

INFORMATION DOCUMENT

Directive 71/ 320 – Annex XIV
ECE Regulation 13/09

Trailer Anti-Lock Braking System
Information Document
ID_EB123.5E

Electronically controlled Brake System (EBS)
for trailers

Trailer EBS D (plus)
Trailer EBS D (plus) with TCE

2S/ 2M - 4S/ 3M

A.Stender	A	04-09-01	COPYRIGHT			WABCO	
			APPR. LEV.	DATE	NAME		
			COMPILER	02-06-06	A. Stender	Trailer EBS D	
			2	02-06-06	N. Witte		
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Introduction

The following items have been changed or added in the system approval report EB 123.5E in comparison to EB 123.4E

paragraph 2.5: Energy consumption

Determination of equivalent static brake applications for energy consumption to fulfil the requirements of ECE R13/09, supplement 8, Annex 19.

paragraph 4.3: Suspension type

Mechanical suspension types are added.

paragraph 4.4: Differential(s) in brake torque input within a trailer bogie

paragraph 4.5 : Wheel base for full trailers

Reducing the minimum wheel base to 3000 mm for 2-axle trailers and 3755 mm for 3-axle trailers.

paragraph 4.7 : Tube size and length

Increase of maximum tube length between modulators and brakes to 6 m.

Information document for Trailer EBS

This information document is produced in accordance to Annex XIV of Directive 71/320/EEC and Annex 19 of ECE R13/09. The information contained in this document is used for the type approval of the prescribed braking system.

1 General

1.1 Name of manufacturer

WABCO GmbH & CO. OHG
Vehicle Control Systems
An American Standard Company

WABCO Fahrzeugbremsen
Am Lindener Hafen 21
D-30453 Hannover

1.2 System name

Trailer EBS

1.3 System variations

Trailer EBS D (with conventional Relay Emergency Valve)
Trailer EBS D plus (with Park-Release Emergency Valve)
Trailer EBS D with TCE*
Trailer EBS D plus with TCE*

* TCE: Trailer Central Electronic

1.4 System configurations

2S/2M, 2 sensors and one trailer modulator for 1- to 3-axle semi- and centre-axle trailer with air suspension or mechanical suspension.

2S/2M+SLV, 2 sensors, one trailer modulator and one select low valve for 2- to 3-axle semi- and centre-axle trailer with air suspension or mechanical suspension and one self-steering axle.

4S/2M, 4 sensors and one trailer modulator for 2- and 3-axle semi- and centre-axle trailer with air suspension or mechanical suspension.

4S/2M + 1M, 4 sensors, one trailer modulator and one ABS-relay valve for 3- to 4-axle semi-trailers and 3-axle centre-axle trailers with air suspension or mechanical suspension.

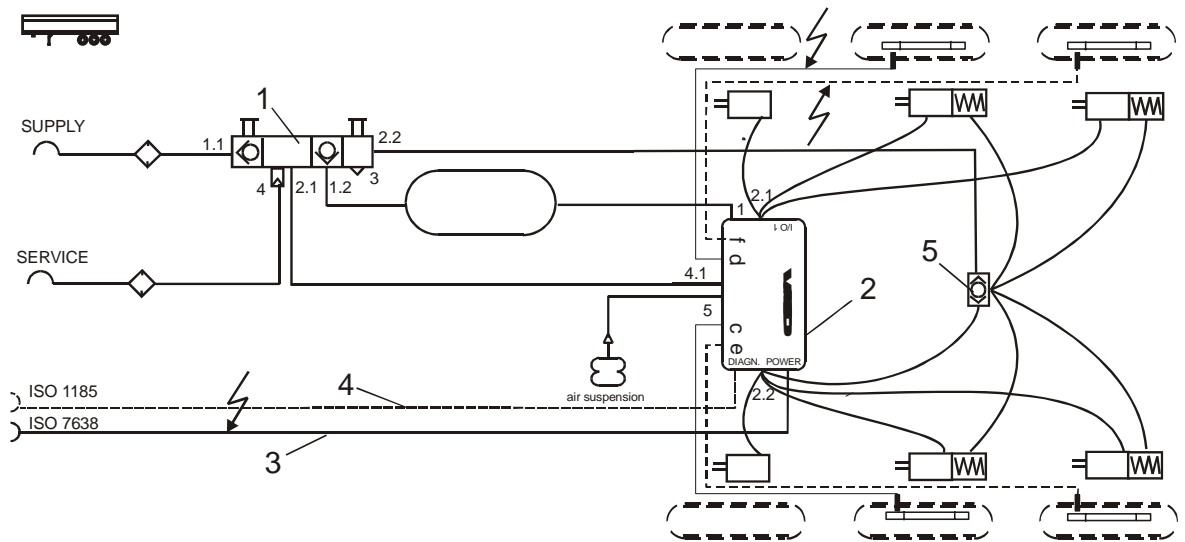
4S/3M, 4 sensors, one trailer modulator and one EBS-relay valve for 2- to 3-axle full trailers and 2- to 3-axle semi-trailer and 2- and 3-axle centre-axle trailer with air suspension or mechanical suspension.

1.5 Explanation of the basic functions and philosophy of the system

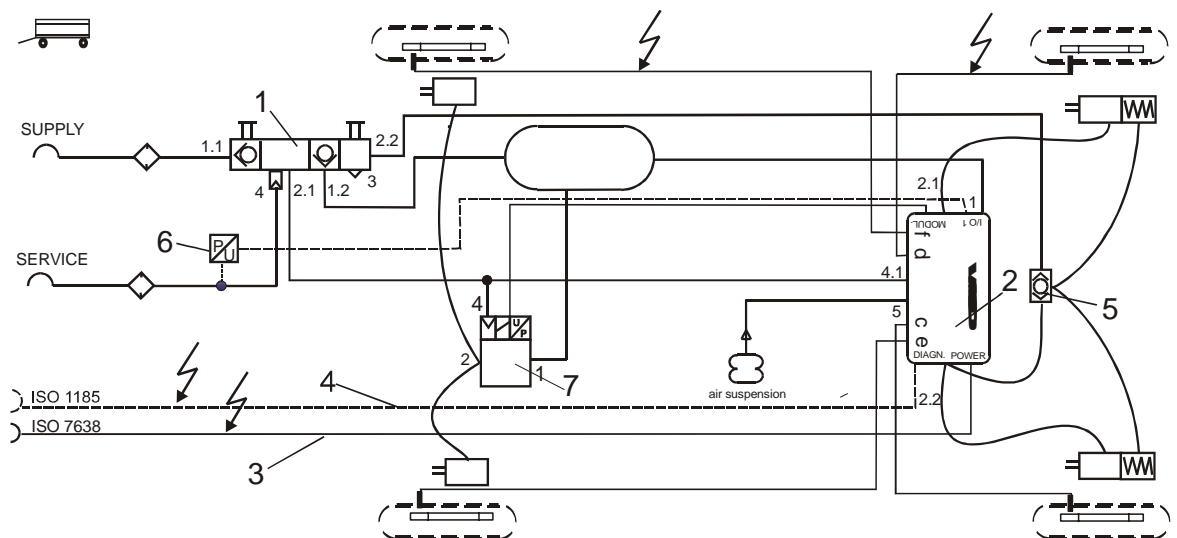
Electronically controlled braking system with load-dependent brake pressure regulation and automatic anti-lock device.

1.5.1 System structure

The standard EBS system for a three-axle semi-trailer is shown in the following figure. It controls the brake pressures electronically on each side. The system is made up of a dual-circuit trailer modulator (2) with digital data interface according to ISO 11992 to the EBS towing vehicle, an EBS relay emergency valve or Park Release Emergency Valve (PREV) (1), and the ABS sensors.



When used in full trailers or semi-trailers, with a steering axle, a system with an additional EBS relay valve (7) on the steering axles is used.



Trailers with this brake system are compatible with conventional and EBS-braked towing vehicles. They can be braked with pneumatic redundancy in the case of an EBS failure on the trailer. This results in three possible modes of operation:

- a) **Operation behind towing vehicles with EBS and extended (7 pin) ISO 7638 plug-type connection with CAN interface according to ISO 11992.**

All EBS functions can be utilised. The driver's braking demand (set value) is transmitted via the data interface to the trailer vehicle.

b) Operation behind conventional towing vehicles with ISO 7638 plug-type connection, without CAN interface

All EBS functions can be used except for transmission of the demand value via the CAN interface. The demand value is specified by the pressure sensor in the relay emergency valve. This pressure sensor measures the trailer control line pressure.

c) Redundancy operation

1. without ISO 1185 or ISO 12098-powering

If the electrical power supply fails or is not plugged in the braking is controlled pneumatically, although **without load-dependent brake force control** and **without ABS function**.

