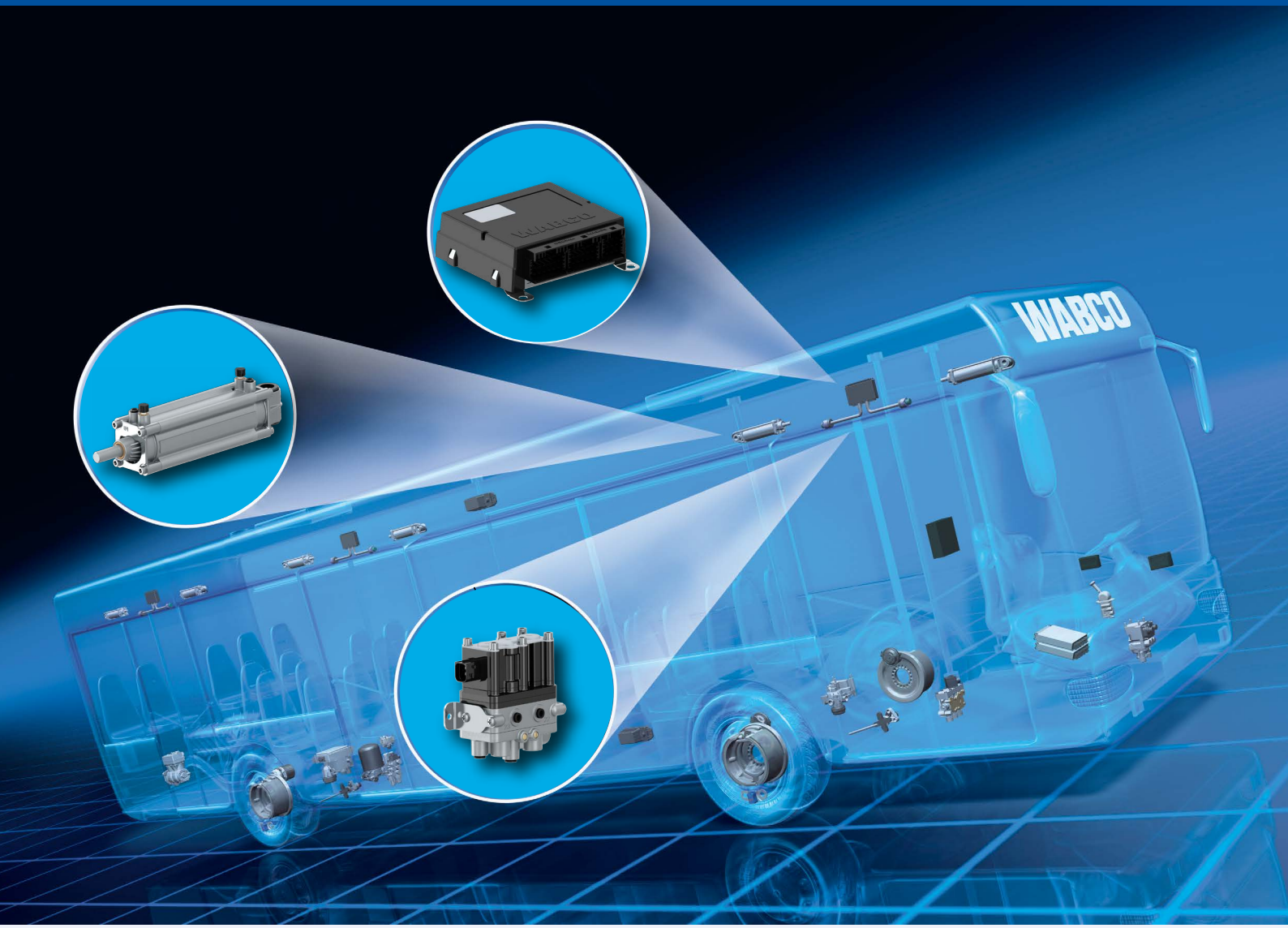
# MTS2 – MODULAR DOOR CONTROL

## SYSTEM DESCRIPTION

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**Original document:**
The German version of this document: is the original document.

**Translation of the original document:**
All non-German language editions of this document are translations of the original document.

**Edition 1 (01.2019)**
**Document number: 815 010 105 3 (en)**

You will find the current edition at:
http://www.wabco.info/i/1096

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# 1 List of abbreviations

| ABBREVIATION | MEANING |
|---|---|
| ADR | Address |
| CAN | Controller Area Network; asynchronous serial bus system for networking ECUs (control units) in vehicles |
| CNT | Incremental transmitter |
| DSZ | (German: Druckschalter zu); pressure switch closed |
| DSA | (German: Druckschalter auf); pressure switch open |
| ES | (German: Endschalter); limit switch |
| ESB | (German: Einstiegsbeleuchtung); entrance lighting |
| FKT | (German: Funktionseingang); function input |
| GND | Ground |
| KL | (German: Kraftlos); powerless |
| MOT | (German: Motor); engine |
| MTS2 E | (German: Modulare Türsteuerung 2 elektrisch); modular door control 2 electrical |
| MTSGND | (German: Sensormasse); sensor ground |
| MTS2 P | (German: Modulare Türsteuerung 2 pneumatisch); modular door control 2 pneumatic |
| MTS-PX/EX | (German: Modulare Türsteuerung der ersten Generation); modular door control of the first generation |
| MTS2 | (German: Modulare Türsteuerung 2); modular door control 2 (for buses) |
| NB | (German: Notbetätigung); emergency control |
| OUT | Output |
| POSV | (German: Potentiometer vorne); potentiometer front |
| POSH | (German: Potentiometer hinten); potentiometer rear |
| REV | Reversing input |
| SP | (German: Sperreingang); blocking input |
| SVC | Service switch |
| TT | (German: Werkstatttaster); workshop button |
| UB | 24 V supply |
| UDS | Unified Diagnostic Services |
| $U_{REF}$ | Reference voltage |

# 2 Symbols used in this document

**⚠ DANGER**

The signal word denotes a hazard with a high degree of risk which, if not avoided, will result in death or serious injury.

**⚠ WARNING**

The signal word denotes a hazard with a medium degree of risk which, if not avoided, can result in death or serious injury.

**⚠ CAUTION**

The signal word denotes a hazard with a low degree of risk which, if not avoided, may result in minor or moderate injury.

***NOTICE***

The signal word denotes a hazard which, if not avoided, can result in material damage.

Important information, notes and/or tips

Reference to information on the internet

Descriptive text

– Action step

1. Action step 1 (in ascending order)
2. Action step 2 (in ascending order)

   ⇨ Consequence of an action

■ Listing

  • Listing

## 2.1 Purpose of this document

This brochure is aimed at employees of bus and door manufacturers as well as specialist workshop personnel and describes the second generation of modular door control systems.

