Pulse width modulation (PWM) signal during opening (control) of the evaporative emission system (EVAP) valve. % duty varies depending on control.
#A51	#A51	Turbocharger (TC) control valve, control signal	$U = U_{bat}$	$U = U_{bat}$	PWM signal during opening (control) of the turbocharger (TC) control valve. % duty varies depending on control.
#A52	#A52	-	-	-	
#A53	#A53	Engine speed (RPM) sensor, signal (-)	U=2.5 V	U = sine wave voltage U_{top}= 5 V U_{offset}= 2.5 V	Measure to terminal #A77 #B17). The frequency increases with engine speed (RPM).
#A54	#A54	-	-	-	
#A55	#A55	Knock sensor (KS) 2, signal (-)	$U=U_{low}$	-	
#A56	#A56	Knock sensor (KS) 1, signal (-)	$U=U_{low}$	-	
#A57	#A57	-	-	-	
#A58	#A58	Ignition coil cyl 2, control signal	$U=U_{low}$	-	The frequency increases with engine speed (RPM).
#A59	#A59	Ignition coil cyl 5, control signal	$U=U_{low}$	-	The frequency increases with engine speed (RPM).
#A60	#A60	Intake camshaft position (CMP) sensor, signal	U =5 V	U = Pulsed signal U_{top}= 5 V U_{offset}= 2.5V	The frequency varies according to engine speed (RPM).
#A61	#B1	Exhaust camshaft position (CMP) sensor, signal	U =5 V	U = Pulsed signal U_{top}= 5 V U_{offset}=	The frequency varies according to engine speed (RPM).

				2.5V	
#A62	#B2	Mass air flow (MAF) sensor, signal ground	U=U_{low}	U=U_{low}	
#A63	#B3	Mass air flow (MAF) sensor, signal	U = 1 V	U≈1.5 V	U increases with increasing air mass.
#A64	#B4	-	-	-	
#A65	#B5	Throttle position (TP) sensor circuit 1, signal	U ≈ 0.4 -4 V	U ≈ 0.4 -4 V	U varies depending on the position of the throttle. U increases with increased throttle opening.
#A66	#B6	Fuel pressure sensor, signal fuel temperature	U ≈ 0.5 -4.5 V	U ≈ 0.5 -4.5 V	U drops with increased fuel temperature. The fuel temperature sensor is integrated in the fuel pressure sensor.
#A67	#B7	Engine coolant temperature (ECT) sensor, signal	(+30°C) U=1.22 V (+80°C) U=0.29 V (+100°C) U=0.17 V	(+30°C) U=1.22 V (+80°C) U=0.29 V (+100°C) U=0.17 V	U drops with increased engine coolant temperature.
#A68	#B8	-	-	-	
#A69	#B9	Front heated oxygen sensor (HO2S), signal (+)	-	-	Pulsed current signal, not measured.
#A70	#B10	Front heated oxygen sensor (HO2S), pump current	-	-	Pulsed current supply, not measured.
#A71	#B11	-	-	-	
#A72	#B12	Reset valve camshaft intake (VVT), control signal	-	PWM signal U top=U_{bat} f=250 Hz (±12.5 Hz)	% duty varies depending on control.
#A73	#B13	Front heated oxygen sensor (HO2S), preheating, control signal	U = U_{bat}	Preheating off: U=U_{bat} Preheating on: U=U_{low}	
#A74	#B14	Throttle unit motor, control signal (+)	-	PWM signal U top=U_{bat} Pulse ratio 0-100%.	The damper motor is controlled using a pulse width