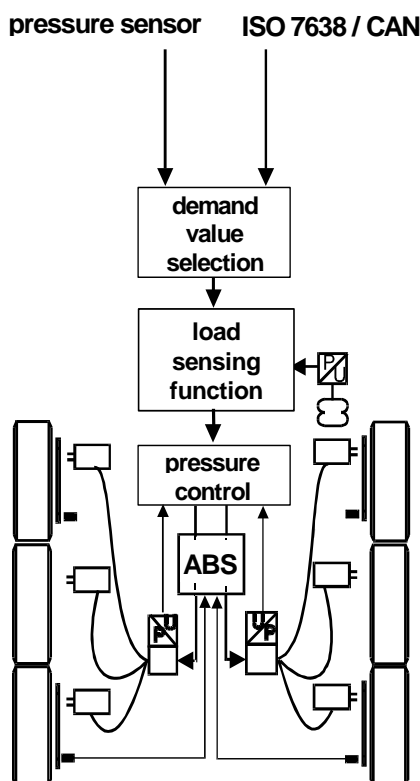
2. with ISO 1185 or ISO 12098-powering as a safety function

It is not allowed to use the trailer without the ISO 7638 connector. If the electrical power supply via ISO 7638 fails and the system is fitted by an ISO 1185 or ISO 12098-cable (optional feature), the system can be supplied by this optional connection (stoplight-powering). In this case only ABS and the load-dependent brake force control are in function with reduced performance.

1.5.1.1 Description of the EBS-functional blocks

The Trailer EBS mode of functioning can be described in terms of various sub-functions.

1.5.1.1.1 Selection of demand value



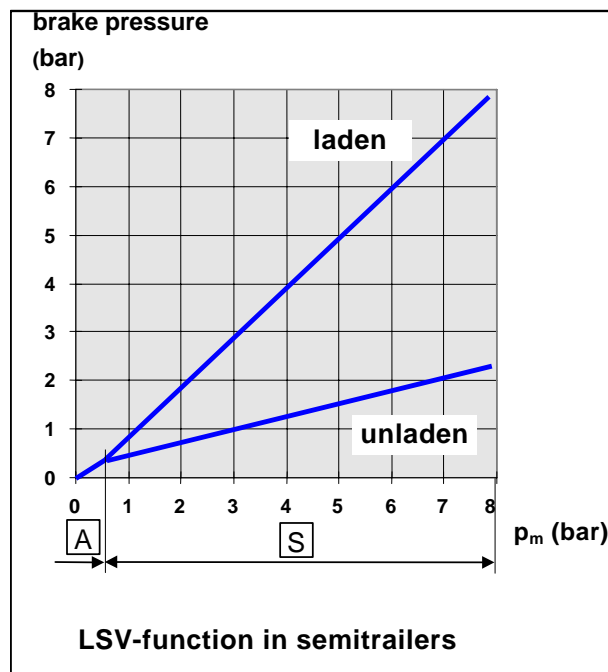
The demand value is the driver's braking request. When operated behind an EBS towing vehicle the trailer modulator obtains the demand value via the trailer interface from the EBS towing vehicle. If no demand value is available via the trailer interface, e.g. when operating the trailer behind a conventionally braked towing vehicle or if the trailer interface in the case of EBS combination is interrupted, a demand value is generated by measuring the control pressure. As a matter of priority, control is always the demand value via CAN.

1.5.1.1.2 LSV- function

The Trailer EBS contains the **load-dependent brake force control**, a distinction being drawn between semi-trailers or centre-axle trailers and full trailers.

The current loading state is determined by sensing the air-suspension bellows pressure.

In case of semi-trailers, as at present, a static linear control function is used. The transmission function of brake pressure (p_{Cyl}) to coupling head pressure (p_m) is broken down into two ranges:

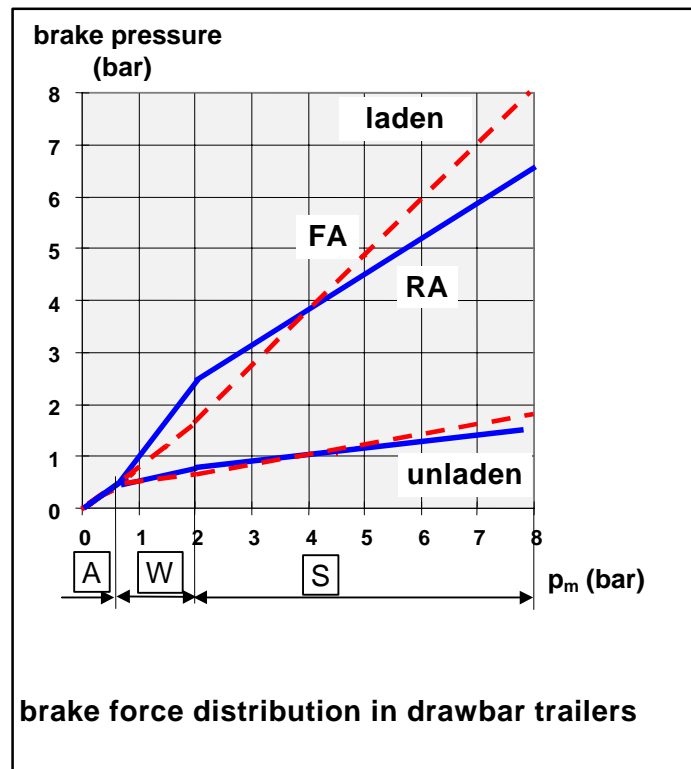


- A • Application range
- S • Stability range

In the example the brake cylinder pressure in the application range ($p_m = 0$ bar to $p_m = 0.7$ bar) rises from 0 to 0.4 bar. At $p_m = 0.7$ bar the threshold pressure of the wheel brake is reached, and the vehicle can start to generate brake force. The parameters for this point, in other words the response pressure of the whole trailer brake, can be set within the framework of the EEC bands.

Subsequently the brake pressure with laden vehicle follows the straight line which passes through the calculated value at $p_m = 6.5$ bar. With the unladen vehicle the response pressure is also modulated from $p_m = 0.7$ bar, and the brake pressure reduced in accordance with the load.

With a full trailer the brake force distribution, achieved on a software basis, replaces the two LSV valves, the adaptor valve on the front axle and the pressure limiting valve on the rear axle which are commonly used at present.



Here the transmission function is broken down into three ranges:

- **A** application range
- **W** wear range
- **S** stability range

At the end of the application range, the response pressures of the brakes are adjusted again, and these pressures may of course differ from axle to axle.

In the partial braking range the pressures are adjusted so as to optimise wear. For a full trailer with, for example, type 24 cylinders on the front axle and type 20 cylinders on the rear axle the pressure to the front axle is reduced in accordance with the design and raised on the rear axle. This ensures uniform loading of all wheel brakes more precisely than can be achieved with the adaptor valve currently used.

In the stability range, the pressures corresponding to equal utilisation of adhesion are adjusted as a function of the axle load.

The rear axle load is determined from the air-suspension bellows pressure. The front axle load is determined, without an axle load sensor, from the slip difference between the speed-sensed wheels.

The parameters are calculated using the WABCO brake calculation program. The parameters are stored in the trailer modulator with the corresponding brake calculation number. The system checks the proper function of the axle load sensor.

1.5.1.1.3 Pressure control

The pressure control circuits convert the set pressure specified by the LSV function into cylinder pressures.

The control unit compares the actual pressures measured at the output of the relay valves with the set pressure specified. If a deviation arises, this is corrected by actuating the supply or exhaust solenoids.

1.5.1.1.4 Anti-lock function (ABS)

The control logic recognises, from the speed behaviour of the wheels, whether one or more wheels display a "locking tendency" and decides if the related brake pressure is to be lowered, maintained or raised.

Each wheel is controlled in its optimum range following this concept (**Modified Axle Control (MAR)**, **Modified Side Control (MSR)**, **Individual Control (IR)**).

1.5.1.1.5 Standstill function

With the vehicle at a standstill ($v \leq 1.8$ km/h) **and** when the pneumatic control pressure is greater than 3.5 bar, there is a switch from electropneumatic to pneumatic pressure adjustment after 5 s. This function serves to prevent unnecessary power consumption when the vehicle is parked with the handbrake applied and ignition is on. This function is deactivated when the vehicle moves.

1.5.1.1.6 Emergency braking function

In order to apply the maximum possible brake force there is an emergency braking function. If the driver's braking command corresponds to more than 90% of the pressure available on the trailer, in other words panic braking is applied, the brake pressures are increased in a ramp fashion up to the characteristic of the vehicle in laden condition.

This function is also effective if the bellows of the air suspension system bursts.

1.5.1.1.7 Monitoring of brake air pressure

The supply pressure in the trailer vehicle is monitored by the EBS. If the supply pressure falls below 4.5 bar the driver is warned by a warning light which illuminates. When the braking system is filling the warning light only goes out when the supply pressure in the trailer vehicle rises above 4.5 bar.

1.5.1.1.8 Lifting axle control

In conjunction with the WABCO lift axle control valve the EBS controls the lifting axle automatically as a function of the current axle load.

1.5.1.1.9 Integrated speed switch

This output can be used, for example, to lock a self-steering axle at higher speed.

1.5.1.1.10 Lining wear sensing

The system can read in max. 6 lining wear sensors or wear indicators. The driver will be warned when the wear limit is reached.

1.5.1.1.11 Roll stability support

The system is equipped with a system to prevent roll over of the trailer when exceeding the possible lateral acceleration.