# 3 Introduction

## 3.1 "Modular Door Control" over the course of time

WABCO has produced bus door drive and control components for many decades. Over the years, several generations of door control systems have been developed which have met the many requirements of vehicle manufacturers and users as well as legislation.

Their continuous further development led to the introduction of the new MTS2 (2nd generation modular door control). This system is based on the experience of the MTS-PX/EX and takes electronic door control to a new level. It combines the technical requirements of modern buses and coaches with the goal of a cost-effective system structure and the fulfilment of the extended legal requirements of the ECE R107 regulation.

## 3.2 MTS2 - 2nd generation modular door control system

The MTS2 was developed building on the experience of the MTS-PX/EX. It was first used in series production in 2013 and is now well established on the market. Like the first MTS generation, it can be used for all types of doors, whether pneumatic or electric. For this purpose, all components of the door control system for both the pneumatic and electric drives have been completely redesigned.

In order to comply with the specification of a simplified system layout, the layout of the system has been significantly improved. The internal MTS-PX/EX system bus is no longer required; all MTS2 ECUs are directly connected to the vehicle CAN bus as so-called multi-master units. As a result, the interface to the vehicle has been standardised. The connection to the vehicle via conventional cabling is no longer necessary; all MTS2 ECUs are connected to the vehicle architecture exclusively via a CAN bus interface.

One MTS2 system can control up to 8 doors in a vehicle. In comparison to the 1st generation MTS, each ECU for pneumatic doors is capable of controlling up to 3 valves and monitoring 4 door wings. This means that one ECU is sufficient to control two doors, one of which may be equipped with a separate wing control. Furthermore, the MTS2 can control both outward-swinging doors of a touring coach using only a single ECU.

The architecture of the pneumatic control of the doors has also been significantly simplified. Thanks to an innovative new door control valve with integrated safety function, the separate emergency switching valves used previously can be omitted and the emergency cocks (both outside and inside) can be connected directly to the door control valve.

In combination with the new door control valve, innovative emergency cocks enable automatic resetting of the door function after emergency cock actuation from the driver's seat. It is therefore no longer necessary for the driver to leave his driving position in order to put a door back into operation after actuating the emergency cock. In addition, the emergency cock (inside) is closed while driving in accordance with the legal requirements according to ECE-R107.

To further simplify the installation, all pneumatic components are equipped with so-called "push-to-connect" connections (6 or 8 mm). Pneumatic lines can thus be easily and quickly connected to the MTS2 components without further screw connections.

As before, the pneumatic doors are monitored via potentiometers mounted directly on the rotary column and via pressure switches screwed into the MTS2 solenoid valve. Due to mechanical coding, no adjustment of the potentiometers is required. Electrically driven doors can equally be monitored with the help of these potentiometers; alternatively, pulse generators installed in the engine can be used together with an limit switch.

A simple teaching process is used to balance all the tolerances during initial start-up or when the ECU is replaced for every door. For this, it is necessary to move the doors once to both end positions by continuously actuating the workshop button.

# Introduction

The proven damping principle has been further developed for pneumatically operated doors. The end position damping is integrated in the door valve. What is new is that both the damping in opening and closing direction can be set separately. In addition, the cylinders are equipped with adjustable throttles acting in both directions. This provides a wide range of adjustment options to ensure optimum door travel for different types of doors.

Optionally, electrical terminal strips can be connected directly to the MTS2 and can be monitored directly without additional devices.

The control unit is delivered with a bootloader. Depending on the type of door, a suitable application program is loaded into the ECU during start-up at the vehicle manufacturer, so that a tailor-made unit is created. In addition, the door travel can be adapted to the vehicle conditions by means of various parameter settings.

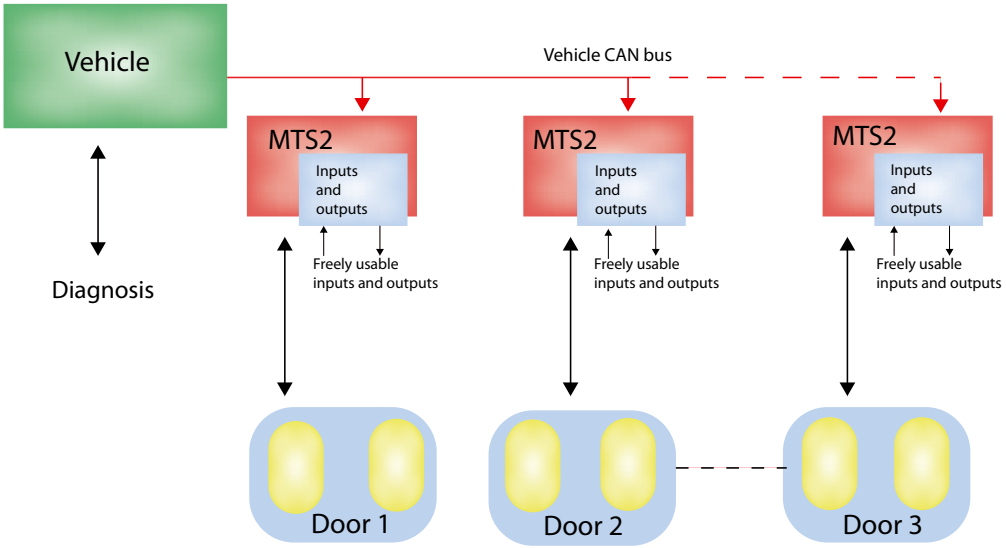
The MTS2 system can be diagnosed; diagnosis is carried out via UDS. As before, the WABCO Standard Diagnostic Interface must be used in conjunction with the new MTS2 diagnosis to connect the ECU to the diagnosis system.

As known from the MTS-PX/EX, the MTS2 also has - depending on the system configuration - up to 9 inputs and 7 outputs, which can be used freely. The programming and definition of the functionalities are the responsibility of the vehicle manufacturer.

# 4 System configuration

The modular door control 2 can be used in two different systems.

