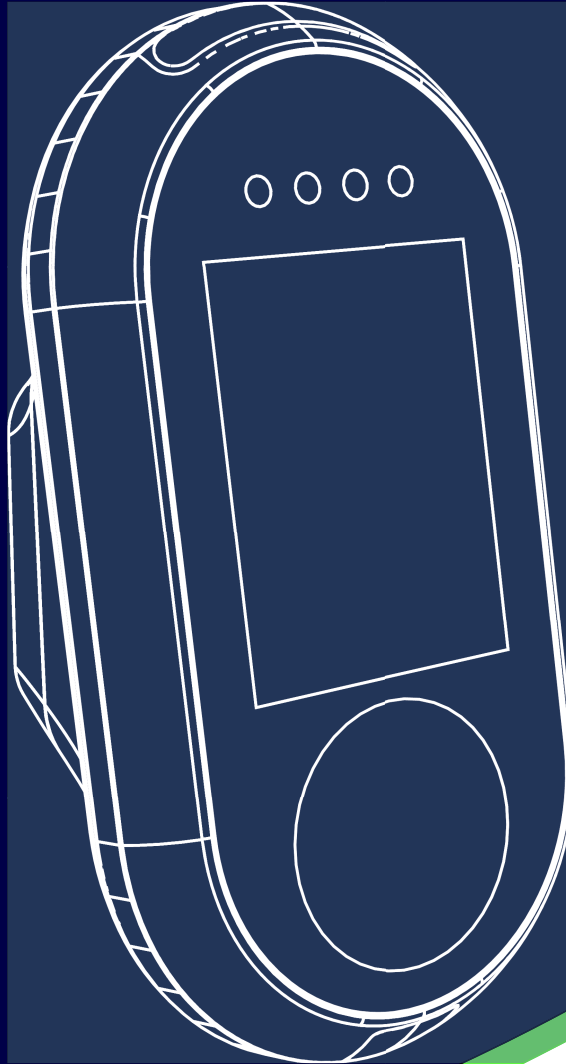


Service Manual

FareGo VAL OV|41

Ver.: 1.00

Art. No.: -



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Chapter 1

Introduction

1.1 Overview

The service manual provides complete, detailed instructions for maintenance technicians responsible for servicing, maintaining, and repairing the device.

Concise instructions for maintaining, troubleshooting, and repairing the device along with comprehensive charts, tables, graphs, and other diagrams provide a technical document for the device that is easy to use and understand.

The service manual also acts as a step-by-step instructional guide that can be used by technical trainers and trainees to provide or receive instructions on the device.

This manual reflects Scheidt & Bachmann's commitment to providing our Customers with comprehensive technical documentation for the device along with training guidelines to augment our customer training program.

This document release comprises the basic maintenance and operational instructions for the OV|41 product. The document is included in ongoing product maintenance and subject to periodic updates as product and procedural improvements are being made.

1.2 Manual Organization

The organizational structure of the Service Manual is outlined below.

- Chapter 1 - Introduction
- Chapter 2 - Safety
- Chapter 3 - Installation
- Chapter 4 - Commissioning
- Chapter 5 - Product description
- Chapter 6 - Service Commands
- Chapter 7 - Revenue Service
- Chapter 8 - Preventive Maintenance
- Chapter 9 - Troubleshooting (and Remedial Maintenance)
- Chapter 10 - Glossary
- Chapter 11 - Appendix

1.3 Important Warnings

The following specific warnings and instructions must be followed.

Please read this manual and all referenced documents carefully before attempting to install or maintain this device. Failure to follow the instructions in this manual and the instructions or notes in the installation drawings may cause injury to yourself or damage the equipment and ultimately compromise the operability of the equipment.

- All Automated Fare Collection (AFC) equipment is TÜV-SÜD-NRTL (Technischer Überwachungsverein-Süd-Nationally Recognized Testing Laboratory) listed. To continue to be compliant with TÜV-SÜD-NRTL requirements, please note that the following items need to be performed during installation:
The equipment will remain TÜV-SÜD-NRTL compliant only if the mounting and wiring are also TÜV-SÜD-NRTL compliant. Please take great care during installation to comply with TÜV-SÜD-NRTL and NEC (National Electrical Code) requirements.
- Ensure compliance with all Safety Regulations and Safety Recommendations.

Although this manual has been prepared with great care, some information may seem unclear. If so, please feel free to contact us with your remarks or questions.

Scheidt & Bachmann GmbH

Disclaimer

Scheidt & Bachmann Fare Collection Systems GmbH is not liable for injuries to any person or damage to the Equipment resulting from failure to comply with the manufacturer's instructions or documentation. This disclaimer includes all third party documentation prepared by OEMs and provided as a courtesy by Scheidt & Bachmann Fare Collection Systems GmbH. to its customer.

Chapter 2

Safety

2.1 Overview

This chapter deals with safety. It provides information and instruction on the safe handling, maintenance and repair of Scheidt & Bachmann fare collection equipment.

Please read this manual and all referenced documents carefully before attempting to work with this equipment. Failure to follow these instructions may cause injuries or damage the equipment.

Not all of the warning labels or hazards described in this chapter are attached to each type of fare collection equipment. For example, only those labels that apply to the device, and that are required to meet certification requirements, will be found in the device. Be cautious and observant, and look for such warning labels and potential hazards.

Disclaimer

Scheidt & Bachmann USA, Inc. is not liable for injuries to any person or damage to the equipment resulting from failure to comply with these instructions or documentation. This disclaimer includes all third party documentation provided by Scheidt & Bachmann USA, Inc.. Failure to follow manufacturers instructions may invalidate any or all warranties, express or implied.

2.2 Safety Features

Safety engineering is an integral part of Scheidt & Bachmann designs. Maintenance technicians must perform maintenance and repair in accordance with industry safety standards including OSHA and other Federal, State, and local codes and regulations. Close attention to proper safety precautions is of the utmost importance. Equipment should be installed, maintained, and repaired only by trained, qualified personnel using reasonable care. Improper installation, maintenance, or repair procedures may damage the equipment or cause serious personal injury or death. This chapter should be carefully read and thoroughly understood before handling, storing or working on Scheidt & Bachmann fare collection equipment. It is the responsibility of the maintenance agency to ensure that the safety instructions in this manual are read, understood, and implemented by properly trained maintenance and service technicians. All persons who work with Scheidt & Bachmann fare collection equipment should also be trained in safety principles and their application.

2.3 General Safety Guide

All electro-mechanical devices, such as fare collection equipment, create certain risks. These risks can generally be avoided by taking reasonable care and precautions, and by following the instructions provided.

- Only qualified, trained technicians should perform maintenance or repair.
- Service technicians must read and understand all operating and service instructions.
- Turn electrical power off before opening any electrical enclosure.
- Do not operate the machine with the cover of any enclosure, or the guard or covers over any mechanism removed.
- Do not turn on the device when components are disconnected.
- Do not use the equipment for any purpose other than that for which it was designed.
- When servicing or repairing the machine, all machine control panels must be tagged in compliance with OSHA (Occupational Safety and Health Administration) Lockout/Tagout procedures to indicate that machine should not be operated.
- All branch circuits for hard wired units must be suitable for the unit ratings.
- The generally accepted rules of electric engineering as well as the generally accepted rules of mechanical engineering shall be binding for all work performed on the device!
- The device may only be opened and maintained by people who have been trained and informed in detail about all safety instructions by Scheidt & Bachmann.
- Replacement of fuses must be with equivalent type and rating.
- Never perform any interventions, modifications or changes on the device.
- There may be moving parts inside the unit. There is a risk of crushing hands and fingers. Keep hands and fingers away from moving parts.
- Only use original spare parts or parts to prevent subsequent damage.

2.4 Protective Equipment

Technicians should use care when working with solvents and other cleaning agents that may be abrasive or have a tendency to cause irritation to the skin or eyes. Read all labels and safety datasheets carefully and follow instructions for the use of protective gear (e.g. gloves, safety glasses) when working with chemicals (e.g. cleaning agents) or compressed air.

2.5 Special Tools

In general, no special tools are required to ensure the safety of technicians when working with Scheidt & Bachmann fare collection equipment.

However, a standard ESD Safety Wrist Strap should be worn when working with electrostatic sensitive printed circuit boards.

2.6 Storage

Certain types of fare collection equipment, such as ticket vending machines, gates and fareboxes should be stored exactly as they are delivered. They should not be removed from their containers or pallets until they are being installed. Hardware that is used to keep such equipment stable and immovable should be left in place until the equipment is ready to be installed.

2.7 Transporting and Moving Equipment

All fare collection equipment should be properly secured when it is being transported.

Some fare equipment is heavy and/or bulky and should be moved or lifted only with special equipment.

Manufacturer's recommendations for transport and special equipment are described in the installation chapter.

2.8 Disposal of Packaging Material

After unpacking, please dispose of all packaging material properly and in accordance with all applicable environmental regulations.

Risk of Suffocation by Plastic Foils!

Plastic foils, bags, and Styrofoam parts etc. may become dangerous toys for children.

- ▶ Do not leave packaging material lying around!
- ▶ Packaging materials must be kept out of reach children!

2.9 Cautioning Words and Symbols in the Manual

The following cautioning words are used to indicate risks:

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

This refers to information or a potential risk that may lead to property damage.

2.10 Smart Card Reader (SCR)

The Scheidt & Bachmann Smart Card Reader deserves a special mention in this safety chapter.

2.10.1 Check for Manipulation of the Smart Card Reader

S&B Smart Card Reader Safety instruction

With every service activity it needs to be checked:

- ✓ The device housing does not have signs of tampering, opening by force, physical damage etc.
- ✓ The device identification (serial number) is correct and matches company records. In other words it needs to be checked if the device number XXXXXXXX is supposed to be installed in station/vehicle number YYYYYYYY.
- ✓ There are no unauthorized devices connected to the device, especially around the landing plane of S&B Smart Card Reader antenna. Please note that such devices can be well hidden, so their presence might only be indicated by i.e. increased thickness of some parts.
- ✓ There are no extra wires or devices soldered or connected to the S&B Smart Card Reader.

Annually it needs to be checked:

- ✓ The S&B Smart Card Reader identification (serial number) is correct and matches company records – is the S&B Smart Card Reader number ZZZZZZZZ supposed to be installed in device number XXXXXXXX?
- ✓ The SAM card identification (serial number) is correct and matches company records – is the SAM reader number AAAAAAAA supposed to be installed in reader number ZZZZZZZZ?

For more information see “SBSCR2_SecurityGuidance_LifeCycle” document. Regarding security aspects the document applies equally to SCR2 and SCR3.

2.10.2 Scrapping

Risk of manipulation

Sensitive cryptographic data could be stolen.

- Destroy the security chip.
- Send the Smart Card Reader back to Scheidt&Bachmann.

The operator is responsible for the proper compliance with these procedures.

Smart Card Readers that are classified as not feasible for further use (damaged, broken, tampered etc.) need to undergo a special operation before they are thrown away. Their security chip (TPM on the image below) must be physically destroyed beyond any possibility of repair. This is because there might be sensitive cryptographic data stored in the chip.

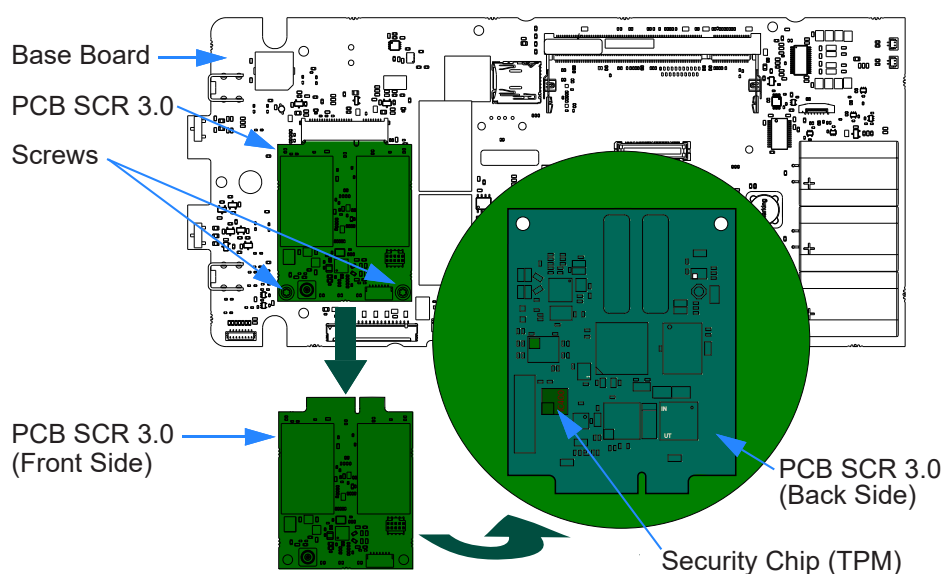


Figure 2-1 Position of the SCR3 Security Chip

A recommended way of destroying the TPM is to use a drill with a drill bit that is at least 4mm in diameter. Drilling through the chip all the way to underlying PCB (it's not necessary to go through PCB itself) shall damage it sufficiently so no cryptographic material can be retrieved.

2.11 Device Safety Labels

The device has safety labels on some internal components to alert service technicians and other personnel that a safety hazard may exist when working on certain machine sub-assemblies.

A series of different labels is used within the machine. The following paragraphs describe these labels and note the location within the machine where they will be found. It is important to read and understand this information thoroughly.

2.11.1 Fuses

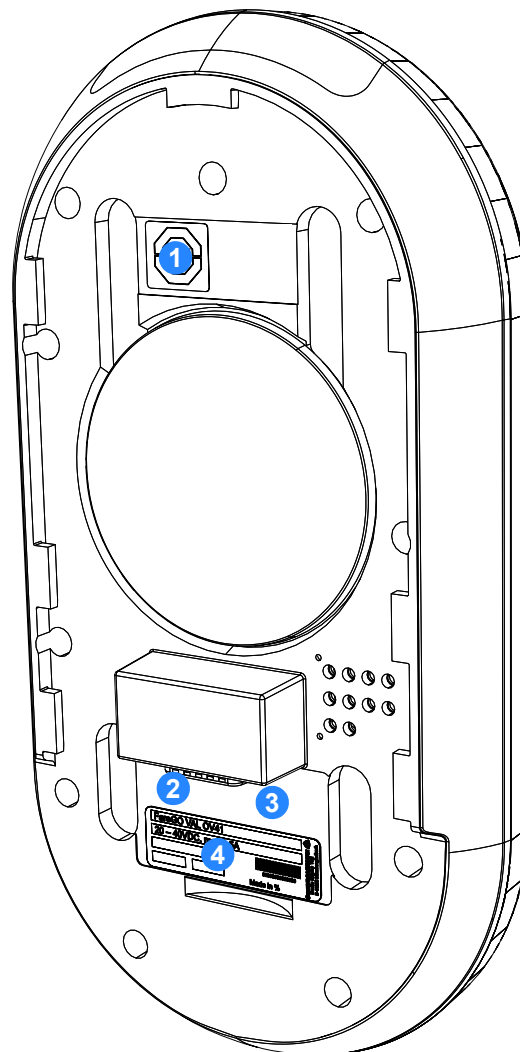
Risk of Shock and Fire Hazard

For continued protection against risk of shock and fire hazard, replace only with same type of fuse.

