

# Technical Report

No. KO250.3E

on the „TRAILER CONTROL MODULE“

**TÜV NORD Mobilität  
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## 0. General

This Technical Report serves as a working document for the officially authorised expert or examiner of the accredited testing laboratory in the assessment of trailers according to §§ 19, 20 and 21 StVZO or Directive 71/320/EEC and ECE Regulation No. 13.

With the exception of the eliminated version A and B, this report is identical with the previous TÜV NORD Report KO250.2. Thus, it contains the two versions B and D which are itemized in paragraph 1.4.1

The opportunity was taken to also make editorial amendments.

The fulfilment of the ECE-R13 requirements is also confirmed for the current state.

For the sake of simplicity the abbreviation **TrCM** is used in this report for the type „Trailer Control Module“.

## 1. Identification

- 1.1 Manufacturer:** **Haldex Brake Products GmbH**  
**Mittelgewannweg 27**  
**D-69123 Heidelberg-  
Wieblingen**
- 1.2 Applicant:** **As 1.1**
- 1.3 System component:** **Trailer brake valve**  
**with emergency brake**  
**device, combined control**  
**valves (shunt and park-**  
**ing brake valve) and a**  
**pressure protection**  
**valve without backflow**
- 1.4 Type of device:** **Trailer Control Module**

**1.4.1 Versions:**

**B) With pressure protection valve and without internal non-return valve**

**D) Without pressure protection valve and without internal non-return valve**

**2 Area of use**

**2.1 Vehicles:**

Trailers of the categories O according to the Framework Directives 2007/46/EC (70/156/EEC) and according to Annex 7 of the “Consolidated Resolution on the Construction of Vehicles (R.E.3)”

**2.2 Braking systems:**

Power-operated braking systems with pneumatic transmission; designed according to the specifications of StVZO or Directive 71/320/EEC or ECE-Regulation No. 13

**2.2.1 Notice:**

The TrCM is intended for installation in twin-line braking systems with purely pneumatic (see paragraph 5.1.3.1.1 of ECE-13) or pneumatic/electric control (see paragraph 5.1.3.1.2 of ECE-13).

**3 Technical details**

**3.1 General:**

The TrCM is a trailer brake valve with emergency brake device (automatic braking), combined control valves (shunt and parking brake valve) and a pressure protection valve without backflow.

The shunt valve allows the disconnection of the “emergency braking” function, see paragraph 3.5.6 below.

Actuation of the parking brake valve releases or applies the parking braking system.

Version B

The pressure protection valve without backflow integrated in the TrCM assures the priority compressed air supply of the braking system and prevents any inadmissible mutual pressure influence between braking system and auxiliary equipment.

Version D

The TrCM without pressure protection valve may be used in braking systems without auxiliary equipment or in braking systems where the function of pressure protection is ensured by another device.

**3.2 Installation:**

The TrCM is intended for the installation in trailers (semi-trailers, centre-axle trailers, full trailers) with ABS or EBS and with spring actuated braking systems.

**Sample schematics (see chapter “6 Annexes”)**

**3.3 Identification:**

Haldex part numbers \*

\* The Haldex numbers not fully specified (by the letter “x”) in this report indicate that modifications to the TrCM (e.g. threaded connections, characteristics etc.) are possible, but such modifications do not affect the function and performance in relation to the assessment conducted.

	Version	
	B	D
<b>352 067</b>	1 0 x	1 2 x
	1 1 x	1 3 x
	1 4 x	
	1 5 x	
	1 6 x	
	1 7 x	
	1 8 x	
	1 9 x	

**3.4 Ports:**

**Port 1:**

The TrCM has the following ports:

Supply line (coupling head, red)

**Port 4:**

Control line (coupling head, yellow)

**Ports 4-2:**

Further optional pressure connection, e.g. for a pressure switch\*

**\*Note:** This pressure switch is required for instance for trailers with certain installations using Haldex EBS type **EB+**, where this pressure switch is part of the special system equipment.

**Port 21:**

Control line (to the braking device/modulator or LSV)

**Port 22:**

Spring braking system

**Ports 1-2:**

Air reservoir (braking system)

**Port 3:**

Exhaust

**Ports 23, 24, 25:**

Shorted (common) connections for the auxiliary equipment (e.g. air suspension, backup interlock for trailing axles etc.)

### 3.5 Function

#### 3.5.1 Pressure loss in the supply line / automatic braking

**Air reservoir /  
auxiliary equipment:**

If the supply line (red coupling head) breaks off, integrated non-return valves prevent the supply air from escaping out of the air reservoir(s) of the trailer braking system and – if any – of the auxiliary equipment.

**Effect on the service  
braking system:**

If the pressure in the supply line falls by at least 100 kPa per second, the trailer is automatically braked before the pressure in the supply line has fallen to 200 kPa (see par. 2.2.1.18.4.2, Annex I of Directive 71/320/EEC or par. 5.2.1.18.4.2 of ECE Regulation No. 13). In addition a direct connection is made between the air reservoir (port 1-2) and the control line (port 21).

This assures that the automatic braking is provided by the service braking system and hence is ABS-controlled.

**Wheel locking is prevented by ABS control until the spring actuated parking brake forces cause the wheels to lock because the air reservoir pressure has dropped below the application pressure of the spring braking system.**

This application pressure is normally below 450 kPa. In the case of the Haldex **EB+** the pressure of 450 kPa is equivalent to the warning pressure at which the red and yellow warning signals indicate that the prescribed service braking performance is no longer ensured.

**Note:** "Application pressure" is used here to mean the pressure at which the wheel brakes are applied if the pressure in the spring compression chamber is **lowered** from a high pressure (e.g. 650 kPa) to a lower pressure.

**Effect on the parking  
braking system:**

Parking braking system **released** (red control knob pushed): The same pressure level is established at ports 21, 22 and 1-2.

As long as the pressure in the air reservoir(s) of the trailer braking system is above the application pressure of the spring braking system the parking braking system remains released.

With further pressure reduction in the brake air reservoir ports 21 and 22 are vented simultaneously, which automatically activates the spring braking system and hence prevents the trailer from rolling away.

With the spring braking system **applied** (red control knob pulled out) the parking brake performance is kept with a spring braking system **without** two-way check (anti-compounding) valve mounted in front of the spring brake actuators, i.e. port 22 remains vented.

In the case of a spring braking system **with** front-mounted two-way check (anti-compounding) valve the current pressure of the brake air reservoir is introduced into the service brake actuators and spring brake actuators via port 21, once the automatic braking is initiated.

### 3.5.2 Pressure loss in the auxiliary equipment (Version B)

#### Air reservoir:

In the case of pressure loss in the auxiliary equipment a “securing pressure” of at least 520 kPa in the air reservoir of the service braking system is guaranteed by the integrated pressure protection valve (opening pressure of 620 (+10/-20) kPa) in order to meet the statutory requirements (see Directive 2002/78/EC, Annex I, paragraph 2.2.2.15 or ECE Regulation No. 13, paragraph 5.2.2.14 and paragraph 3.5.3 below in this report).

#### Effect on the service braking system:

A pressure loss in an accessory does not reduce the pressure in the service braking system below the required “securing pressure” of at least 520 kPa (see paragraph 4.3 below).

#### Effect on the parking braking system:

With the spring braking system **released** (red control knob pushed) the pressure in the spring braking system is not lowered.

With the spring braking system **applied** (red control knob pulled out) the parking brake performance is maintained.

### 3.5.3 Pressure loss in air reservoir (Version B)

**Auxiliary equipment:**

In the case of pressure loss in the brake air reservoir the auxiliary equipment is protected by a non-return valve integrated in the pressure protection valve. There is no backflow from the auxiliary equipment to the braking system. In this way the test requirement of isolating the energy storage device(s) for the auxiliary equipment according to paragraph 1.3.2.2 (Annex IV (A), Directive 71/320/EEC or Annex 7 (A) of ECE Regulation No. 13) is fulfilled.

**Effect on the service braking system:**

Lowering of the brake air reservoir pressure also reduces the pressure in the supply line (port 1), which triggers the automatic braking (see chapter 3.5.1 above).

**Effect on the parking braking system:**

see chapter 3.5.1

### 3.5.4 Pressure input through the coupling head of the control line / response time

**Supply line connected - Effect on auxiliary equipment / air reservoir:**

With the supply line connected the supply pressure provided by the towing vehicle is available in the braking system without limitation.

**Supply line connected Effect on service braking system:**

With pressure input through the coupling head pressure of the control line is passed on undiminished to control port “21” via port 4 (“push through”).

**Response time:**

Based on the design of the TrCM, a similar response time to that for a conventional relay emergency valve (REV) is expected (see also chapter 4.5).

**Supply line connected Effect on parking braking system:** None

This also applies to pressure fluctuations caused by actuations of the service braking system (as long as pressure is above the pressure of the “emergency braking” at which automatic braking is initiated).

**Supply line not connected:**

In the case of pressure input through the coupling head of the control line (e.g. with applied parking braking system of the towing vehicle) the brake air reservoir and hence as well the auxiliary equipment with a pressure reduced by the overflow loss are filled. Filling of the auxiliary equipment depends on the opening pressure of the integrated pressure protection valve..

As a result, an empty / partially filled braking system is **already** filled **before** the coupling head of the supply line is connected.

The automatic braking initiated by the disconnected coupling head of the supply line is **not** affected by this, i.e. even with no braking pressure at the coupling head of the control line (for instance with no longer applied parking braking system of the towing vehicle) the automatic braking is sustained.

With the spring braking system **released** (red control knob pushed) the pressure in the spring braking system will rise with the air reservoir pressure.

With the spring braking system **applied** (red control knob pulled out) the parking brake performance is kept with a spring braking system **without** two-way check valve (anti-compounding) mounted in front of the spring brake actuators, i.e. port 22 remains exhausted.

In the case of a spring braking system **with** front-mounted two-way check valve (anti-compounding) the current pressure of the brake air reservoir is feeding the service brake actuators and spring brake actuators via port 21.

**3.5.5 Actuation of parking braking system:**

The spring braking system (port 22) is connected with the exhaust (port 3) by pulling the red control knob. In this way the pressure in the spring braking system is exhausted and the parking braking system is **applied**.

