Trailer ABS

for Multiple Trailer Combinations

WABCO

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for Multiple Trailer Combinations

System Description

Edition 1

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Area of application

This publication applies to employees of workshops or trailer manufacturers for repairing utility vehicles with a knowledge of vehicle electronics.

This publication describes the system structure, functions and components for multiple Trailer ABS applications, as used in Brazil for example.

1 Symbols used

DANGER

Imminent hazard situation which can cause serious personal injury or death if the safety instruction is not observed.

WARNING

Potential hazard situation which can cause death or serious personal injury if the safety instruction is not observed.

CAUTION

Potential hazard situations that can cause minor or moderate personal injury if the safety instruction is not observed.

Important instructions, information, or tips that you should always observe.

Reference to information, publications etc. on the Internet

- List

– Step
  ➔ Consequence of an action

2 Disclaimer

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3 Safety Instructions

Observe all necessary provisions and instructions

- Read this publication thoroughly.
  Adhere to all instructions, information and safety information to prevent injury to persons and damage to property.
  WABCO will only guarantee the safety, reliability and performance of their products and systems if all information in concerned publications is adhered to.
- Workshops must strictly follow the specifications and instructions of the vehicle manufacturer.
- Adhere to all company safety regulations as well as regional and national regulations.

Meet all provisions for a safe work environment

Only trained and qualified persons are to perform any work on the vehicle.

- Use personal protective equipment if required (protective goggles, respiratory protection, ear protectors, etc.).

Pedal actuations can lead to severe injuries if persons are in the vicinity of the vehicle. Make sure that pedals cannot be actuated as follows:

- On trucks, switch the gearbox to "neutral" and actuate the hand brake.
- Use chocks to secure the vehicle against rolling.
- Fasten a visible note to the steering wheel indicating the work is being performed on the vehicle and that the pedals must not be operated.

Avoid electrostatic charge and uncontrolled discharging (ESD)

Observe the following during construction and assembly of the vehicle

- Prevent potential differences between components (e. g. axles) and the vehicle frame (Chassis).
  Make sure that the resistance between metallic parts of the components to the vehicle frame is lower than 10 Ohm.
  Connect moving or insulated vehicle parts such as axles electrically conductive with the frame.
- Prevent potential differences between the towing vehicle and the trailer.
  Make sure that an electrically conductive connection is made via the coupling (king pin, fifth wheel, claws with pins) between metal parts on the towing vehicle and the hitched trailer, even without a cable being connected.
- Use electrically conductive bolted connections when fastening the ECUs to the vehicle frame.
- Run the cable in metallic casing if at all possible (e. g. inside the U-beam) or behind metallic and grounded protective plating, to minimise the influence of electro-magnetic fields.
- Avoid the use of plastic materials if they can cause electrostatic charging.
- Connect the ground line of the ISO 7638 plug connector (pin 4) to paintwork ground (vehicle chassis) during electrostatic coating.

During repair and welding work on the vehicle observe the following

- Disconnect the battery - if installed in the vehicle.
- Disconnect cable connections to devices and components and protect the connectors and connections from contamination and humidity.
- Always connect the grounding electrode directly with the metal next to the welding position when welding to prevent magnetic fields and a current flow via the cable or components.
- Make sure that the current is well conducted by removing paint or rust.
- Prevent heat influences on devices and cabling when welding.

4 Introduction

Purpose

Anti-lock brake systems (ABS) must prevent the vehicle's wheels from locking as a result of excessively powerful actuation of the service brake, mainly on slippery road surfaces.

As a result, cornering forces on braked wheels should be maintained even during full braking to ensure that the vehicle or vehicle combination remains stable and can still be steered as far as physically possible. At the same time, the friction contact between tyres and the road surface should be fully optimised to reduce the braking distance and make the vehicle decelerate more rapidly.

Why ABS?

Despite the advanced development status of commercial vehicle brakes, potential accident situations often occur when braking on slippery road surfaces. During full or even partial braking on a slippery road, it may no longer be possible to transmit the full braking force onto the road due to the low coefficients of friction between the tyres and the carriageway. The braking force becomes excessive and the wheels lock. When the wheels are locked, they cease to provide any traction on the road and they transfer virtually no cornering forces (steering and tracking forces).

This often has dangerous consequences:

- The vehicle cannot be steered.
- The vehicle swerves despite countersteering and starts to skid.
- The braking distance is increased significantly.
- Tractor-trailer combinations or semitrailer trains may show the dreaded breakaway or jackknifing effect.

Advantages of ABS

Only the Anti-Lock Brake System (ABS) guarantees

- stable braking characteristics on all road surfaces
- that the vehicle can still be steered and the braking distance is reduced
- that vehicle combinations do not jackknife
- that tyre wear is reduced

Limits of ABS

Although ABS is an effective safety device, it cannot overcome the limits of driving dynamics. Even a vehicle fitted with ABS will become uncontrollable if driven too fast around a bend.

ABS must therefore never be seen as a carte blanche for driving in a manner inappropriate to conditions or failing to maintain the correct safety distance.

Technical Documents

Further technical documents can be found on the Internet by entering the document number or an index word (e.g. VCS) in the WABCO Online Product Catalogue INFORM: http://www.wabco-auto.com => *Product Catalogue INFORM*

Technical Document	Number of Technical Document
VCS II – System description (Part 1)	815 340 008 3
VCS II – Installation instructions with overview of cables (Part 2)	815 340 009 3
VCS II – Poster "Cables & connections"	815 340 145 3
VCS II – Poster "ABS for Trailers"	815 340 146 3
Pole Wheel – Outline drawing	895 905 568 4 (doc. code 005) rev. A - 2011-12-02
Pole Wheel – Assembly Instruction	895 905 568 4 (doc. code 092) rev. A - 2012-03- 05
Sensor Adaptation – Product Specification	441 032 100 0 (doc. code 035/435) rev. A - 2004-12-03
Pole Wheel – CAD Data Model	895 908 868 4____a12.prt rev. -.1 - 2011-11-03

4.1 System Description and Function

4.1.1 Design of the ABS

The Vario Compact ABS (VCS) is designed for all-purpose air-braked trailers. The scope of the system extends from 2S/2M to 4S/3M configurations. ABS is a complement to the conventional braking system and essentially consists of:

- two to four inductive speed sensors and toothed pole wheels (for directly picking up the speed at the wheels)
- two to three electro-pneumatic modulators with the following functions:
  - building up braking pressure
  - maintaining braking pressure
  - reducing braking pressure
- an Electronic Control Unit (ECU) with three control channels divided into three functional groups:
  - input circuit
  - main circuit
  - safety circuit
  - valve actuation

In the input circuit the signals, generated by the respective inductive sensors, are filtered and converted into digital information for determining period lengths.

The main circuit consists of a microcomputer. It contains a complex program for the computation and logical operation of the control signals and for outputting the actuating variables for the valve control system. The safety circuit monitors the ABS system, i. e. the sensors, solenoid control valves, ECU and wiring, before the vehicle moves off and also whilst it is in motion, regardless of whether or not the brakes are operated. It alerts the driver of any faults or defects by means of a warning lamp and can deactivate the entire system or parts of it as required. While the conventional brake remains operational, only the anti-lock system is completely or partially deactivated. The valve actuation contains power transistors (output stages) which are actuated by signals from the main circuit and switch the current for actuating the control valves.

ABS relay valves as well as ABS solenoid valves can be used. The choice depends on the braking system and in particular the response time. The corresponding electronic control unit must be used. The normal build-up and reduction of braking pressure as requested by the driver will not be influenced unless the ABS relay valves are electrically actuated.

Self-Configuration

For convenience, the ECU is programmed with a mechanism for self-configuration. During start-up, the modulator unit automatically detects which components are connected. If no failure is detected, this configuration is accepted and memorised.

As supplied from the factory, all devices are programmed as 2S/2M.

If a different configuration (4S/2M or 4S/3M) is detected during initial start-up, it will be accepted automatically. What is referred to as “baptising” during the initial start-up cycle is no longer required. This feature only applies if the new configuration detected is of a higher order (i.e. from 2S/2M to 4S/2M or 4S/3M) but not the other way round, in order to avoid the configuration being modified automatically when individual components are removed (e.g., modulator A).

If the configuration needs to be changed from a higher to a lower order, please use the diagnostic tools.

4.1.1.1 Modular System Structure

The Vario Compact ABS is a modular unit that supports 2S/2M, 4S/2M and 4S/3M system configurations. This means a suitable variant is available for virtually every vehicle type. At least one sensor and one modulator constitute a control channel in this respect.

2S/2M Configuration

With a 2S/2M configuration, one sensor and one modulator of one side of the semitrailer are respectively integrated to form a control channel. Any other wheels on one side are included in the control function indirectly. The braking forces are controlled according to the principle of what is known as Individual (Wheel)-Control. In this case, each side of the vehicle is controlled separately depending on road conditions and the brake characteristics. If unsensed wheels of a multi-axle vehicle are controlled with this configuration, the system is called "Indirect Individ-ual Control".

In some instances the 2S/2M configuration is also intended for a control per axle. The 2S/2M Diagonal Axle Control was developed for this purpose. Here the brake cylinders of one axle are respectively connected to an ABS modulator (control per axle). The modulator of the first axle is controlled by a sensor on the right side of the vehicle and the modulator of the second axle is controlled by a sensor on the left side of the vehicle (diagonal arrangement). In this way, the braking pressure can be adjusted separately for each axle. On µ-split roads however, the unsensed wheel on the lower friction value will lock.

4S/2M Configuration

With a 4S/2M configuration, two sensors are located on each vehicle side. The sensor signals from both wheels are used by the electronic control unit for controlling one modulator. Here too control is separate for each side. The braking pressure is the same for all wheels on each side. The two sensed wheels of this vehicle side are controlled according to the principle known as Modified Sidewise Control. In this case, the first wheel to lock on one side of the vehicle is the determining factor for ABS control. The two modulators on the other hand are controlled individually. The principle of individual control is applied to both sides of the vehicle. When unsensed wheels of a multi-axle vehicle equipped with this configuration are controlled, the system is called Indirect Sidewise Control.

4S/3M Configuration

A 4S/3M configuration is to be preferred for full trailers or semitrailers with a trailing steering axle.

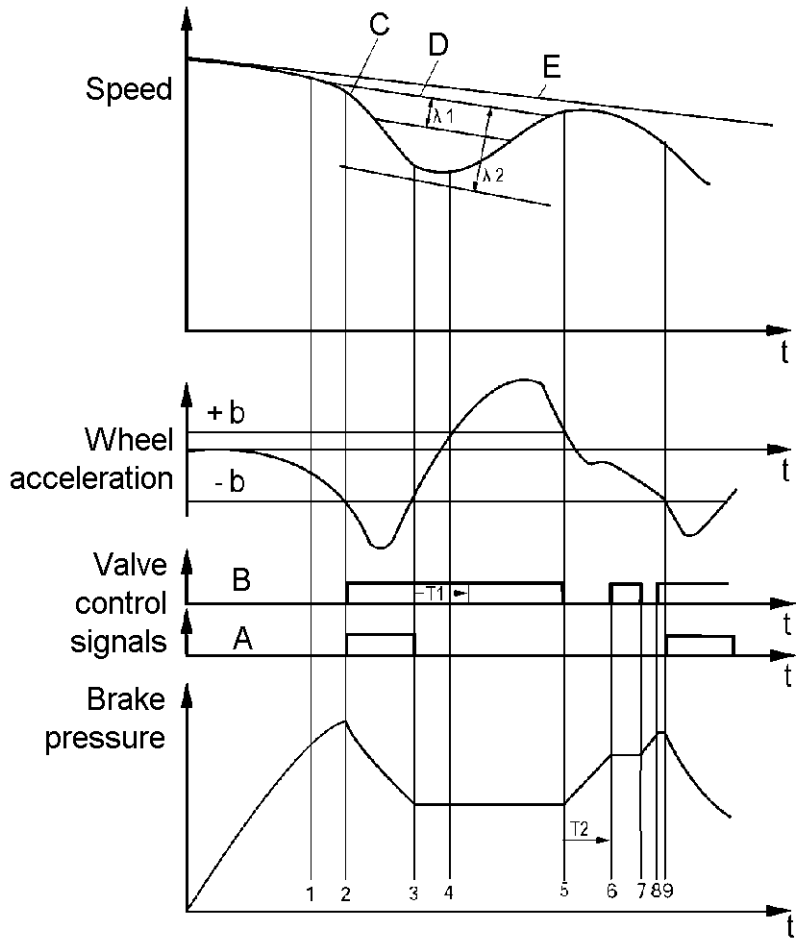
Two sensors and one modulator are located on the steering axle. Control is carried out per axle because the braking pressure is identical on all wheels of this axle. The wheels of the L-axle are controlled by the ABS modulator A. Control is based on the Modified Axle Control principle. One sensor and one modulator are used for a sidewise control of an additional axle. These wheels are individually controlled.

Valid for all configurations: Additional brake cylinders for other axles can be connected to the available modulators in addition to the brake cylinders of the sensed wheels. These indirectly controlled wheels do not send any information to the electronic control unit. Consequently it is not possible to ensure the lock efficiency of these wheels.

4.1.2 Description of an ABS Control Cycle

The figure below shows an example of a control cycle with the most important control variables: wheel deceleration threshold -b, wheel acceleration threshold +b as well as the slip thresholds λ1 and λ2.

ABS Control Cycle



Key			
A	Inlet valve	**B**	Outlet valve
C	Wheel speed	**D**	Reference speed
E	Vehicle speed		
T1	Time	**T2**	Time
λ1	Slip threshold	**λ2**	Slip threshold
+b	Wheel acceleration threshold	**-b**	Wheel deceleration threshold

Increasing the braking pressure will gradually decelerate the wheel.

At point 1, the wheel deceleration exceeds a value that the vehicle deceleration cannot physically exceed. The reference speed, which up to this point corresponds to the current wheel speed, departs from the wheel speed value and decreases according to a predefined vehicle deceleration. A maximum value is calculated

from the determined reference speeds and this value is generally used as a common reference speed for the wheels. The respective wheel slip is calculated from the respective wheel speed and the common reference speed.

At point 2, the deceleration threshold -b is exceeded. The wheel runs into the unstable range of the μ-λ-slip curve. Now the wheel has reached its maximum braking force so that each further increase of braking torque only increases the wheel deceleration. The braking pressure is therefore rapidly so that the wheel deceleration will also decrease after a short time. The deceleration time is essentially determined by the hysteresis of the wheel brake and the course of the μ-λ-slip curve within the unstable range. Only after passing through the wheel brake hysteresis will a further reduction in pressure result in a decrease in wheel deceleration.

At point 3, the deceleration signal -b drops when the value falls below the threshold and the braking pressure is maintained at a constant level for a defined time T1.

Generally, the wheel acceleration exceeds the acceleration threshold +b (point 4) during this holding time. While the threshold is exceeded, the braking pressure remains constant. When (for example due to a low coefficient of friction) the +b signal is not generated within the time T1, the braking pressure is further reduced via the slip signal λ1. The higher slip threshold λ2 is not be reached in this control cycle.

The +b signal drops off at point 5 after falling below the threshold. The wheel is now within the stable range of the μ-λ-slip curve and the μ-value used is slightly below the maximum value. Now, for the duration of a determined time T2, the braking pressure level is increased steeply to override the hysteresis of the brake. Time T2 is predefined for the first control cycle, then it is newly calculated for each subsequent control cycle. After this steep regulating phase, the braking pressure is increased by pulsing, i.e. by alternating braking pressure maintenance and braking pressure input.

The principle logic described above is not rigidly predefined but adapted to the respective dynamic wheel behaviour on the various coefficients of friction, i.e. the system is working adaptively. The thresholds for wheel deceleration, wheel acceleration resp. wheel slip are also not constant but depend on many parameters such as the wheel speed. The number of control cycles depends on the dynamic behaviour of the entire control circuit of ABS modulator unit - wheel brake - wheel - road surface. The adhesion coefficient is also significant. Usually there are 3 to 5 cycles per second, but fewer on wet ice.

4.1.3 Warning Lamp Control

An output is provided for controlling the trailer ABS warning lamp (pin 7 on connector X1) which allows warning lamp control in accordance with ISO 7638. The warning lamp is activated by connecting to ground inside the ECU – even when the ECU is switched off.

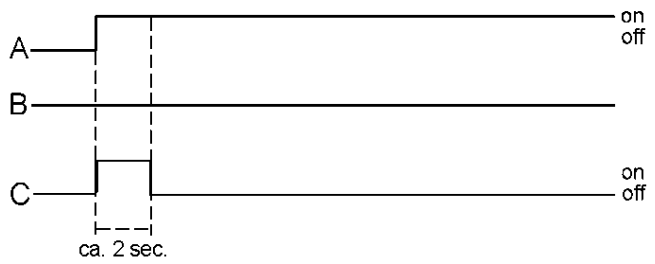
Warning Lamp Sequence

The VCS II can carry out two different warning lamp sequences. The section below describes these alternatives, which can be switched at any time by parameter settings.

Warning lamp sequence 1

The first option is the most frequently used function in commercial vehicles and cars: After the ignition is switched on, the warning lamp goes out again after approx. 2 seconds if the vehicle is stationary and if no static fault is detected (i.e one that can be identified while the vehicle is at a standstill).

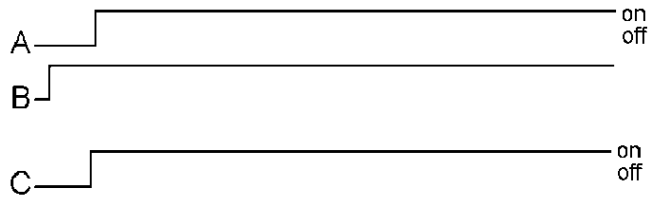
No current fault



A = Ignition; B= Fault condition; C = Warning lamp

If a current fault is present after the ignition is switched on, the warning lamp will not go out.

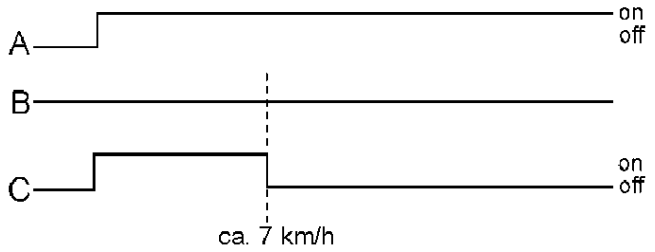
Current fault after switching on



A = Ignition; B= Fault condition; C = Warning lamp

If during the last trip a fault occurred at an ABS speed sensor which can only be detected while driving, the warning lamp will only go out once the vehicle exceeds a speed of approx. 7 km/h and it is ensured that the sensor signal is available again.

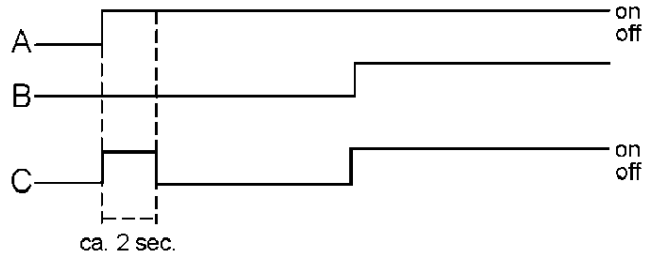
Sensor fault during last trip



A = Ignition; B= Fault condition; C = Warning lamp

If a fault is detected during the current trip, the warning lamp remains on continuously.

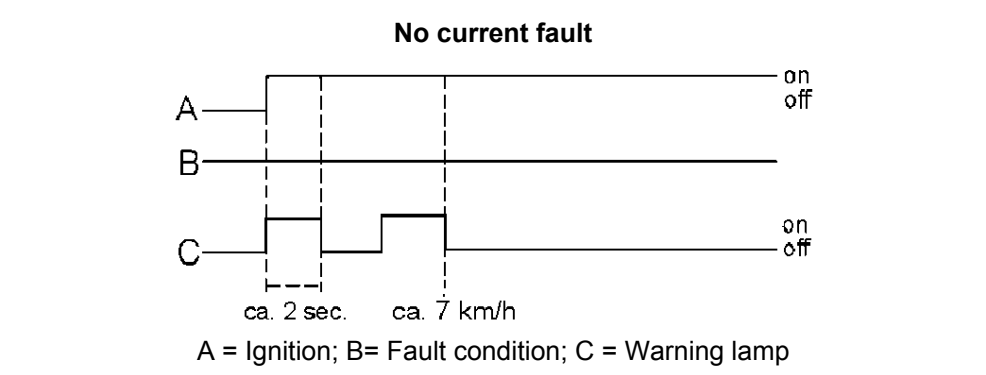
Current fault while driving



A = Ignition; B= Fault condition; C = Warning lamp

Warning lamp sequence 2

With the second option the warning lamp comes on again once the vehicle is at a standstill, if no static fault is detected. Once the vehicle exceeds a speed of approx. 7 km/h, it goes out again completely.



A = Ignition; B= Fault condition; C = Warning lamp

If a current fault is present after the ignition is switched on, the warning lamp is not switched off. This case is identical to warning lamp sequence 1, case B.

Other Warning Lamp Functions

If the vehicle does not start driving over a period of one hour while the ignition is on, the warning lamp lights up. This avoids a situation where an ABS that does not receive a sensor signal due to a very large sensor air gap (after the brake was repaired for example) always switches off the warning lamp without detecting a fault. If this condition is detected, the warning lamp is switched off immediately as soon as sensor signals are available. The period of one hour can be composed of several smaller periods (e.g., 4 times 15 minutes).

4.1.4 Fault monitoring

During operation, the ECU is monitored by an integrated safety circuit. When the ABS system detects faults,either the failed components themselves are switched off (selective switch-off) or the complete ABS system. The normal braking function remains in operation. Fault mode or fault frequencies are durably memorised in an EEPROM (permanent memory). They can be read out using diagnostic devices.

The control channels – still available due to selective switch-off – enable partial availability of the ABS system to ensure good braking effect and secondary vehicle stability.

4.1.5 Diagnostic Interface

The ECU is equipped with a diagnostic interface according to ISO standard 14230. As diagnostic protocol the KWP2000 standard (ISO 14230-2) or JED 677 is used.

These interfaces enable the following functions:

- to read out and delete type and frequency of the memorized faults
- to carry out function tests
- to modify system parameters
- to adjust GenericIO functions

The diagnostic K-cable is located on the plug X6, pin 8 (body identification MOD RD 7). Moreover, also diagnosis via the CAN interface will be supported if connected to ISO 7638 7-pin harnesses.

4.1.6 Recognition of lifting axles

If a trailer is equipped with a lifting axle and this is, fitted with speed sensors, the ECU automatically detects whether this axle is lifted.

CAUTION

– Please do not install sensors c and d (the two sensor connectors in the middle of the ECU) at the lifting axle.
The lifting axle must only be equipped with the sensors e and f (outer sensor connectors of the ECU).

5 System for Road Trains and BiTrains

Special vehicle concepts such as BiTrains or RoadTrains, for example, require the use of multiple Trailer ABS systems on different axle units or trailer modules.

Up to 3 ABS systems need to be connected via ISO 7638 for the ABS power supply in multiple trailer combinations.

In addition, all connected ABS systems must work properly if connected to ISO 1185 or ISO 12098 only.

