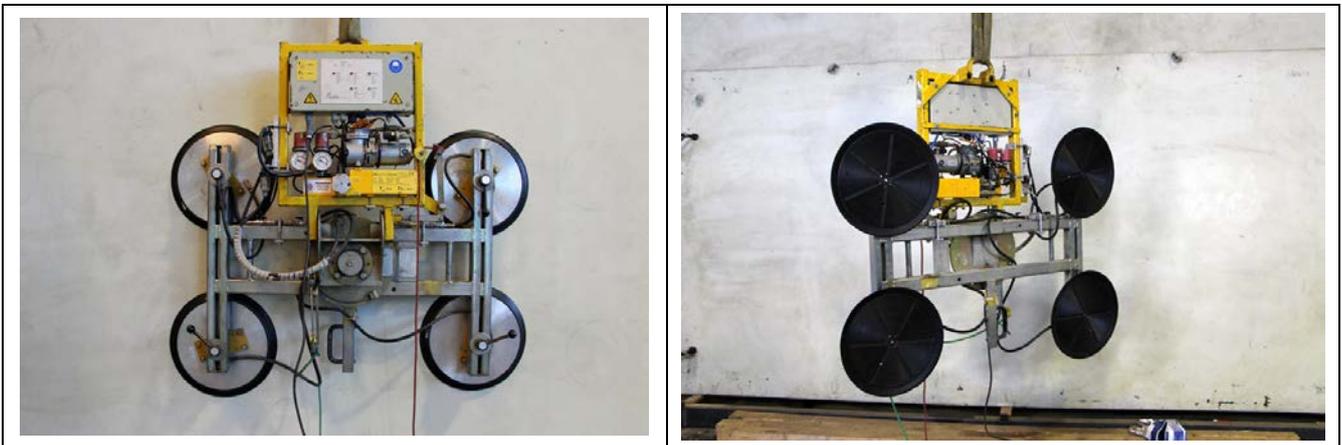


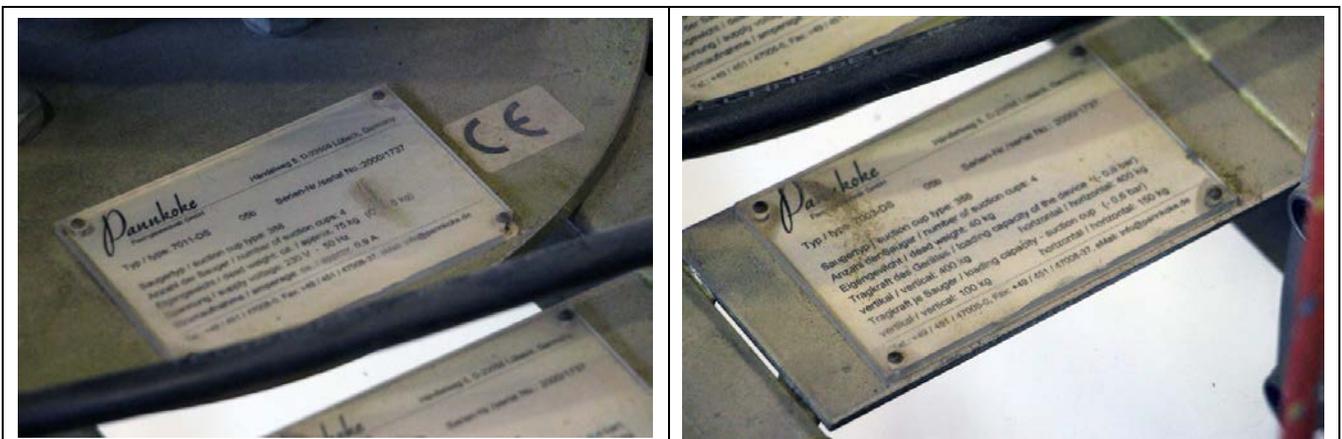
Maintenance of a converted vacuum lifting device

Device

Manufacturer: Eurotech
serial number: 2000/1737
Date of conversion: cannot be established.