The spring braking system (port 22) is connected with the air reservoir (port 1-2) by pushing the red control knob. In this way the pressure in the spring braking system is increased and the parking braking system is **released**.

### 3.5.6 Release device (Shunt valve):

The shunt valve allows the cancellation of the automatic braking (“emergency braking”) triggered by disconnecting the supply line (see EC Directive, Annex I, paragraph 2.2.2.11 or ECE-R13, paragraph 5.2.2.11).

The automatic braking is cancelled by pushing the black control knob (with the supply line disconnected). This is achieved by disconnecting port 21 from port 1-2 and connecting port 4 to port 21.

When the supply line is reconnected and compressed air is made available the shunt valve returns automatically into normal operation position (see Directive 2002/78/EC, Annex I, paragraph 2.2.2.11 or ECE Regulation No. 13, paragraph 5.2.2.11).

### 3.5.7 Size of the brake air reservoirs:

Paragraph 1.3 of Annex IV of the Directive 71/320/EEC or paragraph 1.3 of Annex 7 of the ECE Regulation No. 13 demand that air reservoirs with which trailers are equipped shall be such that, after eight full-stroke actuations of the towing vehicle's service braking system, the energy level supplied to the operating members using the energy does not fall below a level equivalent to one-half of the figure obtained at the first brake application and without actuating either the automatic or the parking braking system of the trailer.

See also the measurement performed in chapter 4.8 below.

## 4 Tests

### 4.1 General:

The tests listed below were conducted on a sample braking system (see chapter 6, annexes 10.1 and 10.2, “TrCM” and “REV” versions) of a 3-axle semi-trailer (brake air reservoir 120 l, reservoir for auxiliary equipment 60 l, size of brake actuators 6x30”/30”).



#### 4.2 Pressure loss in the supply line / automatic braking (chapter 3.5.1)

##### Air reservoir / auxiliary equipment:

With the supply line disconnected/broken off (red coupling head) the air consumption of the automatic braking operation lowered the pressure level of the brake air reservoir slightly, the pressure level of the air reservoir for the auxiliary equipment remained unchanged. Escape of the supply air from the air reservoir on the interrupted supply line is prevented.

##### Effect on the service braking system:

When the pressure in the supply line fell by at least 100 kPa per second, the automatic braking began at a pressure of approx. 230 kPa.

By means of driving tests performed by the manufacturer (see chapter 5.1 below) on roadways with a low coefficient of adhesion it was demonstrated that ABS control prevented wheel locking up to an air reservoir pressure of approx. 370 kPa (see also chapter 3.5.1). At this pressure a braking force was produced by the spring brake actuators.

##### Effect on the parking braking system:

With the spring braking system **released** (red control knob pushed) the pressure in the spring braking system was maintained until the automatic braking started at approx. 230 kPa. Once the automatic braking had started the pressure levels in ports 21, 22 and 1-2 were balanced.

With the spring braking system **applied** (red control knob pulled) port 22 was exhausted and stayed so when the pressure in the supply line was lowered.

#### 4.3 Pressure loss in the auxiliary equipment (chapter 3.5.2) (Version B)

##### Air reservoir:

When pressure loss occurred in the auxiliary equipment a “protecting pressure” of approx. 560 kPa was reached in the air reservoir of the service braking system.

##### Effect on the service braking system:

With service braking system **released** and simultaneous pressure loss in the auxiliary equipment no direct effect on the service braking system was established (service braking system stays released).

With service braking system **applied** ( $p_m = 830$  kPa) and simultaneous total pressure loss in the auxiliaries circuit the pressure previously fed into the service brake actuators fell from 810 kPa to approx. 560 kPa. The pressure in the brake air reservoir had also fallen to 560 kPa.

**Effect on the parking braking system:**

With the spring braking system **released** (red control knob pushed) the pressure in the spring braking system was not lowered.

With the spring braking system **applied** (red control knob pulled out) the parking brake performance was maintained.

**4.4 Pressure loss in the air reservoir (chapter 3.5.3)**

**Auxiliary equipment:**

When the pressure in the brake air reservoir was lowered from 850 kPa to a value of 0 kPa there was no backflow from the air reservoir of the auxiliaries.

**Effect on the service braking system:**

Lowering the brake air reservoir pressure reduced the pressure in the supply line (port 1) which triggered the automatic braking. The braking pressure thus reached corresponded to the current pressure of the air reservoir of the service braking system.

**Effect on the parking braking system:**

With the pushed spring braking system **released** (red control knob) the pressure in the spring braking system was maintained until the automatic braking started and lowered after the automatic braking had started. In this way the same pressure level was reached at ports 21, 22 and 1-2.

With further pressure reduction in the brake air reservoir ports 21 and 22 were evenly vented.

With the spring braking system **applied** (red control knob pulled out) the parking brake performance was kept until the automatic braking started. The current brake air reservoir pressure is then fed into the service brake actuators and spring brake actuators through the two-way valve (Port 22 remained connected to exhaust).

**4.5 Pressure input through the coupling head of the control line / response time (chapter 3.5.4)**

**Response time:**

With a view to the response time, reference measurements were conducted on the sample braking system according to Annex 4 with the TrCM and the conventional Haldex relay emergency valves (REV) Nos. **351008 ...**, **351 009 ...** and **351 033 ...**

<b>Time between the moment when the pressure of 65 kPa introduced by the simulator into the control line is reached and the moment when the pressure in the brake cylinder of the trailer reaches 75% of the asymptotic value.</b>			
<b>Haldex TrCM 352 067 ...</b>	<b>Haldex REV 351 008 ...</b>	<b>Haldex REV 351 009 ...</b>	<b>Haldex REV 351 033 ...</b>
<b>0.44 s</b>	<b>0.41 s</b>	<b>0.41 s</b>	<b>0.41 s</b>
<b>pneumatic control</b>			

The measurements revealed a comparable time response.

**Supply line not connected:**

In the case of **pressure input** through the coupling head of the control line (e.g. with applied parking braking system of the towing vehicle) the control line (port 21) to the braking device (ABS/EBS modulator) was aerated. Parallel to this the brake air reservoirs and hence once the opening pressure of the integrated pressure protection valve of 620 kPa was exceeded the auxiliaries' circuit was as well filled with a pressure which was approx. 150 kPa below the opening pressure of the charging valve (overflow loss).

The automatic braking and the pressure in the reservoirs were maintained after venting of the coupling head of the control line.

The disconnected pressure-free supply line was unaffected during the filling phase through the coupling head of the control line and so the automatic braking initiated through the disconnected coupling head of the supply line was sustained.

While the spring braking system was **released** (red control knob pushed) the spring braking system was filled with the pressure of the air reservoir.

While the spring braking system was **applied** (red control knob pulled out) port 22 remained vented, i.e. the action of the spring braking system was not cancelled.

**4.6 Actuation of parking braking system (Chapter 3.5.5):**

At a pressure of 820 kPa in the brake air reservoir the pressure in the spring braking system was exhausted by pulling the control knob and the parking braking system was **applied**.

By pushing the red control knob the pressure in the spring braking system was increased and the parking braking system **released**.

**4.7 Release device (Shunt valve) (Chapter 3.5.6):**

The automatic braking (emergency braking) was cancelled by pushing the black control knob (with the supply line disconnected).

When the supply line was reconnected and compressed air was fed the shunt valve returned automatically into normal operating position. This return could also be achieved by manual operation.

**4.8 Size of the air reservoir for the braking system:**

The brake air reservoir pressure of the sample braking system tested (see **annex 10.1**) had fallen to 810 kPa after the first full braking. After the eighth full braking the pressure in the brake air reservoir was still 630 kPa.

**5 Test documents:**

**5.1 Engineering Report No. C9414 of 08.06.2004: Trailer Control Module Valve Performance Tests**

**5.2 Engineering Report No. A9915 of 11.10.2007: TrCM Evaluation ED 1521**

**6 Annexes \***

380 100 131:	Semi-trailer with ABS	<u>Annex 1</u> (with TrCM)
380 099 242:	Semi-trailer with EBS	<u>Annex 2</u> (with TrCM)
380 092 660:	Semi-trailer with ABS	<u>Annex 3</u> (without TrCM)
380 101 010:	Centre-axle trailer with EBS	<u>Annex 4</u> (with TrCM)
380 101 000:	Centre-axle trailer with ABS	<u>Annex 5</u> (with TrCM)
380 100 990:	Centre-axle trailer with ABS	<u>Annex 6</u> (without TrCM)
380 100 230:	Full trailer with EBS	<u>Annex 7</u> (with TrCM)

380 100 170:	Full trailer with EBS	<u>Annex 8</u> (without TrCM)
380 095 010:	Full trailer with ABS	<u>Annex 9</u> (without TrCM)
Test set-up – bench test without REV		<u>Annex 10.1</u> (with TrCM)
Test set-up – bench test with REV		<u>Annex 10.2</u> (without TrCM)
Installation drawing TrCM (Versions B and D)		<u>Annex 11</u>

\* The annexes of this report are only examples in order to show the functionality of the Trailer Control Module. Braking systems with differing components (part numbers) are covered also by this report (as appropriate).

## 7 Concluding certification

It is hereby confirmed that there is no technical reason to object to the installation / replacement of the Trailer Brake Valve of the type TrCM (see sample brake diagrams of Annexes 1, 2, 4, 5, 7 and 10.1 – “with TrCM”) instead of the previous combination of conventional relay emergency valve (REV) and push/pull valve (see sample brake diagrams of Annexes 3, 6, 8, 9 and 10.2 – “without TrCM”).

The provisions of Directive 71/320/EEC in the version of the Directive 2002/78/EC and ECE Regulation No. 13, 11 series of amendments (as of 11<sup>th</sup> July 2008\*) and of Section 41 StVZO can be regarded as satisfied with respect to the statutory requirements given in this report.

\*does also comply with Supplement 1 to the 11 series of amendments which will in all probability enter into force on 22<sup>nd</sup> July 2009.