► Replace only with same type of fuse.

2.12 Device Labels FareGo Val OV|41

The **Figure 2-2** shows the location of several labels on the device.



- 1 TÜV SÜD Listing Label
- 2 FCC License Label
- 3 E1 License Label
- 4 Modell Number Label

Figure 2-2 Location of Labels - OV41

2.12.1 TÜV SÜD Listing Label

The TÜV SÜD Listing Label appears typically inside all AFC devices at the bottom of the enclosure. This label indicates that the AFC device is TÜV SÜD listed. TÜV SÜD is a Nationally Recognized Testing Laboratory (NRTL) by the Occupational Safety and Health Administration (OSHA) to test products to applicable product safety standards.

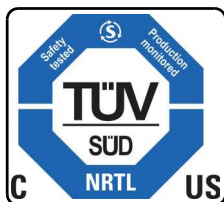


Figure 2-3 The TÜV SÜD Listing Label

2.12.2 FCC License Label

The FCC License label shown in **Figure 2-4** appears on the backside of the device.

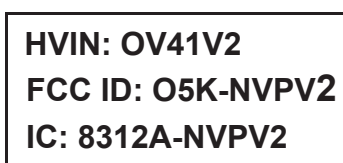


Figure 2-4 FCC-License

2.12.3 E1 10R License Label

The E1 License label shown in **Figure 2-5** appears on the backside of the device.

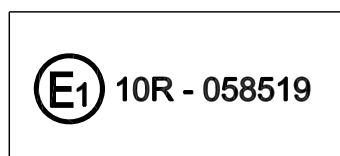


Figure 2-5 E1-License

2.12.4 Model Number Labels

The Model Number Label shown in **Figure 2-6** is found on the backside of the device, and also on all main modules. This label indicates the drawing or part number as well as the serial number. The index in brackets after the drawing number or part number indicates the hardware release. It will be changed in conjunction with hardware updates, i.e. index "A" will become index "B."

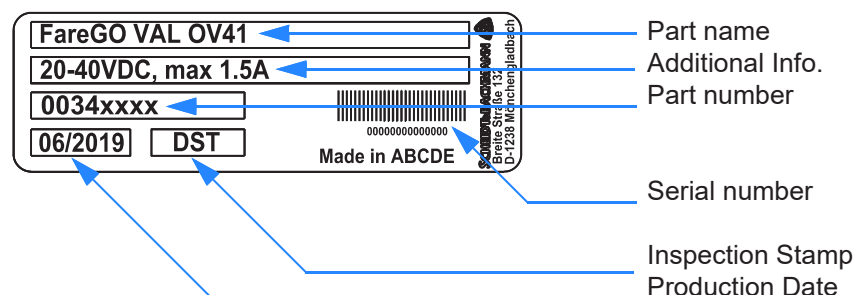
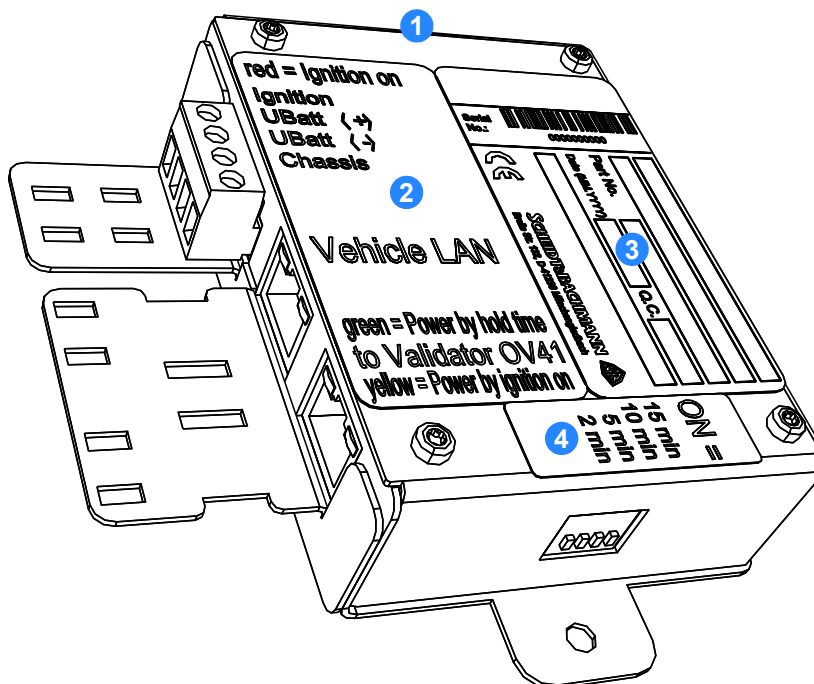


Figure 2-6 Model Number Labels (Example)

2.13 Device Labels Power Box



- 1 Preliminary Fuse Label (not visible in this view)
- 2 Serial/Part Number Label
- 3 Validator Port Label
- 4 Part and Serial Number Label
- 5 DIP Switch Label

Figure 2-7 Location of Labels - Power Box

2.13.1 Preliminary Fuse Label

The Preliminary Fuse Label shown in **Figure 2-8** is located on the side of the housing as shown in **Figure 2-7**. This label indicates that the power supply of the Power Box must be protected by a fuse with a certain value. The power supply of the Power Box must be protected by a 5A fuse.



Figure 2-8 Preliminary Fuse Label

2.13.2 Validator Port Label

The Validator Port Label shown in **Figure 2-9** is located on the top of the housing as shown in **Figure 2-7**. This label shows the position and the description of the LAN ports.

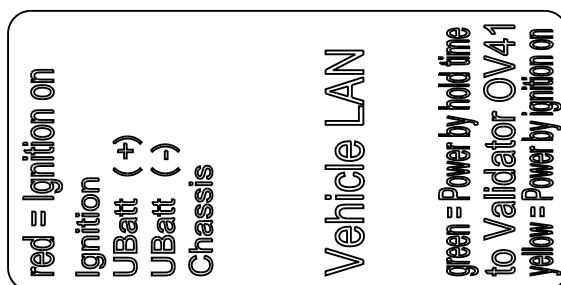


Figure 2-9 Validator Port Label

2.13.3 Part and Serial Number Label

The part number label shown in **Figure 2-10** is located on the top of the housing as shown in **Figure 2-7**. This label indicates the part / serial number and additional information of the device.

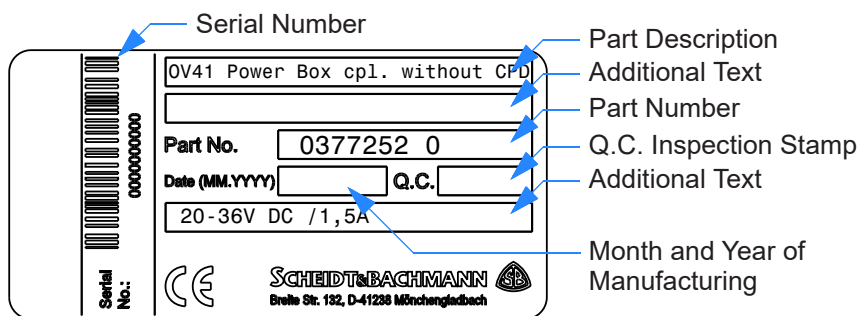


Figure 2-10 Part/Serial Number Label

2.13.4 DIP Switch Label

The DIP Switch Label shown in **Figure 2-11** is located on the top of the housing as shown in **Figure 2-7**. This label shows the DIP switch function of the service port. To access the DIP switches, the cover must be removed.

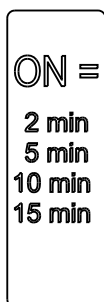
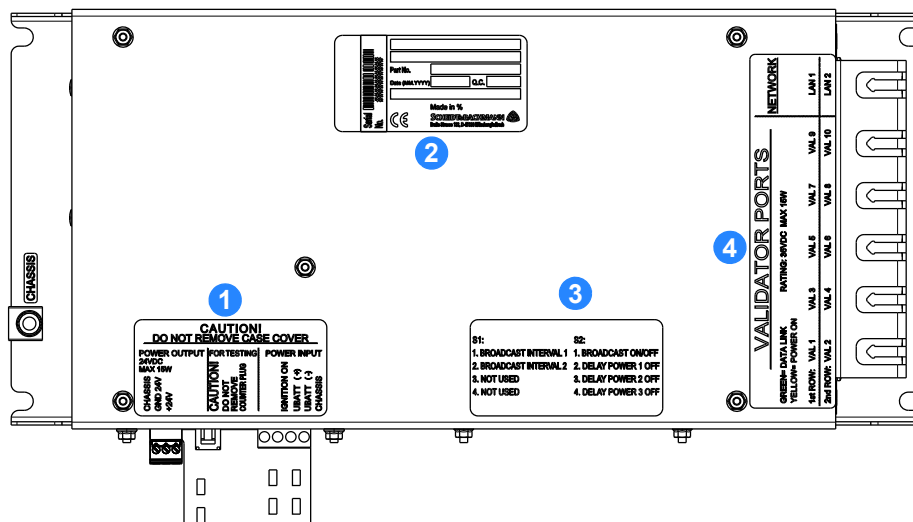


Figure 2-11 DIP Switch Label

2.14 Device Labels Power Switch Box



- 1 Caution Label
- 2 Serial/Part Number Label
- 3 DIP Switch Label
- 4 Validator Port Label

Figure 2-12 Location of Labels - Power Switch Box

2.14.1 Part and Serial Number Label

The part number label shown in **Figure 2-13** and **Figure 2-14** is located on the top of the housing as shown in **Figure 2-12**. This label indicates the part / serial number and additional information of the device.

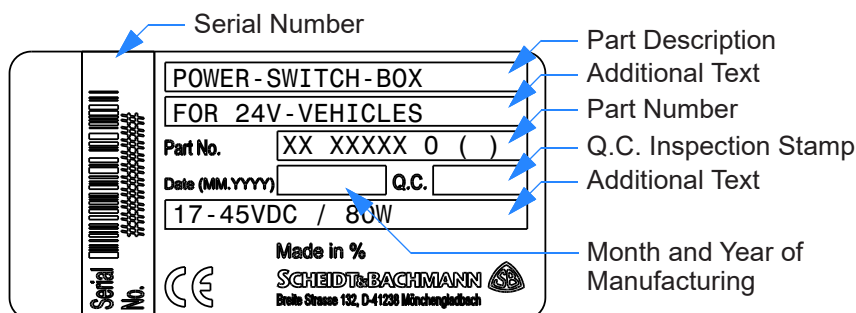


Figure 2-13 Part/Serial Number Label (24V Vehicles)

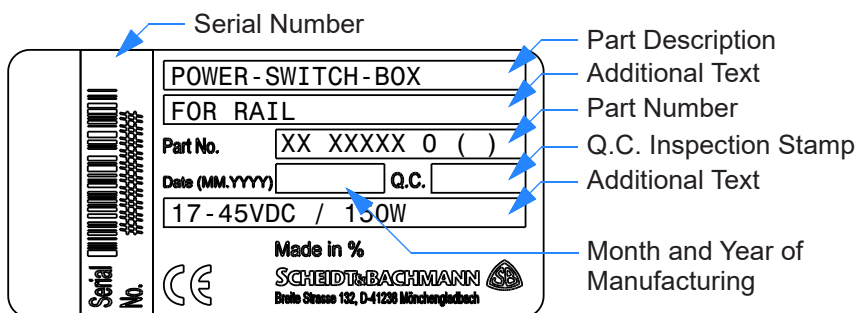


Figure 2-14 Part/Serial Number Label (Rail)

2.14.2 Caution Label

The Caution Label shown in **Figure 2-15** is located on the top of the housing as shown in **Figure 2-12**. This label shows various safety and connection instructions.

DO NOT REMOVE CASE COVER		
POWER OUTPUT	FOR TESTING	POWER INPUT
24VDC MAX 15W	CAUTION! DO NOT REMOVE COUNTER PLUG	
CHASSIS GND 24V +24V		IGNITION ON UBATT (+) UBATT (-) CHASSIS

Figure 2-15 Caution Label

2.14.3 DIP Switch Label

The DIP Switch Label shown in **Figure 2-16** is located on the top of the housing as shown in **Figure 2-12**. This label shows the DIP switch function of the service port. To access the DIP switches, the cover must be removed.

S1:	S2:
1. BROADCAST INTERVAL 1	1. BROADCAST ON/OFF
2. BROADCAST INTERVAL 2	2. DELAY POWER 1 OFF
3. NOT USED	3. DELAY POWER 2 OFF
4. NOT USED	4. DELAY POWER 3 OFF

Figure 2-16 DIP Switch Label

2.14.4 Validator Port Label

The Validator Port Label shown in **Figure 2-17** and **Figure 2-18** is located on the top of the housing as shown in **Figure 2-12**. This label shows the position and the description of the LAN ports.

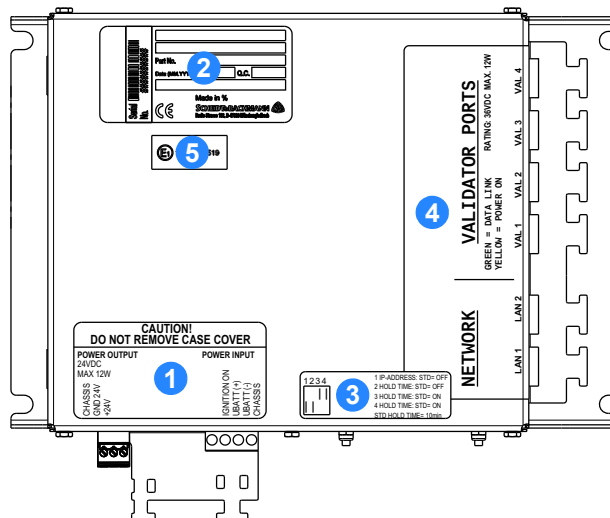
		NETWORK
GREEN = DATA LINK YELLOW = POWER ON		
1st ROW: VAL 1	VAL 3	LAN 1
2nd ROW: VAL 2	VAL 4	LAN 2

Figure 2-17 Validator Port Label (24V Vehicles)

					NETWORK
GREEN = DATA LINK YELLOW = POWER ON					
1st ROW: VAL 1	VAL 3	VAL 5	VAL 7	VAL 9	LAN 1
2nd ROW: VAL 2	VAL 4	VAL 6	VAL 8	VAL 10	LAN 2

Figure 2-18 Validator Port Label (Rail)

2.15 Device Labels Power Switch Box - All in One



- 1 Caution Label
- 2 Serial/Part Number Label
- 3 DIP Switch Label
- 4 Validator Port Label
- 5 E1 Approval Label

Figure 2-19 Location of Labels - Power Switch Box - All in One

2.15.1 Part and Serial Number Label

The part number label shown in **Figure 2-20** is located on the top of the housing as shown in **Figure 2-19**. This label indicates the part / serial number and additional information of the device.

