SCANIA

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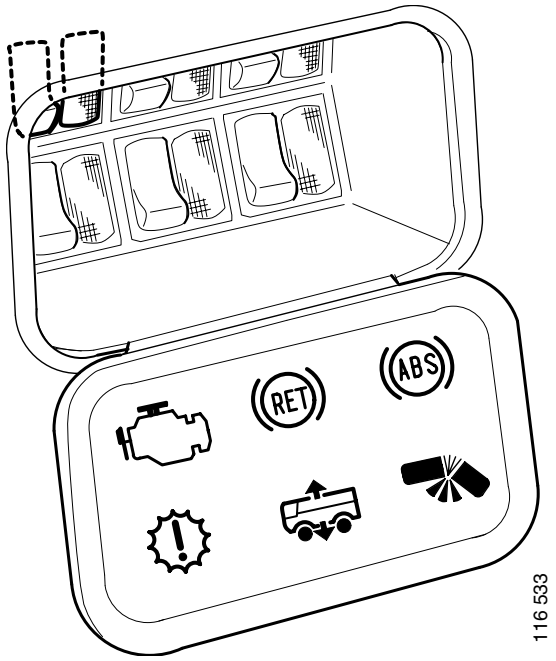
Issue 1 **en**

Electric throttle

Troubleshooting and fault code list



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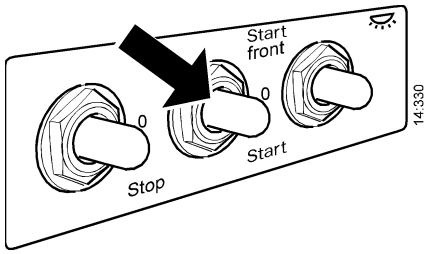
Contents

Troubleshooting

Important information

WARNING!

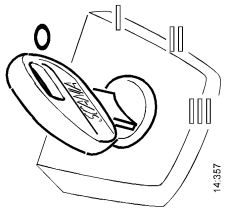
When working in the engine compartment in buses, remember to set the 'Start front' switch on the rear central electrical unit to position 0 so that the vehicle cannot be started from the driver area.



Note: This work description applies to buses with diesel or ethanol engines. Differences relating to buses and trucks with gas engines are described in the function description.

Always switch off the voltage using the starter key when:

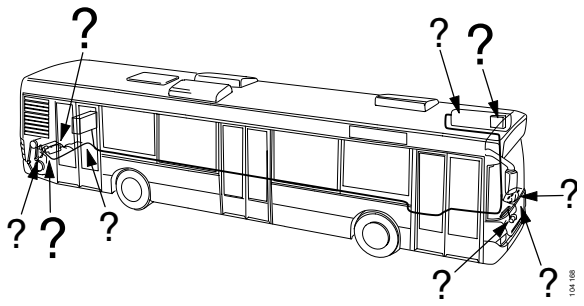
- Connecting and removing measuring instruments.
- Measuring resistance using an ohmmeter.
- Connecting and disconnecting the control unit connector.



Breakdown procedure

General

Obvious faults resulting in obvious breakdowns are usually easy to detect. However, simpler faults, e.g. maladjustment, are much more difficult to detect.



Such faults tend above all to disrupt interaction between the various systems. It is often hard to differentiate between cause and effect in such cases.

Firstly, you have to create a basis from which to work. One pre-condition for balance within the electric throttle system – and between the electric throttle and adjacent systems – is that all the basic settings are correct. If you are unsure about which system the fault lies in, it is recommended to begin with basic adjustment and setting up of the electric throttle system.

Some simple advice

1 Note down fault codes already present before starting to work.

2 Then erase the fault codes after every troubleshooting or adjustment procedure. You will then know which new fault codes have been generated.

3 Run the engine until warm before any adjustment work is started.

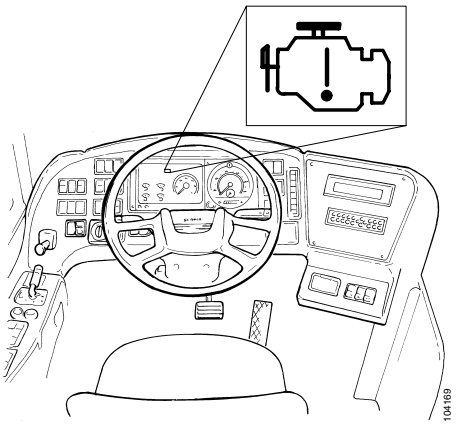
4 If different fault codes are generated, begin with basic adjustment of the accelerator pedal sensor, idle speed and the control motor link rod. Once the link rod has been adjusted, any fault codes can be taken seriously. Now you know that the wear compensation will function, and will not give rise to any misleading fault codes.

