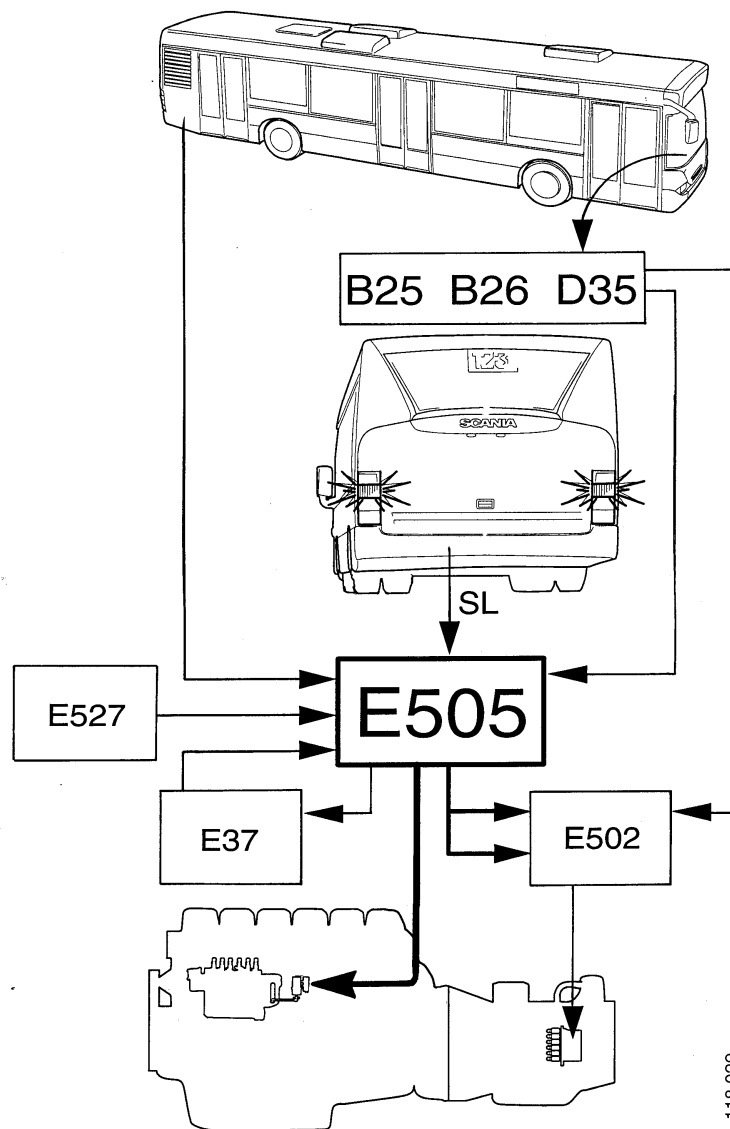


Electric throttle

Work description



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Safety system

General

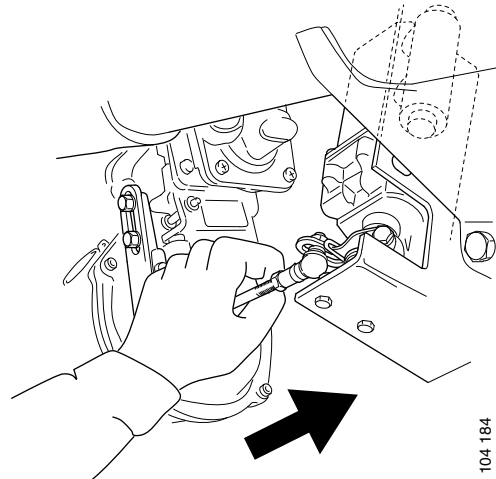
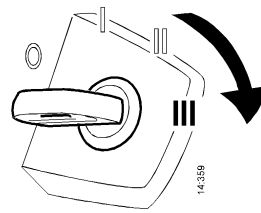
Note: This work description applies to buses with diesel or ethanol engines. Differences relating to buses and trucks with gas engines are described in the function description.

The electric throttle has a safety feature which is activated if a serious fault occurs. During driving, the control unit continuously compares the throttle actuation from the accelerator pedal with the value from the positional potentiometer in the control motor. If these should deviate from each other in an undesired way, a fault code is generated and the fuel valve is activated.

The function of the safety system can be checked in an easy way according to the functional description on the next page.

Functional inspection

- 1 Start the engine. Let the engine idle, with the gearbox in neutral and the parking brake applied.
- 2 Pull the link rod between the control motor and the injection pump to maximum throttle actuation. The safety function will now take effect, as the control unit receives contradictory information. The accelerator pedal position does not correspond to the control motor position. The fuel valve should engage and pulse the engine speed down to approx. 1,000 rpm. This will tell you that the safety system is working. Note: 2,250 rpm for gas engines (both trucks and buses). The safety system will shut off the gas supply.
- 3 Switch off the engine.
- 4 Clear any fault codes that were generated. See section Erasing fault codes in the booklet Electric throttle troubleshooting and fault code list.



When the safety function has been activated, the vehicle can be driven a maximum of 500 metres, e.g. to be able to drive away from a junction where the vehicle has stopped.

Control motor

Preventive checks

The control motor arm must not be loose on the control motor spindle. Check that the retaining screw for the control motor arm is sufficiently tightened. The tightening torque is 6 Nm.

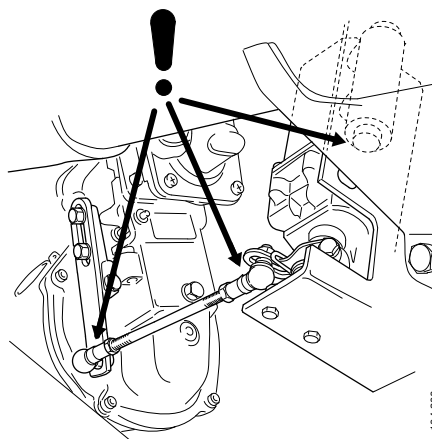
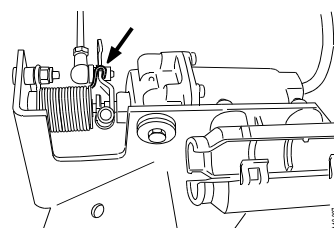
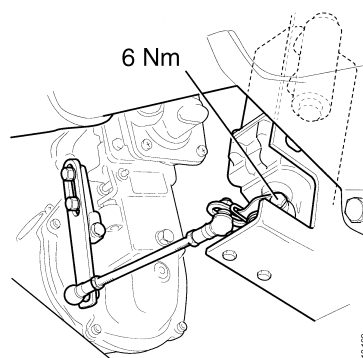
Check that the return spring is properly secured on the control motor arm. This is important in case the control motor loses power.

