

■ **ELM**
Test Report
TÜH - TB 2004 - 051.00

■ **1st Edition**

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WABCO

Vehicle Control Systems
An American Standard Company



Type : **Electronic Leveling Module**
Manufacturer : **WABCO**

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Test Report

No.: **TÜH - TB 2004 - 051.00**

According to the Directive of the European
Parliament and of the Council
relating to

separate technical unit

ELM Electronic Leveling Module

98/91/ EC dated 14.12.1998

ECE-R 105
including last amended 02
and
chapter 9.2.2 ADR 2002

Approval status		
EEC	Number of approval e1*72/245*95/54*1764*00 (EMC- system type approval)	Date: 19.10.2000

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0. General

- 0.1. Make (trade name of manufacturer) : **WABCO Vehicle Control System**
- 0.2. Type : **ELM Electronic Leveling Module**
Commercial description : **Electronic Leveling Module ELM**
474 100 001 0 to 474 100 099 0
- 0.3. Means of identification of type, if marked on the separate technical unit : **474 100 0XX 0**
- 0.4. Location of that marking : **On the identification plate**
- 0.5. Name and address of manufacturer : **WABCO GmbH & Co. OHG**
Am Lindener Hafen 21
D-30453 Hannover
- 0.6. System description : **Product Specification 474 100 001 0 (DOC.535)**
- 0.7. In the case of components and separate technical units, location and method of affixing of the EEC type-approval mark : **Either printed on the identification plate or bonded to the ECU housing as metallic adhesive label or cast into the housing, raised lettering.**
- 0.8. modifications : **--**

1. Vehicle part

1.1. Description

- 1.1.1.. Variant : **474 100 001 0 to 474 100 099 0**
- 1.1.2.. Ports for connections : **see wiring system**
- X1 (6.1) Pin 1 - 7 : **Supply cable**
(applies to all variants)
- X2 (6.2) Pin 1 - 4 : **remote control unit - cable**
(available according to the device variants)
- 1.1.3. Location
- POWER / SIGNAL** : **Supply cable**
- REMOTE CONTROL** : **cable remote control unit**



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**1.1.4. Connecting cable on the Location at the
 ELM Electronic Leveling Module (Supply cable)**

System terminals Location	Device plug/ device sockets interface plug	Degree of protection	Connecting cable (Product Identification No.:)	Termination device plug/device socket disconnection plug	Degree of protection	Cable end / requirements
<i>Supply cable X 1 Power</i>	7-pole device socket (thereof 3 poles assigned) 894 101 724 2	IP 67	449 344 XXX 0	894 110 136 4 with sealing 897 106 903 4	IP 67	EBS - Electronic
				894 101 696 2 7-pole socket (thereof 3 poles assigned)	IP 67	Diagnostic-connection to 446 300 329 2
<i>Supply cable X 1 Power</i>	7-pole device socket (thereof 3 poles assigned) 894 101 772 2	IP 67	449 334 XXX 0	894 110 136 4 with sealing 897 106 903 4	IP 67	EBS - Electronic
				894 101 696 2 7-pole socket (thereof 3 poles assigned)	IP 67	Diagnostic-connection to 446 300 329 2
				894 101 719 2 2-pole socket	IP 67	Lifting axle
<i>Supply cable X 1 Power</i>	7-pole device socket (thereof 4 poles assigned) 894 101 725 2	IP 67	449 354 XXX 0	894 101 547 2 with sealing	IP 67	VCSI- Electronic
				894 101 714 2 7-pole socket (thereof 5 poles assigned)	IP 67	Diagnostic-connection to 446 300 329 2
<i>Supply cable X 1 Power</i>	7-pole device socket (thereof 4 poles assigned) 894 101 725 2	IP 67	449 355 XXX 0	with openend	--	Vehicle wiring system distribution box Suitable ADR installation required, min. IP54!