## 4.1 System with one-door control

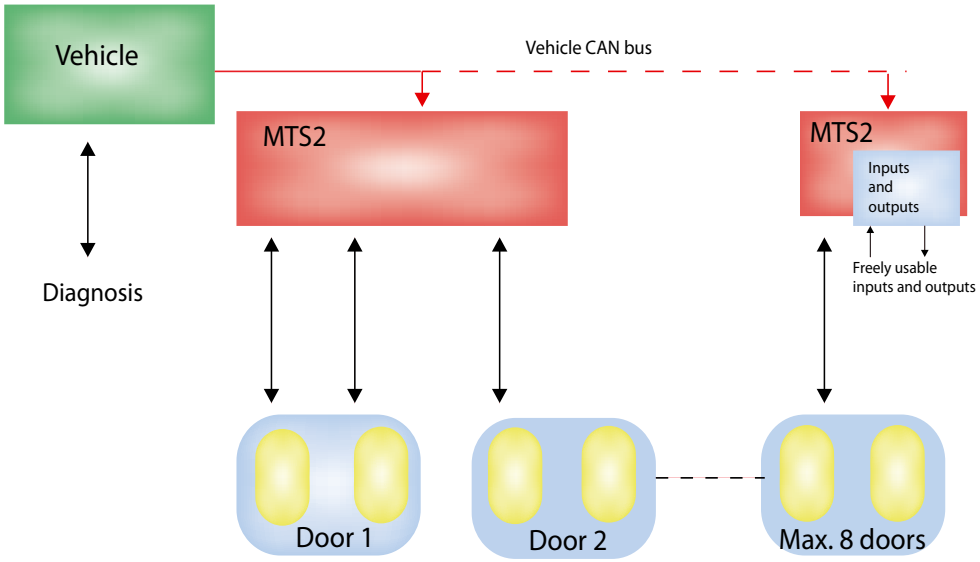



The MTS2, like the MTS-PX/EX, can be used as a one-door controller. For this purpose, each door is equipped with an ECU which controls and monitors the respective door.

With this system variant, the ECUs also offer the option of freely using unused inputs and outputs. This enables different configuration options, adapted to the needs of the manufacturer. The number depends on the respective system configuration (one or two valve control).

Unlike in the past, each ECU is connected directly to the vehicle CAN bus with the same rights (multi-master system). This means that the previous separate MTS door CAN bus is no longer required.

## 4.2 System with multi-door control



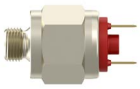

As an alternative to one-door control, the MTS2 can also control up to 3 valves with one ECU and read in up to 4 potentiometers. This makes it possible to control two doors in parallel from one ECU, where it is even possible for one of the doors to have a separate door wing control. With this configuration, all vehicles with up to two doors, such as standard city buses, intercity buses and coaches, can be controlled with just one ECU.

With a multi-door control with 3 valves, all available inputs and outputs are used and no pins remain for free disposal.

# 5 System components

In order to ensure perfect interaction between door electronics and door mechanics and thus passenger and operational safety, WABCO is usually required to carry out tests and, if necessary, make adjustments. To use the system in series it is imperative to discuss this with the door or vehicle manufacturer and to obtain his approval if the joint assessment was positive.

| PRODUCT NUMBER | FIGURE | DESCRIPTION |
|---|---|---|
| 446 190 006 0 |  | ECU for pneumatic doors |
| 446 190 016 0 |  | ECU for electrical doors |
| 472 601 001 0 |  | MTS2 solenoid valve<br>1x for each door<br>2x in the case of separate door wing actuation |

| PRODUCT NUMBER | FIGURE | DESCRIPTION |
|---|---|---|
| 422 814 000 0<br>422 814 001 0<br>422 814 002 0 |  | MTS2 door cylinder<br>50 x 140 mm diameter for doors swinging to the inside<br>Diameter 50x160 mm<br>Diameter 50x180 mm<br>1x for each door wing |
| 446 190 150 0 |  | Sensor for inward-swinging door<br>125 degrees angle of rotation<br>1x for each door wing with "pressure wave duct" |
| 446 190 151 0 |  | Sensor for outward-swinging door<br>180 degrees angle of rotation<br>1x for each door wing |
| 446 190 152 0 |  | Sensor for inward-swinging door<br>125 degrees angle of rotation<br>1x for each door wing without "pressure wave duct" |
| 441 014 017 0 |  | Pressure switch<br>4 bar, NO (Normally open)<br>2x for each door valve |
| 952 004 001 0<br>952 004 002 0 |  | Emergency cock, 1x inside and outside for each door respectively<br>With microswitch<br>Without microswitch |

## 5.1 MTS2 solenoid valve

The MTS2 valve operates the pneumatic door cylinders responsible for opening and closing the doors. The safety functionality integrated in the valve leads to a pressureless function of the doors in the event of an inside emergency cock actuation in accordance with the blocking specification under ECE R107.

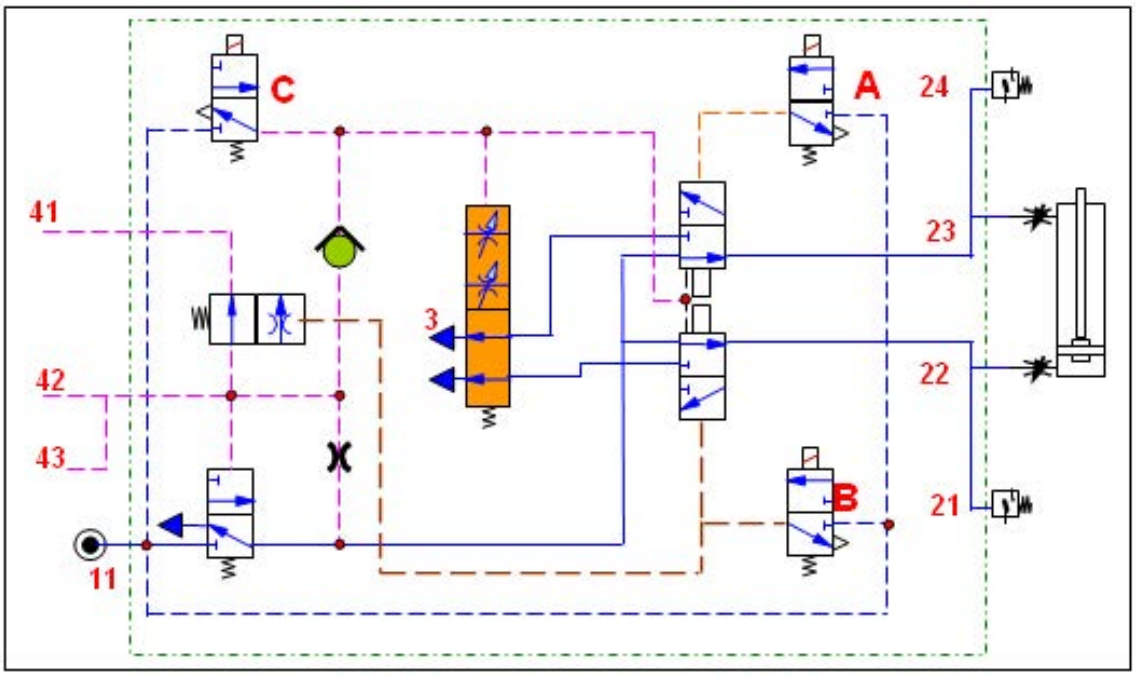



Fig. 1 Circuit diagram MTS2 solenoid valve

## 5.2 ECU

The ECU controls the MTS2 solenoid valve. Depending on the configuration, either one ECU is used for each door or two doors are controlled per ECU. The ECU is connected to the vehicle electrical system via the connection to the vehicle CAN bus.

