## Trailer brake systems with single brake chambers and no ABS function

<table>
<thead>
<tr>
<th>Braking Diagram</th>
<th>Type of Trailer</th>
<th>Load Sensing Valve</th>
<th>Suspension</th>
<th>Brake Chamber</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 axle drawbar trailer / 12 .... 16t</td>
<td>X</td>
<td>steel</td>
<td>single</td>
</tr>
<tr>
<td>841 600 000 0</td>
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<td>1+2 axle drawbar trailer / 12 .... 16t</td>
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<tr>
<td>841 700 872 0</td>
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<td>841 700 873 0</td>
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<td>841 700 861 0</td>
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<td>841 700 862 0</td>
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<td>4</td>
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<td>841 700 863 0</td>
<td>X</td>
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<td>4</td>
</tr>
<tr>
<td>841 700 511 0</td>
<td>3 axle semi-trailer / 12 .... 16t</td>
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<td>steel</td>
<td>single</td>
</tr>
<tr>
<td>841 700 516 0</td>
<td>X</td>
<td></td>
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<tr>
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<tr>
<td>841 700 881 0</td>
<td>X</td>
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<td>841 700 882 0</td>
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</table>

## Trailer brake systems with TRISTOP brake chambers and no ABS function

<table>
<thead>
<tr>
<th>Braking Diagram</th>
<th>Type of Trailer</th>
<th>Load Sensing Valve</th>
<th>Suspension</th>
<th>Brake Chamber</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 axle semi-trailer / 12 .... 16t</td>
<td>X</td>
<td>air</td>
<td>single</td>
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</tr>
<tr>
<td>841 700 256 0</td>
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<td>841 700 556 0</td>
<td>X</td>
<td></td>
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<tr>
<td>841 700 557 0</td>
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</tr>
<tr>
<td>3 axle semi-trailer / 12 .... 16t</td>
<td>X</td>
<td>air</td>
<td>single</td>
<td></td>
</tr>
<tr>
<td>841 700 243 0</td>
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<tr>
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### Brake system for 3 axle semi-trailer with ABS

<table>
<thead>
<tr>
<th>Braking Diagram</th>
<th>Type of Trailer</th>
<th>Load Sensing Valve</th>
<th>Suspension</th>
<th>Brake Chamber</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>manual</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>automatic</td>
<td>air</td>
<td>tristop</td>
</tr>
<tr>
<td>841 700 972 0</td>
<td>3 axle semi-trailer</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>841 700 973 0</td>
<td>3 axle semi-trailer</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>841 701 063 0</td>
<td>3 axle semi-trailer</td>
<td>X</td>
<td>X</td>
<td>6</td>
</tr>
<tr>
<td>841 701 065 0</td>
<td>3 axle semi-trailer</td>
<td>X</td>
<td>X</td>
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</tr>
<tr>
<td>841 701 066 0</td>
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<td>841 701 067 0</td>
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</table>

### Brake system for 3 axle semi-trailer with TEBS

<table>
<thead>
<tr>
<th>Braking Diagram</th>
<th>Type of Trailer</th>
<th>Load Sensing Valve</th>
<th>Suspension</th>
<th>Brake Chamber</th>
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<tr>
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<td>single</td>
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<td>air</td>
<td>tristop</td>
</tr>
<tr>
<td>841 701 101 0</td>
<td>3 axle semi-trailer / TEBS E without PEM</td>
<td>X</td>
<td>2</td>
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</tr>
<tr>
<td>841 701 239 0</td>
<td>3 axle semi-trailer / TEBS E with PEM</td>
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</tbody>
</table>

### Brake system for road train trailers – no ABS function

#### 2 axle dolly trailer

<table>
<thead>
<tr>
<th>Braking Diagram</th>
<th>Type of Trailer</th>
<th>Load Sensing Valve</th>
<th>Suspension</th>
<th>Brake Chamber</th>
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</thead>
<tbody>
<tr>
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<td>841 600 544 0</td>
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#### 3 axle semi-trailer “trailer-to-tow-trailer”

<table>
<thead>
<tr>
<th>Braking Diagram</th>
<th>Type of Trailer</th>
<th>Load Sensing Valve</th>
<th>Suspension</th>
<th>Brake Chamber</th>
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</thead>
<tbody>
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<td></td>
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<td>automatic</td>
<td>air</td>
<td>tristop</td>
</tr>
<tr>
<td>841 700 247 0</td>
<td>3 axle semi-trailer / 12 .... 16t</td>
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<td>79</td>
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<tr>
<td>841 700 519 0</td>
<td>3 axle semi-trailer / 12 .... 16t</td>
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</table>

### Air suspension and lifting axle control systems

<table>
<thead>
<tr>
<th>Braking Diagram</th>
<th>Type of Trailer</th>
<th>Load Sensing Valve</th>
<th>Suspension</th>
<th>Brake Chamber</th>
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<tr>
<td></td>
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<td></td>
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<td>automatic</td>
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<td>tristop</td>
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<td>841 801 448 0</td>
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<td></td>
<td></td>
<td>83</td>
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<tr>
<td>841 802 150 0</td>
<td>3 axle semi-trailer / GIO feature &quot;conventional air suspension with rotary slide valve and lift axle control&quot; / to use for trailer EBS E version only</td>
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<td>841 802 153 3</td>
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<td></td>
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<tr>
<td>841 802 175 0</td>
<td>3 axle semi-trailer / air suspension with rotary slide valve / lift axle control with 2 circuit lift-axle control valve (mech. controlled) / to use for conventional brake systems</td>
<td></td>
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<td>91</td>
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<tr>
<td>841 802 176 0</td>
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<td></td>
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<td>97</td>
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</table>
Purpose of the Publication

This brochure is intended to be for guidance purposes only and its contents are purely of a general informational nature. The diagrams appearing in this brochure do not adhere to all regulations of all countries, so please do not forget:

- To follow the legal regulations in your country when applying and maintaining brake systems.
- To follow your country’s regulations and safety instructions for work behaviour and environment to avoid accidents.
- That brake tests are mandatory before putting vehicles on the road.

