

REDBOXtop-1pqb

REDBOX recorder unit

Unit description



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Applies to

This document applies to:

REDBOXtop-1pqb

Revision index

Version	Date	Change	Chapter No. ¹
A	07.04.2016	First edition	all

¹: The chapter numbers specified in this table always refer to the preceding document.

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1 General

1.1 About these instructions

General notes on how to use these instructions

- Read these instructions carefully before starting up the REDBOX^{top} for the first time.
- Comply with the warning and safety notes.
- Keep these instructions ready to hand.
- Make sure that every user of the REDBOX^{top} has read these instructions thoroughly.
- Explanations and definitions to terms and abbreviations are found in the Glossary.

Copyright

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The information contained therein is confidential and may only be used to fulfil the contractually planned purpose.

1.2 Contact for enquiries

How to reach us

DEUTA-WERKE GmbH
Paffrather Strasse 140
D-51465 Bergisch Gladbach, Germany
Phone +49 (0) 2202 958-100
Fax +49 (0) 2202 958-145
www.deuta.de
support@deuta.de

Suggestions for improvement

Please let us know about your suggestions on how to improve the content and layout of this document. We are constantly striving to improve the quality of our customer documentation.

Phone +49 (0) 2202 958-198

Personal assistance

If you need personal assistance in using this product, please contact our Support directly.

Product	Support number
Multi functional terminals and displays	+49 (0) 2202 958-325
Recorders and evaluation software	+49 (0) 2202 958-106 +49 (0) 2202 958-124 +49 (0) 2202 958-186
Sensor technology	+49 (0) 2202 958-235
Video technology, indicators and IconTrust technology	+49 (0) 2202 958-325
or	support@deuta.de

1.3 DEUTA Academy

Attend our workshop and qualify as a

"Travel Data Recorder Expert"

At our workshop you will receive practical knowledge on the topics of installation, commissioning, preventive and corrective maintenance of the DEUTA travel data recorder as well as comprehensive practical training. Further content items are the use of the Service software and the reading out of travel data.

<http://www.deuta.de>

1.4 Document structure

The following figure shows you a complex example of possible documents.