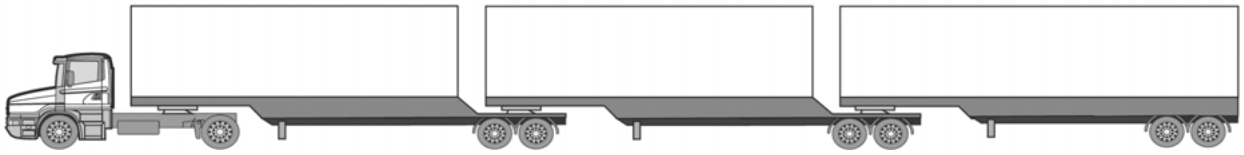


fig. 5-1: Typical Roadtrain combination of 3 semi trailer

To allow a simple and safe RoadTrain or BiTrain application, WABCO has developed several, perfectly matched, components.

In particular, it has to be taken into account that the ABS modulators operate with a low power consumption to avoid increasing cross sections of the power or light harness. The specific variant **400 652 149 0** has been designed for this purpose.

It must be assured that only this variant is used for multiple trailer configurations.

However, all described components can be used for trailers in single truck-trailer combinations, too.

5.1 Principle System Architecture

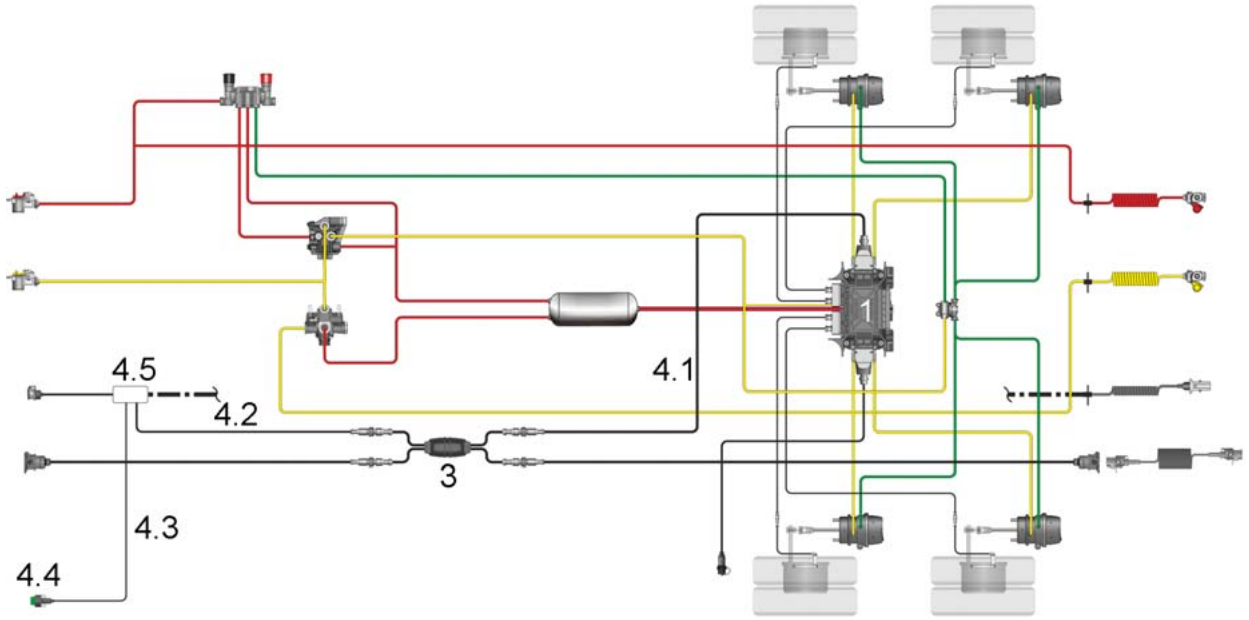


fig. 5-2: Principle system diagram for Road Train and BiTrain applications

Key			
1	Modulator 400 652 149 0 with reduced power consumption	**3**	Distributor for ISO 7638 and 24N operation 894 600 052 0
4.1	Cable 449 360 000 0 to connect ECU and allow 24N operation	**4.2**	24N and Warning Lamp Harness 449 380 000 0
4.3	Warning Lamp Harness 449 900 000 0	**4.4**	Green Warning Lamp 446 105 523 2
4.5	Distribution box light 446 122 633 0		

5.2 Examples of Trailer Configurations

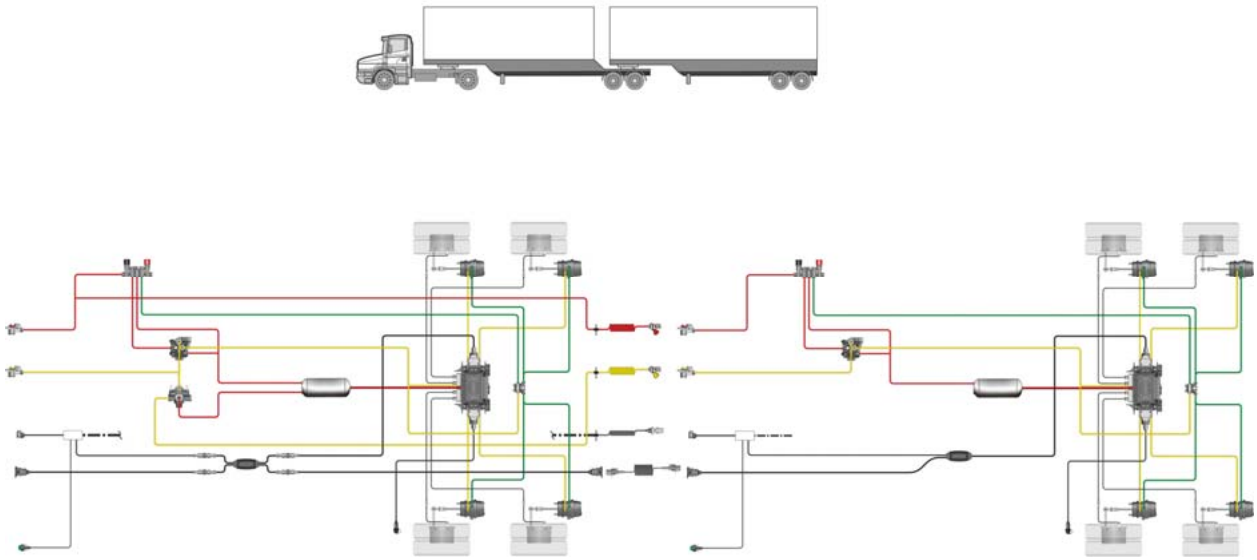


fig. 5-3: Typical BiTrain connection of 2 semi trailer (shows a 4S/2M configuration)

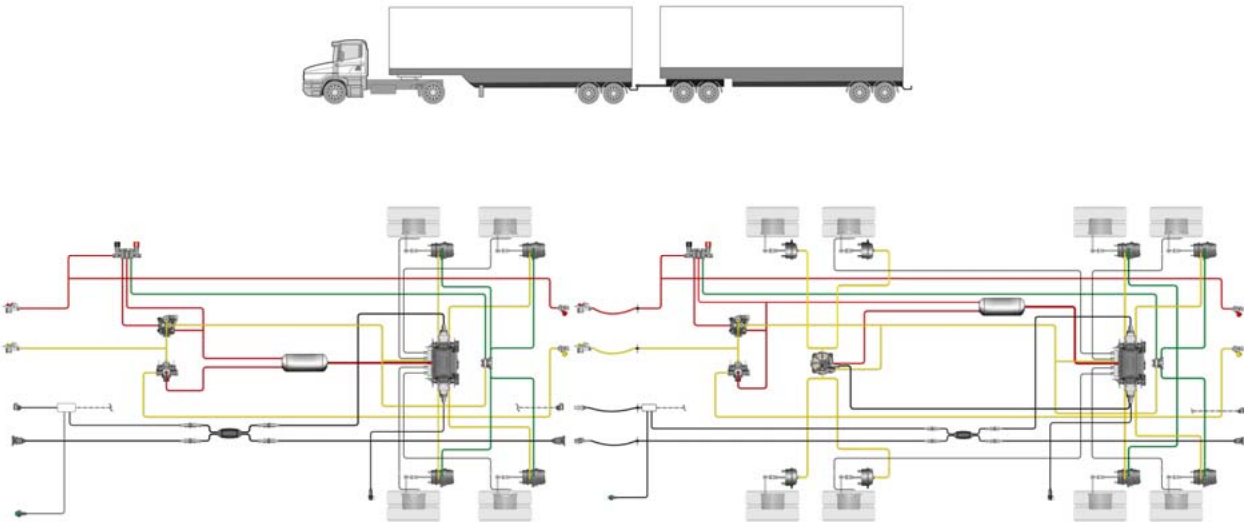


fig. 5-4: Typical semi trailer – drawbar trailer configuration

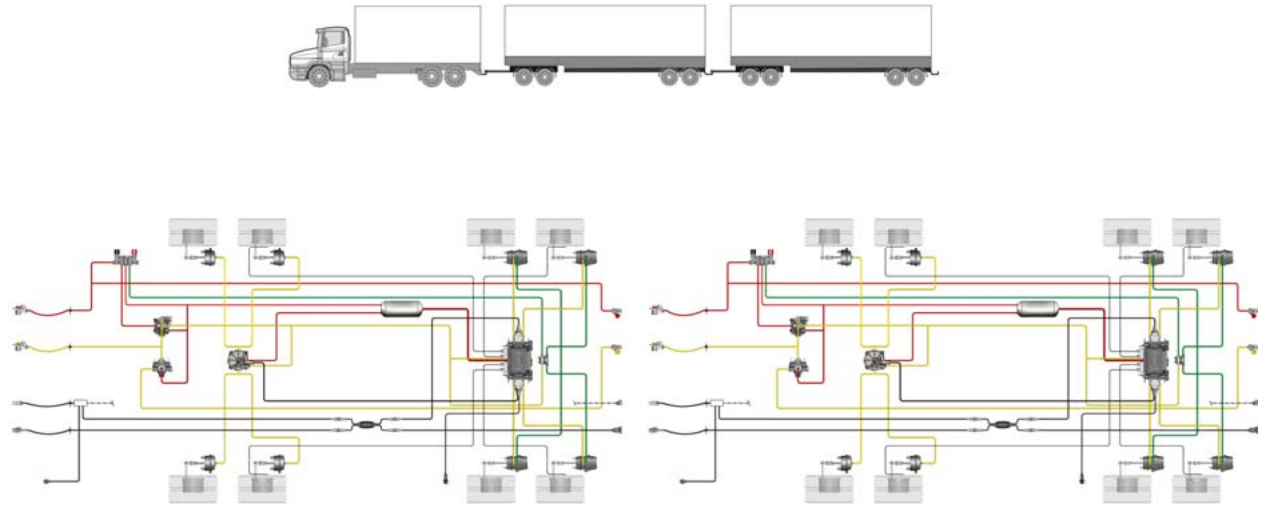


fig. 5-5: Typical drawbar trailer – drawbar trailer configuration

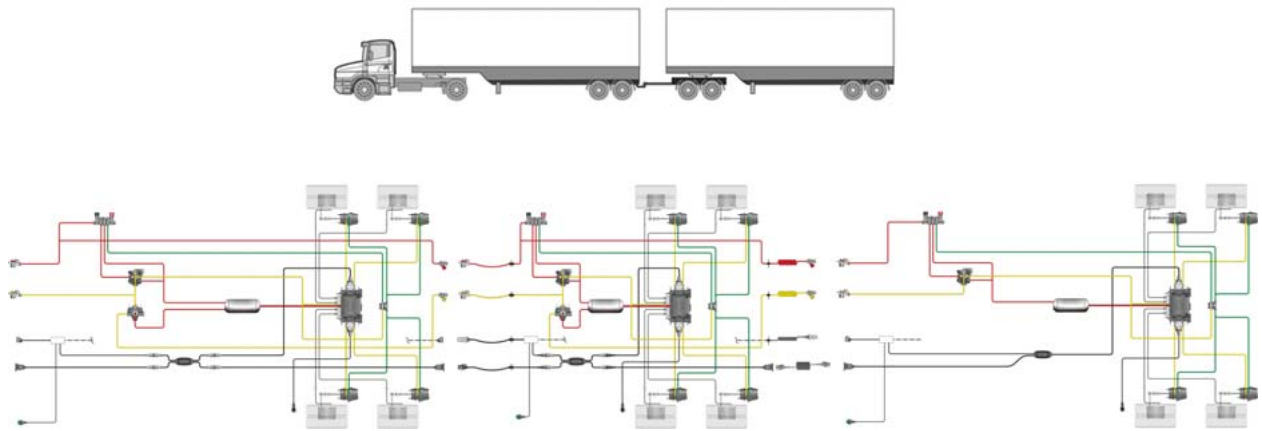


fig. 5-6: Typical semi trailer – Dolly – semi trailer configuration

5.3 General Limits

To connect multiple ABS systems it is necessary to take the following restrictions into account:

- Only the ABS modulator 400 652 149 0 must be used in all cases. This modulator is optimised in terms of power consumption and permits combining up to 3x 4S/2M systems **or** 2x 4S/3M systems via ISO 7638 with restrictions as mentioned below. Even when only connected via ISO 1185 or ISO 12098, the full range of ABS functions is provided, as required by legislation in Brazil for example. In this case, Generic Input/Output functions are limited however.
- In the case of 4S/3M configurations, the ABS relay valve **472 195 038 0** must additionally be installed.
- Vehicles with lengths more than 18 m are not allowed to communicate via CAN according to ISO 11992.

  Due to this restriction, multiple connected VCS II systems are only supplied via 5-pin ISO 7638 connector and are not able to communicate via CAN (e.g. for diagnostic purpose via ISO 7638).
- In combinations of multiple ABS systems, the stop lights in each trailer must not exceed a power consumption of 0.24 A at 24 V.

For this reason LED stop lights are mandatory for RoadTrain combinations. This is required because ABS functionality via the 24N power supply (light harness) must always be ensured. Stop lights with bulbs consume too much current. This would have a negative impact on ABS functions due to the high voltage drop across trailers.

Generic Input/Output functions of the ABS modulator are only allowed for lifting axle control and if connected to ISO 7638.

5.4 System Configurations

According the national Brazil regulation NBR 14535, item 7 (Nov 2011), the manufacturer of the trailer must specify in the owner manual that trailer's anti-lock system must be connected using specific ISO 7638 connector to ensure proper operation of the anti-lock system on the trailer.

In addition, the trailer's anti-lock system must be able to operate via the stop light circuit (connecting the supply line directly to pin 4 of the ISO 1185 (24N) connector or pin 7 of ISO 12098, without compromising the stop light circuit.

The trailer must also be equipped with an optical warning signal (green, in compliance with the technical photometric criteria for the side marker lamp of Resolução CONTRAN 227/07) that is within the field of vision of the driver's rear-view mirror, visible in daylight and able to signal any failures of the trailer's anti-lock system.

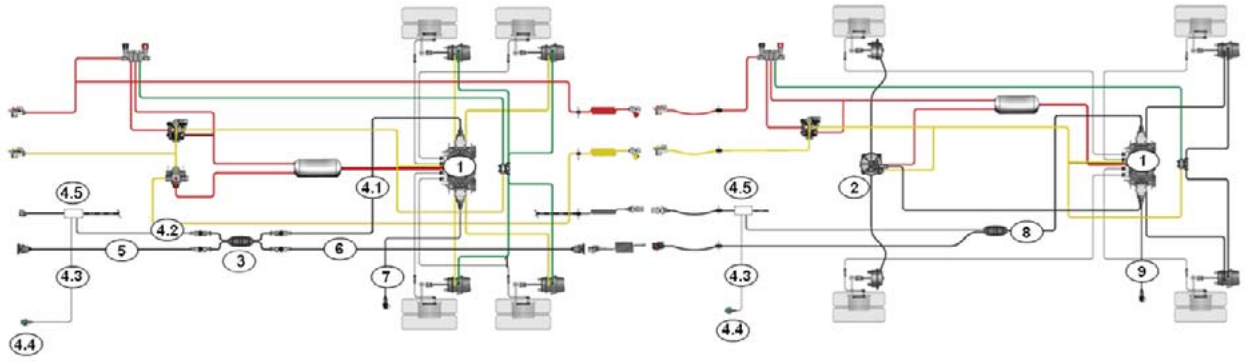


fig. 5-7: Typical semi trailer – drawbar combination (4S/2M-4S/3M combination)

The system configuration will be explained on the basis of a typical semitrailer - drawbar combination.

A multiple trailer configuration requires a distribution box (Position 3) for connecting the first trailer's 5-pin ISO 7638 power supply harness (Position 5) using a bayonet connector.

To connect the trailer ABS modulator (Position 1), the power supply harness (Position 4.1) must be connected to the distribution box (Position 3) using a bayonet connector. The other end must be connected to the power socket of the ABS-ECU using a specific WABCO connector. This connector is coded to prevent cross-polarity. This harness contains additional wires which ensure 24N and green warning lamp operation.

The power supply harness (Position 6), which is also connected to the distribution box (Position 3) by a bayonet, ensures the power supply to trailer 2 by means of an ISO 7638 connector.

A diagnostic cable (Position 7) can be installed as an option and connected to the ABS modulator (Position 1).

The second trailer (which in this example could only be used as the last trailer of the combination) is equipped with the same ABS modulator (Position 1). Because this trailer is a drawbar trailer, a 4S/3M system is required. This, in turn, makes an additional ABS relay valve (Position 2) necessary, which has to be connected to the ABS modulator (Position 1) using a combined power and diagnostic harness (Position 9). In this example, the ABS modulator is supplied with power by the ISO 7638 power supply harness (Position 8). This harness includes a distributor provided with an additional cable for the 24N connection. However, if the last trailer is also to be used as a first trailer in a combination, the harness layout needs to be implemented as shown in the figure below.

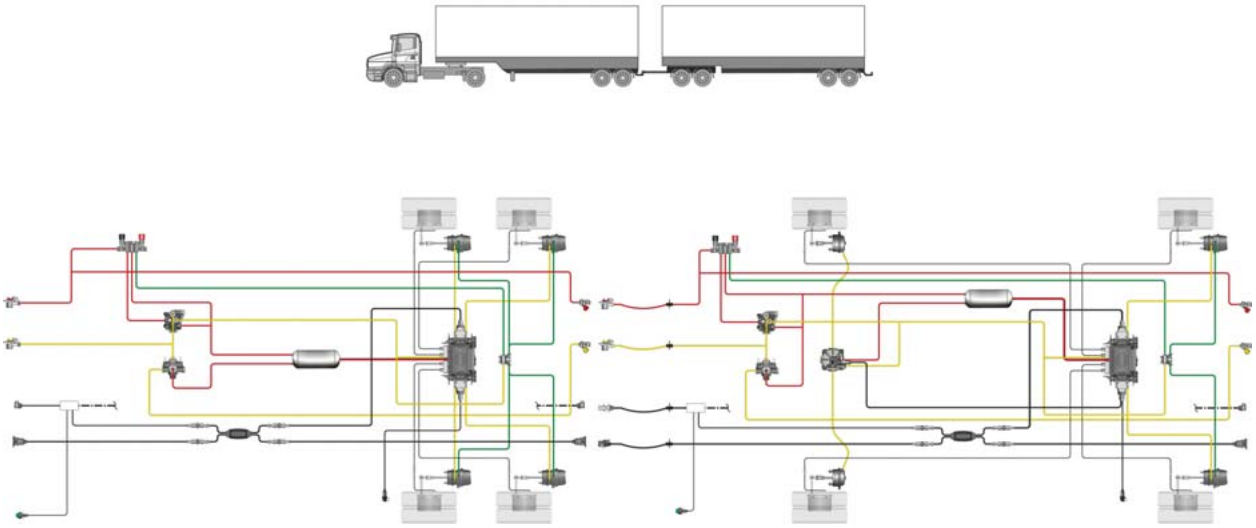


fig. 5-8: Typical semi trailer – drawbar combination, last trailer prepared to be the first trailer too (4S/2M-4S/3M combination)

5.4.1 Connecting to ISO 1185 or ISO 12098

To ensure the correct operation of anti-lock systems in towed road vehicles even before all motorised vehicles on the market are standardised and equipped with the specified ISO 7638 connector, the towed road vehicles must meet the following requirements:

The anti-lock system of the trailer must be capable of operating via the stop light circuit (connecting the supply line directly to pin 4 of the ISO 1185 (24N) connector or pin 7 of the ISO 12098 connector without compromising the stop light circuit.

The connection to the stop light circuit for trailers configured for multiple vehicle combinations is implemented by the harness (Position 4.2, see chapter 5.1 "Principle System Architecture", page *17*), which on one side is attached to the distribution box (Position 3, see chapter 5.1 "Principle System Architecture", page *17*) using a bayonet connector. On the other side the harness has open ends, where the wires can be connected to ISO 1185 or ISO 12098 (sealed distribution box 4.5, optional WABCO content, see chapter 5.1 "Principle System Architecture", page *17*) and can cut to the required length. The open ends of the harness need to be connected within the sealed distribution box because the installation needs to be waterproof.

The connection to ISO 1185 or ISO 12098 needs to be implemented as illustrated here:

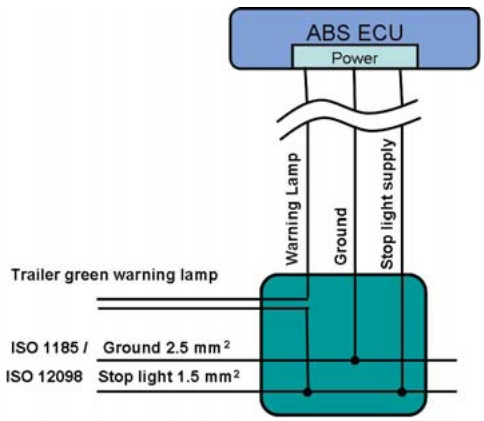


fig. 5-9: Typical system connection

5.4.2 Connecting the Warning Lamp

In the case of power supply via ISO 7638, the trailer ABS warning lamp installed in the **towing vehicle** must be connected between terminal 15 and pin 5 of the ISO 7638 connector. This pin is then connected directly to the warning lamp output of the ECU.

If power is supplied via ISO 1185 or ISO 12098, an additional warning lamp to signal any failure of the anti-lock system has to be installed on the trailer. This lamp must be connected between the warning lamp output and pin 4 (stop light supply) of the ISO 1185 or pin 7 of the ISO 12098 connector. The external warning lamp on the trailer is only active when the system is supplied via one of these plug connections during brake actuation.

The behaviour of this warning lamp is identical to the behaviour of the warning lamp in the towing vehicle.

The connection to ISO 1185 or ISO 12089 requires a sealed distribution box (Position 4.5, optional WABCO content) which has to be mounted within the light harness in the front of the vehicle. The 24N harness (Position 4.2) coming from the distribution box (Position 3) has to be cut to the required length and connected as shown in the wiring diagrams, see chapter 5.4.1 "Connecting to ISO 1185 or ISO 12098", page *22*. The required green lamp (Position 4.4) must also be connected to this separate distribution box (Position 4.5), see chapter 5.1 "Principle System Architecture", page *17*.

The corresponding harness for the green lamp (Position 4.3) has on one end an AMP connector, which fits to the green lamp (Position 4.4). The other end provides open ends that can be cut to the required lengths. These ends must be connected as shown in the wiring diagrams, see chapter 5.4.1 "Connecting to ISO 1185 or ISO 12098", page *22*.

To avoid that LED lights, which have a very low power consumption, starts to glow during normal operation without any faults being present in the ABS system, a resistor of 1 kOhm needs to be switched in parallel to pin 4/7 (ISO 1185) or pin 7/7 (ISO 12098).