5 Checking and troubleshooting the system components can then begin.

Driveability in the event of fault

General

If there is a fault in the electric throttle system, the warning lamp comes on or flashes. (The same warning lamp is also used when stored fault codes are retrieved.)



If the engine speed is not consistent with the throttle pedal position (excessive engine speed), the safety system will intervene. The engine speed is reduced to approximately 1000 RPM.

1 Stop the vehicle and switch off the engine.

2 Restart the engine.

If the warning lamp goes out after these steps, the electric throttle is working again. However, the vehicle must be checked at the workshop at the earliest convenient opportunity (e.g. at the end of the session). The fault code is stored in the control unit memory.

Lit warning lamp

The vehicle may be driven to the nearest workshop if the warning lamp is lit.

Flashing warning lamp

Stop as soon as possible in a suitable place. Personnel with technical knowledge may drive to a workshop if the vehicle does not prove difficult to drive.

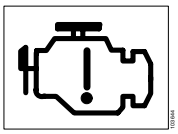
When the warning lamp is flashing and the engine speed is pulsed (fuel valve) to approximately 1000 RPM, the vehicle may only be driven a short distance – maximum 500 metres – e.g. in order to drive away from a junction.

Driving for too long a distance risks damaging the fuel valve. This will stop the engine. If the engine is still revving up, shift the gearbox into neutral position and switch off the engine with the starter key. The engine can stand running at full throttle during this time (the injection pump governor regulates the engine speed).

Fault codes

General

Fault codes from the system are shown as a flashing code using both the diagnostic switch lamp and the warning lamp on the instrument panel. The diagnostics switch lamp and the warning lamp on the instrument panel are connected in parallel.

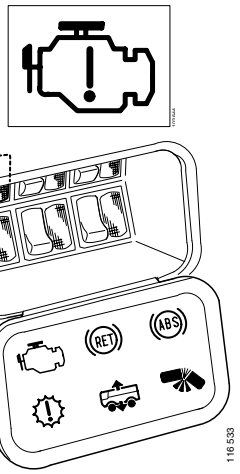


If a fault is detected by the control unit during driving, a fault code is stored in the control unit memory. At the same time, the warning lamp comes on or flashes on the instrument panel. (However, certain faults not affecting road safety do not cause the warning lamp to come on.) In the event of minor faults or temporary faults, the lamp may be extinguished by cutting off the voltage supply with the starter key. The fault code will remain in the control unit and can be retrieved later.

The fault code is shown as a flashing code that can be converted to a number code with tens and units.

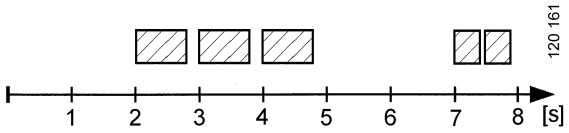
Retrieving fault codes

Stored fault codes in the control unit are shown as flashing codes both on the instrument panel warning lamp and the warning lamp next to the diagnostics switch.



The power must be switched on with the starter key.

The flashing code can be activated 2 seconds after the power is switched on. The warning lamp may now be off, on or flashing depending on the type of fault. The illustration to the right represents flashing code 32.



1 Depress the diagnostic switch for at least 0,5 seconds and then release it.

2 The warning lamp will now switch off for two seconds.

3 The first digit in the fault code indicates the tens. It flashes once per second. Count the number of flashes to obtain the tens digit of the fault code.

4 The lamp remains off for 2 seconds.

5 The second digit in the fault code shows the units. It flashes twice per second. Count the number of flashes to obtain the unit digit of the fault code.

6 The warning lamp will now switch off for two seconds.

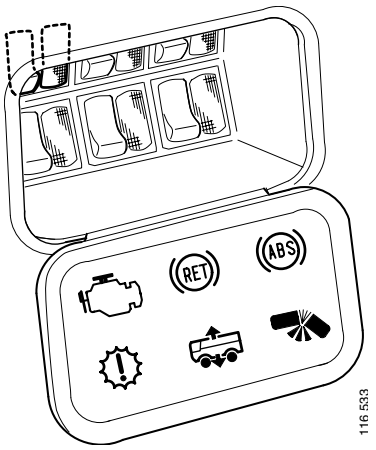
7 The fault code is repeated until the diagnostic switch is depressed again.

8 The next fault code will then be displayed.

If there are any further fault codes, the warning lamp will return to the same state as before the diagnostics switch was first depressed (i.e. as shown above point 1).