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**1.1.4. Connecting cable on the Location at the
 ELM Electronic Leveling Module (Supply cable)**

System terminals Location	Device plug/ device sockets interface plug	Degree of protec- tion	Connecting cable (Product Identification No.):	Termination device plug/device socket disconnection plug	Degree of protec- tion	Cable end / requirements
<i>Supply cable X 1 Power</i>	7-pole device socket (thereof 3 poles assigned) 894 101 724 2	IP 67	449 340 XXX 0	894 110 222 4 with sealing 897 106 903 4	IP 67	VCS II- Electronic
				894 101 696 2 7-pole device socket (thereof 3 poles assigned)	IP 67	Diagnostic- connection to 446 300 329 2
<i>Supply cable X 1 Power</i>	7-pole device socket (thereof 3 poles assigned) 894 101 783 2	IP 67	894 607 345 0	894 101 764 2 with sealing	IP 67	Supply plug socket
				894 110 134 4 with sealing	IP 67	TCS II- Electronic
				7-pole 894 101 782 2 device socket (thereof 3 poles assigned)	IP 67	Remote- Control
<i>Supply cable X 1 Power</i>	7-pole device socket (thereof 3 poles assigned) 894 101 784 2	IP 67	894 607 330 2	with open end	--	ELM- towing vehicle Suitable ADR installation required, min. IP54!
<i>Supply cable X 1 Power</i>	7-pole device socket (thereof 3 poles assigned) 894 101 772 2	IP 67	449 554 000 0	894 110 136 4 with sealing 897 106 903 4	IP 67	EBS- Electronic
				7-pole 894 101 696 2 device socket (thereof 3 poles assigned)	IP 67	Diagnostic- connection to 446 300 329 2
				4-pole 894 101 680 2 device socket (thereof 2 poles assigned)	IP 67	Lift axle circuit-1



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1.1.4. Cable for the Remote Control Unit / Remote Control Box at the ELM Electronic Leveling Module

System terminals Location	Device plug/ device sockets interface plug	Degree of protection	Connecting cable (Product Identification No.:)	Termination device plug/device socket disconnection plug	Degree of protection	Cable end / requirements
<i>Cable with socket</i> X 2 <i>Remote control</i>	4-pole (thereof 4 poles assigned) device plug 894 590 164 2	IP 67	449 633 XXX 0	9-pole (thereof 4 poles assigned) device socket 894 110 058 2 ¹⁾	IP 54 ¹⁾	Connection to 446 056 116 0 Remote Control Unit ¹⁾ installation by means of flat gasket 897 049 824 4 The socket of the device has to be installed in a separate placement box. This will meet the degree of protection IP 54 requirement.
X 2 <i>Remote control</i>	4-pole (thereof 3 poles assigned) device plug 894 590 164 2	IP 67	449 638 XXX 0	7-pole (thereof 4 poles assigned) device plug 894 101 774 2	IP 67	Connection to 446 156 010 0



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1.1.5. Remote Control Unit / Remote Control Box

System terminals	Device plug/ device sockets interface plug	Degree of protection	Remote Control Unit / Remote Control Box (Product Identification No.:)	Termination device plug/device socket disconnection plug	Degree of protection	Cable end / requirements
<i>Cable with socket 449 633 XXX 0</i>	9-pole (thereof 4 poles assigned) device socket to device plug 894 110 058 2	IP 50 (Basis without sealing) 2)	Remote Control Unit 446 056 116 0	---	IP 64	²⁾ Remote Control Unit has to be installed in a separate placement box which meets the degree of protection IP 54 requirements.
<i>Cable with socket 449 638 XXX 0</i>	7-pole (thereof 4 poles assigned) device socket at the device plug 894 101 774 2	IP 67	Remote Control Box 446 156 010 0	---	IP 67	



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2.1. Test Results

- 2.1.1. General : With regard to the a.m. directives, the **ELM – Electronic Leveling Module** was tested for its suitability for trailers effecting the transport of dangerous goods. The scope of testing also included all the peripheral devices stated above. IP 54 is the minimum degree of protection demanded for plug connections in ADR vehicles (GGVS (Act Governing the Road Haulage of Hazardous Materials (Germany))).
- 2.1.2. Tests on vehicle : The applicant presented the **ELM – Electronic Leveling Module** in a semi-trailer.
- Place of testing : On vehicle frame
- Date of testing : 22.04.2004