In any case the light harness has to be designed that the wires connected at pin 1 (ISO 1185) or pin 4 (ISO 12098) will have a cross section of 2.5 mm^2.

The wires at pin 4 (ISO 1185) and pin 7 (ISO 12098) have to be with a cross section of 1.5 mm^2 in minimum.

To connect the open ends of both, the 24 harness and the green lamp harness to the ISO 1185 or ISO 12098, only tinned cable clips according DIN 46247, part 3 are allowed.

5.5 Protection fuse in the truck

In long vehicles with up to 3 trailers the overall resistance R_{total} is higher than in vehicles with only one trailer (standard configuration).

When the overall resistance R_{total} increases, the short circuit current IK decreases to $IK = U0/R_{total}$

The truck current rating for the fuses used for the 24N and ISO 7638 power supply therefore need to be checked and adjusted.

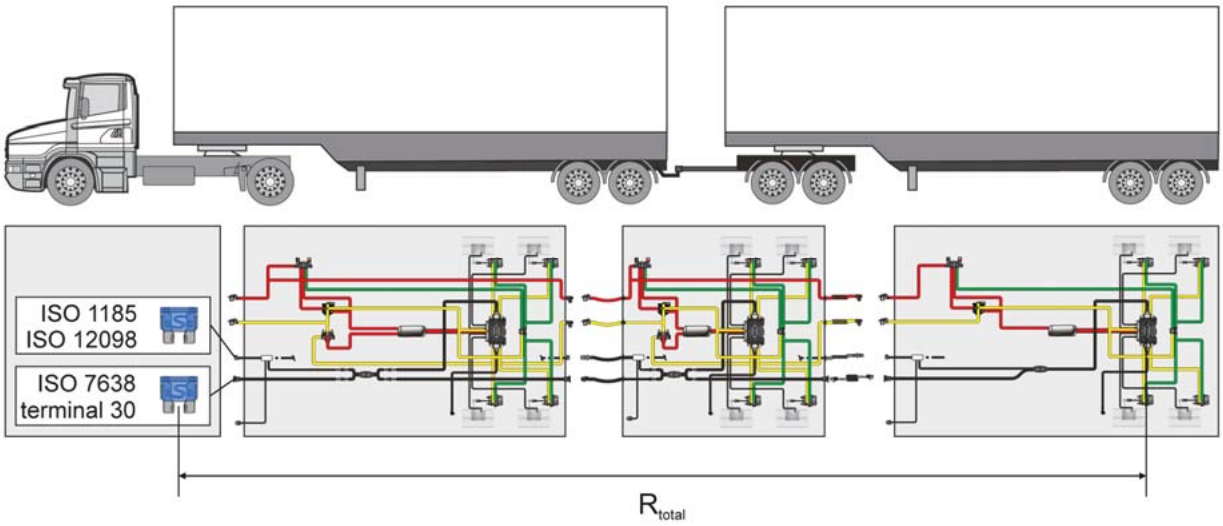


fig. 5-10: Protection fuse in the truck

Defect is much more critical in end of the last trailer because of highest R_{total}.

WARNING **Danger of cable fire**

If the fuses are not adjusted, a defect or short circuit could cause a cable fire.

– Adjust the fuses.

Based on the values measured in test vehicles, WABCO recommends:

24N power supply (1,5mm²); ATO fuse with max. 15 A

ISO 7638 power supply; ATO fuse with max. 15 A

The fuses for terminal 30 in the truck need to be adapted to the new situation.

6 Components

Scope of the system

VCS II is an ABS system for trailers, ready for installation. It meets all the legal requirements defined according ECE R-13.

The range of configurations reaches from the 2S/2M system designed for semitrailers to the 4S/3M system which is used for drawbar trailers or for a semitrailer equipped with a steering axle for example.

Each trailer of a Road Train uses a stand-alone ABS.

6.1 ABS Modulator 400 652 149 0

fig. 6-1: ABS Modulator 400 652 149 0

The ABS modulator 400 652 149 0 is a premium modulator and especially designed for multiple trailer combinations such as BiTrains or Road Trains.

The difference as against all other ABS modulators is the considerable reduction of power consumption. In combination with the use of trailer LED stop lights this permits combining a 3x 4S/2M system **or** 2x 4S/3M system for Road Trains or BiTrains unproblematically with either an ISO 7638 or ISO 1185/12098 power supply.

In the VCS II system description 815 340 008 3 the technical features of the modulator 400 500 081 0 also apply to 400 652 149 0.

Only the ABS modulator 400 652 149 0 must be used for multiple trailer applications. This type of modulator can also be used for all single trailer applications.

In a multiple ABS configuration, Generic Input/Out functions must only be used for lifting axle control, wear indication and the speed signal in combination with ISO 7638 connection. If other GIO functions are required, you will need to consult WABCO.

Voltage Supply

The VCS II ABS modulator 400 652 149 0 works with a nominal voltage of 24 V.

The primary supply is implemented using a 5 or 7 pin supply connection according to ISO 7638. WABCO recommends this supply mode.

If used in BiTrain or Road Train applications, only 5 pin supply is permitted.

The modulator unit is also designed for the additional voltage supply via ISO 1185 or ISO 12098 (brake lamp supply 24N).

The power supply mode can be selected as an option. If more than one type of supply is connected, the control device selects the one that delivers the highest voltage. In the event that one supply mode fails, the system automatically switches to the other mode. After the ignition is switched on, all solenoid valves are briefly activated. A slight clicking noise is noticeable.

Other characteristics

- Voltage supply ISO 7638
- Additional 24 V supply via stop light wiring
- 2 to 4 wheel speed sensor inputs
- Configuration range: 2S/2M to 4S/3M (4S/3M uses additional external 3rd ABS relay valve)
- ISO 11992 interface (CAN); (which cannot be used in BiTrain and Road Train applications due to the 5 pin connection)
- Generic IO functions D1, D2, A1
- Battery charge output

The application of GIO functions in road trains is only permitted with an ISO 7638 connection.

Permitted GIO functions are:

- lifting axle control
- lining wear indications
- speed switch

If other functions are required, please contact your WABCO partner.

In many cases a 2S/2M configuration is sufficient for semitrailer applications:

The modulator 400 652 149 0 provides this option but can also be configured for more advanced sensing modes such as 4S/2M and 4S/3M.

6.2 ABS Relay Valve 472 195 038 0

fig. 6-2: ABS Relay Valve 472 195 038 0

Electrically (24 V) driven relay with the function to hold, reduce and increase pressure.

During braking action with deactivated ABS, the device operates as a standard relay valve. This specific ABS relay valve is designed for Road Train / BiTrain applications and has a reduced power consumption.

Only this ABS relay valve must be used for Road Train applications.

6.3 ABS Rotational Speed Sensor

fig. 6-3: ABS Rotational Speed Sensor with bush and special grease

The ABS sensor is fitted with a bush in a hole of the brake mounting plate.

The rotation of the pole wheel induces an oscillating voltage in the sensor. The frequence indicates the rotation speed of the wheel.

Application: 441 032 808 0 (with 0.4 m connection cable)

Repair Kits: 441 032 921 2 (including the bush and the special grease)

6.4 Green Lamp with AMP connector 446 105 523 2

fig. 6-4: Green Lamp with AMP connector 446 105 523 2

This LED lamp provides the corresponding AMP connector for the harness 449 900 100 0 and can be mounted to the vehicle chassis using screws.

6.5 Pole Wheel 895 905 568 4

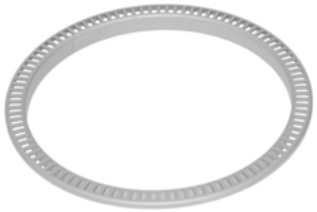


fig. 6-5: Pole Wheel 895 905 568 4

The correct allocation of the pole wheels to the tyre circumference is necessary for the ABS control functions.

A specific pole wheel with a defined number of teeth must be used for a specific range of tyre size.

For details on the allocation of pole wheels to tyre circumference please refer to the VCS II System Description 815 340 008 3.

The pole wheel adaptation should allow servicing activities in the wheel brake area to be carried out without having to remove the pole wheel.

Placing the pole wheel in the sealed wheel hub area is permitted but not required.

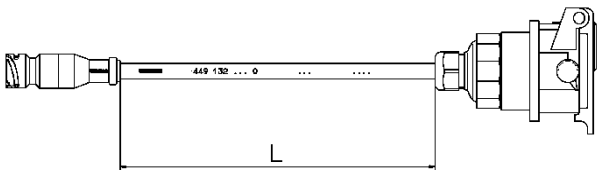
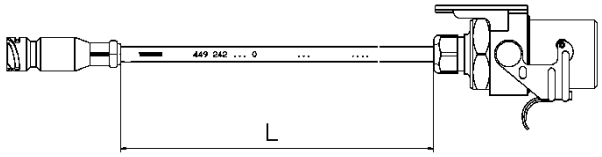
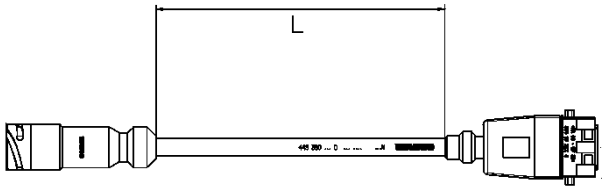
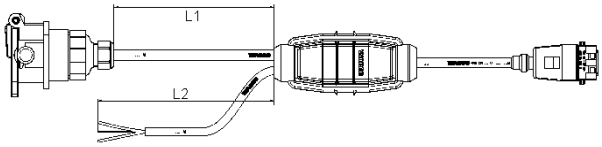
Pole wheel and hub generally need to be connected using an H8/s7 press fit

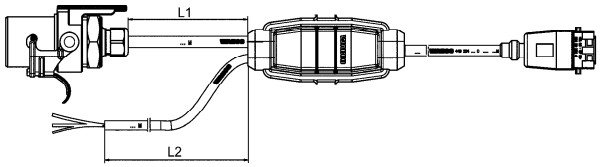
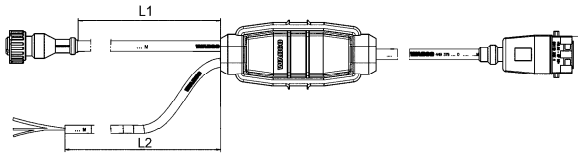
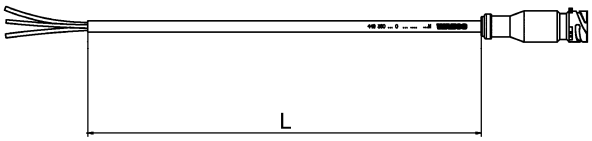
When using the WABCO pole wheel 895 905 568 4, some basic instructions and information needs to be considered, see chapter 4 "Introduction", page 7 => Section "Technical Documents". The objective of this document is to list and describe the specifications and documents related to the pole wheel. The contents of the described documentation are binding for the warranty offered by WABCO to remain valid. Deviations must be agreed with WABCO prior to installation.

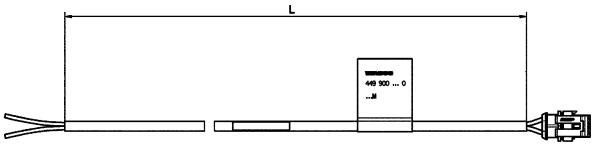
6.5.1 FEM calculation

In addition to the provided specifications, instructions and drawings, the customer must ensure by means of FEM calculation or another suitable method (e.g. boundary sample tests) that the pole wheel is fixed securely and the components (pole wheel, hub) are not deformed beyond the permissible tolerances.

6.6 Cables

Application	Part number	Lenghts L [m]	Cable ends	
Power harness ABS-ECU incl. 24N  Provides ABS connection for semitrailers to ISO 7638 and can be connected to the distributor 894 600 052 0 via the bayonet connector.	449 132 005 0 449 132 010 0 449 132 020 0 449 132 030 0 449 132 060 0 449 132 080 0 449 132 100 0 449 132 120 0	0.5 1.0 2.0 3.0 6.0 8.0 10.0 12.0	Socket ISO 7638	Coupling 5 pin Counterpart of 449 375 xxx 0 and 449 374 xxx 0
Power harness ISO 7638 female  Provides ABS power connection for drawbar trailers to ISO 7638 and can be connected to the distributor 894 600 052 0 via the bayonet connector.	449 242 030 0 449 242 040 0 449 242 100 0	3.0 4.0 10.0	Socket ISO 7638	Coupling 5 pin Counterpart of 449 375 xxx 0 and 449 374 xxx 0
Power harness ABS-ECU incl. 24N  Connect the ABS-ECU via a bayonet connector to the distributor (894 600 052 0). The connection to the ABS-ECU is provided by a specific connector that guarantees safe and water-resistant assembly. Apart from enabling a power supply via ISO 7638, this cable (together with distribution box and harness 449 380 xxx 0) can also provide a power supply (24N) via ISO 1185 or ISO 12098, if connected.	449 360 005 0 449 360 020 0 449 360 030 0 449 360 040 0	0.5 2.0 4.0 5.0	Socket ISO 7638 and ISO 1185 (24N) 3x 1.5 mm^2 1x 2.5 mm^2 2x 4 mm^2	Plug VCS II Eletronic "power" 3x 1.5 mm^2 1x 2.5 mm^2 2x 4 mm^2
Power harness ISO 7638 male, ABS-ECU, 24N  Provides the ABS power connection for semitrailers to ISO 7638 and 24N (ISO 1185 or ISO 12098). It can be used where the trailer does not need to supply another trailer via ISO 7638, the last trailer in a combination for example.	449 124 333 0	L_1: 6.0; L_2: 12.0	Socket ISO 7638 and ISO 1185 (24N) 1x 1.5 mm^2 2x 2.5 mm^2	Plug VCS II Eletronic "power"
	449 124 337 0	L_1: 12.0; L_2: 12.0		

Application	Part number	Lenghts L [m]	Cable ends	
Power harness ISO 7638 female, ABS-ECU, 24N  Provides the ABS power connection for drawbar trailers to ISO 7638 and 24N (ISO 1185 or ISO 12098). It can be used where the trailer does not need to supply another trailer via ISO 7638, the last trailer in a combination for example.	449 224 337 0	L_1: 12.0; L_2: 12.0	Socket ISO 7638 and ISO 1185 (24N) 1x 1.5 mm^2 2x 2.5 mm^2	Plug VCS II Eletronic "power"
Power Harness ISO 7638 bayonett connector, ABS-ECU, 24N  Can be used together with 449 132 xxx 0 (for semitrailer) or 449 242 xxx 0 (for drawbar trailers) in the last trailer in a BiTrain or Road Train combination. This harness combination facilitates easy installation if the ISO 7638 connector can not be connected through the chassis.	449 379 281 0 449 374 281 0 449 374 323 0 449 374 328 0 449 374 333 0	L_1: 0.25; L_2: 8.0 L_1: 0.25; L_2: 8.0 L_1: 1.0; L_2: 12.0 L_1: 3.0; L_2: 12.0 L_1: 6.0; L_2: 12.0	Bayonet coupling 5 pin and ISO 1185 (24N) 1x 1.5 mm^2 2x 2.5 mm^2	Plug VCS II Eletronic "power"
24N harness  Connect systems to ISO 1185 or ISO 12098 (vehicle light circuit) if required by law or as an option. The bayonet connector must be mounted to the distribution box (Position 3 / 894 600 052 0). The harness has a length of 10 m and the wires are open at the other end. The wires can be cut to the required lengths if necessary. These wires must be connected within a watertight distribution box following the diagrams in the figures, see chapter 5.4.1 "Connecting to ISO 1185 or ISO 12098", page *22*. It is important to know that the design of this (and all other) harnesses does not allow capillary water movement to the ECU and other contact areas. This avoids corrosion or other related defects.	449 380 100 0	10.0	Open end 1x 1.5 mm^2 2x 2.5 mm^2	Bayonet coupling

Application	Part number	Lenghts L [m]	Cable ends	
Green lamp harness with AMP connector  Several legal provisions require that the trailer must also be equipped with an optical warning signal (green, in compliance with the technical photometric criteria of the side marker lamp of Resolução CONTRAN 227/07) that is within the field of vision of the driver's rear-view mirror, visible in daylight, in order to signal any failures of the anti-lock system in the trailer. The use of this additional electrical supply through the brake light circuit must be checked to ensure there is no interference with the anti-lock system. This cable has been designed to connect this required green lamp to the trailer ABS system. On one end, an AMP Superseal 1.5 Series connector is available to connect this end to lamps with matching connectors. This allows an easy replacement of the green lamp when defective. The other end of the harness provides open wires with the option to shorten the harness and to connect the wires to the ABS system as shown in the figures, see chapter 5.4 "System Configurations", page *21*.	449 900 100 0	10.0	Open end 2x 0.5 mm^2	AMP Superseal plug

Application	Part number	Description
Coiled cable  For connection of semitrailers and dollys if required.	446 008 234 0 446 008 238 0 446 008 243 0 446 008 244 0	>5 pin, Ø 55 >5 pin, Ø 55 >7 pin, Ø 110 >7 pin, Ø 55

6.7 Distributor 894 600 052 0

fig. 6-6: Distributor 894 600 052 0

This distributor represents the heart of a multiple trailer ABS system and provides the option to connect a second trailer to ISO 7638 without difficulty.

It also connects the trailer's ABS-ECU to the corresponding ISO 7638 power supply, or – if power is supplied via ISO 1185 or ISO 12098 – the distributor automatically supplies the trailer ECU in this mode. The ABS system automatically detects a 24N supply and will switch into this mode accordingly.

The harness (449 360 xxx 0) must be used to connect the ABS-ECU.

The distributor has an additional 24N port for a connection to ISO 1185 or ISO 12098 connectors and it is to this port that the corresponding harness (449 380 xxx 0) needs to be connected. This harness is also designed to provide the signal for the green warning lamp in the event of a system failure (signal is coming from the ABS-ECU).

The distributor facilitates a safe and high-quality installation of the ABS wiring and also significantly reduces the time required for installation. All connections use DIN bayonet connectors, which have been designed for convenient assembly and automotive environments.

The maximum overall length of the distribution box with connected harness has to be in total not more than ≤ 15 m, see following figure.

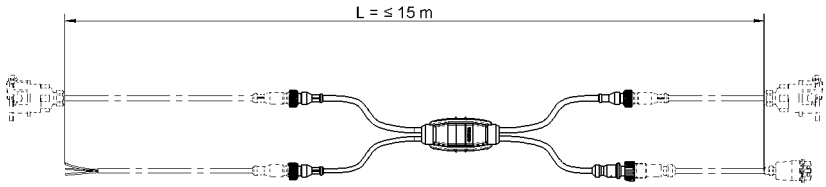


fig. 6-7: Distributor 894 600 052 0 with maximum overall length of the distribution box with connected harness (L = ≤ 15 m)

The water-resistant design of the distributor (IP6K9K) protects ABS against "black-outs" due to corrosion and electrical short-circuits.

The concept of preassembled components avoids incorrect wiring and ensures a high quality of assembly.

The concept enables connecting the second trailer to ISO 7638.

The distributor meets the demands of the relevant legislation.

Connecting the ABS-ECU to ISO 1185 or ISO 12098 is simplified.

The time required for installation is reduced significantly.

6.8 Distribution Box Light 446 122 633 0

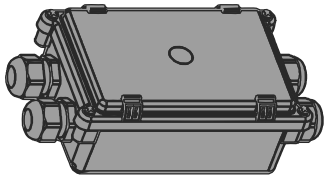


fig. 6-8: Distribution Box Light 446 122 633 0

This distribution box can be ordered from WABCO if the light harness manufacturer is not able to supply it.

This distribution box includes 4 ports, of which 2 are for the light harness, one for the ABS connection (24N) to ISO 1185 or ISO 12098 and one to connect the green warning lamp.

A contact distribution block is also included for easy connection of all wires. The protection class of this box is specified as IP 6K9K.

7 Installation Instruction

Cables

- Identify the connections on the ABS modulator by means of the designations on the labels on the housing cover and the tags on the connections.
- Remove the protective cap on the cable and connect the cable to the respective connections.
- Press the connector into the slot applying a little initial force.
  All connections must be occupied by a cable or have a sealing cap.
- Fasten the cable only on solid elements that are connected with the components, e.g. the vehicle frame.
  Fastening to flexible elements can cause cable breaks and the seal can be broken.
- Fasten the cable and plug so that no tension or lateral forces affect the plug-in connections.
- Be sure not to route cables over sharp edges or in the vicinity of aggressive media (e.g. acids).
- Fasten the cable max. 30 cm away from the device using a a cable tie for example.
- Fix the cable ties in such a way that the cables are not damaged (if you are using tools, please observe the instructions of the manufacturer of the cable tie).

Installation Instruction for Cables

Open the website http://www.wabco-auto.com.

Click on *Product Catalogue INFORM => Product Number*.

Enter 449 000 000 0 into the search field.

Click the Start button.

8 Workshop instructions

8.1 System Training and PIN

A number of functions in the PC diagnostic interface that could have an effect on safety aspects of the braking system are protected by a PIN (personal identification number). This includes system and GenericIO parameter settings. In order to obtain a PIN, it is a requirement to have participated in a WABCO VCS II system training course or an E-Learning course.

More detailed information on our training and E-Learning can be found on the WABCO homepage.

Open the website http://www.wabco-auto.com.

Click on *WABCO University*.

8.2 Diagnosis

The expression diagnosis comprises the following activities:

- Fault analysis (fault display and storage)
- Setting the system parameters
- Startup

Hardware

Access to the diagnostic functions is by way of the diagnostic interface according to ISO 14230 (diagnosis according to KWP 2000). It is used to connect diagnostic devices such as the Diagnostic Interface.

For detailed information regarding diagnosis please use poster "VCS II - Cables & connections", see chapter 4 "Introduction", page *7* => Section "Technical Documents".

Software

A PC diagnosis is available for the tasks specified above. This diagnosis supports the full scope of functions of the VCS II system. This includes the following menu items:

- System startup: End-of-Line test at the vehicle manufacturer’s or after extensive repair work
- Messages: Display of current and stored messages, delete and save diagnostic memory
- Actuation: Perform test activations of the connected components
- Measured values: Display the values measured for the connected components
- System: ECU parameterisation, GenericIO parameterisation, saving of EEPROM content
- Tools: Setting and read-out of service intervals, trip counter, and notebook

Blink Code

The blink code can be used for the simple diagnosis of current faults.

The blink code consists of a pattern of blinking pulses used for the display of faults. The blink code output device is the trailer ABS warning lamp installed in the towing vehicle, or, if present, the external ABS warning lamp mounted on the trailer. The two lamps are connected in parallel and they are activated synchronously.

The blinking code only indicates the current fault. Access to the diagnostic memory content is not supported.

The blink code is activated by switching the ignition on for a period of one to five seconds and then switching it off again. When the ignition is switched on the next time, the warning lamp will start to blink once a current fault is present.

After activation of the blink code, the current fault will be displayed. The number of blinking pulses indicates the nonconforming component. All relevant fault numbers are stated in the following blink code list. Moreover, these numbers are stamped on the ECU housing. A number that is identical with the fault number is provided behind each designation of a slot, (example: fault on sensor E1/4: 4 blink pulses). After the ignition is switched on, the blink code will be repeated three times.

Blink Code List

Blink Code Number	Component
3	Sensor BU1 (H2) c
4	Sensor YE1 (H1) d
5	Sensor BU2 (Z2) e
6	Sensor YE 1 (Z1) f
7	External modulator RD (L)
9	Internal modulator inlet valve 2
10	Internal modulator inlet valve 1
11	Internal modulator outlet valve
14	Voltage supply
15	Internal ECU fault
18	GenericIO fault

8.3 Replacement and Repair

WABCO repair kits

Open the website http://www.wabco-auto.com.