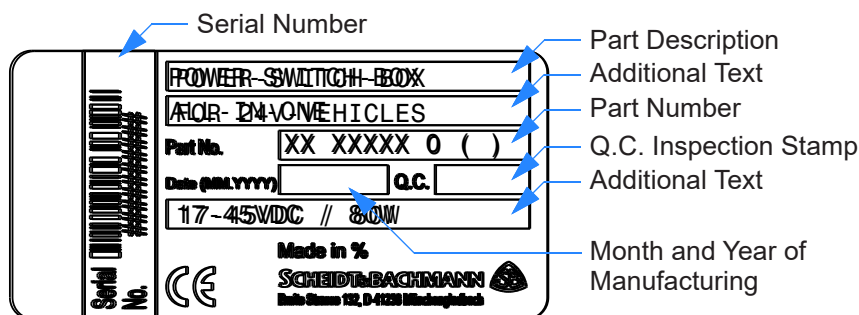


Figure 2-20 Part/Serial Number Label

2.15.2 Caution Label

The Caution Label shown in **Figure 2-21** is located on the top of the housing as shown in **Figure 2-19**. This label shows various safety and connection instructions.

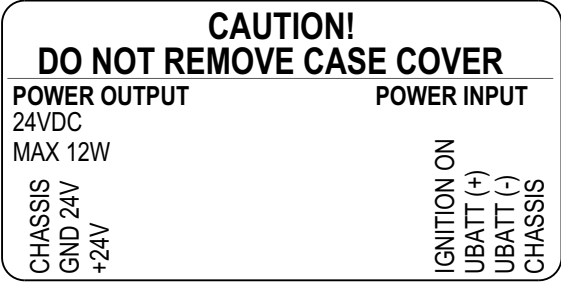


Figure 2-21 Caution Label

2.15.3 DIP Switch Label

The DIP Switch Label shown in **Figure 2-22** is located on the top of the housing as shown in **Figure 2-19**. This label shows the DIP switch function of the service port. To access the DIP switches, the cover must be removed.

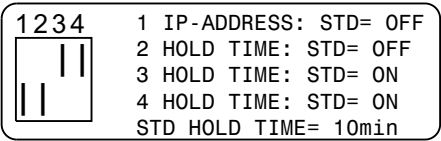


Figure 2-22 DIP Switch Label

2.15.4 Validator Port Label

The Validator Port Label shown in **Figure 2-23** is located on the top of the housing as shown in **Figure 2-19**. This label shows the position and the description of the LAN ports.

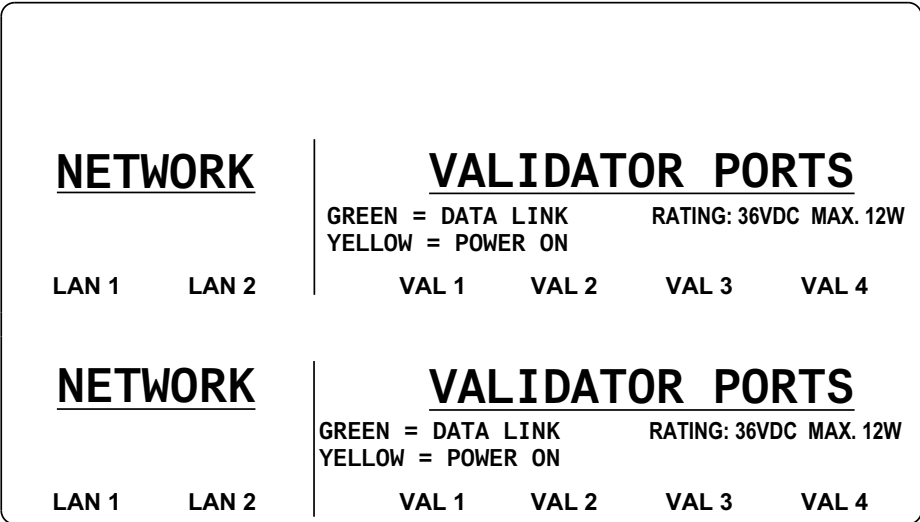


Figure 2-23 Validator Port Label

2.15.5 E1 Approval Label

The E1 Approval Label shown in **Figure 2-24** is located on the top of the housing as shown in **Figure 2-19**. This label shows the E1 approval number.



Figure 2-24 E1 Approval Label

2.16 Declaration of Conformity

2.16.1 USA/CANADA

ZERTIFIKAT ♦ CERTIFICATE ♦ 認證證書 ♦ CERTIFICADO ♦ CERTIFICAT




CERTIFICATE

No. U8 115133 0009 Rev. 00

Holder of Certificate: **Scheidt & Bachmann Fare Collection Systems GmbH**
Breite Str. 132
41238 Mönchengladbach
GERMANY

Certification Mark:



Product: **Information Technology Equipment Onboard Validator System**

This product was voluntarily tested to the relevant safety requirements referenced on this certificate. It can be marked with the certification mark above. The mark must not be altered in any way. This product certification system operated by TÜV SÜD America Inc. most closely resembles system 3 as defined in ISO/IEC 17067. Certification is based on the TÜV SÜD "Testing and Certification Regulations". TÜV SÜD America Inc. is an OSHA recognized NRTL and a Standards Council of Canada accredited Certification body.

Test report no.: 713239270-07

Date, 2022-02-02


(Benedikt Pulver)

Page 1 of 2

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Figure 2-25 NRTL TÜV-SÜD Declaration Page 1



CERTIFICATE

No. U8 115133 0009 Rev. 00

Model(s):

FareGo VAL OV41
OV41 Power Box (optional accessory)
FAREGO VAL OV41 (XXXXX)(@)
(XXXXX)(@) represents additional suffixes for customer ID not safety relevant

Brand Name:

Scheidt & Bachmann

**Tested
according to:**

UL 62368-1:2014
CSA C22.2 No. 62368-1:2014

Parameters:

Rated voltage:	
FareGo VAL OV41,	20-40 VDC
FAREGO VAL OV41 (XXXXX)(@)	
OV 41 Power Box:	20-36 VDC (optional accessory)
Rated current:	1.5 A
Protection class:	III

Conditions of Acceptability:

1. The EUT shall comply with the National Standards and/or Electrical Codes of the country in question.
2. An instructional safeguard shall be provided to reduce the likelihood of unintentional use as support
3. EUT (OV41 Power Box inclusive) shall be supplied from Mains via a LPS R/C PSU (certified according: IEC 60950-1:2005 (2nd E.) + Am 1:2009 + Am 2:2013 / IEC 62368-1:2014
4. Output voltage/power of the external power supply voltages shall comply with the requirements for ES1 in the sense of IEC 62368-1.
5. Mounting means and mounting surface shall be checked at final installation.
6. The equipment is accompanied by installation instructions stating that an appropriate disconnect device shall be provided as part of the building installation.
7. Safety related equipment marking, instructions and instructional safeguards shall be in a language accepted in the respective countries. In Canada, there are two official languages, English and French.
8. It is the responsibility of the manufacturer to provide bilingual markings, where applicable, in accordance with local jurisdictional requirements.

Page 2 of 2

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Figure 2-26 NRTL TÜV-SÜD Declaration Page 2

This device complies with Part 15 of the FCC Rules and with Industry Canada license-exempt RSS standard(s).

Operation is subject to the following two conditions:

- this device may not cause harmful interference, and
- this device must accept any interference received, including interference that may cause undesired operation.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- l'appareil ne doit pas produire de brouillage, et
- l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Changes or modifications made to this equipment not expressly approved by Scheidt & Bachmann may void the FCC authorization to operate this equipment.

Radiofrequency Radiation Exposure Information:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. It also complies with Industry Canada license-exempt RSS standard(s).

The radiated output power of the device is far below the FCC radio frequency exposure limits. Nevertheless, the device shall be used in such a manner that the potential for human contact during normal operation is minimized.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Chapter 3 Installation

3.1 Overview

Please read this chapter carefully before attempting to install the devices. Failing to follow the instructions in this chapter may cause injury to yourself or damage to the equipment and may ultimately compromise the operability of the equipment.

The validator installation instructions described in this chapter explain how to install the devices, but do not prepare the devices for operation. Once installation is complete, the installer should follow the validator Initialization instructions.

The following information and instructions are provided for the installer of a validator.

- To avoid damage, deliver FareGo Val OV|41 equipment to the installation location in the original packaging and Scheidt & Bachmann wrapping.
- The validator is installed inside bus vehicles and provides Farecard validation.

The FareGo Val OV|41 equipment is fragile. Handle with extreme care. Do not drop!

Although this manual has been prepared with great care, some information may seem unclear to you. If so, please feel free to contact us with your remarks or questions.

3.2 Disclaimer

Scheidt & Bachmann is not liable for injuries to any person or damages to the equipment resulting from failure to comply with the manufacturers instructions.

3.3 Packaging Information

The following information is provided for those responsible for unpacking and installing the validator in its permanent location:

- The validator is delivered in a carton.
- To avoid damage, do not unpack the validator arriving at the installation location.
- Disposal of packaging is not the responsibility of Scheidt & Bachmann.

3.3.1 Power Requirements

The power/network connector of the FareGo Val OV|41 is located in the mounting unit and has a full operating range from 20 VDC to 40 VDC.

In standby mode, the FareGo Val OV|41 uses 8 W. In operational mode, the FareGo Val OV|41 uses 12 W.

The safety labels shown in the section “Device Safety Labels” must be followed. Review them carefully before proceeding.

Mode		Power Consumption
Standby	FareGo Val OV 41 Ready to Accept Smart Card	8 W
Operational	Farecard Processing and Audio	12 W

Table 3-1 Power Consumption

Use only S&B EPF systems as power source and CAT 5e S/FTP cable as wiring.

3.4 Power Supply

Article No.	Description
03772520	Power Box
03790970	Power Switch Box for Tram / Rail
03791630	Power Switch Box for 24 V Vehicles
03806400	Power Switch Box all in one

Table 3-2 Power Supply

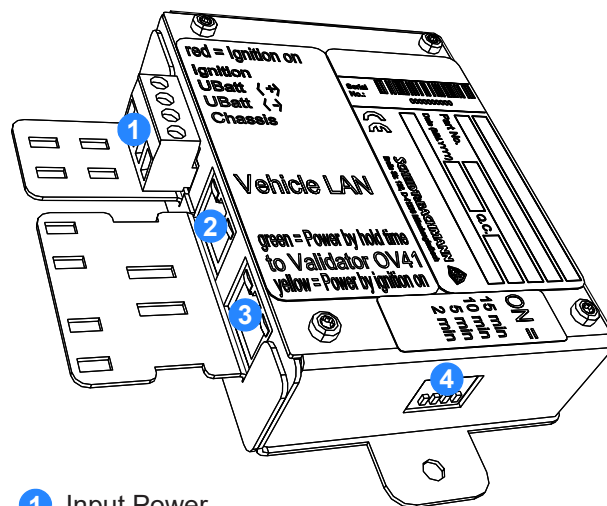
3.4.1 Power Box

Power Box for a single Validator in a 24 V bus.

The on-board validator will be connected to a Power Box which provides the power supply for the on-board validator within a bus. One Power Box is able to connect and operate one on-board validator.

The Power Box is equipped with an internal on/off switch logic in connection with the ignition signal of the vehicle and needs to be connected to the permanent vehicle plus battery power.

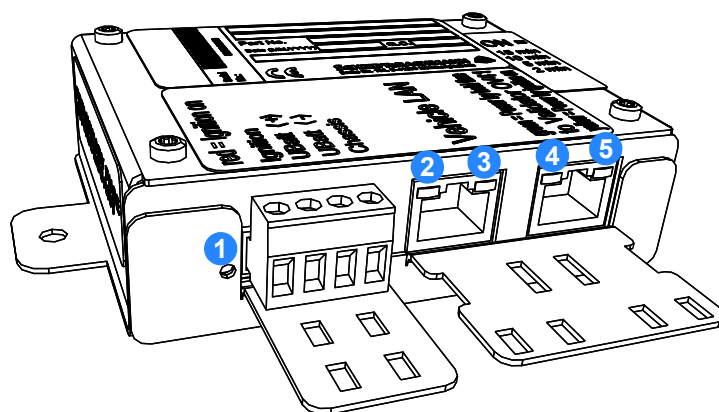
The Power Box has the following interfaces and connectors:



- 1 Input Power
- 2 Input LAN Output
- 3 Power and LAN
- 4 DIP Switch (selection of the switch off delay time)

Figure 3-1 Power Box - Connector

The Power Box has 5 LEDs to signal the following functions:



- 1 LED 1 (red) Indicates input power is ON
- 2 LED 2 (yellow) Indicates connection established
- 3 LED 3 (green) Indicates data traffic
- 4 LED 4 (yellow) Indicates that UB+_IGNITION is ON or OFF
- 5 LED 5 (green) Indicates that UB+_SELF-HOLD is ON or OFF

Figure 3-2 Power Box - LEDs

3.4.1.1 Connector and Cable

1x Validator Communication Interface with Ethernet Power Feed for the Validator.	RJ45 / CAT 5e S/FTP (or better) Maximum cable length 10 m (393.7")
1x Ethernet Router Interface	RJ45 / CAT 5e cable (or better)
Permanent Vehicle Power Connection 20 - 40 VDC, UB(+) and UB(-) (No Tolerances)	2x 2,5 mm ² (AWG14) cables
Grounding	2,5 mm ² (AWG14) cable
Vehicle Ignition Signal	1,5 mm ² (AWG16) cable