Essen, 29<sup>th</sup> June 2009

TDB/Gaupp

Order-No. 09.1554

**TÜV NORD Mobilität GmbH & Co. KG**  
**Institute for Vehicle Technology and**  
**Mobility (IFM)**

Accredited by the accreditation authority of the Kraftfahrt-Bundesamt Bundesrepublik Deutschland - Federal Republic of Germany - DAR-registration-number KBA-P 00004-96

Technical Service for Braking Systems



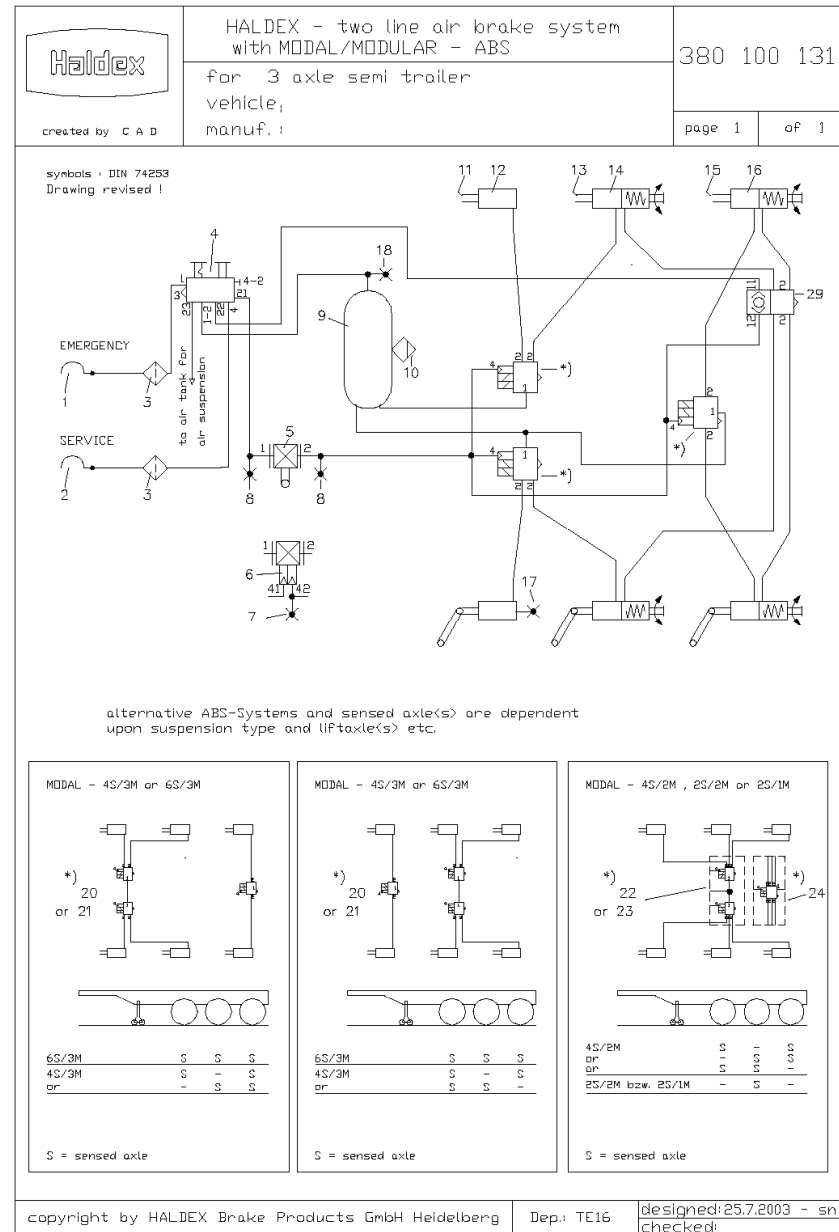
Dipl.-Ing. Winfried Gaupp

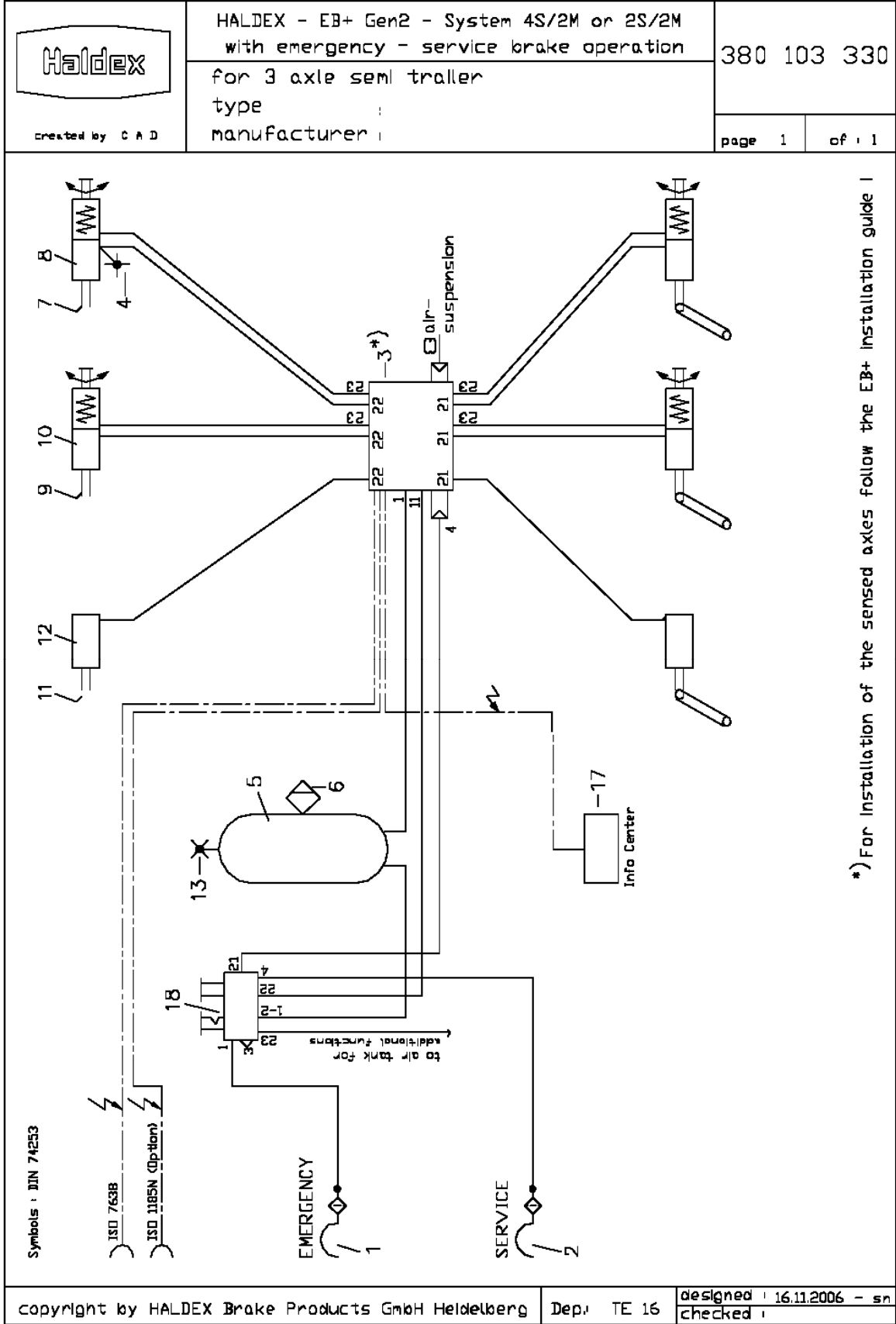


<b>HALDEX BRAKE PRODUCTS GmbH</b>	HALDEX - TWO LINE AIR BRAKE SYSTEM with	<b>380 100 131</b>
<b>Client :</b>	MODALMODULAR - ABS for 3-Axle semi trailer	18.06.2009
<b>Vehicle :</b>	PR =	Page 1

Pos.	Qty.	Description	Part number
1	1	EMERGENCY COUPLING " RED "	334 055 ...
2	1	SERVICE COUPLING " YELLOW "	334 054 ...
3	2	LINE FILTER	310 005 011
4	1	TRAILER CONTROL MODULE (TrCM)	352 067 ...
5	1	LSV, mech.contr. (alternative to pneum.contr. LSV)	601 ... ..
6	1	LSV, pneum.contr. (alternative to mech.contr. LSV)	602 005 ...
7	1	SIMULATOR POINT for pneum.controlled L.S.V.	.....
8	2	TEST POINT (ISO 3583) , M16*1.5 - D10mm	.....
9	1	AIR RESERVOIR (EN) , V >= ... ltr.	030 .... 09
10	1	DRAIN VALVE , manual	315 019 001
11	2	YOKE (as occasion demands)	003 6164 09
12	2	BRAKE ACTUATOR , TYPE ..	.....
13	2	YOKE (as occasion demands)	003 6164 09
14	2	SPRING BRAKE ACTUATOR , TYPE ../.	.....
15	2	YOKE (as occasion demands)	003 6164 09
16	2	SPRING BRAKE ACTUATOR , TYPE ../.	.....
17	1	TEST POINT (ISO 3583) , M 16*1.5	.....
18	1	TEST POINT (ISO 3583) , M 22*1.5	.....
19	6	SENSOR ( In acc. to the system 2, 4 or max. 6 )	364 094 011
20	1	6S/3M MODAL - KIT ( alternative to Pos. 21 - 24 )	364 ... ..
21	1	4S/3M MODAL - KIT ( alternative to Pos. 20 - 24 )	364 ... ..
22	1	4S/2M MODULAR 2 ( alternative to Pos. 20 - 24 )	364 ... ..
23	1	2S/2M MODULAR 2 ( alternative to Pos. 20 - 24 )	364 ... ..
24	1	2S/1M MODULAR 1 ( alternative to Pos. 20 - 23 )	364 ... ..
25	1	POWER CABLE (ISO 7638)	364 ... ..
26	1	POWER CABLE (ISO 1185) Option	364 ... ..
27	1	WARNING LAMP, GREEN (SET) OPTION	003 6020 09
28	1	12m WIRE for WARNING LAMP	030 0132 09
29	1	QUICK RELEASE VALVE with integrated TWO WAY VALVE	350 036 ...

Partnumbers for MODAL/MODULAR-Parts should be chosen and ordered by the up to date business catalogue !