1.5.1.1.12 Parameter Setting

Variable parameters: The following parameters must be set in the production by the trailer manufacturer.

<i>Vehicle type</i>	semi-trailer or full trailer
<i>Number of axles</i>	for semi-trailers are allowed a max. of 3 axles and for full trailers 3 axles
<i>ABS-system</i>	installed ABS-system and position of sensors
<i>Lift axle control</i>	1 or 2 lift axles controlled
<i>Integrated speed switch</i>	to control self-steering axles or air suspension
<i>Roll stability support (RSS)</i>	for semi-trailers and full trailers
<i>Lining wear sensors</i>	to choose the type of wear sensors
<i>Warning lamp sequence</i>	on, after 2 s off or on – off - on- at 7 km/h off
<i>Tyre diameter and pole wheel teeth number</i>	to calibrate the wheel speeds for ABS and odometer
<i>Service interval</i>	The driver will be informed after a specified distance
<i>Axles load unladen and laden</i>	to adjust the load sensing function
<i>Air bellow pressure unladen and laden</i>	to adjust the load sensing function
<i>Brake pressure unladen and laden</i>	to adjust the load sensing function
<i>Special functions</i>	special functions like traction help or telematic support can be choosen

2. Applications

2.1 List of trailer types and ABS configurations

Single or multi-axle semi-trailer, centre- axle trailers or full trailers of categories O3 and O4 according to Directive 71/320/EEC, with air suspension or mechanical suspension, disc or drum brakes.

Number of axles ⇒ ABS configuration	Semi trailer			Centre-axle trailer			Full trailer	
	1	2	3	1	2	3	2	3
2S/2M	X	X	X	X	X	X		
2S/2M+SLV		X	X		X	X		
4S/2M		X	X		X	X		
4S/2M + 1 M		X	X		X	X		
4S/3M		X	X		X	X	X	X

For sample diagrams see 3.5.

2.2. Schematic diagrams of the system configurations

Appendix 1 shows possible configurations of sensors and modulators for the different trailers defined in item 2.1.

For possible length and diameters of tube/pipe length see 3.5.

2.3 Relationship of tyre circumference to the resolution of the exciter

The ratio between tyre circumference [mm] and pole wheel teeth number must be between 25,6 and 38,4.

The actual tyre circumference and pole wheel teeth numbers are stored in the trailer modulator.

2.4 Tolerance on tyre circumference between one axle and another fitted with the same exciter

The inter wheel variations of rolling circumference must not exceed a value of 6,5 %. Otherwise, the rolling circumference must be adjusted by setting parameter in the trailer modulator.

2.5 Scope of application with respect to suspension type

The Trailer EBS is applicable to trailers with air suspension or mechanical suspension. Appendix 2 defines the specific suspension types by manufacturer for use.

2.6 Recommendations on differential brake input torque in relation to the ABS configuration and trailer bogie

For multiple-axle applications an almost identical utilization of friction of these axles is required. If all of the wheels are not fitted with sensors, the axle(s) which usually lock(s) first must be equipped with sensors.

Multiple-axle applications having only static axle load proportioning must be equipped in that way that the wheels of all axles reach their locking point simultaneously and that one wheel directly controlled

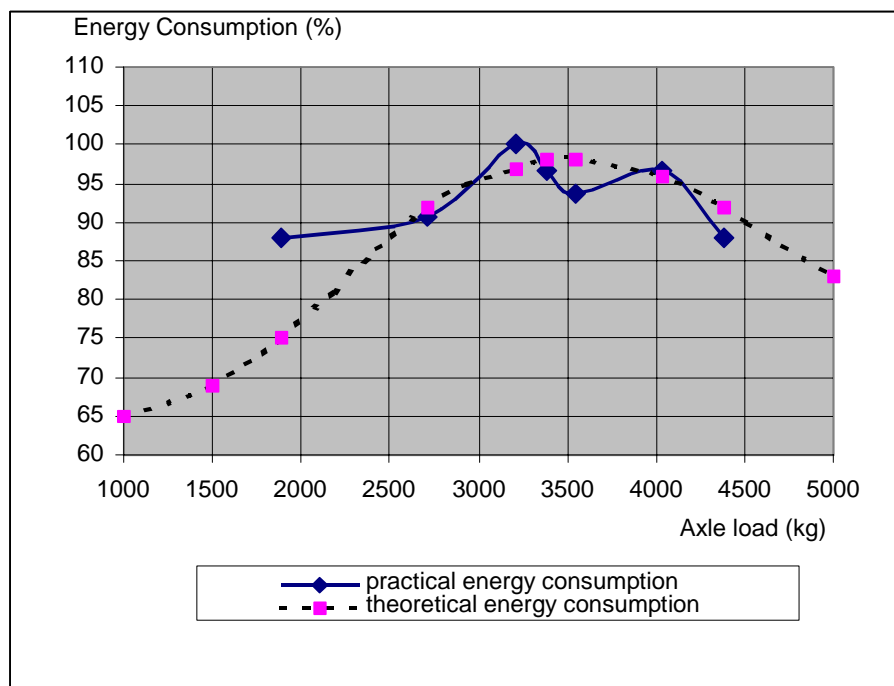
- does not control more than two other wheels
or
- in the case of central axle trailers does not indirectly control more than one wheel or one axle

Differentials on brake input torque are admissible for all anti-lock configurations within a range of 20 %.

2.7 Test data of energy consumption

The energy consumption has been tested according to paragraph 6.1 of annex 10 of 98/12/EG and annex 13 of ECE R 13, series 09, respectively. To determine the worst case a variation of axle load has been made. Within a range of $\pm 10,000$ N of the worst case, the energy consumption for different ABS configurations has been determined.

During all energy consumption tests the load-sensing valve was in a fully laden position. The following diagram represents the data from the energy consumption tests. It gives the supply pressure after ABS control of 15 sec and five additional brake applications.



2.8 Additional information to the application of the anti-lock braking system

When the vehicle is first put into service the parameters must be set and the system checked in accordance with the vehicle equipment using the WABCO Trailer- EBS PC diagnostic program. If this sign-off procedure is not followed, the warning light will not go out during operation, even if the system is fault-free. The parameters for the load-dependent brake pressure control and tyre circumference are determined by means of the WABCO brake calculation

3 Component description**3.1 Sensors and exciters****3.1.1 Wheel speed sensors**

The sensors transmit the information from the rotating toothed wheels to the trailer modulator. Based on this information the ECU calculates the wheel and vehicle speeds. Special care must be taken to ensure accurate speed information.

Identification:

Wheel speed sensors: WABCO part number 441 032 ... 0

Sensors are mounted in clamp bushings, WABCO part number 899 760 510 4 or 899 759 815 4

3.1.2 Exciters

Exciters according WABCO specification 895 905 000 4

3.1.3 Pressure sensor

The sensor can be used optional as an external driver demand sensor in long vehicles or as an external axle load sensor.

Identification:

Pressure sensor: WABCO No. 441 040 007 0 to 441 040 015 0

3.1.4 Stroke sensor

The sensor can be used in trailers with mechanical suspension to measure the axle load.

Identification:

Stroke sensor WABCO No. 441 050

3.2 Controllers

3.2.1 Trailer modulator

The trailer modulator (TM) serves to control and monitor the electropneumatic braking system. The TM is installed in the braking system between the reservoir, relay emergency valve and the brake cylinders. It controls the brake cylinder pressure on both sides of one, two or three axles.

The TM communicates directly or via TCE (Trailer Central Electronic see 3.2.2) using the extended ISO 7638 connector with the motor vehicle via the electric trailer interface according ISO 11992. The TM has two pneumatically independent pressure control circuits, each with a supply and exhaust valve, redundancy valve, pressure sensor and common control electronics. The required deceleration of the vehicle is determined from the pressure signal received from the integrated demand sensor and - if there is a trailer interface present - from the CAN set value. The TM has an integrated axle load sensor. If necessary an external demand sensor and axle load sensor can be connected. The TM has also a connector for lining wear sensor(s). The brake force is modified as a function of the vehicle load (brake force distribution function). In addition the wheel speeds are registered and analysed via up to four rotary speed sensors. If there is a locking tendency the braking pressure specified for the brake cylinder is controlled by the ABS control circuit. The TM has an electrical connection for the EBS relay valve. With this connection, it is possible to control the brake pressure of an axle separately. In the TM the reservoir pressure is sensed so that the driver can be warned if there is any pressure loss.

Identification:

Trailer modulator: WABCO No. 480 102 0.. 0

Failure modes:

The TM monitors itself. In the event of a fault, any parts found to be defective (ECU, sensors, modulator(s)) are selectively switched off, and the warning system is actuated. Even in the event of the whole system being switched off the back-up braking function is maintained **but without load-dependent brake force control and without ABS function**. In the case of stoplight-powering only ABS and the load-dependent brake force control are in function with reduced performance.

Correct electrical/electronic function of the EBS is indicated by warning device in the driver's cab of towing vehicle according to the provisions of the ECE regulation No. 13/09 (Supplement 2) Section 5.2.1.29.