Table 3-3 Power Box - Connector and Cable

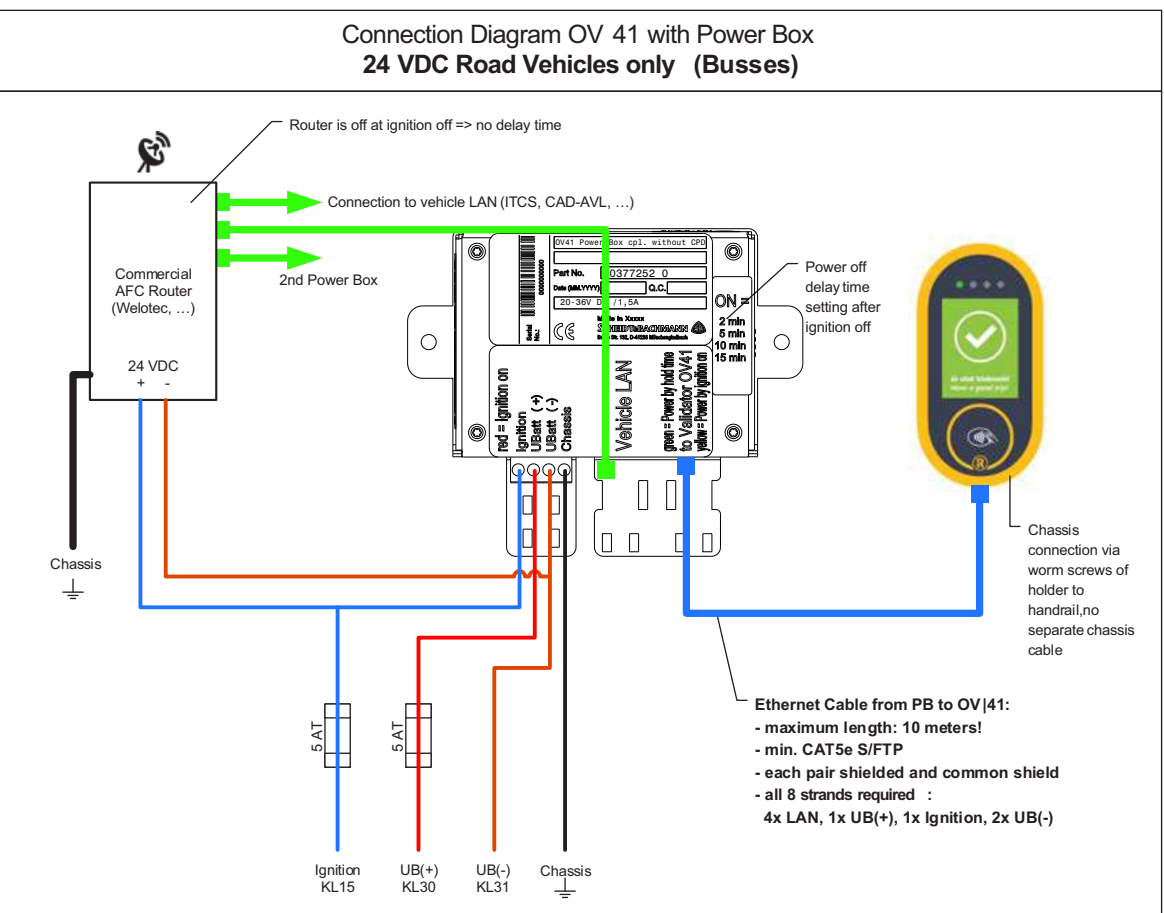
3.4.1.2 Technical Data

Power Input Fuse UB (+)	5 A
Ignition Signal Fuse	5 A
Dimensions	130 mm x 115 mm x 35 mm 5.12" x 4.33" x 1.38"
Power Hold Time	Configurable between 60 and 900 Seconds
Operating Temperature	-40 °C to +65 °C -40 °F to +149 °F
IP Protection Class	IP 20

Table 3-4 Power Box - Technical Data

Power Box Connection Diagram

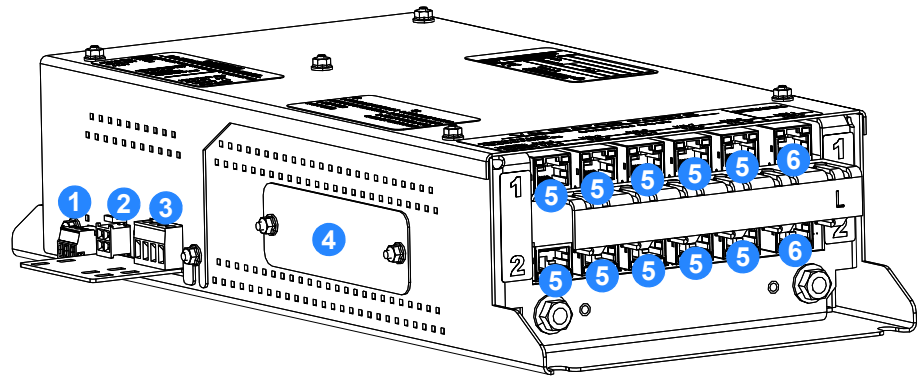
Figure 3-3 Power Box - Connection Diagram



3.4.2 Power Switch Box for Tram / Rail

The on-board validator(s) are connected to a Power Switch Box which provides the power supply for the on-board validator(s) within a vehicle. One Power Switch Box is able to connect and operate up to ten on-board validators. The Power Switch Box is equipped with an internal on/off switch logic in connection with the ignition signal of the vehicle and needs to be connected to the permanent vehicle plus battery power.

The Power Switch Box has the following interfaces and connectors:

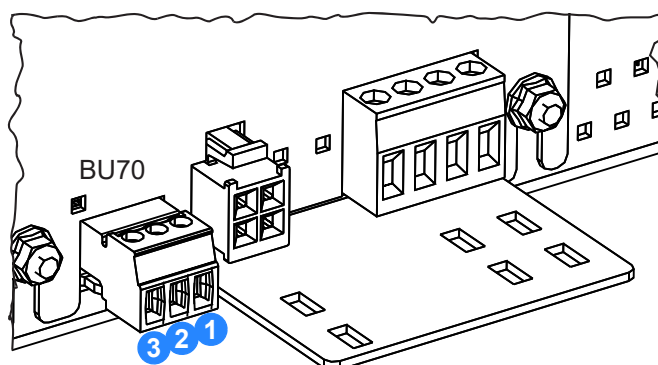


- 1 Power Output
- 2 Test Connector (internal use only)
- 3 Power Input Connector
- 4 Service
 - LAN Port
 - DIP Switches (selection of the switch off delaytime)
 - C2 Programming Interface
- 5 LAN with Power Connector
- 6 LAN only Connector

Figure 3-4 Power Switch Box - Connectors

3.4.2.1 Power Output Connector

Pinning of the 3 pin Power Output Connector

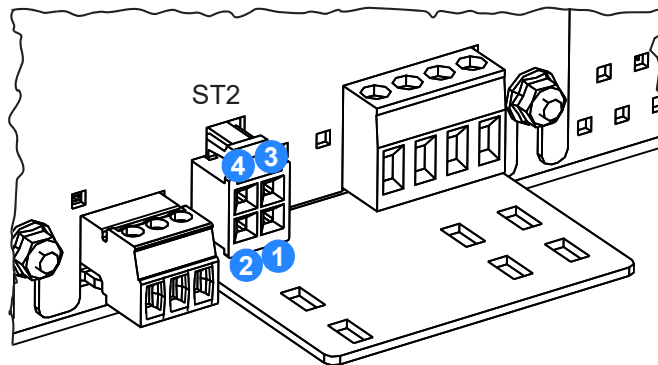


- 1 +24V
- 2 GND 24V
- 3 Chassis

Figure 3-5 Power Switch Box - Power Output Connector

3.4.2.2 Test Connector

4 pin Connector

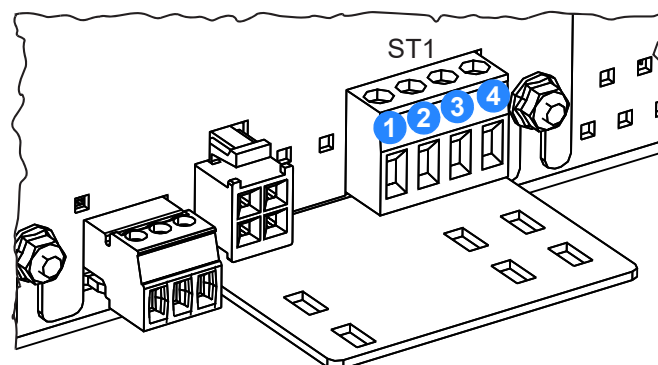


- ① - UB
- ② Chassis
- ③ Ignition
- ④ + UB

Figure 3-6 Power Switch Box - Test Connector

3.4.2.3 Power Input Connector

Pinning of the 4 pin Connector

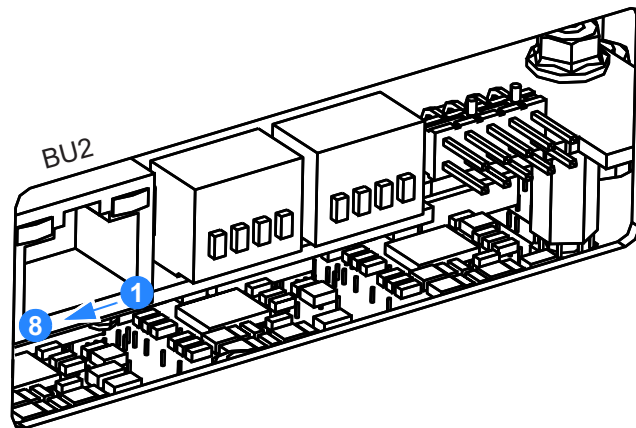


- ① Ignition (16,8 V - 45 V)
- ② + UB (16,8 V - 45 V)
- ③ - UB
- ④ Chassis

Figure 3-7 Power Switch Box - Power Input Connector

3.4.2.4 Service Ethernet Connector

Description of the 8 Pin RJ45 Connector (BU2)



- | | |
|--------|--------|
| ① RX+ | ⑤ n.c. |
| ② RX- | ⑥ TX- |
| ③ TX+ | ⑦ n.c. |
| ④ n.c. | ⑧ n.c. |

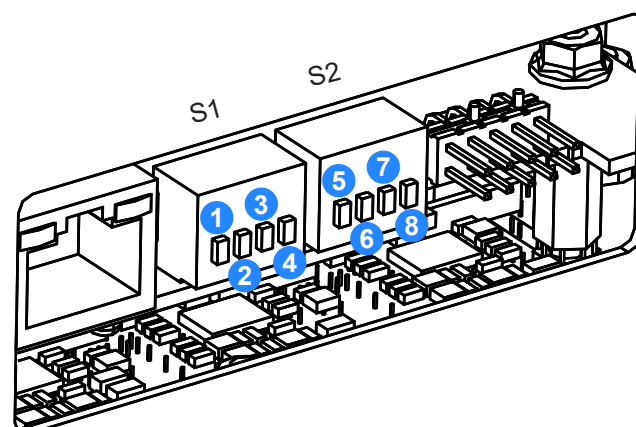
Figure 3-8 Power Switch Box - Service Ethernet Connector

3.4.2.5 DIP Switches

Description of the DIP Switch Blocks (S1 and S2)

With the DIP Switches will be defined:

- The interval of the broadcasting message (S1 Switch 1 and 2), see **Figure 3-9**.
- A second Power Switch Box on a vehicle (S2 Switch 1), see **Figure 3-9**.
- The switch off delay, after the ignition was switched off (S2 Switch 1,2 and 3), see **Figure 3-9**.



- | | |
|------------------------|---------------------------------|
| ① Broadcast Interval 1 | ⑤ IP Address (Broadcast ON/OFF) |
| ② Broadcast Interval 2 | ⑥ DELAY_1 |
| ③ Not Used | ⑦ DELAY_2 |
| ④ Not Used | ⑧ DELAY_3 |

Figure 3-9 Power Switch Box - DIP Switches

Broadcast Interval 1	Broadcast Interval 2	Interval in Seconds
OFF	OFF	1
OFF	ON	5
ON	OFF	10
ON	ON	30

Table 3-5 Power Switch Box - Broadcast Interval

IP Address (Broadcast ON/OFF)	Description
OFF	Set this Power Switch Box as the first Power Switch Box in the vehicle.
ON	Set this Power Switch Box as the second Power Switch Box in the vehicle.

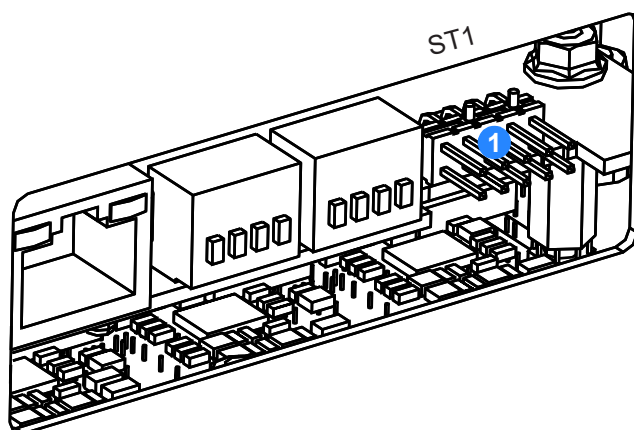
Table 3-6 Power Switch Box - Broadcast ON/OFF

DELAY_1	DELAY_2	DELAY_3	Time in Seconds
OFF	OFF	OFF	60
OFF	OFF	ON	120
OFF	ON	OFF	300
OFF	ON	ON	600
ON	OFF	OFF	900
ON	OFF	ON	1200
ON	ON	OFF	1800
ON	ON	ON	3600

Table 3-7 Power Switch Box - Switch Off Delay Time

3.4.2.6 C2 Programming Interface

This interface is for internal use only.