Click on *Product Catalogue INFORM => Product Number*.

Enter the product number of the device into the search field to find the appropriate repair kit(s).

Click the *Start* button.

If you have further questions regarding replacement and repair please contact your WABCO partner.

8.4 Maintenance

The ABS system is maintenance-free.

– Drive to the next workshop immediately if warning messages occur.

8.5 Disposal and Recycling

Do not dispose of electronic devices, batteries, or accumulators together with household refuse. Instead it must be handed over to a designated collection point.

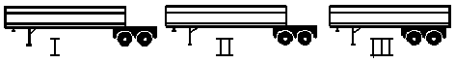
Observe the national and regional regulations.

Defective WABCO brake units can be returned to WABCO to guarantee the best possible processing.

Use the box of the replacement unit to return the ABS modulator to WABCO via used-parts-return. This will ensure the most economical means of processing the modulator. Simply contact your WABCO partner.

9 Appendix

9.1 Trailer ABS Schemes

Trailer Combinations	Trailer ABS System	Number of Scheme
	4S/2M	841 701 123 0
	2S/2M	841 701 250 0
	4S/2M	841 701 124 0
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	2S/2M	841 701 253 0
	4S/2M	841 701 127 0
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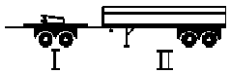	2S/2M	841 701 254 0
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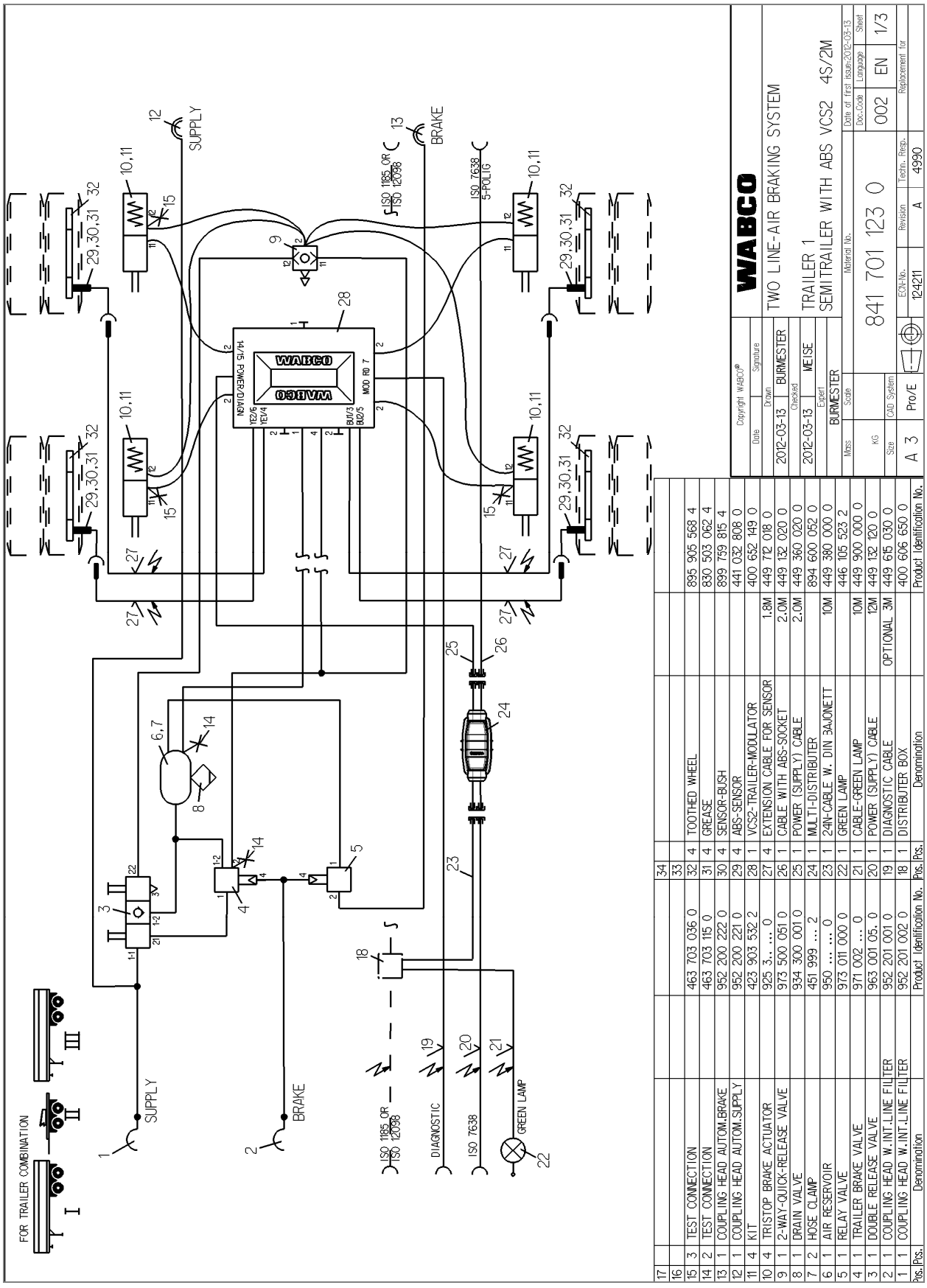
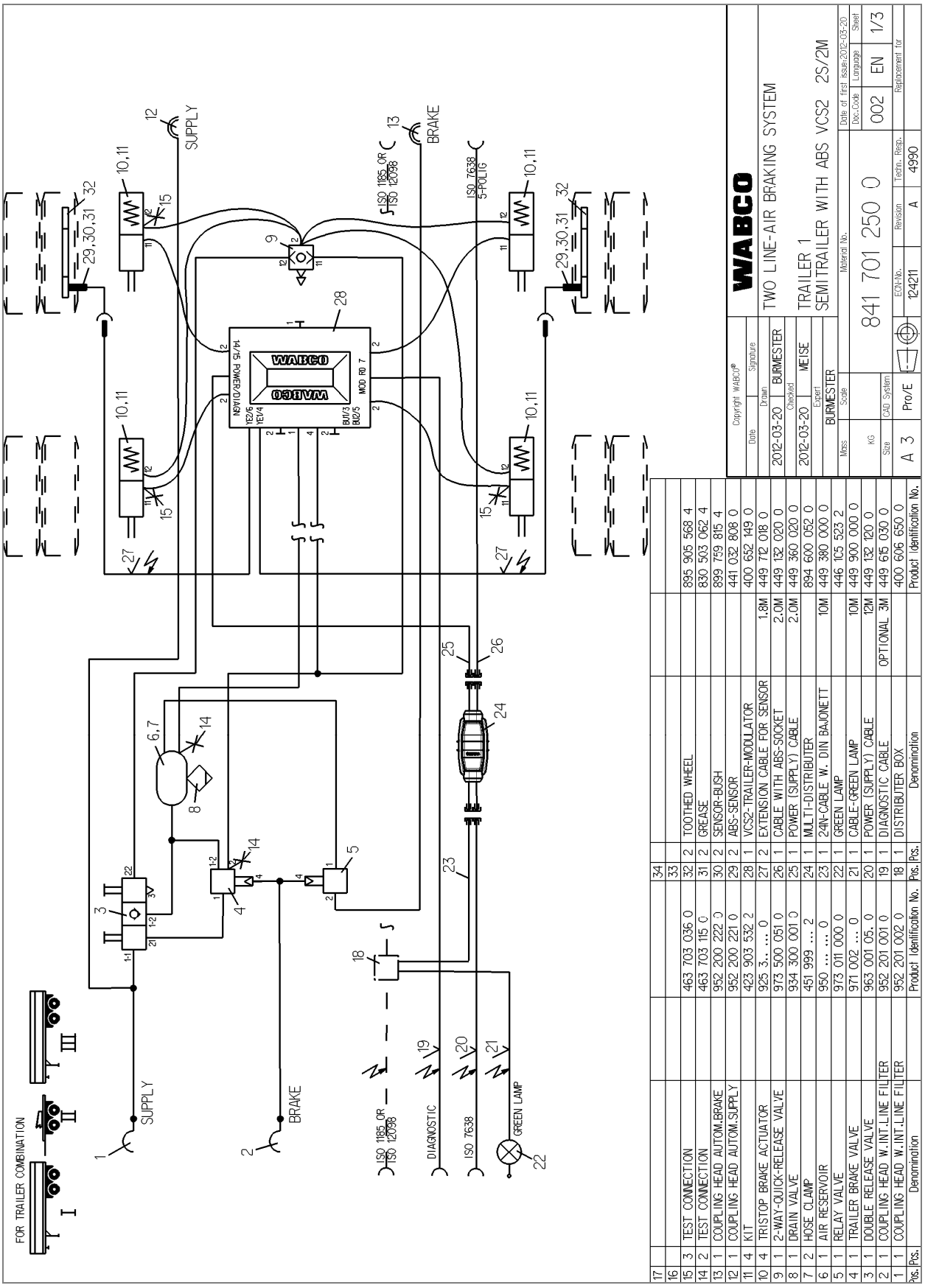


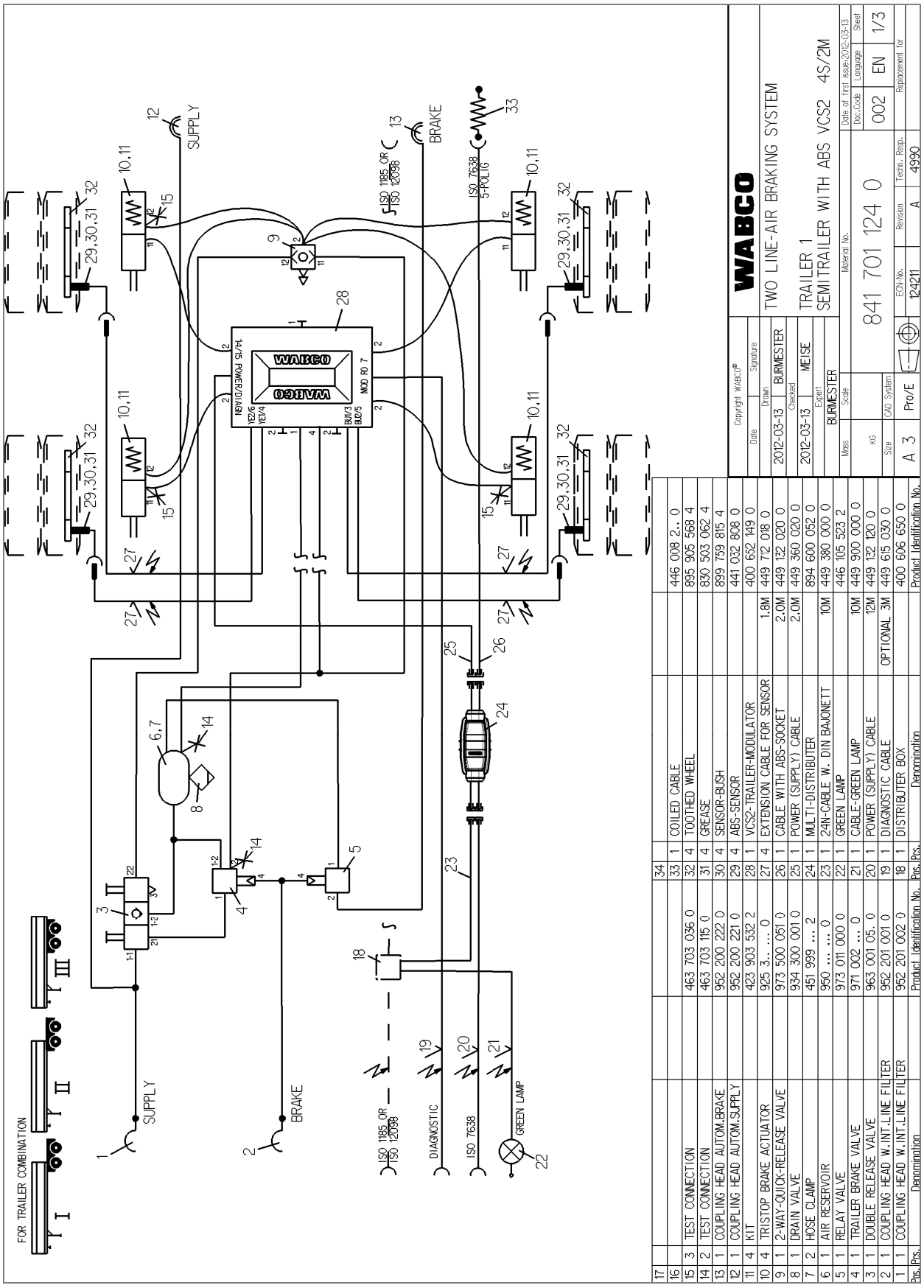
Pos.	Pcs.	Denomination	Product Identification No.
17			
16			
15	3	TEST CONNECTION	463 703 036 0
14	2	TEST CONNECTION	463 703 115 0
13	1	COUPLING HEAD AUTOM.BRAKE	952 200 222 0
12	1	COUPLING HEAD AUTOM.SUPPLY	952 200 221 0
11	4	KIT	423 903 532 2
10	4	TRISTOP BRAKE ACTUATOR	925 3.. ... 0
9	1	2-WAY-QUICK-RELEASE VALVE	973 500 051 0
8	1	DRAIN VALVE	934 300 001 0
7	2	HOSE CLAMP	451 999 ... 2
6	1	AIR RESERVOIR	950 0
5	1	RELAY VALVE	973 011 000 0
4	1	TRAILER BRAKE VALVE	971 002 ... 0
3	1	DOUBLE RELEASE VALVE	963 001 05. 0
2	1	COUPLING HEAD W. INT.LINE FILTER	952 201 001 0
1	1	COUPLING HEAD W. INT.LINE FILTER	952 201 002 0
Pos.	Pcs.	Denomination	Product Identification No.
34			
33			
32	4	TOOTHED WHEEL	895 905 568 4
31	4	GREASE	830 503 062 4
30	4	SENSOR-BUSH	899 759 815 4
29	4	ABS-SENSOR	441 032 808 0
28	1	VCS2-TRAILER-MODULATOR	400 652 149 0
27	4	EXTENSION CABLE FOR SENSOR	1,8M 449 712 018 0
26	1	CABLE WITH ABS-SOCKET	2,0M 449 132 020 0
25	1	POWER (SUPPLY) CABLE	2,0M 449 360 020 0
24	1	MULTI-DISTRIBUTER	894 600 052 0
23	1	24N-CABLE W. DIN BAJONETT	10M 449 380 000 0
22	1	GREEN LAMP	446 105 523 2
21	1	CABLE-GREEN LAMP	10M 449 900 000 0
20	1	POWER (SUPPLY) CABLE	12M 449 132 120 0
19	1	DIAGNOSTIC CABLE	OPTIONAL 3M 449 615 030 0
18	1	DISTRIBUTER BOX	400 606 650 0
Pos.	Pcs.	Product Identification No.	

841 701 250 0



Pos.	Qty	Denomination	Product Identification No.	Pos.	Qty	Denomination	Product Identification No.
1	1	COUPLING HEAD W.INT.LINE FILTER	952 201 002 0	18	1	DISTRIBUTER BOX	400 606 650 0
2	1	COUPLING HEAD W.INT.LINE FILTER	952 201 001 0	19	1	DIAGNOSTIC CABLE	OPTIONAL 3M 449 615 030 0
3	1	DOUBLE RELEASE VALVE	963 001 05. 0	20	1	POWER (SUPPLY) CABLE	12M 449 132 120 0
4	1	TRAILER BRAKE VALVE	971 002 ... 0	21	1	CABLE-GREEN LAMP	10M 449 900 000 0
5	1	RELAY VALVE	973 011 000 0	22	1	GREEN LAMP	446 105 523 2
6	1	AIR RESERVOIR	950 0	23	1	24N-CABLE W. DIN BAJONETT	10M 449 380 000 0
7	2	HOSE CLAMP	451 999 2	24	1	MULTI-DISTRIBUTER	894 600 052 0
8	1	DRAIN VALVE	934 300 001 0	25	1	POWER (SUPPLY) CABLE	2.0M 449 360 020 0
9	1	2-WAY-QUICK-RELEASE VALVE	973 500 051 0	26	1	CABLE WITH ABS-SOCKET	2.0M 449 132 020 0
10	4	TRISTOP BRAKE ACTUATOR	925 3.. 0	27	2	EXTENSION CABLE FOR SENSOR	1.8M 449 712 018 0
11	4	KIT	423 903 532 2	28	1	VCS2-TRAILER-MODULATOR	400 652 149 0
12	1	COUPLING HEAD AUTOM.SUPPLY	952 200 221 0	29	2	ABS-SENSOR	441 032 808 0
13	1	COUPLING HEAD AUTOM.BRAKE	952 200 222 0	30	2	SENSOR-BUSH	899 759 815 4
14	2	TEST CONNECTION	463 703 115 0	31	2	GREASE	830 503 062 4
15	3	TEST CONNECTION	463 703 036 0	32	2	TOOTHED WHEEL	895 905 568 4
16				33			
17				34			

841 701 124 0



Pos.	Pcs.	Denomination	Product Identification No.	Pos.	Pcs.	Denomination	Product Identification No.
1	1	COUPLING HEAD W.INT.LINE FILTER	952 201 002 0	18	1	DISTRIBUTER BOX	400 606 650 0
2	1	COUPLING HEAD W.INT.LINE FILTER	952 201 001 0	19	1	DIAGNOSTIC CABLE	449 615 030 0
3	1	DOUBLE RELEASE VALVE	963 001 05. 0	20	1	POWER (SUPPLY) CABLE	449 132 120 0
4	1	TRAILER BRAKE VALVE	971 002 ... 0	21	1	CABLE-GREEN LAMP	449 900 000 0
5	1	RELAY VALVE	973 011 000 0	22	1	GREEN LAMP	446 105 523 2
6	1	AIR RESERVOIR	950 0	23	1	24N-CABLE W. DIN BAJONETT	449 380 000 0
7	2	HOSE CLAMP	451 999 ... 2	24	1	MULTI-DISTRIBUTER	894 600 052 0
8	1	DRAIN VALVE	934 300 001 0	25	1	POWER (SUPPLY) CABLE	449 360 020 0
9	1	2-WAY-QUICK-RELEASE VALVE	973 500 051 0	26	1	CABLE WITH ABS-SOCKET	449 132 020 0
10	4	TRISTOP BRAKE ACTUATOR	925 3.. ... 0	27	4	EXTENSION CABLE FOR SENSOR	449 712 018 0
11	4	KIT	423 903 532 2	28	1	VCS2-TRAILER-MODULATOR	400 652 149 0
12	1	COUPLING HEAD AUTOM.SUPPLY	952 200 221 0	29	4	ABS-SENSOR	441 032 808 0
13	1	COUPLING HEAD AUTOM.BRAKE	952 200 222 0	30	4	SENSOR-BUSH	899 759 815 4
14	2	TEST CONNECTION	463 703 115 0	31	4	GREASE	830 503 062 4
15	3	TEST CONNECTION	463 703 036 0	32	4	TOOTHED WHEEL	895 905 568 4
16				33	1	COILED CABLE	446 008 2.. 0
17				34			

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2012-03-13	BURMESTER						
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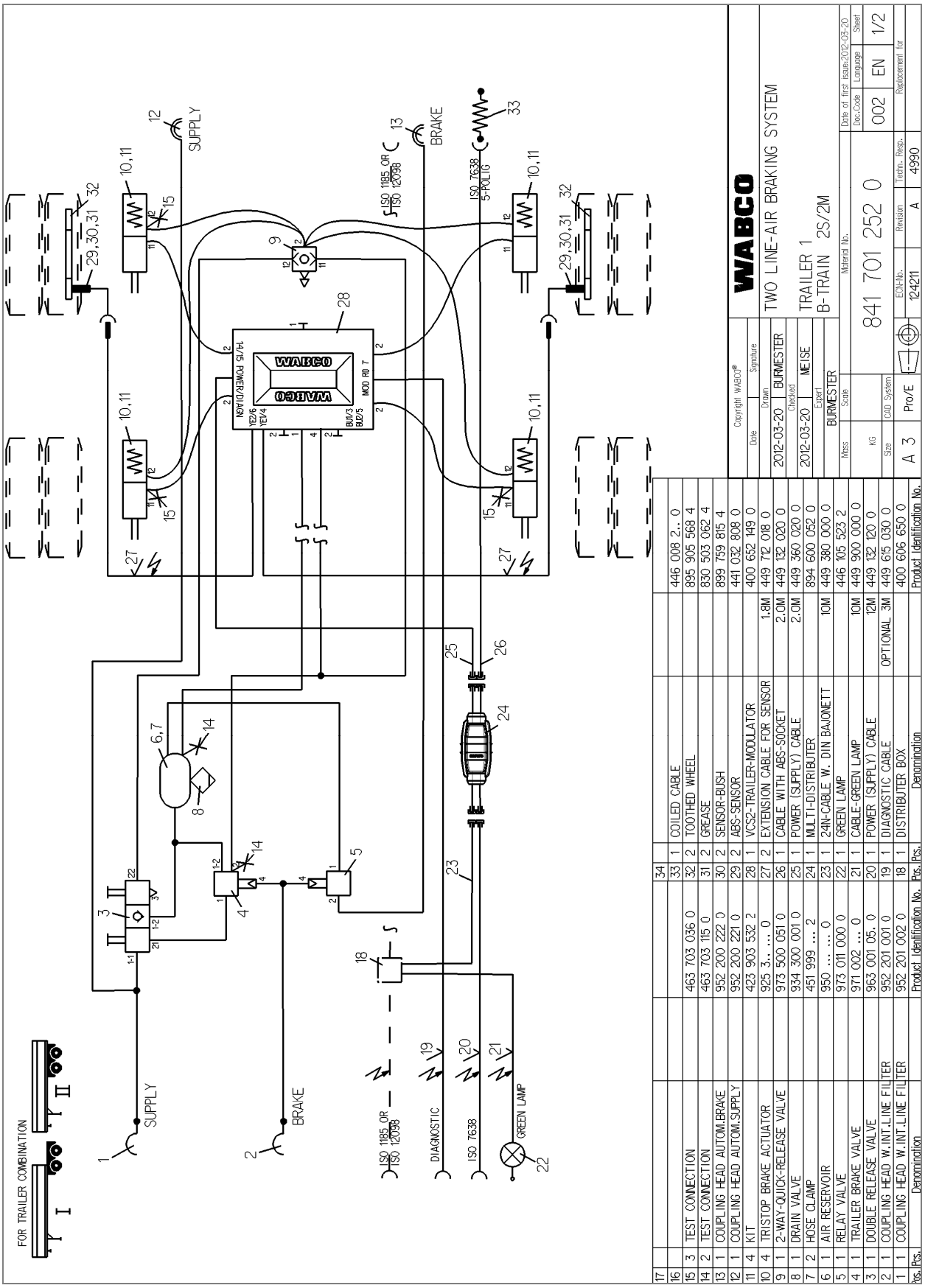
2012-03-13	MEISE						
Expert							
BURMESTER							
Mass	Scale	Material No.				Date of first issue 2012-03-13	
KG		841 701 124 0				Doc.-Code 002	Language EN
Size	CAD System						Sheet 1/3
A 3	Pro/E		EDM-No. 124211	Revision A	Techn. Resp. 4990	Replacement for	