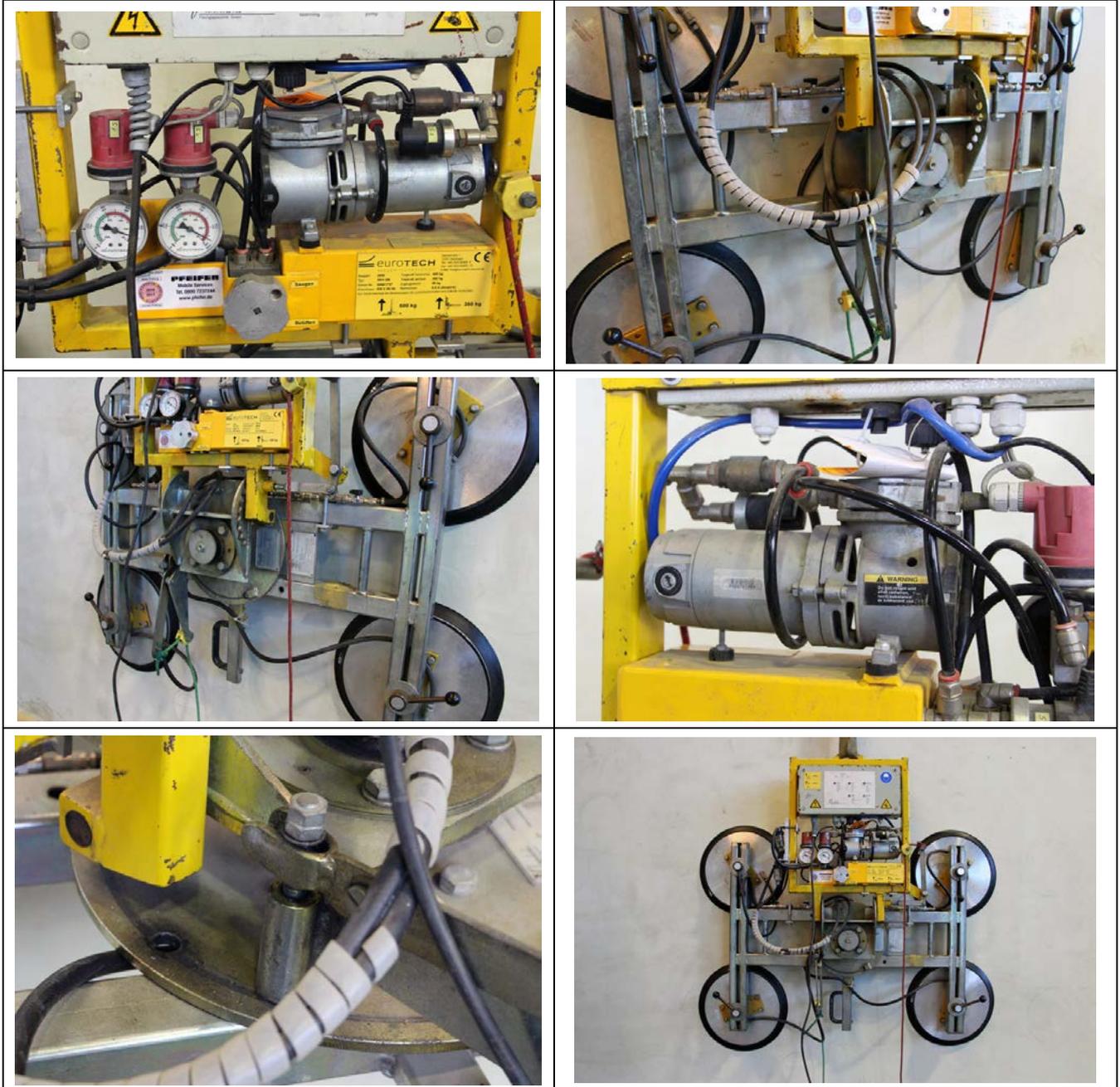


Original manufacturer: Pannkoke Flachglastechnik GmbH
Serial no.: 2000/1737
Entered service as a 1-circuit vacuum lifting device Kombi 7011-DS for a carrying capacity of 400 kg with four 388 suction cups



