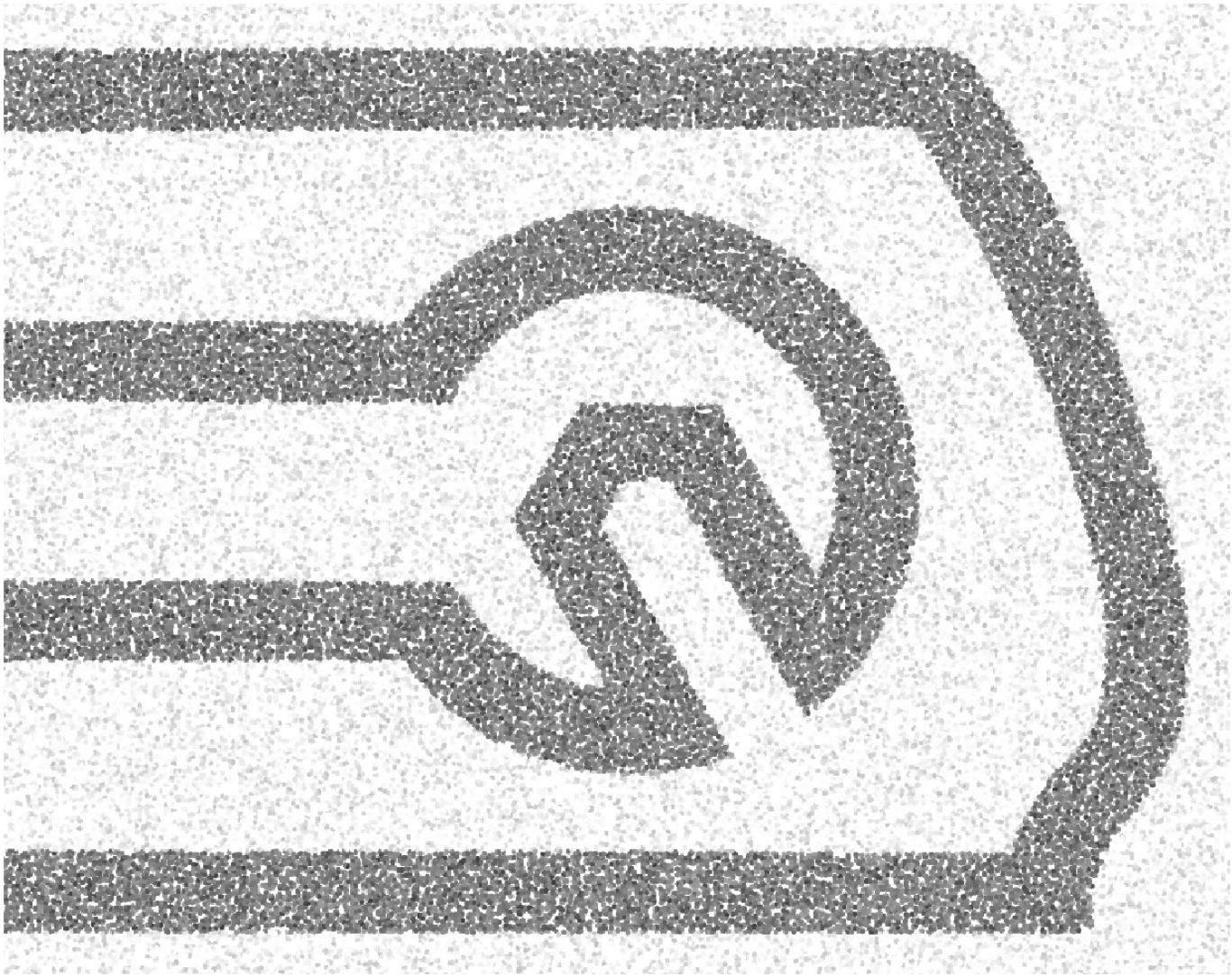
Chapter 2
Engines



Contents section 2

2.1 Throttle control

1 Introduction

Installing and adjusting the throttle control components demands great accuracy. If the throttle control (cable, pedals and levers) is not installed and adjusted (stroke, play) in accordance with the procedures in this chapter, the following may happen:

- The engine power will not be used to the full,
- The throttle cable will be damaged,
- The pedals will be damaged,
- The speed limiter will be used incorrectly.

All possible control types will be dealt with in this chapter, including replacement and repair of the throttle cable.

2 Safety

Correct operation and adjustment of the throttle control are essential for the safety of driver and passengers. Correct operation can only be guaranteed, if all instructions relating to installation, adjustment and maintenance are observed. Failing to observe these instructions may lead to dangerous situations and unpredictable behaviour of the coach (just think about a sticking throttle cable).

Installation, maintenance and repair may only be carried out by personnel trained and authorised by the Bova service organisation. Repairs and maintenance work carried out by non-authorised persons may lead to dangerous situations and are not covered by the warranty conditions.

2.1 Safety in the workshop

In order to work safely on the throttle control, the following instructions must be strictly observed:

1. Provide an adequate extraction for exhaust fumes and vapours of cleaning agents and solvents.
2. Protect the coach from rolling away.
3. Never let the engine run during work on the throttle control.
4. Only use tools that have been approved by the Bova Service Organisation.
5. Only use tools that fit perfectly.
6. Only use original Bova parts.

3 Installation / Adjusting procedures

3.1 Accelerator pedal for left-hand drive coaches

The most occurring accelerator pedal in the Futura coaches is the continental type. This type is used in all left-hand drive coaches. With a slight adaptation this accelerator pedal is also suitable for:

- A MAN engine (type FHX400 EDC),
- An automatic gearbox,
- The manual throttle option (Denmark).

1. Before an accelerator pedal is installed in the coach, it is best to assemble it as far as possible on the workbench (see drawing below).