841 701 252 0



Pos.	Pos.	Denomination	Product Identification No.
1	1	COUPLING HEAD W.INT.LINE FILTER	952 201 002 0
2	1	COUPLING HEAD W.INT.LINE FILTER	952 201 001 0
3	1	DOUBLE RELEASE VALVE	963 001 05. 0
4	1	TRAILER BRAKE VALVE	971 002 ... 0
5	1	RELAY VALVE	973 011 000 0
6	1	AIR RESERVOIR	950 0
7	2	HOSE CLAMP	451 999 ... 2
8	1	DRAIN VALVE	934 300 001 0
9	1	2-WAY-QUICK-RELEASE VALVE	973 500 051 0
10	4	TRISTOP BRAKE ACTUATOR	925 3.. ... 0
11	4	KIT	423 903 532 2
12	1	COUPLING HEAD AUTOM.SUPPLY	952 200 221 0
13	1	COUPLING HEAD AUTOM.BRAKE	952 200 222 0
14	2	TEST CONNECTION	463 703 115 0
15	3	TEST CONNECTION	463 703 036 0
16			
17			

Pos.	Pos.	Denomination	Product Identification No.
18	1	DISTRIBUTER BOX	400 606 650 0
19	1	DIAGNOSTIC CABLE	449 615 030 0
20	1	POWER (SUPPLY) CABLE	449 132 120 0
21	1	CABLE-GREEN LAMP	449 900 000 0
22	1	GREEN LAMP	446 105 523 2
23	1	24N-CABLE W. DIN BAJONETT	449 380 000 0
24	1	MULTI-DISTRIBUTER	894 600 052 0
25	1	POWER (SUPPLY) CABLE	449 360 020 0
26	1	CABLE WITH ABS-SOCKET	449 132 020 0
27	2	EXTENSION CABLE FOR SENSOR	449 712 018 0
28	1	VCS2-TRAILER-MODULATOR	400 652 149 0
29	2	ABS-SENSOR	441 032 808 0
30	2	SENSOR-BUSH	899 759 815 4
31	2	GREASE	830 503 062 4
32	2	TOOTHED WHEEL	895 905 568 4
33	1	COILED CABLE	446 008 2.. 0
34			

1M	2M	3M	4M	5M	6M	7M	8M	9M	10M	12M	OPTIONAL
0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.6	

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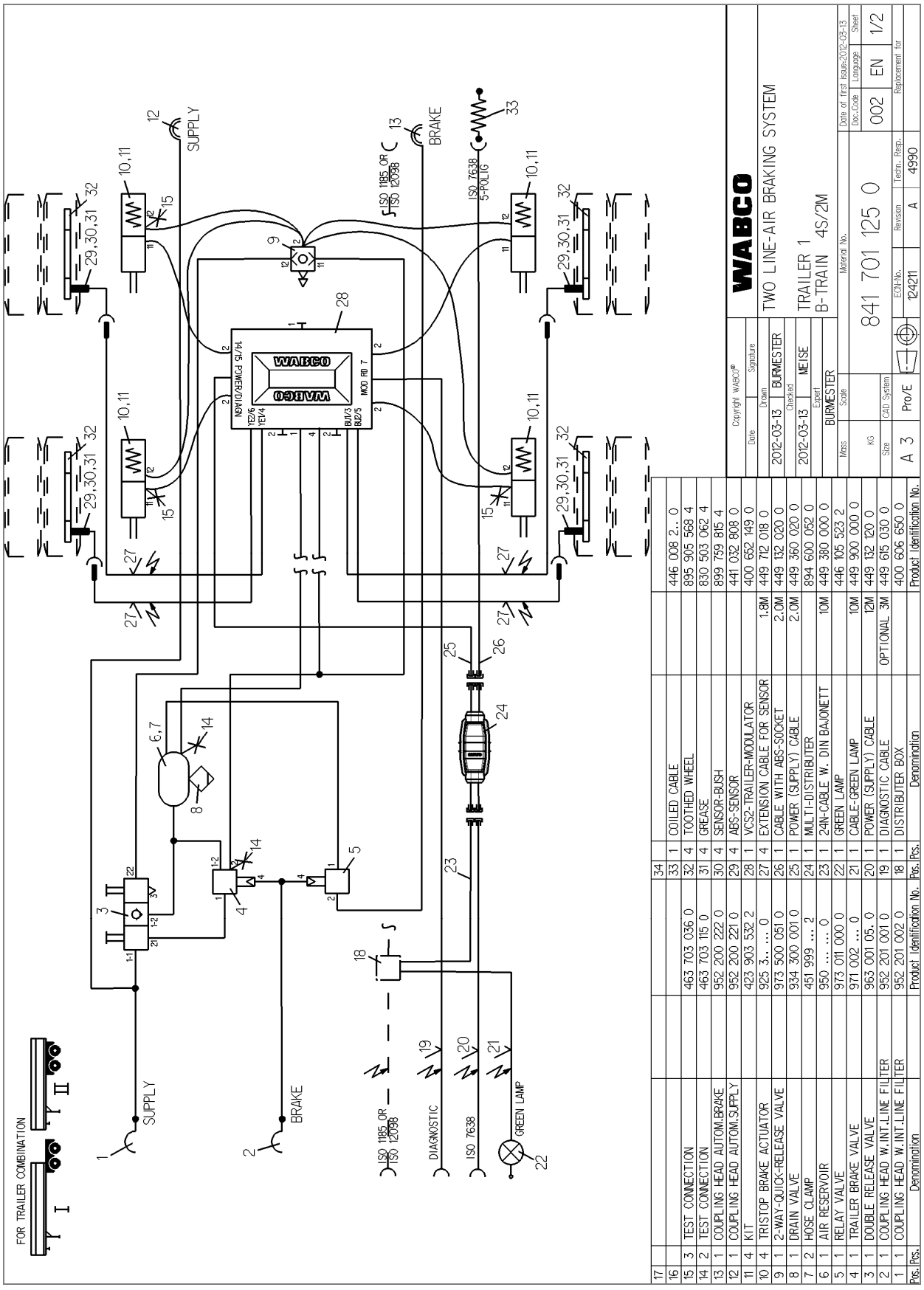

Pos.	Pcs.	Denomination	Product Identification No.
34			
33	1	COILED CABLE	446 008 2.. 0
32	4	TOOTHED WHEEL	895 905 568 4
31	4	GREASE	830 503 062 4
30	4	SENSOR-BUSH	899 759 815 4
29	4	ABS-SENSOR	441 032 808 0
28	1	VCS2-TRAILER-MODULATOR	400 652 149 0
27	4	EXTENSION CABLE FOR SENSOR 1.8M	449 712 018 0
26	1	CABLE WITH ABS-SOCKET 2.0M	449 132 020 0
25	1	POWER (SUPPLY) CABLE 2.0M	449 360 020 0
24	1	MULTI-DISTRIBUTER	894 600 052 0
23	1	24N-CABLE W. DIN BAJONETT 10M	449 380 000 0
22	1	GREEN LAMP	446 105 523 2
21	1	CABLE-GREEN LAMP 10M	449 900 000 0
20	1	POWER (SUPPLY) CABLE 12M	449 132 120 0
19	1	DIAGNOSTIC CABLE OPTIONAL 3M	449 615 030 0
18	1	DISTRIBUTER BOX	400 606 650 0
17			
16			
15	3	TEST CONNECTION	463 703 036 0
14	2	TEST CONNECTION	463 703 115 0
13	1	COUPLING HEAD AUTOM.BRAKE	952 200 222 0
12	1	COUPLING HEAD AUTOM.SUPPLY	952 200 221 0
11	4	KIT	423 903 532 2
10	4	TRISTOP BRAKE ACTUATOR	925 3.. ... 0
9	1	2-WAY-QUICK-RELEASE VALVE	973 500 051 0
8	1	DRAIN VALVE	934 300 001 0
7	2	HOSE CLAMP	451 999 ... 2
6	1	AIR RESERVOIR	950 0
5	1	RELAY VALVE	973 011 000 0
4	1	TRAILER BRAKE VALVE	971 002 ... 0
3	1	DOUBLE RELEASE VALVE	963 001 05. 0
2	1	COUPLING HEAD W.INT.LINE FILTER	952 201 001 0
1	1	COUPLING HEAD W.INT.LINE FILTER	952 201 002 0

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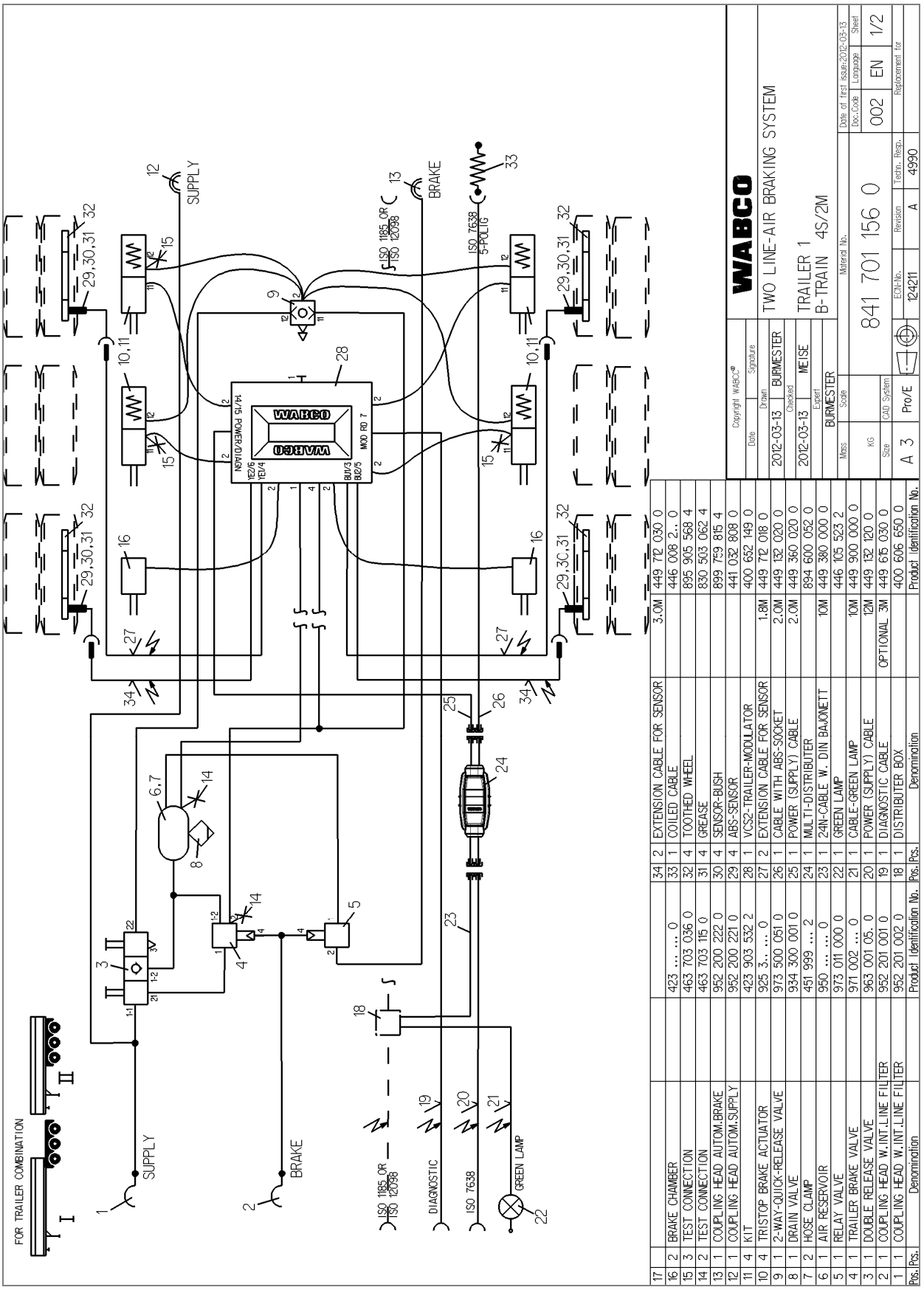
Mass KG Scale
Size A 3 CAD System Pro/E
Material No. 841 701 125 0
ECN-No. 124211 Revision A Techn. Resp. 4990
Date of first issue 2012-03-13
Doc.Code 002 Language EN Sheet 1/2
Replacement for

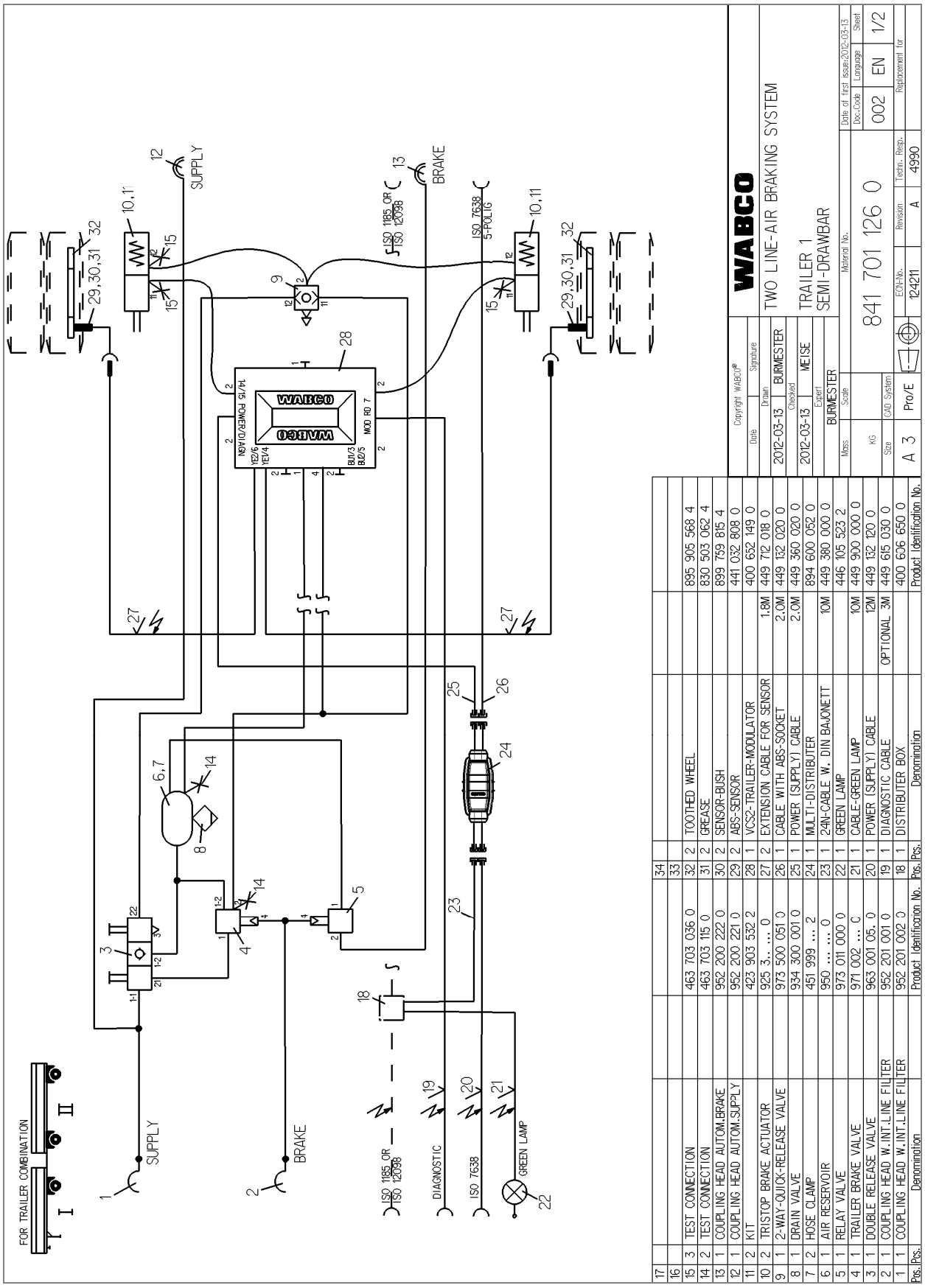
841 701 156 0



Pos.	Pcs.	Denomination	Product Identification No.
17			
16	2	BRAKE CHAMBER	423 0
15	3	TEST CONNECTION	463 703 036 0
14	2	TEST CONNECTION	463 703 115 0
13	1	COUPLING HEAD AUTOM.BRAKE	952 200 222 0
12	1	COUPLING HEAD AUTOM.SUPPLY	952 200 221 0
11	4	KIT	423 903 532 2
10	4	TRISTOP BRAKE ACTUATOR	925 3.. ... 0
9	1	2-WAY-QUICK-RELEASE VALVE	973 500 051 0
8	1	DRAIN VALVE	934 300 001 0
7	2	HOSE CLAMP	451 999 ... 2
6	1	AIR RESERVOIR	950 0
5	1	RELAY VALVE	973 011 000 0
4	1	TRAILER BRAKE VALVE	971 002 ... 0
3	1	DOUBLE RELEASE VALVE	963 001 05. 0
2	1	COUPLING HEAD W.INT.LINE FILTER	952 201 001 0
1	1	COUPLING HEAD W.INT.LINE FILTER	952 201 002 0

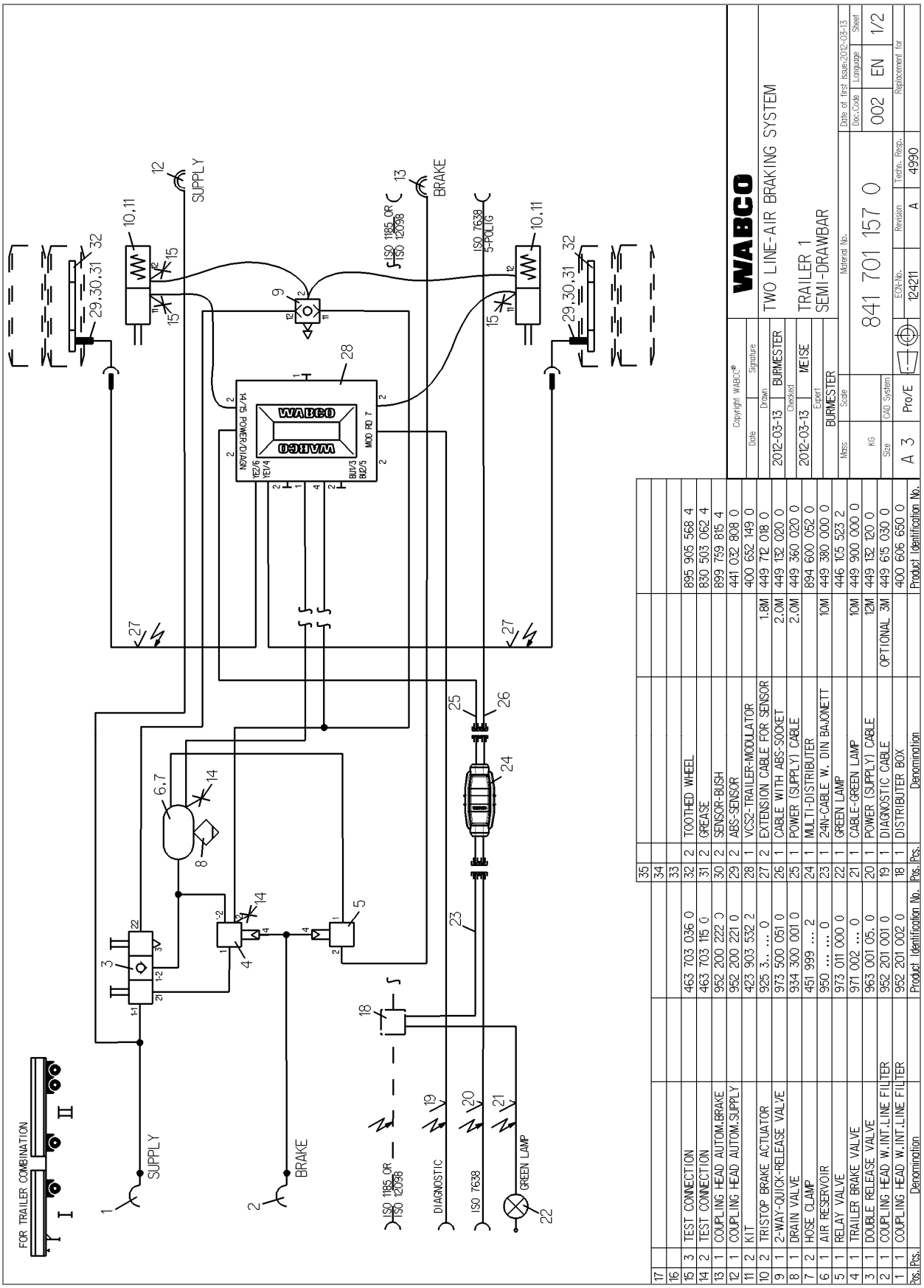
Pos.	Pcs.	Denomination	Product Identification No.
34	2	EXTENSION CABLE FOR SENSOR	3.0M 449 712 030 0
33	1	COILED CABLE	446 006 2.. 0
32	4	TOOTHED WHEEL	895 905 568 4
31	4	GREASE	830 503 062 4
30	4	SENSOR-BUSH	899 759 815 4
29	4	ABS-SENSOR	441 032 808 0
28	1	VCS2-TRAILER-MODULATOR	400 652 149 0
27	2	EXTENSION CABLE FOR SENSOR	1.8M 449 712 018 0
26	1	CABLE WITH ABS-SOCKET	2.0M 449 132 020 0
25	1	POWER (SUPPLY) CABLE	2.0M 449 360 020 0
24	1	MULTI-DISTRIBUTER	894 600 052 0
23	1	24N-CABLE W. DIN BAJONETT	10M 449 380 000 0
22	1	GREEN LAMP	446 105 523 2
21	1	CABLE-GREEN LAMP	10M 449 900 000 0
20	1	POWER (SUPPLY) CABLE	12M 449 132 120 0
19	1	DIAGNOSTIC CABLE	OPTIONAL 3M 449 615 030 0
18	1	DISTRIBUTER BOX	400 606 650 0