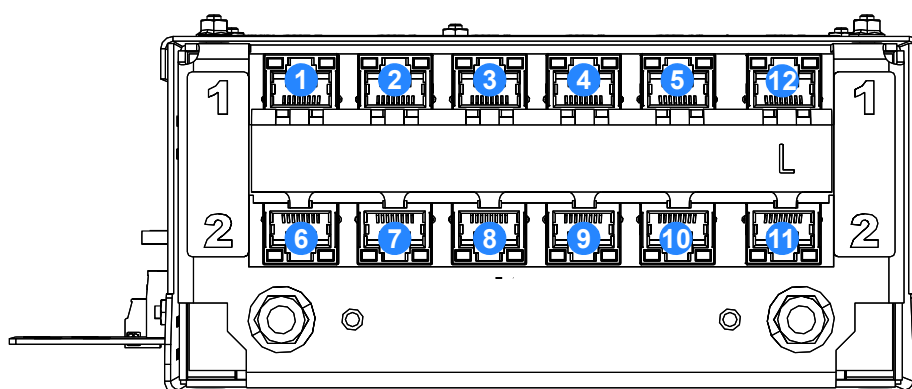


1 C2 Programming Interface

Figure 3-10 Power Switch Box - C2 Programming Interface

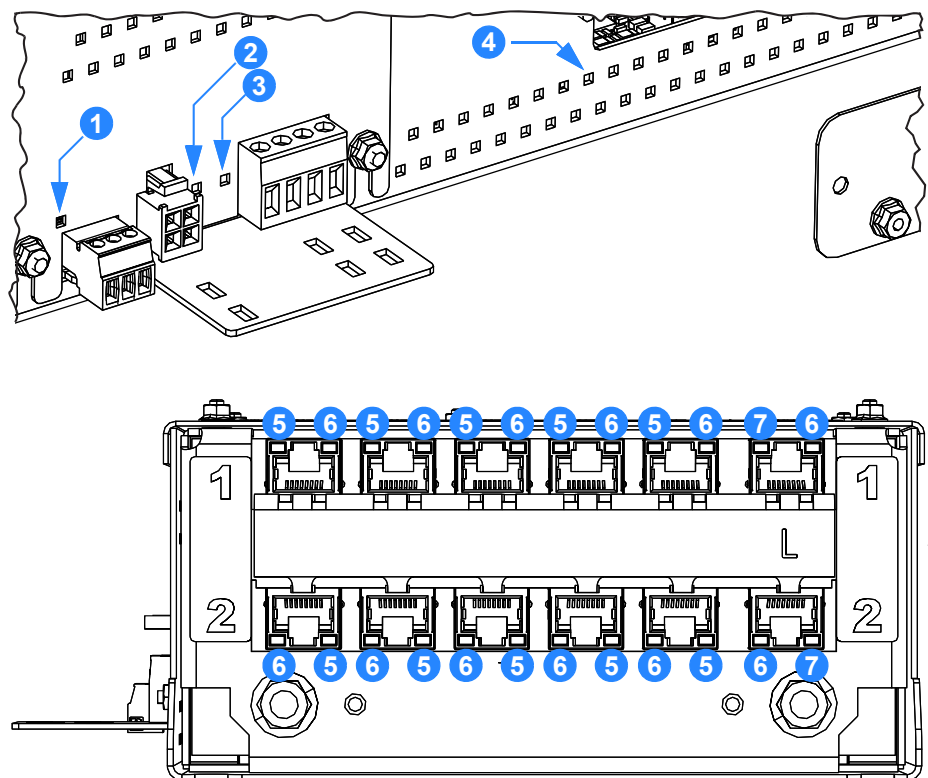
3.4.2.7 LAN Ports

Definition of the LAN Ports



- | | |
|-------------------------------|--|
| 1 Validator 1 (LAN and Power) | 7 Validator 7 (LAN and Power) |
| 2 Validator 2 (LAN and Power) | 8 Validator 8 (LAN and Power) |
| 3 Validator 3 (LAN and Power) | 9 Validator 9 (LAN and Power) |
| 4 Validator 4 (LAN and Power) | 10 Validator 10 (LAN and Power) |
| 5 Validator 5 (LAN and Power) | 11 LAN 1 - Connection to Vehicle LAN Router (4G / Wi-Fi) |
| 6 Validator 6 (LAN and Power) | 12 LAN 2 - Connection to a Second Power Switch Box |

The Power Switch Box has 28 LEDs to signal the following functions:



- | | |
|-----------------|--|
| ① LD70 (Green) | 24 V (For External Device e.g. GSM Router) |
| ② LD1 (Yellow) | +UB Present (Permanent) |
| ③ LD3 (Red) | Ignition Present |
| ④ LD380 (Green) | +36 V Present |
| ⑤ LED (Yellow) | +36 V Present |
| ⑥ LED (Green) | Indicates Data Traffic |
| ⑦ LED (Yellow) | Indicates Connection Established |

Figure 3-11 Power Switch Box - LEDs

3.4.2.8 Connector and Cable

1 x Connection to a Second Power Switch Box	RJ45 / CAT 5e Cable (or better)
10 x Validator Communication Interfaces with Ethernet Power Feed 36 VDC for the Validators	RJ45 / CAT5e S/FTP (or better) Maximum cable length 60 m (2362.2")
1 x Connection to Vehicle LAN Router (4G/WiFi)	RJ45 / CAT 5e Cable (or better)
1 x Power Output Connector Router Power Supply	1,5 mm ² (AWG16) Cable
1 x Service Ethernet Connector Service Laptop Interface for Switch Box Configuration.	RJ45 / Ethernet Cable and USB
1 x Power Input Connector Permanent Vehicle Power Connection 17 - 48 VDC, UB(+) and UB(-)	2 x 2,5 mm ² (AWG14) Cables
1 x Power Input Connector Chassis	2,5 mm ² (AWG14) Cable
1 x Power Input Connector Vehicle Ignition Signal	1,5 mm ² (AWG16) Cable

Table 3-8 Power Switch Box - Connector and Cable

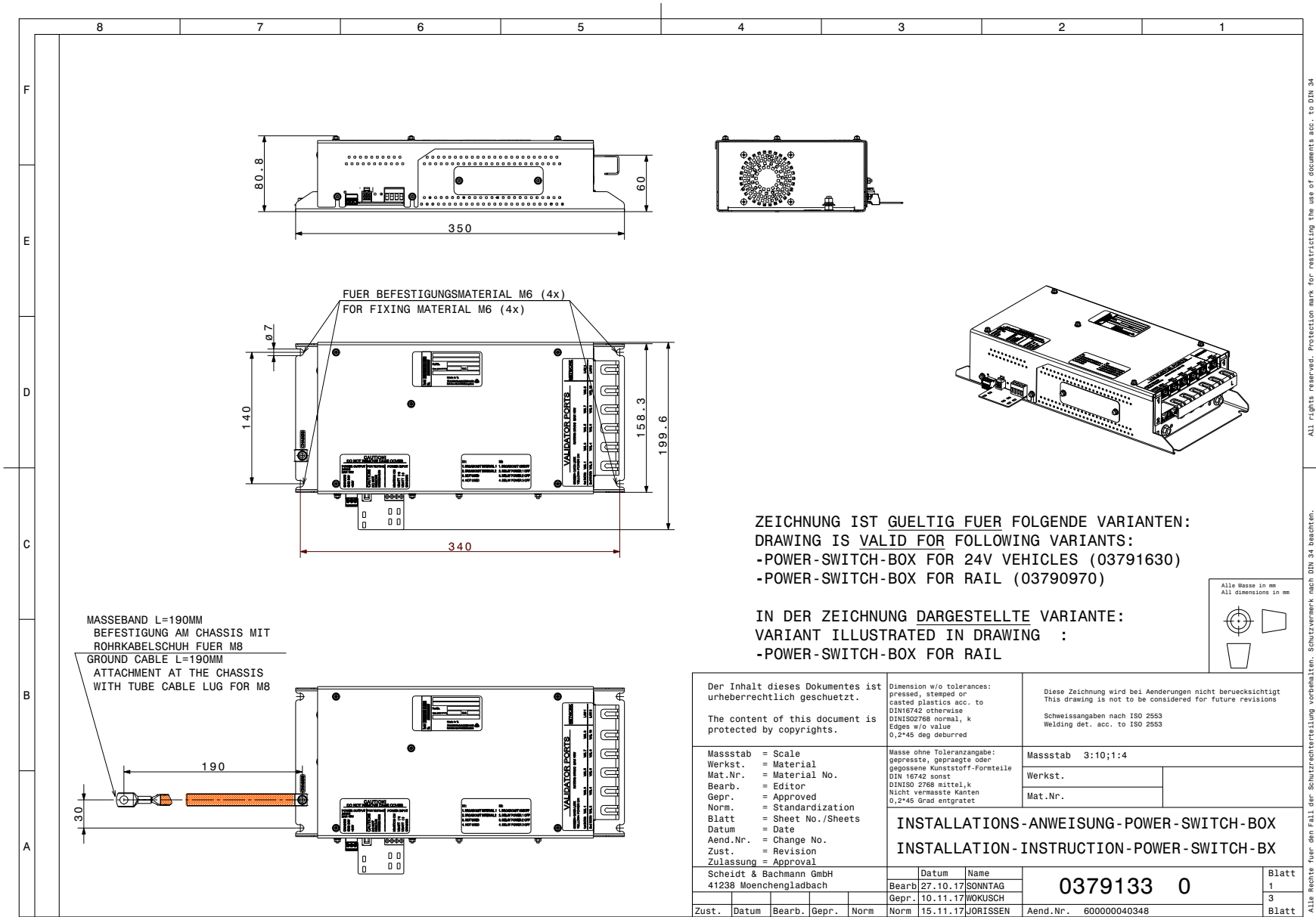
3.4.2.9 Technical Data

Power Input Fuse UB (+)	15 A
Ignition Signal Fuse	5 A
Power Output	150 W
Dimensions	350 mm x 200 mm x 81 mm 13.78" x 7.87" x 3.19"
Switch Off Delay	Configurable between 60 and 3600 Seconds
Broadcasting Message Interval	Configurable between 5 and 30 Seconds
Operating Temperature	-30 °C to +60 °C -86 °F to +140 °F
IP Protection Class	IP20

Table 3-9 Power Switch Box - Technical Data

The following drawings are the official Installation Notes for the Power Switch Box.

Figure 3-12 Installation Instruction Power Switch Box Page 1/3



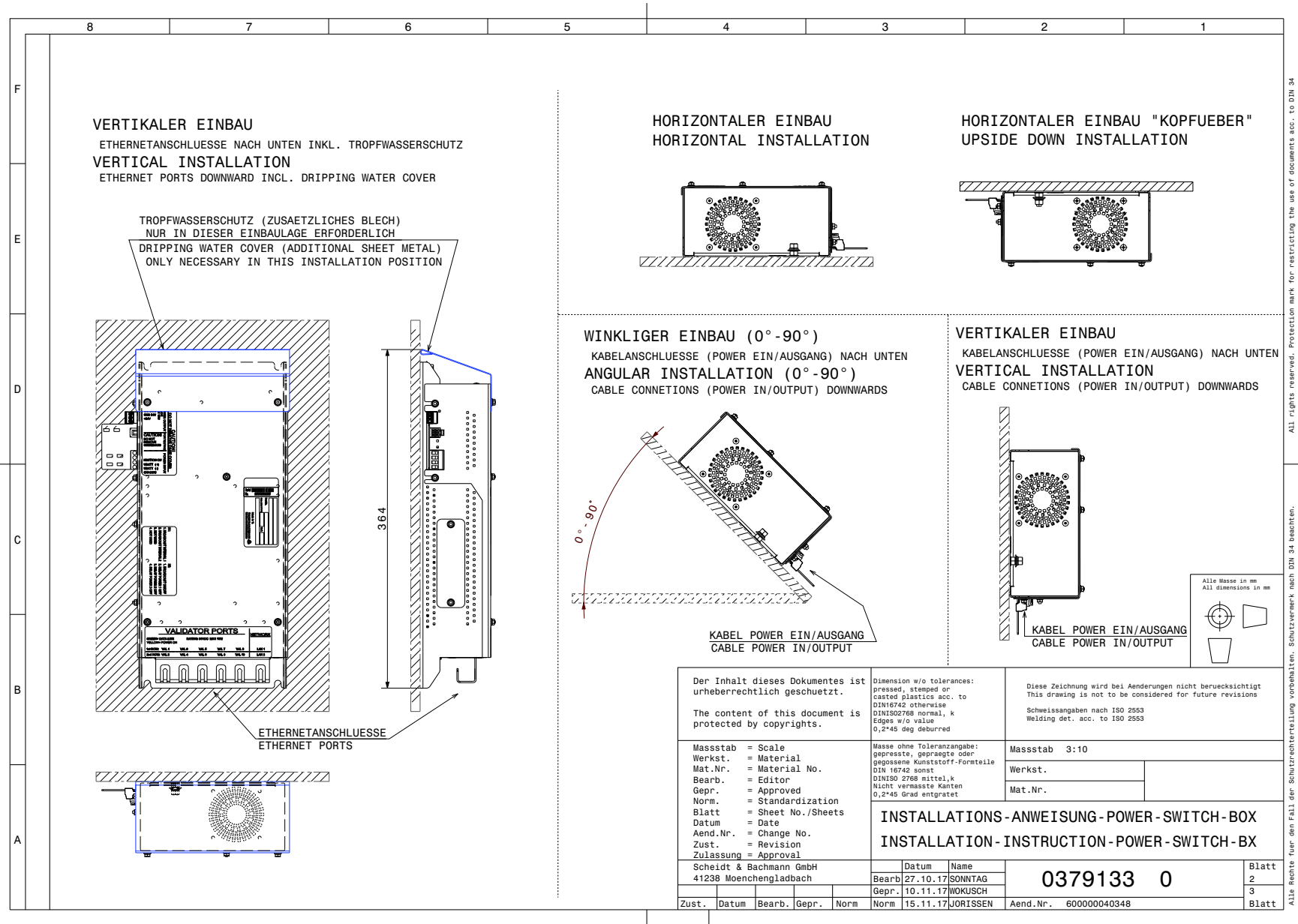
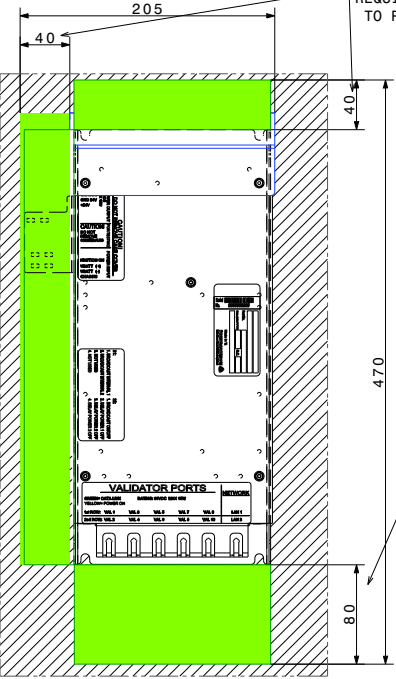
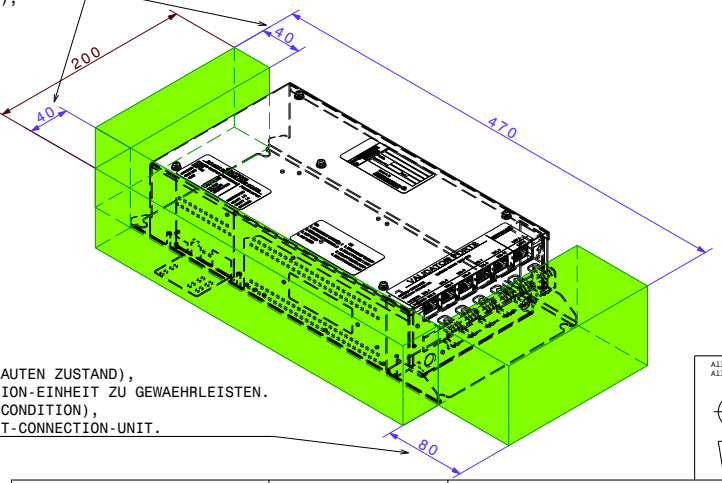