We have taken care to try and ensure the accuracy of the information in this brochure. However, WABCO is not responsible for any harm or damage caused by error or inaccuracies that may be contained in this brochure.

This brochure is not intended to replace appropriate advice and confirmation. Do always get WABCO confirmation based on the trailer configuration you are intending to build before proceeding.
1. Introduction

This "TRAILER BROCHURE for MEA" is the successor of the brochure 815 010 125 3 "TRAILER BROCHURE for MEA" – 1st edition from June 2007.

The demands in trailer systems of the trailer manufacturers in the region "Middle East & Africa" (MEA) increased in the last few years. This brochure should give an overview of trailer systems WABCO may offer to trailer manufacturers in this region.

The shown trailer systems give a choice WABCO handles as "standard systems" in the MEA region. Of course there won't be any problem to modify these schemes due to customer requests or to design solutions for trailer systems based on customer’s specification.

In chapter "General remarks" therein might be found some general points about the system layout that should help you to choose the right system.

In chapter "Trailer specification" therein might be found an overview of questions trailer manufacturers have to think about, when they choose a trailer brake system. The complete answering of all these questions should help to improve the communication and avoid time delay with excessive communication to specify the system.

In chapter "Brake calculation" therein might be found some remarks what data needed from trailer manufacturer’s side to get a proper brake calculation without unnecessary communication.

This brochure includes low-price trailer systems as well as high advanced trailer systems which follow the regulation ECE R-13. Herein it's also to find trailer systems which are not used in Europe e.g. as Road-Train-Brake systems (dolly and trailer-to-tow).

The trailer systems are shared in groups as:

- brake systems with single brake chambers without ABS/TEBS for semi and drawbar trailers
- brake systems with single brake chambers and TRISTOP cylinders without ABS/TEBS for semitrailers
- brake systems with WABCO ABS "VCSII" for 3 axle semitrailers
- brake systems with WABCO TEBS E generation for 3 axle semitrailers
- brake systems for road train vehicles:
  - 2 axle dollies
  - 3 axle semitrailers to tow other trailers
- Air suspension systems without lift axle control for 3 axle semitrailers
- Air suspension systems with lift axle control for 3 axle semitrailers
- Suspension systems to use with WABCO TEBS E generation only
2. General remarks

There are some general remarks to read before choosing the right trailer system.

1. The drawings are modified to the newest technical standard

The pipe and hose sizes are redesigned due to a clear structure as:

- Hose size in general: hose 11x4
- Pipe size "supply pressure" power between air tank and consumer during brake process: pipe 15x1.5 at least
- Pipe size in general for other connections (fill lines and control lines) in the brake system: pipe 12x1.5 (except TEBS E)
- Pipe size in general for fill and control lines in the TEBS E system: pipe 8x1
- Pipe size in the air suspension system in general: pipe 12x1.5
- Pipe size for lift bellow control: pipe 8x1
- Coupling heads with integrated line filter for semi-trailers

2. The parts lists (esp. the fittings and pipe lengths) are proposals – PROTOTYPE INSTALLATION IS RECOMMENDED

- WABCO gives a proposal for a system only
- Prototype installation is recommended strongly before ordering the selected system in higher quantities
- It's important to check
  - If the proposed size and volume of pipes / hoses is correct
  - If the proposed number and type of fittings is correct
  - If some changes in fact of the specific trailer design are necessary (e.g. change straight fitting into elbow version).

This job only can be done at the specific trailer model.

- You may find more information concerning fittings in the WABCO brochure: 815 010 080 3 "Pipe Couplings – For workshop and vehicle construction"

3. Adaptation possible of the proposed brake chambers in the brake systems

- The selection of the brake chambers depends on the axle load of the trailer in full laden situation. From our experiences there is defined:
  - Axle load 8 ... 10t => brake chamber type 24"
  - Axle load 12 ... 14t => brake chamber type 30"
  - Axle load >16t => brake chamber type 36"
- These values are general assessments. In every case the brake cylinder proposal has to be checked at the trailer.
- Recommended tools:
  - brake calculation
  - roller test bench

4. Automatically load-sensing valves are to adjust

- The automatically load-sensing valves (LSV) in trailers are "universal valves"
  - Universal" means the valve can be used for several types of trailers.
  - "Universal" doesn't mean "plug-and-play" – the LSV can't be taken out of the box and assembled into the trailer brake system without any further handling.
- It is necessary to do an adjustment of the LSV before installation into the brake system. The information about the needed tools and adjustment procedure you'll find in the WABCO brochure "LSV testing equipment" (Publication number: 815 010 032 3)
- The values for the adjustment must be calculated
  - First of all – there is a need for a brake calculation – this service may be requested from WABCO.
    For that WABCO needs a filled application form for brake calculation.
    For further information see also the remarks for brake calculation in the chapter "brake calculation".
  - Afterwards the lengths and adjustment of several screws / levers / springs have to be calculated with the LSV calculation software you may get this software as freeware from our WABCO homepage http://www.wabco-auto.com/service_and_support/download
- or you'll get it from your WABCO partner.
5. **TEBS is a universal system**
   - The trailer electronically brake system (TEBS) is a "universal system". It can be used for most of the popular types of trailers.
   - It is necessary urgently to adjust the TEBS to the specific trailer conditions after the installation.
   - This adjustment only can be done with a PC and the WABCO diagnostic software. WABCO offers also the adapter cabling to connect the PC with the trailer system.
   - For more information please contact your WABCO partner.
   - by trained people.
   - For that it is necessary to contact your WABCO partner for training and support.
   - The values for adjustment (= parameters) will be calculated with a brake calculation. The brake calculation have to be done under the own responsibility of the trailer manufacturer.
   - can be ordered as service from WABCO. For further information see chapter "Brake calculation".
   - If there is no adjustment of the TEBS after installation the TEBS won't work properly and the vehicle user will get several problems.