The lower spring eyelet must grip around the edge of the arm (shown by the arrow in the illustration); it must not be in the way of the arm or in any other way block the movement of the arm.

Check the entire link rod and ball joints to ensure that nothing is loose.

Lubricate the link rod heads with heat resistant lubricating paste 561 205.

After driving, when the engine is turned off, the temperature in the engine compartment exceeds 130°C. No ordinary greases or oils can withstand such high temperatures. Always use the above mentioned lubricating paste.

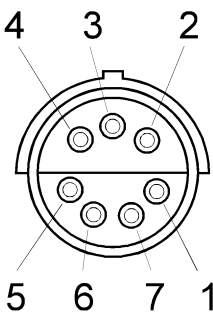


Checks using breakout box

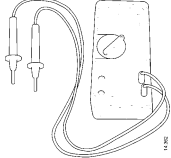
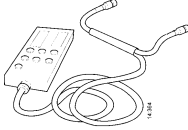
Specifications

Connections in control motor connector
(C558)

Pin	Cable colour	Application
1	Blue	Motor -
2	Black	Motor +
3	White	Safety switch
4	Green	Safety switch
5	Brown	Potentiometer -
6	Yellow	Potentiometer, contact shoe
7	Red	Potentiometer +



Tools

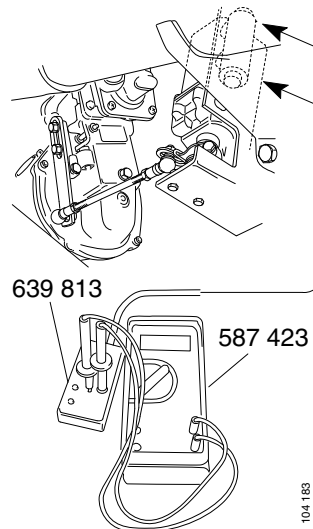
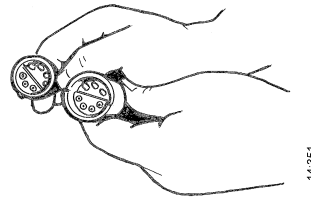
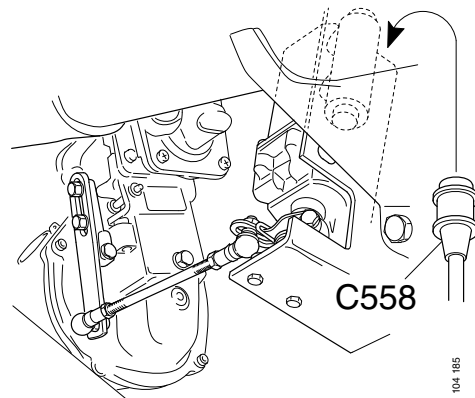
Number	Denomination	Illustration	Board
587 423	Multimeter		-
639 813	Breakout box		-

Check

Checking and troubleshooting require the link rod to be correctly adjusted between the control motor and the injection pump. If this is not the case, adjust the link rod before starting troubleshooting.

By connecting the switch box at the connector closest to the control motor, the control motor function can be checked. Here the voltage can be measured on the control motor positional potentiometer and the safety switch status can be established.

- 1 Disconnect the connect at the control motor.
- 2 Ensure that the contact pins are correctly located in the connector, and that they are not corroded.
- 3 Connect the breakout box 639 813 to the connector. Ensure that the connectors are not hanging down and blocking the movement of the link rod.



Checking the potentiometer

Measuring voltage

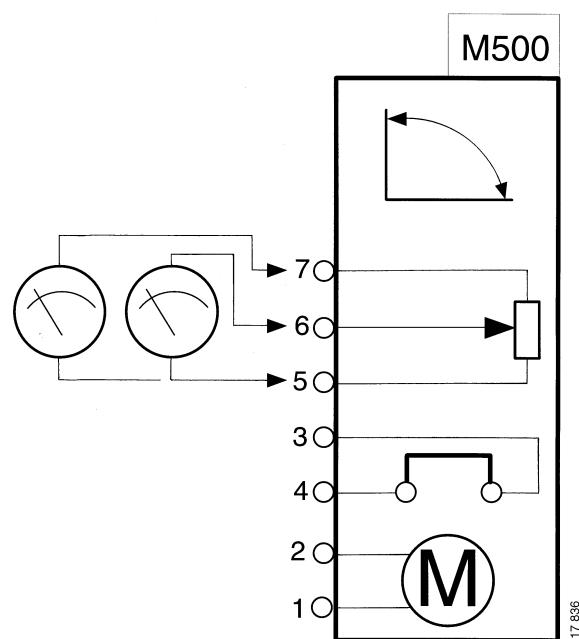
Potentiometer	+ pole	- pole	Voltage
Idling	7	5	3.0 V **
Partial throttle	7	5	3.0 V **
Full throttle / kick-down	7	5	3.0 V **
Idling	6	5	2.5 V
Partial throttle	6	5	2.6 - 0.6 V *
Full throttle / kick-down	6	5	0.6 V

* The voltage decreases evenly as the accelerator pedal is depressed.

** The voltage must be between 2.6 - 3.1 V.

Measuring voltage

- 1 Connect the multimeter probes to the outputs on the breakout box between which you wish to measure the voltage.
- 2 Check that the multimeter is set to measure voltage (direct current).
- 3 Switch on the voltage supply using the starter key.
- 4 Measure the voltage at various throttle actuation levels and check that the values correspond to the table.



- 5 Switch off the voltage supply using the starter key.
- 6 This troubleshooting procedure generates fault codes, which are erased after measurement has been completed according to the section Erasing fault codes in the booklet Electric throttle Troubleshooting and fault code list.

If the voltmeter shows 0 V across pins 5/6 or 5/7:

- Remove the connection between the breakout box and the control motor. If the voltage across pins 5 and 7 is still 0 V, the fault lies in the control unit or in the cable harness.
- Remove the connection between the breakout box and the control motor. If the voltage is 2.5 V (pin 5/6) or 3.0 V (pin 5/7), but falls to zero when the control motor is connected, the fault lies in the potentiometer, which is short circuiting.

If the value across pins 5/6 deviates:

- If varying voltage cannot be obtained, there is a fault with the potentiometer.