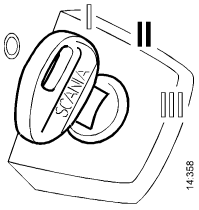
Erasing fault codes

Erasing fault codes is only necessary if fault codes have been indicated. All fault codes are stored in the control unit until they are erased.



1 Turn off the power supply with the starter key.

2 Press the diagnostics switch and keep it depressed.



3 Switch on the power using the starter key.

4 Keep the diagnostic switch depressed for at least an additional 2 seconds before releasing it. The fault codes have now been erased.

Fault code table

How to use the fault code table

The fault code table indicates: fault codes, possible faults, system response and how these are shown by the warning lamp.

The fault codes stored in the control unit are of great help in locating any faults in the electric throttle system.

1 Retrieve the fault codes stored in the control unit.

2 Under 'Terminal' in the fault code table you will find information on what pin on the control unit the fault code relates to. Then compare this to the circuit diagram under group 16 to see where the cable leads.

3 Under 'Cause' in the fault code table you will find type of fault (usually for the pin affected).

   'System response or possible remedy' in the fault code table indicates how the system reacts to the fault and in certain cases gives tips on fault remedying.

If 'Short circuit to +24 V / earth' or 'Cable fault' is shown under 'Cause' in the fault code table, this is how the control unit interprets the fault at its terminal. The control unit cannot determine where in the circuit the fault lies. Therefore, it could be in the cables or in one of the components.

Example of troubleshooting

1 The bus arrives at the workshop, as the engine cannot be turned. Fault codes 21, 34 and 36 can be retrieved.

2 Comparing the causes of fault codes 21, 34 and 36 reveals that some fault causes are in common. From these, eliminate those that do not give the system response 'No throttle actuation'.

3 This leaves the following possible faults:

3 / Actuator–Wiring fault

4 / Actuator+Wiring fault

Short circuit to +24 V

4 Refer to the circuit diagram to find common electrical points, connectors, etc.

5 In this case, the cables pass through connector C558, by the control motor.

6 Therefore the fault should be in the cable harness (interruption, etc.) or in connector C558. Check if there is any obvious fault on C558. If not, check connector C558 according to 'Checking the potentiometer in the accelerator pedal sensor'.

7 If no cable information is available, check them in the traditional way using a multimeter.

Different warning lamp states

When the fault in the fault code table is given with three different variations for the warning lamp status, this is due to the fact that it can differ depending on such factors as whether the bus is moving or stationary. Refer to the system response table for further information.

Difficulties with fault codes

Detecting faults and interpret them in order to display fault codes may be difficult for the control unit program. This means that the control unit sometimes has difficulty in determining which fault code to display. Sometimes it will show one fault code too many.

If you have several fault codes and only find faults relating to the one fault code: correct the fault you have found, erase the fault codes and test drive.

If no more fault codes are registered, it was probably one fault code too many.

Example: There is a break in the cable to connection 4 / Actuator +. The control unit then detects – via the potentiometer in the control motor – that the control motor is not moving. The control unit cannot determine whether this is due to the break or the fact that the link rod is incorrectly adjusted, so blocking the movement.

The control unit shows fault codes 21, 34 and 36. (Incorrectly adjusted link rod or cable fault 4 / Actuator +).

The fault codes are generated only in certain situations. To obtain correct generation of fault codes, it is not sufficient simply to switch on the voltage supply after repairing a fault.

First attempt to start the engine, apply full throttle (even kick-down), brake, switch on raised idling speed. If this fails to generate any fault codes, test drive the vehicle, applying both full throttle and full braking during the drive.

Example: There is a break in the cable to 54 / Safety switch sensor. The control unit compares the potentiometer value with the status of the throttle actuation switch. The control unit cannot determine that these do not correspond until the accelerator pedal is depressed, because only then is the fault code generated.

Possible faults

If the fault lies in the control unit, it is likely to be so serious that it cannot even manage to send any fault codes.

If troubleshooting shows that the accelerator pedal sensor is intact, but an incorrect voltage supply is received from the control unit – together with any of the fault codes 14 or 41-44 – it is likely that the cable harness is faulty.

Fault code table

Fault codes, possible faults, system response and indication by the warning lamp.