6. **Start-up procedure demanded in trailers brake systems with ABS and TEBS**
   - WABCO insists on a start-up procedure in trailer brake systems with electronically components (ABS, TEBS).
   - The start-up procedure gives the certainty that the parts are assembled in the right position.
   - generates a certificate to show the successful job.
   - The start-up has to be done with a PC and the WABCO diagnostic software. WABCO offers also the adapter cabling to connect the PC with the trailer system. For more information, please contact your WABCO partner.
   - by trained people.
   - For that it is necessary to contact your WABCO partner for training and support.

7. **Levelling valves in trailer air suspension are to adjust**
   - The lever length of levelling valves is to adjust for optimal suspension conditions. The levelling valve 464 006 100 0 has the additional feature "heigt restriction", which is adjustable. For that the rubber cap on the valve bottom is to remove and therein is a screw to adjust.
   - For more information see WABCO brochure "Air Braking Equipment for Trailers" (Publication number: 815 010 034 3).
   - contact your WABCO partner.

8. **Lift axle control valve 463 084 000 0 / …020 0 is to adjust before installation**
   - The lift axle control valves (LACV) in trailers are "universal valves"
   - "Universal" means the valve can be used for several operation requests of lift axles.
   - "Universal" doesn't mean "plug-and-play" - the LACV can't be taken out of the box and assembled into the trailer brake system without any further handling.
   - It is necessary to do an adjustment of the LACV before installation into the lift axle control system.
   - The information about the needed tools and adjustment procedure you'll find in the WABCO brochure 815 010 034 3 "Air Braking Equipment for Trailers".
   - The values for the adjustment must be calculated:
     - The bellow pressure when the axle should LOWER must not exceed than the equivalent bellow pressure of 100% axle load.
     - The bellow pressure when the axle might LIFT must be less than the bellow pressure to LOWER. It might not be too enclosed to the value for axle LOWER. Contact your WABCO partner if more information is needed.
3. Brake Calculation

WABCO recommends a brake calculation for each type of trailer brake system in general.

WABCO requests a brake calculation for trailer brake systems with adjustable brake components as…
  >> Automatic load-sensing valve
  >> TEBS modulator

The proposed brake systems don't consider the specific conditions on the trailer like trailer dimensions, axle type, wheel brake type, tyre type, etc.

Why a brake calculation is important?
• A brake calculation gives an overview of the expected brake characteristic of the trailer.
• A brake calculation considers influences as …
  • Trailer dimensions
  • Trailer and axle weights
  • Tyre diameters
  • Brake force alignment from the brake cylinders to the road surface
• On the basis of the brake calculation, it is possible to analyse the brake system concerning legality for different regulations (e.g. ECE R-13, national rules etc.)
• A brake calculation gives the values for adjustment of "universal brake units" as:
  • Automatic load-sensing valve
  • TEBS modulator

Please note - the result of a brake calculation is only as good as the available input values.

What information is needed?
• Important to fill the application form "technical vehicle data …".
• The application form is attached at the end of this chapter. There is also an example how to fill this form.

In case of doubt or need of support, don't hesitate to contact your WABCO partner.

Additional remarks:
• Attention! The data sheet has 2 pages to fill.
• Trailer mass

• there is a chance to give in a tolerance range of minimal and maximal trailer mass
• centre-of-gravity
  • realistic value LADEN: 1.800 … 1.900 mm
  • realistic value UNLADEN: 1.100 … 1.200 mm
• wheel base on semitrailers:
  • 1- or 3-axle trailers: from king-pin to the middle of the middle axle
  • 2- or 4-axle trailers: from king-pin to the middle between the 2 middle axles
• Axle load
  • Put in the axle load as planned for the trailer but not the max. permitted axle load
  • E.g. a 12t-axle could be limited in a trailer to 9t-load from constructive reasons or by law
• Possible lever lengths; drum/disk radius; C* or brake factor; mechanical efficiency; cam radius
• These parameters covers the foundation brake - they are important to calculate the brake force alignment in the foundation brake
• These parameters are available from your axle manufacturer
• Axle manufacturer / type / test report number
  • Alternatively to the parameters of the foundation brake you could send us the test report number of the axle (available from your axle manufacturer - either in the documents or at the type label on the axle)
• Typical layout of a test protocol number is…
  • TDB xxx” resp. "TBD xxx ECE"
  • 361…” resp. ”361-…” resp. ”361-…ECE"
  • RDW…” resp. "RDW … ECE"
• Axle boogie
  • Choose the axle configuration as in use - it's important for the brake dynamic
• For air suspension are important:
  >> the bellow diameter
  >> bellow pressure laden/unladen
  >> the lever ratio at the axle
  • to calculate the ration to load
• (if there is a request for lift axle control) to design of the lift axle control
### Brake Calculations