Checking the safety switch

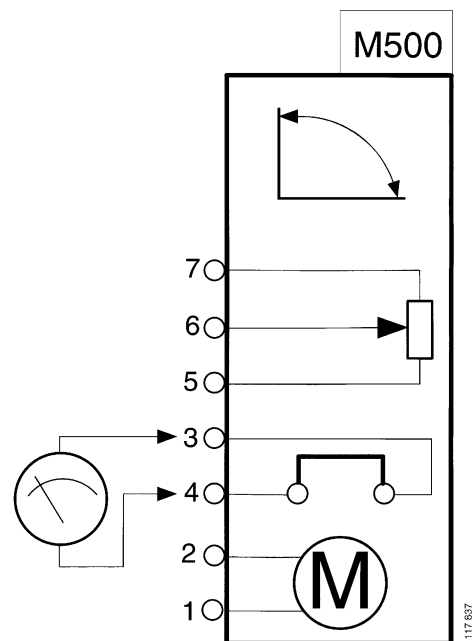
Measurements

Safety switch	+ pole	- pole	Status	Voltage
Idling	3	4	closed	0 V
Partial throttle	3	4	open	+24 V
Full throttle / kick-down	3	4	open	+24 V

The switch should open immediately after idling.

Measuring voltage

- 1 Connect the multimeter probes to the outputs on the breakout box between which you wish to measure the voltage.
- 2 Check that the multimeter is set to measure voltage (direct current).
- 3 Switch on the voltage supply using the starter key.
- 4 Measure the voltage at various throttle actuation levels and check that the values correspond to the table.
- 5 Switch off the voltage supply using the starter key.



- 6 This troubleshooting procedure generates fault codes, which are erased after measurement has been completed according to the section Erasing fault codes in the booklet Electric throttle Troubleshooting and fault code list.

If the voltmeter shows +24 V:

- If the safety switch is at +24 V even when idling, there is a fault with the safety switch. In this event, the safety switch will not close in any position.

If the voltmeter shows 0 V:

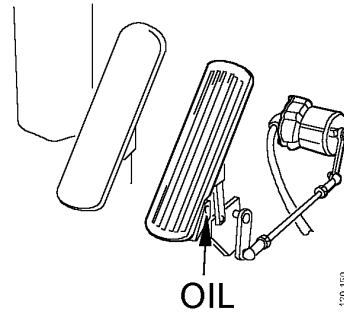
- If the safety switch is at 0 V even at partial and full throttle, there are two possibilities. Disconnect the connectors between the switch box and the control motor in order to see that the safety switch is not permanently closed.
- If the voltage is now +24 V: Fault with safety switch, which is short circuiting.
- If the voltage is now 0 V: There is a fault in the control unit or in the cable harness.

Accelerator pedal

Preventive checks

Gravel and dirt has entered the accelerator pedal, brought into the bus by the driver. When the vehicle is washed and cleaned internally, the lubricant may disappear from the pedal joint. Clean around the pedal joint and lubricate it using common engine oil.

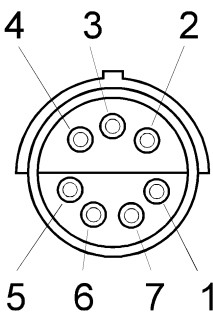
The link rod yokes for the accelerator pedal sensor do not generally need to be lubricated, but check that they are not jamming.



Checks using breakout box

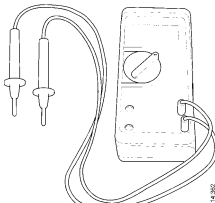
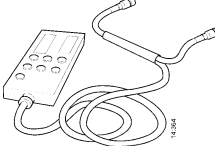
Connections

Pin	Cable colour	Application
1	White	Throttle actuation switch
2	Red	Potentiometer +
3	Yellow	Potentiometer, contact shoe
4	Blue	Kick-down switch
5	Brown	Potentiometer -
6	Green	Kick-down switch
7	Black	Throttle actuation switch



14:339

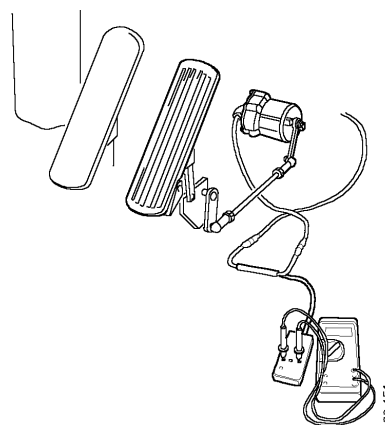
Tools

Number	Denomination	Illustration	Board
587 423	Multimeter		-
639 813	Breakout box		-

Check

Checking and troubleshooting require the link rod to be correctly adjusted. If this is not the case, adjust the link rod before starting troubleshooting.

- 1 By connecting the breakout box at the connector closest to the accelerator pedal sensor, the function of the accelerator pedal sensor can be checked. Here the voltage can be measured from the potentiometer as well as the status of the throttle actuation and kick-down switch.

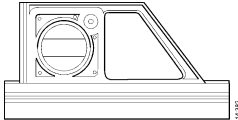


Adjusting

Specifications

Clearance between arm and stop lug	2 ± 1 mm
------------------------------------	--------------

Tools

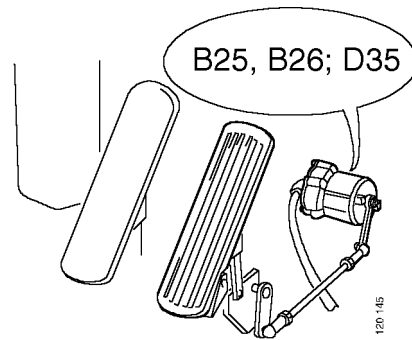
Number	Denomination	Illustration	Board
587 090	Protractor		-

Description

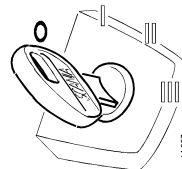
Adjusting the link rod between the accelerator pedal and the accelerator pedal sensor.

- 1 Remove the panel externally at the front to access the accelerator pedal sensor. This may appear differently depending on the body type.

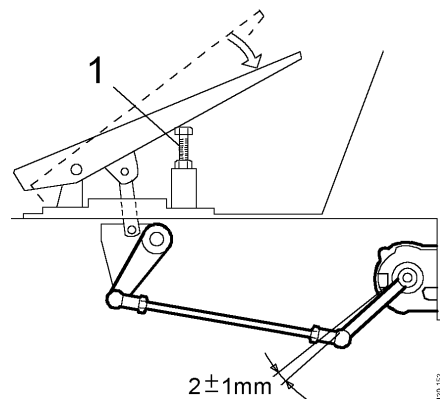
Ensure that the bus is level.



- 2 Ensure that the voltage supply is disconnected.