2.2 Range of Application

- 2.2.1. Vehicle and trailer Specification : All N₂, N₃, O₃ and O₄ manufacturers of vehicles and trailers requiring a Registration Certificate for the transport of certain dangerous goods. (See section 2.2.3.)
- 2.2.2. Designation of vehicle body according to 9.1.1.2 guideline ADR 2002 : vehicle **EX/II** or **EX/III**
 vehicle **FL**
 vehicle **OX**
 vehicle **AT**
- 2.2.3. Definition vehicles and trailers
- 2.2.3.1. Definition of N₂ and N₃ vehicle (for chapter 2.2.2.) : According to Framework Directive 70/156/EEC, annex II, clause A, subclause 2
 According to Framework Directive 70/156/EEC, Motor vehicles with at least four wheels designed and constructed for the carriage of goods.
- 2.2.3.1.1. Vehicle category N₂ : Vehicles designed and constructed for the carriage of goods and having a maximum mass exceeding 3,5 tonnes but not exceeding 12 tonnes.
- 2.2.3.2.2. Vehicle category N₃ : Vehicles designed and constructed for the carriage of goods and having a maximum mass exceeding 12 tonnes.
- 2.2.3.2. Definition of O₃ and O₄ trailers (for chapter 2.2.2.) : According to Framework Directive 70/156/EEC, annex II, clause A, subclause 3
 Trailers (including semi-trailers)
- 2.2.3.2.1. Vehicle category O₃ : Trailers with a maximum mass exceeding 3,5 tonnes but not exceeding 10 tonnes.
- 2.2.3.2.2. Vehicle category O₄ : Trailers with a maximum mass exceeding 10 tonnes.



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2.2.4. According to **ADR 2002, part 9,**
chapter 9.1, clause 9.1.1.2 :

2.2.4.1. vehicle EX/II or EX/III : A vehicle intended for the carriage of explosives or objects including explosive material (class 1)

2.2.4.2. vehicle FL : A vehicle intended for the carriage of liquids with a flashpoint of not more than 61 °C (with the exception of Diesel fuels according to the standard EN 590:1993, gas oil or heating oil (light) – UN number 1202 – with a flashpoint according to standard EN 590:1993) or flammable gases, in fixed tanks, demountable tanks or MEGC having a volumetric capacity of more than 3 m³ or in fixed tanks or mountable tanks having a volumetric capacity of more than 1 m³ for the carriage of flammable gases.

2.2.4.3. vehicle OX : A vehicle intended for the carriage of hydrogen peroxide, stabilized, or of hydrogen peroxide, aqueous solution, stabilized with more than 60 % hydrogen peroxide (class 5.1 UN number 2015) in fixed tanks, demountable tanks having a volumetric capacity of more than 3 m³ or in fixed tanks or mountable tanks having a volumetric capacity of more than 1 m³ .

2.2.4.4. vehicle AT : A vehicle other than those of type FL or OX intended for the carriage of dangerous goods in fixed tanks, demountable tanks or MEGC having a volumetric capacity of more than 3 m³ or in fixed tanks or mountable tanks having a volumetric capacity of more than 1 m³ or a battery vehicle having a volumetric capacity of more than 1 m³ which is not a vehicle FL.



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- 2.2.5. Requirements and instructions relating to the homologation of installation
FL-vehicles
according 2.2.4.2. : In its subclause 9.7.8.2, the ADR gives an explanation of the classification of zones 0 and 1. Together with the application of the relevant explosion protection regulations and their instructions for implementation, these explanations are the basis for the general indications stated here.
- 2.2.5.1. Zone 0
Zone 0 comprises areas in which an explosive gas atmosphere is present continuously or for long periods. In case of tank trucks, vehicles having tanks and battery vehicles, this is, for instance,
- the internal of the tanks, armatures and lines used for filling or delivering and for gas return
- 2.2.5.2. Zone 1
Zone 1 comprises areas in which an explosive gas atmosphere is likely to occur in normal operation. In case of tank trucks, vehicles having tanks and battery vehicles, this is, for instance,
- the internal of closed armature boxes
- within a radius of 0,5m around the armatures
- within a radius of 0,5m around the venting equipment which cannot be shut off and is open under normal operating conditions. (such as tipping valve)
- within a radius of 0,5m around the safety valves
- 2.2.5.3. Zone 2
Zone 2 comprises areas in which an explosive gas atmosphere is not likely to occur in normal operation and, if it does occur, is likely to do so only infrequently and will exist for a short period only.



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2.3. Restrictions

- 2.3.1. Ground return line : When fitting and installing a **ELM – Electronic Leveling Module** into a vehicle or a trailer having the ADR certificate (indicating suitability for the carriage of dangerous goods), the complete calculation of the actual current load via negative terminal has to be conducted.
In these vehicles the ground return line shall not be led via vehicle frame.
The maximum current load shall not exceed the device-specific load of the connection
- 2.3.2. Installation position of ELM – Electronic Leveling Module : Here, the suitable location on the vehicle or trailer has to be found first. The installation shall be effected according to system documentation (Installation Instruction).
The installation in FL vehicles (according to chapter 2.2.5.) should be made outside the areas of zone 0 and 1!
In ADR vehicles, additional batteries have to be operable by means of a disconnection switch (Emergency OFF).
- 2.3.3. Fastening of cable : In order to prevent any vibration transfer to connectors or connector sealings, the free cable length between connector and cable clip shall not exceed 30 cm (except the cable ensuring the connection to the towing vehicle).
Fastening of cables shall be such to prevent any chafing.