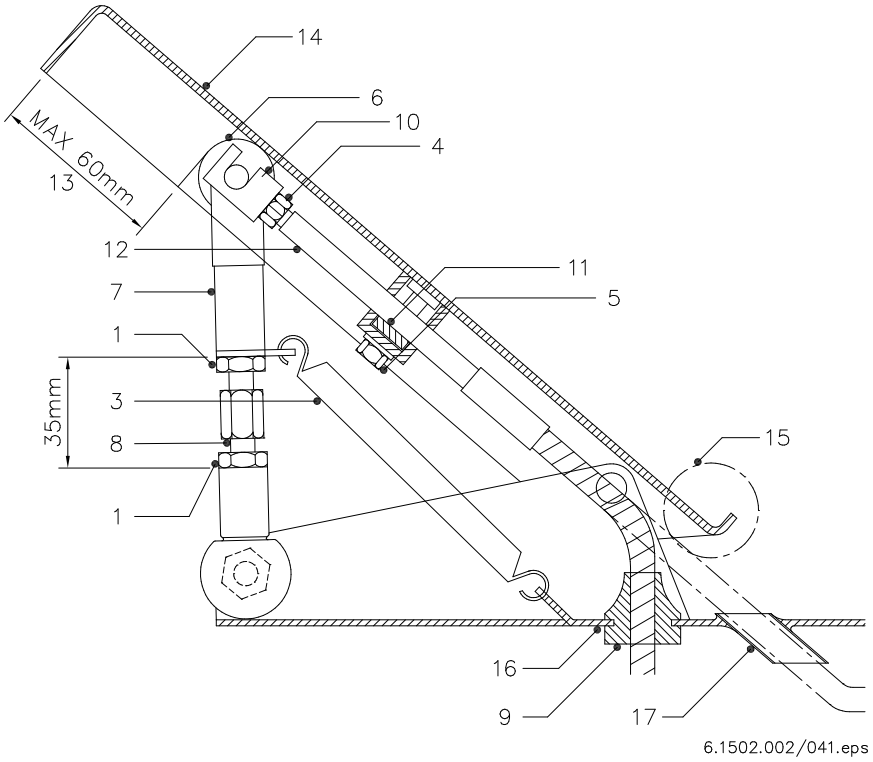


Figure 1 Accelerator pedal for left-hand drive coaches

1. Lock nut
3. Spring
4. Lock nut
5. Nut
6. Guide roller
7. Spacer
8. Stud for pedal angle adjustment
9. Grommet
10. Fork
11. Cable clamp for stroke adjustment
12. Throttle cable
13. Stroke, adjustable over 60 mm
14. Pedal
15. Heel supports
16. Cement at this place
17. Guide pipe (60003860++)

2. The angle between the accelerator pedal and the floor can be adjusted by means of stud {**8**}. By keeping the distance between spacers {**7**} at approximately 35 mm, the most comfortable position is obtained. Of course, this distance can be adapted to the driver=s preference.
3. Secure this angle by means of lock nuts {**1**}.
4. The pedal can then be installed in the coach. Fit the bolts from top to bottom. At the two rearmost bolts, insert two washers between accelerator pedal and floor.
5. Check the position of the throttle cable (this applies to all types of accelerator pedal). At the accelerator pedal the cable must run towards the rear under the same angle as the pedal angle. If the cable is laid under too acute an angle, a lack of lubrication may occur (before and after the bend) later on. Then the operation of the accelerator pedal will also be more difficult.
6. Fit the throttle cable to the accelerator pedal. Do not forget to slide grommet {**9**} over the throttle cable. After the adjustment this grommet must be cemented down with butyl cement.

*As from chassis number 6003860 the cable is more in line with the pedal and no grommet is used, but a small guide pipe which is welded to the chassis. The throttle cable must be run through this pipe, after which it must be cemented down with butyl cement; see Figure 1 {**17**}.*

7. Next screw fork {**10**} onto the end of the throttle cable. Make sure that the cable does not touch the shaft of the guide rollers, as in that case the accelerator pedal would not pivot very well; see Figure 2 {**2**}.

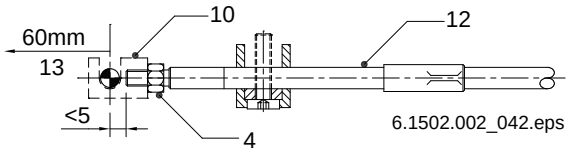


Figure 2 Fitting the manual throttle set to the accelerator pedal

4.	Lock nut	12.	Throttle cable
10.	Fork	13.	Stroke, adjustable over 60 mm

8. Secure fork {**10**} by means of lock nut {**4**}.
9. Then the stroke of the accelerator pedal must be adjusted. The adjustment depends on the type of engine used in the coach. Euro 2 engines have been fitted with an RQV pump (like the DAF 430 Euro1). Euro 1 engines have been fitted with an RQ pump (except DAF 430 Euro1) for which the accelerator pedal stroke must be set to 50 mm.

Accelerator pedals for Mercedes engines must have a stroke of 40 mm.

10. The distance of 40, 50 or 60 mm is measured between the pedal and the outer side of guide roller {**6**}; see Figure 1 {**1**}.
11. Lock this stroke by securing the throttle cable with the aid of cable clamp {**11**}.
12. The operation of the accelerator pedal can only be checked after the cable has been connected to the injection pump and has been adjusted.

3.2 Accelerator pedal for left-hand drive coaches with manual throttle option

Pedals for left-hand drive coaches can be fitted with manual throttle operation. This is used in particular when an increased engine idling speed is required, for example, when the air-conditioning compressor cuts in frequently in a stationary coach.

The procedure for the installation and adjustment of an accelerator pedal provided with the manual throttle option is exactly the same as far as the cable to the engine is concerned (refer to the previous section). Fit the manual throttle set to the accelerator pedal before the latter is fitted to the floor.

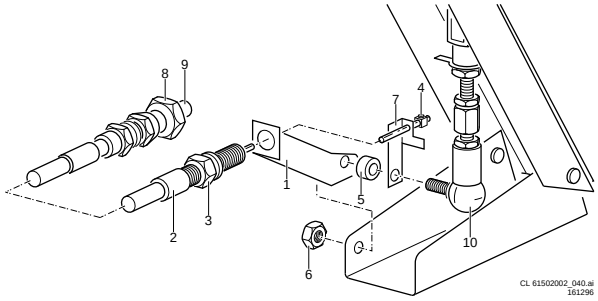


Figure 3 Accelerator pedal fitted with manual throttle option

1. Attachment
2. Manual throttle cable
3. Nut
4. Clamp
5. Spacer
6. Nut
7. Bracket
8. Rotary knob
9. Knob
10. Ball-and-socket joint
11. Washer

1. Remove spacer {**5**} by unscrewing nut {**6**}.
2. In the place of this spacer, attachment {**1**} and bracket {**7**} are fitted. This bracket pulls the pedal down, if the knob on the dashboard is turned anticlockwise.
3. Screw the manual throttle cable on the attachment in such a way that the inner cable protrudes about 1 cm through the bracket eyelet.
4. Then slide clamp {**4**} onto the end of the manual throttle cable and tighten it securely.
5. Rotate the outer cable in the attachment {**1**}, as a result of which the inner cable is retained without any play. Make sure that the pedal is not pulled down.
6. Lock the adjustment of the manual throttle cable by means of nut {**3**}.
7. Slide a plastic sleeve over spring {**3**}; see Figure 1. The length of the sleeve equals the length of the spring in its relaxed state. This sleeve makes sure that clamp {**4**} (see Figure 3) will not be caught in the spring when the accelerator pedal is normally pushed down.
8. Fit the pedal to the coach floor. Fit the bolts from top to bottom. At the two rearmost bolts, insert two washers between accelerator pedal and floor.
9. Check the operation of the manual throttle set by means of knobs {**8**} and {**9**}. By rotating knob {**8**} anticlockwise the pedal is pulled down and, thus, the engine speed increased. Next press the red knob. The pedal is released and the engine returns to its idling speed.
10. *Do not leave the manual throttle in one particular position during driving. Then the engine would no longer run at idling speed, which would result in dangerous situations.*

3.3 Accelerator pedal for Great Britain

Coaches with right-hand drive have the accelerator pedal near the outside of the coach. Therefore, it is not possible to use accelerator pedals for left-hand drive coaches. The installation / adjustment procedure is also different.