<b>HALDEX BRAKE PRODUCTS GmbH</b>	HALDEX - EB+ Gen2 - System - 4S/2M or 2S/2M for	<b>380 103 330</b>
<b>Client :</b>	3 axle semi trailer	18.06.2009
<b>Vehicle :</b>	with Emergency - Service brake operation	Page 1

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<b>Pos.</b>	<b>Qty.</b>	<b>Description</b>	<b>Part number</b>
1	1	EMERGENCY COUPLING with FILTER "RED"	334 055 411
2	1	SERVICE COUPLING with FILTER "YELLOW"	334 054 411
3	1	EB+ Gen2 - SYSTEM, optional as 2S/2M or 4S/2M	820 ... ..
4	1	TEST POINT (ISO 3583)	... ..
5	1	AIR RESERVOIR (EN) , V >= ... ltr.	030 ... 09
6	1	DRAIN VALVE , manual	315 019 001
7	2	YOKE (as occasion demands)	003 ... 09
8	2	SPRING BRAKE ACTUATOR , TYPE ./..	... ..
9	2	YOKE (as occasion demands)	003 6164 09
10	2	SPRING BRAKE ACTUATOR , TYPE ./..	... ..
11	2	YOKE (as occasion demands)	003 6164 09
12	2	BRAKE ACTUATOR , TYPE ..	... ..
13	1	TEST POINT (ISO 3583)	... ..
14	1	POWER CABLE 24N - ISO 1185	814 ... ..
15	1	POWER CABLE - ISO 7638	814 ... ..
16	4	SENSOR KIT (in acc. to the system 2 or 4 parts )	950 ... ..
17	1	INFO - CENTRE ( Option )	815 ... ..
18	1	TRAILER CONTROL MODULE (TrCM)	352 067 ...

Partnumbers for EBS - Parts should be chosen and ordered by the up to date business catalogue !

For installation please follow the installation instructions !

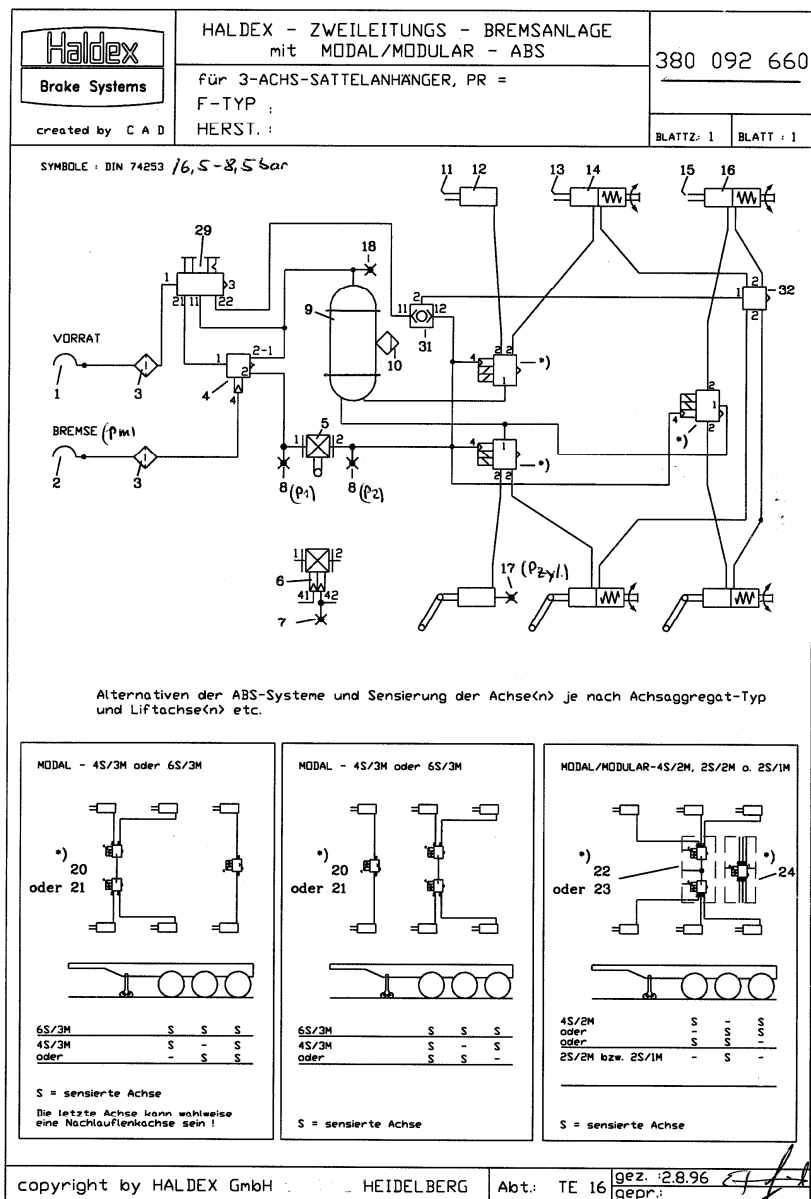


<b>HALDEX BRAKE PRODUCTS GmbH</b>	HALDEX - ZWEILEITUNGS - BREMSANLAGE	<b>380 092 660</b>
<b>Kunde</b>	integr.MODAL/MODULAR - ABS - System	17.06.2004
<b>Fz.-Typ</b>	für 3-ACHS-SATTELANH., PR =	Seite 1

Pos.	Anz.	Bezeichnung	Bestellnummer
1	1	KUPPL.-KOPF " VORRAT "	334 055 ...
2	1	KUPPL.-KOPF " BREMSE "	334 054 ...
3	2	FILTER für ROHRLEITUNG	310 005 011
4	1	ANHÄNGER-BREMSVTL.m.DRUCKVORGABE	351 008 ...
5	1	ALB, mech.gest. (alternativ zu pneum.gest. ALB)	601 ....
6	1	ALB, pneum.gest. (alternativ zu mech.gest. ALB)	602 005 ...
7	1	SIMULIERANSCHLUSS für pneum.gest. ALB	318 072 001
8	2	PRÜFANSCHLUSS (ISO 3583) , M16*1.5-D=10mm	318 057 001
9	1	DRUCKLUFTBEHÄLTER (EN) , V >= ... ltr.	030 .... 09
10	1	ENTWÄSSERUNGSVENTIL , manuell	315 019 001
11	2	GABELGELENK , RUNDLOCH	003 6164 09
12	2	MB-ZYLINDER , TYP ..	120 .... 101
13	2	GABELGELENK , RUNDLOCH	003 6164 09
14	2	KOMBI-ZYLINDER , TYP../..	346 ....
15	2	GABELGELENK , RUNDLOCH	003 6164 09
16	2	KOMBI-ZYLINDER , TYP../..	346 ....
17	1	PRÜFANSCHLUSS (ISO 3583) , M 16*1.5	318 078 001
18	1	PRÜFANSCHLUSS (ISO 3583) , M 22*1.5	318 040 001
19	6	SENSOR ( Anz. je nach System 2, 4 oder 6 )	364 094 011
20	1	4S/3M MODAL - KIT (alternativ zu Pos. 21-24)	364 ....
21	1	6S/3M MODAL - KIT (alternativ zu Pos. 20-24)	364 ....
22	1	4S/2M MODULAR 2 (alternativ zu Pos. 20-24)	364 ....
23	1	2S/2M MODULAR 2 (alternativ zu Pos. 20-24)	364 ....
24	1	2S/1M MODULAR 1 (alternativ zu Pos. 20-24)	364 ....
25	1	12m STROMVERSORUNGSKABEL 394 096 001 oder	364 137 001
26	1	STROMVERSORUNGSKABEL 12m (ISO 1185N) Option	364 124 001
27	1	WARNLAMPE, grün (Set) Option	003 6020 09
28	1	12m KABEL für WARNLAMPE	030 0132 09
29	1	DOPPELÖSEVENTIL	352 045 001
30			
31	1	ZWEIWEGEVENTIL 333 004 001 oder	333 001 001
32	1	SCHNELLÖSEVENTIL 356 022 ... oder	356 013 ...

Bestellnummern für MODAL/MODULAR - Teile sind den aktuellen Verkaufsunterlagen entsprechend auszuwählen und festzulegen !!!

Positton 31 und 32 kann durch das Schnellöseventil mit integriertem Zweigeventil 350 036 ... ersetzt werden !!!





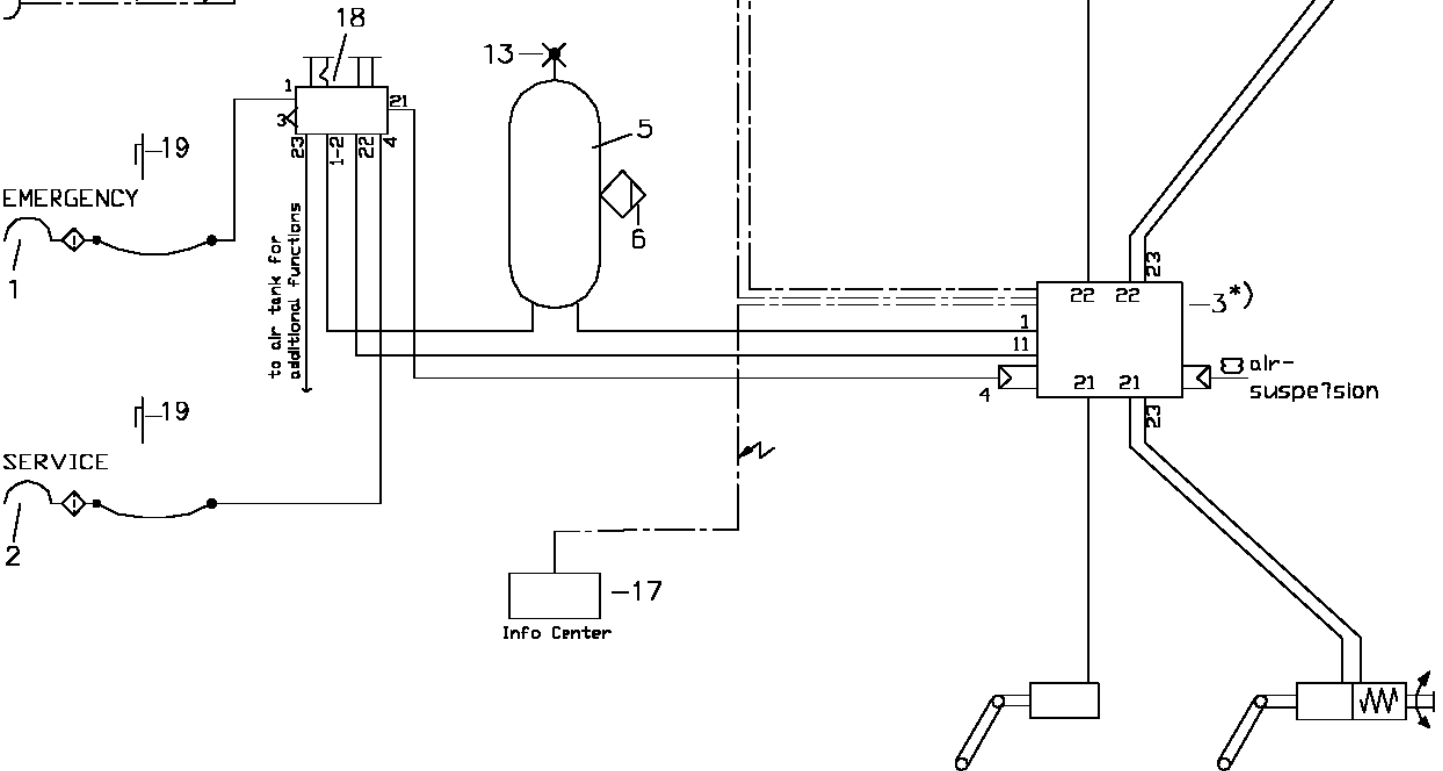
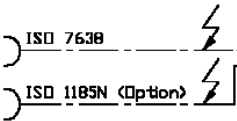
created by L A D