Fault code	Fault	Pin no. / name	Cause	System response or possible remedy	Warning lamp
11	Vehicle speed signal	11 / Speed	Cable fault. Short circuit to +24 V.	Raised idling speed malfunction. Engine speed limited to 1400 RPM.	On
12	Engine speed signal	42 / Ref. RPM	Cable fault. Short circuit to +24 V. Short circuit to earth.	Raised idling speed and idle speed control malfunction.	On / Off
		49 / RPM	Short circuit to +24 V.		
13	TC signal	35 / PWM throttle reducing	Cable fault. Short circuit to +24 V. Short circuit to earth. Incorrectly programmed ABS/ TC control unit.	TC malfunction. TC lamp is on. Only applies if TC is active. Otherwise nothing will happen. The electric throttle warning lamp changes from on to off when the fault is removed.	On / Off

Fault code	Fault	Pin no. / name	Cause	System response or possible remedy	Warning lamp
14	Brake pedal signal	38 / Cruise control off, brake	Short circuit to +24 V. Retardation >2 m/s^2 for more than 1 second, still with +24 V to pin 38 and no signal to pin 14.	-	On
15	Safety system malfunction	31 / Safety system +	Short circuit to +24 V.	Engine stops.	Flashing
			Cable fault. Short circuit to earth.	Engine speed limited to 1400 RPM.	

Fault code	Fault	Pin no. / name	Cause	System response or possible remedy	Warning lamp
			The safety system is only checked for 1.5 seconds after the power supply (starter key pin 15) is switched on. If the stop button (in the engine compartment or an emergency shut-off switch) is pushed during this time, fault code 15 is generated (31 / Safety system + is then connected to +24 V). Also perform normal troubleshooting to determine whether there are any other faults.		
16	Cruise control switch.	9 / Cruise control ret	Short circuit to +24 V.	Cruise control is switched off.	Off

Fault code	Fault	Pin no. / name	Cause	System response or possible remedy	Warning lamp
		9 / Cruise control ret 36 / Cruise control acc	+24 V input to both pins simultaneously.	Cruise control is switched off.	On
21	Range limitation automatic adjustment	-	Link rod incorrectly adjusted or jammed. Clearing not performed when adjusting link rod.	-	On
		3 / Actuator –	Cable fault.	No throttle actuation.	Flashing
		4 / Actuator+	Cable fault. Short circuit to +24 V. Short circuit to earth.		
		23 / Pot–, actuator	Cable fault. Short circuit to +24 V.	Raised idling speed and cruise control malfunction. Adjusting throttle actuation current. TC lamp is on.	

Fault code	Fault	Pin no. / name	Cause	System response or possible remedy	Warning lamp
		52 / Pot signal actuator	Cable fault.	Idle speed control malfunction. Adjusting throttle actuation current. TC lamp is on. Jerky gear changing.	
31	Control motor safety switch	22 / Safety switch actuator	Short circuit to +24 V.	-	On
			Switches fused together.		
32	Control motor positional potentiometer short-circuited to voltage supply (+24 V)	23 / Pot–, actuator	Cable fault. Short circuit to +24 V.	Raised idling speed and cruise control malfunction.	Flashing
		24 / Pot+, actuator	Short circuit to +24 V.	Adjusting throttle actuation current. TC lamp is on.	
		52 / Pot signal actuator	Short circuit to +24 V.	Adjusting throttle actuation current.	
			Cable fault.	Idle speed control malfunction. Adjusting throttle actuation current. TC lamp is on. Jerky gear changing.	

Fault code	Fault	Pin no. / name	Cause	System response or possible remedy	Warning lamp
33	Control motor positional potentiometer short-circuited to earth	24 / Pot+ actuator	Cable fault. Short circuit to earth.	Raised idling speed and cruise control malfunction. Adjusting throttle actuation current. TC lamp is on.	Flashing
		52 / Pot signal actuator	Short circuit to earth.	Adjusting throttle actuation current.	
34	Desired control motor position not attained	3 / Actuator –	Cable fault. Short circuit to +24 V.	No throttle actuation.	Flashing
			Short circuit to earth.	Raised idling speed and cruise control malfunction.	
		4 / Actuator+	Cable fault. Short circuit to +24 V. Short circuit to earth.	No throttle actuation.	
35	Safety system activated (fuel valve)	3 / Actuator –	Short circuit to earth.	Raised idling speed and cruise control malfunction.	Flashing

Fault code	Fault	Pin no. / name	Cause	System response or possible remedy	Warning lamp
		22 / Safety switch actuator	Cable fault. Short circuit to earth.	Raised idling speed, idle speed control and cruise control malfunction.	
35	Safety system activated (fuel valve)	23 / Pot–, actuator	Cable fault.	Raised idling speed and cruise control malfunction. Adjusting throttle actuation current. TC lamp is on.	Flashing
		25 / Kick down / Safety switch +	Cable fault. Short circuit to earth.	Safety system activated. Raised idling speed and cruise control malfunction.	
		27 / Pot+, sensor	Short circuit to +24 V.	Safety system activated.	
		32 / Kick-down	Short circuit to earth.	The safety system is activated in the event of kick-down due to common power supply with the safety switch.	
		51 / Safety switch actuator +	Cable fault. Short circuit to earth. Control motor faulty.	Raised idling speed, idle speed control and cruise control malfunction.	