841 701 126 0



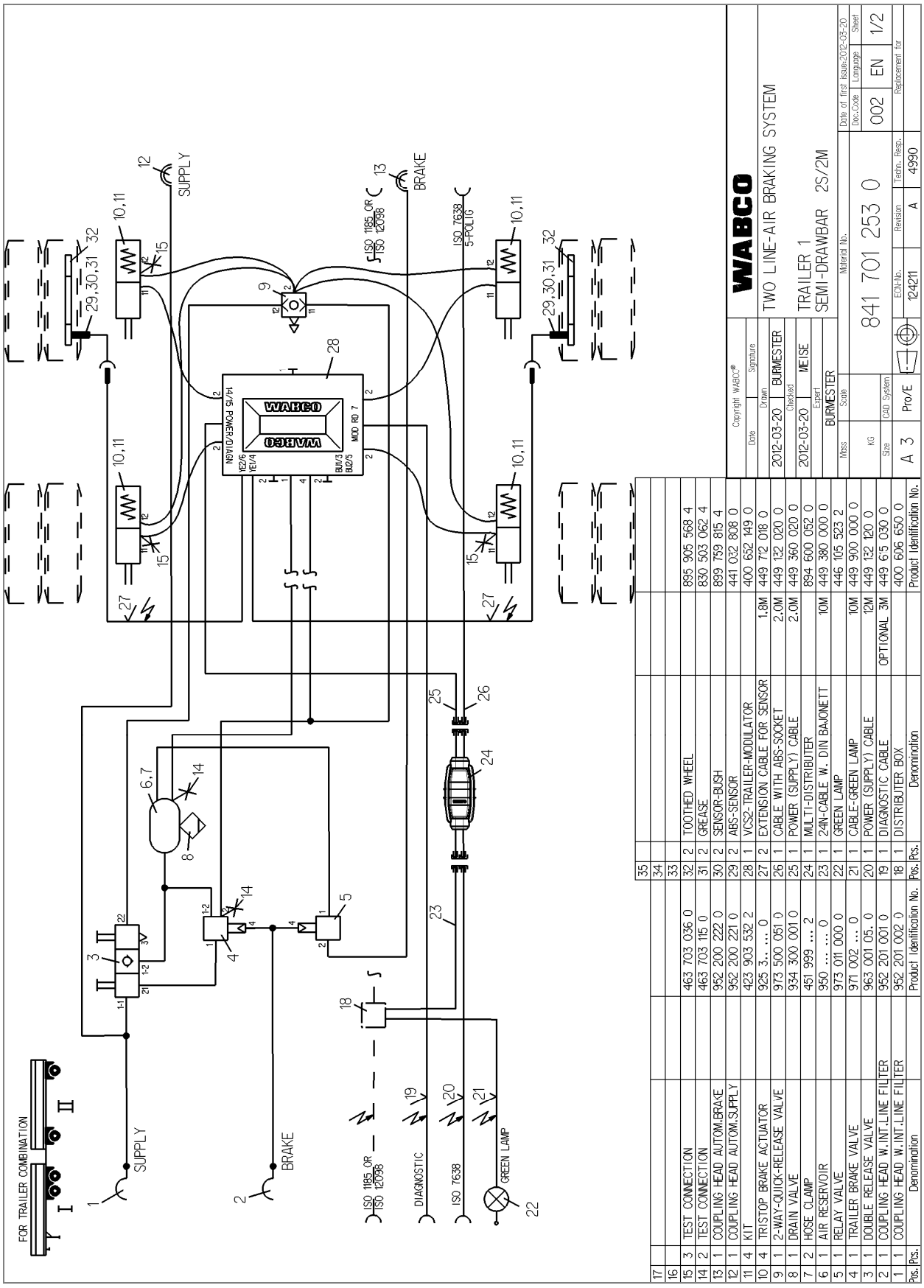
Pos.	Pcs.	Denomination	Product Identification No.
17			
16			
15	3	TEST CONNECTION	463 703 036 0
14	2	TEST CONNECTION	463 703 115 0
13	1	COUPLING HEAD AUTOM.BRAKE	952 200 222 0
12	1	COUPLING HEAD AUTOM.SUPPLY	952 200 221 0
11	2	KIT	423 903 532 2
10	2	TRISTOP BRAKE ACTUATOR	925 3... ... 0
9	1	2-WAY-QUICK-RELEASE VALVE	973 500 051 0
8	1	DRAIN VALVE	934 300 001 0
7	2	HOSE CLAMP	451 999 ... 2
6	1	AIR RESERVOIR	950 0
5	1	RELAY VALVE	973 011 000 0
4	1	TRAILER BRAKE VALVE	971 002 ... 0
3	1	DOUBLE RELEASE VALVE	963 001 05. 0
2	1	COUPLING HEAD W.INT.LINE FILTER	952 201 001 0
1	1	COUPLING HEAD W.INT.LINE FILTER	952 201 002 0
Pos.	Pcs.	Denomination	Product Identification No.
34			
33			
32	2	TOOTHED WHEEL	895 905 568 4
31	2	GREASE	830 503 062 4
30	2	SENSOR-BUSH	899 759 815 4
29	2	ABS-SENSOR	441 032 808 0
28	1	VCS2-TRAILER-MODULATOR	400 652 149 0
27	2	EXTENSION CABLE FOR SENSOR	1.8M 449 712 018 0
26	1	CABLE WITH ABS-SOCKET	2.0M 449 132 020 0
25	1	POWER (SUPPLY) CABLE	2.0M 449 360 020 0
24	1	MULTI-DISTRIBUTER	894 600 052 0
23	1	24N-CABLE W. DIN BAJONETT	10M 449 380 000 0
22	1	GREEN LAMP	446 105 523 2
21	1	CABLE-GREEN LAMP	10M 449 900 000 0
20	1	POWER (SUPPLY) CABLE	12M 449 132 120 0
19	1	DIAGNOSTIC CABLE	OPTIONAL 3M 449 615 030 0
18	1	DISTRIBUTER BOX	400 606 650 0
Pos.	Pcs.	Denomination	Product Identification No.

841 701 157 0



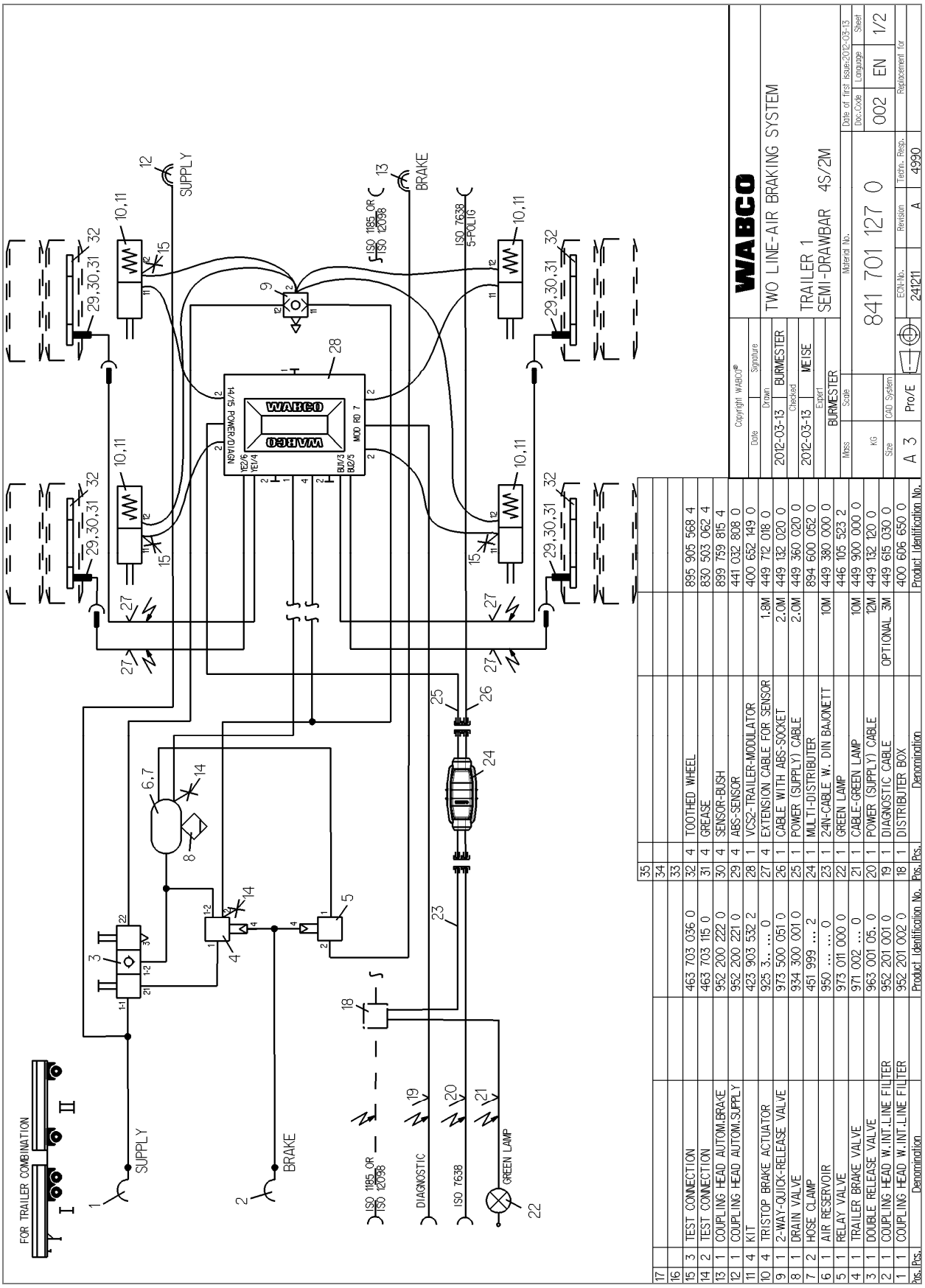
Pos.	Pcs.	Denomination	Product Identification No.	Pcs.	Pcs.	Denomination	Product Identification No.
17							
16							
15	3	TEST CONNECTION	463 703 036 0	32	2	TOOTHED WHEEL	895 905 568 4
14	2	TEST CONNECTION	463 703 115 0	31	2	GREASE	830 503 062 4
13	1	COUPLING HEAD AUTOM.BRAKE	952 200 222 0	30	2	SENSOR-BUSH	899 759 815 4
12	1	COUPLING HEAD AUTOM.SUPPLY	952 200 221 0	29	2	ABS-SENSOR	441 032 808 0
11	2	KIT	423 903 532 2	28	1	VCS2-TRAILER-MODULATOR	400 652 149 0
10	2	TRISTOP BRAKE ACTUATOR	925 3... ... 0	27	2	EXTENSION CABLE FOR SENSOR	1.8M 449 712 018 0
9	1	2-WAY-QUICK-RELEASE VALVE	973 500 051 0	26	1	CABLE WITH ABS-SOCKET	2.0M 449 132 020 0
8	1	DRAIN VALVE	934 300 001 0	25	1	POWER (SUPPLY) CABLE	2.0M 449 360 020 0
7	2	HOSE CLAMP	451 999 ... 2	24	1	MULTI-DISTRIBUTER	894 600 052 0
6	1	AIR RESERVOIR	950 0	23	1	24N-CABLE W. DIN BAJONETT	10M 449 380 000 0
5	1	RELAY VALVE	973 011 000 0	22	1	GREEN LAMP	446 105 523 2
4	1	TRAILER BRAKE VALVE	971 002 ... 0	21	1	CABLE-GREEN LAMP	10M 449 900 000 0
3	1	DOUBLE RELEASE VALVE	963 001 05. 0	20	1	POWER (SUPPLY) CABLE	12M 449 132 120 0
2	1	COUPLING HEAD W.INT.LINE FILTER	952 201 001 0	19	1	DIAGNOSTIC CABLE	OPTIONAL 3M 449 615 030 0
1	1	COUPLING HEAD W.INT.LINE FILTER	952 201 002 0	18	1	DISTRIBUTER BOX	400 606 650 0
35							
34							
33							

841 701 253 0



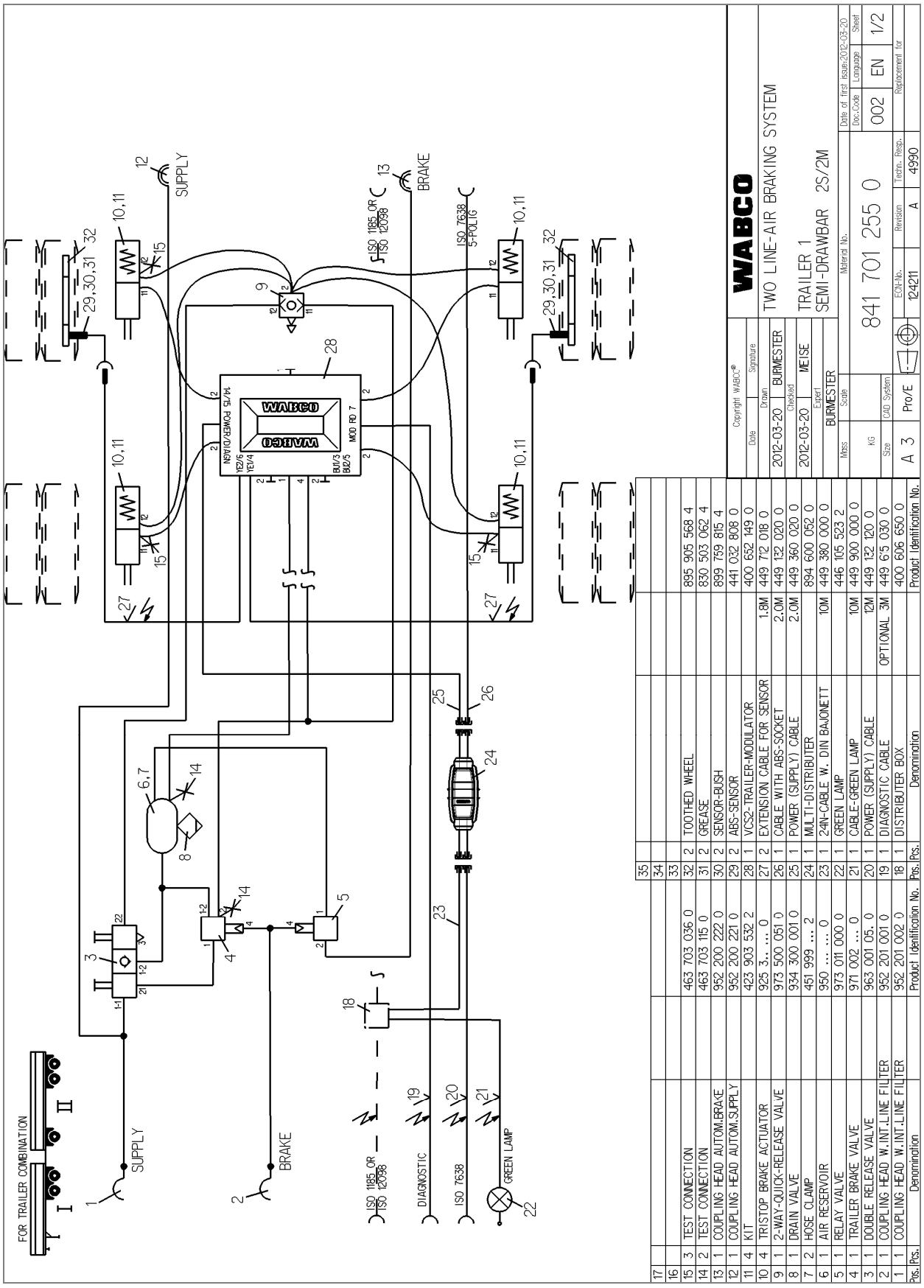
Pos.	Pcs.	Denomination	Product Identification No.
17			
16			
15	3	TEST CONNECTION	463 703 036 0
14	2	TEST CONNECTION	463 703 115 0
13	1	COUPLING HEAD AUTOM.BRAKE	952 200 222 0
12	1	COUPLING HEAD AUTOM.SUPPLY	952 200 221 0
11	4	KIT	423 903 532 2
10	4	TRISTOP BRAKE ACTUATOR	925 3... ... 0
9	1	2-WAY-QUICK-RELEASE VALVE	973 500 051 0
8	1	DRAIN VALVE	934 300 001 0
7	2	HOSE CLAMP	451 999 ... 2
6	1	AIR RESERVOIR	950 0
5	1	RELAY VALVE	973 011 000 0
4	1	TRAILER BRAKE VALVE	971 002 ... 0
3	1	DOUBLE RELEASE VALVE	963 001 05. 0
2	1	COUPLING HEAD W.INT.LINE FILTER	952 201 001 0
1	1	COUPLING HEAD W.INT.LINE FILTER	952 201 002 0
35			
34			
33			
32	2	TOOTHED WHEEL	895 905 568 4
31	2	GREASE	830 503 062 4
30	2	SENSOR-BUSH	899 759 815 4
29	2	ABS-SENSOR	441 032 808 0
28	1	VCS2-TRAILER-MODULATOR	400 652 149 0
27	2	EXTENSION CABLE FOR SENSOR	1.8M 449 712 018 0
26	1	CABLE WITH ABS-SOCKET	2.0M 449 132 020 0
25	1	POWER (SUPPLY) CABLE	2.0M 449 360 020 0
24	1	MULTI-DISTRIBUTER	894 600 052 0
23	1	24N-CABLE W. DIN BAJONETT	10M 449 380 000 0
22	1	GREEN LAMP	446 105 523 2
21	1	CABLE-GREEN LAMP	10M 449 900 000 0
20	1	POWER (SUPPLY) CABLE	12M 449 132 120 0
19	1	DIAGNOSTIC CABLE	OPTIONAL 3M 449 65 030 0
18	1	DISTRIBUTER BOX	400 606 650 0

841 701 127 0



Pos.	Pcs.	Denomination	Product Identification No.
1	1	COUPLING HEAD W.INT.LINE FILTER	952 201 002 0
2	1	COUPLING HEAD W.INT.LINE FILTER	952 201 001 0
3	1	DOUBLE RELEASE VALVE	963 001 05. 0
4	1	TRAILER BRAKE VALVE	971 002 ... 0
5	1	RELAY VALVE	973 011 000 0
6	1	AIR RESERVOIR	950 0
7	2	HOSE CLAMP	451 999 ... 2
8	1	DRAIN VALVE	934 300 001 0
9	1	2-WAY-QUICK-RELEASE VALVE	973 500 051 0
10	4	TRISTOP BRAKE ACTUATOR	925 3.. ... 0
11	4	KIT	423 903 532 2
12	1	COUPLING HEAD AUTOM.SUPPLY	952 200 221 0
13	1	COUPLING HEAD AUTOM.BRAKE	952 200 222 0
14	2	TEST CONNECTION	463 703 115 0
15	3	TEST CONNECTION	463 703 036 0
16			
17			
18	1	DISTRIBUTER BOX	400 606 650 0
19	1	DIAGNOSTIC CABLE	OPTIONAL 3M 449 615 030 0
20	1	POWER (SUPPLY) CABLE	12M 449 132 120 0
21	1	CABLE-GREEN LAMP	10M 449 900 000 0
22	1	GREEN LAMP	446 105 523 2
23	1	24N-CABLE W. DIN BAJONETT	10M 449 380 000 0
24	1	MULTI-DISTRIBUTER	894 600 052 0
25	1	POWER (SUPPLY) CABLE	2.0M 449 360 020 0
26	1	CABLE WITH ABS-SOCKET	2.0M 449 132 020 0
27	4	EXTENSION CABLE FOR SENSOR	1.8M 449 712 018 0
28	1	VCS2-TRAILER-MODULATOR	400 652 149 0
29	4	ABS-SENSOR	441 032 808 0
30	4	SENSOR-BUSH	899 759 815 4
31	4	GREASE	830 503 062 4
32	4	TOOTHED WHEEL	895 905 568 4
33			
34			
35			

841 701 255 0



Pos.	Pcs.	Denomination	Product Identification No.
17			
16			
15	3	TEST CONNECTION	463 703 036 0
14	2	TEST CONNECTION	463 703 115 0
13	1	COUPLING HEAD AUTOM.BRAKE	952 200 222 0
12	1	COUPLING HEAD AUTOM.SUPPLY	952 200 221 0
11	4	KIT	423 903 532 2
10	4	TRISTOP BRAKE ACTUATOR	925 3.. ... 0
9	1	2-WAY-QUICK-RELEASE VALVE	973 500 051 0
8	1	DRAIN VALVE	934 300 001 0
7	2	HOSE CLAMP	451 999 ... 2
6	1	AIR RESERVOIR	950 0
5	1	RELAY VALVE	973 011 000 0
4	1	TRAILER BRAKE VALVE	971 002 ... 0
3	1	DOUBLE RELEASE VALVE	963 001 05. 0
2	1	COUPLING HEAD W.INT.LINE FILTER	952 201 001 0
1	1	COUPLING HEAD W.INT.LINE FILTER	952 201 002 0
35			
34			
33			
32	2	TOOTHED WHEEL	895 905 568 4
31	2	GREASE	830 503 062 4
30	2	SENSOR-BUSH	899 759 815 4
29	2	ABS-SENSOR	441 032 808 0
28	1	VCS2-TRAILER-MODULATOR	400 652 149 0
27	2	EXTENSION CABLE FOR SENSOR	1.8M 449 712 018 0
26	1	CABLE WITH ABS-SOCKET	2.0M 449 132 020 0
25	1	POWER (SUPPLY) CABLE	2.0M 449 360 020 0
24	1	MULTI-DISTRIBUTER	894 600 052 0
23	1	24N-CABLE W. DIN BAJONETT	10M 449 380 000 0
22	1	GREEN LAMP	446 105 523 2
21	1	CABLE-GREEN LAMP	10M 449 900 000 0
20	1	POWER (SUPPLY) CABLE	12M 449 132 120 0
19	1	DIAGNOSTIC CABLE	OPTIONAL 3M 449 65 030 0
18	1	DISTRIBUTER BOX	400 606 650 0

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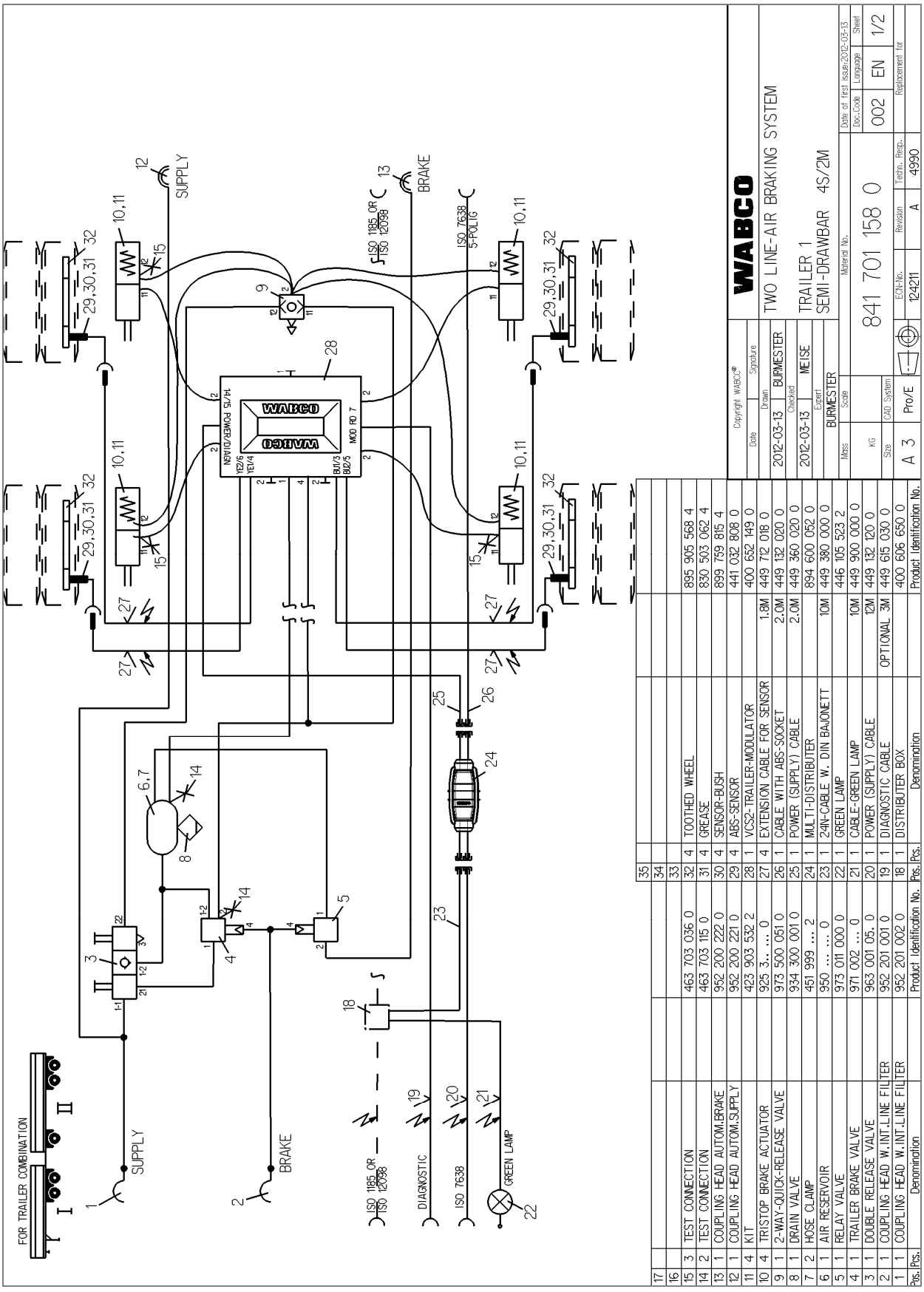
Date: 2012-03-20 | Signature
Drawn: BURMESTER
Checked: MEISE
Expert: BURMESTER
Material No.: 841 701 255 0
Size: A 3 | CAD System: Pro/E | KG | Scale
EDN-No.: 124211 | Revision: A | Techn. Resp.: 4990
Date of first issue: 2012-03-20
Doc.-Code: 002 | Language: EN | Sheet: 1/2
Replacement for