HALDEX - EB+ Gen2 - System 4S/2M or 2S/2M  
 with emergency - service brake operation  
 for 2 axle centre axle trailer  
 type  
 manufacturer :

380 103 550

Blatt : 1 von : 1

Symbols : DIN 74253



\*) For installation of the sensed axles follow the EB+ Installation guide I

<b>HALDEX BRAKE PRODUCTS GmbH</b>	HALDEX - EB+ Gen2 - System - 4S/2M or 2S/2M for	<b>380 103 550</b>
<b>Client :</b>	2 axle centre axle trailer	18.06.2009
<b>Vehicle :</b>	with Emergency - Service brake operation	Page 1

---

<b>Pos.</b>	<b>Qty.</b>	<b>Description</b>	<b>Part number</b>
1	1	EMERGENCY COUPLING with FILTER "RED"	334 055 411
2	1	SERVICE COUPLING with FILTER "YELLOW"	334 054 411
3	1	EB+ Gen2 - SYSTEM, optional as 2S/2M or 4S/2M	820 ... ..
4	1	TEST POINT (ISO 3583)	... ..
5	1	AIR RESERVOIR (EN) , V >= ... ltr.	030 ... 09
6	1	DRAIN VALVE , manual	315 019 001
7	2	YOKE (as occasion demands)	003 6164 09
8	2	SPRING BRAKE ACTUATOR , TYPE ./..	... ..
9	2	YOKE (as occasion demands)	003 6164 09
10	2	BRAKE ACTUATOR , TYPE ..	... ..
11			
12			
13	1	TEST POINT (ISO 3583)	... ..
14	1	POWER CABLE 24N - ISO 1185	814 ... ..
15	1	POWER CABLE - ISO 7638	814 ... ..
16	4	SENSOR KIT (in acc. to the system 2 or 4 parts )	950 ... ..
17	1	INFO - CENTRE ( Option )	815 ... ..
18	1	TRAILER CONTROL MODULE (TrCM)	352 067 ...
19	1	DUMMY COUPLING	334 028 001

Partnumbers for EBS - Parts should be chosen and ordered by the up to date business catalogue !

For installation please follow the installation instructions !

TB: KO250.3E

Brake device: TrCM

# Annex 5

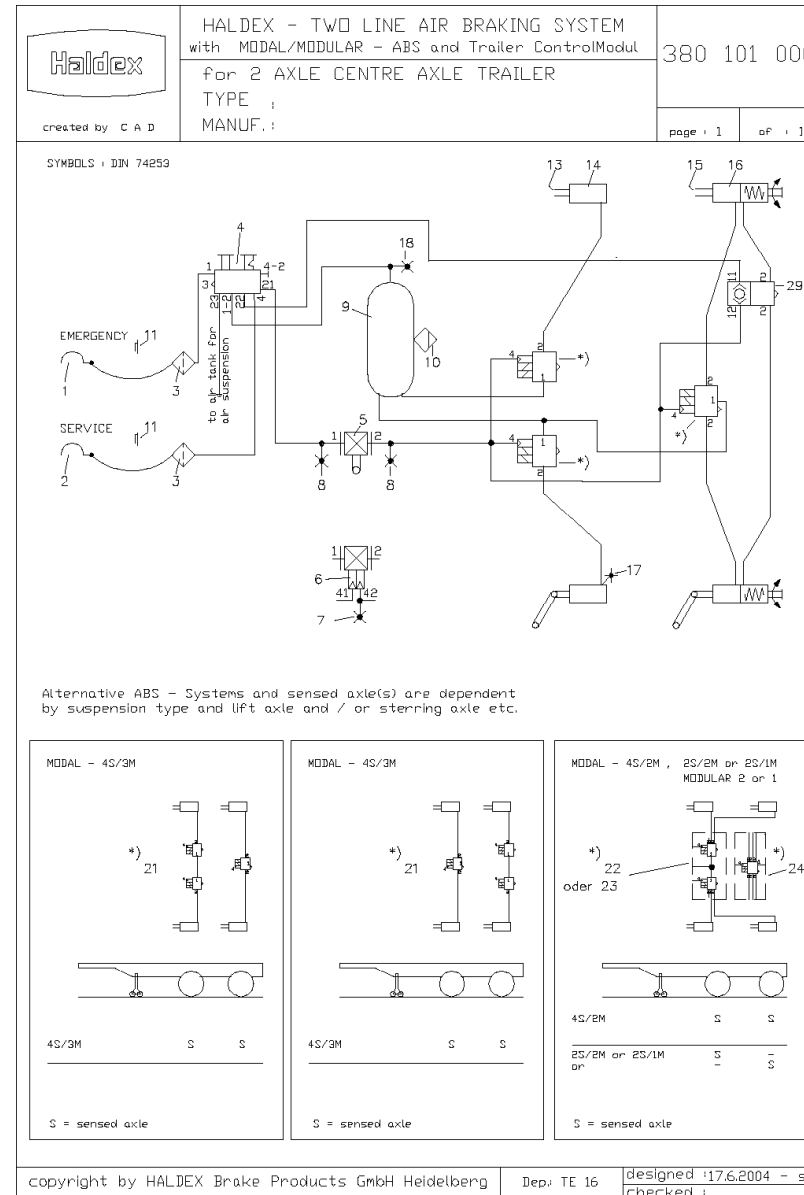
HALDEX BRAKE PRODUCTS GmbH HALDEX - MODAL / MODULAR - ABS - SYSTEM 380 101 000

Client : Trailer Control Modul for 2 axle centre axle trail 17.06.2004

Vehicle : PR = Page 1

Pos.	Qty.	Description	Part number
1	1	EMERGENCY COUPLING * RED *	334 055 ...
2	1	SERVICE COUPLING * YELLOW *	334 054 ...
3	2	LINE FILTER	310 005 011
4	1	TRAILER CONTROL MODUL	352 067 ...
5	1	LSV, mech.contr. (alternative to pneum.contr. LSV)	601 ....
6	1	LSV, pneum.contr. (alternative to mech.contr. LSV)	602 005 ...
7	1	SIMULATOR POINT for pneum.controlled L.S.V.	318 072 001
8	2	TEST POINT (ISO 3583), M16*1.5 - D10mm	318 057 001
9	1	AIR RESERVOIR (EN), V >= ... ltr.	030 .... 09
10	1	DRAIN VALVE, manual	315 019 001
11	2	DUMMY COUPLING	334 028 001
12			
13	2	YOKE (as occasion demands)	003 6164 09
14	2	BRAKE CHAMBER, TYPE ..	... ..
15	2	YOKE (as occasion demands)	003 6164 09
16	2	SPRING BRAKE CHAMBER, TYPE .../...	... ..
17	1	TEST POINT (ISO 3583), M 16*1.5	318 078 001
18	1	TEST POINT (ISO 3583), M 22*1.5	318 040 001
19	1	SENSOR ( depend by ABS-System 2 or max. 4 parts )	364 094 011
20			
21	1	4S/3M MODAL - KIT (alternative to Pos. 22-24)	364 ....
22	1	4S/2M MODULAR 2 (alternative to Pos. 21-24)	364 ....
23	1	2S/2M MODULAR 2 (alternative to Pos. 21-24)	364 ....
24	1	2S/1M MODULAR 1 (alternative to Pos. 21-23)	364 ....
25	1	POWER CABLE (ISO 7638)	364 ....
26	1	POWER CABLE (ISO 1185) Option	364 ....
27	1	WARNING LAMP, GREEN (SET) OPTION	003 6020 09
28	1	12m WIRE for WARNING LAMP	030 0132 09
29	1	QUICK RELEASE VALVE with integrated TWO WAY VALVE	350 037 ...

Partnumbers for MODAL/MODULAR-Parts should be chosen and ordered by the up to date business catalogue !