#### Technical Vehicle Data

For the brake calculation of trailers

<table>
<thead>
<tr>
<th>Designations</th>
<th>Laden</th>
<th>Unladen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Centre-Axle Trailer</strong></td>
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</tr>
<tr>
<td>Maximum mass</td>
<td>$P$</td>
<td>kg</td>
</tr>
<tr>
<td>Drawbar load</td>
<td>$P_{sl}$</td>
<td>kg</td>
</tr>
<tr>
<td>Axle load axle 1</td>
<td>$P_1$</td>
<td>kg</td>
</tr>
<tr>
<td>Axle load axle 2</td>
<td>$P_2$</td>
<td>kg</td>
</tr>
<tr>
<td>Axle load axle 3</td>
<td>$P_3$</td>
<td>kg</td>
</tr>
</tbody>
</table>

| **Full Trailer**           |       |         |
| Maximum mass               | $P$   | kg      |
| Axle load axle 1           | $P_1$ | kg      |
| Axle load axle 2           | $P_2$ | kg      |
| Axle load axle 3           | $P_3$ | kg      |
| Centre of gravity-height   | $h$   | mm      |
| Exist wheel base           | $E_{w}$ | mm |
| Range of wheel base        | $E_{r}$ | mm |

| **Semitrailer**            |       |         |
| Maximum                   | min.  | $P$   | kg |
|                           | max.  | $P$   | kg |
| Axle load axle 1           | $P_1$ | kg      |
| Axle load axle 2           | $P_2$ | kg      |
| Axle load axle 3           | $P_3$ | kg      |
| Centre of gravity-height   | $h$   | mm      |
| Exist wheel base           | $E_{w}$ | mm |
| Range of wheel base        | $E_{r}$ | mm |

| **Axle**                   |       | 1      | 2      | 3      |
| Brake chamber: num./type   | $K_{oz}$ |       |       |       |
| Possible lever lengths     | $l_{bh}$ | mm    |       |       |
| Drum radius                | $r_{bh}$ | mm    |       |       |
| C*                         | $\eta$ | %      |       |       |
| Mechanical efficiency      | $\eta$ | %      |       |       |
| Cam radius                 | $r_{cm}$ | mm    |       |       |
| Dynamic tyre radius        | min.  | $r_{dyn}$ | mm |
| Or                         | max.  | $r_{dyn}$ | mm |
| Tyre type                  | $M_{ax}$ | Nm    |       |       |

**Axle Manufacturer**
- Type: [Test report number]

**Brake Size:**
- With "standard axles", only the manufacturer and test report number necessary!

**WABCO** brake diagram no.: [For axle assembly please see reverse!]

**ABS:** [ ]
**Spring brake:** [ ]
**Steer. axle:** [ ]
**EBS:** [ ]
## Brake Calculations

### WABCO

**Technical Vehicle Data** for the brake calculation of trailers

<table>
<thead>
<tr>
<th>Axle Bogie</th>
<th>Manufacturer</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air suspension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leaf spring bogie (with dyn. compensation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leaf spring bogie (without dyn. compensation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balance beam bogie</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual axles mechanical</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In case of another axle suspension, please add!

- Bag pressure laden + unladen [bar]:
  - Axle 1
  - Axle 2
- Spring deflection (unladen/laden) [mm]:
  - Axle 1
  - Axle 2

### Semitrailer with Lift Axle/s

- Axle
  - Which axle/s shall be lifted [x]
- Wheel base [mm]:
- Bag pressure laden [bar]:
- Bag pressure unladen (with axle/s lifted) [bar]:
- Bag pressure unladen (all axles on bottom) [bar]:
- Axle load unladen (with axle/s lifted) [kg]:
- Axle load unladen (all axles on bottom) [kg]:

Remarks:

- Company:
- Street:
- Researcher:
- City:
- Telephone:
- Telefax:
- E-mail:
# Brake Calculations

## Technical Vehicle Data

### Centre-Axle Trailer

<table>
<thead>
<tr>
<th>Designations</th>
<th>Laden</th>
<th>Unladen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Mass</td>
<td>P</td>
<td>kg</td>
</tr>
<tr>
<td>Drawbar Load</td>
<td>$P_{sb}$</td>
<td>kg</td>
</tr>
<tr>
<td>Axle Load Axle 1</td>
<td>$P_1$</td>
<td>kg</td>
</tr>
<tr>
<td>Axle Load Axle 2</td>
<td>$P_2$</td>
<td>kg</td>
</tr>
<tr>
<td>Axle Load Axle 3</td>
<td>$P_3$</td>
<td>kg</td>
</tr>
</tbody>
</table>

### Full Trailer

<table>
<thead>
<tr>
<th>Designations</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Mass</td>
<td>P</td>
<td>kg</td>
</tr>
<tr>
<td>Axle Load Axle 1</td>
<td>$P_1$</td>
<td>kg</td>
</tr>
<tr>
<td>Axle Load Axle 2</td>
<td>$P_2$</td>
<td>kg</td>
</tr>
<tr>
<td>Axle Load Axle 3</td>
<td>$P_3$</td>
<td>kg</td>
</tr>
<tr>
<td>Centre of Gravity-Height</td>
<td>$h$</td>
<td>mm</td>
</tr>
<tr>
<td>Existing Wheel Base</td>
<td>$E_{fn}$</td>
<td>mm</td>
</tr>
<tr>
<td>Range of Wheel Base</td>
<td>$E_{fr}$</td>
<td>mm</td>
</tr>
</tbody>
</table>