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2.4. **Summary of assessment** : **From the technical point of view, there are no objections to the installation of ELM – Electronic Leveling Module in a vehicle or trailers which according to 5205 ADR 2002 are subject to the special rules defined for the transport of dangerous goods, if installation is effected according to the restrictions stated above.**

2.5. **Other information**

Place of testing : Darmstadt
Date of testing : 21. April 2004

3. **Appendices**

3.1. **Pictures** : ELM – Electronic Leveling Module
block diagram
Wiring diagram ELM - VCS
Wiring diagram ELM - EBS
Wiring diagram ELM – EBS with lift axle
Wiring diagram ELM – EBS with circuit-1 lift axle
VCS Unit with electronic leveling module (ELM)
EBS Unit with electronic leveling module (ELM)



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4. Statement of conformity

The system description given in section No. 0.6. and the vehicle type stated in this description -
- conform to - the directive stated above

This report includes pages 1 to 12.

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TEST LABORATORY
- Automotive -
TÜV Technische Überwachung Hessen GmbH
accredited by accreditation authority of Kraftfahrt-Bundesamt,
Federal Republic of Germany

DAR-registration number:
KBA-P 00005-95

64285 Darmstadt, **22.06.2004**

TÜH 11970



A handwritten signature in blue ink, appearing to be 'Preiß'.

Dipl.-Ing. **Preiß**

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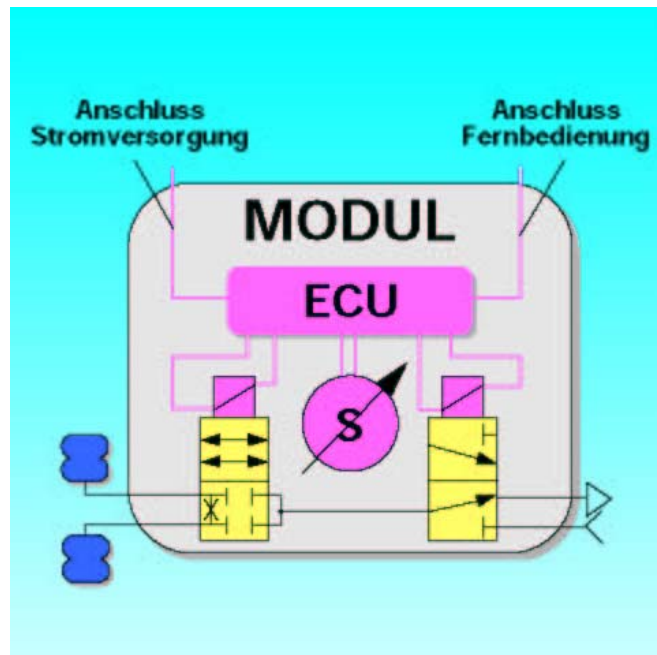
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Pictures

Appendix 3.1.