TB: KO250.3E

Brake device: TrCM

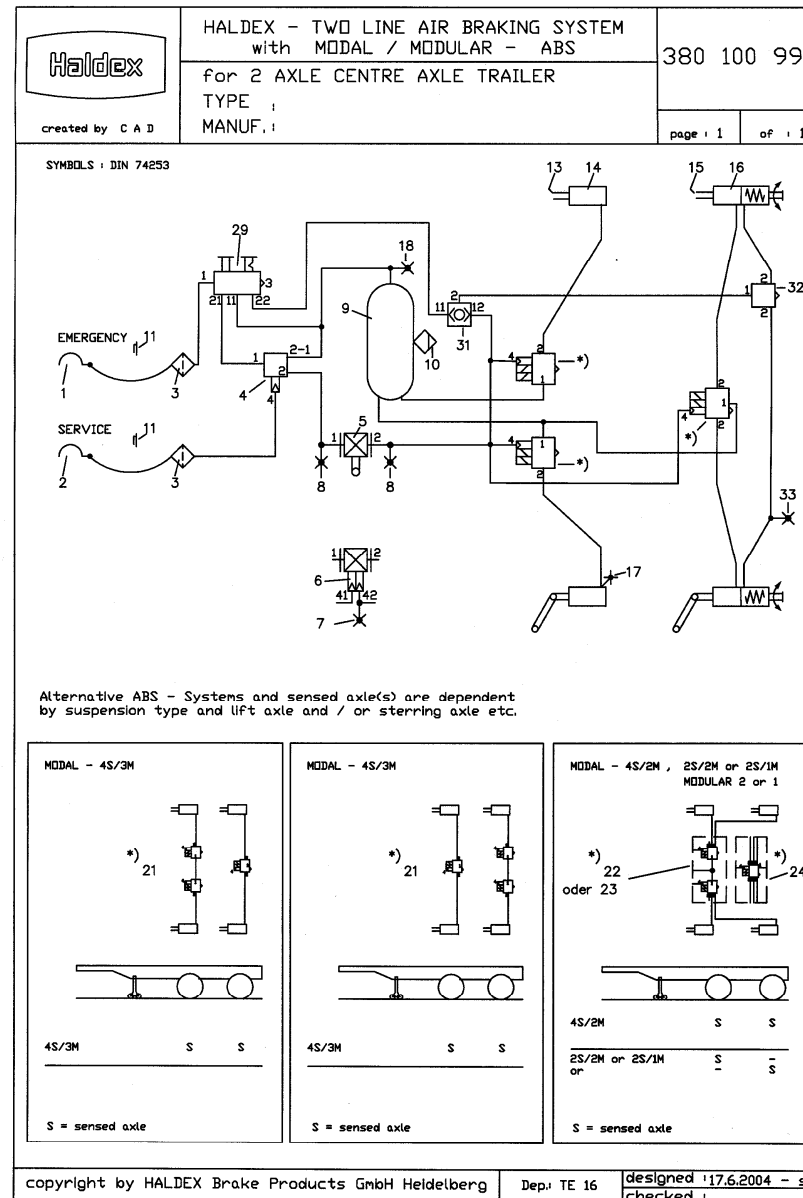
# Annex 6

HALDEX BRAKE PRODUCTS GmbH HALDEX - MODAL / MODULAR - ABS - SYSTEM for 380 100 990  
 Client : 2 axle centre axle trailer 17.06.2004  
 Vehicle : PR = Page 1

Pos.	Qty.	Description	Part number
1	1	EMERGENCY COUPLING " RED "	334 055 ...
2	1	SERVICE COUPLING " YELLOW "	334 054 ...
3	2	LINE FILTER	310 005 011
4	1	RELAY EMERGENCY VALVE	351 008 ...
5	1	LSV, mech.contr. (alternative to pneum.contr. LSV)	601 ... ..
6	1	LSV, pneum.contr. (alternative to mech.contr. LSV)	602 005 ...
7	1	SIMULATOR POINT for pneum.controlled L.S.V.	318 072 001
8	2	TEST POINT (ISO 3583) , M16*1.5 - D10mm	318 057 001
9	1	AIR RESERVOIR (EN) , V >= ... ltr.	030 .... 09
10	1	DRAIN VALVE . manual	315 019 001
11	2	DUMMY COUPLING	334 028 001
12			
13	2	YOKE	003 6164 09
14	2	BRAKE CHAMBER , TYPE ..	120 ... 101
15	2	YOKE	003 6164 09
16	2	SPRING BRAKE CHAMBER , TYPE .../..	346 ... ..
17	1	TEST POINT (ISO 3583) , M 16*1.5	318 078 001
18	1	TEST POINT (ISO 3583) , M 22*1.5	318 040 001
19	1	SENSOR ( depend by ABS-System 2 or max. 4 parts )	364 094 011
20			
21	1	4S/3M MODAL - KIT (alternative to Pos. 22-24)	364 ... ..
22	1	4S/2M MODULAR 2 (alternative to Pos. 21-24)	364 ... ..
23	1	2S/2M MODULAR 2 (alternative to Pos. 21-24)	364 ... ..
24	1	2S/1M MODULAR 1 (alternative to Pos. 21-23)	364 ... ..
25	1	POWER CABLE (ISO 7638)	364 ... ..
26	1	POWER CABLE (ISO 1185) Option	364 ... ..
27	1	WARNING LAMP, GREEN (SET) OPTION	003 6020 09
28	1	12m WIRE for WARNING LAMP	030 0132 09
29	1	DOUBLE RELEASE VALVE	352 045 001
30			
31	1	ZWEIWEGEVENTIL	333 004 001
32	1	SCHNELLÖSEVENTIL	356 022 ...
33	1	TEST CONNECTION (ISO 3583) , M 12*1.5	318 036 001

Partnumbers for MODAL/MODULAR-Parts should be chosen and ordered by the up to date business catalogue !

Positon 31 and 32 can be changed by the quick release valve with integrated two way valve : 350 037 ... !!!



TB: KO250.3E  
 Brake device: TrCM

# Annex 7

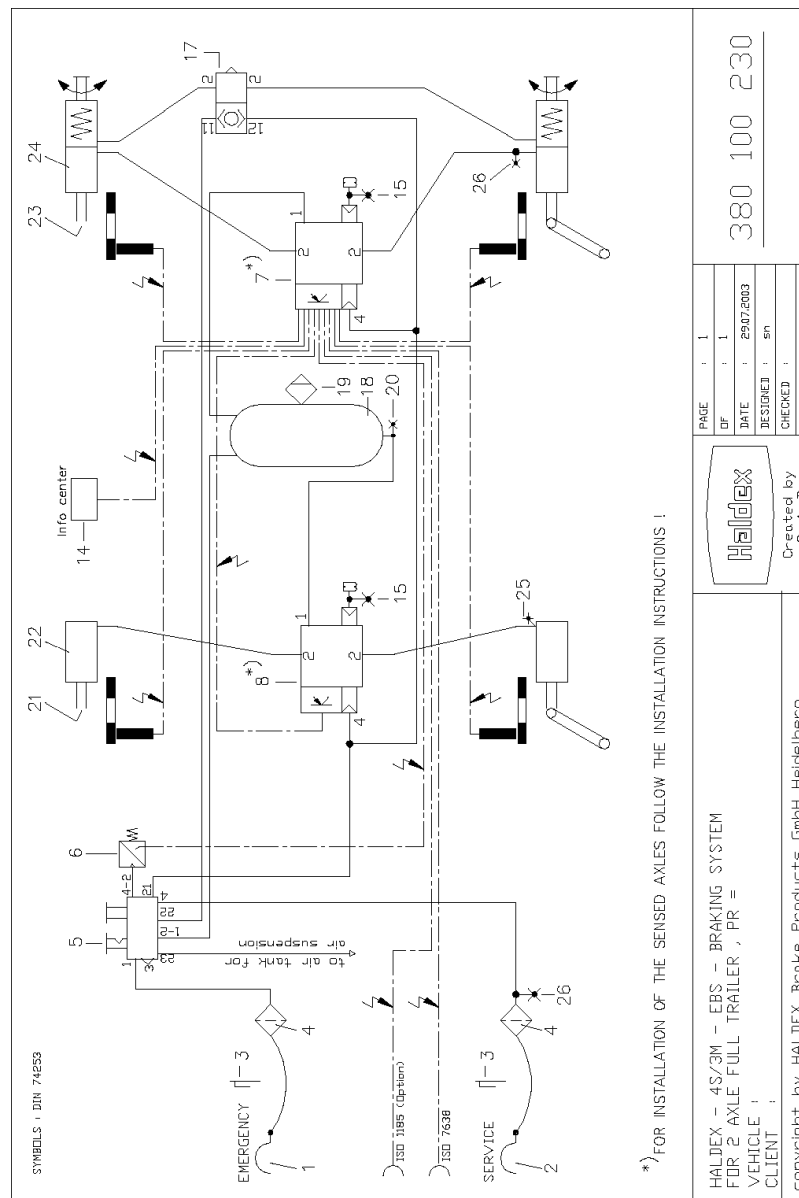
HALDEX BRAKE PRODUCTS GmbH HALDEX - 4S/3M - EBS (EB+) - braking system for 380 100 230  
 Client : 2 axle full trailer 29.07.2003  
 Vehicle : PR = Page 1

Pos.	Qty.	Description	Part number
1	1	EMERGENCY COUPLING * RED *	334 055 ...
2	1	SERVICE COUPLING * YELLOW *	334 054 ...
3	2	DUMMY COUPLING	334 028 001
4	2	LINE FILTER	310 005 011
5	1	TRAILER CONTROL MODUL	352 067 ...
6	1	Pressure SWITCH for EBS	041 5023 09 *)
7	1	EBS MODULATOR with ECU (MASTER)	810 ....
8	1	EBS MODULATOR with ECU (REMOTE)	810 ....
9	1	POWER CABLE - ISO 7638	814 ....
10	1	POWER CABLE - ISO 1185 (Option)	814 ....
11	1	CABLE for CONNECTION (MASTER-REMOTE)	814 ....
12	1	PRESSURE SWITCH CABLE	814 .... *)
13	1	SENSOR KIT	950 ....
14	1	INFO - CENTRE (Option)	815 ....
15	2	SIMULATOR POINT for AIR SUSPENSION BAG PRESSURE	318 072 001
16			
17	1	QUICK RELEASE VALVE with integrated TWO WAY VALVE	350 037 011
18	1	AIR RESERVOIR (EN) , V >= ... ltr.	030 .... 09
19	1	DRAIN VALVE , manual	315 019 001
20	1	TEST POINT (ISO 3583) , M 22*1.5	318 040 001
21	2	YOKE	003 .... 09
22	2	BRAKE CHAMBER , TYPE ..	... ..
23	2	YOKE	003 .... 09
24	2	SPRING BRAKE CHAMBER , TYPE ../.	... ..
25	1	TEST POINT (ISO 3583) , M 16*1.5	318 078 001
26	2	TEST CONNECTION (ISO 3583) , M 12*1.5	318 036 001
27	2	MOUNTING BRACKET for AIR RESERVOIR , D ... mm	030 .... 09
28	1	SIGN BOARD (EBS)	028 5262 09

Partnumbers for EBS - Parts should be chosen and ordered by the up to date business catalogue !