Function check and visual inspection

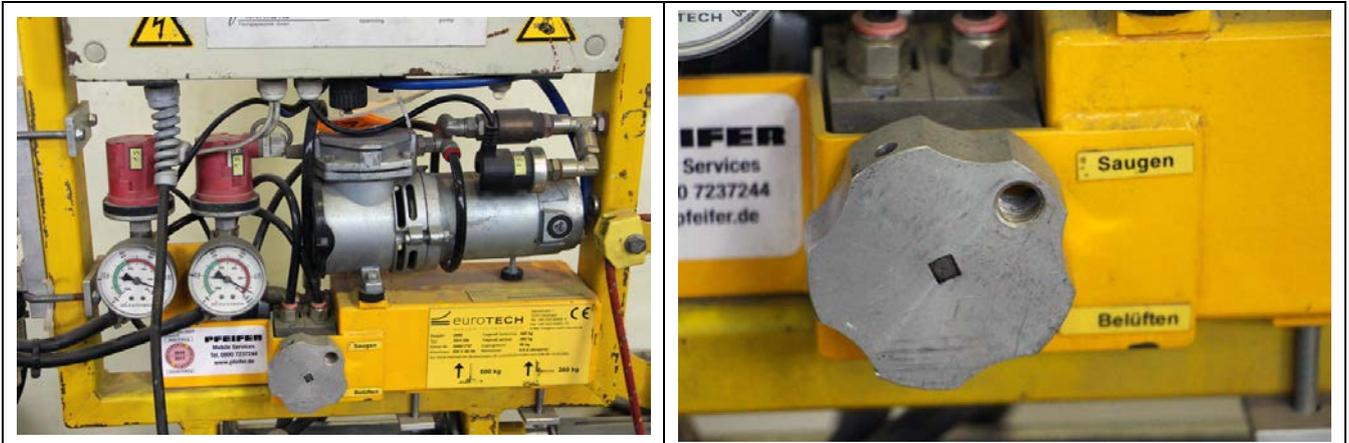
- Hose routing is not obvious, with many points where hoses can snag or get crushed.



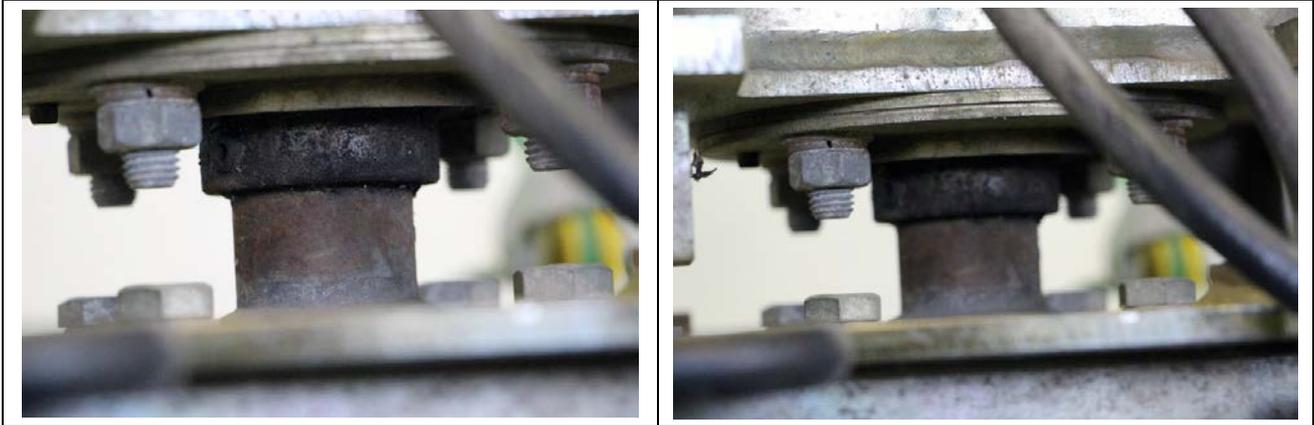
- Hand valve without locking in the SUCTION position.