ELM – Elektronisches Luftfeder-Modul
für luftgefederte Anhängfahrzeuge

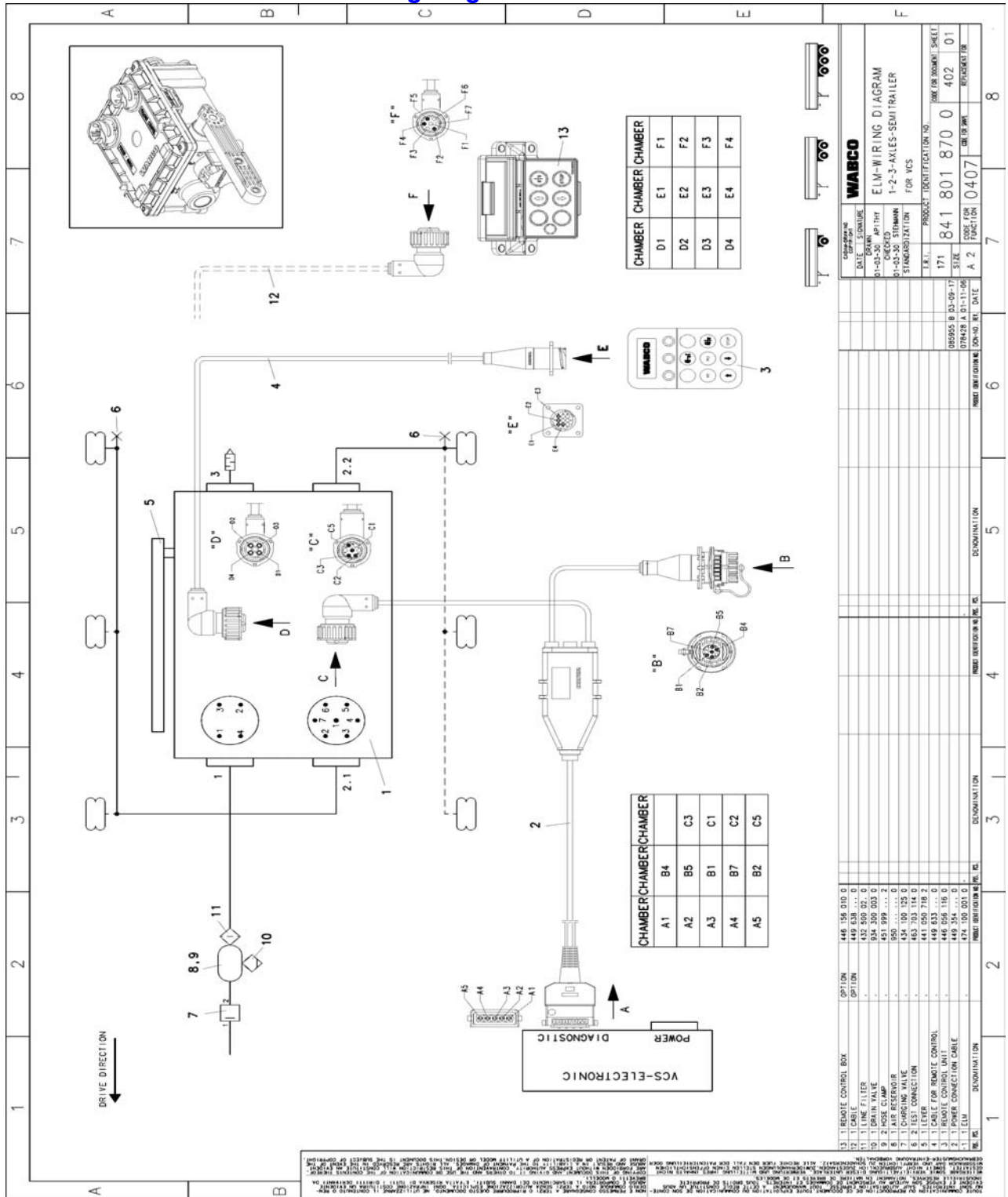


Wiring diagram

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Pictures Appendix 3.1.