Figure 3-13 Installation Instruction Power Switch Box Page 2/3

	8	7	6	5	4	3	2	1
F								
E								
D								
C								
B								
A								
	SERVICERAUM VERTIKALER EINBAU ETHERNETANSCHLUESSE NACH UNTEN INKL. TROPFWASSERSCHUTZ SERVICE SPACE VERTICAL INSTALLATION ETHERNET PORTS DOWNWARD INCL. DRIPPING WATER COVER  BENOETIGTER SERVICERAUM (IM EINGEBAUTEN ZUSTAND), UM ERFORDERLICHE LUFTZIRKULATION ZU GEWAHRLEISTEN. REQUIRED SERVICE SPACE (INSTALLED CONDITION), TO PROVIDE THE CORRECT COOLING. BENOETIGTER SERVICERAUM (IM EINGEBAUTEN ZUSTAND), UM DEMONTAGE DER ETHERNET-CONNECTION-EINHEIT ZU GEWAHRLEISTEN. REQUIRED SERVICE SPACE (INSTALLED CONDITION), TO PROVIDE EXCHANGING THE ETHERNET-CONNECTION-UNIT.				SERVICERAUM RESTLICHE EINBAUMÖGLICHKEITEN (SIEHE BLATT 2) SERVICE SPACE OTHER INSTALLATION POSSIBILITIES (SEE SHEET 2)  Alle Masse in mm All dimensions in mm			
	Der Inhalt dieses Dokumentes ist urheberrechtlich geschützt. The content of this document is protected by copyrights. Masstab = Scale Werkst. = Material Mat.Nr. = Material No. Bearb. = Editor Gepr. = Approved Norm. = Standardization Blatt = Sheet No./Sheets Datum = Date Aend.Nr. = Change No. Zust. = Revision Zulassung = Approval Scheidt & Bachmann GmbH 41238 Moenchengladbach				Dimension w/o tolerances: pressed, stamped or casted plastics acc. to DIN16742 otherwise DINISO2768 normal, k Edges w/o value 0,2°45 deg deburred Masse ohne Toleranzangabe: gepresste, geprägte oder gegossene Kunststoff-Fornsteile DIN 16742 sonst DINISO 2768 mittel,k Nicht vermasste Kanten 0,2°45 Grad entgratet Masstab 3:10 Werkst. Mat.Nr. Diese Zeichnung wird bei Aenderungen nicht beruecksichtigt This drawing is not to be considered for future revisions Schweissangaben nach ISO 2553 Welding det. acc. to ISO 2553			
	INSTALLATIONS - ANWEISUNG - POWER - SWITCH - BOX INSTALLATION - INSTRUCTION - POWER - SWITCH - BX				Datum Name Bearb. 27.10.17SONNTAG Gepr. 10.11.17WOKUSCH Norm 15.11.17JORISSEN			
	Zust. Datum Bearb. Gepr. Norm				Aend.Nr. 600000040348			
					0379133 0			
					Blatt 3			
					Blatt 3			

3.4.2.10 Power Switch Box Connection Diagram

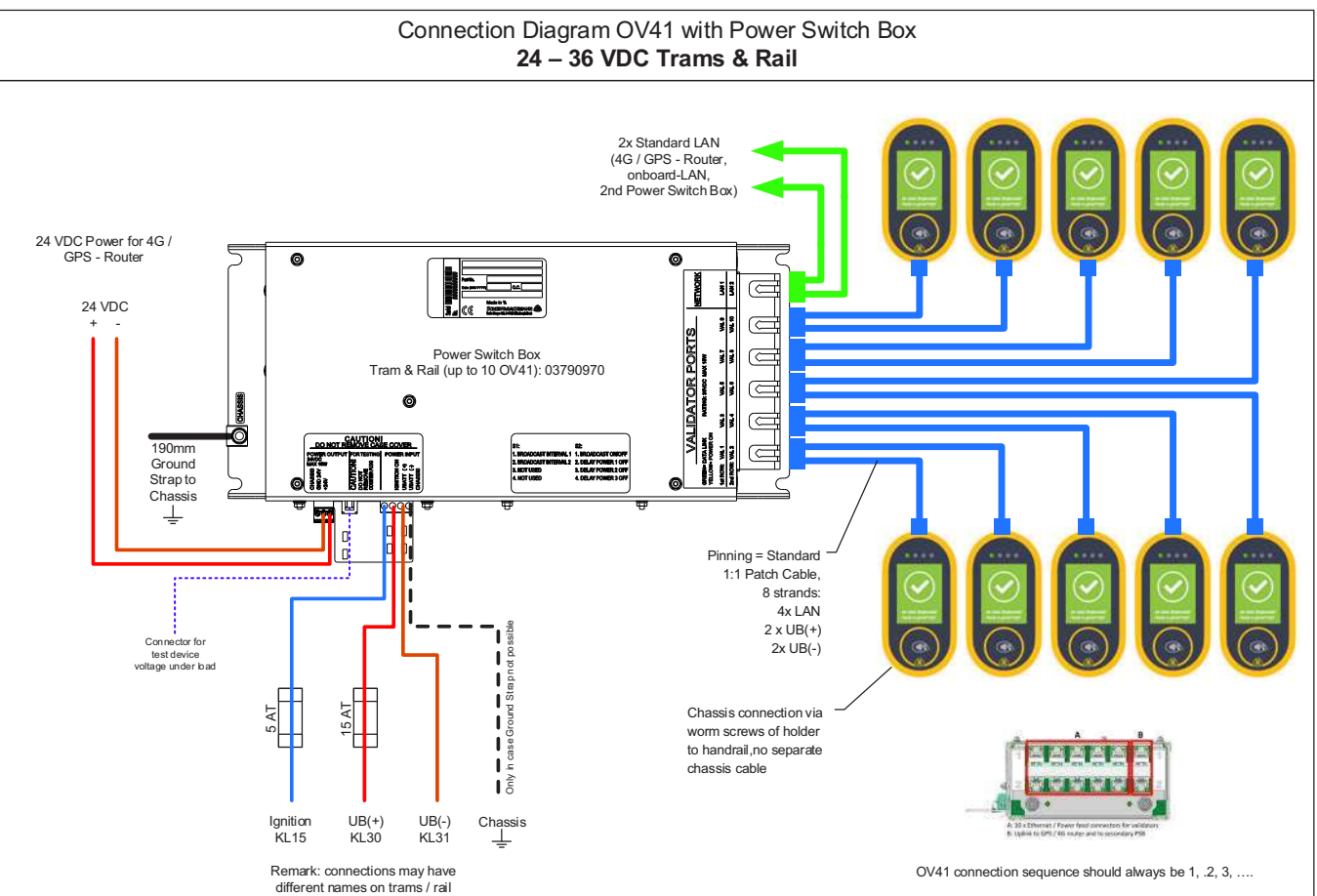


Figure 3-15 Power Switch Box - Connection Diagram

3.4.3 Power Switch Box for 24 V Vehicles

The Power Switch Box for 24 V Vehicles has the same features as the Power Switch Box for Tram / Rail. Only the number of LAN ports and the power output are different, see **Section 3.4.2**.

3.4.3.1 Connector and Cable

4 x Validator Communication Interfaces with Ethernet Power Feed 36 VDC for the Validators	RJ45 / CAT5e S/FTP (or Better) Maximum Cable Length 60m(2362.2")
1 x Connection to Vehicle LAN Router (4G/WiFi)	RJ45 / CAT 5e Cable (or Better)
1 x Service Ethernet Connector Service Laptop Interface for Switch Box Configuration.	RJ45 / Ethernet Cable and USB
1 x Power input connector Permanent Vehicle Power Connection 17 - 48 VDC, UB (+) and UB (-)	2 x 2,5 mm ² (AWG14) Cables
1 x Power Input Connector Chassis	2,5 mm ² (AWG14) Cable
1 x Power Input Connector Vehicle Ignition Signal	1,5 mm ² (AWG16) Cable

Table 3-10 Power Switch Box - Connector and Cable

3.4.3.2 Technical Data

Power Input Fuse UB (+)	10 A
Ignition Signal Fuse	5 A
Power Output	80 W
Dimensions	350 mm x 200 mm x 81 mm 13.78" x 7.87" x 3.19"
Switch Off Delay	Configurable between 60 and 3600 Seconds
Operating Temperature	-30 °C to +60 °C -86 °F to +140 °F
IP Protection Class	IP20

Table 3-11 Power Switch Box - Technical Data

3.4.3.3 Power Switch Box for 24 V Vehicles Connection Diagram

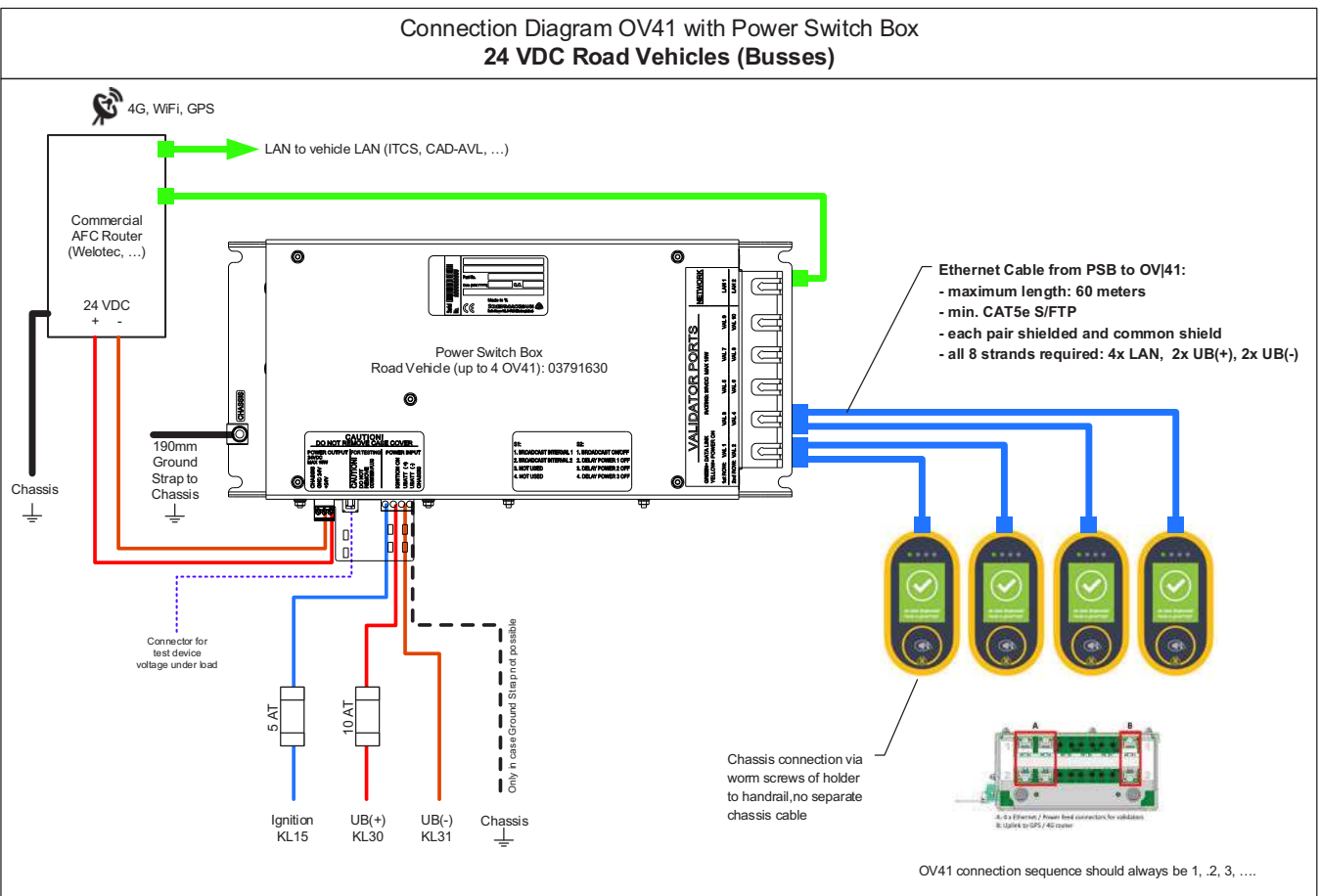
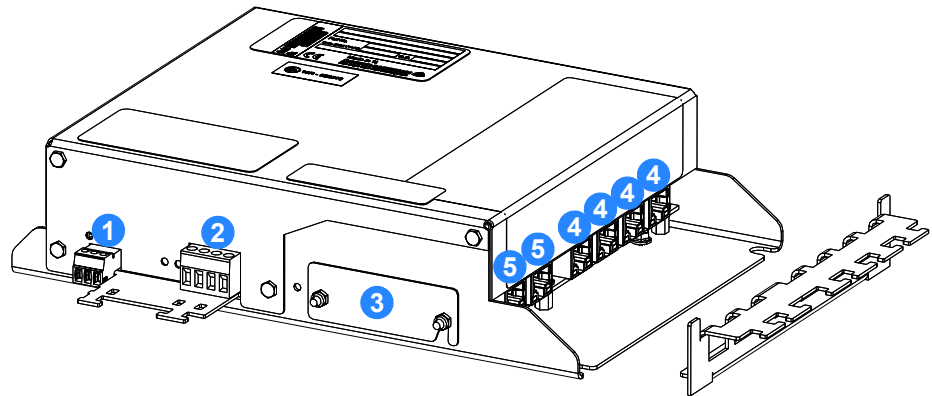


Figure 3-16 Power Switch Box - Connection Diagram

3.4.4 Power Switch Box - All in One

The on-board validator(s) are connected to a Power Switch Box - All in one which provides the power supply for the on-board validator(s) within a vehicle. One Power Switch Box is able to connect and operate up to four on-board validators. The Power Switch Box is equipped with an internal on/off switch logic in connection with the ignition signal of the vehicle and needs to be connected to the permanent vehicle plus battery power. The Power Switch Box - All in one can be used in Trams, Rail and 24 V vehicles.

The Power Switch Box has the following interfaces and connectors:

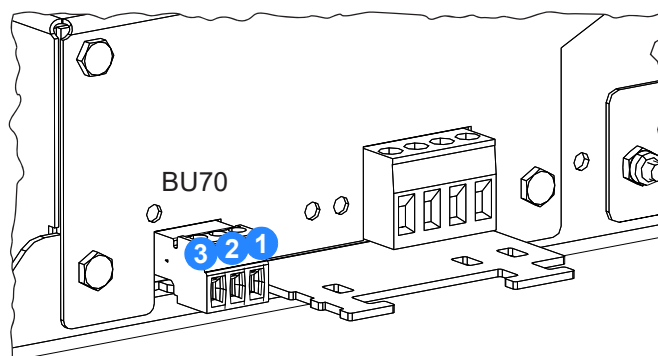


- 1 Power Output
- 2 Power Input Connector
- 3 Service
 - DIP Switches (selection of the switch off delay time)
 - C2 Programming Interface
- 4 LAN with Power Connector
- 5 LAN only Connector

Figure 3-17 Power Switch Box - All in One - Connectors

3.4.4.1 Power Output Connector

Pinning of the 3 pin power output connector

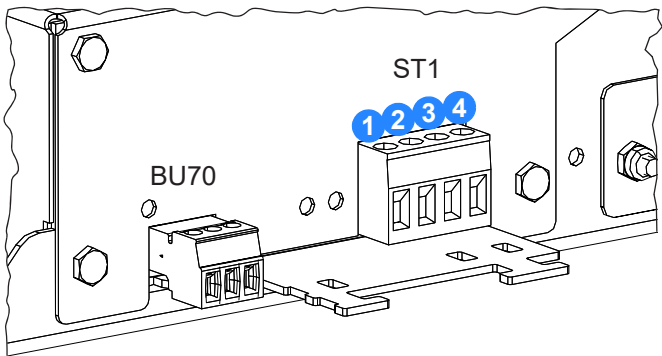


- 1 +24 V
- 2 GND 24 V
- 3 Chassis

Figure 3-18 Power Switch Box - All in One - Power Output Connector

3.4.4.2 Power Input Connector

Pinning of the 4 pin Connector



- 1 Ignition (16,8 V to 45 V)
- 2 +UB (16,8 V to 45 V)
- 3 -UB
- 4 Chassis

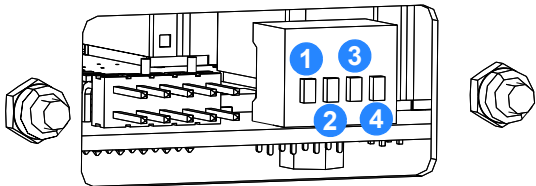
Figure 3-19 OV|41 Power Switch Box - All in One - Power Input Connector

3.4.4.3 DIP Switch

Description of the DIP switch block

With the DIP switch will be defined:

- The state of the broadcasting message on / off (see **Figure 3-20**).
- The switch off delay, after the ignition was switched off (see **Figure 3-20**).