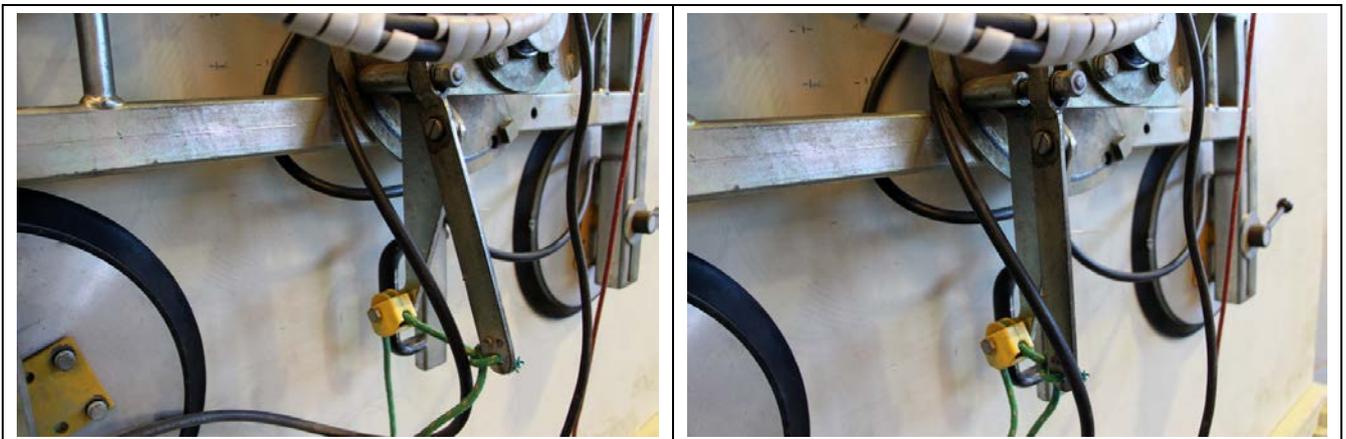
- Vacuum pump runs in RELEASE positioning (venting) without disengagement. This causes a high level of power consumption but it is not a device fault with safety implications. Conversion work was not carried out carefully enough.



- The rotary bearing is defective and there is no spacer ring between the bearing shell and the suction frame. The service life limit of this rotary fixture has also been exceeded.



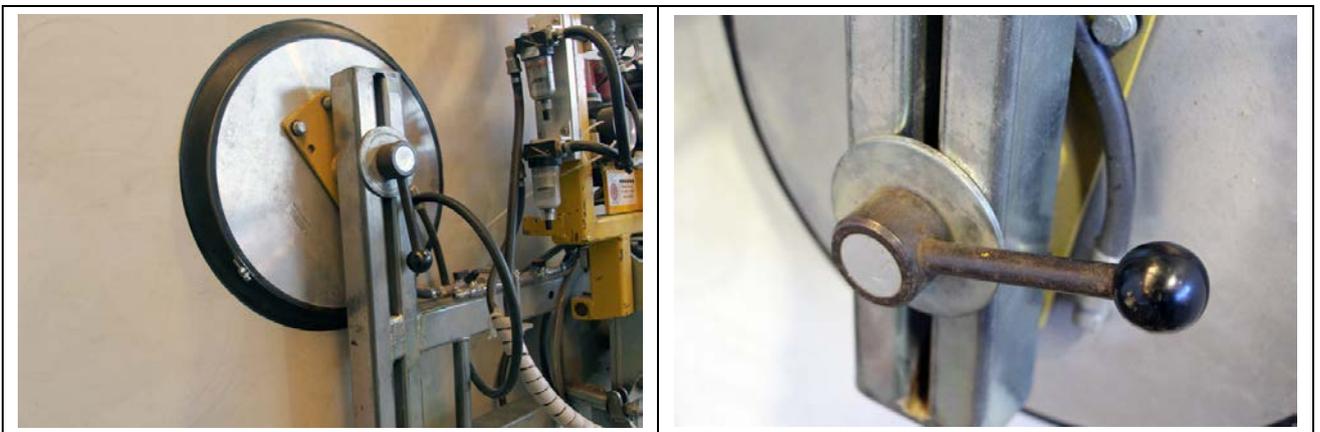
- The rotary lock is defective and it no longer engages within the standard time, and it is also difficult to unfasten.