Depending on the door drive, either the ECU for pneumatic doors (446 160 006 0) or the ECU for electric doors (446 190 016 0) is used.

## 5.3 MTS2 door cylinder

The MTS2 door cylinder is compatible with the MTS system with WABCO linear cylinders. Due to the use of aluminium and plastic, it is approx. 500 grams lighter than a linear cylinder from the MTS system. The pneumatic connection is made via the integrated plug connections. The door running speed can be adjusted via the variable throttles of the cylinder. It is available in three stroke lengths: 140 mm, 160 mm and 180 mm. The diameter of the cylinder is always 50 mm. The piston has an M14x1.5 thread. One MTS2 door cylinder is required per door wing.

## 5.4 Emergency cock

The MTS2 is designed for the use of one emergency cock respectively inside and outside the vehicle. Manual actuation is effected by turning the emergency cock by approx. 90°. When released, the emergency cock is reset by a spring. It is used in combination with the MTS2 door valve and has plug connections. The sensing of the switching position by microswitch is optionally possible.

## 5.5 Pressure switch

The monitoring of the opening and closing process and the detection of power- and pressureless switching is carried out via pressure switches. They have a switching pressure of 4 +/- 0.4 bar. Two pressure switches are required per door valve.

## 5.6 Travel sensor

The travel is sensed by potentiometers or incremental encoders mounted directly on the rotary columns. The values of the potentiometer are processed by the ECU as relative values. If a travel sensor is replaced, the door must be learned again.

# 6 Assembly

– Follow the vehicle manufacturer's installation details.

# 7 Start-up

For start-up of the MTS2, the ECU must be fully connected. Local start-up (on a test stand / without CAN connection) of the door is possible. Start-up consists of a learning procedure to be carried out before series use. The values of the door leaf end positions [ZU (closed), AUF (open)] are learned and permanently stored in the ECU.

Operating elements for learning

- Service switch (SVC)
- Workshop button (TT)
- Entrance lighting (ESB)

All MTS2 series ECUs are supplied without the application or a parameter set. Both must be loaded into the ECU during start-up (factory or workshop) according to the respective door design and desired functionality.

## 7.1 Learning the doors

The door control must be learned for each door of the vehicle in order to compensate production tolerances of the doors. All the learned values can be read out with the diagnosis.

During the learning procedure, the entrance lighting of the respective door flashes. The number of flashing pulses depends on the door position. The lighting flashes once for door 1, twice for door 2, and so on.

### 7.1.1 Requirements

- The ECU contains the door- and vehicle-specific parameter set.
- The vehicle is stationary (ground potential on pin 12/18 C3 at the ECU of door 1).

- The ignition is switched on (24 V on pin 3/12 on the ECU of door 1 or ignition signal on the CAN bus of the vehicle).
- The service switch (SVC) is active.
- Operating voltage and pressure are OK.

### 7.1.2 Learning procedure

A learning procedure is carried out as follows:

1. Close door.
2. Continuously press workshop button.
   ⇨ The door moves to the AUF (open) position.
   ⇨ After approx. 7 seconds, the entrance lighting of the learned door flashes: once at door 1, twice at door 2, etc.
3. Release workshop button.
   ⇨ The flashing indicates the end of the learning procedure AUF (open).
4. Open door.
5. Continuously press workshop button.
   ⇨ The door moves to the ZU (closed) position.
   ⇨ After approx. 7 seconds, the entrance lighting of the learned door flashes: once at door 1, twice at door 2, etc.
6. Release workshop button.
   ⇨ The flashing indicates the end of the learning procedure ZU (closed).

The teach-in process is confirmed by the entrance lighting flashing only after the door has run smoothly.

## 7.2 Learning the system

1. Switch off ignition.
2. Switch on ignition.
3. Carry out learning procedure on door 1.
4. Repeat steps 1 to 3 for all other doors.
   ⇨ The system is learned.

## 7.3 Standstill detection

The standstill is detected via the C3 speedometer signal (pin 2/9) and via CAN bus signals.

The speed threshold of the C3 speedometer signal for "vehicle stationary" is approx. 3 km/h.

The CAN bus signal "FAHRT" (driving) is linked to the "C3 speedometer signal" or to the CAN bus signal "STC3_3" of the first door.

The link can be selected via parameter P01 Chapter "7.4 Parameters", page 14.

When linking to the CAN bus signal "STC3_3" of the first door, pin 2/9 on door 2-8 can remain unconnected.

If after switching on the supply voltage a valid status "vehicle stationary" or "vehicle moving" was once received by the ECU, this information is always linked to the signal of the first door. The signal must have a "vehicle stationary" status so that the doors can be opened.

Once a valid status "vehicle stationary" or "vehicle driving" has been received, the status "not defined" and "signal not available" are internally set to "vehicle driving".

The door can only be opened if the door control detects the "vehicle stationary" state.

Emergency actuation is excluded from this.

## 7.4 Parameters

### 7.4.1 Standstill detection / Emergency cock blocking (P01)

Signal selection for standstill detection (v < 3 km/h) and emergency cock blocking (v > 5 km/h):

"C3 speedometer signal" or status signals "STC3_3" / "STC3_5" of the first door.

Possible setting values:

- C3 speedometer signal
- Status signal STC3_3 (T1)
- Status signal STC3_5 (T1)

Default setting: C3 speedometer signal

# 8 Diagnosis

As before with the MTS-PX/EX, the MTS2 is diagnosed by means of a diagnostic program via the Diagnostic Interface and the corresponding cable. A standard PC/laptop (WIN 10) and a connecting cable between the Diagnostic Interface and the door system are also required. The type of connecting cable required depends on the diagnostic socket installed by the vehicle manufacturer.

The Diagnostic Interface serves to connect the PC/Laptop with the vehicle control system. It is included in the delivery of the connecting cable to the USB port of a PC/laptop.

| PRODUCT NUMBER | COMPONENT | COMMENT |
|---|---|---|
| 446 301 030 0 | Diagnostic Interface 2 | Standard Diagnostic Interface |
| 246 301 671 0 | Diagnostic program | Version in German |