Additional features:

- integrated speed switch
- diagnostic interface according to ISO 14230 (KWP 2000)
- automatic lift-axle control
- integrated load proportioning function
- Roll stability control
- Lining wear sensing

3.3.2 ABS Relay Valve

The ABS relay valve serves the purpose of holding or venting the pressure in the brake chambers, this is being done independently of the pressure that is transmitted by the brake valve of the trailer.

Electrically controlled relay valve with two solenoids to hold and vent the brake pressure during ABS-braking of one axle in 4S/2M+1M systems.

Identification:

ABS Relay Valve WABCO part numbers: 472 195 ... 0

3.3.3 EBS Relay Valve

Electrically controlled relay valve with pressure sensor and redundancy valve (secondary safety circuit) to control the brake pressure during normal braking and ABS-braking of one axle in 4S/3M systems.

Identification:

EBS relay valve: WABCO No. 480 207 ... 0

3.3.4 Park Relay Emergency Valve (PREV)

Trailer brake valve with emergency brake function and integrated release and park valve.

Identification:

Park Release Emergency Valve WABCO part numbers: 971 002 9.. 0

3.3.5 Select Low Valve (SLV)

Double Cut Off Valve or Relay valve to control self-steering axles in 2S/2M+SLV systems.

Identification:

Select Low Valve WABCO part numbers: 434 500 00. 0

Relay valve WABCO part numbers: 973 001 ... 0
973 011 ... 0

3.4 Electrical equipment

The circuit diagrams in appendix 4 shows the connection of all external components (power supply, sensors and modulators). All components are connected via external connectors, which are moulded and coded to avoid mismatching. The cables and connectors fulfil GGVSE resp. ADR requirements (Test report TÜV Nord No. 1203/04).

Powering methods

Permanent power supply via the connector according to ISO 7638-1997 (7-pin) Part 1 (24 V) **or** to ISO 7638-1985 (5-pin) (24 V).

In the event of ISO 7638 power supply failure to maintain trailer stability during braking: Intermittent power supply via the connector according to ISO 1185 or ISO 12098. In this case only ABS and the load- dependent brake force control are in function with reduced performance.

Warning lamp sequence

The system can output two different warning lamp sequences. The sequences are according to the provisions of the ECE regulation No. 13/09 Section 5.2.1.29 and can be changed by parameter setting.

1. Option

When vehicle is stationary:

- Warning light comes on when ignition is switched on.
- Warning light goes off after approx. 2 s if no fault is detected.
- If a fault has been detected e.g. sensor fault, the warning light will stay on.
- If a sensor fault was recorded during the previous journey but is no longer current, the warning light will go off at $v \geq 7$ km/h.

When vehicle is travelling at $v \geq 7$ km/h:

- Warning light comes on, or stays on, if a current error is detected.

2. Option

- Warning light comes on when ignition is switched on
- If no current defect has been detected, warning light goes out after about 2 s, lights up again after a further 2 s, and goes out at $v \geq 7$ km/h.
- If a current defect is detected, e.g. sensor broken off, the warning light stays on.

ISO 1185 (ISO 12098) powering failure warning:

The provision of powering the trailer braking system from the ISO1185 or ISO 12098 connector is to provide a backup in the event of failure of the power supplied via the ISO 7638 connector and therefore there is no failure warning requirement.

Non-specified faults

Non-specified faults are monitored by a flashing warning lamp. After energising the Trailer EBS the flashing of the yellow signal starts after the normal warning signal sequence was completed. When the vehicle speed increases over 10 km/h the flashing warning signal is terminated.

When a specified failure is present the flashing warning lamp signal is replaced by a non-flashing warning lamp signal.

3.5 Pneumatic circuits

Sample brake diagrams for different trailers with standard air brakes are represented in Appendix 4 (page 1 to 8):

Page 1: semi-trailer with 2S/2M and 4S/2M

Page 2: semi-trailer with 2S/2M and 4S/2M

Page 3: semi-trailer with 2S/2M +SLV

Page 4: semi-trailer with 4S/2M+1M

Page 5: semi-trailer with 4S/3M

Page 6: full trailers with 4S/3M

Page 7: full trailers with 4S/3M

Page 8: example for a semi-trailer with 2S/2M and 4S/2M and TCE

Limitations on pipe/tube sizes and associated lengths:

The length of the hoses between actuator and brake chambers should be as short as possible.

tube and hoses	min. diameter	max. length
reservoir – trailer modulator	12 mm (see note)	see note
reservoir – EBS (ABS) relay valve	9 mm (see note)	see note
trailer modulator – brake chamber		
directly controlled wheels	9 mm	6 m
indirectly controlled wheels	9 mm	6 m
EBS (ABS) relay valve – brake chamber	9 mm	6 m

Note: energy supply lines between air reservoir and modulator(s): response time according to Annex III of Directive 71/320/EEC or Annex 6 of ECE R13/9 has to be fulfilled.

3.6 Electromagnetic Compatibility (EMC)**3.6.1 Documentation**

In order to fulfil the legal requirements regarding EMC, the electronics are certified according to the EU Directive 72/245/EEC in the version 95/54/EC and have been given the following approval marks:

Approval mark e1 *72/245/*95/54*1206*00

Approval mark e1 *72/245/*95/54*1665*00

A copy of the EMC type approval certificates are attached as Appendix 6a (3 pages) and 6b (3 pages).

Appendix 1 (page 1/3)

System Configurations

ABS-Configurations for Semitrailer, Centre Axle Trailer and Drawbar Trailer

Lift axles

System 2S/2M: Lift axles shall not be sensed

All other systems: Lift axles can be sensed with ABS-sensors e and f.

Steering axles

Positively steered axles have to be handled like rigid axles.


WABCO recommends that trailers with self steering axles shall be used with 4S/3M, 4S/2M+1M or 2S/2M+SLV configuration.

If 2S/2M or 4S/2M EBS- Systems are used, checks should be carried at the time of type approval of a trailer to ensure that no undue vibration or course deviation is observed. It is not possible to evaluate the reaction of all available steering axles in the case of anti-lock braking control.


In the case of requirement to provide additional stability to a self-steering axle during anti-lock operation the output-signal of the ISS may be connected to a solenoid valve which locks the self steering function at higher speed.

LEGEND: Mounting Instructions for axle boogie types:

 = driving direction

 = trailer modulator

 = two way valve (SHV)


 = select low valve (SLV)


 = EBS-relay valve

 = ABS-relay valve

Arrangement of control channels:
 (acc. to wiring diagram
 841 801 620 to 841 801 622 0)

Modulator	Sensors	Arrangement of control channels:	
		System axle:	control logic:
M	c, d	main axle (not liftable)	IR / MSR
A/E	e, f	steering axle (liftable)	MAR
Z	e, f	addition axle (liftable)	MSR

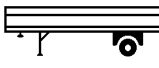
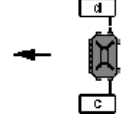
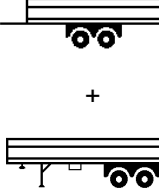

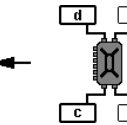
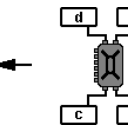
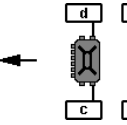
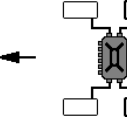
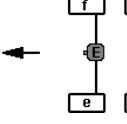
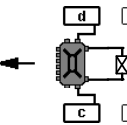


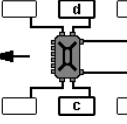
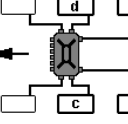
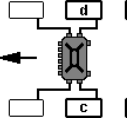
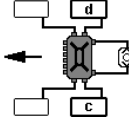
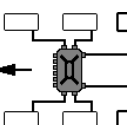
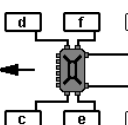
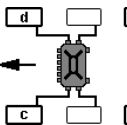
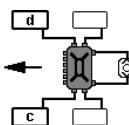
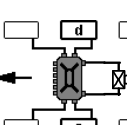
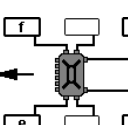
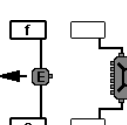
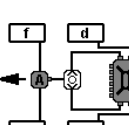
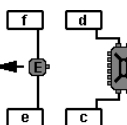
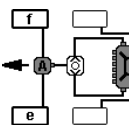
 sensed (directly controlled)

 not sensed (indirectly controlled)

Appendix 1 (page 2/3)

System Configurations


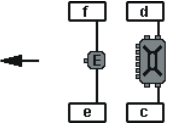
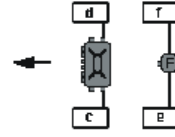

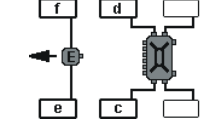
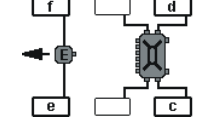
Semi-trailer and Centre-axle Trailer

Vehicle Type	2S/1M	2S/2M	4S/2M	4S/3M	4S/2M+1M
					
 + 					
					
		 2S/2M-SLV			
 					
					
		 2S/2M+SLV			
					

Appendix 1 (page 3/3)

