# LEVELSYSTEM

## English - Electronic Levelling System

**Assembly Manual**

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## Set content

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## Preface

Products must be 100% user friendly and reliable. That is the strategic vision at E&P Hydraulics, the designer of this levelling system. This philosophy does not only apply to customers. The mechanics installing the system at the dealers, are also very important to us. Our product greatly depends on a proper, professional installation. That is the reason why E&P do all they can do to support the people who must install the system. This assembly manual is part of this policy. In 10 steps we will explain as simply as possible how this system can be installed as properly and efficiently as possible.

However, this does not mean that installing the E&P Levelling System is an easy job. Installing this system requires a high level of skill. After all, we are dealing with equipment that must be able to withstand huge forces, something that is often underrated by people with insufficient technical training. If the installation is not performed correctly, serious damages could result in a short time, and even personal injury. Therefore, this system may only be installed by professional mechanics with sufficient practical experience and a thorough relevant technical training. At all times, mechanics will bear sole responsibility for the assembly of the system.

This document is based on hundreds of test hours as well as hundreds of successful installations. If you follow this manual step-by-step, you will see what a wonderful as well as user friendly quality product the E&P Levelling System is. However, there will always be aspects that can be improved. If you have any suggestions, remarks or questions concerning this manual or the product, please do not hesitate to contact us.

On behalf of E&P Hydraulics

Eric Klinkenberg & Pierre Blom

## ❱STEP 1 Mounting the jacks

You should first determine the best installation locations for the four cylinders. We cannot give a univocal guideline for this, the best location can differ per camper. Particularly around the undercarriage at the back, campers often differ greatly. When mounting the jacks, only use the standard E&P mounting brackets. They will usually result in a proper positioning. Out of experience, we know that the installation space is ofter rather limited, also in longitudinal direction. To simplify locating the correct installation location, E&P Hydraulics included all possible mounting plates and adapters in its range (for an overview, see the appendix on pages 13, 14, 15 and 16). Make sure that the position of the cylinders does not undermine the bearing capacity of the system. In general, the following will apply: the more apart the cylinders are, the more efficient the system will work. In any case, the cylinders should be installed outside of the undercarriage. The longitudinal distance between the legs is also important: mount the rear jacks behind the rear axle and place the front jacks as close as possible to the front axle.

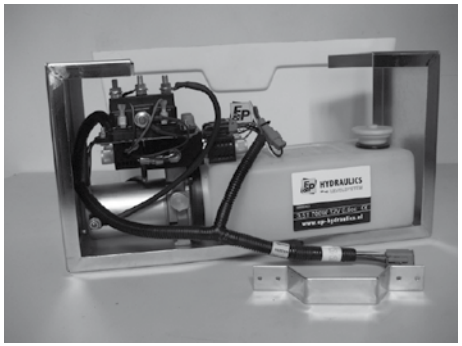
When the correct location has been established, check carefully once again whether you are using the correct cylinders. Basic principle is the bearing capacity of the system. Use type and all other ordering data to determine whether the cylinders are perfectly able to bear the maximum weight of the camper (for this, see the diagram and explanation on page 13). Apart from this, the height position of the cylinders (the length) is also a decisive factor. In case of small campers (weight class up to 5.2 tons), the raised jacks should remain between 18 and 21 centimetres from the ground; in case of larger campers the distance from the ground should be between 20 and 23 centimetres. The stroke of the cylinders is important as well. In case of smaller campers, the system in extended position should be able to lift the vehicle at least 12 centimetres out of the springs. In case of medium sized campers (3.5 tons of bearing capacity per cylinder) this is 14 centimetres, in case of large campers 18 centimetres (although there may be exceptions). For all this, also see the technical data on page 13). Finally, the way in which the jacks are connected is also very important. Make sure they are attached with sound bolts and nuts, at various extended positions (at least 6), allowing an optimum bearing capacity.

!! **Warning:** Attaching the jacks is the first and also most important step when installing the E&P Levelling System, and requires a lot of skill. Do not underestimate the forces that the system and camper are subjected to. For instance, never drill in the undercarriage without asking the camper dealer if this is safe. In case of any other doubts, also always consult the dealer. Because at all times, the mechanic will bear sole responsibility for the system's installation.