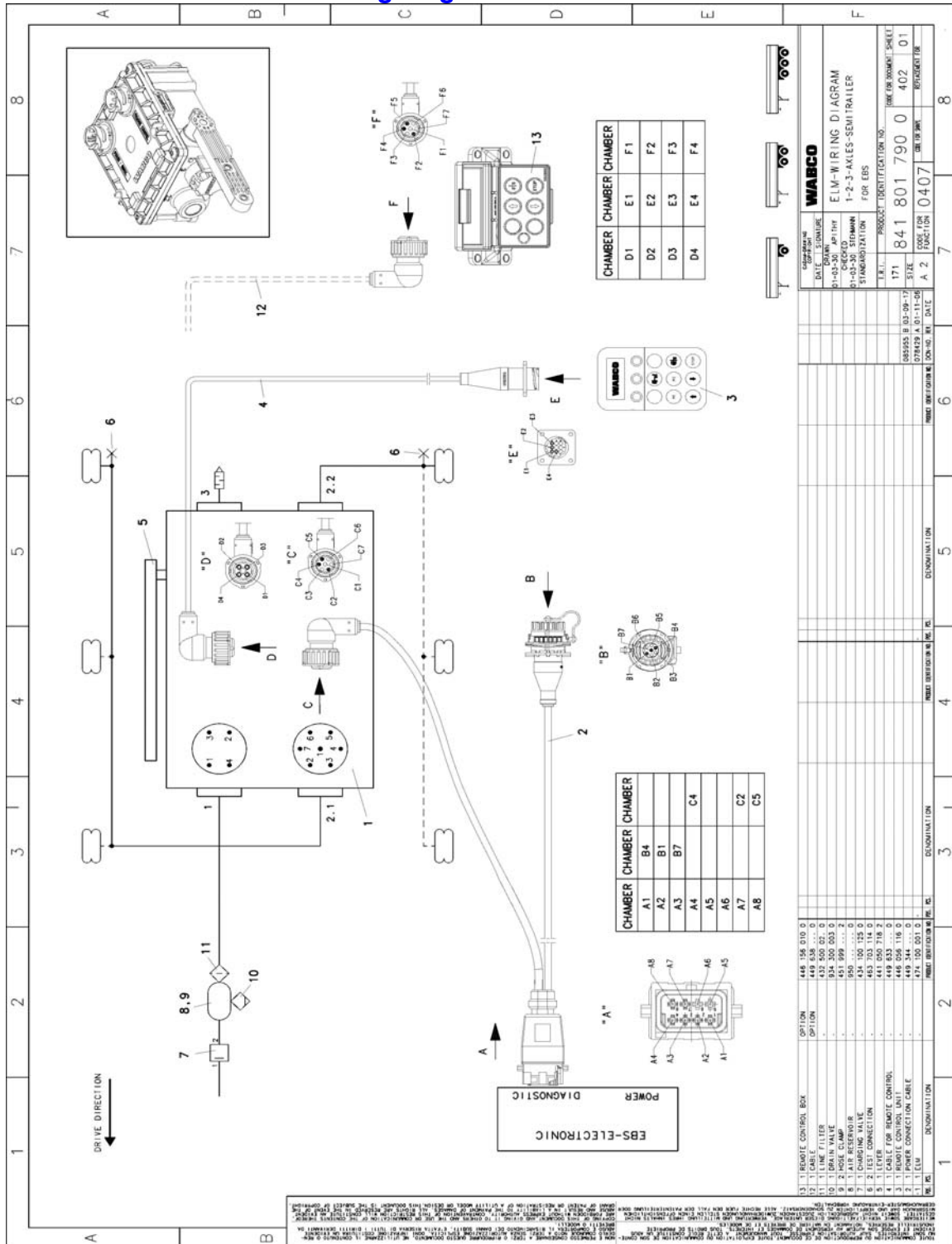
Wiring diagram ELM – VCS





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Pictures Appendix 3.1.
Wiring diagram ELM – EBS