- 3 Press the accelerator pedal down completely, right to the end of the kick-down range. The clearance between the arm and the stop lug should then be 2 ± 1 mm. The clearance can be adjusted using the set screw (1) under the accelerator pedal.



Accelerator pedal sensor

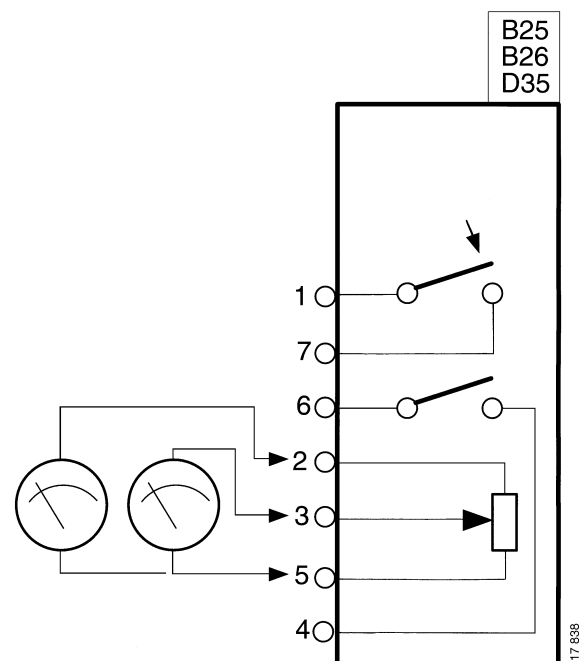
Measuring voltage

Potentiometer	+ pole	- pole	Voltage
Idling	2	5	3.0 V **
Partial throttle	2	5	3.0 V **
Full throttle / kick-down	2	5	3.0 V **
Idling	3	5	0.1 V
Partial throttle	3	5	0.1 - 2.0 V*
Full throttle / kick-down	3	5	2.0 V

* The voltage increases evenly as the accelerator pedal is depressed.

** The voltage must be between 2.6 - 3.1 V.

- 1 Connect the multimeter probes to the outputs on the breakout box between which you wish to measure the voltage.
- 2 Check that the multimeter is set to measure voltage (direct current).
- 3 Switch on the voltage supply using the starter key.
- 4 Measure the voltage at different throttle actuation levels. Check that the values correspond to the table.



- 5 Switch off the voltage supply using the starter key.
- 6 This troubleshooting procedure generates fault codes, which are erased after measurement has been completed according to the section Erasing fault codes in the booklet Electric throttle Troubleshooting and fault code list.

If the voltmeter shows 0 V across pins 2/5 or 3/5:

- Remove the connection between the breakout box and the accelerator pedal sensor. If the voltage is still 0 V, the fault lies in the control unit or in the cable harness.
- Remove the connection between the breakout box and the accelerator pedal sensor. If the voltage is now 3.0 V (pin 2/5) or 2.0 V (pin 3/5), but falls to zero when the accelerator pedal sensor is connected, the fault lies in the potentiometer, which is short circuiting.

If the value across pins 3/5 deviates:

- If varying voltage cannot be obtained, there is a fault with the potentiometer.

Check measurement of the throttle actuation switch

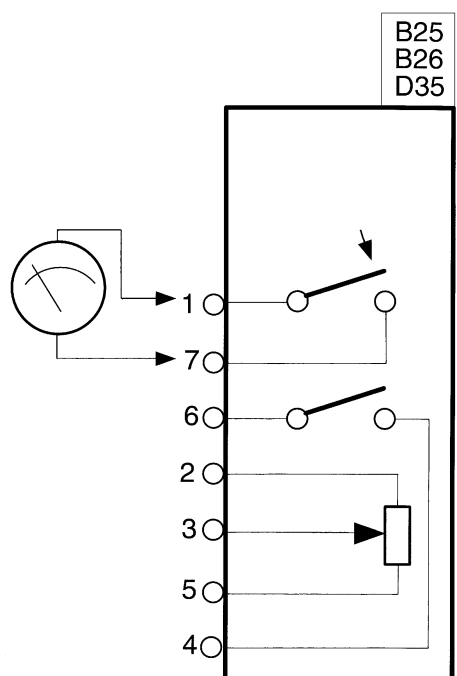
Measurements

Actuation	+ pole	– pole	Status	Voltage
Idling	1	7	open	+24 V
Partial throttle	1	7	closed	0 V
Full throttle / kick-down	1	7	closed	0 V

The switch should close immediately after idling.

Measuring voltage

- 1 Connect the multimeter probes to the outputs on the breakout box between which you wish to measure the voltage.
- 2 Check that the multimeter is set to measure voltage (direct current).
- 3 Switch on the voltage supply using the starter key.
- 4 Measure the voltage at different throttle actuation levels. Check that the values correspond to the table.
- 5 Switch off the voltage supply using the starter key.



- 6 This troubleshooting procedure generates fault codes, which are erased after measurement has been completed according to the section Erasing fault codes in the booklet Electric throttle Troubleshooting and fault code list.

If the voltmeter shows +24 V:

- If the throttle actuation switch is at +24 V even at partial and full throttle actuation levels, there is a fault with the throttle actuation switch. It will not close in any position.

If the voltmeter shows 0 V:

- If the throttle actuation switch is at 0 V when the accelerator pedal is released, there are two possibilities. Disconnect the connectors between the switch box and the accelerator pedal sensor in order to see that the throttle actuation sensor is not permanently closed.
- If the voltage is now +24 V: Fault with throttle actuation switch, which is short circuiting.
- If the voltage is now 0 V: There is a fault in the control unit or in the cable harness.

Measuring resistance

- 1 Ensure that the voltage supply (starter key, pin 15) is disconnected.
- 2 Connect the switch box only to the accelerator pedal sensor, and ensure that it is not connected to the cable harness of the bus.

- 3 Connect the multimeter probes to the outputs on the breakout box between which you wish to measure the resistance.
- 4 Check that the multimeter is set to measure resistance.
- 5 Measure the resistance at various throttle actuation levels and check that the values correspond to the table.
- 6 This troubleshooting procedure generates fault codes, which are erased after measurement has been completed according to the section Erasing fault codes in the booklet Electric throttle Troubleshooting and fault code list.

If the ohmmeter indicates infinite resistance:

- If the throttle actuation switch shows infinite resistance even at partial and full throttle, there is a fault with the throttle actuation switch. In this event, the throttle actuation switch will not close in any position.

If the ohmmeter indicates short circuit:

- If the throttle actuation switch is at 0 ohm even when the accelerator pedal is released, there is a fault with the throttle actuation switch. In this case, the throttle actuation switch is permanently closed.