Fault code	Fault	Pin no. / name	Cause	System response or possible remedy	Warning lamp
		54 / Safety switch sensor	Cable fault.	Safety system activated. Raised idling speed and cruise control malfunction.	
			Short circuit to earth.	Safety system activated. Raised idling speed and cruise control malfunction. The warning lamp changes from flashing to on when the fault is removed.	Flashing / On
36	Control motor current limiter	3 / Actuator –	Cable fault.	No throttle actuation.	Flashing
			Short circuit to earth.	Raised idling speed and cruise control malfunction.	
		4 / Actuator+	Cable fault. Short circuit to +24 V. Short circuit to earth.	No throttle actuation.	

Fault code	Fault	Pin no. / name	Cause	System response or possible remedy	Warning lamp
			Actual and reference values for current do not correspond. Internal fault in the control unit.	Renew the control unit.	
41	Accelerator pedal sensor safety switch	26 / Pot–, sensor	Short circuit to +24 V.	3-position throttle actuation adjustment. Otherwise see system response table.	Flashing / On / Off
		27 / Pot+, sensor	Cable fault. Short circuit to earth.		
		54 / Safety switch sensor	Short circuit to +24 V.	Raised idling speed and cruise control malfunction.	On / Off
			Switches fused together.		
		55 / Pot signal sensor		See system response table.	On

Fault code	Fault	Pin no. / name	Cause	System response or possible remedy	Warning lamp
42	Accelerator pedal sensor potentiometer short circuit to +24 V	26 / Pot–, sensor	Cable fault.	3-position throttle actuation adjustment.	Flashing
		27 / Pot+, sensor	Short circuit to +24 V.	Safety system activated.	
		55 / Pot signal sensor	Cable fault.	See system response table.	Flashing / Off
			Short circuit to +24 V.		
43	Accelerator pedal sensor potentiometer short circuit to earth	26 / Pot–, sensor	Short circuit to +24 V.	3-position throttle actuation adjustment. Otherwise see system response table.	Flashing / On / Off
		27 / Pot+, sensor	Cable fault. Short circuit to earth.		
		55 / Pot signal sensor	Cable fault.	See system response table.	Flashing
			Short circuit to earth.	3-position throttle actuation adjustment.	Flashing / Off

Fault code	Fault	Pin no. / name	Cause	System response or possible remedy	Warning lamp
44	Accelerator pedal sensor potentiometer collecting shoe open	25 / Kick down / Safety switch +	Cable fault. Short circuit to earth.	Safety system activated. Raised idling speed and cruise control malfunction.	Flashing
		26 / Pot–, sensor	Cable fault.	3-position throttle actuation adjustment.	Flashing
			Short circuit to +24 V.	3-position throttle actuation adjustment. Otherwise see system response table.	Flashing / On / Off
		27 / Pot+, sensor	Short circuit to +24 V.	Safety system activated.	Flashing
45	Accelerator pedal sensor incorrectly adjusted	-	Sensor incorrectly adjusted or faulty.	-	On
51	Memory error (EEPROM)	-	-	Uses pre-programmed values. Renew the control unit.	On

Notes

3-position adjustment

The control unit regulates the control motor actuation in three positions: idling, 50% and 100% actuation.

This can easily be checked if two people are performing the troubleshooting: one person depresses the accelerator pedal, the other person looks at the control motor in the engine compartment. Gently release and depress the accelerator pedal. At the same time, the control motor arm can be seen to jump between the three positions.

Current control

When adjusting the current, the control unit disregards the value it obtains from the control motor potentiometer. The control motor position is regulated instead by means of the control motor power consumption value.

This fault will be recognised when driving the vehicle. The test may also be performed on a stationary vehicle, but it will not be as clear. If the accelerator pedal is gently depressed, very little will happen at first. After the accelerator pedal is depressed approximately halfway, strong throttle actuation is attained.

System responses

The table shows the faults and system responses obtained due to various faults on control unit terminals.

The table contains more information than in the fault code table. You can look for a fault symptom similar to that on the vehicle in the 'System response' column.

The column 'Pin/name' indicates the relevant terminal on the control unit for the present fault.