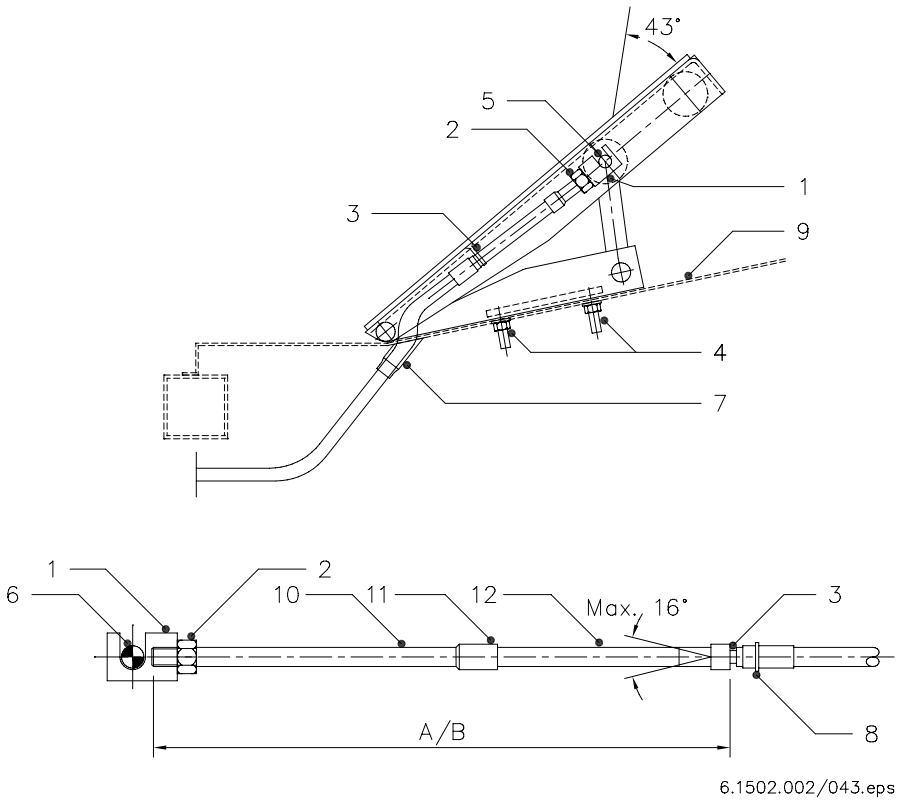


Figure 4 Accelerator pedal for Great Britain

1. Fork
2. Lock nut
3. Attachment point
4. Nut
5. Guide roller
6. Shaft
7. Grommet
8. Ring
9. Floor
10. Inner cable end piece
11. Sealing
12. Outer cable

A. Stroke 50 mm: length = 157 mm
B. Stroke 60 mm: length = 192 mm

The accelerator pedal is of a simpler construction than the accelerator pedal for left-hand drive coaches. The height of the pedal cannot be adjusted. It depends on the stroke the pedal must make.

The stroke is not adjustable either. The stroke is determined by the type of cable that is used. Depending on the engine the stroke is 40 mm (Mercedes engines), 50 mm (Euro 1 engines with RQ pump) or 60 mm (Euro 2 engines with RQV pomp and the DAF 430 Euro1). This must be taken into account when cables are ordered. See Figure 4 for this.

1. Feed the cable through the hole at the lower side.
2. Slide ring {**8**} over the cable. This ring makes sure that the cable cannot vibrate off the attachment point.
3. Next screw fork {**1**} onto the end of the cable. Make sure that the cable just does not protrude from the fork, as in that case it would not pivot very well.
4. Secure the fork by means of lock nut {**2**}. The stroke of the accelerator pedal has now been fixed.
5. Fit the fork together with the guide rollers onto the shaft.
6. The cable is fixed by pressing its attachment point {**3**} into the attachment point of the pedal.
7. Fold the lug of ring {**8**} around the pedal attachment point to prevent the cable from vibrating out of it.
8. Secure the pedal by means of three hexagonal bolts.
9. Cement grommet {**7**} down with butyl cement and check that there are no sharp bends or kinks in the cable. The more bends in the cable, the more difficult it will be to operate the accelerator pedal.
10. It is now very important that the cable adjustment at the pump is carried out correctly. The stroke of the pedal must correspond to the stroke made by the pump (refer to procedures 6 to 11 of this section).

3.4 Kick-down pedal

Futura coaches fitted with an automatic gearbox need an adaptation of the accelerator pedal. This applies to both left-hand drive and right-hand drive coaches (see Figure 5).

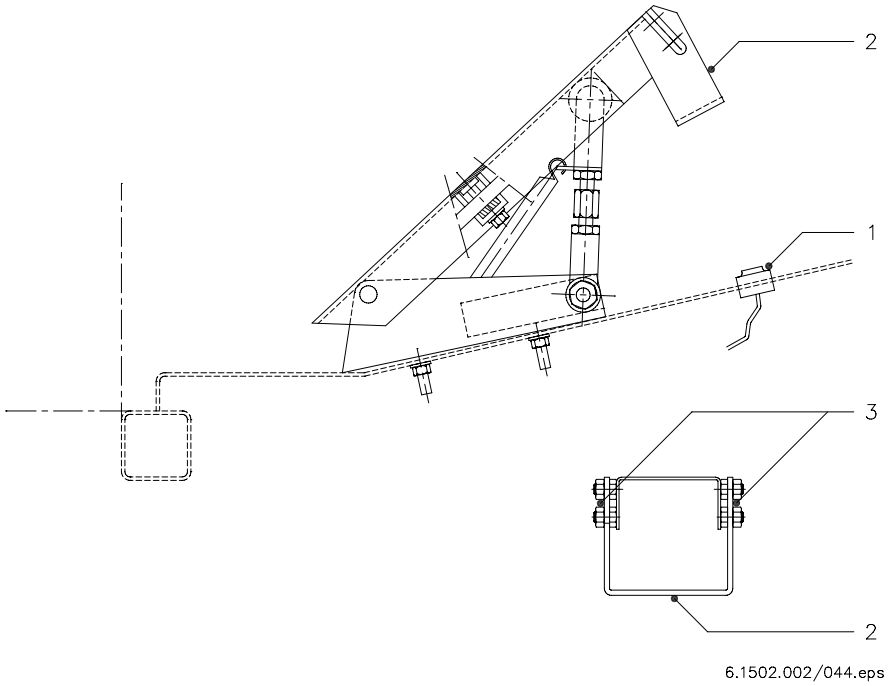


Figure 5 Kick-down pedal

1. Switch
2. Bracket
3. Bolt

Installation and adjustment of the accelerator pedal are the same as for Futura coaches equipped with manual gear change (not FHX400 EDC).

During replacement or readjustment of the cable, make sure that switch {**1**}, which is fitted to the floor, is pushed down 5 mm at full throttle (audible switching). If this is not the case, this distance can be readjusted by means of the four bolts {**3**}.