## ❱STEP 2 Installing the pump

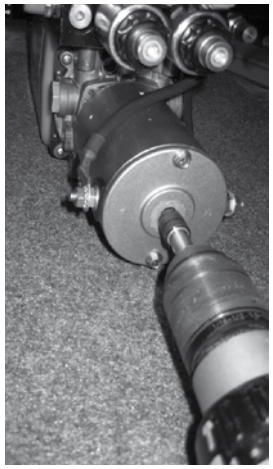
For pumps subjected to weather influences, the warranty will become invalid. For that reason, E&P Hydraulics developed a special subconstruction tray (see photo next to this paragraph) allowing you to hang the pump outside, under the camper. Most pumps are placed inside the camper in one of the storage spaces, at a location where it is easy to lead pipes and wires through the camper's floor. Very often, the main unit is also The special subconstruction unit, incl bracket and plastic protective housing mounted in the same space (see step 3b), so it would be a good idea to leave enough space for this purpose.



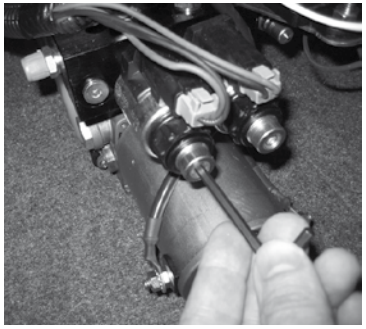
*De speciale onderbouwunit, incl. beugel en plastic beschermingsbak*

!! **Caution:** to prevent failures, the pump should be in a flat position. The bottom of the plastic oil tank should be covered over its complete surface. Attach the pump using two M10 bolts. When installing you should also take the pump's relay into account.

It will continuously have 12 volts running through it, and we recommend protecting this fragile piece of the pump with the supplied protective cap. At least make sure that the customer cannot place or throw anything on top of it. Warning: when placing the pump, always take the emergency control into account (a screw drill, for instance, should always be able to reach the front side of the electric motor).

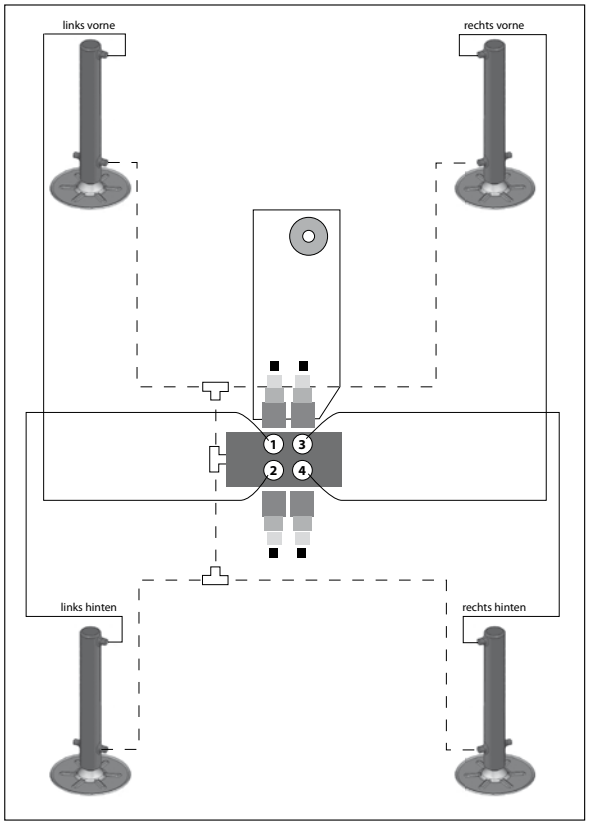


*Always take the emergency control of the pump into account when installing.*



## ❱INTERMEDIATE STEP **Ordering hoses**

Now that the jacks and pump have been installed, it is time to measure and order the required hydraulic hoses. Use the included order form for this. The returns to the pump (the bottom connections at the foot plate) can be looped through, but this is not necessary. When measuring the required lengths, seriously consider the heat sources (e.g. the exhaust) and moving parts (e.g. laminated suspension springs and hand brake cable). This could be a reason for not looping through. When finished, the hoses should be properly concealed, without any risk of wear or leakage. 10 hoses in total will have to be made to size (8 in case of looping through). The drawing at the back of the order form shows the difference between looping through and not looping through (1 = rear left, 2 = front left, 3 = rear right, 4 = front right). Both straight and right-angled connections are possible. If you need T- pieces, you should clearly indicate this when ordering. Nipples for looping through are supplied as standard. Send the form to us, and we will make sure that you will receive the order a.s.a.p. It is also possible, by the way, to have the hoses made by a company near you (hose must be able to withstand at least 220 bar).