The next step is to compare this with the circuit diagram (see workshop manual group 16) to find out which function is affected. Using the component code from the circuit diagram and the pin number on the control unit, the source of the fault can now be determined.

This method is also suitable for faults that are difficult to detect where the fault codes do not provide sufficient information.

Special faults

There are also two unusual types of fault to be found in the table:

- Pin 9, short circuit to +24 V, generates fault code 16, but with the warning lamp off.
- Pin 13, short circuit to earth, results in warning lamp on, but no fault code.

System response to various faults on the control unit connections.

Pin / name	Cause	Fault code	Warning lamp	System response
1 / Pin 31	Cable fault.	-	Off	No throttle actuation.
	Short circuit to +24 V.	-	Off	Fuse blows, no throttle actuation.
	Short circuit to earth.	-	Off	-
2 / Part load 3	Cable fault.	-	Off	Bus stop brake not released. Reduction 4 continues (no throttle actuation). (Applies to Scania bodies).
	Short circuit to +24 V.	-		
	Short circuit to earth.	-	Off	-
3 / Actuator –	Cable fault.	21, 34, 36	Flashing	No throttle actuation.
	Short circuit to +24 V.	34		
	Short circuit to earth.	34, 35, 36	Flashing	Raised idling speed and cruise control malfunction.
4 / Actuator +	Cable fault.	21, 34, 36	Flashing	No throttle actuation.

Pin / name	Cause	Fault code	Warning lamp	System response
	Short circuit to +24 V.			
	Short circuit to earth.			
5 / Neutral	Cable fault.	-	Off	The cruise control gives full throttle if neutral position is selected with the drive mode selector (with cruise control activated).
	Short circuit to +24 V.	-	Off	Raised idling speed possible with the drive mode selector in a position other than N, cruise control not functioning and speed under approximately 8 km/h.
	Short circuit to earth.	-	Off	Raised idling speed malfunction. Neutral position in the drive mode selector leads to a short circuit, gearbox fuse blows. The cruise control gives full throttle if neutral position is selected with the drive mode selector (with cruise control activated).
7 / PWM actual throttle	Cable fault.	-	Off	Jerky gear changing. TC lamp is on.

Pin / name	Cause	Fault code	Warning lamp	System response
	Short circuit to +24 V.	-	Off	TC lamp is on.
	Short circuit to earth.	-	Off	Jerky gear changing. TC lamp is on.
8 / Cruise control +	Cable fault.	-	Off	Raised idling speed and cruise control malfunction.
	Short circuit to +24 V.	-	Off	-
	Short circuit to earth.	-	Off	Raised idling speed and cruise control malfunction.
9 / Cruise control ret.	Cable fault.	-	Off	Reduction of cruise control speed not possible.
	Short circuit to +24 V.	16	Off	Cruise control malfunction.
	Short circuit to earth.	-	Off	Cruise control deactivated when attempting to reduce its speed.
10 / Cruise control off.	Cable fault.	-	Off	Cruise control and raised idling speed malfunction.
	Short circuit to +24 V.	-	Off	Cruise control cannot be switched off using its switch.
	Short circuit to earth.	-	Off	Cruise control malfunction.

Pin / name	Cause	Fault code	Warning lamp	System response
11 / Speed	Cable fault.	11	On	Raised idling speed malfunction.
	Short circuit to +24 V.			Engine speed limited to 1400 RPM.
	Short circuit to earth.	-	Off	Cruise control provides engine speed control (to maximum 1200 RPM) instead of vehicle speed control. Engine counteracts when braking.
12 / Speed limit 2	Cable fault.	-	Off	Speed limit 2 malfunction.
	Short circuit to +24 V.	-	Off	Speed limit 2 activated.
	Short circuit to earth.	-	Off	-
13 / Flashing code	Cable fault.	-	Off	Diagnostics switch malfunction.
	Short circuit to +24 V.	-	Off	-
	Short circuit to earth.	-	On	Flashing code activated when fault removed.
14 / Reduction 4	Cable fault.	-	Off	Possible to turn the engine despite brake lamp circuit being activated.