3.5 Accelerator pedal for FHX400 EDC

The FHX400 EDC is a Futura coach fitted with a powerful 400 hp MAN engine. The engine has an electronically controlled injection pump. There is no longer a throttle cable between injection pump and accelerator pedal. The position of the accelerator pedal is translated into an electric signal by means of a accelerator-pedal position sensor. This signal is fed to a control unit. This unit determines how much diesel fuel will be injected into the engine. Thus, the adjustment of the throttle cable is obviated.

The accelerator pedal is the same pedal which is used for left-hand drive Futura coaches, however, with several modifications. The construction of this pedal is shown in Figure 6.

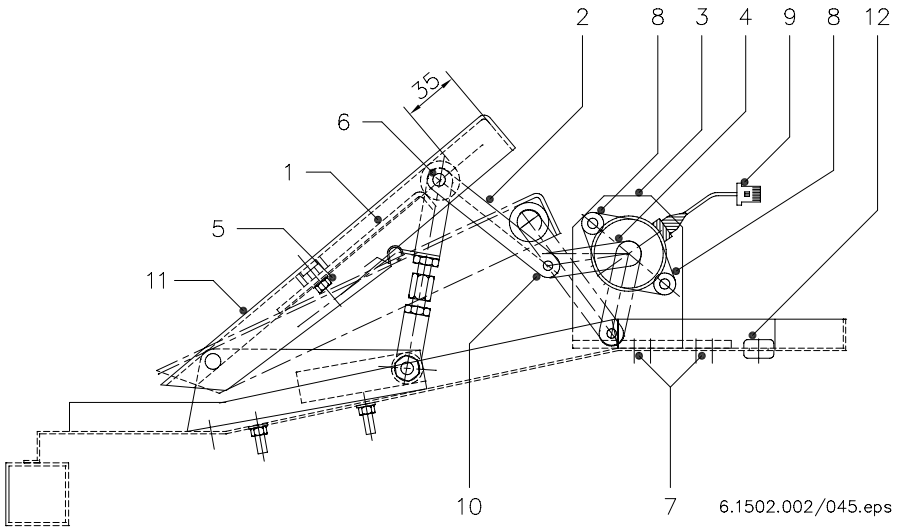


Figure 6 Accelerator pedal FHX400 EDC

1. Strip
2. Bracket
3. Support
4. Strip
5. Bolt
6. Guide roller
7. Slotted holes
8. Nut
9. Plug
10. Nut
11. Pedal
12. Grommet

Although there is no longer a throttle cable, the maximum and minimum engine speed must be regularly checked (idling 600 rpm, full throttle 2150 rpm). This is certainly necessary when the pedal height has been changed (refer to procedure 3.1 in this section) or when a new accelerator-pedal position sensor has been fitted (refer to next section).

1. Support {**3**} has been fitted with slotted holes {**7**}. Slightly slacken the bolts through these slotted holes to facilitate pedal stroke adjustment.
2. By means of the two bolts {**5**} and strip {**1**} set the distance between the guide rollers and the pedal to 35 mm; see Figure 6. This distance must be accurately set, as it determines the stroke of the accelerator-pedal position sensor and, thus, the minimum and maximum engine speed.
3. If the pedal is in the upper position, the engine must run at idling speed. If the pedal is in the lowest position, the maximum engine speed must be reached.
4. As soon as both engine speeds conform to the specifications, support {**3**} can be secured again by means of the bolts through slotted holes {**7**}.

3.5.1 Removing the accelerator-pedal position sensor

1. To remove the accelerator-pedal position sensor, the accelerator pedal must be removed as well, in order to gain access to the sensor. To this end remove the bolts that secure the accelerator pedal to the floor.
2. Detach the position sensor plug. This is located directly below the tachograph. Do not detach the cables from the tachograph, as these are put under seal.
3. The cable to the sensor is fixed with a number of clamping strips. Cut these strips.
4. Unscrew nuts {**8**} and {**10**}; the accelerator-pedal position sensor can then be replaced.

3.5.2 Installing the accelerator-pedal position sensor

1. Secure the position sensor by means of nuts {**8**} and {**10**} as indicated in Figure 6. The position of strip {**4**} with respect to the position sensor has been correctly fixed by MAN and may not be changed.
2. Position the cable behind the dashboard and fix it by means of a number of clamping strips.
3. Attach the plug and replace the tachograph.
4. Check the stroke of the accelerator pedal and the engine speed. If the idling engine speed is 600 rpm and the full throttle speed 2150 rpm, the sensor has been adjusted correctly (fit the sensor as supplied, the EDC unit controls the engine speeds).
5. Fit the accelerator pedal to the floor again.

3.6 Throttle control, rear, for DAF WS/RS engines

After the accelerator pedal has been adjusted in accordance with the procedures above, the throttle control at the rear must be adjusted. Up to chassis number 6003850 the RS engines are fitted with a lever which is shorter than the WS engine levers. RS engines as from this chassis number have the same lever as the WS engines. The stroke of the injection pump arm is different for Euro 1 and Euro 2 engines. However, the adjustment procedure for the throttle control is the same for all DAF engines.

1. Before the throttle cable is fitted, the distance between the centre of the lever {**9**} and the attachment point of the throttle cable must be checked. This must be 288 mm; see Figure 8. This distance can be adjusted by means of the four bolts 1 to 4 on support {**15**}. This is the basic adjustment.

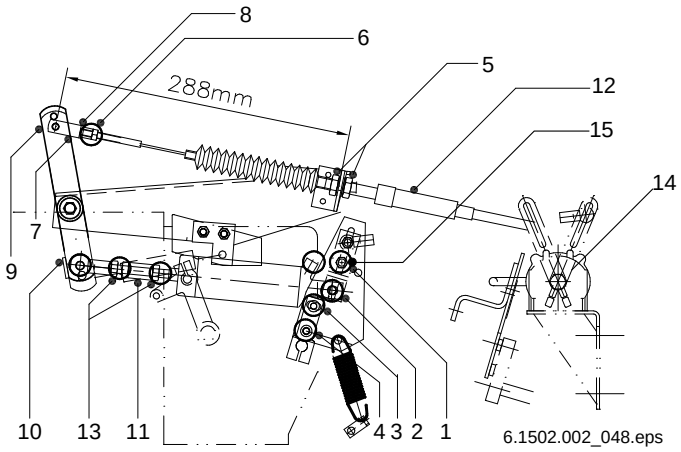


Figure 7 Fitting and adjusting the throttle control at the rear for DAF WS/RS engines

1. Bolt
2. Bolt
3. Bolt
4. Bolt
5. Nut
6. Lock nut
7. Fork
8. Bracket
9. Lever
10. Lug
11. Air cylinder rod
12. Compensator
13. Nut
14. Sensor in case of an AVS gearbox / automatic transmission
15. Support