- 1 IP Address (Broadcast On/Off)
- 2 Delay 1
- 3 Delay 2
- 4 Delay 3

Figure 3-20 Power Switch Box - All in One - DIP Switches

IP Address (Broadcast On / Off)	Description
Off	Set this Power Switch Box as the first Power Switch Box in the vehicle.
On	Set this Power Switch Box as the second Power Switch Box in the vehicle.

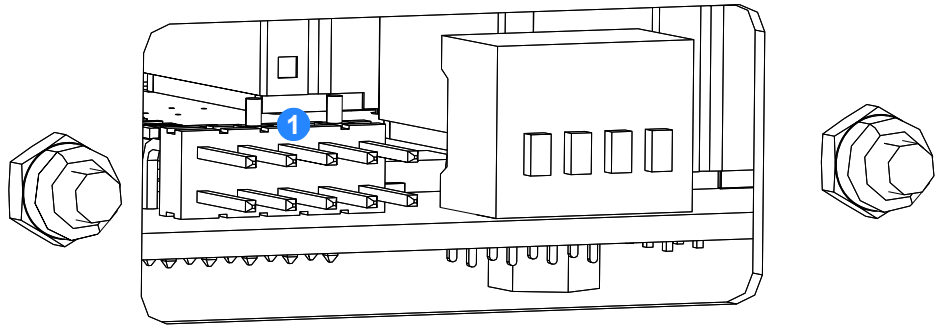
Table 3-12 Power Switch Box - All in One - Broadcast On / Off

Delay 1	Delay 2	Delay 3	Time in Seconds
Off	Off	Off	60
Off	Off	On	120
Off	On	Off	300
Off	On	On	600
On	Off	Off	900
On	Off	On	1200
On	On	Off	1800
On	On	On	3600

Table 3-13 Power Switch Box - All in One - Switch Off Delay Time

3.4.4.4 C2 Programming Interface

This interface is for internal use only.

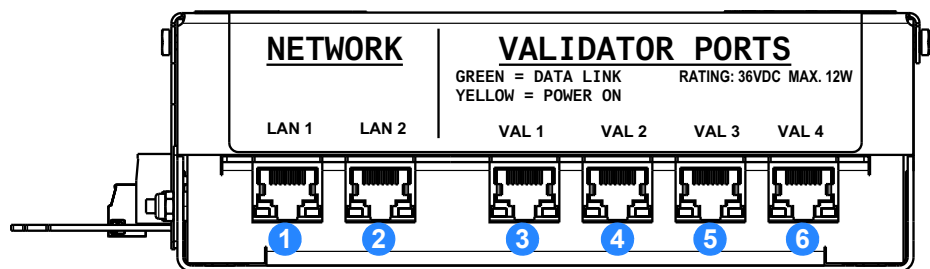


1 C2 Programming Interface

Figure 3-21 Power Switch Box - All in One - C2 Programming Interface

3.4.4.5 LAN Ports

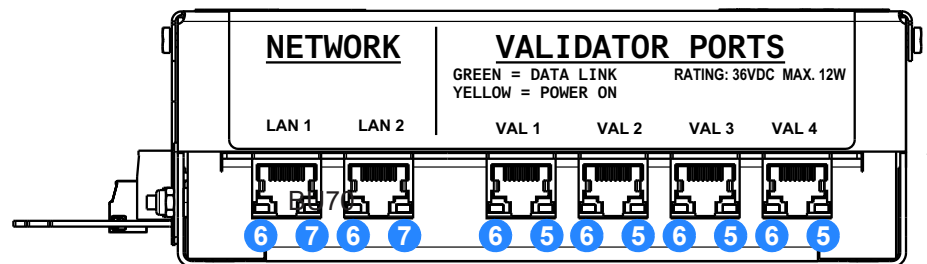
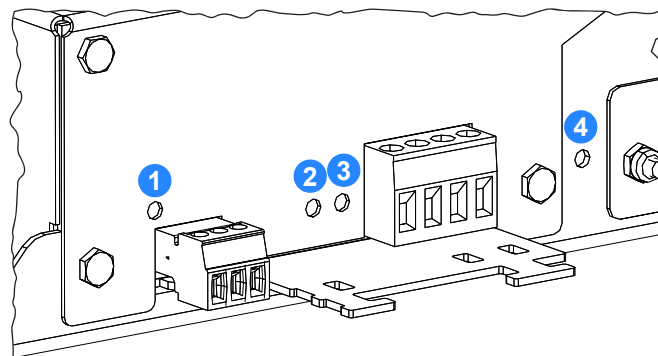
Definition of the LAN Ports:



- 1 LAN 1 - Connection to Vehicle LAN Router (4G / Wi-Fi)
- 2 LAN 2 - Connection to a Second Power Switch Box
- 3 Validator 1 (LAN and Power)
- 4 Validator 2 (LAN and Power)
- 5 Validator 3 (LAN and Power)
- 6 Validator 4 (LAN and Power)

Figure 3-22 Power Switch Box - All in One - LAN Ports

The Power Switch Box has 28 LEDs to signal the following functions:



- | | |
|-----------------|---|
| 1 LD70 (Green) | 24 VDC On (For External Device e.g. GSM Router) |
| 2 LD1 (Yellow) | Vehicle Power On (Permanent) |
| 3 LD3 (Red) | Ignition On |
| 4 LD380 (Green) | 36 VDC On |
| 5 LED (Yellow) | 36 VDC On |
| 6 LED (Green) | Indicates Data Traffic |
| 7 LED (Yellow) | Indicates Connection Established |

Figure 3-23 Power Switch Box - All in One - LEDs

3.4.4.6 Connector and Cable

1 x Connection to a Second Power Switch Box	RJ45 / CAT 5e Cable (or Better)
4 x Validator Communication Interfaces with Ethernet Power Feed 36 VDC for the Validators	RJ45 / CAT5e S/FTP (or Better) Maximum Cable Length 60 m (2362,2")
1 x Connection to Vehicle LAN Router (4G / Wi-Fi)	RJ45 / CAT 5e Cable (or Better)
1 x Power Output Connector Router Power Supply	1,5 mm ² (AWG16) Cable
1 x Power Input Connector Permanent Vehicle Power Connection 17 to 48 VDC, UB (+) and UB (-)	2 x 2,5 mm ² (AWG14) Cables
1 x Power Input Connector Chassis	2,5 mm ² (AWG14) Cable
1 x Power Input Connector Vehicle Ignition Signal	1,5 mm ² (AWG16) Cable

Table 3-14 Power Switch Box - All in One - Connector and Cable

3.4.4.7 Technical Data

Power Input Fuse UB (+)	10 A
Ignition Signal Fuse	5 A
Power Input	24 V / 36 V
Power Output	24 V / max. 15 VA / max. 750 µF
Dimensions	235 mm x 197 mm x 56 mm 9.25" x 7.75" x 2.20"
Switch Off Delay	Configurable between 60 and 3600 Seconds
Broadcasting Message Interval	Configurable between 5 and 30 Seconds
Operating Temperature	-30 °C to +60 °C -22 °F to +140 °F
IP Protection Class	IP20

Table 3-15 Power Switch Box - All in One - Technical Data

3.4.4.8

Connection Diagram - OV41 with Power Switch Box - All in one
Trams and Rail

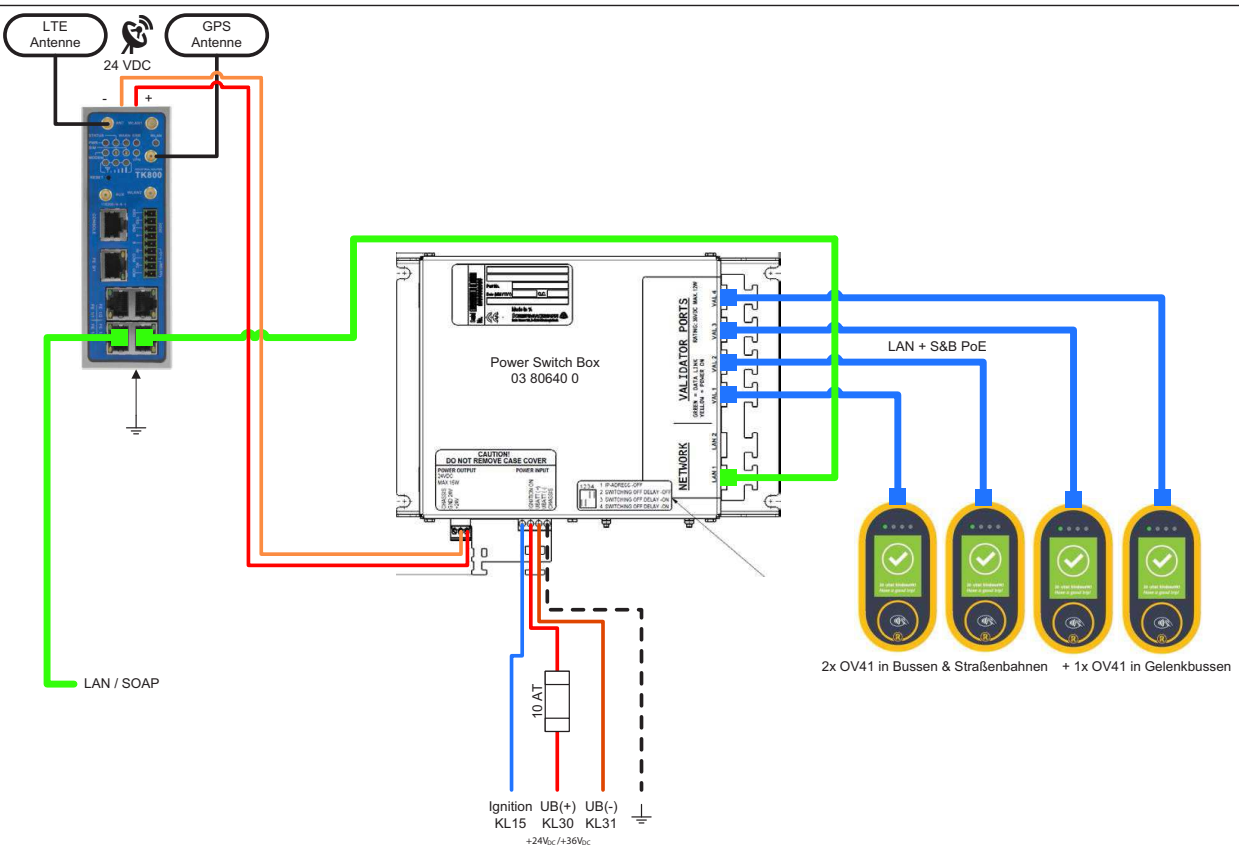


Figure 3-24 Power Switch Box - All in One - Connection Diagram

3.4.5 Network Requirements

A NRTL listed, flexible CAT 5e S/FTP cable will provide data communication and power supply. The cable complies with NFPA70 and NEC including Chapter 800. The Ethernet Connector is a standard RJ45.

3.5 General Conditions of Use and Storage

The validator equipment installed within a bus or train should function normally in a protected environment between an ambient temperature range of -30 °C to +50 °C (-22 °F to +122 °F) and in a relative humidity range of 5 % to 95 %, non-condensing.

The device must be stored in a dry place when not in use. Maintenance on validator equipment subject to outdoor environmental conditions should be performed ONLY if the following conditions are met:

- Temperature of the validator does not fall below -30 °C (-22 °F).
- Humidity must be between 5 % and 95 %, non-condensing.
- Rain and snow ingress during maintenance must be prevented.

These restrictions are necessary because exposure to severe environmental conditions such as cold temperatures, rain, snow, and wind, can cause serious and permanent damage to the equipment. PCBs (Printed Circuit Board) may malfunction and cease operation at temperatures below -30 °C (-22 °F). Exposure to rain or snow may lead to short circuits and resulting equipment damage.

3.6 Components Location

There is different mounting equipment depending of the installation location in the vehicle:

- Mounting at the wall, see **Section 3.6.1**
- Optional: Mounting on a vertical or horizontal pole, see **Section 3.6.1**

3.6.1 Wall Mounting

This section gives an overview of the component location of the validator for wall mounting.