# 9 Pin assignment

### Variants

### MTS2 P: Pneumatic drives

One-door controls or two-door controls

- for one, two or three MTS2 door valves with potentiometer sensing

| | | | |
|---|---|---|---|
| 1T1 | One-door control | 1 valve | 9 inputs / 7 outputs freely usable |
| 1T2 | One-door control | 2 valves | 6 inputs / 4 outputs freely usable |
| 2T2 | Two-door control | 2 valves | 3 inputs / 3 outputs freely usable |
| 2T3 | Two-door control | 3 valves | No freely usable outputs |

| Pin | 1T1 | 1T2 | 2T2 | 2T3 | Pin NAME | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1/9 | UB | UB | UB | UB | Terminal 15 / 24 Volt | 24 Volt supply |
| 2/9 | C3 | C3 | C3 | C3 | C3 speedometer signal | Digital input |
| 3/9 | GND | GND | GND | GND | Terminal 31 / Ground | Ground |
| 4/9 | ADR1 | ADR1 | ADR1 | ADR1 | Address 1 | Analogue input (0V/NC/24V) |
| 5/9 | ADR2 | ADR2 | ADR2 | ADR2 | Address 2 | Analogue input (0V/NC/24V) |
| 6/9 | SVC | SVC | SVC | SVC | Service switch | Digital input |
| 7/9 | CANH | CANH | CANH | CANH | CAN High | CAN High |
| 8/9 | CANG | CANG | CANG | CANG | CAN Ground | CAN Ground |
| 9/9 | CANL | CANL | CANL | CANL | CAN Low | CAN Low |

# Pin assignment

| Pin | 1T1 | 1T2 | 2T2 | 2T3 | Pin NAME | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1/15 | AUF | AUF | AUF | AUF | Door open | Switching output 0.5 A |
| 2/15 | ZU | ZU | ZU | ZU | Door closed | Switching output 0.5 A |
| 3/15 | KL | KL | KL | KL | Door Powerless | Switching output 0.5 A |
| 4/15 | ESB | ESB | ESB | ESB | Entrance lighting | Switching output 2 A |
| 5/15 | DSZ | DSZ | DSZ | DSZ | Pressure switch Closed | Analogue input (24 V) |
| 6/15 | DSA | DSA | DSA | DSA | Pressure switch Open | Analogue input (24 V) |
| 7/15 | POSV | POSV | POSV | POSV | Potentiometer front | Analogue input (15 V) |
| 8/15 | POSH | POSH | POSH | POSH | Potentiometer rear | Analogue input (15 V) |
| 9/15 | REVA | REVA | REVA | REVA | Reversing input A | Analogue input (24 V) |
| 10/15 | REVB | REVB | REVB | REVB | Reversing input B | Analogue input (24 V) |
| 11/15 | TT | TT | TT | TT | Workshop button | Digital input |
| 12/15 | NB | NB | NB | NB | Emergency control | Digital input |
| 13/15 | SP | SP | SP | SP | Blocking input | Digital input |
| 14/15 | $U_{REF}$ | $U_{REF}$ | $U_{REF}$ | $U_{REF}$ | Reference voltage | Voltage output (15 V / 60mA) |
| 15/15 | MTSGND | MTSGND | MTSGND | MTSGND | Sensor ground | Ground for valves/ sensors |

# Pin assignment

| Pin | 1T1 | 1T2 | 2T2 | 2T3 | Pin NAME | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1/18 | AUS1 | AUS1 | AUF2 | AUF2 | free output 1 / door open 2 | Switching output 0.5 A |
| 2/18 | AUS2 | AUS2 | ZU2 | ZU2 | free output 2 / door closed 2 | Switching output 0.5 A |
| 3/18 | AUS3 | AUS3 | KL2 | KL2 | free output 3 / door Powerless 2 | Switching output 0.5 A |
| 4/18 | AUS4 | AUS4 | ESB2 | ESB2 | free output 4 / entrance lighting 2 | Switching output 2 A |
| 5/18 | EIN1 | EIN1 | DSZ2 | DSZ2 | free output 1 / pressure switch Closed 2 | Analogue input (24 V) |
| 6/18 | EIN2 | EIN2 | DSA2 | DSA2 | free input 2 / pressure switch Open 2 | Analogue input (24 V) |
| 7/18 | EIN3 | EIN3 | POSV2 | POSV2 | free input 3 / potentiometer front 2 | Analogue input (15 V) |
| 8/18 | EIN4 | EIN4 | POSH2 | POSH2 | free input 4 / potentiometer rear 2 | Analogue input (15 V) |
| 9/18 | EIN5 | EIN5 | REVA2 | REVA2 | free input 5 / reversing input A 2 | Analogue input (24 V) |
| 10/18 | EIN6 | EIN6 | REVB2 | REVB2 | free input 6 / reversing input B 2 | Analogue input (24 V) |
| 11/18 | FKTA | FKTA | TT2 | TT2 | Function input A / Workshop button 2 | Digital input |
| 12/18 | FKTB | FKTB | NB2 | NB2 | Function input B / Emergency actuation 2 | Digital input |
| 13/18 | EIN7 | SPH | EIN7 | SPH | free input 7 / blocking input rear | Digital input |
| 14/18 | EIN8 | DSZH | EIN8 | DSZH | free input 8 / pressure switch Closed rear | Analogue input (24 V) |
| 15/18 | EIN9 | DSAH | EIN9 | DSAH | free input 9 / pressure switch Open rear | Analogue input (24 V) |
| 16/18 | *AUS5* | AUFH | AUS5 | AUFH | free output 5 / valve Open rear | Switching output 0.5 A |
| 17/18 | AUS6 | ZUH | AUS6 | ZUH | free output 6 / valve Closed rear | Switching output 0.5 A |
| 18/18 | AUS7 | KLH | AUS7 | KLH | free output 7 / door Powerless rear | Switching output 0.5 A |

## MTS2 E: Electric drives

One-door controls

- for 1 or 2 motors
- with potentiometers or incremental encoders/limit switches

Optionally up to 9 inputs and 4 outputs can be used freely.

The individual door applications for different electric drives are illustrated in separate software applications. This results in alternative pin assignments to this standard overview.

The application software is loaded into the MTS2 E-ECU by the door manufacturer or bus manufacturer.

| Pin | MTS2 E | Pin NAME | DESCRIPTION |
|---|---|---|---|
| 1/9 | UB | Terminal 15 / 24 Volt | 24 Volt supply |
| 2/9 | C3 | C3 speedometer signal | Digital input (Pull-Up) |
| 3/9 | GND | Terminal 31 / Ground | Ground |
| 4/9 | ADR1 | Address 1 | Analogue input (0V/NC/24V) |
| 5/9 | ADR2 | Address 2 | Analogue input (0V/NC/24V) |
| 6/9 | SVC | Service switch | Digital input |
| 7/9 | CANH | CAN High | CAN High |
| 8/9 | CANG | CAN ground | CAN ground |
| 9/9 | CANL | CAN Low | CAN Low |

| Pin | MTS2 E | Pin NAME | DESCRIPTION |
|---|---|---|---|
| 1/15 | MOT+ | Motor Positive (open) | Motor bridge 20 A |
| 2/15 | MOT- | Motor Negative (open) | Motor bridge 20 A |
| 3/15 | OUTA | Output A | Switching output 0.5 A |
| 4/15 | ESB | Entrance lighting | Switching output 2 A |
| 5/15 | ESZ | Limit switch Closed | Digital input |
| 6/15 | FKTC | Function input C | Digital input |
| 7/15 | CNTB/ POSV | Incremental encoder B / Poti front | Analogue input (15 V) |
| 8/15 | CNTA/ POSH | Incremental encoder A / Poti rear | Analogue input (15 V) |
| 9/15 | REVA | Reversing input A | Analogue input (24 V) |
| *10/15* | REVB | Reversing input B | Analogue input (24 V) |
| 11/15 | TT | Workshop button | Digital input |
| 12/15 | NB | Emergency control | Digital input |
| 13/15 | SP | Blocking input | Digital input |
| 14/15 | UREF | Reference voltage | Voltage output (15 V / 30mA) |
| 15/15 | MTSGND | Sensor ground | Ground for sensors |