- The swivel lock is defective and no longer engages within the standard time, and it is also difficult to unfasten.



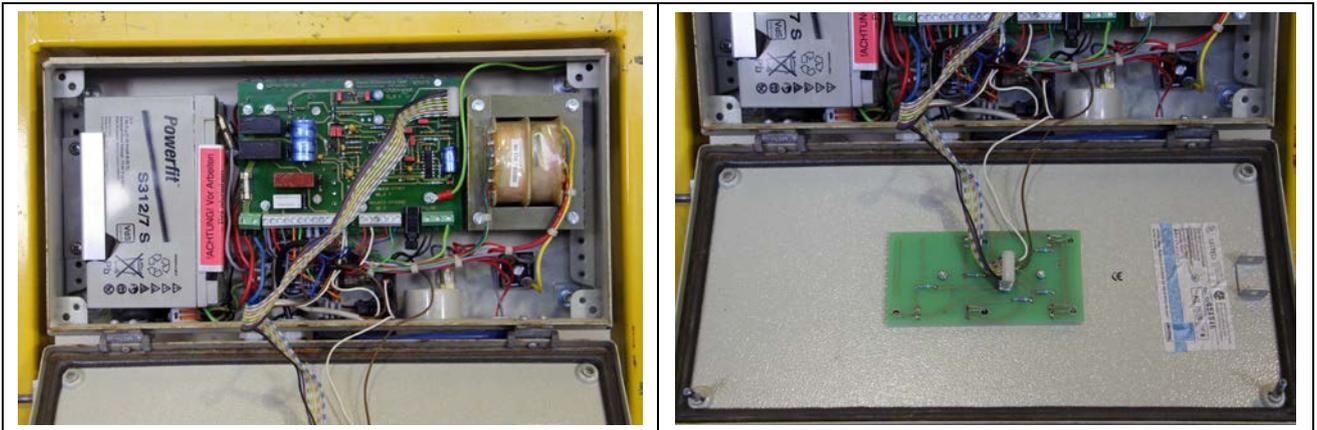
- Two quick-release levers are defective, preventing the suction cup holders from being clamped properly



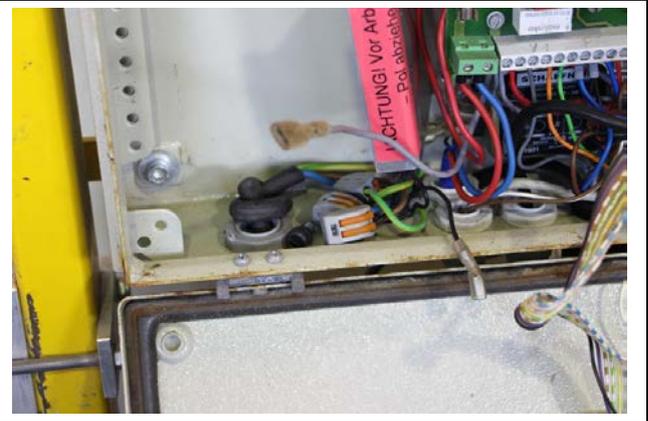
- Rigid power supply cable hanging down a long way presents the danger of jamming.