2. Attach the throttle cable to the lever and the support. Position both nuts {**5**} approximately in the middle of the cable, so that there will be room left at both sides to adjust the cable.
3. The end of the throttle cable is fitted with a 2 cm stud. Screwing this inwards or outwards will remove the free play. The lever is fitted without free play when its lower part touches lug {**10**} and the throttle cable is taut. After the minimum and maximum engine speeds have been adjusted, lock nut {**6**} can be tightened.
4. Remove the free play from support {**15**}. This is done by means of bolts {**3**} and {**4**}. Slacken those to allow the support to move horizontally and remove the free play. Support {**15**} now touches the pump boss. Tighten bolts {**3**} and {**4**} again.
5. Tauten the throttle cable again by means of nuts {**5**}.
6. Push the accelerator pedal all the way down and secure it by means of a clamping strip.
7. Then check that the boss on support {**15**} touches the full-throttle stop of the pump. Fine-adjust this stop by means of bolts {**1**} and {**2**}. There may be 1 mm of free play between the boss on support {**15**} and the stop of the pump.
8. Now the rod connected to the air cylinder of the ASR / speed control may not be pulled out. Neither may compensator {**12**} be pulled in. Should this be the case, it means that the boss on the support touches the stop of the pump too early. By means of bolts {**3**} and {**4**} (coarse adjustment), and {**1**} and {**2**} (fine adjustment) the support can be slightly retracted.

9. Release the accelerator pedal and check for free play between lug {**10**} and lever {**9**}. Should there be free play, then steps 3 to 7 must be repeated.
10. The throttle control has been correctly adjusted when the following conditions are met:
    - Minimum and maximum engine speed conform to specifications,
    - At maximum engine speed, the accelerator pedal is pushed down all the way to the stop,
    - At maximum engine speed, the air cylinder rod has not been pulled out and the compensator has not been pulled in,
    - At idling speed there is no free play between lever {**9**} and the throttle cable.
11. Put a seal on the encircled nuts. This may only be done by authorised persons.

3.7 Throttle control, rear, for Mercedes engines

The throttle control adjustment of Futura coaches fitted with a Mercedes engine is largely carried out through the throttle rod {**1**} which runs to the injection pump; see Figure 9.

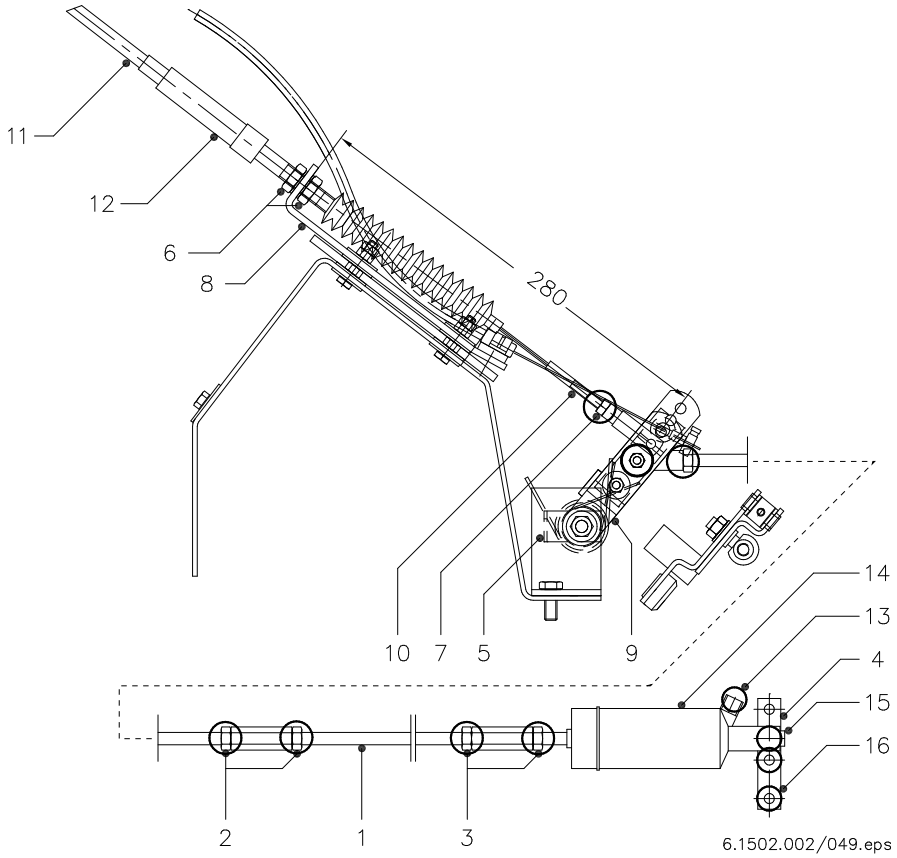


Figure 8 Throttle control, rear, for Mercedes engines

1. Throttle rod
2. Nut
3. Nut
4. Strip
5. Spring
6. Nut
7. Lock nut
8. Strip
9. Lever
10. Stud
11. Throttle cable
12. Compensator
13. Air connection
14. ASR cylinder
15. Ball-and-socket joint
16. Attachment point injection pump

1. Fit the throttle cable as indicated in Figure 8. The distance between strip {**8**} and the centre of lever {**9**} must be 280 mm. This distance can be adjusted by means of nuts {**6**} (coarse adjustment) and stud {**10**} (fine adjustment).
2. When the measure of 280 mm is correct and the cable is taut, nuts {**6**} and lock nut {**7**} can be tightened.
3. Then adjust the idling speed. The idling speed is adjusted by lengthening or shortening threaded rod {**1**} with the aid of nuts {**2**} and {**3**}. This is a coarse adjustment.
4. Fine adjustment can be carried out with the aid of the idling adjustment screw on the fuel pump (not visible in Figure 9).
5. As for Mercedes engines the stroke of the accelerator pedal is set to 40 mm, the maximum travel of lever {**9**} is also determined and, at the same time, the stroke of the lever on the injection pump.
6. The throttle control has been correctly adjusted when:
   - Minimum and maximum engine speed conform to specifications,
   - At maximum engine load, the accelerator pedal is pushed down all the way to the stop and the compensator has not been pulled in,
   - At idling speed there is no free play on the throttle cable.
7. Put a seal on the encircled nuts. This may only be done by authorised persons.

3.8 Throttle control, rear, for Cummins engines

Cummins engines are exclusively supplied to Great Britain. The stroke which is made on the injection pump depends on the type of cable used. Cummins engines are of the Euro 1 type. To this type of engines belongs (for right-hand drive countries) the B219664 throttle cable. After the accelerator pedal has been fitted with the correct cable in accordance with procedure 3.3, the throttle control at the rear must be adjusted.

1. Before the throttle cable is fitted, the distance between the top of lever {**9**} and the attachment point of the throttle cable must be checked. This distance must be 288 mm; see Figure 10. The distance can be adjusted by means of the four bolts 1 to 4 on support {**7**}. This is the basic adjustment.