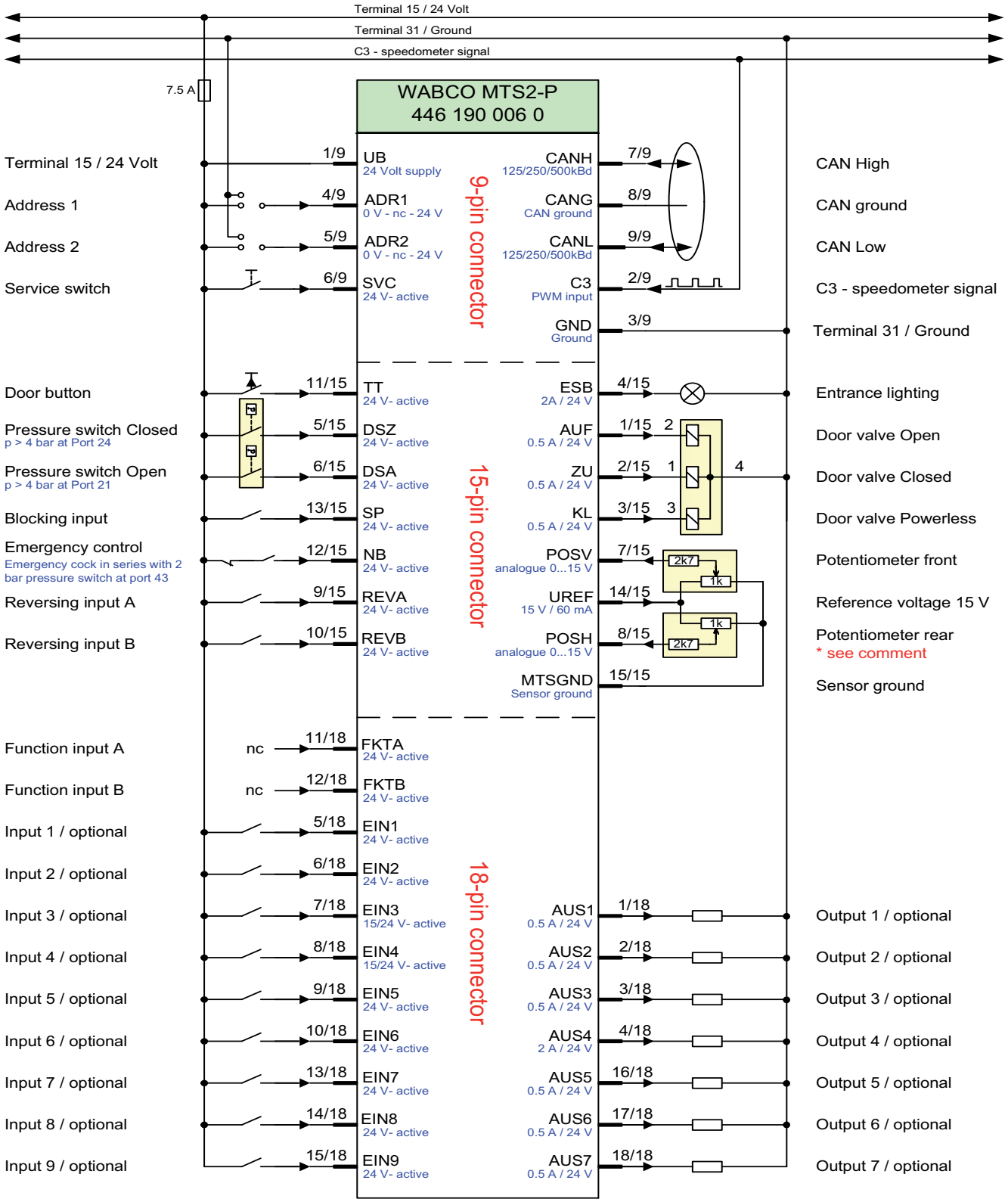
# Pin assignment

| Pin | MTS2 E | Pin NAME | DESCRIPTION |
|---|---|---|---|
| 1/18 | AUS1 | free output 1 | Switching output 0.5 A |
| 2/18 | AUS2 | free output 2 | Switching output 0.5 A |
| 3/18 | AUS3 | free output 3 | Switching output 0.5 A |
| 4/18 | AUS4 | free output 4 | Switching output 2 A |
| 5/18 | EIN1 | free input 1 | Digital input |
| 6/18 | EIN2 | free input 2 | Digital input |
| 7/18 | EIN3 / CNTBH | free input 3 / incremental encoder B rear | Analogue input (24 V) |
| 8/18 | EIN4 / CNTAH | free input 4 / incremental encoder A rear | Analogue input (24 V) |
| 9/18 | EIN5 | free input 5 | Analogue input (24 V) |
| 10/18 | EIN6 | free input 6 | Digital input |
| 11/18 | FKTA | Function input A | Digital input |
| 12/18 | FKTB | Function input B | Digital input |
| 13/18 | EIN7 / SPH | free input 7 / blocking input rear | Digital input |
| 14/18 | EIN8 / ESZH | free input 8 / limit switch closed rear | Analogue input (24 V) |
| 15/18 | EIN9 | free input 9 | Analogue input (24 V) |
| 16/18 | MOT+H | Motor Positive (Open) rear | Motor bridge 20 A |
| 17/18 | MOT-H | Motor Negative (Open) rear | Motor bridge 20 A |
| 18/18 | OUTB | Output B | Switching output 0.5 A |