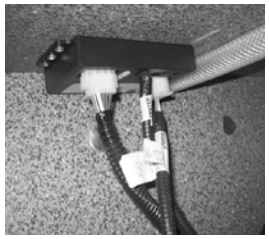



## ❱STEP 3 **Installing electronics**

### Mounting the control panel

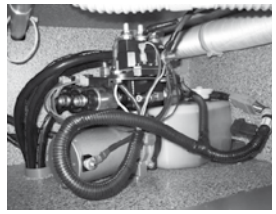
This can be done on various locations, condition is of course that it must be easy to conceal the wiring afterwards. Place the control panel in such a way that the system can be operated from outside (when operating and setting the jacks, there should be no-one in the camper because of vibrations). So preferably near the entrance to the camper or near the entrance to the cabin with the steering wheel. The control panel has a special assembly frame that can be attached by means of screws. Caution: do not use screws that are too big, because of the head of the screw, otherwise the control box will not click into the assembly frame.

### Placing the main unit



Installation should always take place with the plugs pointing downwards, i.e. in the right direction (see labels on main unit). The main unit may never be suspended outside of the camper! The most suitable position is right next to the pump, in the longitudinal direction of the camper. The main unit must be level in relation to the floor/undercarriage. Always connect the main unit with all six screws, making sure that the box is fully stable. A stable and level position will make sure that the system can accurately record all motions of the floor line.

### Drawing the cables



Advance warning: under no circumstances put voltage on the system, this should only take place at step 6. Keep following the manual! Changing the sequence of steps 4 up to 6 may damage the system. 3 electric cables are supplied in total: 1) cable with a 9-pole plug, from the main unit to the pump. If necessary, you can shorten this cable. 2) cable with a 4-pole plug, from the main unit to the control panel. Make sure that the plug properly clicks into the control unit (the hole is rather deep). 3) cable with a 6-pole plug, from the hand brake to the d+ of the dynamo. Do not yet put voltage on the system, but do have the wires ready for use. Red must go to d+, later on white must be switched to ground through the hand brake.

## ❱STEP 4 Laying the hydraulic hoses

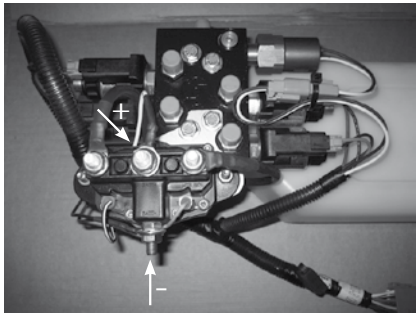
These hoses must be extremely well protected with a protective cover. Due to differences in pressure, these hoses are continuously moving. Properly attach the hoses and make sure that they cannot grate against anything. Do not underestimate the pressure that the hoses will be subjected to. Also be aware of the heat sources (e.g. the exhaust) and moving parts (e.g. laminated suspension springs and hand brake cable). So properly conceal the hoses and carefully check the whole path once more before putting the system into operation. When connecting the hoses, also take into account that the correct jack is connected to the correct port (for this, see the drawing on page 7 or the reverse side of the included order form: 1 = rear left, 2 = front left, 3 = rear right, 4 = front right).

## ❱STEP 5 Filling the system with oil

The E&P Levelling System works on machine transmission oil. Only use oil of type ATF3 or Dexron III. Fill the tank up to 3 centimetres from the edge.

## ❱STEP 6 The power connection to the batteries

The system is driven by a 12 volt direct current motor. So it can only be connected to 12 volts. The most logic connection location is the car battery. Some campers have 24 volts, in that case the connection should be made to the 12 volts user group. The cable for the power connection is not supplied and should have a minimum diameter of 25 mm², at a maximum cable length of six meters (in case of doubt, consult your cable supplier). A common mistake is that cables are used that are too thin, resulting in all kinds of malfunctions. Maximum power can increase to about 120 amperes. The system is constructed in such a way, that the maximum power can never last longer than two seconds. Mount the power fuse as close as possible to the battery. Now apply voltage to the system. As soon as the + and - are connected, a beep will sound.