System Configurations

Drawbar Trailer

VEHICLE TYPE		2S/2M	4S/2M	4S/3M	4S/2M+1M
Drawbar Trailer					
					
					
					

Appendix 2 (page 1/2) Scope of suspension types

Manufacturer	Model	Type
Bartoletti	all	Air suspension, balanced
	all	Mechanical
BPW	SLU, SLO, SLM ALU, ALO, ALM, ALMT, DLU O, OM, OT, AIRLIGHT I AIRLIGHT II, Airlight direct	Air suspension, balanced
	VA	Mechanical, balanced
	VB, GW, BW, VG, W	Mechanical
Cardi	PR, PR	Air suspension, balanced
	MR	Mechanical
Cometto	SP1, SP2	Air suspension, balanced
	MA3 + G1	Mechanical
Daimler Chrysler	DCA	Air suspension, balanced
Fruehauf	FA	Mechanical
Gigant / SAE	LG, TLG, LR, TLR, NLR, TO, NLRM 50, NTLRO 50, TLRM 72, NKLRT 50, NKLRM 50, NLRT 50, TKLRO 50	Air suspension, balanced
	LK	Mechanical
Granning	PTS, PTL	Air suspension, balanced
Hendrikson	HTE, HT 250, HDB	Air suspension, balanced
	HST	Mechanical
Kaiser	RK, RKV2	Air suspension, balanced
Leciñena	ALN	Air suspension, balanced
	411	Mechanical
Lecitrailer	LTU, LTO, LTM	Air suspension, balanced
	SB	Mechanical
Mecanización	SN	Air suspension, balanced
Meritor	Flexair, Indair, Flexlite, FL, FM, FP, XL	Air suspension, balanced
	SMT	Mechanical

Appendix 2 (page 2/1) Scope of suspension types

Manufacturer	Model	Type
Montenegro	all	Air suspension, balanced
	all	Mechanical
Merkeryshima	all	Air suspension, balanced
Piazenza	U2, N2, P1, R2, S2,V1, V2	Air suspension, balanced
	R2, N2, S2	Mechanical
Rolfo	7T, 10T, 16T	Air suspension, balanced
SAF	Intraax, Intradisk, Intradisk plus, Intradisk plus II, Intradisk plus II integral, IWST, Modular, R421, AR313/413, AR 321/421, U, M, O, EO, HU, EU, XU/XO, PU/PO, IU/IO, SK RS 9042	Air suspension, balanced
Schmitz	MRH, AC	Air suspension, balanced
SMB	NA, SA, ZA	Air suspension, balanced
	FA, M2 Cantilever	Mechanical
TMM	all	Air suspension, balanced
	all	Mechanical
Trouillet	9T12, 9T13, 11T	Air suspension, balanced
Weweler	Euro, Heavy Duty, Mega Lite, Specials, Ultra Lite, DLS	Air suspension, balanced
Viberti – Acerbi	all	Air suspension, balanced
Zorzi	B4P, R4P, R6P, R10P, S6P, S10P, S12P	Air suspension, balanced
	S6M, S10M, R10M	Mechanical

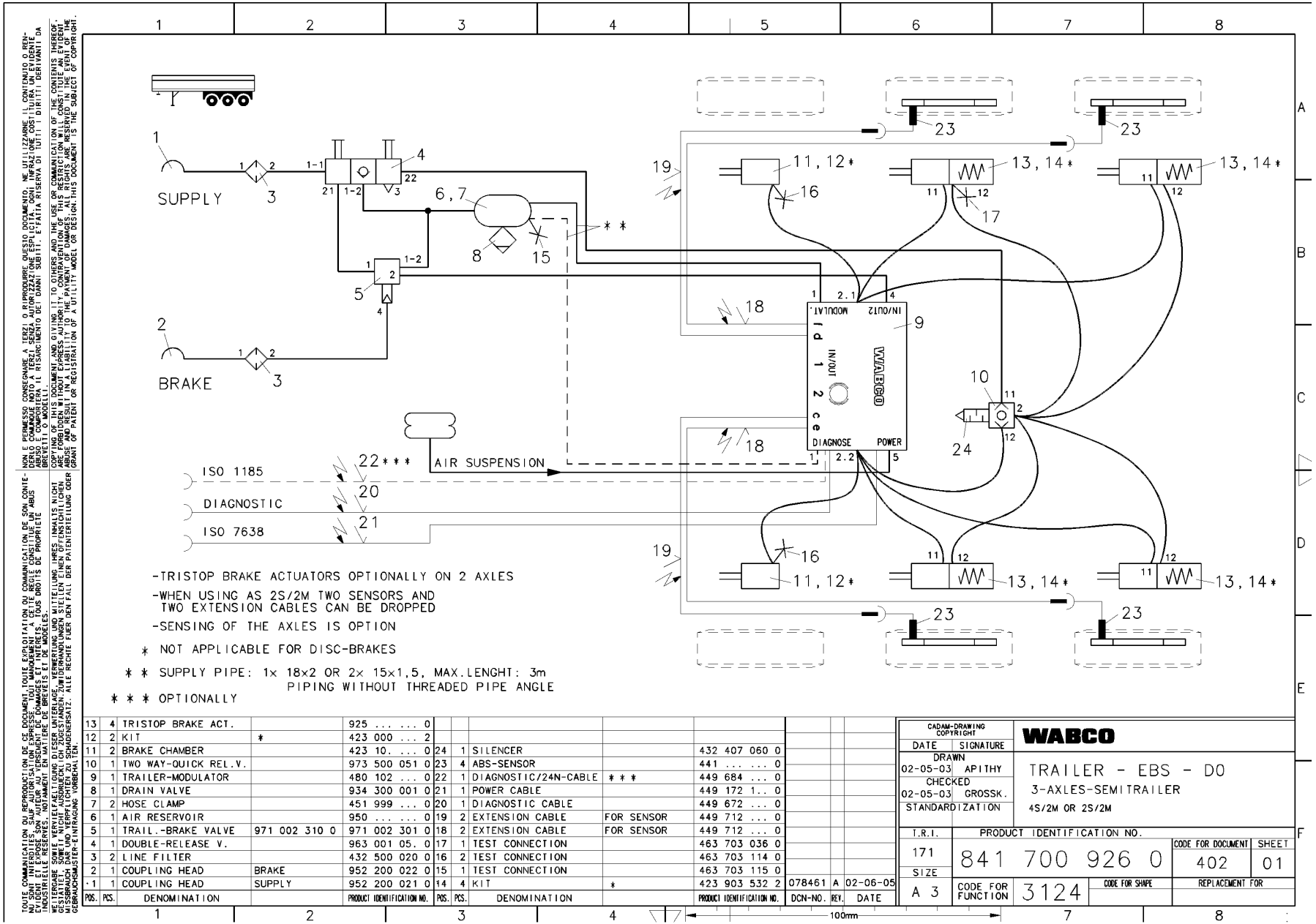
Appendix 3 (page 1/2) Failure-Deactivation Matrix

WABCO																		
Failure Deactivation Matrix		Semitrailer 4S/3M	Semitrailer 4S/2M + 1M	Semitrailer 2S/2M	Semitrailer 4S/2M	Trailer 4S/3M	ABS axle c,d not active(1)	ABS axle e,f not active(1)	EBS axle e,f not active(2)	EBS axle c,d not active(2)	loadpropor.trail.-mod.set laden	loadpropor.EBS relay-valve .set laden	solenoidvalve EBS relay-valve.currentless	back-up valve EBS relay-valve.currentless (2)	solenoid valve trailmod .currentless	back-up valve trailer mod. currentless(2)	Integrated switch 1 or 2 not active	failure status
1.	Sensors																	
1.1	Wheel speed sensors																	
1.1.1	failure of wheel speed sensor axle c or d	x	x	x	x		■											1
1.1.2	failure of wheel speed sensor axle c or d					x	■					■						1
1.1.3	failure of wheel speed sensor axle e or f	x	x	x	x		■											1
1.1.4	failure of wheel speed sensor axle e or f					x	■					■						1
1.2	Brake pressure sensors																	
1.2.1	failure of a pressure sensor in the trailer- modulator	x	x	x	x	x					■						■	1
1.2.2	failure of a pressure sensor in the EBS relay-valve	x				x			■					■				1
1.3	Driver demand																	
1.3.1	failure of the driver demand sensor/ switch (CAN available)	x	x	x	x	x												1
1.3.2	failure of the driver demand sensor/ switch (CAN not available)	x	x	x	x	x			■	■				■			■	1
1.3.3	failure of the driver demand sensor and CAN-communication	x	x	x	x	x			■	■				■			■	1
1.4	Axle load sensor																	
1.4.1	failure of the axle load sensor	x	x	x	x	x					■	■						1
2	Solenoid valves																	
2.1	EBS/ABS)- relay valve																	
2.1.1	failure of solenoid valves in the EBS(ABS) relay-valve	x	x			x		■	■				■	■				1
2.2	Trailer modulator																	
2.2.1	failure of solenoid valves in the trailer-modulator	x	x	x	x	x	■	■		■					■	■		1
2.2.2	failure of integrated switch 1 or 2	x	x	x	x	x											■	1
2.3	Back-up valve																	
2.3.1	back-up valve failure trailer-modulator	x	x	x	x	x											■	1
2.3.2	back-up valve failure EBS relay-valve	x				x								■				1
3	ECU																	
3.1	failure of the ECU (CPU, RAM, ROM...)	x	x	x	x	x	■	■	■	■	■	■	■	■	■	■	■	2
4	CAN-Communication																	
4.1	partial failure of CAN-Communication/ one-wire-operation	x	x	x	x	x												0
4.2	failure of CAN-communication	x	x	x	x	x												0