### Semi-Trailer

<table>
<thead>
<tr>
<th>Designations</th>
<th>Min.</th>
<th>Max.</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>P</td>
<td>kg</td>
<td>36.00</td>
<td>6.00</td>
</tr>
<tr>
<td>Axle Load Axle 1</td>
<td>$P_1$</td>
<td>kg</td>
<td>12.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Axle Load Axle 2</td>
<td>$P_2$</td>
<td>kg</td>
<td>12.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Axle Load Axle 3</td>
<td>$P_3$</td>
<td>kg</td>
<td>12.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Centre of Gravity-Height</td>
<td>$h$</td>
<td>mm</td>
<td>1.800</td>
<td>1.200</td>
</tr>
<tr>
<td>Existing Wheel Base</td>
<td>$E_{fn}$</td>
<td>mm</td>
<td></td>
<td>8.000</td>
</tr>
<tr>
<td>Range of Wheel Base</td>
<td>$E_{fr}$</td>
<td>mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Axle

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brake Chamber: Number/Type</td>
<td>$K_{cm}$</td>
<td>24&quot;</td>
<td>24&quot;/30&quot;</td>
</tr>
<tr>
<td>Possible Lever Lengths</td>
<td>$l_{el}$</td>
<td>mm</td>
<td></td>
</tr>
<tr>
<td>Drum Radius</td>
<td>$R_{dr}$</td>
<td>mm</td>
<td></td>
</tr>
<tr>
<td>Mechanical Efficiency</td>
<td>$\eta$</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Cam Radius</td>
<td>$R_{cm}$</td>
<td>mm</td>
<td></td>
</tr>
<tr>
<td>Dynamic Tyre Radius</td>
<td>$R_{ty}$</td>
<td>mm</td>
<td></td>
</tr>
<tr>
<td>Tyre Type</td>
<td>$T_{ty}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threshold Torque</td>
<td>$M_{th}$</td>
<td>Nm</td>
<td></td>
</tr>
</tbody>
</table>

### Axle Manufacturer

**BPW**

### Brake Size

**SN 4220**

### Test Report Number

**TDB 753 ECE**

---

With "standard axles", only the manufacturer and test report number necessary!
# Brake Calculations

## WABCO Technical Vehicle Data

**Axle Bogie**
- Manufacturer: BPW
- Type: H 120

### Axle Types
- **Air Suspension**
- **Leaf Spring Bogie (with dyn. compensation)**
- **Leaf Spring Bogie (without dyn. compensation)**
- **Balance Beam Bogie**

### Individual Axles Mechanical

**Spring Deflection**
- Unladen/Laden [mm]:
  - Axle 1
  - Axle 2

### Semitrailer with Lift Axle(s)

- **Axle**: 
- Which axle(s) shall be lifted [x]: 
- Wheel Base 1 [mm]: 
- Bag Pressure Laden [bar]: 
- Bag Pressure Unladen (with axle(s) lifted) [bar]: 
- Bag Pressure Unladen (all axles on bottom) [bar]: 
- Axle Load Unladen (with axle(s) lifted) [kg]: 
- Axle Load Unladen (all axles on bottom) [kg]: 

### Remarks:

- Company: Example Co.
- Street: Milky Way 123
- Researcher: Engineer Bigfoot
- City: New Packham
- Telephone: +0012 (0) 345 678
- Telefax: +0012 (0) 345 999
- E-mail: bigfoot@web.com
4. Trailer System Specification

Sometimes Trailer OE manufacturer ask for trailer brake systems without sufficient information. However it's necessary to give a basic specification to request a trailer brake system. It will avoid additional communication to get the correct information for a system offer.

This chapter should give a tool to the customers to transfer the proper information to WABCO for a selection of a trailer brake system.

The customer has…
… to think about the trailer system he wants to use
… to define the below subjects for a first proposal

For that WABCO has to know at least the following subjects:

1. Kind of trailer
   • Semi-trailer
   • Drawbar trailer
   • Central axle trailer

2. Trailer load …
   … empty: _______________kg
   … full-laden: _______________kg

3. Number of axles: ____________

4. Max. permitted axle load in the trailer
   Axle1: _______________kg
   Axle2: _______________kg
   Axle3: _______________kg
   Axle4: _______________kg
   Axle5: _______________kg

5. Length from front wall to the middle of the rear axle(s)
   ____________m

6. Basic layout of the brake system
   • Pure pneumatic brake system
   • Pneumatic brake system+ ABS
   • Trailer EBS

7. Kind of foundation brake
   • Drum brake
   • Disk brake

8. Regulation requests (Which?)
   • ECE R13
   • Others? If YES, which? _______________
   • nothing special

9. Kind of suspension
   • Leaf spring
   • Air suspension

9.1 Air suspension delivery (only if "Air suspension")
   • WABCO delivery requested
   • Air suspension from other source

9.1.1 Air suspension layout (only if "WABCO delivery requested")
   • Basic (levelling valve only)
   • Advanced (with chassis-lift-lower valve / rotary slide valve)
   • ECAS (only in combination with ABS or TEBS)
   • eTASC (only in combination with TEBS E)

10. Trailer with lift axle control
    • 1 lift axle
    • 2 lift axles parallel controlled
    • 2 lift axles controlled separately
    • No lift axle in the trailer

10.1 Lift axle control delivery
    • WABCO delivery requested
    • Lift axle control from other source

11. Trailer with steering axle control
    • 1 steering axle
    • 2 steering axles
    • No steering axle in the trailer

11.1 Steering axle control delivery
    • WABCO delivery requested
    • Steering axle control from other source
12. Requested brake cylinder layout
   • Only single brake chambers
   • Only Tristop cylinders
   • Combination single brake chambers and Tristop cylinders
   • No special request

12.1 Brake cylinder delivery
   • WABCO delivery requested
   • Brake cylinders from other source (axle manufacturer)

12.2 Manual trailer park brake function (only if Tristop cylinders in the system)
   • Yes
   • No

13. Trailer brake release function
   • Yes
   • No

14. Load detection
   • No load detection requested
   • Manual load adjuster
   • Automatic load sensing valve (LSV)
   • Trailer EBS

Remark:
In case of selection of "Automatic Load-Sensing Valve (LSV)" or "Trailer EBS" a brake calculation is requested urgently. The parameters for adjustment are calculated in the brake calculation. For more information see chapter "Brake calculation" in this brochure.