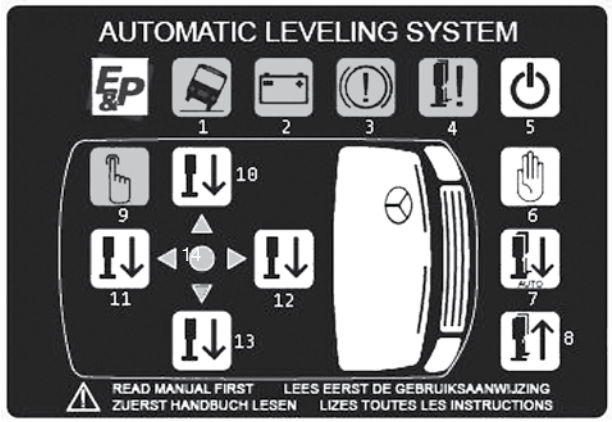





## ❱STEP 7 Taking the system into operation

When taking the system into operation, no force should be submitted to the jacks. Therefore, make sure that the jacks can make the maximum stroke without reaching the floor. Make sure the hand brake is engaged and that the engine is running. Now switch on the installation through the control panel (button 5, see figure below). Switch on the manual mode (button 6). LED 9 will light now. Push back the jacks, even if they have already been retracted (button 8). Keep pressing button 8 until there is pressure on the system. You can hear this in the engine , which will start to run heavier (may take approximately one minute). The route is now being filled with oil. Again completely fill up the tank (up to 3 centimetres from the edge). Extend the front jacks by pressing button 12. Keep pressing button 12 (the pump will start to run); the jacks are now lowering in a jerky fashion (cylinders and hoses are now being filled with oil). Keep pressing button 12 now, until the jacks have made the maximum stroke and are fully extended. The cylinder has now been able to bleed without using any force. Continuously monitor the oil level in the tank. The tanks should maintain at least 5 centimetres of oil level. As soon as the tank has less than five centimetres of oil level: first retract the jacks (button 8), fill the tank again up to 3 centimetres under the edge and then continue with button 12.

**!! Warning:** never fill up the tank to the top when the jacks are extended. Retract the front jacks again (hold down button 8). When bleeding the system, take the formation of foam into account. If too much foam is formed, wait until the foam has disappeared (appr. 5 to 10 minutes). Repeat fully retracting and extending the front jacks for four times. Keep monitoring the oil level (at least 5 centimetres of oil level), and if necessary fill up the tank up to 3 centimetres below the edge.




*The control panel*

## ❱STEP 7 Taking the system into operation

After retracting the front jacks for the fifth time, do the same with the rear jacks (button 11). Let the rear jacks perform five full extending and retracting strokes as well. Also keep checking whether the oil level does not drop below five centimetres. When bleeding the system, also take into account the formation of foam, and - if necessary - wait a moment. When the rear jacks have been retracted for the fifth time, the tank can finally be filled up to 2 centimetres below the edge.

!! **TEST 1:** now look whether both left jacks come down when you press button 10. In this way you can check whether all hydraulic hoses have been connected properly. If this is not the case (a cylinder extends at both the left and right side), two or more hydraulic hoses have been interchanged. This is a common mistake.

!! **TEST 2:** Check the safety function of the hand brake. Make sure the cylinders are extended. Now switch off the system, let the motor run, place your foot on the brake and release the hand brake. Now the system should produce a beep sound and immediately retract the jacks.

## ❱STEP 8 Programming the zero point

Place the car on an even floor. Switch on the control panel (button 5) and set it to manual operation (button 6). Take a spirit level and place it on the floor of the camper where you can see it. By manually operating the jacks, make sure that the camper is level. During this process, the red LED (LED 1) may flash continuously. Ignore this LED. When the camper is perfectly level lengthways and widthways, you have found the zero point. In order to program this zero point, you must first switch off the installation (button 5) and then switch it on again (press button 5 once more). Then press 5 times subsequently on the button for extending the front jacks (button 12). This operation is confirmed through a beep sound. Then press five time subsequently on the button for the rear jacks (button 11). Once more a beep will sound to confirm (5 times). Now all the LEDs will light. Then press 3 times on the button for retracting the jacks (button 8). Only the LED for manual operation will remain on (LED 9). Now switch off the installation (button 5) and switch it on again (button 5 once more). Now the green LED between the four arrows in the middle will light, which means that you have successfully programmed the zero point (LED 14).