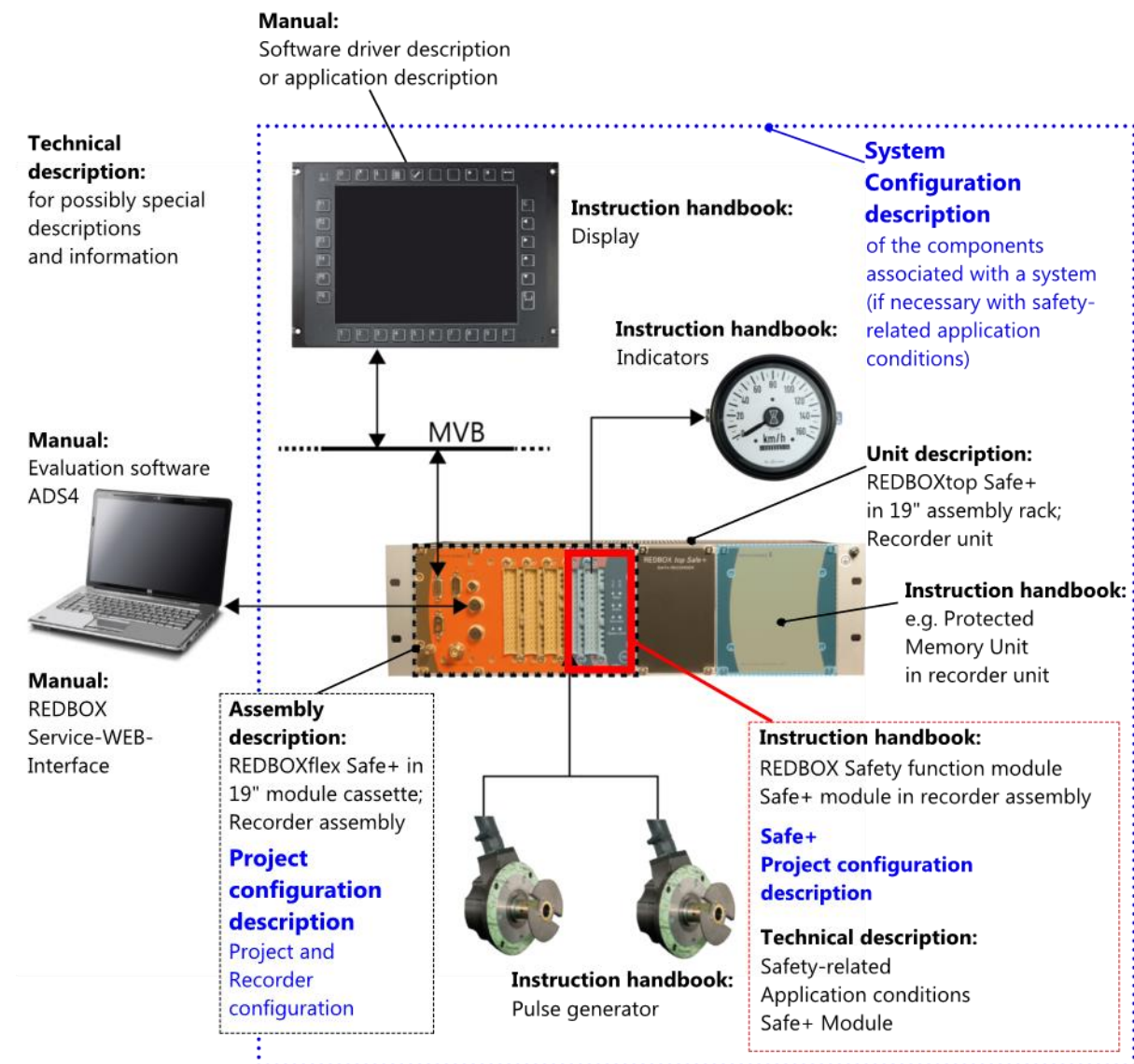


Fig. 1/1: Documentation example

INFO

Necessary documents

The documentation to a device (recorder, display, sensor, indicator, etc.), a recorder assembly (19" cassette), a recorder unit (19" assembly rack), software, a project or system can consist of one document or of several documents. Make certain that you have all of the necessary documents.

1.5 Additional documents

You will also find further information in the following documents:

Documents	No.
Manuals:	
Evaluation software ADS4 manual	4AB1165

1.6 Presentation in the document

1.6.1 Markings, symbols and lettering

Presentation	Usage
Character #	Used as placeholder for device variants. Example: MFT_L11##o could be, e.g.: MFT_L11byo or MFT_L11dyo
Angle brackets <>	Indicates buttons to be actuated. Examples: <F1> <Shift> + <F1>
Font Courier	Indicates ▪ Screen messages for devices having a display unit or a service PC ▪ File name ▪ Directories Example C:\Programs
"Quotation marks"	The menu commands and names of dialogue windows or names of chapters are put in quotation marks (example: "File", "Edit", dialogue window "Data export").
Arrows →	Arrows indicate individual steps of navigation paths or operating steps (Example: "File → Open").

Presentation	Usage
underlined	▪ Link in the PDF file to the <u>Glossary</u> ▪ Refers to entry and explanation in the <u>Glossary</u>
square brackets with arrow and page number	▪ Link in PDF file to the specified page, e.g.: see Figure [→ Page 33] ▪ You will find further information on the specified page
further Links in PDF file (via left mouse button)	▪ In the Table of Contents: e.g. <i>1.1 About these Instructions10</i> Link is on the chapter no., the chapter text and the page no. and jumps to the specified page ▪ In the List of Keywords: <i>Storage temperature 50, 56, 66</i> Link is on the page no. and jumps to the clicked on page

1.6.2 Units

If not shown otherwise, the units of measure in drawings are millimetres [mm].

1.6.3 Highlights and notes

Symbols have been used to specifically highlight the following information:

Symbol	Meaning
	Important Indicates technical requirements that are important for the product to function smoothly. Non-compliance can lead to disruptions, but not to damage to persons or objects.
	Info Indicates ▪ additional important information. ▪ Practical tips to simplify your work with the product.

1.6.4 Presentation of warning and safety notes

Warning and Safety notes are indicated by symbols and a signal word. The signal word indicates the severity of the imminent danger.

Danger classes

Symbol	Signal word
	Danger There is a direct danger for the life and health of people. Non-compliance with these notes will have serious health-related consequences and may even result in death.
	Warning There is a possible imminent danger for the life and health of people. Non-compliance with these notes can have serious health-related consequences and may even result in death.
	Caution There is a possibly dangerous situation. Non-compliance with these notes can result in slight injuries or cause material damage.
	Notice There is a possibility of material damage or malfunctions. Non-compliance with these notes can result in material damage or malfunctions, but will not cause harm to people.

Additional symbols

Symbol	Explanation
	Notice Combined with the signal word Note warns of material damage or malfunctions.
	General danger Combined with a signal word, warns of dangers that could result in injuries or even death.

Symbol	Explanation
	High voltage Combined with a signal word, warns of occurring dangerous electrical voltages that could result in injuries or even death.
	Hot surfaces Combined with a signal word, warns of hot surfaces that could result in burns.
	ESD protection Combined with a signal word, warns of damage to components at risk of electrostatic discharge.

1.7 Overview of standards and issue statuses

You will find the issue statuses of the standards used in this document in the Glossary.