15. Brake calculation
   • Requested from WABCO
   • No

Remark:
In case of "Requested from WABCO" there is a technical data sheet, which is to fill and to send to WABCO further support. For more information see chapter "Brake calculation" in this brochure.

16. Component range
   • Full trailer kit with fittings and pipes
   • Main components only (no fittings; no pipes)

16.1 Fitting style (only if "Full trailer kit with fittings and pipes")
   • DIN fittings (fittings to screw)
   • Quick-In fittings (the pipe is to plug in)

17. Extras
   • No further extras
   • Trailer-to-tow
   • ECAS
   • SmartBoard (only with TEBS)
   • Further extras as ....

The following items have to be known, if there is a request for an electrical system like ABS or TEBS...

18. Electrical POWER supply from truck side
   • 12V
   • 24V (Standard version)

19. Requested ABS sensor configuration
   • 2S/2M
   • 4S/2M
   • 4S/3M
   • 4S/2M+1M (TEBS only)
   • No special request

20. ABS sensor delivery
   • WABCO delivery requested
   • ABS sensors from other source (axle manufacturer)
MEA standard trailer – 1+2axle drawbar trailer
schemes 841 600 413 0 / 841 600 414 0 / 841 600 415 0

the illustration does not replace the WABCO drawing
3 Axle drawbar trailer

MEA 5

Hose: Φ11x4 828 876 011 6
Nylon pipe: Φ12x1.5 828 251 112 6
Nylon pipe: Φ15x1.5 828 251 115 6

1. HOSE CLAMP 451 998 398 2
2. AIR RESERVOIR 590 080 052 2
3. SUPPLY, RED
4. BRAKE, YELLOW

NOT APPLICABLE FOR DISC-BRAKE

WABCO

23
1 Axle semi-trailer with automatic LSV

MEA standard trailer scheme 841 700 872 0

MEA5 1

Axle semi-trailer 841 700 872 0 with automatic LSV

the illustration does not replace the WABCO drawing
1 Axle semi-trailer
841 700 872 0

MECA 5

Axle semi-trailer with automatic LSV

Supply, red

Brake, yellow

Hose ø11x4 828 876 011 6
Nylon pipe ø12x1.5 828 251 112 6
Nylon pipe ø15x1.5 828 251 115 6
1 Axle semi-trailer 841 700 873 0
with automatic LSV (air suspension)
2 Axle semi-trailer 841 700 861 0
with automatic LSV (air suspension)
31 Axle semi-trailer 841 700 861 0
with automatic LSV (air suspension)
2 Axle semi-trailer
with manual LSV

MEA standard trailer with manual load-detection
scheme 841 700 863 0

MEA5 1

WABCO

34
3 Axle semi-trailer 841 700 511 0
with manual LSV (air suspension)
3 Axle semi-trailer 841 700 511 0
with manual LSV (air suspension)
3 Axle semi-trailer 841 700 516 0 with automatic LSV (air suspension)

* NOT APPLICABLE FOR DISC-BRAKE

Hose \( \phi 11 \times 4 \) 828 876 011 6
Nylon Pipe \( \phi 12 \times 1.5 \) 828 251 112 6
Nylon Pipe \( \phi 15 \times 1.5 \) 828 251 115 6
MEA standard trailer with automatic load-sensing valve (leaf spring)

3 Axle semi-trailer scheme 841 700 517 0

The illustration does not replace the WABCO drawing.
4 Axle semi-trailer 841 700 881 0 with automatic LSV

SUPPLY, RED

BRAKE, YELLOW

* NOT APPLICABLE FOR DISC-BRAKE

Hose 011x4 828 878 011 6
Nylon pipe 012x1.5 828 251 112 6
Nylon pipe 015x1.5 828 251 115 6
4 Axle semi-trailer 841 700 882 0
with automatic LSV (air suspension)
Axle semi-trailer with automatic LSV

WABCO

Hose ø11x4 828 876 011 6
Nylon pipe ø12x1.5 828 251 112 6
Nylon pipe ø15x1 828 251 115 6

11, 12
11, 12
11, 12
11, 12
4, 5
12, 12
12, 12

1. TEST CONNECTION 463 703 115 0
2. KIT 423 2... 2
3. TRISTOP BRAKE ACT. 925 ... 0
4. CYLINDER 432 497 060 0
5. QUICK RELEASE VALVE 973 500 059 0
6. LOAD-SENS RELAY EMERGENCY VALVE 475 712 004 0
7. DRAIN VALVE 934 300 ... 0
8. HOSE CLAMP 451 999 ... 2
9. AIR RESERVOIR 850 ... 0
10. RELEASE VALVE PARKING BRAKE 883 006 ... 0
11. COUPLING HEAD INTERCHANGE LINE FILTER 832 201 001 0
12. COUPLING HEAD INTERCHANGE LINE FILTER 832 201 002 0
13. TEST CONNECTION 463 703 036 0

MEASUREMENTS

Dimensions: 595.2x842.0

WABCO

2 A X E S  -  S E M I - T R A I L E R

LOAD-SENS RELAY EMERGENCY VALVE, MECH.
2 Axle semi-trailer with automatic LSV (air suspension)
### Table: Components and Specifications