Pin / name	Cause	Fault code	Warning lamp	System response
	Short circuit to +24 V.	-	Off	-
	Short circuit to earth.	-	Off	Continuous throttle reduction 4 (No throttle actuation).
17 / Reduction 2	Cable fault.	-	Off	Reduction malfunction. Not used.
	Short circuit to +24 V.	-	Off	Reduction malfunction. Not used.
	Short circuit to earth.	-	Off	Continuous throttle reduction 2. Not used.
18 / High idle 3	Cable fault.	-	Off	-
	Short circuit to +24 V.	-	Off	Idling speed 1200 RPM (1400 RPM for trucks).
	Short circuit to earth.	-	Off	-
19 / Motor on speed	Cable fault.	-	Off	-
	Short circuit to +24 V.	-	Off	Cruise control provides motor on speed (up to 1500 RPM).
	Short circuit to earth.	-	Off	-

Pin / name	Cause	Fault code	Warning lamp	System response
20 / n	Cable fault.	-	Off	-
	Short circuit to +24 V.	-	Off	-
	Short circuit to earth.	-	Off	-
22 / Safety switch actuator	Cable fault.	35	Flashing	Raised idling speed, cruise control and idle speed control malfunction.
	Short circuit to +24 V.	31	On	-
	Short circuit to earth.	35	Flashing	Raised idling speed, cruise control and idle speed control malfunction.
23 / Pot–, actuator	Cable fault.	21, 32, 35	Flashing	Raised idling speed and cruise control malfunction. Adjusting throttle actuation current.
	Short circuit to +24 V.	21, 32		TC lamp is on.
	Short circuit to earth.	-	Off	-

Pin / name	Cause	Fault code	Warning lamp	System response
24 / Pot+, actuator	Cable fault.	33	Flashing	Raised idling speed and cruise control malfunction.
	Short circuit to +24 V.	32		Adjusting throttle actuation current.
	Short circuit to earth.	33		TC lamp is on.
25 / Kick down / Safety switch +	Cable fault.	35, 44	Flashing	Safety system activated. Raised idling speed and cruise control malfunction.
	Short circuit to +24 V.	-	Off	-
	Short circuit to earth.	35, 44	Flashing	Safety system activated. Raised idling speed and cruise control malfunction.
26 / Pot–, sensor	Cable fault.	42, 44	Flashing	3-position throttle actuation adjustment.
	Short circuit to +24 V.	41, 43, 44	Flashing / On – On / Off	3-position throttle actuation adjustment. The warning lamp changes from flashing to on or from on to off when the fault is removed. Whether the warning lamp flashes or is on in the output position depends on the situation when the fault code is generated.

Pin / name	Cause	Fault code	Warning lamp	System response
	Short circuit to earth.	-	Off	-
27 / Pot+, sensor	Cable fault.	41, 43	Flashing / On – On / Off	3-position throttle actuation adjustment. The warning lamp changes from flashing to on or from on to off when the fault is removed. Whether the warning lamp flashes or is on in the output position depends on the situation when the fault code is generated.
	Cable fault, without speed.	43	On / Off	3-position throttle actuation adjustment. The warning lamp changes from on to off when the fault is removed.
	Short circuit to +24 V.	Flashing	35, 42, 44	Safety system activated.
	Short circuit to earth.	41, 43	Flashing / On	3-position throttle actuation adjustment. The warning lamp changes from flashing to on when the fault is removed.
28 / Pin 15	Cable fault.	-	Off	Control unit shut-off, no throttle actuation.
	Short circuit to +24 V.	-	Off	-
	Short circuit to earth.	-	Off	Control unit shut-off, no throttle actuation. Fuse blows.

Pin / name	Cause	Fault code	Warning lamp	System response
30 / Status lamp	Cable fault.	-	Off	-
	Short circuit to +24 V.	-	Off	-
	Short circuit to earth.	On	-	-
31 / Safety system +	Cable fault.	15	Flashing	Engine speed limited to 1400 RPM.
	Short circuit to +24 V.	15	Flashing	Engine stops.
	Short circuit to earth.	15	Flashing	Engine speed limited to 1400 RPM.
32 / Kick down	Cable fault.	-	Off	-
	Short circuit to +24 V.	-	Off	-
	Short circuit to earth.	35, 44	Flashing	Safety system activated on kick-down. Due to common power supply with throttle actuator switch.

Pin / name	Cause	Fault code	Warning lamp	System response
33 / High idle 2.	Cable fault.	-	Off	-
	Short circuit to +24 V.	-	Off	Idling speed 850 RPM (1200 RPM for trucks).
	Short circuit to earth.	-	Off	-
34 / Part load 1	Cable fault.	-	Off	-
	Short circuit to +24 V.	-	Off	-
	Short circuit to earth.	-	Off	-
35 / PWM throttle reducing	Cable fault, without TC.	-	Off	-
	Cable fault, with TC.	13	On / Off	The warning lamp changes from on to off when the fault is removed. TC lamp is on.
	Short circuit to +24 V, without TC.	-	Off	-
	Short circuit to +24 V, with TC.	13	On / Off	The warning lamp changes from on to off when the fault is removed. TC lamp is on.