Checking the kick-down switch

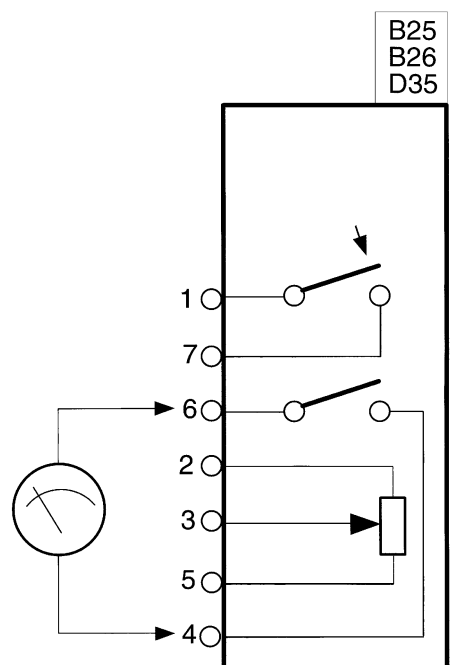
Measurements

Actuation	+ pole	- pole	Status	Voltage
Idling	6	4	open	+24 V
Partial throttle	6	4	open	+24 V
Full throttle / kick-down	6	4	closed	0 V

The switch should close just before the pedal reaches the bottom.

Measuring voltage

- 1 Connect the multimeter probes to the outputs on the breakout box between which you wish to measure the voltage.
- 2 Check that the multimeter is set to measure voltage (direct current).
- 3 Switch on the voltage supply using the starter key.
- 4 Measure the voltage at different throttle actuation levels. Check that the values correspond to the table.
- 5 Switch off the voltage supply using the starter key.



- 6 This troubleshooting procedure generates fault codes, which are erased after measurement has been completed according to the section Erasing fault codes in the booklet Electric throttle Troubleshooting and fault code list.

If the voltmeter shows +24 V:

- If the kick-down switch is at +24 V even at full throttle actuation, there is a fault with the kick-down switch. In this event, the kick-down switch will not close in any position.

If the voltmeter shows 0 V:

- If the kick-down switch is at 0 V when the accelerator pedal is released, there are two possible faults. Disconnect the connectors between the breakout box and the accelerator pedal sensor and investigate whether the kick-down switch is not permanently closed.
- If the voltage is now +24 V: Fault with throttle actuation switch, which is closed and therefore short circuiting.
- If the voltage is now 0 V: There is a fault in the control unit or in the cable harness.

Measuring resistance

- 1 Ensure that the voltage supply (starter key, pin 15) is disconnected.
- 2 Connect the breakout box only to the accelerator pedal sensor, and ensure that it is not connected to the cable harness of the bus.

- 3 Connect the multimeter probes to the outputs on the breakout box between which you wish to measure the resistance.
- 4 Check that the multimeter is set to measure resistance.
- 5 Check the resistance at various throttle actuation levels and that the values correspond to the table.
- 6 This troubleshooting procedure generates fault codes, which are erased after measurement has been completed according to the section Erasing fault codes in the booklet Electric throttle Troubleshooting and fault code list.

If the ohmmeter indicates infinite resistance:

- If the kick-down switch indicates infinite resistance even at full throttle actuation, there is a fault with the kick-down switch. In this event, the kick-down switch will not close in any position.

If the ohmmeter indicates short circuit:

- If the kick-down switch indicates 0 ohm even when the accelerator pedal is released, there is a fault with the kick-down switch. In this case, the kick-down switch is permanently closed.

Actions affecting the electric throttle

The following describes those steps that need to be taken when changing components and that may affect the electric throttle. The procedure for each individual point is described later in this booklet.

Renewing the injection pump

- 1 Checking / adjusting the mechanical idle speed of the injection pump.
- 2 Using the SP2, program the correct idle speed into the electric throttle control unit.
- 3 Clear the end position memory.
- 4 Checking / adjusting the link rod (idling / full throttle) between the control motor and injection pump.

Renewing the control motor

- 1 Clear the end position memory.
- 2 Checking / adjusting the link rod (idling / full throttle) between the control motor and injection pump.

Renewing the link rod on the control motor

Renewal may be necessary due to play in the ball rod.

- 1 Clear the end position memory.
- 2 Checking / adjusting the link rod (idling / full throttle) between the control motor and injection pump.

Adjusting the idle speed

- 1 Checking / adjusting the mechanical idle speed of the injection pump.
- 2 Using the SP2, program the correct idle speed into the electric throttle control unit.
- 3 Clearing the end position memory.
- 4 Checking / adjusting the link rod (idling / full throttle) between the control motor and injection pump.

Renewing the electric throttle control unit

- 1 Using the SP2, program the electric throttle control unit for the current vehicle engine type.
- 2 Checking / adjusting the mechanical idle speed of the injection pump.
- 3 Using the SP2, program the correct idle speed into the electric throttle control unit.
- 4 Clearing the end position memory.
- 5 Checking / adjusting the link rod (idling / full throttle) between the control motor and injection pump.

Renewing the accelerator pedal sensor

- 1 Check and adjust the link rod (idling) by the accelerator pedal sensor.
- 2 Check / adjust the pedal stop (full throttle).

Changing the accelerator pedal inclination

- 1 Adjust the inclination angle of the accelerator pedal.
- 2 Check and adjust the link rod (idling) by the accelerator pedal sensor.
- 3 Check / adjust the pedal stop (full throttle).

Work procedures


Programming engine type using SP2

Using the Scania Programmer 2, program the current engine type into the electric throttle control unit.

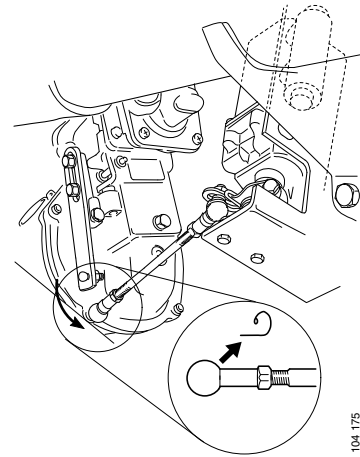
IMPORTANT! In order to achieve the best results, all steps in the adjustment procedure should be carried out in one sequence.