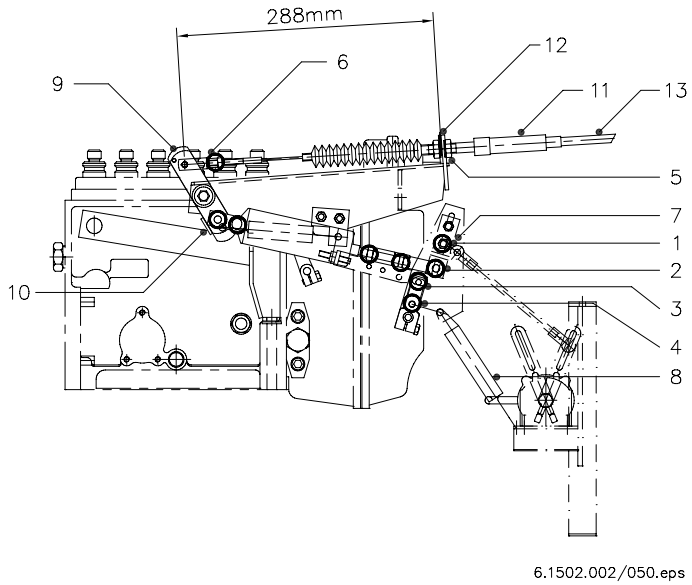


Figure 9 Fitting and adjusting the throttle control at the rear for Cummins engines

1. Bolt
2. Bolt
3. Bolt
4. Bolt
5. Nuts
6. Lock nut
7. Support
8. Spring
9. Lever
10. Lug
11. Compensator
12. Attachment point throttle cable
13. Throttle cable

2. Attach the throttle cable to the lever and the support. Position both nuts {**5**} approximately in the middle of the cable, so that there will be room left at both sides to adjust the cable.
3. The end of the throttle cable is fitted with a 2 cm stud. Screwing this inwards or outwards will remove the free play. The lever is fitted without free play when its lower part touches lug {**10**} and the throttle cable is taut. After the minimum and maximum engine speeds have been adjusted, lock nut {**6**} can be tightened.
4. Remove the free play from support {**7**}. This is done by means of bolts {**3**} and {**4**}. Slacken those to allow the support to move horizontally and remove the free play. Support {**7**} now touches the pump boss. Tighten bolts {**3**} and {**4**} again.
5. Tauten the throttle cable again by means of nuts {**5**}.
6. Push the accelerator pedal all the way down and secure it by means of a clamping strip.
7. Then check that the boss on support {**7**} touches the full-throttle stop of the pump. Fine-adjust this stop by means of bolts {**1**} and {**2**}. There may be 1 mm of free play between the boss on support {**7**} and the stop of the pump.
8. Now the rod connected to the air cylinder of the ASR / speed control may not be pulled out. Neither may compensator {**11**} be pulled in. Should this be the case, it means that the boss on the support touches the stop of the pump too early. By means of bolts {**3**} and {**4**} (coarse adjustment), and {**1**} and {**2**} (fine adjustment) the support can be slightly retracted.
9. Release the accelerator pedal and check for free play between lug {**10**} and lever {**9**}. Should this be the case, then steps 3 to 7 must be repeated.
10. The throttle control has been correctly adjusted when the following conditions are met:
    - Minimum and maximum engine speed conform to specifications,
    - At maximum engine speed, the accelerator pedal is pushed down all the way to the stop,
    - At maximum engine speed, the air cylinder rod and the compensator have not been pulled out,
    - At idling speed there is no free play between lever {**9**} and the throttle cable.
11. Put a seal on the encircled nuts. This may only be done by authorised persons.

3.9 Throttle control, rear, for type Euro 1 MAN engines

MAN engines of the Euro 1 type are fitted with an injection pump that is controlled by a throttle cable, just like the Mercedes, Cummins and DAF engines. This is contrary to MAN engines of the Euro 2 type whose injection pump is fully electronically controlled.

1. Before fitting the throttle cable at the rear, check that the stroke of the accelerator pedal is 50 mm. If the coach is for Great Britain, the correct cable type (B219664) must be used.
2. Fit the throttle cable as indicated in Figure 10. Position both nuts {**5**} approximately in the middle of the cable, so that there will be room left at both sides to adjust the cable.

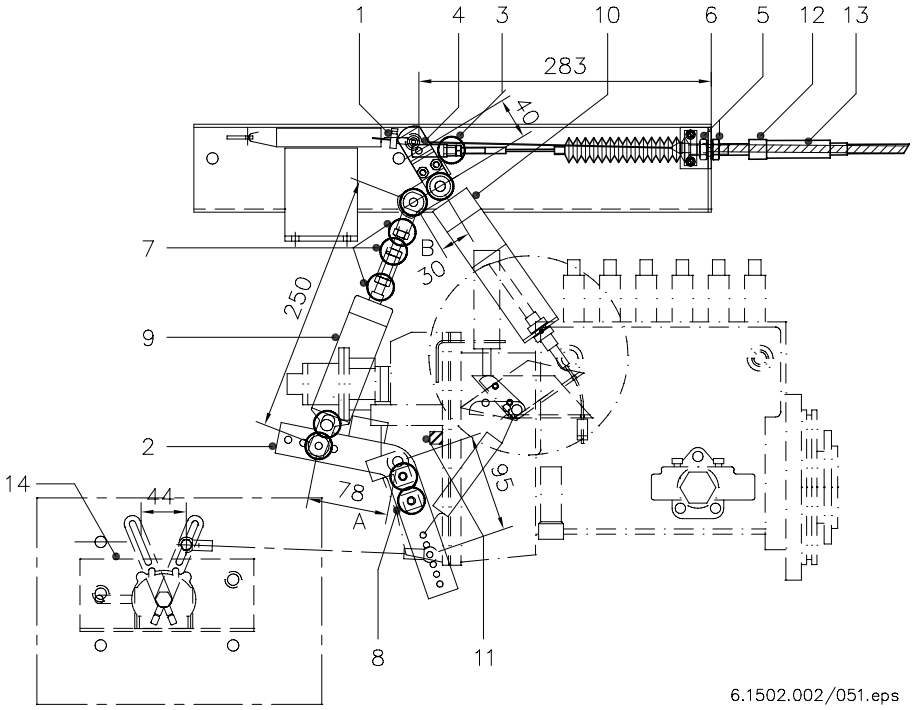


Figure 10 Fitting and adjusting the throttle control at the rear for MAN Euro 1 type engines

1. Strip
2. Strip
3. Nut
4. Fork
5. Nuts
6. Attachment point throttle cable
7. Nuts
8. Nut
9. ASR / speed limiter
10. Engine stop strip
11. Injection pump stop
12. Compensator
13. Throttle cable
14. Sensor in case of AVS

3. Check the engine idling speed adjustment. If this has been adjusted correctly by means of the adjusting screw on the engine (not visible in Figure 11), the following dimensions must be checked and, if necessary, adjusted:
   - distance fork centre - strip pivot-point centre {**1**} : 40 mm,
   - length cylinder plus shaft ASR / speed limiter: 250 mm. This distance is adjustable by means of nuts {**7**},
   - distance A : 78 mm
   - distance B : 30 mm
4. Adjust the distance between the fork centre {**4**} and the attachment point of the throttle cable {**6**} to 283mm. This can be done by means of nuts {**5**} and lock nut {**3**}. If all dimensions are correct, the cable is taut, but the levers are not rotated.
5. Push the accelerator pedal all the way down and secure it by means of a clamping strip.
6. When the accelerator pedal is pushed down all the way, the length of the ASR / speed limiter cylinder plus shaft must be 250 mm, thus, the shaft of the speed limiter may not be pulled out. If this is the case, the speed limiter can drive the fuel pump back to idling speed when the accelerator pedal is completely pushed down. Check this.