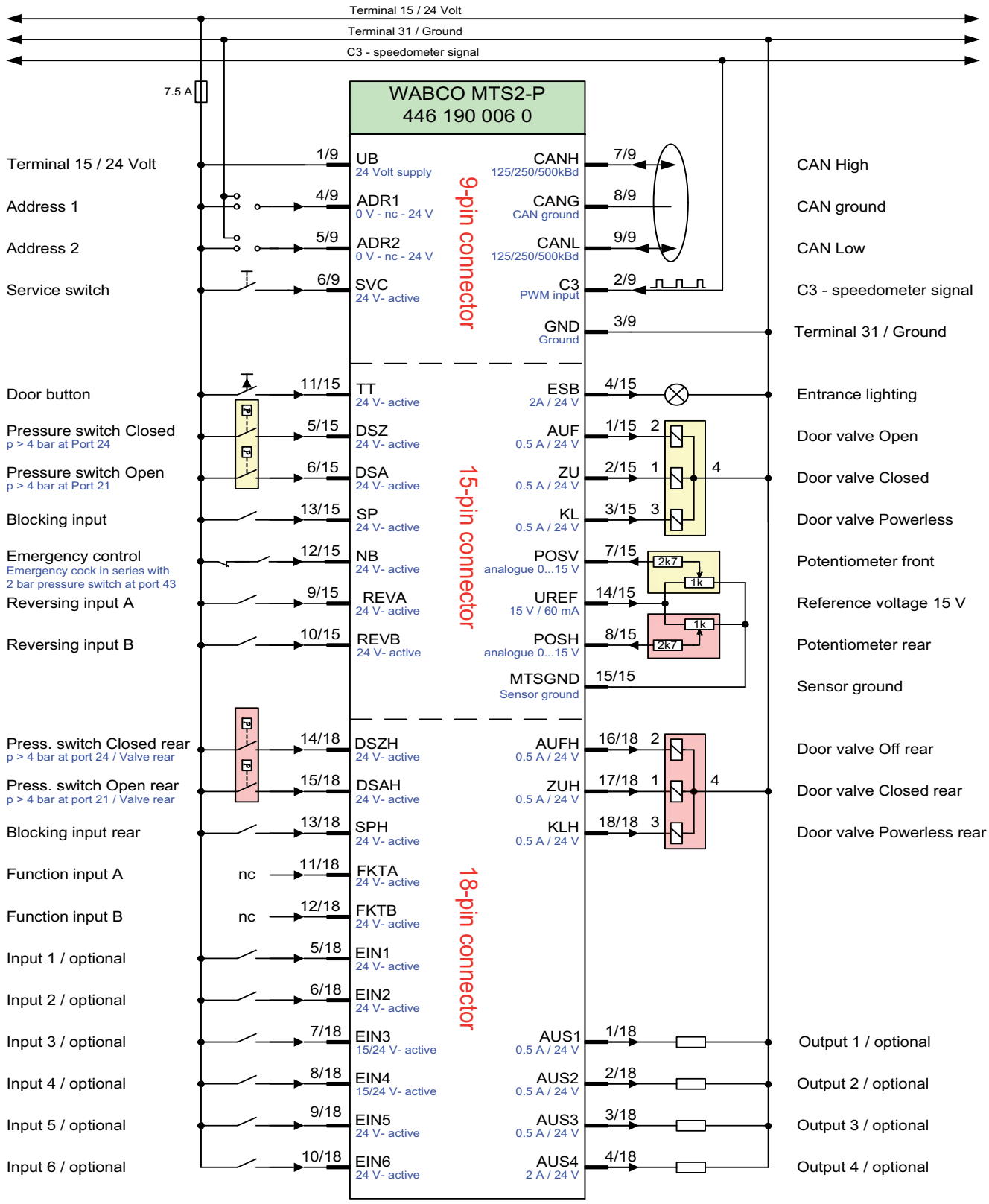
# 10 Wiring examples

## One-door control, 1 valve per door

* Comment: If only one door wing is installed on a door, the two potentiometer inputs (POSV / POSH) must be bridged.