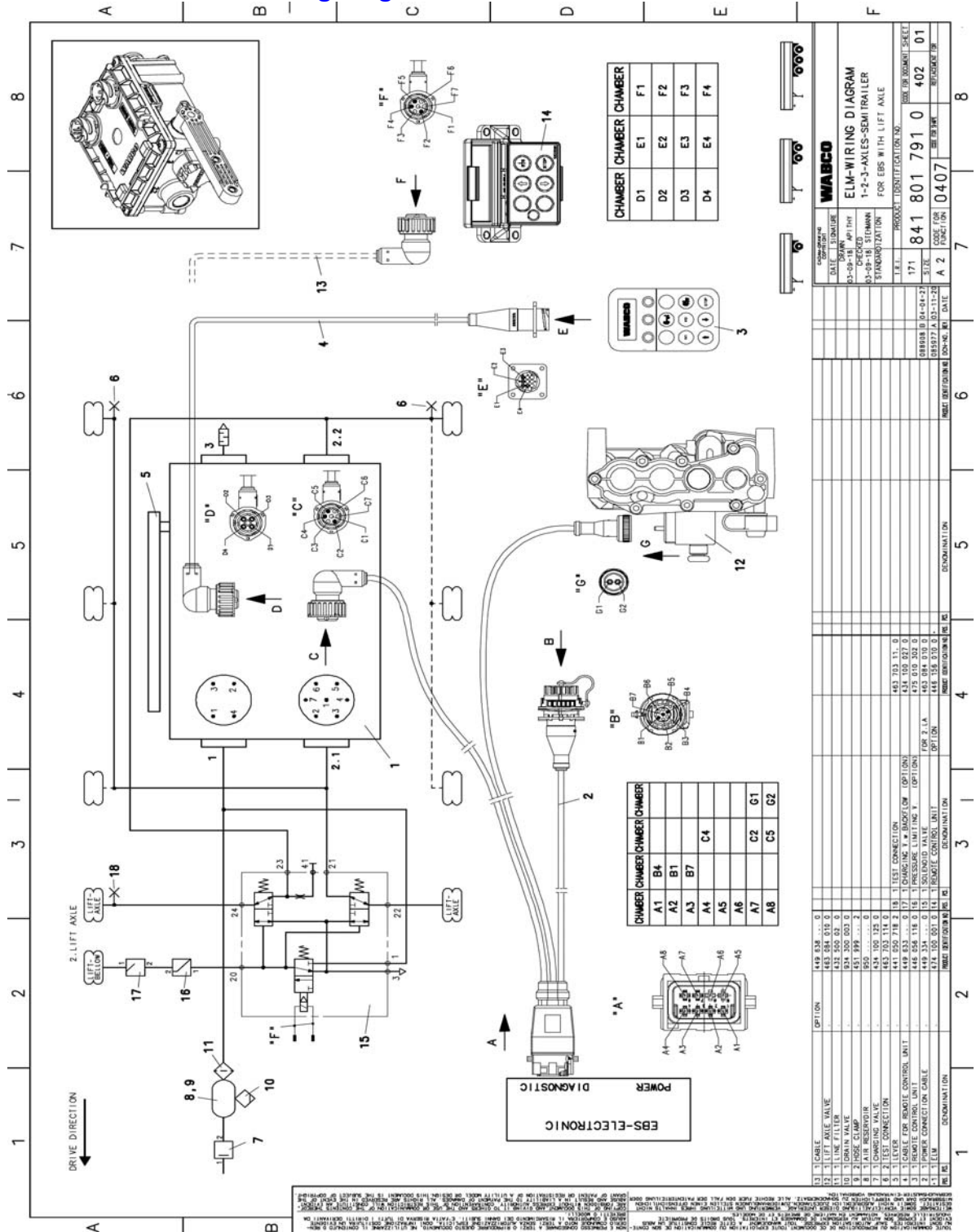




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Pictures **Appendix 3.1.**

Wiring diagram ELM – EBS with lift axle

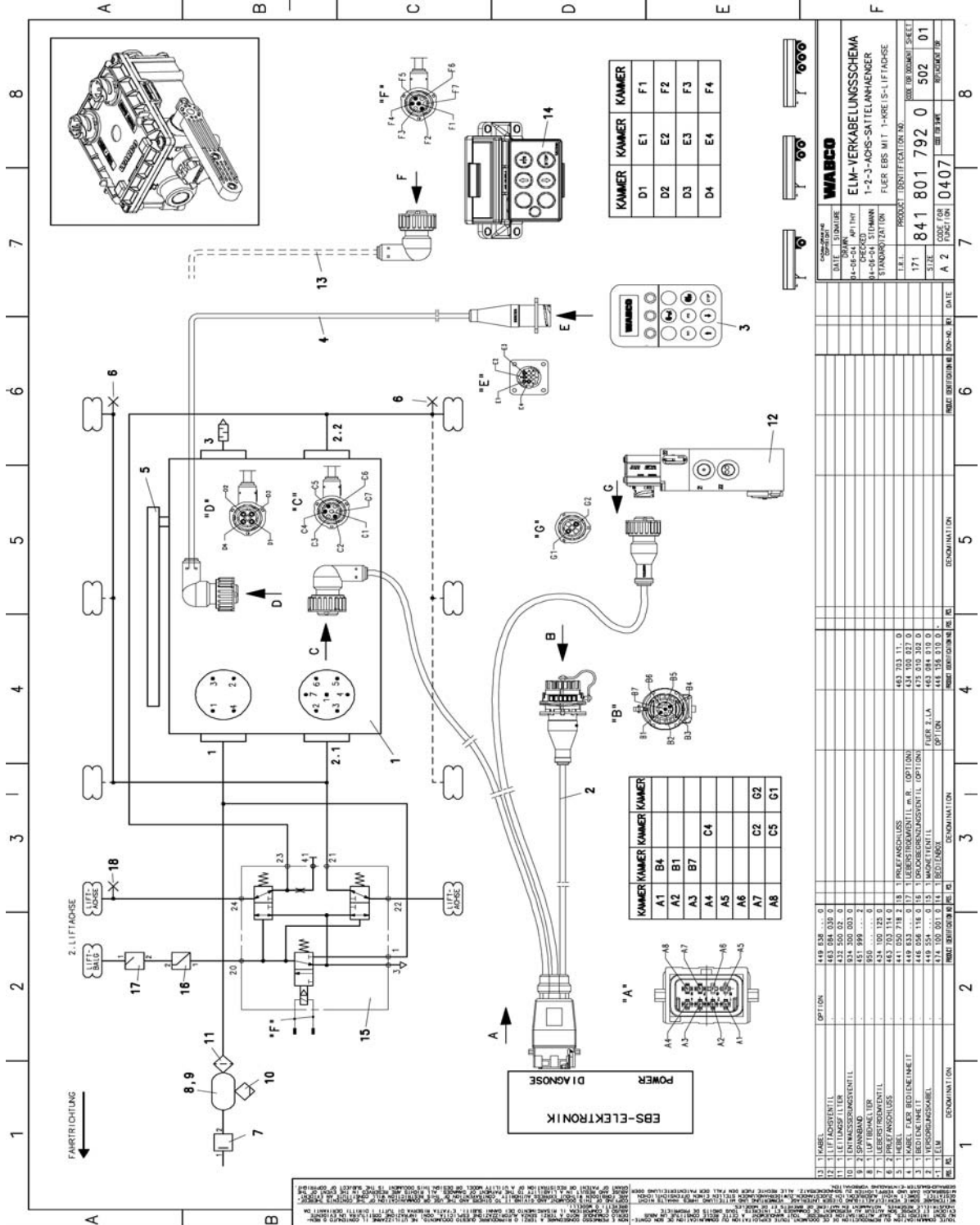




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Pictures Appendix 3.1.

Wiring diagram ELM – EBS with circuit-1 lift axle