!! **TEST:** Press on the button for automatic mode (button 7). The system will now retract the jacks and it will level the vehicle again – this time fully automatic. When it is finished, the green LED between the arrows will light again to indicate that the test was successful.



## ❱STEP 9 Finishing the installation

Make sure that all passages (for cables, hydraulic hoses, wiring, etc.) made are carefully sealed. We recommend injecting the complete cylinders - including hose connections - with an anti-corrosive agent. This layer (e.g. tectyle) will protect the system against erosion and rust.

## ❱STEP 10 Maintenance of the system

The oil in the hydraulic system should be changed every three years. Regularly check the oil level. Annually injecting the system with anti-corrosive agent will significantly increase the product's life span.

**Five brief tips for the customer**

- Under no circumstances should the system be used as a replacement for tyres or to install snow chains.
- During winter sports: put something (e.g. a piece of carpet) under the jacks to avoid sliding.
- Manual operation is particularly recommended for bad surfaces. In manual operation, all jacks should always be extended. In manual mode, the system also has a semi-automatic function (see the user manual for this).
- Always operate cylinders 2 at a time at 1 side. When retracting, operate all 4 at the same time. Only in case of short additional retraction, briefly operate all 4 cylinders separately.
- The system cannot handle all angles. In that case, bring the camper as close as possible to the zero point by means of manual operation. Another option is to drive the camper on wedges and filling up the jacks.

For a further, extensive description of what is possible or what is not possible, please see the included user manual of the E&P Levelling System.

**Questions? Call the experts of E&P Hydraulics:**
**+31 6-53750529 (Pierre Blom) or +31 6-53175137 (Eric Klinkenberg).**
**For installation photos and tips, also see our internet page: www.ep-hydraulics.nl.**

## APPENDIX Cylinders & technical data

**Size A (for smaller camper up to appr. 5.2 tons)**

| *force* | *type* | *features* | *foot plate* | *length* | *stroke* | *assembly* |
|---|---|---|---|---|---|---|
| 2 tons | 2 tons + + long | Large foot plate + assembly plate + 5cm | 230 mm | 480 mm | 320 mm | 12 holes integr. |
| 2 tons | 2 tons + + | Large foot plate + assembly plate | 230 mm | 430 mm | 320 mm | 12 holes integr. |
| 2 tons | 2 tons + half | Large foot plate + cylindrical clamp | 230 mm | 430 mm | 320 mm | separate clamp |
| 2 tons | 2 tons regular | Small foot plate + cylindrical clamp | 120 mm | 415 mm | 320 mm | separate clamp |
| 2 tons | 2 telescope + + | Large foot plate + assembly plate | 230 mm | 330 mm | 320 mm | 12 holes integr. |
| 2 tons | 2 telescope + | Large foot plate / suitable for Fiat | 230 mm | 330 mm | 320 mm | spec. clamp Fiat |
| 2 tons | 2 telescope | Small foot plate + assembly platet | 120 mm | 315 mm | 320 mm | 12 holes integr. |

**Size B (for medium-sized campers)**

| *force* | *type* | *features* | *foot plate* | *length* | *stroke* | *assembly* |
|---|---|---|---|---|---|---|
| 3 ½ tons | 3.5 tons + + long | Large foot plate + assembly plate + 4cm | 230 mm | 540 mm | 380 mm | 12 holes integr. |
| 3 ½ Ttons | 3.5 tons + + | Large foot plate + assembly plate | 230 mm | 500 mm | 340 mm | 12 holes integr. |

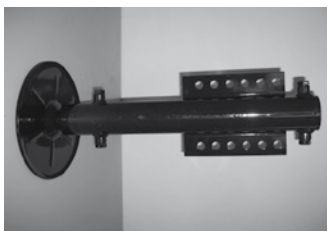
**Size C (for campers in heaviest weight class)**

| *force* | *type* | *features* | *foot plate* | *length* | *stroke* | *assembly* |
|---|---|---|---|---|---|---|
| 6 tons | 6 tons + + long | Large foot plate + assembly plate + 10cm | 230 mm | 640 mm | 480 mm | 12 holes integr. |
| 6 tons | 6 tons + + | Large foot plate + assembly plate | 230 mm | 540 mm | 380 mm | 12 holes integr. |