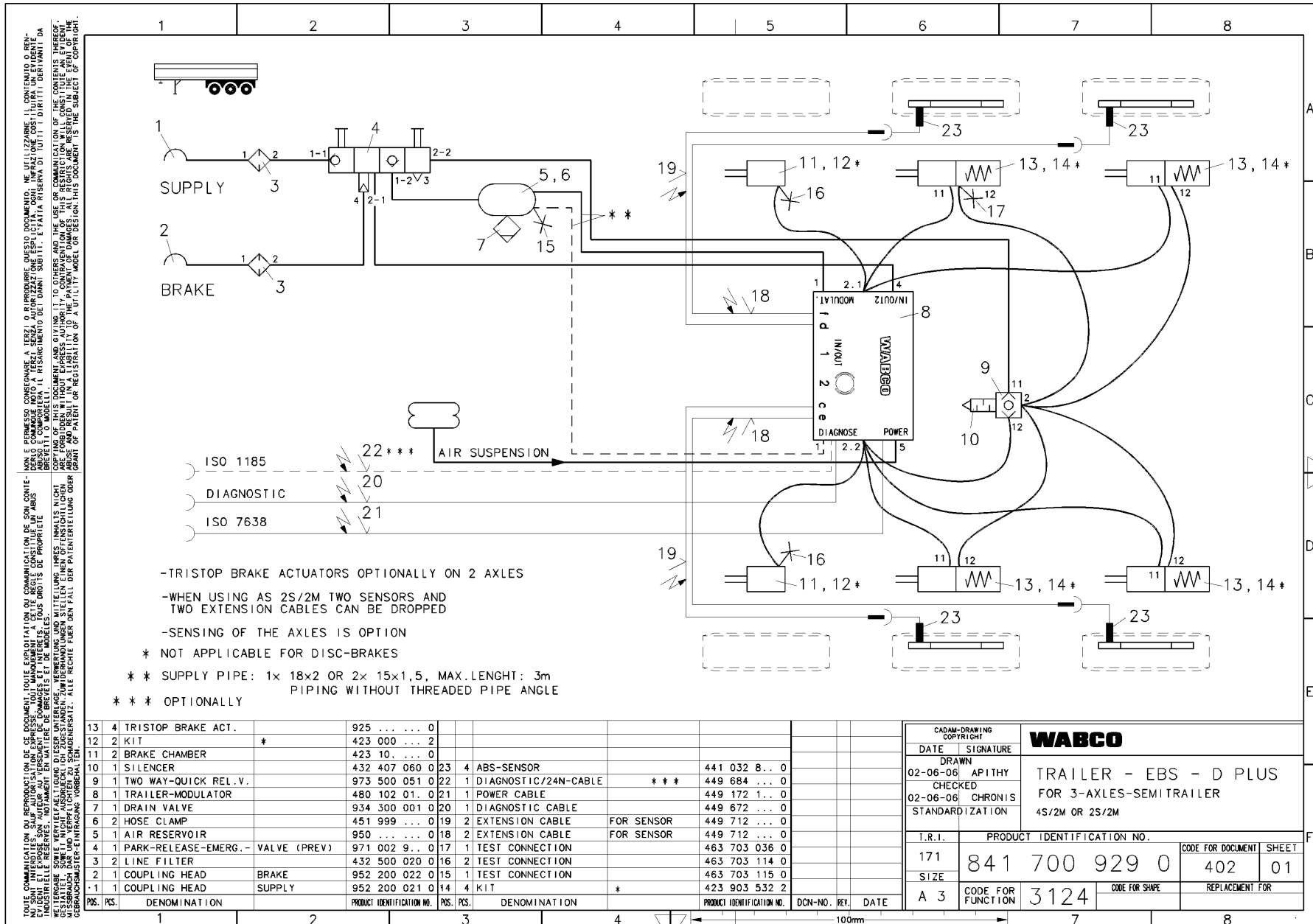
Appendix 3 (page 2/2) Failure-Deactivation Matrix

WABCO																		
Failure Deactivation Matrix		Semitrailer 4S/3M	Semitrailer 4S/2M + 1M	Semitrailer 2S/2M	Semitrailer 4S/2M	Trailer 4S/3M	ABS axle c,d not active(1)	ABS axle e,f not active(1)	EBS axle e,f not active	EBS axle c,d not active	loadpropor.trail.-mod.set laden	loadpropor.EBS relay-valve .set laden	solenoidvalve EBS relay-valve.currentless	back-up valve EBS relay-valve.currentless (2)	solenoid valve trailmod .currentless	back-up valve trailer mod. currentless(2)	Integrated switch 1 or 2 not active	failure status
5	Voltage Supply																	
5.1	failure in the voltage supply	x	x	x	x	x	■	■	■	■	■	■	■	■	■	■	■	1
5.2	low/ high voltage	x	x	x	x	x	■	■	■	■	■	■	■	■	■	■	■	1
5.3	failure in the voltage supply of external sensors	x	x	x	x	x			■		■	■		■				1
5.4	failure in the voltage supply TCE/ EBS	x	x	x	x	x	■	■	■	■	■	■	■	■	■	■	■	1
6	Pneumatic																	
6.1	service line not connected (only with ISO 7638 extended)	x	x	x	x	x												2
6.2	supply pressure low	x	x	x	x	x												2
6.3	supply line not connected	x	x	x	x	x												2
Meaning of failure status																		
0 = yellow warning lamp during the failure (ECE R13 para. 5.2.1.29.1.2)																		
1 = yellow warning lamp until reset (ECE R13 para. 5.2.1.29.1.2)																		
2 = yellow and red warning lamp until reset (ECE R13 para. 5.2.1.29.1.1)																		
Remarks:																		
(1) ABS selective deactivated																		
(2) braking with pneumatic service line																		
■ = Function deactivated																		

Appendix 4 (page 1/8) Braking schematic 2S/2M and 4S/2M for Semi-trailer

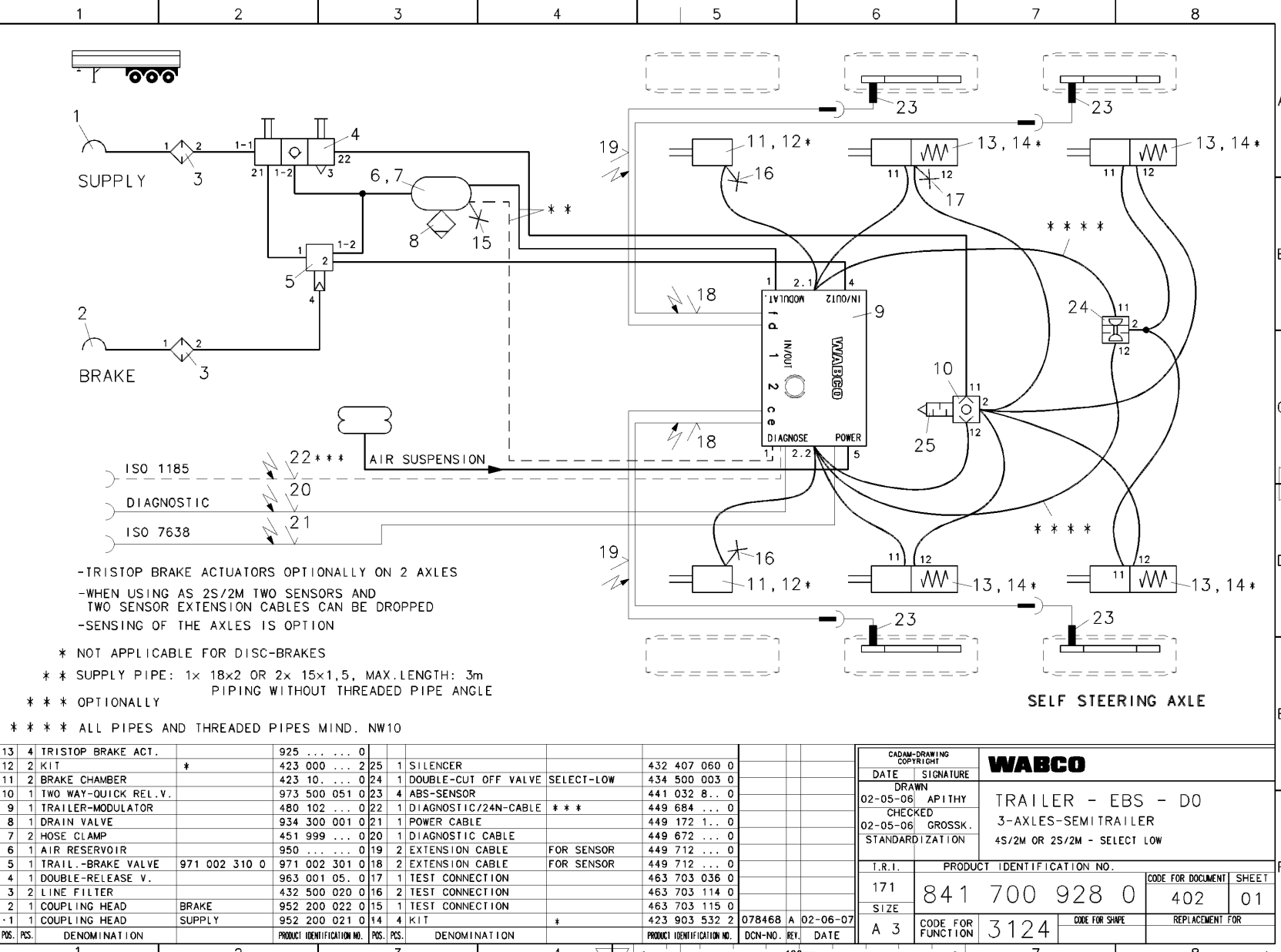


Appendix 4 (page 2/8) Braking schematic 2S/2M and 4S/2M for Semi-trailer with Park Release Emergency Valve (PREV)