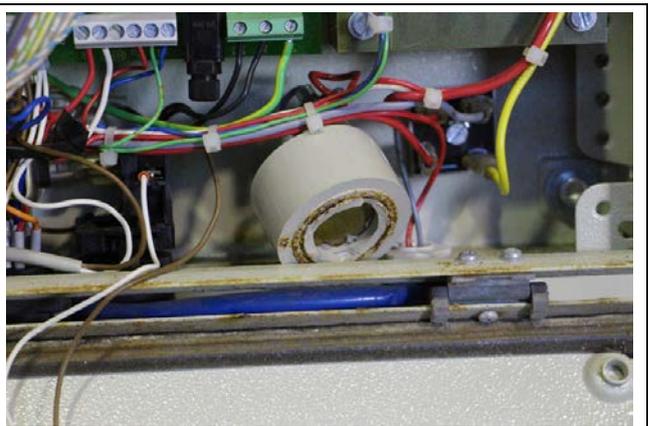
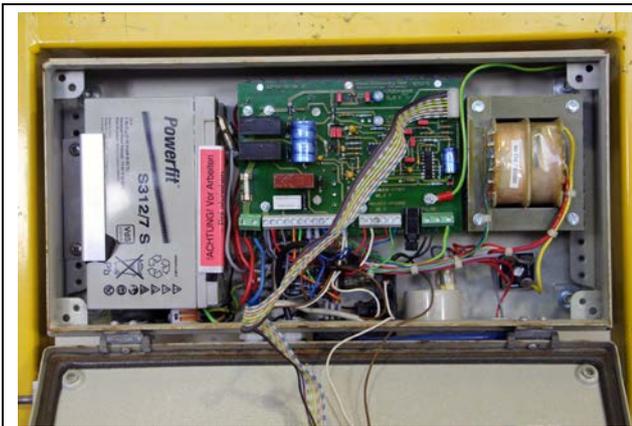
- The accumulator is standing on the power supply cable.



- The tension relief for the power supply cable consists of a knot in the cable.

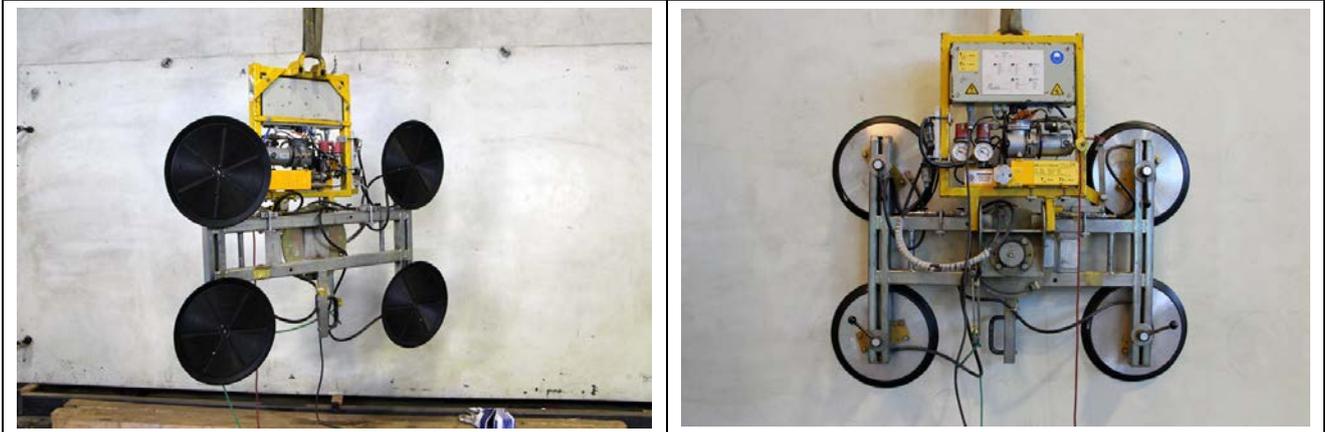


- The warning signal sensor is defective.