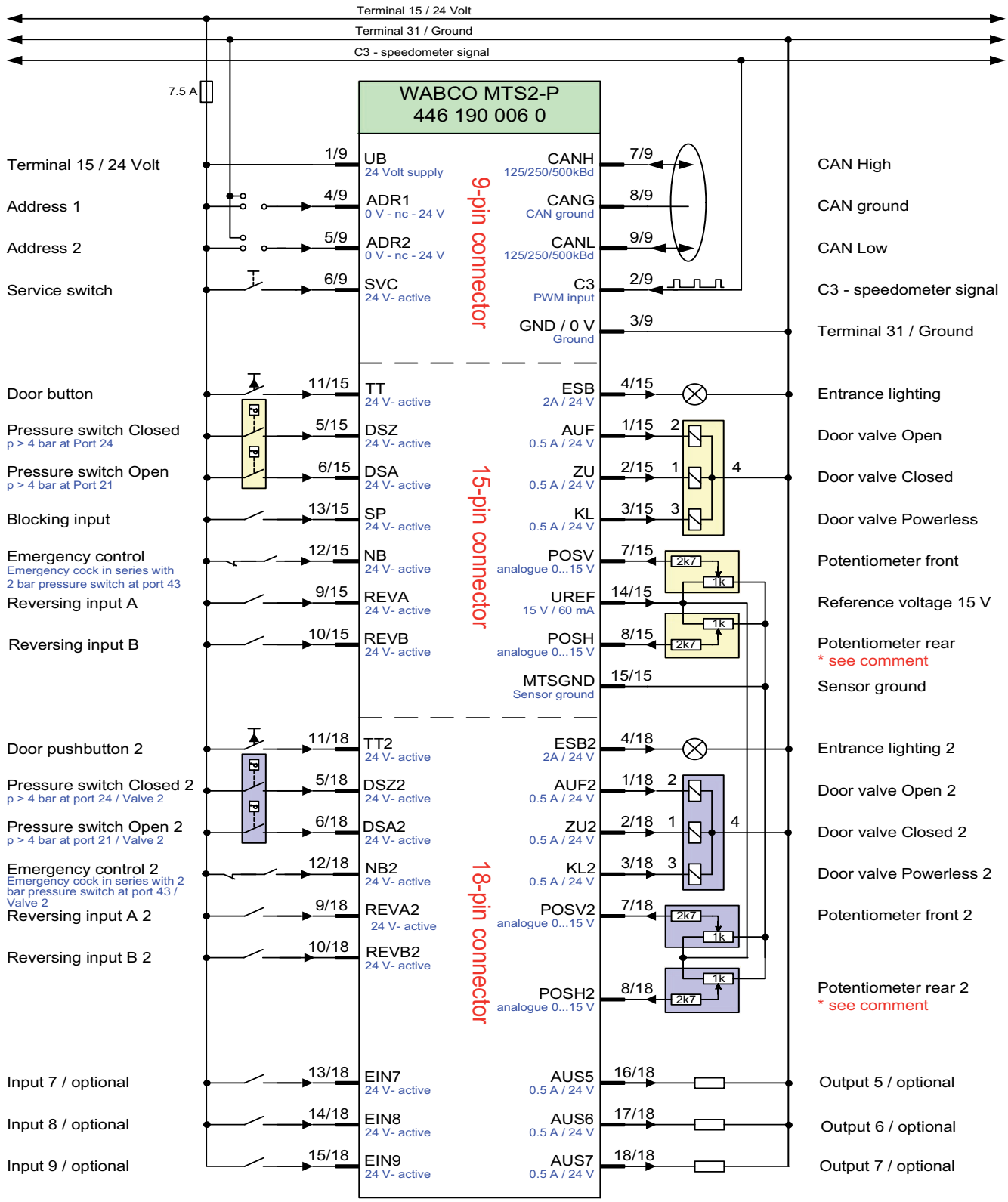


## One-door control, 2 valves per door



## Two-door control, 2 valves, 1 valve per door

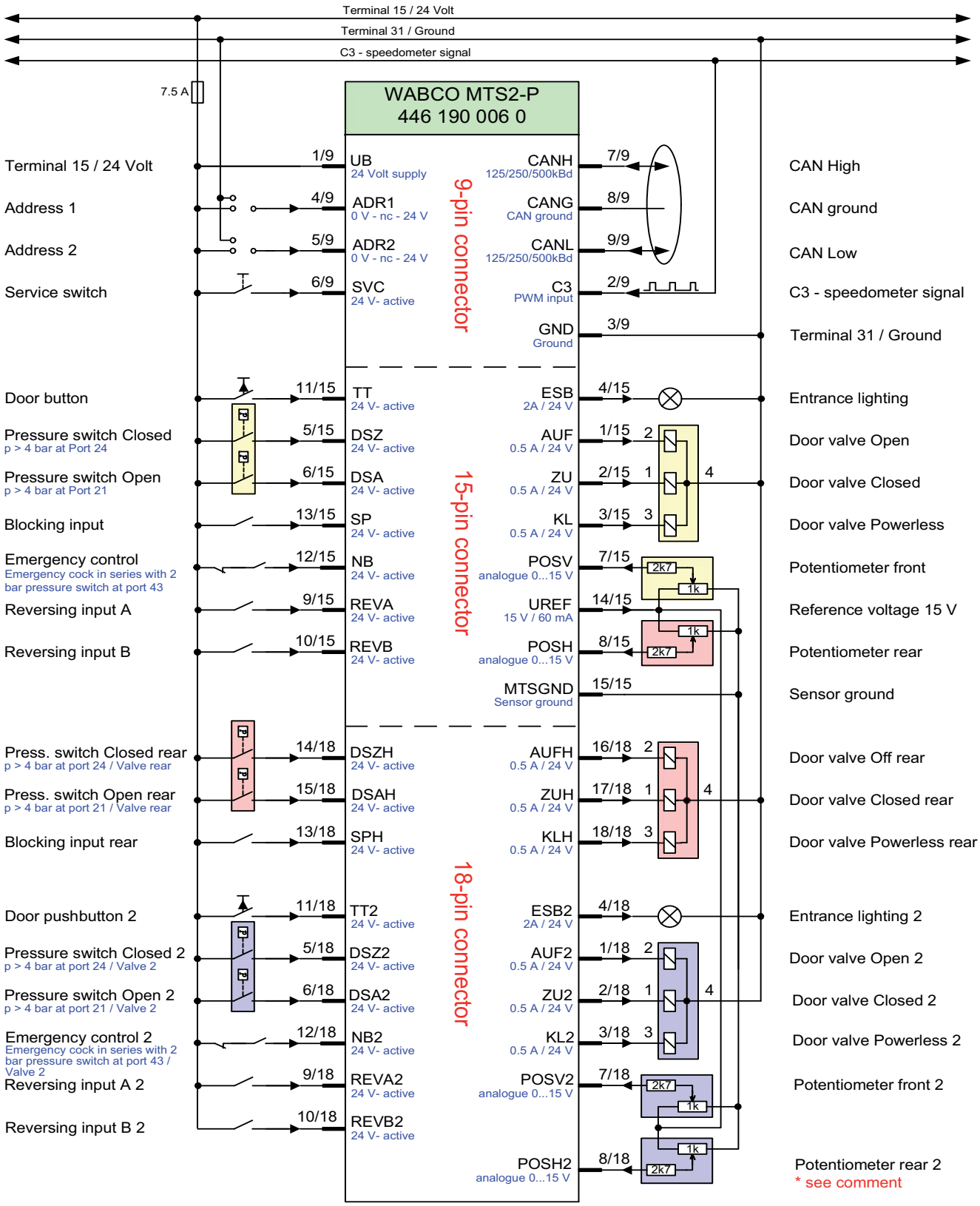
* Comment: If only one door wing is installed on a door, the two potentiometer inputs (POSV / POSH or POSV2 / POSH2) must be bridged.



# Wiring examples

## Two-door control, 3 valves, 2 for door 1, 1 for door 2

* Comment: If only one door wing is installed on the second door, the two potentiometer inputs (POSV2 / POSH2) must be bridged.



# 11 Disposal

- The final and professional decommissioning and disposal of the product must be carried out in accordance with the applicable legal regulations of the user country. In particular, the regulations for the disposal of batteries, equipment and the electrical system must be observed.
- Electrical appliances must be collected separately from household or commercial waste and recycled or disposed of in accordance with regulations.
- If applicable, take the old device to the company's internal disposal department, which will then forward it to specialist companies (specialist disposal companies).
- In principle, it is also possible to return the old device to the manufacturer. For this purpose, contact the manufacturer's customer service. Any special agreements must be observed.
- Electrical and electronic equipment must be collected separately from unsorted municipal waste and recycled or disposed of properly, because harmful substances can cause lasting damage to health and the environment if disposed of improperly.
- Detailed information can be obtained from specialist waste management companies or the responsible authorities.
- The packaging must be disposed of separately. Paper, cardboard and plastics must be recycled.

# 12 WABCO regional offices

| | | |
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**WABCO** (NYSE: WBC) is the leading global supplier of braking control systems and other advanced technologies that improve the safety, efficiency and connectivity of commercial vehicles. Originating from the Westinghouse Air Brake Company founded nearly 150 years ago, WABCO is powerfully “Mobilizing Vehicle Intelligence” to support the increasingly autonomous, connected and electric future of the commercial vehicle industry. WABCO continues to pioneer innovations to address key technology milestones in autonomous mobility and apply its extensive expertise to integrate the complex control and fail-safe systems required to efficiently and safely govern vehicle dynamics at every stage of a vehicle’s journey – on the highway, in the city and at the depot. Today, leading truck, bus and trailer brands worldwide rely on WABCO’s differentiating technologies. Powered by its vision for accident-free driving and greener transportation solutions, WABCO is also at the forefront of advanced fleet management systems and digital services that contribute to commercial fleet efficiency. In 2018, WABCO reported sales of over $3.8 billion and has more than 16,000 employees in 40 countries. For more information, visit

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