For installation please follow the installation instructions !

\*) Pressure switch (Pos.6) and Cable (Pos.12) are not required anymore for EBS Modulators built later than 08/2004 !



PAGE : 1		380 100 230	
DF : 1	DATE : 29.07.2003	RESIGNED : sm	CHECKED : TE 16
		Created by - C A J -	
HALDEX - 4S/3M - EBS - BRAKING SYSTEM FOR 2 AXLE FULL TRAILER , PR = VEHICLE : CLIENT : copyright by HALDEX Brake Products GmbH Heidelberg			

TB: KO250.3E

Brake device: TrCM

# Annex 8

HALDEX BRAKE PRODUCTS GmbH HALDEX - 4S/3M - EBS (EB+) - braking system for 380 100 170

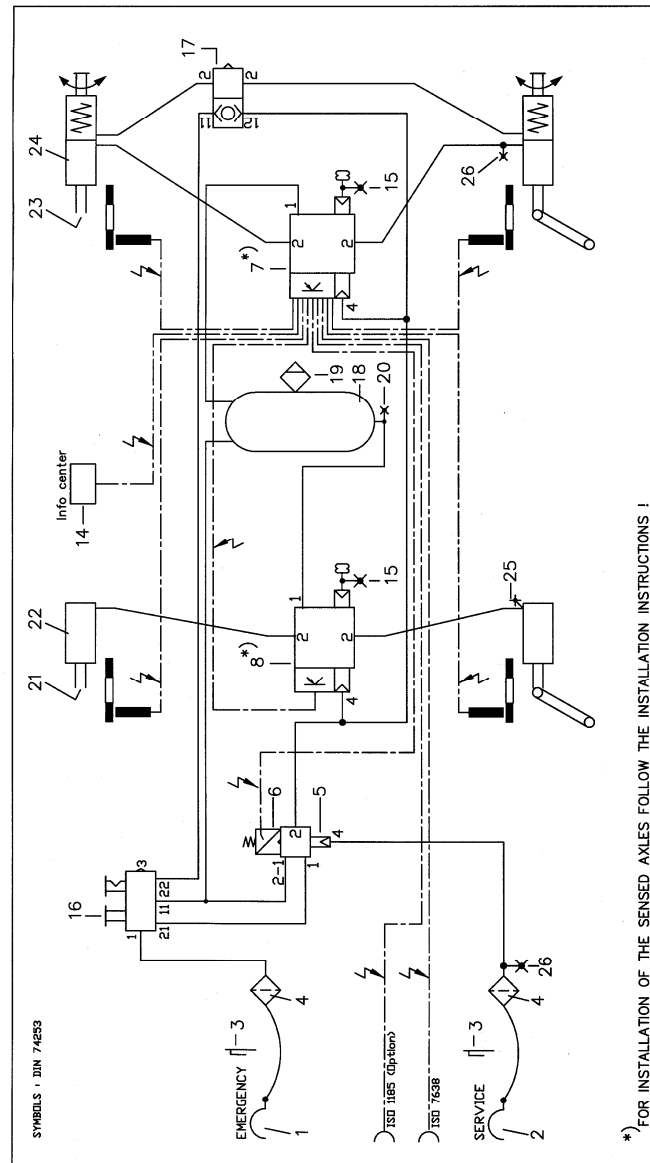
Client : 2 axle full trailer 17.06.2004

Vehicle : PR = Page 1

Pos.	Qty.	Description	Part number
1	1	EMERGENCY COUPLING " RED "	334 055 ...
2	1	SERVICE COUPLING " YELLOW "	334 054 ...
3	2	DUMMY COUPLING	334 028 001
4	2	LINE FILTER	310 005 011
5	1	R.E.V. for EBS - SYSTEM	351 033 ...
6	1	PRESSURE SWITCH for HALDEX - EBS	041 5023 09
7	1	EBS MODULATOR with ECU (MASTER)	810 ....
8	1	EBS MODULATOR with ECU (REMOTE)	810 ....
9	1	POWER CABLE - ISO 7638	814 ....
10	1	POWER CABLE - ISO 1185 (Option)	814 ....
11	1	CABLE for CONNECTION (MASTER-REMOTE)	814 ....
12	1	PRESSURE SWITCH CABLE	814 ....
13	1	SENSOR KIT	950 ....
14	1	INFO - CENTRE OPTION	815 ....
15	2	SIMULATOR POINT for AIR SUSPENSION BAG PRESSURE	318 072 001
16	1	DOUBLE RELEASE VALVE	352 045 ...
17	1	QUICK RELEASE VALVE with integrated TWO WAY VALVE	350 037 011
18	1	AIR RESERVOIR (EN) , V >= ... ltr.	030 .... 09
19	1	DRAIN VALVE , manual	315 019 001
20	1	TEST POINT (ISO 3583) , M 22*1.5	318 040 001
21	2	YOKE	003 .... 09
22	2	BRAKE CHAMBER , TYPE ..	... ..
23	2	YOKE	003 .... 09
24	2	SPRING BRAKE CHAMBER , TYPE ../.	... ..
25	1	TEST POINT (ISO 3583) , M 16*1.5	318 078 001
26	2	TEST CONNECTION (ISO 3583) , M 12*1.5	318 036 001
27	2	MOUNTING BRACKET for AIR RESERVOIR , D ... mm	030 .... 09
28	1	SIGN BOARD (EBS)	028 5262 09

Partnumbers for EBS - Parts should be chosen and ordered by the up to date business catalogue !

For installation please follow the installation instructions !



\*) FOR INSTALLATION OF THE SENSED AXLES FOLLOW THE INSTALLATION INSTRUCTIONS !

PAGE	1
OF	1
DATE	26.07.2003
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CHECKED	
REP.	TE 16

380 100 170

Created by  
- C A D -

HALDEX

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HALDEX - 4S/3M - EBS - BRAKING SYSTEM  
FOR 2 AXLE FULL TRAILER, PR =  
VEHICLE:  
CLIENT :

TB: KO250.3E

Brake device: TrCM

# Annex 9

HALDEX BRAKE PRODUCTS GmbH HALDEX - MODAL 4S/3M - BREMSANLAGE (EG) 380 095 010

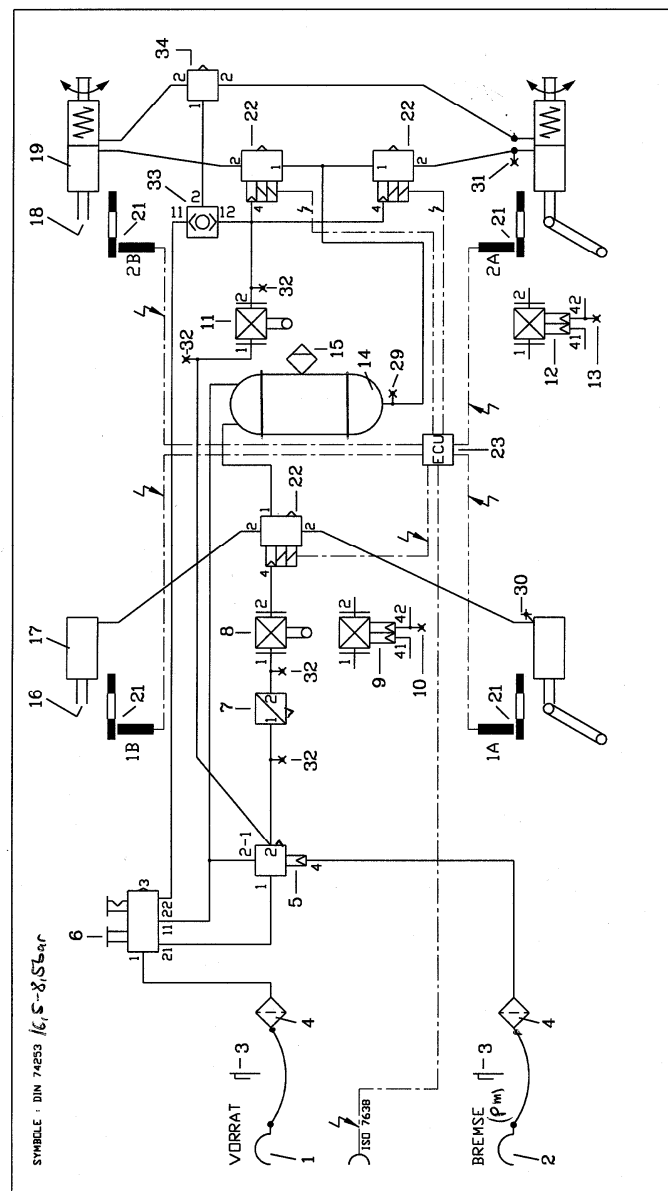
Kunde : für 2 - ACHS - ANHÄNGER , PR = 17.06.2004