<table>
<thead>
<tr>
<th>Component</th>
<th>Code</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Supply (Red)</td>
<td>1</td>
<td>Axle Semi-trailer w/ automatic LSV</td>
<td></td>
</tr>
<tr>
<td>2. Brake (Yellow)</td>
<td>2</td>
<td>Axle Semi-trailer w/ automatic LSV</td>
<td></td>
</tr>
<tr>
<td>3. Brake Chamber 30°</td>
<td>03</td>
<td>Axle Semi-trailer w/ automatic LSV</td>
<td></td>
</tr>
<tr>
<td>4. Brake Chamber 30°</td>
<td>03</td>
<td>Axle Semi-trailer w/ automatic LSV</td>
<td></td>
</tr>
<tr>
<td>5. Tag Setting Value</td>
<td>025</td>
<td>Axle Semi-trailer w/ automatic LSV</td>
<td></td>
</tr>
<tr>
<td>6. Load Sensing Valve</td>
<td>03</td>
<td>Axle Semi-trailer w/ automatic LSV</td>
<td></td>
</tr>
<tr>
<td>7. Load Sensing Valve</td>
<td>03</td>
<td>Axle Semi-trailer w/ automatic LSV</td>
<td></td>
</tr>
<tr>
<td>8. Tag Setting Value</td>
<td>025</td>
<td>Axle Semi-trailer w/ automatic LSV</td>
<td></td>
</tr>
<tr>
<td>9. Load Sensing Valve</td>
<td>03</td>
<td>Axle Semi-trailer w/ automatic LSV</td>
<td></td>
</tr>
<tr>
<td>10. Load Sensing Valve</td>
<td>03</td>
<td>Axle Semi-trailer w/ automatic LSV</td>
<td></td>
</tr>
<tr>
<td>11. Load Sensing Valve</td>
<td>03</td>
<td>Axle Semi-trailer w/ automatic LSV</td>
<td></td>
</tr>
<tr>
<td>12. Load Sensing Valve</td>
<td>03</td>
<td>Axle Semi-trailer w/ automatic LSV</td>
<td></td>
</tr>
<tr>
<td>13. Load Sensing Valve</td>
<td>03</td>
<td>Axle Semi-trailer w/ automatic LSV</td>
<td></td>
</tr>
<tr>
<td>14. Load Sensing Valve</td>
<td>03</td>
<td>Axle Semi-trailer w/ automatic LSV</td>
<td></td>
</tr>
</tbody>
</table>

### Diagram

- **Hose**: Φ11x4 828 876 411 6
- **Nylon Pipe**: Φ12x1.5 828 251 112 6
- **Nylon Pipe**: Φ15x1.5 828 251 115 6

---

**WABCO**

- **Date**: 07-02-04
- **Checked**: APITH
- **Signature**: SCHRADE
- **File**: TWO LINE-AIR BRAKING SYSTEM FOR 2-AXLES SEMI-TRAILER
- **Remarks**: STANDARDIZATION WITH LOAD-SENSING VALVE, MECH.
MEA trailer with TRISTOP cylinders
scheme 841 700 243 0

3 Axle semi-trailer with automatic load-sensing valve (air suspension)

With automatic LSV (air suspension)
3 Axle semi-trailer
no load detection
MEA trailer with brake chambers
3 axle semi-trailer with ABS 4S/2M

MEA 5 3 Axle semi-trailer
841 700 972 0
with automatic LSV (air suspension) (ref.-no. 841 701 065 0)
3 Axle semi-trailer
no load detection
3 Axle semi-trailer with manual LSV

MEA trailer with TRISTOP cylinders
3 axle semi-trailer with ABS 4S/2M
basic scheme 841 700 973 0 – manual load adjuster

The illustration does not replace the WABCO drawing
MEA trailer with TRISTOP cylinders
3 axle semi-trailer with ABS 4S/2M

Basic scheme 841 700 973 0 / 841 701 066 0 – automatic LSV for steel spring

MEA 5
3 Axle semi-trailer
841 700 973 0
with automatic LSV (steel spring)
(ref.-no. 841 701 066 0)
MEA 3 Axle semi-trailer 841 700 973 0
with automatic LSV (air suspension) (ref. no. 841 701 067 0)
3 Axle semi-trailer 841 700 973 0
with automatic LSV (air suspension)

SUPPLY, RED

BRAKE, YELLOW

X1 TABLE: APPLICABLE LOAD-SENS. VALVE VARIATIONS

AIM IS:
IDENTIC DEAD VOLUMINA OF ALL BRAKE ACTUATORS PLUS CORRESPONDING BRAKE HOSES BASED ON AN ABS-RELAY VALVE

NOT APPLICABLE FOR DISC-BRAKES
** OPTIONAL

WIRING DIAGRAM: SEE 841 801 931 0 OR/AND 841 801 932 0
TEBS E 4S/2M — basic scheme 841 701 101 0
TEBS modulator 480 102 062 0 (premium) — no PEM

the illustration does not replace the WABCO drawing
- TRISTOP BRAKE ACTUATORS OPTIONALLY ON 2 AXLES
- WHEN USING AS 25/2M TWO SENSORS AND TWO SENSOR EXTENSION CABLES CAN BE DROPPED
- SENSING OF THE AXLES IS OPTION
* NOT APPLICABLE FOR DISC-BRAKE
** SUPPLY PIPE: 1x 18x2 OR 2x 15x1.5, MAX LENGTH: 3m
*** PIPING WITHOUT THREADED PIPE ANGLE
**** OPTIONALLY (ONLY POSSIBLE FOR PREMIUM ECU)