Checking / adjusting mechanical idle speed on the pump

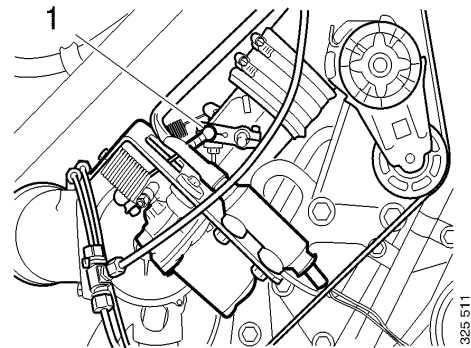
Tools

Number	Denomination	Illustration
587 304	IR tachometer	

- 1 Run the engine until warm, preferably using frequent retarder braking, for at least 30 minutes. The engine must be warm throughout.
- 2 Undo the latch clamp securing the ball joint (1) at the injection pump. Remove the link rod from the arm.

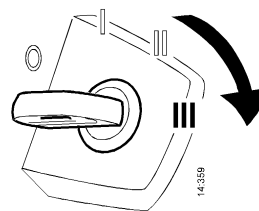


Diesel and ethanol engines.



Gas engines

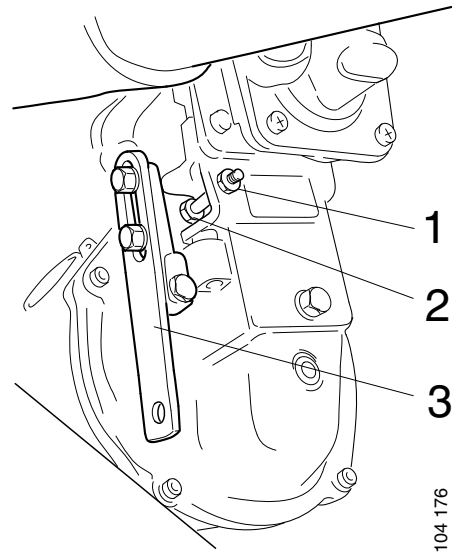
- 3 Start the engine.
- 4 Measure the engine speed against the marking on the pulley. Use an IR tachometer.



Note: Do not use the tachometer on the instrument panel. It does not yield a sufficiently accurate reading.

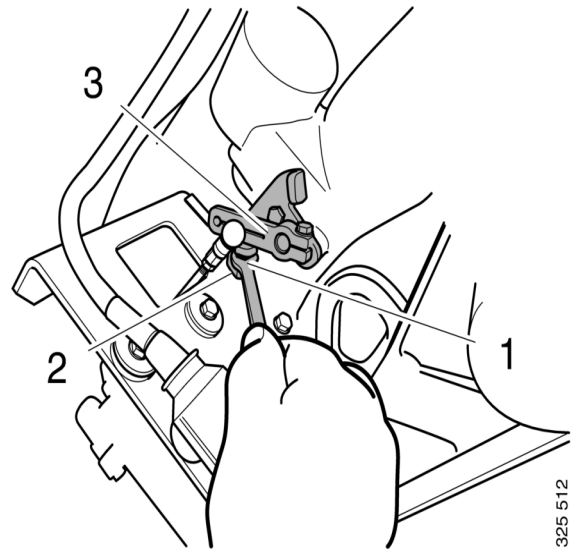
- 5 Adjust to the desired speed (520 or 550 rpm) using the idling screw.
 - Undo the lock nut (1) on the under side. Adjust the idling screw (2).
 - Ensure that the arm (3) is resting against the idling screw.
 - Tighten the lock nut (1).
- 6 Shut off the engine using the starter key.

Next: "Clear the end position memory".



104 176

Diesel and ethanol engines.



325 512

Gas engines

Programming correct idle speed using SP2

The idling speed 520 rpm (or 550 rpm) is also programmed in the control unit. Therefore a mechanical idling speed differing from the pre-programmed speed (520 or 550 rpm) must not be used. This may be required to avoid undesirable vibrations. It is important that the control unit is programmed to the actual idle speed.

The speed value depends on the engine type. The idle speed may need to be checked using the Scania Programmer 2.

Setting values

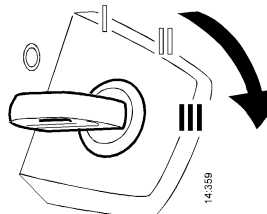
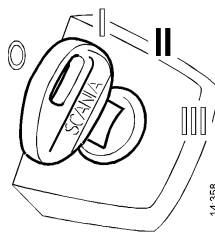
Denomination	Value
Standard idle speed for diesel engines	520 rpm
Standard idling speed for ethanol engines	550 rpm
Standard idling speed for gas engines (both trucks and buses).	550 rpm

Clearing the end position memory

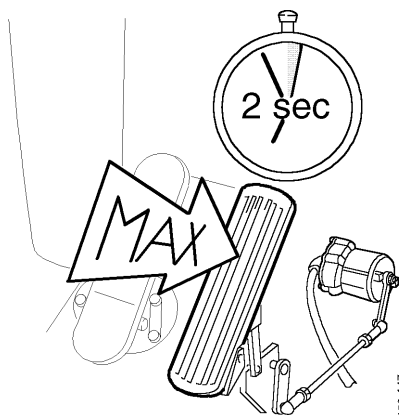
- 7 Switch on the power using the starter key.

Clearing (i.e. storing the values for maximum end position) will now begin.

- 8 Start the engine and run it at idling speed (520 or 550 rpm).

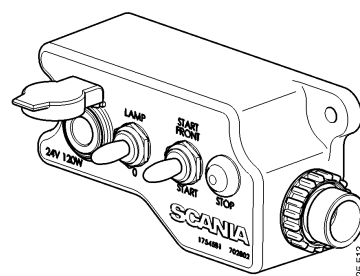


- 9 Depress the accelerator pedal to full throttle for at least two seconds, with the link rod loose by the injection pump.



- 10 Shut off the engine using the switch located in the engine compartment.

Note: It is important to use the switch in the engine compartment since voltage needs to be on during the rest of the adjustment procedure.

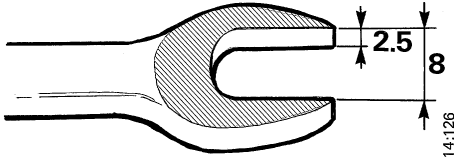


Clearing is now complete.

Next: "Checking / adjusting the link rod between the control motor and pump".

Checking / adjusting the link rod between the control motor and pump

Tools

Denomination	Illustration
Special cut spanner	

Consumables

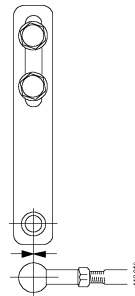
Heat-resistant paste 561 205

- 11 Adjust the link rod so that the centres of the ball seat and ball are lined up. Tighten the lock nut. Let the link rod dangle.

This is the adjustment of the idle speed position on the link rod.