Fz.-Typ : mit FEDERSPEICHER-FESTSTELLBREMSE Seite 1

Pos.	Anz.	Bezeichnung	Bestellnummer
1	1	KUPPL.-KOPF " VORRAT "	334 055 ...
2	1	KUPPL.-KOPF " BREMSE "	334 054 ...
3	2	LEERKUPPLUNG	334 028 001
4	2	FILTER für ROHRLEITUNG	310 005 011
5	1	ANHÄNGER-BREMSVTL.m.DRUCKVORGABE	351 008 ...
6	1	DOPPELÖSEVENTIL	352 045 001
7	1	ANPASSUNGVENTIL mit KNICKREGELUNG	356 005 ...
8	1	ALB, mech.gest. (alternativ zu pneum.gest. ALB)	601 ....
9	1	ALB, pneum.gest. (alternativ zu mech.gest. ALB)	602 005 ...
10	1	SIMULIERANSCHLUß für pneum.gest. ALB	318 072 001
11	1	ALB, mech.gest. (alternativ zu pneum.gest. ALB)	601 ....
12	1	ALB, pneum.gest. (alternativ zu mech.gest. ALB)	602 005 ...
13	1	SIMULIERANSCHLUß für pneum.gest. ALB	318 072 001
14	1	DRUCKLUFTBEHÄLTER (EN) , V = ... ltr.	030 .... 09
15	1	ENTWÄSSERUNGSVENTIL , manuell	315 019 001
16	2	GABELGELENK , RUNDLOCH	003 6164 09
17	2	MB-ZYLINDER , TYP ..	120 ... 101
18	2	GABELGELENK , RUNDLOCH	003 6164 09
19	2	KOMBI-ZYLINDER , TYP../..	346 ....
20			
21	4	SENSOR mit KLEMMHÜLSE	364 094 011
22	3	MODAL-ABS-VENTIL	364 ....
23	1	ABS-STEUERGERÄT für MODAL/MODULAR	364 ....
24	1	STROMVERSORGUNGSKABEL 12 m (ISO 7638) DA	364 123 001
27	3	VENTILKABEL, rot,blau,gelb (nach Bedarf)	364 122 ...
28	4	SENSORKABEL (n.Bed. 3, 5, 8 oder 10 m)	364 ....
29	1	PRÜFANSCHLUß (ISO 3583) , M 22*1.5	318 040 001
30	1	PRÜFANSCHLUß (ISO 3583) , M 16*1.5	318 078 001
31	1	PRÜFANSCHLUß (ISO 3583) , M 12*1.5	318 036 001
32	4	PRÜFANSCHLUß (ISO 3583) , M16*1.5-D=10mm	318 057 001
33	1	ZWEIWEGEVENTIL	333 004 001
34	1	SCHNELLÖSEVENTIL	356 023 ...

Bestellnummern für MODAL - Teile sind den aktuellen Verkaufsunterlagen entsprechend auszuwählen und festzulegen !!!

Für Pos. 33 und 34 kann auch das Schnellöseventil mit integr. Zweiwegeventil eingesetzt werden : 350 037 ... !!!



380 095 010

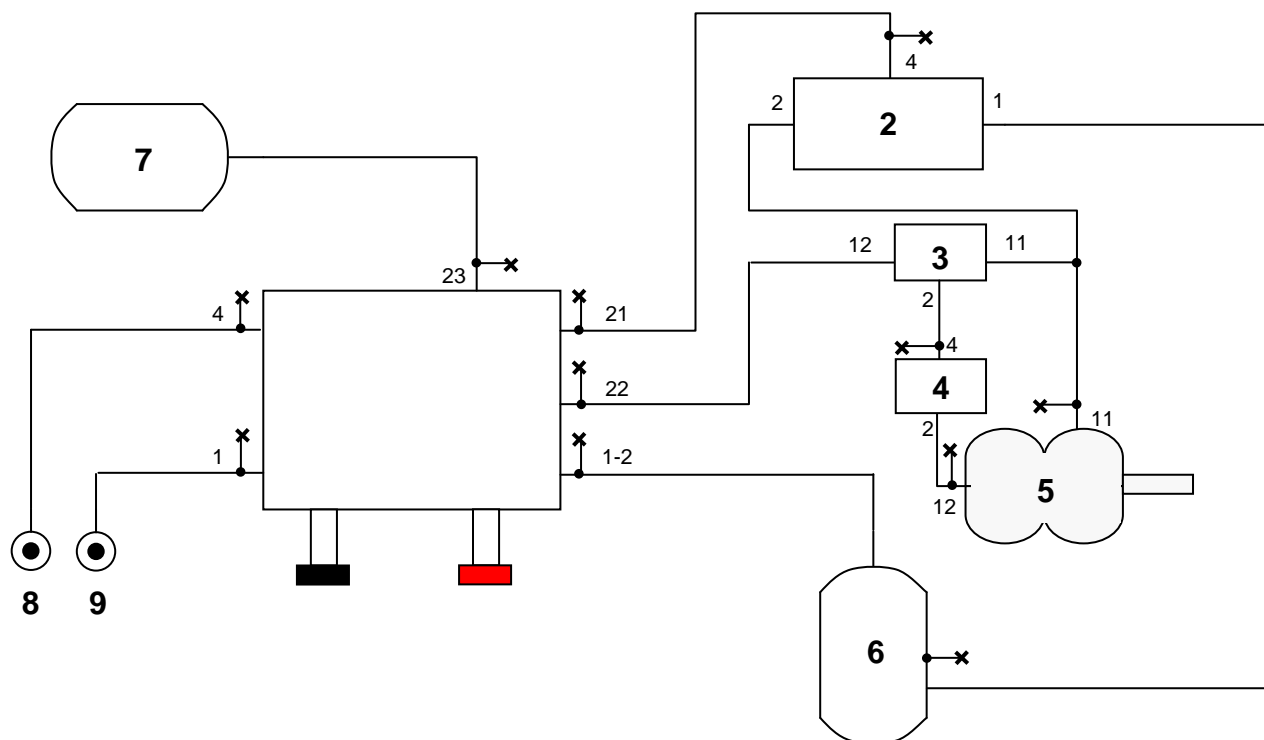
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HALDEX		Brake Systems		Created by
				- C A D -

HALDEX - MODAL 4S/3M - BREMSANLAGE (EG)  
für 2-ACHS-ANHÄNGER , PR =  
F- Typ:  
Herst. :  
Copyright by HALDEX GmbH - HEIDELBERG



## Prüfaufbau – Trailer Control Module

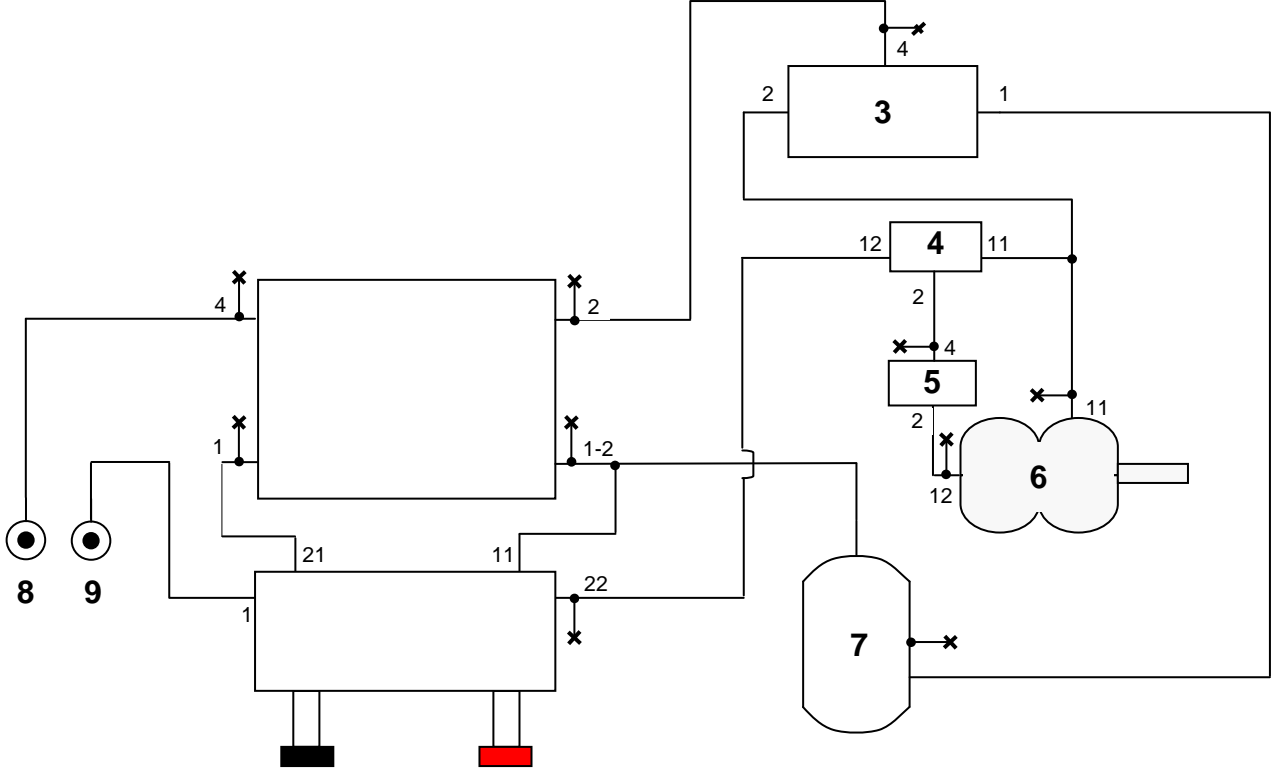
### Bench test – Trailer Control Module



Nr. / No	Anz./ Qty.	Bezeichnung	Description
1	1	Trailer Control Module	Trailer Control Module
2	1	ABS / EBS / Relais	ABS / EBS - Relay
3	1	Zweiwegeventil	Two - way check valve
4	1	Schnelllöseventil	Quick release valve
5	6	Kombizylinder Typ 30/30	Spring brakes Type 30/30
6	1	Vorratsbehälter 120 Liter	Reservoir 120 litre
7	1	Vorratsbehälter Nebenverbraucher 60Liter	Reservoir 60 litre (Auxiliary)
8	1	Kupplungskopf - Gelb (KKG) Kupplungskopf - Bremse (KKB)	Coupling head CONTROL - LINE / yellow
9	1	Kupplungskopf - Rot (KKR) Kupplungskopf - Vorrat (KKV)	Coupling head SUPPLY - LINE / red

**Prüfaufbau – REV**

**Bench test – REV**



Nr. / No	Anz./ Qty.	Bezeichnung	Description
1	1	REV	Relay - Emergency Valve
2	1	P&S Doppellöseventil	Park & Shut Valve
3	1	ABS / EBS / Relais	ABS / EBS - Relay
4	1	Zweiwegeventil	Two - way check valve
5	1	Schnelllöseventil	Quick release valve
6	6	Kombizylinder Typ 30/30	Spring brakes Type 30/30
7	1	Vorratsbehälter 120 Liter	Reservoir 120 litre
8	1	Kupplungskopf - Gelb (KKG) Kupplungskopf - Bremse (KKB)	Coupling head CONTROL - LINE / yellow
9	1	Kupplungskopf - Rot (KKR) Kupplungskopf - Vorrat (KKV)	Coupling head SUPPLY - LINE / red