841 701 158 0



Pos.	Pcs.	Denomination	Product Identification No.
1	1	COUPLING HEAD W.INT.-LINE FILTER	952 201 002 0
2	1	COUPLING HEAD W.INT.-LINE FILTER	952 201 001 0
3	1	DOUBLE RELEASE VALVE	963 001 05. 0
4	1	TRAILER BRAKE VALVE	971 002 ... 0
5	1	RELAY VALVE	973 011 000 0
6	1	AIR RESERVOIR	950 0
7	2	HOSE CLAMP	451 999 ... 2
8	1	DRAIN VALVE	934 300 001 0
9	1	2-WAY-QUICK-RELEASE VALVE	973 500 051 0
10	4	TRISTOP BRAKE ACTUATOR	925 3.. ... 0
11	4	KIT	423 903 532 2
12	1	COUPLING HEAD AUTOM.SUPPLY	952 200 221 0
13	1	COUPLING HEAD AUTOM.BRAKE	952 200 222 0
14	2	TEST CONNECTION	463 703 115 0
15	3	TEST CONNECTION	463 703 036 0
16			
17			
33			
34			
35			
6	1	24N-CABLE W. DIN BAJONETT	449 380 000 0
19	1	DIAGNOSTIC CABLE	OPTIONAL 3M
20	1	POWER (SUPPLY) CABLE	12M
21	1	CABLE-GREEN LAMP	10M
22	1	GREEN LAMP	10M
23	1	MULTI-DISTRIBUTER	
24	1	POWER (SUPPLY) CABLE	2.0M
25	1	CABLE WITH ABS-SOCKET	2.0M
26	1	EXTENSION CABLE FOR SENSOR	1.8M
27	4	GREEN LAMP	446 105 523 2
28	1	DISTRIBUTER BOX	400 606 650 0
29	4	ABS-SENSOR	441 032 808 0
30	4	SENSOR-BUSH	899 769 815 4
31	4	GREASE	830 503 062 4
32	4	TOOTHED WHEEL	895 905 568 4

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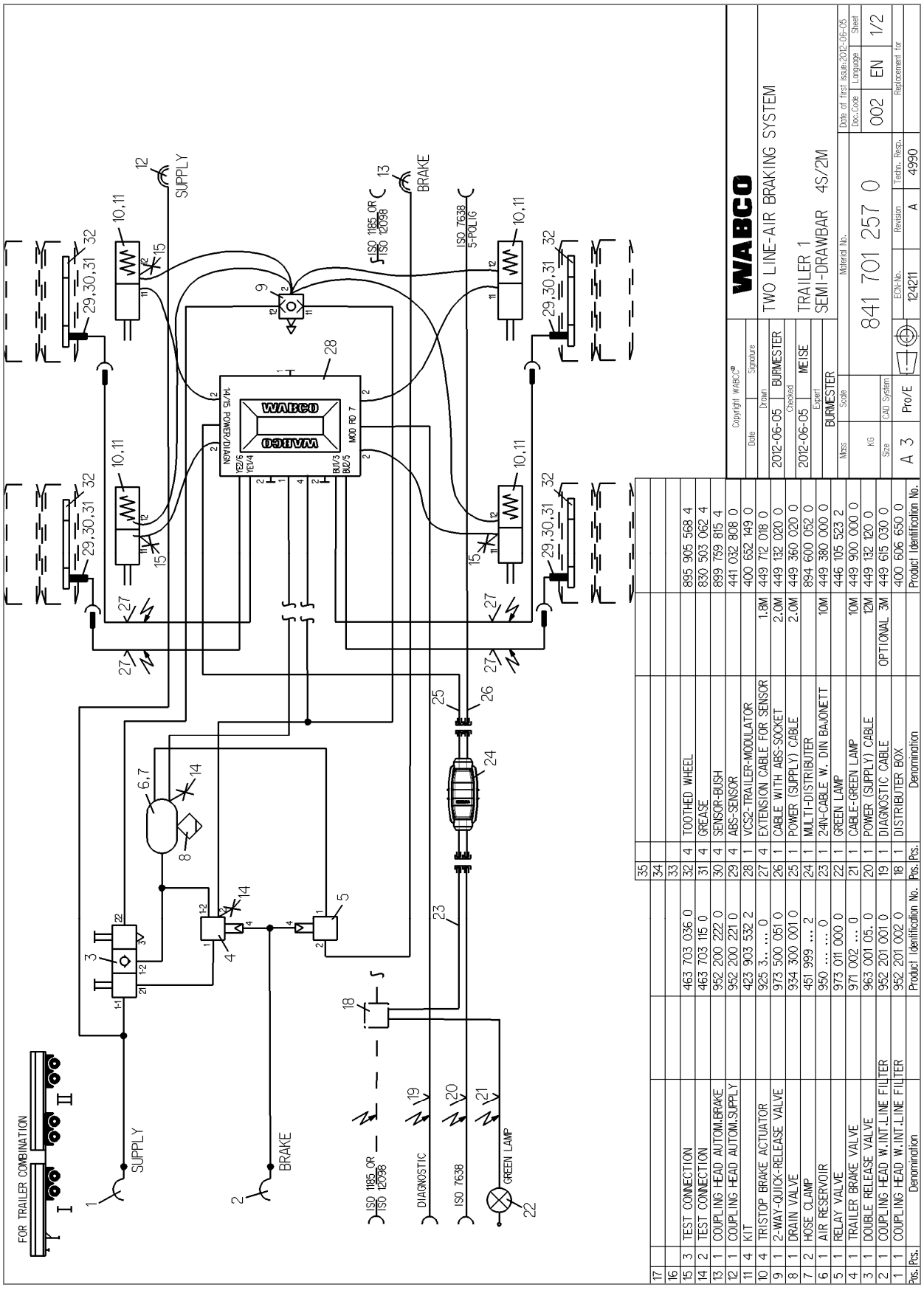
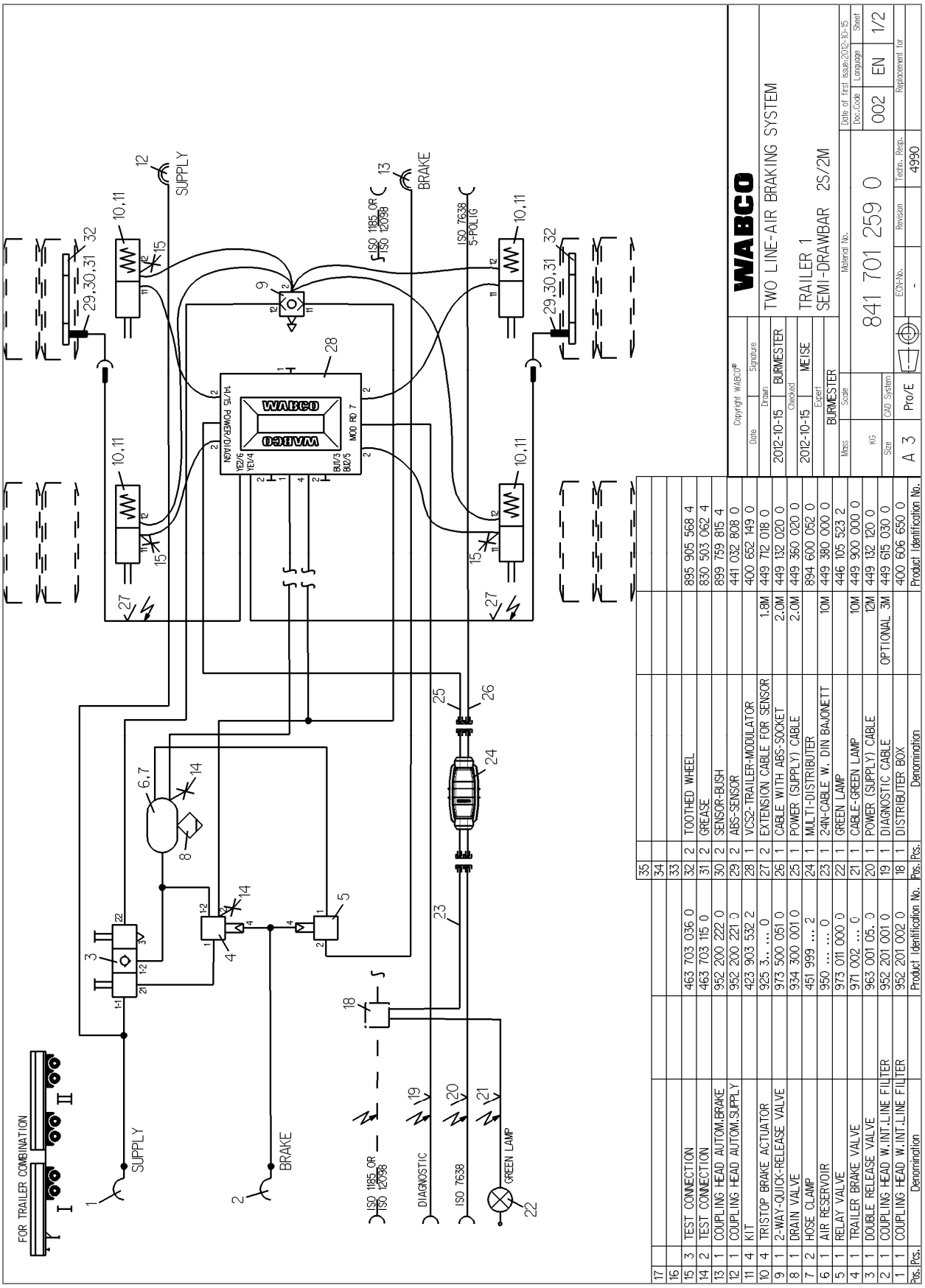
Date	Signature	TWO LINE-AIR BRAKING SYSTEM	
Drawn 2012-03-13	BURMESTER		
Checked 2012-03-13	MEISE	TRAILER 1 SEMI-DRAWBAR 4S/2M	
Expert	BURMESTER		
Mass	Scale	Material No.	Date of first issue 2012-03-13
KG		841 701 158 0	Doc.Code 002 / Language EN / Sheet 1/2
Size A 3	CAD System Pro/E	ECN-No. 124211 / Revision A / Techn. Resp. 4990	Replacement for

841 701 257 0



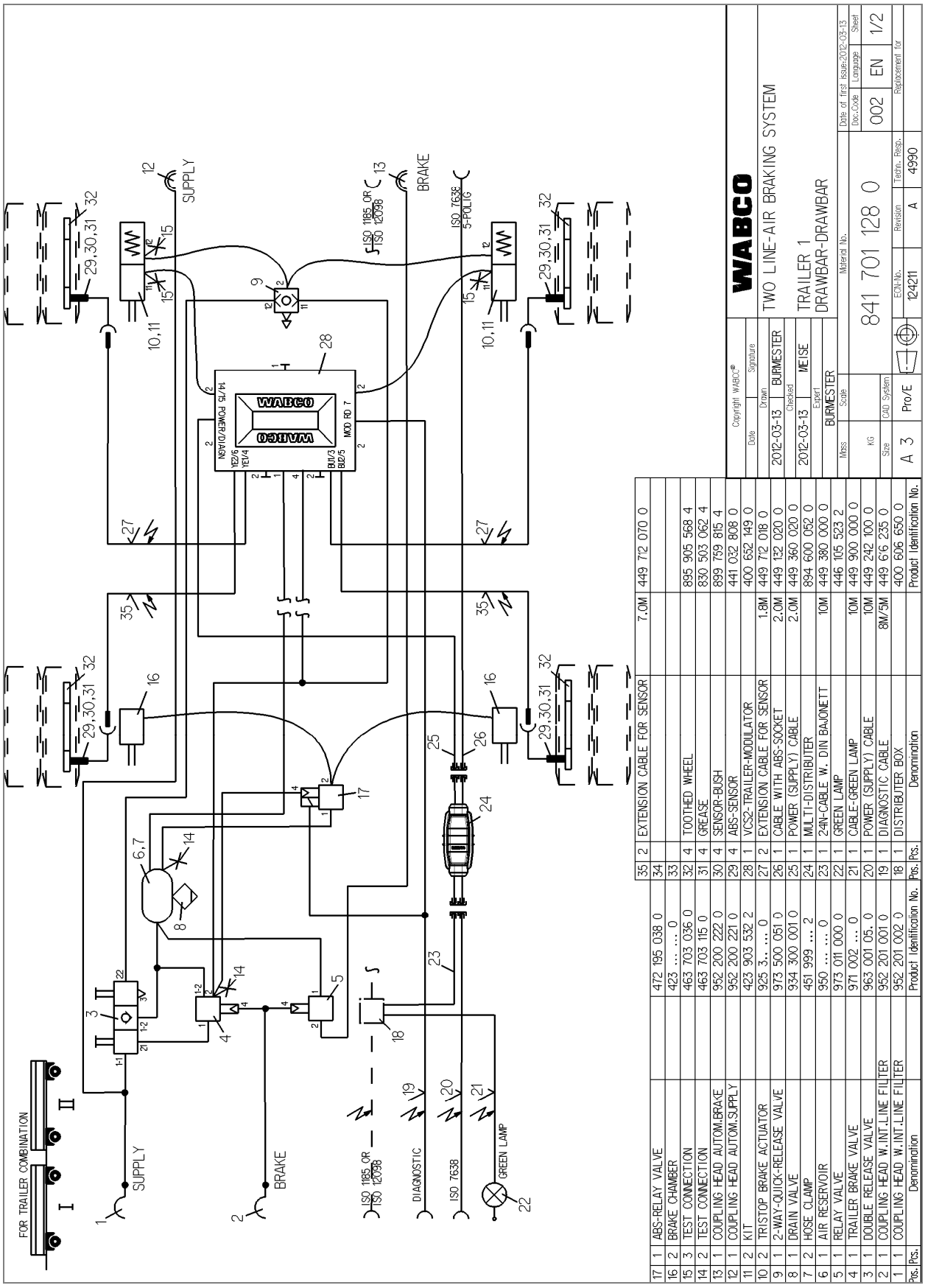
Pos.	Pcs.	Denomination	Product Identification No.
17			
16			
15	3	TEST CONNECTION	463 703 036 0
14	2	TEST CONNECTION	463 703 115 0
13	1	COUPLING HEAD AUTOM.BRAKE	952 200 222 0
12	1	COUPLING HEAD AUTOM.SUPPLY	952 200 221 0
11	4	KIT	423 903 532 2
10	4	TRISTOP BRAKE ACTUATOR	925 3.. ... 0
9	1	2-WAY-QUICK-RELEASE VALVE	973 500 051 0
8	1	DRAIN VALVE	934 300 001 0
7	2	HOSE CLAMP	451 999 ... 2
6	1	AIR RESERVOIR	950 0
5	1	RELAY VALVE	973 011 000 0
4	1	TRAILER BRAKE VALVE	971 002 ... 0
3	1	DOUBLE RELEASE VALVE	963 001 05. 0
2	1	COUPLING HEAD W.INT.LINE FILTER	952 201 001 0
1	1	COUPLING HEAD W.INT.LINE FILTER	952 201 002 0
35			
34			
33			
32	4	TOOTHED WHEEL	895 905 568 4
31	4	GREASE	830 503 062 4
30	4	SENSOR-BUSH	899 759 815 4
29	4	ABS-SENSOR	441 032 808 0
28	1	VCS2-TRAILER-MODULATOR	400 652 149 0
27	4	EXTENSION CABLE FOR SENSOR	1.8M 449 712 018 0
26	1	CABLE WITH ABS-SOCKET	2.0M 449 132 020 0
25	1	POWER (SUPPLY) CABLE	2.0M 449 360 020 0
24	1	MULTI-DISTRIBUTER	894 600 052 0
23	1	24N-CABLE W. DIN BAJONETT	10M 449 380 000 0
22	1	GREEN LAMP	446 105 523 2
21	1	CABLE-GREEN LAMP	10M 449 900 000 0
20	1	POWER (SUPPLY) CABLE	12M 449 132 120 0
19	1	DIAGNOSTIC CABLE	OPTIONAL 3M 449 615 030 0
18	1	DISTRIBUTER BOX	400 606 650 0

841 701 259 0



Pos.	Pcs.	Denomination	Product Identification No.	Pos.	Pcs.	Denomination	Product Identification No.
1	1	COUPLING HEAD W.INT.LINE FILTER	952 201 002 0	18	1	DISTRIBUTER BOX	400 606 650 0
2	1	COUPLING HEAD W.INT.LINE FILTER	952 201 001 0	19	1	DIAGNOSTIC CABLE	OPTIONAL 3M 449 615 030 0
3	1	DOUBLE RELEASE VALVE	963 001 05. 0	20	1	POWER (SUPPLY) CABLE	12M 449 132 120 0
4	1	TRAILER BRAKE VALVE	971 002 ... 0	21	1	CABLE-GREEN LAMP	10M 449 900 000 0
5	1	RELAY VALVE	973 011 000 0	22	1	GREEN LAMP	446 105 523 2
6	1	AIR RESERVOIR	950 0	23	1	24N-CABLE W. DIN BAJONETT	10M 449 380 000 0
7	2	HOSE CLAMP	451 999 ... 2	24	1	MULTI-DISTRIBUTER	894 600 052 0
8	1	DRAIN VALVE	934 300 001 0	25	1	POWER (SUPPLY) CABLE	2.0M 449 360 020 0
9	1	2-WAY-QUICK-RELEASE VALVE	973 500 051 0	26	1	CABLE WITH ABS-SOCKET	2.0M 449 132 020 0
10	4	TRISTOP BRAKE ACTUATOR	925 3.. ... 0	27	2	EXTENSION CABLE FOR SENSOR	1.8M 449 712 018 0
11	4	KIT	423 903 532 2	28	1	VCS2-TRAILER-MODULATOR	400 652 149 0
12	1	COUPLING HEAD AUTOM.SUPPLY	952 200 221 0	29	2	ABS-SENSOR	441 032 808 0
13	1	COUPLING HEAD AUTOM.BRAKE	952 200 222 0	30	2	SENSOR-BUSH	899 759 815 4
14	2	TEST CONNECTION	463 703 115 0	31	2	GREASE	830 503 062 4
15	3	TEST CONNECTION	463 703 036 0	32	2	TOOTHED WHEEL	895 905 568 4
16				33			
17				34			
				35			

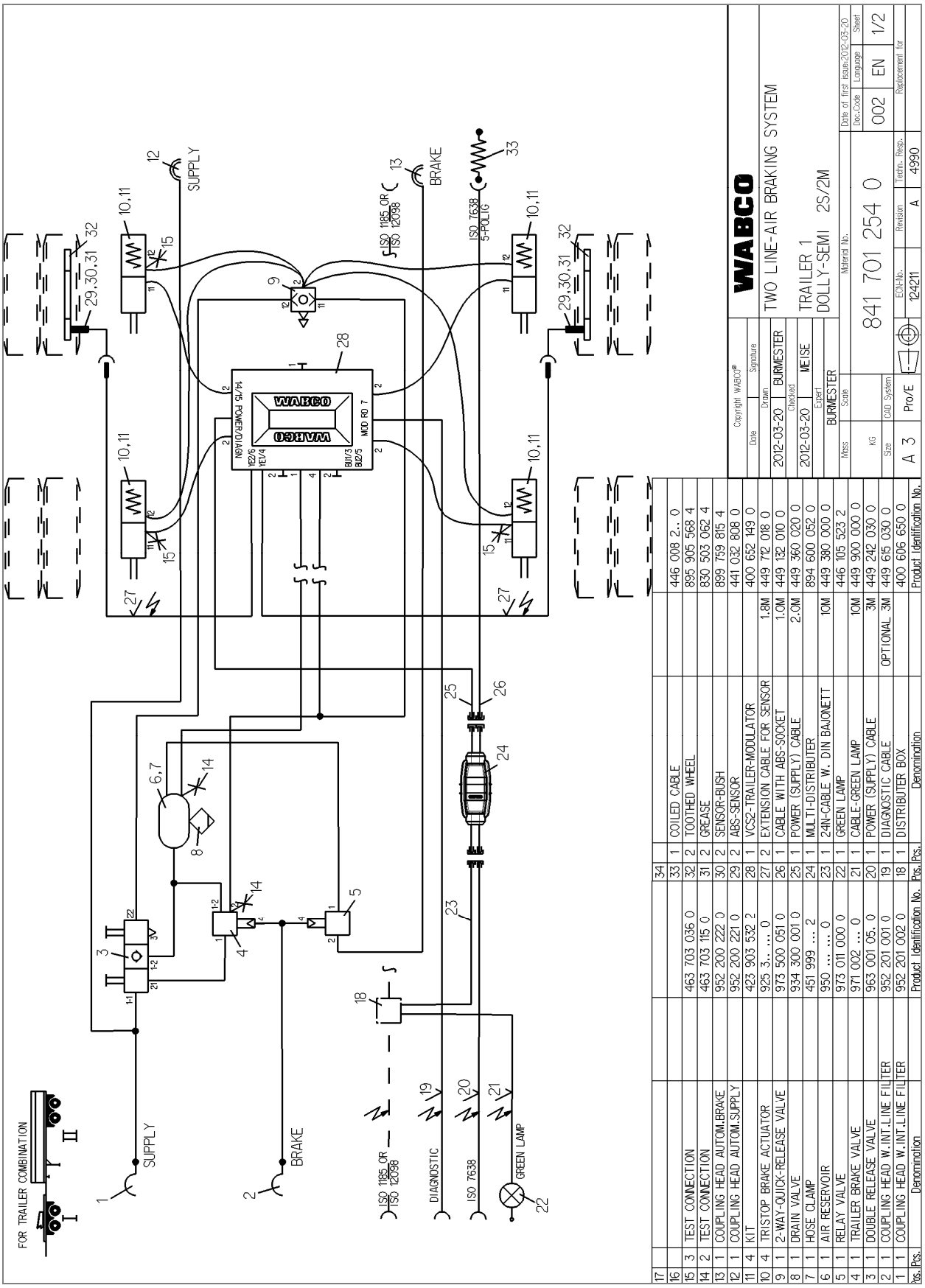
841 701 128 0



Pos.	Pcs.	Denomination	Product Identification No.
17	1	ABS-RELAY VALVE	472 195 038 0
16	2	BRAKE CHAMBER	423 0
15	3	TEST CONNECTION	463 703 036 0
14	2	TEST CONNECTION	463 703 115 0
13	1	COUPLING HEAD AUTOM.BRAKE	952 200 222 0
12	1	COUPLING HEAD AUTOM.SUPPLY	952 200 221 0
11	2	KIT	423 903 532 2
10	2	TRISTOP BRAKE ACTUATOR	925 3.. ... 0
9	1	2-WAY-QUICK-RELEASE VALVE	973 500 051 0
8	1	DRAIN VALVE	934 300 001 0
7	2	HOSE CLAMP	451 999 ... 2
6	1	AIR RESERVOIR	950 0
5	1	RELAY VALVE	973 011 000 0
4	1	TRAILER BRAKE VALVE	971 002 ... 0
3	1	DOUBLE RELEASE VALVE	963 001 05. 0
2	1	COUPLING HEAD W.INT.LINE FILTER	952 201 001 0
1	1	COUPLING HEAD W.INT.LINE FILTER	952 201 002 0