<table>
<thead>
<tr>
<th>TEST CONNECTION</th>
<th>463 703 119 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Kit</td>
<td>423 903 332 0</td>
</tr>
<tr>
<td>1 Kit</td>
<td>423 000 000 2</td>
</tr>
<tr>
<td>121 BRAKE CHAMBER</td>
<td>423 10 0 0</td>
</tr>
<tr>
<td>1 TWO WAY VALVE</td>
<td>434 208 055 0</td>
</tr>
<tr>
<td>1 TRAILER-VALVE</td>
<td>480 102 000 0</td>
</tr>
<tr>
<td>1 DRAIN VALVE</td>
<td>434 300 000 0</td>
</tr>
<tr>
<td>1 HOSE CLAMP</td>
<td>461 999 000 0</td>
</tr>
<tr>
<td>1 AIR RESERVOIR</td>
<td>900 000 000 0</td>
</tr>
<tr>
<td>1 PARK-VALVE</td>
<td>971 002 000 0</td>
</tr>
<tr>
<td>1 COUPLING HEAD W. INT. LINE FILTER</td>
<td>952 201 000 0</td>
</tr>
<tr>
<td>1 COUPLING HEAD W. INT. LINE FILTER</td>
<td>952 201 000 0</td>
</tr>
</tbody>
</table>

---

TRAILER - EBS E
FOR 3-AXLES SEMI-TRAILER
45/2M OR 25/2M

- CODE FOR DOCUMENT SHEET
- SIZE
- CODE FOR FUNCTION
- REPLACEMENT FOR
3 Axle Dolly
with automatic LSV (steel spring)
1. **Axle semi-trailer-to-tow 841 700 247 0**

2. **with manual LSV**

3. **Diagram showing supply, red and brake, yellow connections.**

4. **Hose specifications:**
   - **Hose:** ø11x4 828 876 011 6
   - **Nylon pipe ø12x1,5:** 828 251 112 6
   - **Nylon pipe ø15x1,5:** 828 251 115 6

5. **Legend:**
   - **AXLE:** 841 700 247 0
   - **NOT APPLICABLE FOR DISC-BRAKE**
Air suspension with automatically lift axle control

3 Axle semi-trailer

MEA

841 801 448 0
83

3 Axle semi-trailer
841 801 448 0
Air suspension with automatically lift axle control

MEA 5

13 Axle semi-trailer 841 801 448 0
Air suspension with automatically lift axle control

* OPTIONAL

LIFTBALG

LUFFEDERBALG

LUFFEDERBALG

94-05-27 APITHY
94-06-27 SCHRADE

LIFTACHSSCHALTUNG
MECH. BETÆTIGT

171 841 801 448 0 502 01
0107

10 1 RUECKSCHALT. M. GEOG SS. RUECKSTR. 434 014 0 0
9 1 LUFTFEDERVENTIL 464 006 0 0
8 1 PRUEFANSCHLUSS 463 703 000 0
7 1 LIEBERSTROMVENTIL 434 100 0 0
6 1 DRUCKGRENZWERT. 475 010 0 0
5 1 LIFTACHSVENTIL 465 986 000 0
4 1 BEHAELTER 950 410 004 0
3 1 FILTER 432 500 0 0
2 1 BEHAELTER 950 700 0 0
1 1 LIEBERSTROMVENTIL 434 100 125 0
3 Axle semi-trailer  841 802 150 0
TEBS E (without PEM), Air suspension with Rotary Slide Valve (RSV), automatically lift axle control
3 Axle semi-trailer
TEBS (with PEM), Air suspension with Rotary Slide Valve (RSV), automatically lift axle control

841 802 150 0

MECO
3 Axle semi-trailer
TEBS E (with PEM), Air suspension with Rotary Slide Valve (RSV), automatically lift axle control
Mech. suspension for a 3 axle semi-trailer with TEBS E
Basic plan 841 802 153 0

distance sensor
441 050 100 0

Cable 5m
449 811 050 0

TEBS E modulator part of the brake scheme

all pipes with dimension 12x1.5
3 Axle semi-trailer
TEBS E, Mechanical Suspension

MECHANICAL SUSPENSION

DIAGRAM

DATE
05-12-04

APPROVED
06-12-04

MECH. SUSPENSION

MODERNIZATION

WABCO

PROD. IDENTIFICATION NO.
841 802 153 0

SHEET 1/1

CMO FOR DOCUMENT
0425

89
3 Axle semi-trailer
Air suspension with RSV, Height Limitation, automatically lift axle control
3 Axle semi-trailer
Air suspension with RSV, Height Limitation, automatically lift axle control

Air levelling valve

<table>
<thead>
<tr>
<th>PART NAME</th>
<th>PART NUMBER</th>
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<tbody>
<tr>
<td>8 cap test connection</td>
<td>463 703...0</td>
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<tr>
<td>7 cap rotary slide valve</td>
<td>453 032...0</td>
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<td>6 cap levelling valve</td>
<td>464 006 100 0</td>
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<td>5 cap test connection</td>
<td>463 703...0</td>
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<td>4 cap drain valve</td>
<td>934 300 001 0</td>
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<td>3 cap hose clamp</td>
<td>461 901 10.2</td>
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<td>2 cap air reservoir</td>
<td>950 ....0</td>
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<tr>
<td>1 cap charging valve w/o back flow 8,0 bar</td>
<td>434 100 125 0</td>
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3 Axle semi-trailer
Air suspension with RSV, automatically lift axle Control
3 Axle semi-trailer
Air suspension with RSV, no height limitation
3 Axle semi-trailer
Air suspension with RSV
3 Axle semi-trailer

Air suspension with RSV and height limitation

Diagram: Air suspension for a 3 axle semi-trailer with Rotary Slide Valve (RSV) height limitation. Basic plan 841 802 176 0.
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