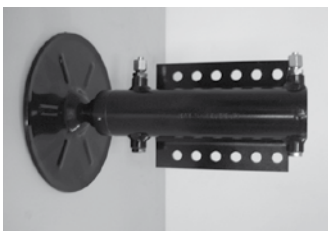


## APPENDIX Adapters & clamps

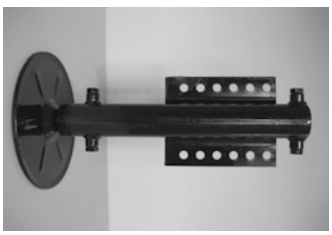
Order the hoses now (intermediate step)



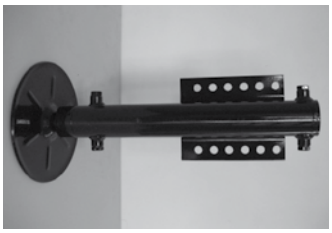
*3,5 tons + + long*



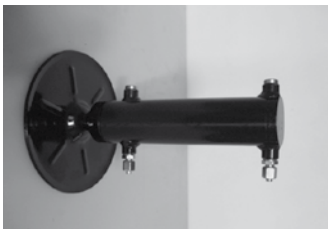
*2 telescope + +*



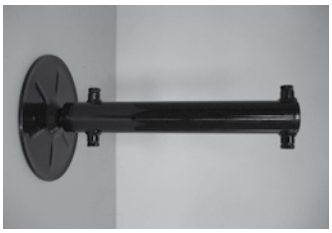
*2 tons + +*



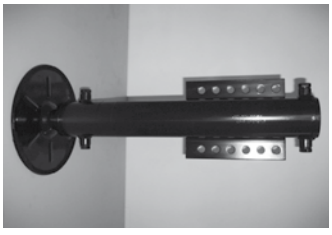
*3,5 tons + +*



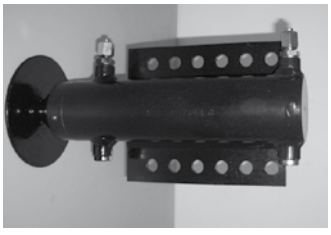
*2 telescope +*



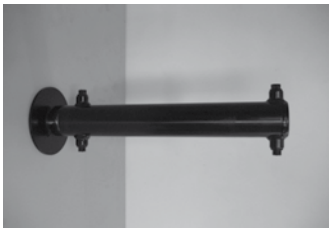
*2 tons + half*



*6 tons + +*

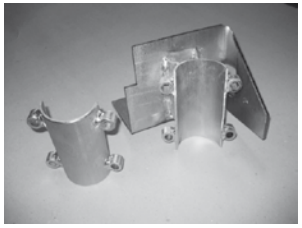


*2 telescope*

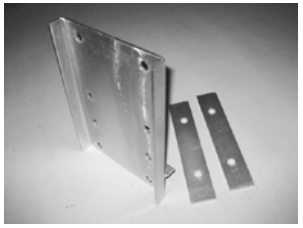


*2 tons regular*

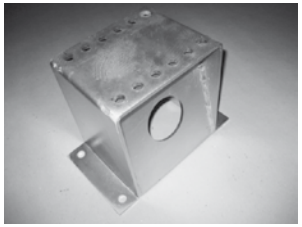
## ❱APPENDIX **Adapters & clamps**



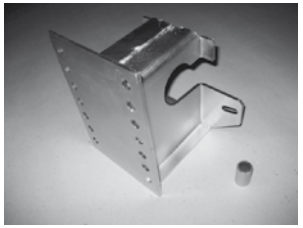
*Fiat ducato/Citroën jumper/*
*Peugeot boxer (front)*