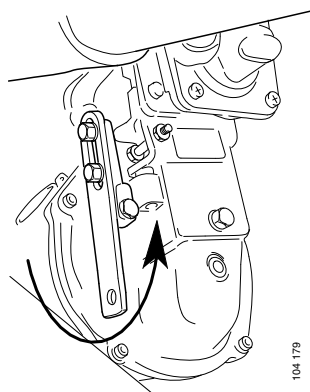
- 12 Ask a colleague to depress the accelerator pedal to full throttle.

This is to adjust the full throttle position on the link rod.



- 13 Move the injection pump arm to full throttle position.
- 14 The link rod should be 3 ± 1 mm too short at the end by the injection pump. The value can be read off by the injection pump arm.

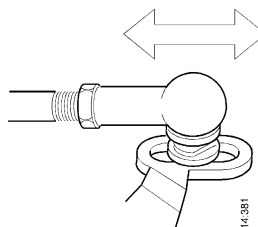
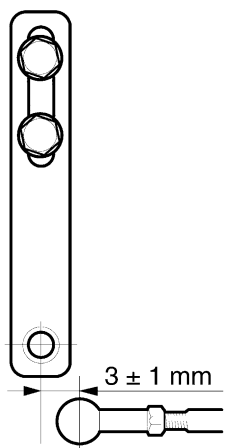
Full throttle position on the link rod is now adjusted. Before the link rod is screwed together, grease the ball seat using heat-resistant lubricating paste 561 205.



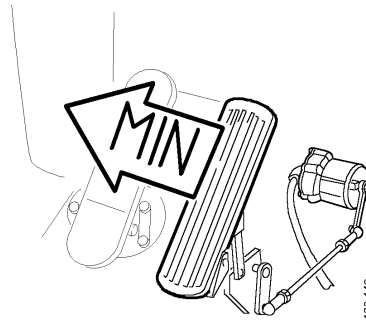
- 15 If required, make the adjustment on the control motor arm. Use fixed spanner: special cut 8 and 10 mm respectively.

Adjustments to this track do not affect adjustment of the idling speed position.

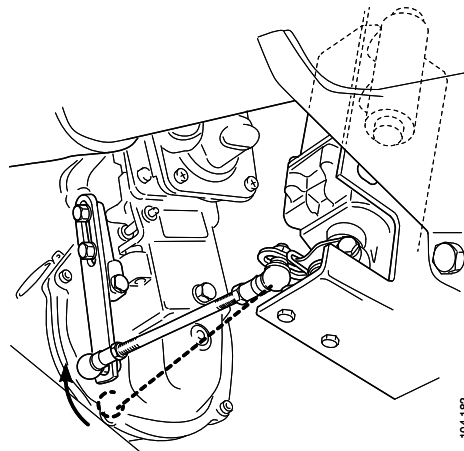
- 16 If the stroke length of the injection pump arms or control motor arms is insufficient, the injection pump arm length must be adjusted. In this case, move the arm along the track.



- 17 Release the accelerator pedal.
- 18 Check the idling speed position again. (If necessary, restart from step 2.)

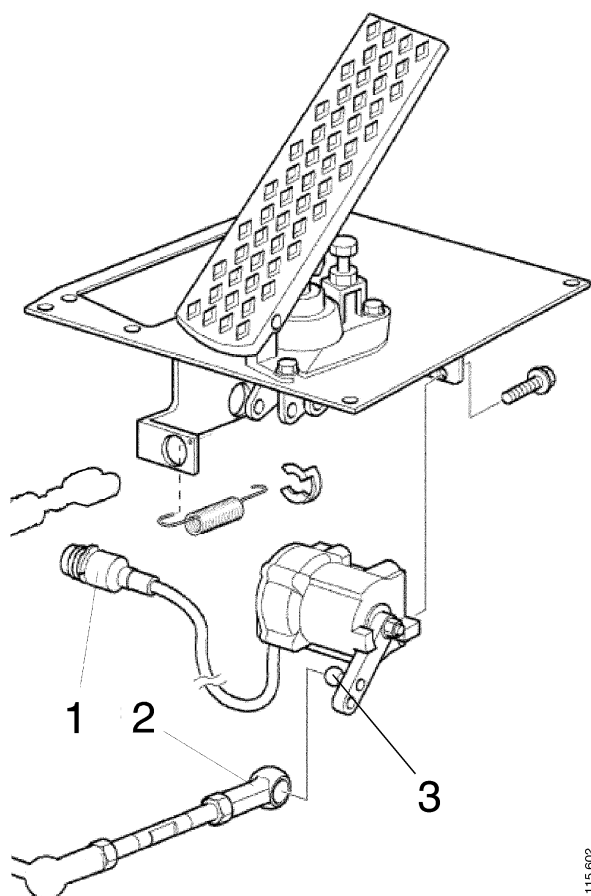


- 19 Replace the link rod onto the injection pump arm.
- 20 Erase all fault codes, according to the section *Erasing fault codes* in the booklet *Electric throttle troubleshooting and fault code list*.



Adjusting the pedal angle

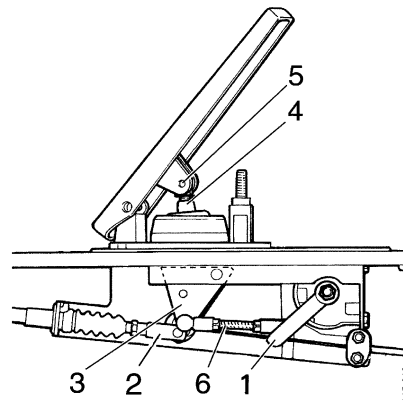
Note: Ball pin position 3 applies to 4 series buses.



- 1 Connector
- 2 Link yoke
- 3 Ball pin position for 4 series buses

Idling position

- 1 The accelerator pedal arm (3) should act as a stop for the upward pedal movement and rest against the underside of the accelerator pedal bracket. If this is not the case, extend the accelerator pedal sensor link (6).
- 2 The pedal angle should be approx. 45° from horizontal. Adjust the pedal angle according to the customer requirements using the vertical link rod (4) under the pedal. The link rod is secured in the pedal with a pin and lock plate (5).

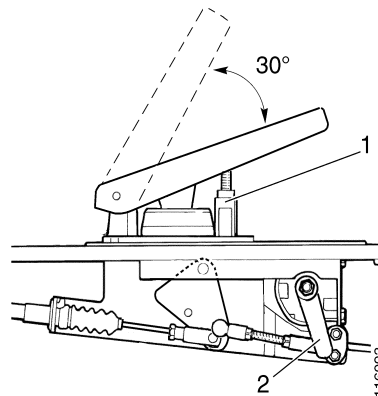


- 1 Accelerator pedal sensor arm
- 2 Cable fork
- 3 Lever
- 4 Vertical link rod
- 5 Pin and lock plate
- 6 Link

Full throttle position

- 1 Adjust the set screw (1) so that the pedal has a range of movement of approx. 30° .