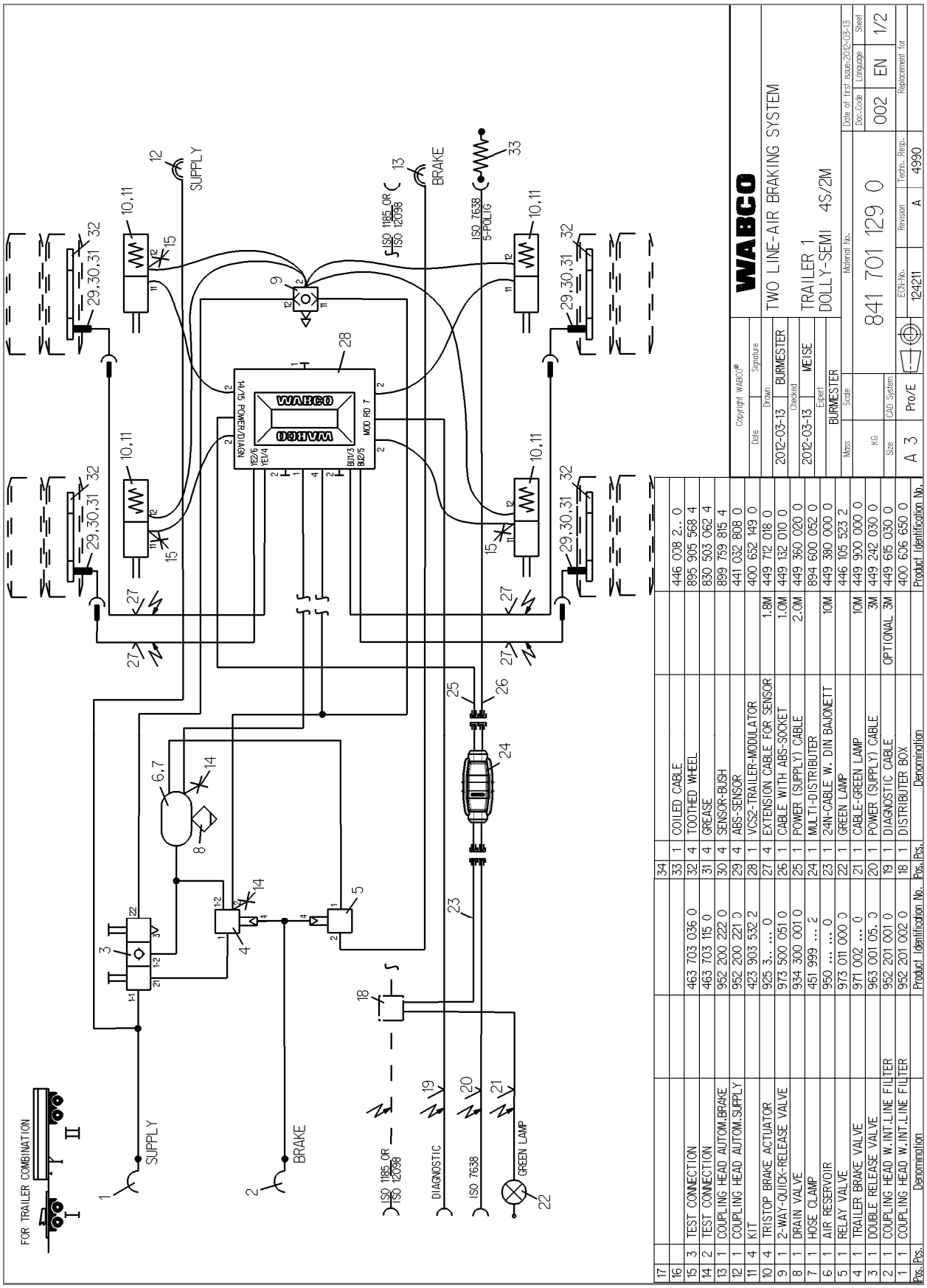
Pos.	Pcs.	Denomination	Product Identification No.	7.0M
35	2	EXTENSION CABLE FOR SENSOR	449 712 070 0	
34				
33				
32	4	TOOTHED WHEEL	895 905 568 4	
31	4	GREASE	830 503 062 4	
30	4	SENSOR-BUSH	899 759 815 4	
29	4	ABS-SENSOR	441 032 808 0	
28	1	VCS2-TRAILER-MODULATOR	400 652 149 0	
27	2	EXTENSION CABLE FOR SENSOR	449 712 018 0	1.8M
26	1	CABLE WITH ABS-SOCKET	449 132 020 0	2.0M
25	1	POWER (SUPPLY) CABLE	449 360 020 0	2.0M
24	1	MULTI-DISTRIBUTER	894 600 052 0	
23	1	24N-CABLE W. DIN BAJONETT	449 380 000 0	10M
22	1	GREEN LAMP	446 105 523 2	
21	1	CABLE-GREEN LAMP	449 900 000 0	10M
20	1	POWER (SUPPLY) CABLE	449 242 100 0	10M
19	1	DIAGNOSTIC CABLE	449 646 235 0	8M/5M
18	1	DISTRIBUTER BOX	400 606 650 0	

841 701 254 0



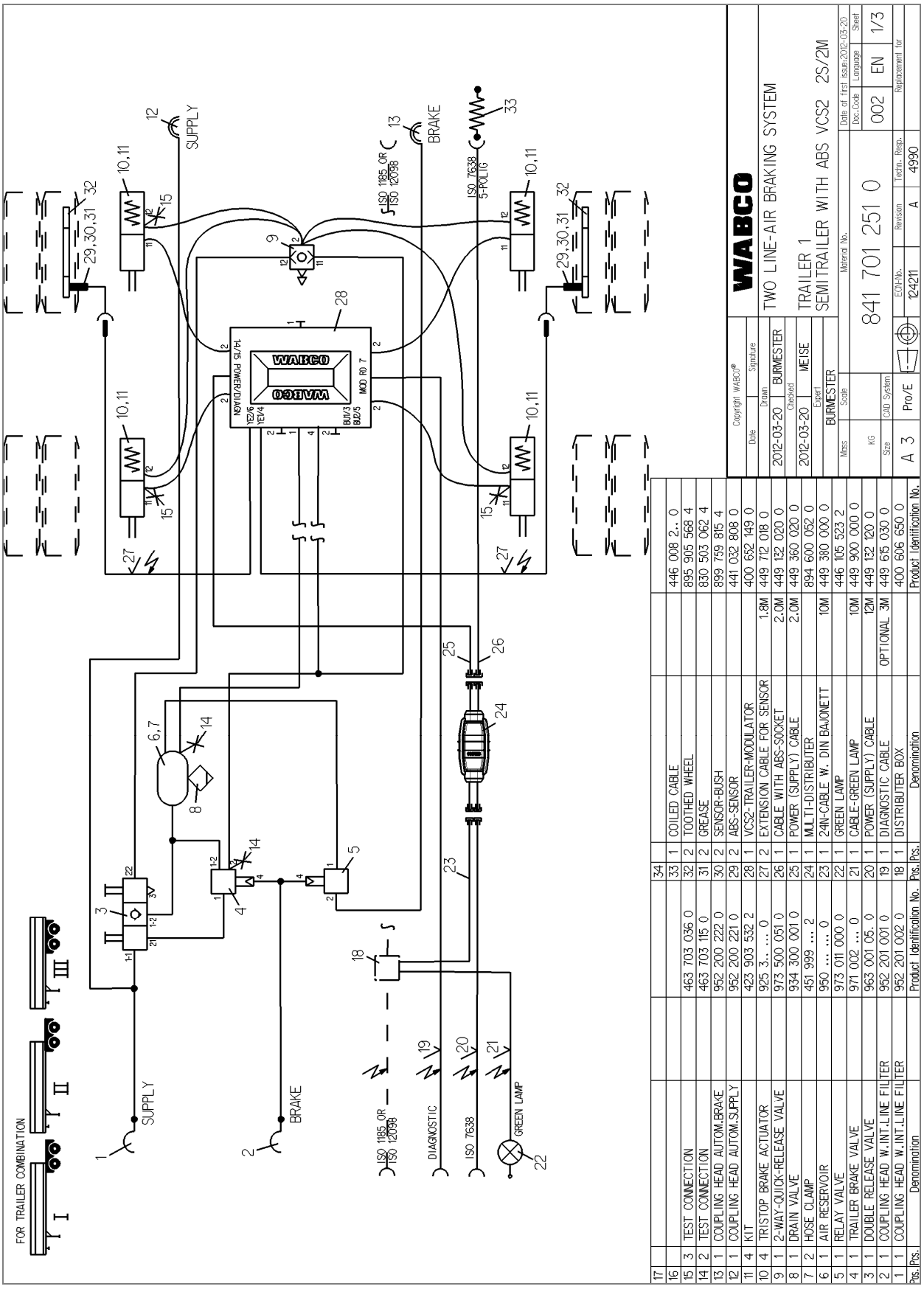
Pos.	Pcs.	Denomination	Product Identification No.
34			
33	1	COILED CABLE	446 008 2.. 0
32	2	TOOTHED WHEEL	895 905 568 4
31	2	GREASE	830 503 062 4
30	2	SENSOR-BUSH	899 759 815 4
29	2	ABS-SENSOR	441 032 808 0
28	1	VCS2-TRAILER-MODULATOR	400 652 149 0
27	2	EXTENSION CABLE FOR SENSOR 1.8M	449 712 018 0
26	1	CABLE WITH ABS-SOCKET 1.0M	449 132 010 0
25	1	POWER (SUPPLY) CABLE 2.0M	449 360 020 0
24	1	MULTI-DISTRIBUTER	894 600 052 0
23	1	24N-CABLE W. DIN BAJONETT 10M	449 380 000 0
22	1	GREEN LAMP	446 105 523 2
21	1	CABLE-GREEN LAMP 10M	449 900 000 0
20	1	POWER (SUPPLY) CABLE 3M	449 242 030 0
19	1	DIAGNOSTIC CABLE OPTIONAL 3M	449 615 030 0
18	1	DISTRIBUTER BOX	400 606 650 0
Pos.	Pcs.	Denomination	Product Identification No.
17			
16			
15	3	TEST CONNECTION	463 703 036 0
14	2	TEST CONNECTION	463 703 115 0
13	1	COUPLING HEAD AUTOM.BRAKE	952 200 222 0
12	1	COUPLING HEAD AUTOM.SUPPLY	952 200 221 0
11	4	KIT	423 903 532 2
10	4	TRISTOP BRAKE ACTUATOR	925 3.. ... 0
9	1	2-WAY-QUICK-RELEASE VALVE	973 500 051 0
8	1	DRAIN VALVE	934 300 001 0
7	1	HOSE CLAMP	451 999 2
6	1	AIR RESERVOIR	950 0
5	1	RELAY VALVE	973 011 000 0
4	1	TRAILER BRAKE VALVE	971 002 ... 0
3	1	DOUBLE RELEASE VALVE	963 001 05. 0
2	1	COUPLING HEAD W.INT.LINE FILTER	952 201 001 0
1	1	COUPLING HEAD W.INT.LINE FILTER	952 201 002 0

841 701 129 0



Pos.	Pcs.	Denomination	Product Identification No.	
17				
16				
15	3	TEST CONNECTION	463 703 036 0	
14	2	TEST CONNECTION	463 703 115 0	
13	1	COUPLING HEAD AUTOM.BRAKE	952 200 222 0	
12	1	COUPLING HEAD AUTOM.SUPPLY	952 200 221 0	
11	4	KIT	423 903 532 2	
10	4	TRISTOP BRAKE ACTUATOR	925 3... ... 0	
9	1	2-WAY-QUICK-RELEASE VALVE	973 500 051 0	
8	1	DRAIN VALVE	934 300 001 0	
7	1	HOSE CLAMP	451 999 ... 2	
6	1	AIR RESERVOIR	950 0	
5	1	RELAY VALVE	973 011 000 0	
4	1	TRAILER BRAKE VALVE	971 002 ... 0	
3	1	DOUBLE RELEASE VALVE	963 001 05. 0	
2	1	COUPLING HEAD W.INT.LINE FILTER	952 201 001 0	
1	1	COUPLING HEAD W.INT.LINE FILTER	952 201 002 0	
Pos.	Pcs.	Denomination	Product Identification No.	
34				
33	1	COILED CABLE	446 038 2.. 0	
32	4	TOOTHED WHEEL	895 905 568 4	
31	4	GREASE	830 503 062 4	
30	4	SENSOR-BUSH	899 759 815 4	
29	4	ABS-SENSOR	441 032 808 0	
28	1	VCS2-TRAILER-MODULATOR	400 652 149 0	
27	4	EXTENSION CABLE FOR SENSOR	1.8M 449 712 018 0	
26	1	CABLE WITH ABS-SOCKET	1.0M 449 132 010 0	
25	1	POWER (SUPPLY) CABLE	2.0M 449 360 020 0	
24	1	MULTI-DISTRIBUTER	894 600 052 0	
23	1	24N-CABLE W. DIN BAUONETT	10M 449 380 000 0	
22	1	GREEN LAMP	446 105 523 2	
21	1	CABLE-GREEN LAMP	10M 449 900 000 0	
20	1	POWER (SUPPLY) CABLE	3M 449 242 030 0	
19	1	DIAGNOSTIC CABLE	OPTIONAL 3M 449 615 030 0	
18	1	DISTRIBUTER BOX	400 606 650 0	
Pos.	Pcs.	Denomination	Product Identification No.	

841 701 251 0



Pos.	Pcs.	Denomination	Product Identification No.	Pos.	Pcs.	Denomination	Product Identification No.
1	1	COUPLING HEAD W.INT.LINE FILTER	952 201 002 0	18	1	DISTRIBUTER BOX	400 606 650 0
2	1	COUPLING HEAD W.INT.LINE FILTER	952 201 001 0	19	1	DIAGNOSTIC CABLE	OPTIONAL 3M 449 615 030 0
3	1	DOUBLE RELEASE VALVE	963 001 05. 0	20	1	POWER (SUPPLY) CABLE	12M 449 132 120 0
4	1	TRAILER BRAKE VALVE	971 002 ... 0	21	1	CABLE-GREEN LAMP	10M 449 900 000 0
5	1	RELAY VALVE	973 011 000 0	22	1	GREEN LAMP	446 105 523 2
6	1	AIR RESERVOIR	950 0	23	1	24N-CABLE W. DIN BAJONETT	10M 449 380 000 0
7	2	HOSE CLAMP	451 999 ... 2	24	1	MULTI-DISTRIBUTER	894 600 052 0
8	1	DRAIN VALVE	934 300 001 0	25	1	POWER (SUPPLY) CABLE	2.0M 449 360 020 0
9	1	2-WAY-QUICK-RELEASE VALVE	973 500 051 0	26	1	CABLE WITH ABS-SOCKET	2.0M 449 132 020 0
10	4	TRISTOP BRAKE ACTUATOR	925 3.. ... 0	27	2	EXTENSION CABLE FOR SENSOR	1.8M 449 712 018 0
11	4	KIT	423 903 532 2	28	1	VCS2-TRAILER-MODULATOR	400 652 149 0
12	1	COUPLING HEAD AUTOM.SUPPLY	952 200 221 0	29	2	ABS-SENSOR	441 032 808 0
13	1	COUPLING HEAD AUTOM.BRAKE	952 200 222 0	30	2	SENSOR-BUSH	899 759 815 4
14	2	TEST CONNECTION	463 703 115 0	31	2	GREASE	830 503 062 4
15	3	TEST CONNECTION	463 703 036 0	32	2	TOOTHED WHEEL	895 905 568 4
16				33	1	COILED CABLE	446 008 2.. 0
17				34			

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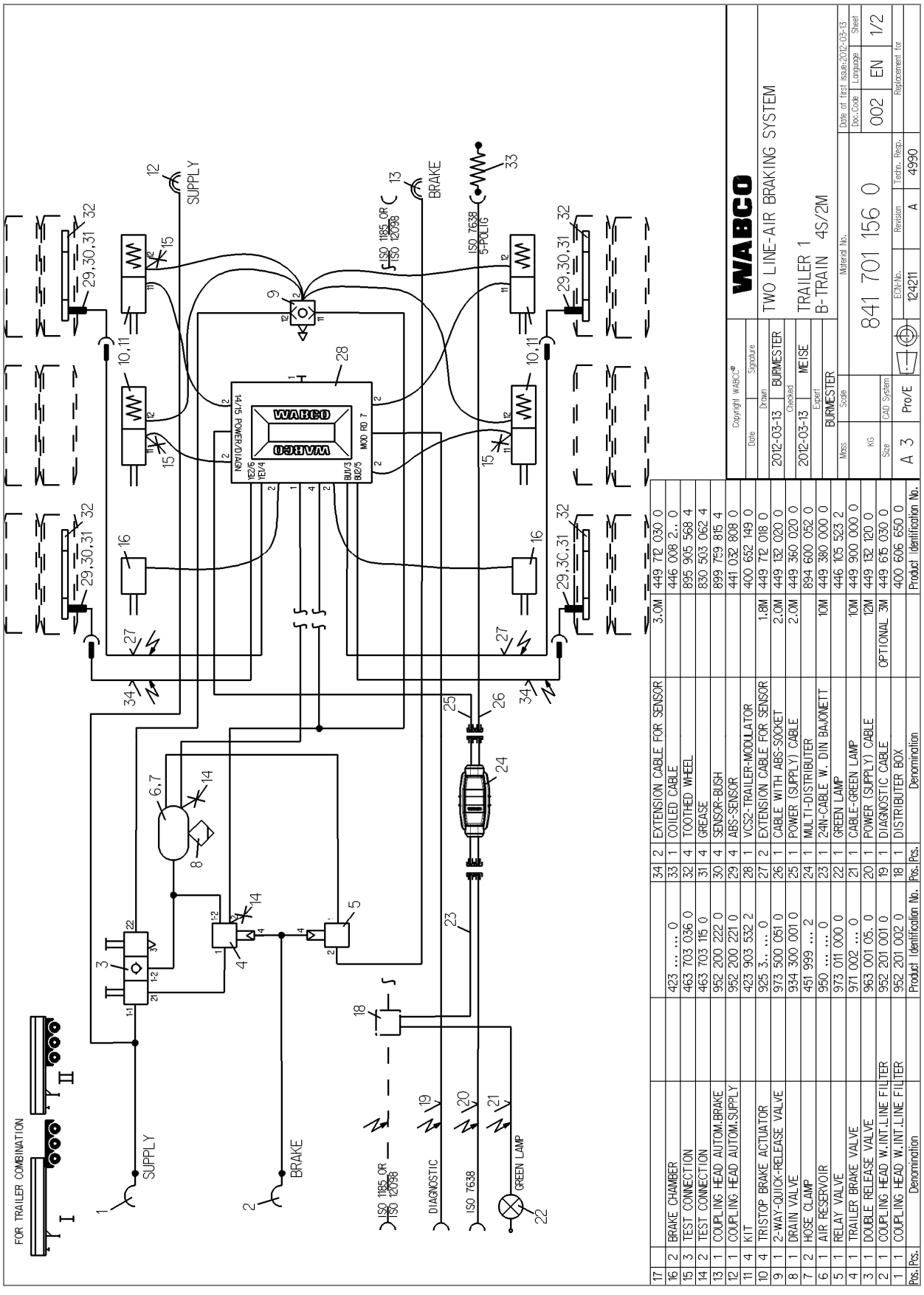
Date	Signature	TWO LINE-AIR BRAKING SYSTEM	
2012-03-20	BURMESTER		
Checked			
2012-03-20	MEISE	TRAILER 1	
Expert		SEMITRAILER WITH ABS VCS2 2S/2M	
BURMESTER			
Mass	Scale	Material No.	Date of first issue 2012-03-20
KG		841 701 251 0	Doc.Code 002 / Language EN / Sheet 1/3
Size	CAD System	ECN-No. / Revision / Techn. Resp.	Replacement for
A 3	Pro/E	124211 / A / 4990	

841 701 256 0



Pos.	Pcs.	Denomination	Product Identification No.	Pos.	Pcs.	Denomination	Product Identification No.
17				34	2	EXTENSION CABLE FOR SENSOR	3.0M 449 712 030 0
16	2	BRAKE CHAMBER	423 0	33	1	COILED CABLE	446 008 2.. 0
15	3	TEST CONNECTION	463 703 036 0	32	4	TOOTHED WHEEL	895 905 568 4
14	2	TEST CONNECTION	463 703 115 0	31	4	GREASE	830 503 062 4
13	1	COUPLING HEAD AUTOM.BRAKE	952 200 222 0	30	4	SENSOR-BUSH	899 759 815 4
12	1	COUPLING HEAD AUTOM.SUPPLY	952 200 221 0	29	4	ABS-SENSOR	441 032 808 0
11	4	KIT	423 903 532 2	28	1	VCS2-TRAILER-MODULATOR	400 652 149 0
10	4	TRISTOP BRAKE ACTUATOR	925 3... ... 0	27	2	EXTENSION CABLE FOR SENSOR	1.8M 449 712 018 0
9	1	2-WAY-QUICK-RELEASE VALVE	973 500 051 0	26	1	CABLE WITH ABS-SOCKET	2.0M 449 132 020 0
8	1	DRAIN VALVE	934 300 001 0	25	1	POWER (SUPPLY) CABLE	2.0M 449 360 020 0
7	2	HOSE CLAMP	451 999 ... 2	24	1	MULTI-DISTRIBUTER	894 600 052 0
6	1	AIR RESERVOIR	950 0	23	1	24N-CABLE W. DIN BAJONETT	10M 449 380 000 0
5	1	RELAY VALVE	973 011 000 0	22	1	GREEN LAMP	446 105 523 2
4	1	TRAILER BRAKE VALVE	971 002 ... 0	21	1	CABLE-GREEN LAMP	10M 449 900 000 0
3	1	DOUBLE RELEASE VALVE	963 001 05.. 0	20	1	POWER (SUPPLY) CABLE	12M 449 132 120 0
2	1	COUPLING HEAD W.INT.LINE FILTER	952 201 001 0	19	1	DIAGNOSTIC CABLE	OPTIONAL 3M 449 615 030 0
1	1	COUPLING HEAD W.INT.LINE FILTER	952 201 002 0	18	1	DISTRIBUTER BOX	400 606 650 0

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Date	Signature	TWO LINE-AIR BRAKING SYSTEM					
2012-03-13	BURMESTER	TRAILER 1					
Checked		B-TRAIN 4S/2M					
2012-03-13	MEISE	Material No.				Date of first issue 2012-03-13	
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BURMESTER						002	EN	1/2
Mass	Scale	KG					
Size	CAD System						
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		124211	A	4990			

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