Appendix 4 (page 3/8) Braking schematic 2S/2M+SLV for Semi-trailer with steering axle

NON È PERMESSO CONSERVARE A TERZI, O RIPRODURRE, QUESTO DOCUMENTO. NE UTILIZZARE IL CONTENUTO O RENDERSI RESPONSABILI PER QUALSIASI DANNO, MATERIALE O MORALE, CHE DERIVA DALL'USO NON AUTORIZZATO. È FATTA RISERVA DI TUTTI I DIRITTI. BREVETTI O MARCHE REGISTRATE DI WABCO O DI ALTRI PROPRIETARI NON SONO STATI RILEVATI. IL CONTENUTO DI QUESTO DOCUMENTO È SOLO A TITOLO INFORMATIVO. IL SUO USO NON GARANTISCE NESSUN RENDIMENTO. WABCO NON È RESPONSABILE PER QUALSIASI DANNO, MATERIALE O MORALE, CHE DERIVA DALL'USO NON AUTORIZZATO. È FATTA RISERVA DI TUTTI I DIRITTI. BREVETTI O MARCHE REGISTRATE DI WABCO O DI ALTRI PROPRIETARI NON SONO STATI RILEVATI. IL CONTENUTO DI QUESTO DOCUMENTO È SOLO A TITOLO INFORMATIVO. IL SUO USO NON GARANTISCE NESSUN RENDIMENTO. WABCO NON È RESPONSABILE PER QUALSIASI DANNO, MATERIALE O MORALE, CHE DERIVA DALL'USO NON AUTORIZZATO. È FATTA RISERVA DI TUTTI I DIRITTI. BREVETTI O MARCHE REGISTRATE DI WABCO O DI ALTRI PROPRIETARI NON SONO STATI RILEVATI. IL CONTENUTO DI QUESTO DOCUMENTO È SOLO A TITOLO INFORMATIVO. IL SUO USO NON GARANTISCE NESSUN RENDIMENTO. WABCO NON È RESPONSABILE PER QUALSIASI DANNO, MATERIALE O MORALE, CHE DERIVA DALL'USO NON AUTORIZZATO. È FATTA RISERVA DI TUTTI I DIRITTI. BREVETTI O MARCHE REGISTRATE DI WABCO O DI ALTRI PROPRIETARI NON SONO STATI RILEVATI. IL CONTENUTO DI QUESTO DOCUMENTO È SOLO A TITOLO INFORMATIVO. IL SUO USO NON GARANTISCE NESSUN RENDIMENTO. WABCO NON È RESPONSABILE PER QUALSIASI DANNO, MATERIALE O MORALE, CHE DERIVA DALL'USO NON AUTORIZZATO. È FATTA RISERVA DI TUTTI I DIRITTI. BREVETTI O MARCHE REGISTRATE DI WABCO O DI ALTRI PROPRIETARI NON SONO STATI RILEVATI. IL CONTENUTO DI QUESTO DOCUMENTO È SOLO A TITOLO INFORMATIVO. IL SUO USO NON GARANTISCE NESSUN RENDIMENTO. WABCO NON È RESPONSABILE PER QUALSIASI DANNO, MATERIALE O MORALE, CH



Appendix 5 (page 1/2)

List of supported messages according ISO 11992-2/ 3 (1998-04-01):

Messages EBS 11 (tractor – trailer)			Used	
Byte(s)	Bit	Description	Trailer-EBS	Trailer-EBS with TCE
1	1 - 2	ABS active	No	No
	3 - 4	Vehicle retarder control active	No	No
	5 - 6	ASR brake control active	No	No
	7 - 8	ASR engine control active	No	No
2	1 - 2	Brake light switch active	No	No
	3 - 4	Vehicle type	No	No
	5 - 8	Not defined	No	No
3 – 4		Service brake demand value	Yes	Yes
5		Park brake demand value	No	No
6		Retarder demand value	No	No
7 – 8		Not defined	No	No

Message EBS 12 (tractor – trailer)				
Byte(s)	Bit	Description		
1	1 - 2	Vehicle retarder control active	No	No
	3 - 8	Not defined	No	No
2	1 - 8	Not defined	No	No
3	1 – 2	Two electrical circuits brake demand value	Yes	Yes
	3 - 4	ABS off road switch on/ off	No	No
	5 –6	Pneumatic control line	Yes	Yes
	7 -8	Not defined	No	No
4 - 8		Not defined	No	No

Message EBS 21 (trailer - tractor)				
Byte(s)	Bit	Description		
1	1 – 2	Vehicle ABS active	Yes	Yes
	2 –3	Vehicle retarder control active	No	No
	3 – 4	Vehicle service brake active	Yes	Yes
	7 – 8	Automatic towed vehicle brake active	No	No
2		Not defined	No	No
3 - 4		Wheel based vehicle speed	Yes	Yes
5		Actual percentage of retarder torque	No	No
6 – 8		Not defined	No	No

Message EBS 22 (trailer - tractor)				
Byte(s)	Bit	Description		
1	1 – 2	Vehicle ABS active	Yes	Yes
	3 – 4	Vehicle retarder control active	No	No
	5 – 6	Vehicle service brake active	Yes	Yes
	7 – 8	Automatic towed vehicle brake active	No	No
2	1 – 2	Vehicle electrical supply sufficient	Yes	Yes
	3 – 4	Red warning signal request	Yes	Yes
	5 – 8	Not Defined	No	No
3	1 – 2	Spring brake installed	No	No
	3 – 4	Electrical load proportional function	No	No
	5 – 6	Vehicle type	Yes	Yes
	7 – 8	Not defined	No	No
4		Not defined	No	No
5 – 6		Axle load sum	Yes	Yes
7 – 8		Reference retarder torque	No	No

Appendix 5 (page 2/2)

List of supported messages according ISO 11992-2/ 3 (1998-04-01):

Message EBS 23 (trailer - tractor)				
Byte(s)	Bit	Description	Trailer-EBS	Trailer-EBS with TCE
1	1 – 2	Tyre pressure sufficient	No	Yes
	3 – 4	Brake lining sufficient	Yes	Yes
	5 – 6	Brake temperature status	No	Yes
	7 – 8	Vehicle pneumatic supply sufficient	Yes	Yes
2		Tyre identification (pressure)	No	Yes
3		Tyre identification (Lining)	No	Yes
4		Tyre identification (Temperature)	No	Yes
5		Tyre pressure	No	Yes
6		Brake Lining	Yes	Yes
7		Brake Temperature	No	Yes
8		Pneumatic supply pressure	Yes	Yes

Message GFM 12 (tractor - trailer)				
Byte(s)	Bit	Description		
1	1 – 2	Ride height request	#	Yes
	3 – 4	Level change request, front axle	#	Yes
	5 – 6	Level change request, rear axle	#	Yes
	7 – 8	Traction help request	Yes; #	Yes
2	1 – 2	Lift axle 1 position request	Yes; #	Yes
	3 – 4	Lift axle 2 position request	Yes; #	Yes
	5 – 6	Steering axle locking request	#	Yes
	7 - 8	Ramp level request	#	Yes
3		Not defined	#	No
4-8		Not defined	#	No

Message GFM 22 (trailer - tractor)				
Byte(s)	Bit	Description		
1	1 – 2	Leveling control system, ride height level	#	Yes
	3 – 4	Level control	#	Yes
	5 – 6	Traction help	#	Yes
	7 – 8	Ramp level position	Yes; #	Yes
2	1 – 2	Lift axle 1 position	Yes; #	Yes
	3 – 4	Lift axle 2 position	Yes, #	Yes
	5 – 6	Steering axle locking	#	Yes
	7 - 8	ODD status	#	Yes
3	1 – 2	Anti-theft device	#	No
	3 – 8	Not Defined	#	No
4		Not defined	#	No
5 - 6		Nominal vehicle body level, front axle	#	No
7 - 8		Nominal vehicle body level, front axle	#	No

#: transferred to/ from the electronically controlled air suspension system (ECAS)



Kraftfahrt-Bundesamt

D-24932 Flensburg

EWG-BG Nr. e1*72/245*95/54*1206*00

T y p g e n e h m i g u n g s b o g e n

EEC type-approval certificate

Benachrichtigung über die Typgenehmigung

für ein Bauteil gemäß der Richtlinie 72/245/EWG, zuletzt geändert durch die Richtlinie 95/54/EG.