Now perform a check on the accelerator pedal sensor settings.

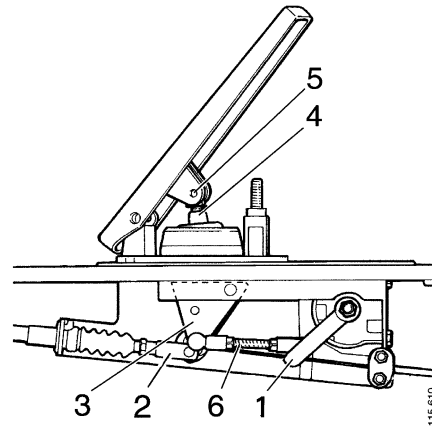


- 1 Set screw
- 2 Accelerator pedal sensor arm

Checking / adjusting the link rod by the pedal sensor

Idling position

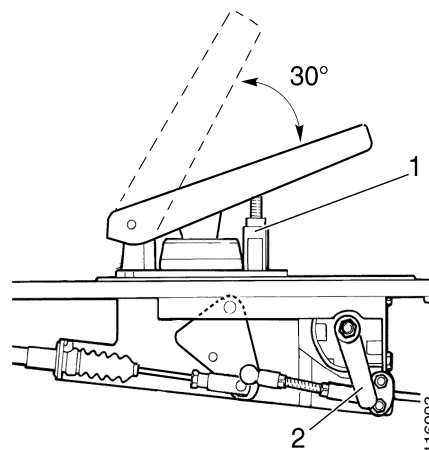
- The accelerator pedal arm (3) should act as a stop for the upward pedal movement and rest against the underside of the accelerator pedal bracket.
- The pedal sensor arm (1) should almost touch the rear stop lug.



- Accelerator pedal sensor arm*
- Cable fork*
- Lever*
- Vertical link rod*
- Pin and lock plate*
- Link*

Full throttle position

- Check that there is a clearance of 1-3 mm between the pedal sensor arm (2) and the front stop lug. Adjust if required using the set screw (1) under the pedal.



- Set screw*
- Accelerator pedal sensor arm*

Updating the end position memory

If the end position memory is not cleared as above, the operating range of the control motor will become more limited every time the link rod is adjusted.

Clearing the memory guarantees that the control motor always has the maximum operating range following adjustment.

Only the basic mechanical adjustment can be used for the idle speed position.

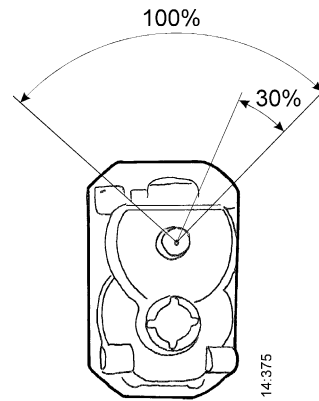
The control unit checks the full throttle end position once after every power-on. The check takes place the first time full throttle is applied for at least 1 second and the speed exceeds 7.5 km/h or the engine speed exceeds 400 rpm. Guided by this end position, the control unit determines whether the end position lies within the permitted operating range.

The end position adjustment lies within 30% of the total turning range for the control motor. If the end position is outside this range, a warning and fault code are generated.

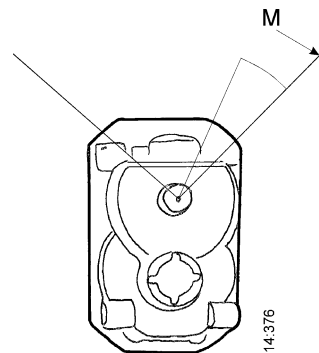
The control unit has stored the end position from the previous check. If the control unit detects a new electric end position, it will replace the old value.

When the end position memory is cleared, the mechanical end position is stored in the control unit memory. If it is not cleared, the self adjustment will be outside the permitted operating range after a number of link rod adjustments.

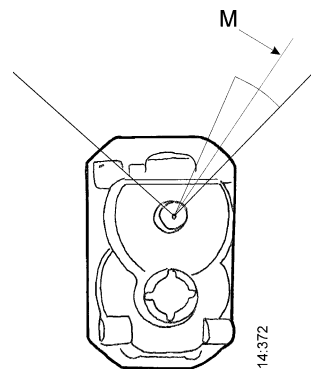
When adjusting the link rod, it is shortened by 3 mm. This is so that the adjusted end position is approximately in the centre of the adjustment range. The next time the bus is driven and the conditions for updating are fulfilled, this value is stored as the electric end position. This gives approximately 15% adjustment in each direction, compared to the total control motor stroke length.



End position adjustment range.



M in the illustration is the position that the control unit stores in its memory.

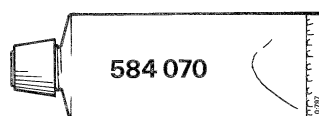


M in the illustration is the position that the control unit stores in its memory when the link rod is correctly adjusted and installed.

Connector

Maintenance

Use special grease 584 070 to prevent corrosion in the connectors. This minimises the risk of unnecessary fault warnings and breakdowns.

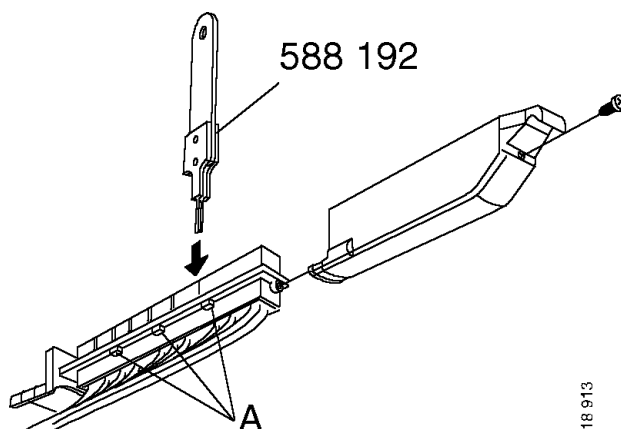


Control unit cable terminals

Two special tools are required to extract the cable terminals from the control unit connector.

Use special tool 588 192 for the larger cable terminals and 588 195 for the smaller ones.

Before the cable terminals can be extracted, the connector latch must be opened. This is done by pushing the upper part of the connector to the side. Whether the connector is open or closed can be seen by the three hooks (A).



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