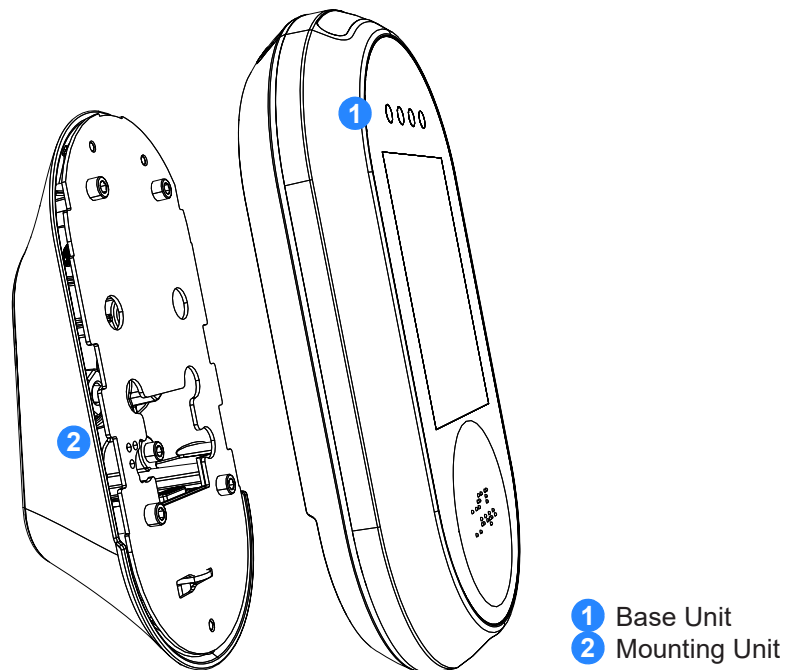
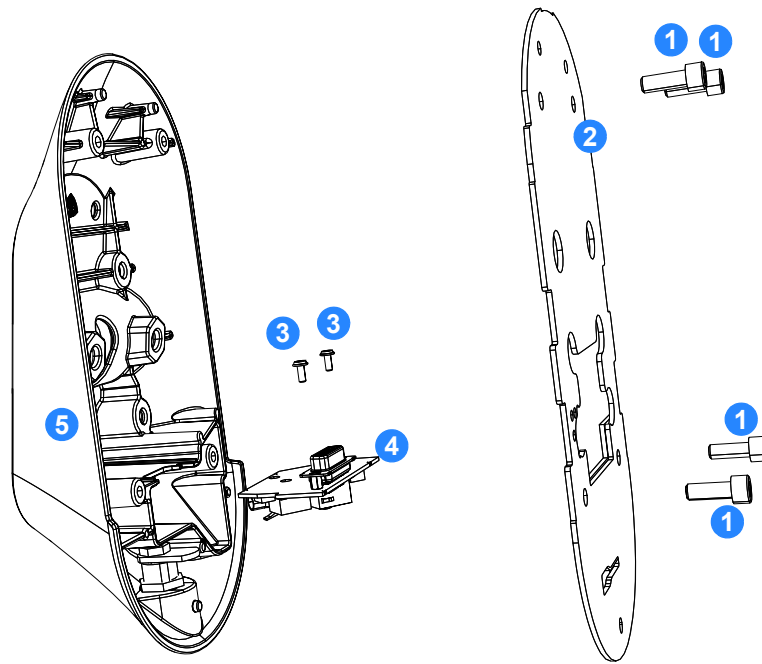


Figure 3-25 Component Identification



- 1 Cylinder Head Screw with Hexagon Socket M6x16
- 2 Interface Plate with Seal
- 3 Flat Head Screw with Hexagon Socket M3x7
- 4 Printed Circuit Board OV41 Connection Board
- 5 Mounting Unit

Figure 3-26 Component Identification - Mounting Unit for Wall Installation
(No Fastening Elements for Wall Mounting in Scope of Delivery)

3.6.2 Pole Mounting (Option)

This section gives an overview of the component location of the validator for pole mounting.

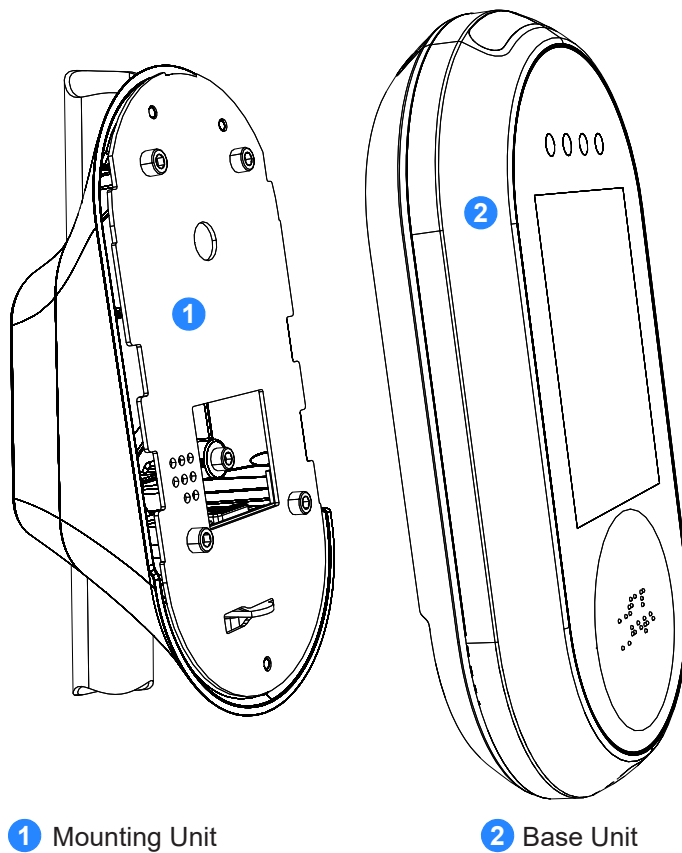
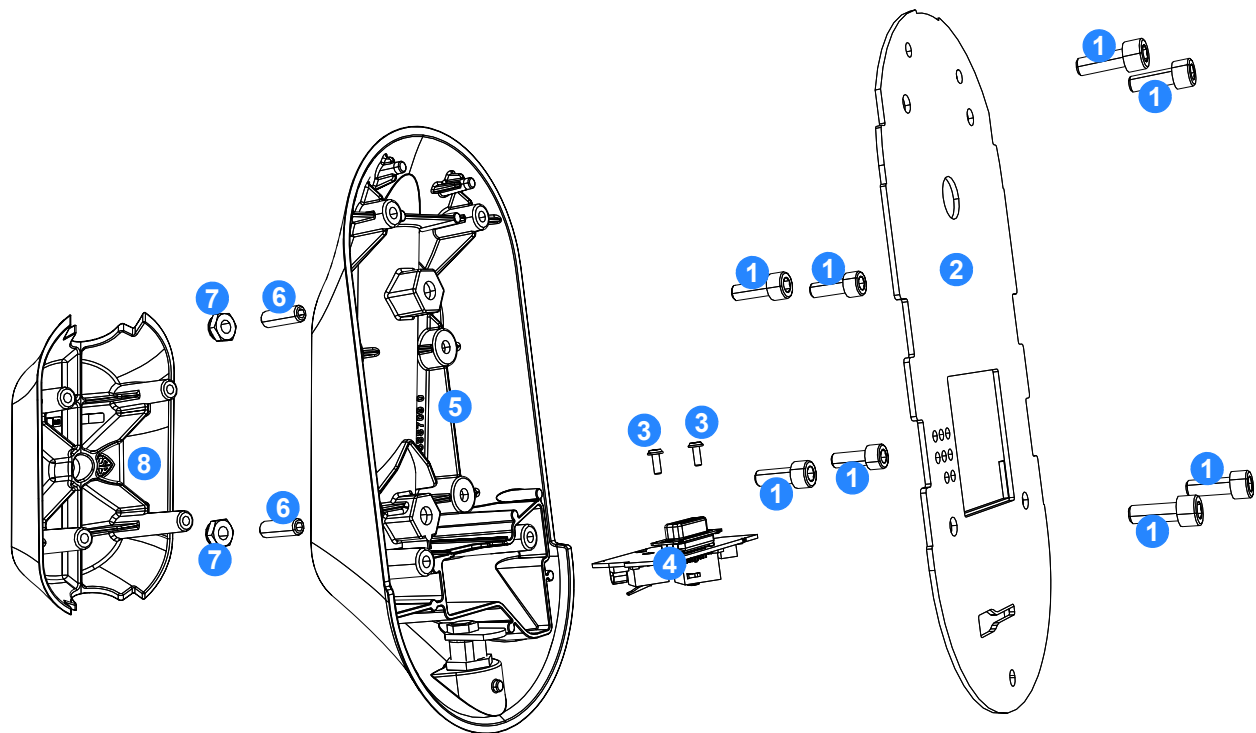
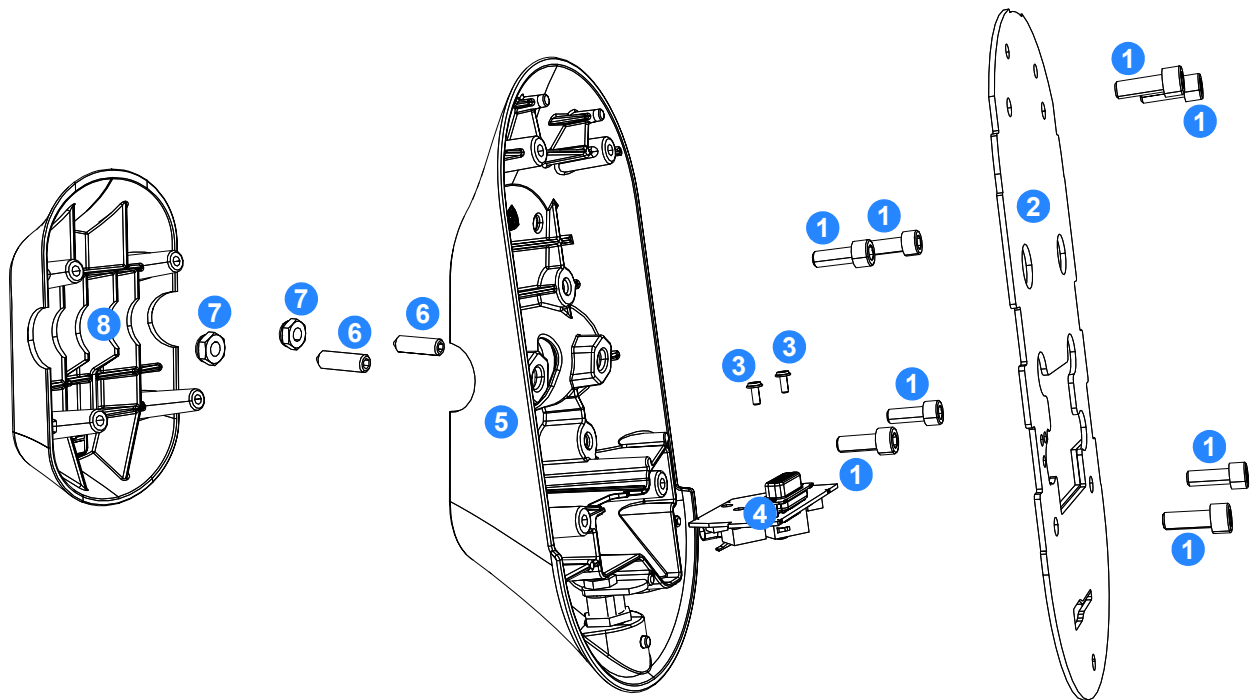


Figure 3-27 Component Identification (Example: Vertical Installation)



- 1 Cylinder Head Screw with Hexagon Socket M6x16
- 2 Interface Plate with Seal
- 3 Flat Head Screw with Hexagon Socket M3x8
- 4 Printed Circuit Board OV41 Connection Board
- 5 Mounting Unit Front Part
- 6 Set Screw ISO4027 M8x25
- 7 Self Securing Nut M8
- 8 Mounting Unit Rear Part

Figure 3-28 Component Identification Mounting Unit (Vertical Installation)



- 1 Cylinder Head Screw with Hexagon Socket M6x16
- 2 Interface Plate with Seal
- 3 Flat Head Screw with Hexagon Socket M3x8
- 4 Printed Circuit Board OV41 Connection Board
- 5 Mounting Unit Front Part
- 6 Set Screw ISO4027 M8x25
- 7 Self Securing Nut M8
- 8 Mounting Unit Rear Part

Figure 3-29 Component Identification Mounting Unit (Horizontal Installation)

3.7 Dimensions and Weights

Table 3-16 lists the dimensions and weights of the validator.

Part	Width	Height	Depth	Weight
Base Unit	155 mm 6.1"	295 mm 11.61"	56 mm 2.2"	1,2 kg 2.64 lb
Base Unit incl. Mounting Unit	155 mm 6.1"	295 mm 11.61"	158 mm 6.22"	2,6 kg 5.73 lb

Table 3-16 Dimensions and Weights

3.8 Installation Requirements

The following materials, standard tools, and preconditions are required for FareGo Val OV|41 installation.

3.8.1 Materials

At a minimum, the following materials will be included in the FareGo Val OV|41 package:

- 1 x Fully Assembled Functional FareGo Val OV|41 unit

3.8.2 Standard Tools

Below is a list of required tools and materials:

- Small wrench with bit holder
- Cable cutter
- Drill
- Spiral drills
- Edge trim for the cable opening
- Measuring tape or ruler

3.8.3 Special Tools

- Drilling aid (for installation on pole)

3.9 Installation

This section gives details related to the mechanical mounting of the FareGo Val OV|41. A mounting unit will be attached to the bus framework. The chosen location is to be agreed upon between the installation subcontractor and the customer.

3.9.1 Wall Installation

The device is delivered without assembly kit. Due to different conditions of the assembly site, the appropriate assembly material must be selected individually for each assembly site.

The drill holes can be marked using the mounting unit. The power/network cable must be fed from the rear through an opening on the back of the mounting unit.

- Step 1** Plan how the mounting unit is to be attached to the wall or to a cabinet inside the vehicle. Provide suitable fastening material, e. g. screws and nuts.
- Step 2** Prepare the assembly site with appropriate holes that match the holes in the mounting unit.
- Step 3** Lead the power/network cable from the rear through the openings in the seal and in the rear of the mounting unit for later connection.

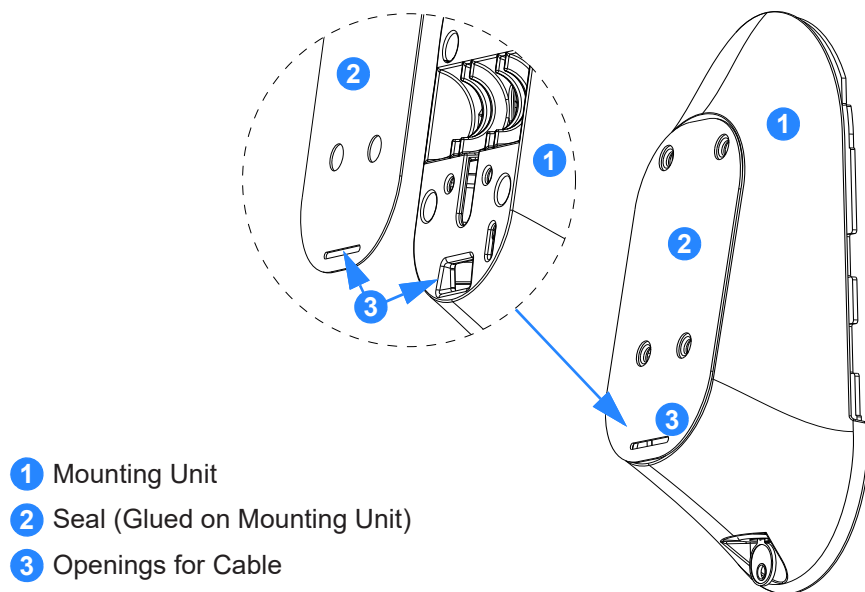


Figure 3-30 Rear of Mounting Unit with Bonded Seal

- Step 4** Attach the mounting unit to the wall. **Figure 3-31** shows fastening screws and the fixing holes to be used inside the mounting unit, but not the fastening elements on the wall side.