Communication concerning the type-approval

of a type of component with regard to Directive 72/245/EEC, as last amended by Directive 95/54/EC

Typgenehmigungsnummer: **e1*72/245*95/54*1206*00**
Type-approval No.

Grund für die Erweiterung - Reason for extension:
entfällt - not applicable

ABSCHNITT I

- 0.1. Fabrikmarke (Handelsname des Herstellers) -
Make (trade name of manufacturer):
WABCO
- 0.2. Typ - Type
EBS Anhänger Elektronik
- Handelsbezeichnung(en) - general commercial description(s):
Elektronisches Steuergerät, EBS Anhänger Elektronik
- 0.3. Merkmale zur Typidentifizierung, sofern am Bauteil vorhanden
Means of identification of type, if marked on the component:
480 102 ??? 0
- 0.3.1. Anbringungsstelle dieser Merkmale -
Location of that Marking:
Typenschild auf dem Gehäuse
manufacturers plate on the housing
- 0.5. Name und Anschrift des Herstellers -
Name and address of manufacturer:
WABCO Standard GmbH
D-30453 Hannover



Kraftfahrt-Bundesamt

D-24932 Flensburg

EWG-BG Nr. e1*72/245*95/54*1206*00

-2-

- 0.7. Bei Bauteilen und selbständigen technischen Einheiten, Lage und Anbringungsart des EG-Genehmigungszeichens - In the case of components and separate technical units, location and method of affixing of the EEC approval-mark:
auf das mit dem Gehäuse vernietet Typschild gedruckt oder in das Gehäuse erhaben eingegossen oder Klebeschild / printed on the manufacturers plate riveted on the housing or cast as relief on the housing or stick-on-label
- 0.8. Anschrift(en) der Fertigungsstätte(n) - Address(es) of assembly plant(s):
**WABCO Standard GmbH
D-30453 Hannover**

ABSCHNITT II Section II

1. Zusätzliche Angaben (erforderlichenfalls): **siehe Anlage**
Additional information (where applicable): **see Appendix**
2. Für die Durchführung der Prüfungen zuständiger technischer Dienst -
Technical service responsible for carrying out the tests:
**WABCO Standard GmbH
D-30342 Hannover**
3. Datum des Prüfprotokolls - Date of test report:
14.10.1997
4. Nummer des Prüfprotokolls - Number of test report:
11
5. Gegebenenfalls Bemerkungen: **siehe Anlage**
Remarks (if any): **see Appendix**
6. Ort: **D-24932 Flensburg**
Place:
7. Datum: **27.10.1997**
Date:
8. Unterschrift: **Im Auftrag**
Signature:


Asmussen



Kraftfahrt-Bundesamt

D-24932 Flensburg

EWG-BG Nr. e1*72/245*95/54*1206*00

Nebenbestimmungen und Rechtsbehelfsbelehrung

Nebenbestimmungen

Änderungen der Erzeugnisse sind nur mit ausdrücklicher Zustimmung des Kraftfahrt-Bundesamtes gestattet. Verstöße gegen diese Bestimmungen führen zum Widerruf der Genehmigung und werden überdies strafrechtlich verfolgt.

Die Genehmigung erlischt, wenn sie zurückgegeben, oder entzogen wird oder der genehmigte Typ den Rechtsvorschriften nicht mehr entspricht. Der Widerruf kann ausgesprochen werden, wenn die für die Erteilung und den Bestand der Genehmigung geforderten Voraussetzungen nicht mehr bestehen, wenn der Genehmigungsinhaber gegen die mit der Genehmigung verbundenen Pflichten verstößt oder wenn sich herausstellt, daß die genehmigte Einrichtung den Erfordernissen der Verkehrssicherheit nicht entspricht.

Das Kraftfahrt-Bundesamt kann jederzeit die ordnungsgemäße Ausübung der durch die Genehmigung verliehenen Befugnisse nachprüfen und zu diesem Zweck Proben entnehmen oder entnehmen lassen.

Die mit der Erteilung der Genehmigung verliehenen Befugnisse sind nicht übertragbar. Schutzrechte Dritter werden durch diese Genehmigung nicht berührt.

Der Einrichtung wird folgendes EG-Genehmigungszeichen zugeteilt:

e1
021206

Das EG-Genehmigungszeichen muß in seiner Größe und Ausführung den Forderungen der Richtlinie entsprechen.

Jede Einrichtung ist an den aus den Genehmigungsunterlagen ersichtlichen Stel-
gut lesbar und dauerhaft mit dem EG-Genehmigungszeichen zu kennzeichnen.

Zeichen, die zu Verwechslungen mit dem Genehmigungszeichen führen können, dürfen auf den Erzeugnissen nicht angebracht werden.

Rechtsbehelfsbelehrung

Gegen diese Genehmigung kann innerhalb eines Monats nach Bekanntgabe Wider-
spruch erhoben werden. Der Widerspruch ist beim **Kraftfahrt-Bundesamt,**
Fördestr. 16, D-24932 Flensburg, schriftlich oder zur Niederschrift einzulegen.



Kraftfahrt-Bundesamt

D-24932 Flensburg

EWG-BG Nr. e1*72/245*95/54*1665*00

T y p g e n e h m i g u n g s b o g e n

EEC type-approval certificate

Benachrichtigung über die Typgenehmigung

für ein Bauteil gemäß der Richtlinie 72/245/EWG, zuletzt geändert durch die Richtlinie 95/54/EG.

Communication concerning the type-approval

of a type of component with regard to Directive 72/245/EEC, as last amended by Directive 95/54/EC

Typgenehmigungsnummer: **e1*72/245*95/54*1665*00**

Type-approval No.

Grund für die Erweiterung - Reason for extension:

entfällt - not applicable

ABSCHNITT I

- 0.1. Fabrikmarke (Handelsname des Herstellers) -
Mark (trade name of manufacturer):
WABCO Fahrzeugbremsen
Ein Unternehmensbereich der WABCO Standard GmbH
- 0.2. Typ - Type
Trailer Central Electronic

Handelsbezeichnung(en) - general commercial description(s):
Trailer Central Electronic, TCE
446 112 000 0 bis / up to 446 122 015 0
- 0.3. Merkmale zur Typidentifizierung, sofern am Bauteil vorhanden
Means of identification of type, if marked on the component:
446 112 000 0 bis / up to 446 122 015 0
- 0.3.1. Anbringungsstelle dieser Merkmale -
Location of that Marking:
Typschild / Klebeschild auf dem Gehäuse
manufacturer's plate / stick-on-label on the housing
- 0.5. Name und Anschrift des Herstellers -
Name and address of manufacturer:
WABCO Standard GmbH
D-30453 Hannover

...



Kraftfahrt-Bundesamt

D-24932 Flensburg

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- 0.7. Bei Bauteilen und selbständigen technischen Einheiten, Lage und Anbringungsart des EG-Genehmigungszeichens - In the case of components and separate technical units, location and method of affixing of the EEC approval-mark:
**Typschild / Klebeschild auf dem Gehäuse
manufacturer's plate / stick-on-label on the housing**
- 0.8. Anschrift(en) der Fertigungsstätte(n) - Address(es) of assembly plant(s):
**WABCO Standard GmbH
D-30453 Hannover**

ABSCHNITT II Section II

1. Zusätzliche Angaben (erforderlichenfalls): **siehe Anlage**
Additional information (where applicable): **see Appendix**
2. Für die Durchführung der Prüfungen zuständiger technischer Dienst -
Technical service responsible for carrying out the tests:
**WABCO Standard GmbH
D-30342 Hannover**
3. Datum des Prüfprotokolls - Date of test report:
17.03.2000
4. Nummer des Prüfprotokolls - Number of test report:
29
5. Gegebenenfalls Bemerkungen: **siehe Anlage**
Remarks (if any): **see Appendix**
6. Ort: **D-24932 Flensburg**
Place:
7. Datum: **05.05.2000**
Date:
8. Unterschrift: **Im Auftrag**
Signature:

(Asmussen)





Kraftfahrt-Bundesamt

D-24932 Flensburg

EWG-BG Nr. e1*72/245*95/54*1665*00

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9. Das Inhaltsverzeichnis der bei den zuständigen Behörden hinterlegten Typgenehmigungsunterlagen, die auf Antrag erhältlich sind, liegt bei.
The index to the information package lodged with the approval authority, which may be obtained on request is attached.
1. Anlage zum EWG-Typgenehmigungsbogen
Appendix to the EEC type-approval certificate
 2. Inhaltsverzeichnis zu den Beschreibungsunterlagen
Index to the information package
 3. Beschreibungsunterlagen
information package

This side is for technical reasons free