7. At the same time check that compensator {**12**} has not been pulled in. The compensator makes sure that the cable is not stretched, if the adjustment is incorrect (too taut).
8. If the speed limiter is pulled out indeed (or the compensator pulled in), this means that the pedal stroke is not 50 mm or strip {**2**} has been misaligned. The strip can be rotated after nut {**8**} has been slackened. Bear in mind that this requires repeating steps 3 to 6.
9. Release the accelerator pedal and put a seal on the encircled points when the following conditions are met:

   • Minimum and maximum engine speed conform to specifications,
   • At maximum engine speed, the accelerator pedal is pushed down all the way to the stop,
   • At maximum engine speed, the air cylinder rod has not been pulled out and the compensator has not been pulled in,
   • At idling speed there is no free play between strip {**1**} and the throttle cable.
   Seals may only be put on by authorised persons.

3.10 Throttle control, rear, for type Euro 2 MAN engines

As from Euro 2, MAN has applied EDC to its engines. This is an electronically controlled injection system by means of which fuel is injected as a function of several parameters. Amongst these parameters are:

- Output signal of the accelerator-pedal position sensor,
- Water temperature,
- Engine speed,
- Fuel temperature.

The advantage of this system is that exactly the right amount of fuel is injected. This means a lower fuel consumption and, hence, less noxious exhaust fumes.

This system obviates the use of a throttle cable between the pedal and the injection pump. The position of the accelerator pedal is electrically transmitted through an accelerator-pedal position sensor. The adjustment of the throttle control at the rear is, therefore, omitted. For the adjustment of the injection pump please refer to the MAN workshop manual

4 Cable repair

4.1 Inner cable

If throttle cables have not been adjusted properly or have been laid under too acute an angle, the inner cable will break after a short while. A correct adjustment and a good check of the adjustment are, thus, important to prevent a breakdown. Although there are several kinds of throttle control and engine, the replacement procedure of the inner cable is the same for all Futura coaches.

If the inner cable is broken, it is not strictly necessary to replace the outer cable. It is, however, better to do this as the coating at the inside of the outer cable may have worn away. In the following procedure the replacement of the inner cable is described.

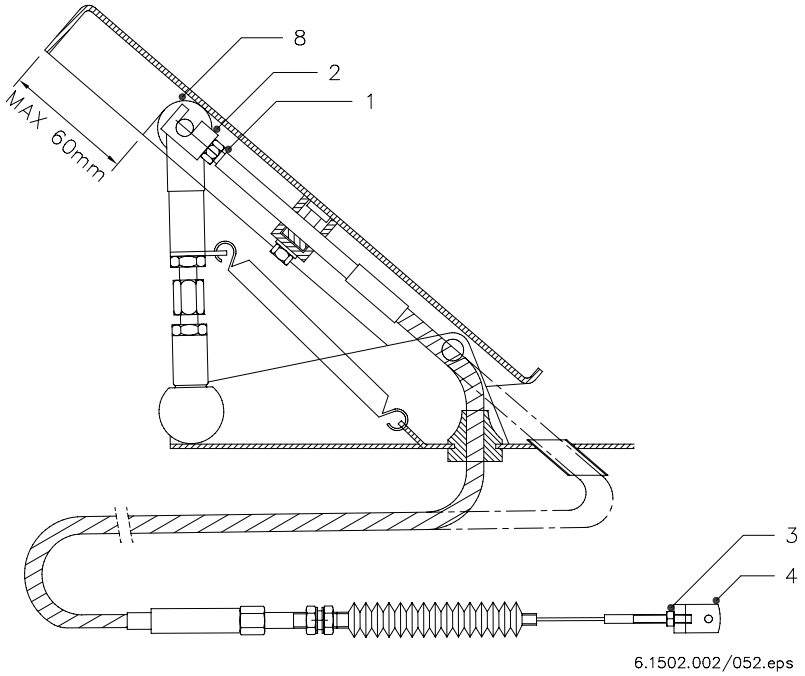


Figure 11 Replacing an inner cable

1. Lock nut
2. Fork
3. Lock nut
4. Fork
5. Stud
8. Guide rollers

1. Remove the broken inner cable. This can be done by unscrewing the lock nuts {**1**} and {**3**} at either end of the cable, after which forks {**2**} and {**4**} can be removed.
2. At either side pull out the inner cable pieces by means of a pair of pliers.
3. Cover the new inner cable with a silicone grease.

Never grease the inner cable with an oil based product. This would attack the coating at the inside of the outer cable.

4. Slide the inner cable into the outer cable at the accelerator pedal side. It is not necessary to detach the outer cable.

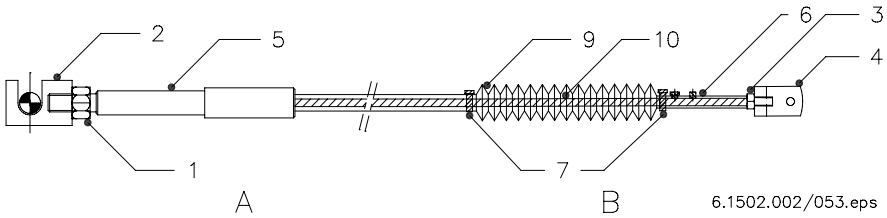


Figure 12 Replacement cable

1. Lock nut
2. Fork
3. Lock nut
4. Fork
5. Stud
6. Stud
7. Clamping strips
9. Dust cover
10. Inner cable

A. Front
B. Rear

5. Screw lock nut {**1**} and fork {**2**} onto stud {**5**}. Screw the fork so far onto the stud that it just does not touch the shaft of guide rollers {**8**}; see Figure 12.
6. Secure the fork by means of lock nut {**1**}.
7. Position a block of the right length (Mercedes=40mm, Euro1=50mm, Euro2=60mm, DAF 430 Euro1=60mm) between pedal and guide rollers.
8. At the rear slide the rubber sleeve over the cable and attach stud {**6**} to the end of the inner cable. This is fixed by means of two Allen screws; see Figure 12.
9. Secure the rubber sleeve by means of two clamping strips {**7**}.
10. Screw lock nut {**3**} and fork {**4**} onto stud {**6**}.
11. Now adjust the throttle cable at the accelerator pedal and at the injection pump in accordance with the procedures described earlier in this chapter.

4.2 Outer cable

As mentioned in the previous procedure, if the inner cable is broken it is better to replace both the inner and the outer cable. More than likely, the outer cable has been damaged too.