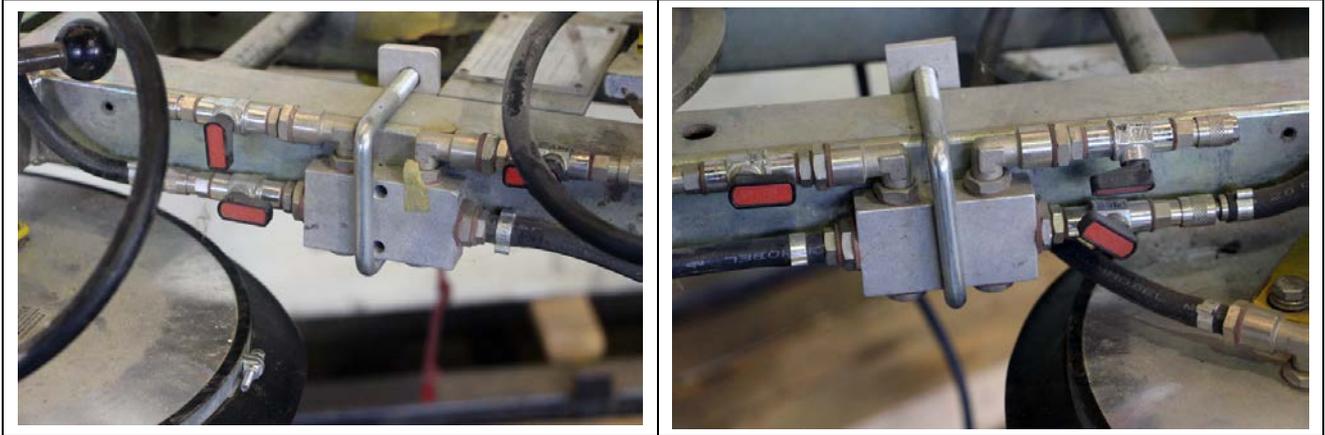
Maintenance report

- The suction cup distribution is mounted on one side in both circuits. One circuit is arranged on the left and the other vacuum circuit is arranged on the right.



Leak test

- One quick-release hose coupling is leaking.
Non-return valves are hard to move.
Quick-release hose couplings are arranged in a location that is difficult to access.



Load test

- The suction cup mounting cannot support the forces that the suction cup applies briefly. The original suction cup had a diameter of approx. 300 mm and a carrying capacity of 100 kg. The suction cup holder was designed by the original manufacturer to lift a load of 220 kg. These suction cups have a diameter of 400 mm and could be used for brief periods together to lift a perpendicular load of more than 1100 kg if the suction cup holders did not slip. The suction cup holder should be capable of holding a load of 360 kg. Based on our calculations, this is not possible due to the clamping action.

Both vacuum circuits together should actually be able to support $2 \times 2 \times 360 \text{ kg} = 1440 \text{ kg}$. Every vacuum circuit (on a 2-circuit device for construction site use in accordance with EU standard EN 13155) must be able to lift twice the nominal rating. This yields $2 \times 360 \text{ kg} = 720 \text{ kg}$ per vacuum circuit. It follows from this that both vacuum circuits should then be able to lift 1440 kg.

Since the original device was designed for 400 kg, with its frame rated for 600 kg, and since we are familiar with steel construction, a test of this kind was possible.

- After 4 minutes, the display on the crane scale had dropped to a value of approx. 860 kg. Theoretically, this yields a value of 430 kg per vacuum circuit. When taking into account the specified 2-fold safety margin, a value of 215 kg should be applied to the device.



Maintenance report

- However, if only one vacuum circuit is activated and if the other vacuum circuit is locked off using the non-return valves, the following picture then emerges:
The suspension frame / suction frame is lifted at an angle and starts to slip at just 380 kg, presenting the risk of the suspension frame getting damaged by a one-sided application of load.
This would mean that the permitted carrying capacity of the device would be less than 190 kg.



Possibly, replacement of the suction cups could help to hold the weight. However, this would change nothing in respect of the insufficient carrying capacity of the suction cup mounting.