				The polarity of the control signal switches when the damper motor is to be deployed in the opposite direction.	modulation (PWM) signal from the integrated power stage in the engine control module (ECM) measured to terminal #A75 (#B15).
#A75	#B15	Throttle unit motor, control signal (-)	-	PWM signal U top=U_{bat} Pulse ratio 0-100%. The polarity of the control signal switches when the damper motor is to be deployed in the opposite direction.	The damper motor is controlled using a pulse width modulation (PWM) signal from the integrated power stage in the engine control module (ECM) measured to terminal #A74 (#B14).
#A76	#B16	-	-	-	
#A77	#B17	Engine speed (RPM) sensor, signal (+)	U=2.5 V	U = sine wave voltage U_{top}= 5 V U_{offset}= 2.5 V	Measured to #A53 (#A53). The frequency increases with engine speed (RPM).
#A78	#B18	-	-	-	
#A79	#B19	Knock sensor (KS) 2, signal (+)	U=U_{low}	-	
#A80	#B20	Knock sensor (KS) 1, signal (+)	U=U_{low}	-	
#A81	#B21	-	-	-	
#A82	#B22	Ignition coil cyl 1, control signal	U=U_{low}	-	The frequency increases with engine speed (RPM).
#A83	#B23	Ignition coil cyl 4, control signal	U=U_{low}	-	The frequency increases with engine speed (RPM).
#A84	#B24	-	-	-	
#A85	#B25	-			
#A86	#B26	-	-	-	
#A87	#B27	Boost pressure sensor (T-MAP), signal intake air	(+20°C) U=3.50 V (+30°C) U=3.00 V	(+20°C) U=3.50 V (+30°	The intake air temperature (IAT)

		temperature (IAT) sensor	(+40°C) U=2.50 V	C) U=3.00 V (+40°C) U=2.50 V	sensor is integrated in the boost pressure sensor.
#A88	#B28	Throttle position (TP) sensor circuit 2, signal	U ≈ 4 -0.4 V	U ≈ 4 -0.4 V	The voltage varies depending on the position of the throttle. U decreases with increasing throttle opening.
#A89	#B29	-	-	-	
#A90	#B30	-	-	-	
#A91	#B31	Fuel pressure sensor, signal fuel pressure	-	350-400 kPa (absolute pressure) U = 1.8 - 2 V	The voltage increases with higher fuel pressure.
#A92	#B32	Rear heated oxygen sensor (HO2S), signal (+)	U≈0.50 V	Between 0.6 - 0.3 V	
#A93	#B33	Front heated oxygen sensor (HO2S), signal (-)	-	-	Pulsed current signal, not measured.
#A94	#B34	Front heated oxygen sensor (HO2S), calibration current	-	-	Pulsed current signal, not measured.
#A95	#B35	-	-	-	
#A96	#B36	Reset valve camshaft exhaust (VVT), control signal		PWM signal $U_{top}=U_{bat}$ f=250 Hz (±12.5 Hz)	% duty varies depending on control.

Connector B					
Contr modu termi	**Break box termi**	**Signal type**	**Ignition on**	**Idle**	**Other**
#B1	#C1	Power ground 1	$U=U_{low}$	-	Ground terminal, connected to the chassis at the right-hand suspension turret
#B2	#C2	Power ground 2	$U=U_{low}$	-	Ground terminal, connected to the chassis at the right-hand suspension turret
#B3	#C3	Power ground 3	$U=U_{low}$	-	Ground terminal,

					connected to the chassis at the right-hand suspension turret
#B4	#C4	Power supply from the system relay	$U = U_{bat}$		Power supply 12 V engine control module (ECM) from the system relay.
#B5	#C5	-	-	-	
#B6	#C6	Power supply from the system relay	$U = U_{bat}$		Power supply 12 V engine control module (ECM) from the system relay.
#B7	#C7	Engine cooling fan control module, control signal	-	-	PWM signal to the engine cooling fan control module.
#B8	#C8	Starter relay, control signal (-)	-	-	
#B9	#C9	-	-	-	
#B10	#C10	A/C relay, control signal	-	-	Air conditioning (A/C) relay activated: $U=U_{low}$ Air conditioning (A/C) relay not activated: $U = U_{bat}$
#B11	#C11	-	-	-	
#B12	#C12	-	-	-	
#B13	#C13	-	-	-	
#B14	#C14	-	-	-	
#B15	#C15	Transmission control module (TCM), signal gear position	With P/N connected: $U=U_{low}$ With P/N disconnected: $U = U_{bat}$	P/N	Grounded in the transmission control module (TCM) at P/N.
#B16	#C16	System relay, control signal		$U=U_{low}$	Relay activated: $U=U_{low}$ Relay not activated: $U=U_{bat}$ Note that the relay can be closed after ignition off due to time for "after run".
#B17	#C17	Start, signal 50-supply			Signal from the