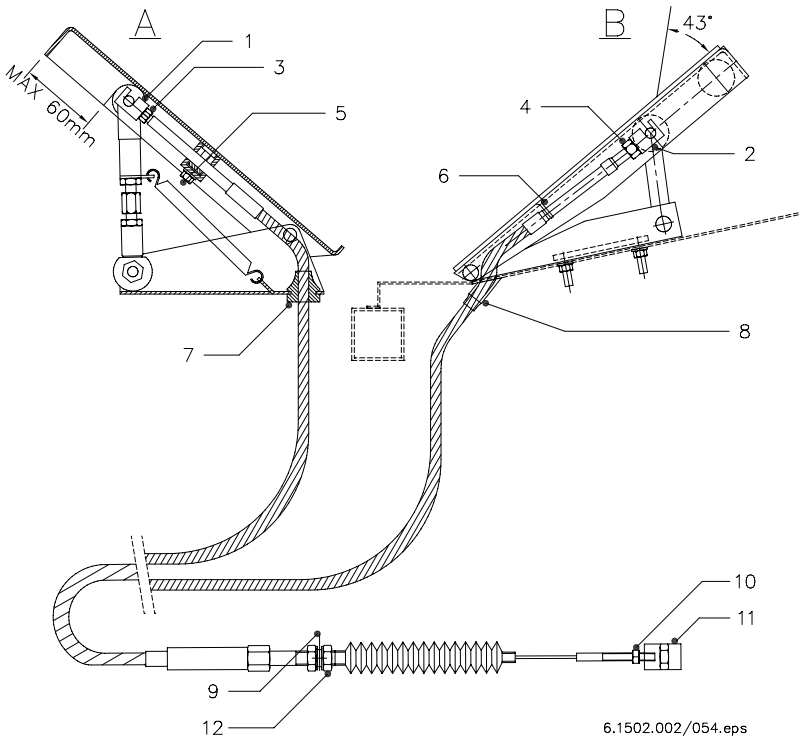


Figure 13 Replacing the outer cable

1.	Fork	8.	Grommet
2.	Fork	9.	Attachment point
3.	Lock nut	10.	Lock nut
4.	Lock nut	11.	Fork
5.	Cable clamp	12.	Nut
6.	Attachment point	A.	Left-hand drive
7.	Grommet	B.	Right-hand drive

1. Detach the cable at the accelerator pedal side. To this end unscrew lock nut {**3**} or {**4**}, after which fork {**1**} or {**2**} can be screwed off.
2. Then, for left-hand drive Futura coaches, cable clamp {**5**} must be unscrewed. For right-hand drive Futura coaches the bracket at attachment point {**6**} must be bent open to allow the outer cable to be taken out of this attachment point.
3. Remove the clamping strips over the full length of the coach. At inaccessible places it is best to cut the cable (in particular above the sleeping compartment).
4. At the injection pump remove lock nut {**10**} and fork {**11**}.
5. After unscrewing nut {**12**} the entire cable can be removed.
6. *Check that the correct cable is used. This depends on the kind of accelerator pedal and engine.*

Fit the new cable into the coach. Limit the number of bends and kinks to a minimum. This prevents lack of lubricant at these locations; see Figure 14. Moreover, it will be easier to operate the accelerator pedal.

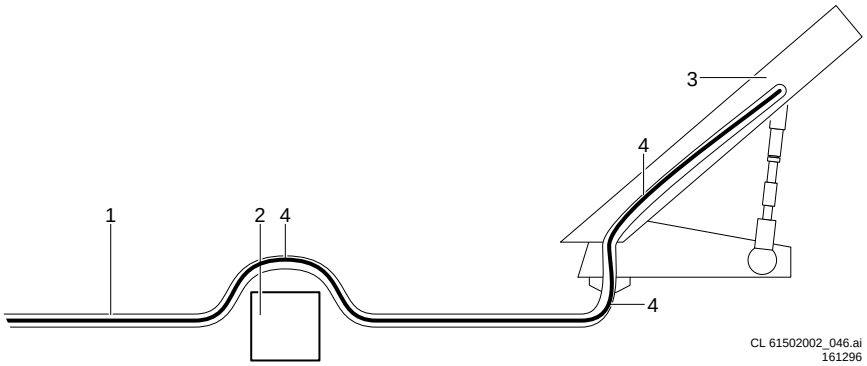


Figure 14 Wrong positioning of the throttle cable

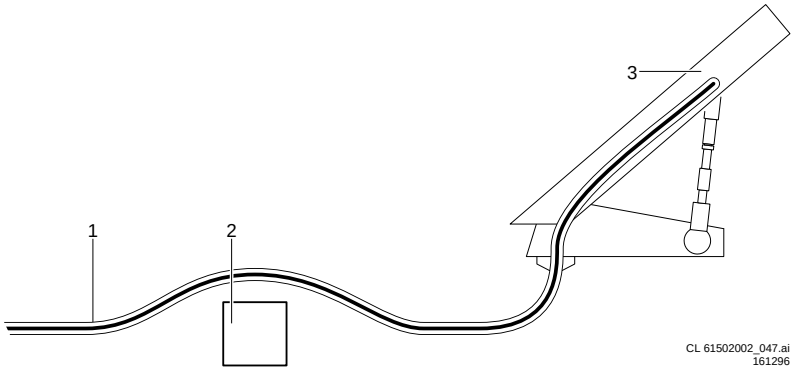


Figure 15 Correct positioning of the throttle cable

1. Throttle cable
2. Obstacle
3. Accelerator pedal
4. Locations at which a lack of lubrication will occur

7. For the fitting and adjustment of the new cable please refer to section Installation / Adjusting procedures.

5 Maintenance

5.1 Lubrication

Never use oil-based products for lubrication. Such a product would attack the coating of inner and outer cable causing them to wear excessively.

Always use a silicone-based lubricant.

The pivot points of the accelerator pedal must be lubricated regularly. This will prevent wear and annoying screeching of the accelerator pedal.

The compensator must also be lubricated. The compensator comprises a spring that makes sure that the inner cable becomes shorter and does not stretch or break, if the accelerator pedal adjustment drifts. Therefore, the compensator must be scrupulously cleaned regularly.

It is impossible to lubricate the cable after it has been installed. If a new inner cable is fitted it must, therefore, be generously provided with lubricant.

5.2 Adjustments

Regularly check that the stop on the accelerator pedal corresponds to the stroke of the lever on the injection pump. As with all mechanical components, the cable is subject to wear. In order to delay this process, not only proper lubrication, but also a proper adjustment is important.

If for one reason or another the adjustment has drifted and the lever at the injection pump touches its stop earlier than the accelerator pedal, the compensator will be pulled in. If the latter is seriously soiled, the cable will stretch or even break. It is also possible that in this case the outer cable becomes bent, as a result of which the Teflon at the inside gets damaged. Then the operation of the accelerator pedal will become difficult and, as a result, the entire cable must be replaced.

For the correct adjustment of the various throttle cables please refer to section 1.

6 Ordering numbers

Ordering numbers for parts that must be replaced are listed in the parts book. Check with the chassis number that you have the correct parts book. The ordering numbers for the throttle control parts are in group 464.