Pin / name	Cause	Fault code	Warning lamp	System response
	Short circuit to earth, without TC.	-	Off	-
	Short circuit to earth, with TC.	13	On / Off	The warning lamp changes from on to off when the fault is removed. TC lamp is on.
36 / Cruise control acc.	Cable fault.	-	Off	-
	Short circuit to +24 V.	-	Off	Idling speed increases to 1200 RPM, disappears if +24 V applied to pin 9. (Simultaneous supply of +24 V to pins 9 and 36 results in fault code 16).
	Short circuit to earth.	-	Off	Cruise control malfunction.
37 / Cruise control resume.	Cable fault.	-	Off	-
	Short circuit to +24 V.	-	Off	Cruise control malfunction.
	Short circuit to earth.	-	Off	Cruise control memory malfunction.
38 / Cruise control off, brake	Cable fault.	-	Off	Cruise control malfunction.
	Short circuit to +24 V.	14	On	
	Short circuit to earth.	-	Off	Gearbox fuse blows.

Pin / name	Cause	Fault code	Warning lamp	System response
42 / Ref. RPM	Cable fault.	12	On / Off	Raised idling speed and idle speed control malfunction. The warning lamp changes from on to off when the fault is removed.
	Short circuit to +24 V.			
	Short circuit to earth.			
44 / Diagnosis	Cable fault.	-	Off	-
	Short circuit to +24 V.	-	Off	-
	Short circuit to earth.	-	Off	-
45 / Reduction 3.	Cable fault.	-	Off	Reduction malfunction.
	Short circuit to +24 V.	-	Off	Reduction malfunction.
	Short circuit to earth.	-	Off	Continuous throttle reduction 3.
46 / Reduction 1.	Cable fault.	-	Off	Reduction malfunction.
	Short circuit to +24 V.	-	Off	Reduction malfunction.
	Short circuit to earth.	-	Off	Continuous throttle reduction 1.

Pin / name	Cause	Fault code	Warning lamp	System response
47 / Part load 2	Cable fault.	-	Off	-
	Short circuit to +24 V.	-	Off	-
	Short circuit to earth.	-	Off	-
48 / High idle 1	Cable fault.	-	Off	-
	Short circuit to +24 V.	-	Off	Idling speed 1000 RPM.
	Short circuit to earth.	-	Off	-
49 / RPM	Cable fault.	-	Off	-
	Short circuit to +24 V.	12	On / Off	Raised idling speed and idle speed control malfunction. The warning lamp changes from on to off when the fault is removed.
	Short circuit to earth.	-	Off	-
50 / Retarder	Cable fault.	-	Off	-
	Short circuit to +24 V.	-	Off	-
	Short circuit to earth.	-	Off	-

Pin / name	Cause	Fault code	Warning lamp	System response
51 / Safety switch actuator +	Cable fault.	35	Flashing	Raised idling speed, idle speed control and cruise control malfunction.
	Short circuit to +24 V.	-	Off	-
	Short circuit to earth.	35	Flashing	Raised idling speed and cruise control malfunction.
52 / Pot signal actuator	Cable fault.	21, 32	Flashing	Idle speed control malfunction. Adjusting throttle actuation current. TC lamp is on. Jerky gear changing.
	Short circuit to +24 V.	32	Flashing	Adjusting throttle actuation current.
	Short circuit to earth.	33		
53 / n-limit	Cable fault.	-	Off	-
	Short circuit to +24 V.	-	Off	Engine speed limited to approximately 2000 RPM.
	Short circuit to earth.	-	Off	-

Pin / name	Cause	Fault code	Warning lamp	System response
54 / Safety switch sensor	Cable fault.	35, 44	Flashing	Safety system activated. Raised idling speed and cruise control malfunction.
	Short circuit to +24 V.	41	On	Raised idling speed and cruise control malfunction. The warning lamp changes from flashing to on when the fault is removed.
	Short circuit to earth.	35, 44	Flashing / On	Safety system activated. Raised idling speed and cruise control malfunction. The warning lamp changes from flashing to on when the fault is removed.
55 / Pot signal sensor	Cable fault. Three alternative fault symptoms depending on the control unit tolerance.	41	On	Gently increases to full engine speed with depressed accelerator pedal. Without the accelerator pedal depressed, the safety system is activated.
		42	Flashing	3-position throttle actuation adjustment.
	Fault codes 42–43 are most common.	43		
	Short circuit to +24 V.	42, 44	Flashing / Off	3-position throttle actuation adjustment.
	Short circuit to earth.	43		The warning lamp changes from flashing to off when the fault is removed.