					ignition switch via the central electronic module (CEM). When the ignition is in position for start: $U=U_{low}$
#B18	#C18	-	-	-	
#B19	#C19	-	-	-	
#B20	#C20	Fuel pump (FP) control module, control signal	-	PWM signal pulse ratio 35% (+/-5%) engine at operating temperature	PWM signal transmitted by the engine control module (ECM) to the fuel pump (FP) control module. The pulse ratio varies with the requested fuel pressure.
#B21	#C21	-	-	-	
#B22	#C22	-	-	-	
#B23	#C23	Leak diagnostic unit, preheating, control signal	-	-	Heating element activated: $U=U_{low}$ Heating element not activated: $U = U_{bat}$
#B24	#C24	-	-	-	
#B25	#C25	Accelerator pedal (AP) position sensor, PWM signal ground	$U=U_{low}$	-	
#B26	#C26	Accelerator pedal (AP) position sensor, PWM signal	PWM signal $U_{top}=U_{bat}$ t=5 ms pulse ratio≈ 6-90%	-	The pulse width modulation (PWM) signal from the accelerator pedal (AP) position sensor to the engine control module (ECM) via the central electronic module (CEM).
#B27	#C27	-	-	-	
#B28	#C28	Air conditioning (A/C) low pressure switch, signal	-	-	High air conditioning (A/C) pressure: U_{bat} Low air conditioning (A/C) pressure: U_{low}
#B29	#C29	-	-	-	
#B30	#C30	Power supply (Wake up,	12 V	12 V	

		15-supply)			
#B31	#C31	A/C high pressure sensor, power supply	-	-	
#B32	#C32	-	-	-	
#B33	#C33	Leak diagnostic unit, pump motor, power supply	Pump motor running: U=U_{low} Pump motor not running: U = U_{bat}		Certain markets only.
#B34	#C34	-	-	-	
#B35	#C35	-	-	-	
#B36	#C36	-	-	-	
#B37	#C37	-	-	-	
#B38	#C38	-	-	-	
#B39	#C39	-	-	-	
#B40	#C40	-	-	-	
#B41	#C41	Stop lamp switch, signal	When the brake pedal is depressed: U=U_{bat} When the brake pedal is unaffected U=U_{low}		Signal via the central electronic module (CEM).
#B42	#C42	-	-	-	
#B43	#C43	Diagnostic lead C-line	-	-	
#B44	#C44	HS-CAN L, transmission control module (TCM)	-	-	
#B45	#C45	HS-CAN L	-	-	Connected to #B58 (#C58) (HS-CAN H) via terminating resistor.
#B46	#C46	Leak diagnostic unit, valve, control signal	-	-	Only certain markets. Valve activated: U=U_{low} Valve not activated: U = U_{bat}
#B47	#C47	A/C high pressure sensor, signal ground	U=U_{low}		
#B48	#C48	-	-	-	
#B49	#C49	-	-	-	
#B50	#C50	-	-	-	
#B51	#C51	Air conditioning (A/C) high pressure sensor signal	-	-	The voltage increases with increased pressure.

#B52	#C52	-	-	-	
#B53	#C53	-	-	-	
#B54	#C54	Power supply, engine control module (ECM) (terminal 30)	-	-	
#B55	#C55	-	-	-	
#B56	#C56	-	-	-	
#B57	#C57	HS-CAN H, transmission control module (TCM)	-	-	
#B58	#C58	HS-CAN H	-	-	Connected to #B45 (#C45) (HS-CAN L) via terminating resistor