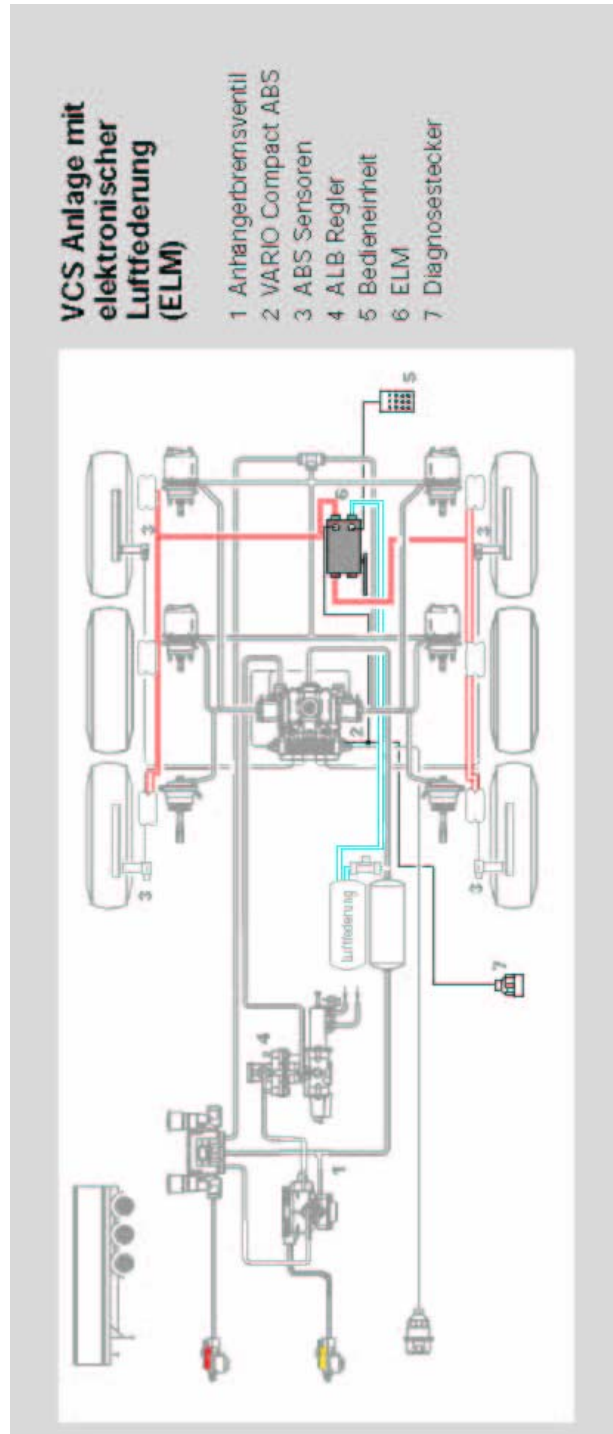
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Pictures

Appendix 3.1.

VCS Unit with electronic leveling module (ELM)



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Pictures

Appendix 3.1.

EBS Unit with electronic leveling module (ELM)