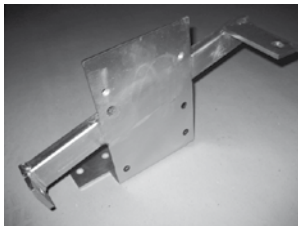
*Ford Transit (front)*



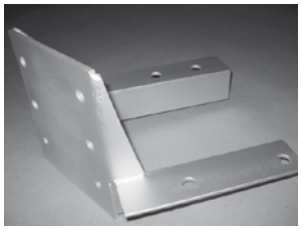
*MAN (rear)*



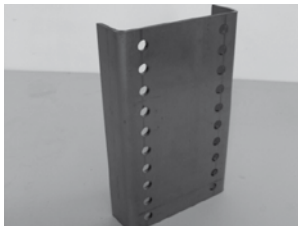
*Iveco Daily (front)*



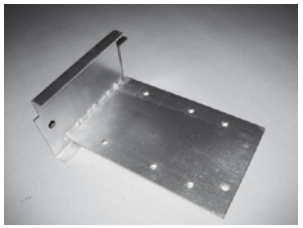
*Mercedes Sprinter (front)*



*Renault/Opel/Nissan (rear)*



*Universal bracket*



*Renault/Opel (front)*

(for a current overview of all other adapters & clamps: www.ep-hydraulics.nl)



## ❱APPENDIX **The error mode**

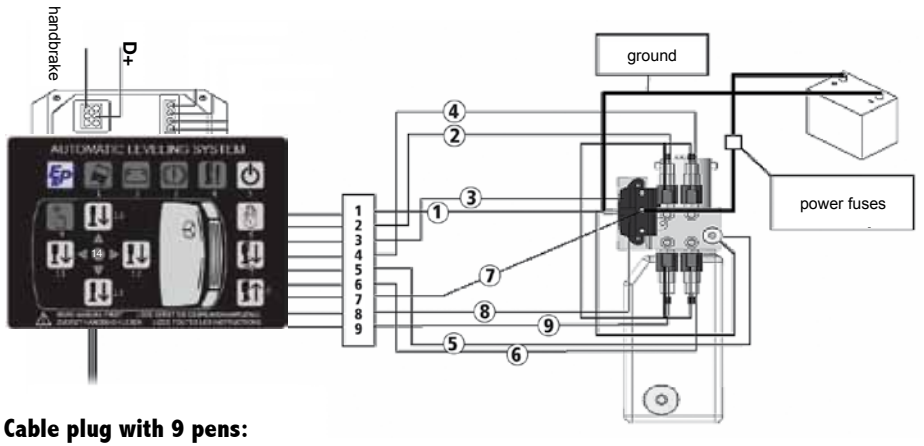
In case of an error message, first check whether the hand brake is engaged, whether the ignition is switched on, whether the battery has sufficient voltage, whether the oil level is correct, whether there is any damage to the cylinders, and check the cables. If this does not lead to a solution for the malfunction, the malfunction could be located in the drive units. In order to check whether they operate correctly, you need a direct current voltage meter (or direct current test lamp) and a test cable.

**TEST:** Connect the voltmeter (or test lamp) to the negative and positive terminals of the engine's solenoid. Does the voltmeter indicate 12V direct current?

**YES:** activate the system and check the incoming cable for 12V direct current (if necessary, pull free the cable at the connecting point). Does the meter indicate 12V? If so, you must replace the drive unit. DO NOT TRY TO REPAIR IT.

**NO:** check all connections between the battery and the engine's relay. Check the manually disconnectable safety switch in the battery supply. Then repeat the check described in step 1. As the drive unit does not have any repairable parts, the search for malfunctions and the maintenance work to the electronics is limited to replacing the abovementioned components.

**Wiring:**




**Cable plug with 9 pens:**

1. Brown (ground)
2. Dark red (valve front right)
3. Grey (pump extend)
4. Green (valve front left)
5. Yellow (float switch)
6. Blue (valve rear left)
7. White (drive undercarriage)
8. Black (pump retract)
9. Red (valve rear right)

## Note

- If, when retracting the jacks, the pump is running on overpressure for a few seconds, the retracting action should stop (in both manual and automatic mode).
- If the jacks are retracted and the pressure switch on the pump de-energizes, the unit will raise the jacks again for a few seconds, if the ignition is switched on.
- A timer will run, which will count up when the pump is running and count down when the pump is not running. If this timer reaches a value that is too high, the pump will stop running in order to prevent overheating.



## Notes