1.8 Licences and rights

1.8.1 GPL licence note

This product contains software components which the copyright owners have licensed as Free Software, or as Open Source software under the **GNU General Public License, Version 2**.

We can provide you with the source code of these software components on a data medium (CD-ROM or DVD) if you enquire of our Customer Service within three years after our distribution of the product.

Send an e-mail with specification of product and serial number to the following address:

[opensource@deuta.de]

and to cover the costs of preparing the data medium and its shipment, transfer €10 in advance to the following account:

Commerzbank AG

IBAN: DE92 3704 0044 0270 0045 00

SWIFT/BIC: COBA DE FF

You are authorised to use, alter and redistribute this software, provided you also comply with the terms of the GNU General Public License, as published by the Free Software Foundation.

You will find the original English language GNU General Public license (GPL) in chapter: Terms of the license [→ Page 47]

1.9 Application of EU Directives

- Our products are designed for installation in rail vehicles, ships or in industrial large-scale plants/machines and may only be mounted, installed, dismantled and disposed of by expert personnel.
- The intended use is only possible in an installed condition in conjunction with other equipment.
- 2014/30/EU (EMC)
These products fall within the scope of the 2014/30/EU (EMC) directive. These products can cause radio interference in residential areas. In this case, the operator can be requested to implement appropriate measures.
- 2011/65/EC (RoHS)
Due to the application, these products do not fall within the scope of the 2011/65/EC directive (RoHS). But they can contain materials for which there are restrictions. If technically possible, we constantly strive to avoid or reduce the stated materials.
- 2014/35/EU (NSR)
Due to the application in rail vehicles and on ships, these products do not fall within the scope of the 2014/35/EU (NSR) directive.
For industrial use, the products do not fall within the scope of the 2014/35/EU (NSR) directive, provided that voltages with a nominal voltage of > 50 VAC or > 75 VDC are not supplied to the product.



IMPORTANT

Voltages > AC 50 V or > DC 75 V in industrial use

In industrial use, voltages with a nominal voltage of > 50 VAC or > 75 VDC must not be supplied to the product.

- If these products are to comply with the requirements of a directive that is not listed in the CE Declaration of Conformity, then this must be clarified by contract before use.

2 Safety

2.1 Intended use

REDBOX^{top}-1pqb is a unit for the recording and storing of travel data on rail vehicles.

Any other use is not permitted without prior consultation with DEUTA.

2.2 Ancillary documents



INFO

Complete documentation

The complete documentation of this product includes the following documents:

Documents	No.
REDBOX recorder:	
Appropriate project configuration description	project-specific
CE Declaration of Conformity REDBOX ^{top} -1 (see chapter "Certificates")	
Installation requirements REDBOX ^{top} -1 (see chapter "Installation requirements")	Zu1396
Instruction Handbook (recorder) REDBOX ^{flex} -3S11sqd	4AB1581
CE Declaration of Conformity REDBOX ^{flex} -3	
Installation requirements REDBOX ^{flex} -3	Zu1434
Unit integrated:	
Instruction Handbook PMU25b (Protected Memory Unit)	4AB1390
CE Declaration of Conformity PMU25	
Installation requirements PMU25	Zu1435
Service and diagnostics:	
Manual Service WEB Interface	4AB1130
Additional documents:	
none	

**IMPORTANT****Observe ancillary documents!**

To ensure smooth and safe operation, the instructions and information in all ancillary documents must be observed!

2.3 Personnel requirements and operator duties

Prior knowledge and qualification

- This document is written solely for personnel (specialists) trained and instructed technically in electronics, electrical engineering and railway technology. Basic knowledge about the installation, EMC measures and safe conduct are presumed.
- It is presumed that only qualified personnel (specialists) will be deployed for the installation, commissioning, operation, maintenance, troubleshooting and repairs of the existing components. Damages due to non-compliance are not included in the guarantee.
- Definition of specialists: see EN50110, DIN VDE 0105, IEC 60364.
Qualified specialists in the meaning of these principal safety notes are persons who are familiar with the assembly, installation, commissioning, operation, etc., of the product and possess the qualifications according to their activities.
- Only personnel especially trained and certified by DEUTA may work on the device as well as the software of the device.

Operator duties

The operator is obliged

- to choose reliable and knowledgeable personnel (specialists) to operate the devices
- to provide training and on-going instruction on how to use the devices to personnel who are entrusted with operating the devices
- to ensure that special activities requiring special knowledge are carried out by suitably knowledgeable and specifically trained specialist personnel (specialists); if necessary, specialists from outside should be brought in
- to ensure the devices are sufficiently maintained, repaired and tested

2.4 Accident prevention regulations

The locally applicable accident prevention regulations must be obeyed.

2.5 Fire protection requirements

The device meets the requirements of fire protection in accordance with DIN EN 45545-2.

2.6 Environmental details on materials

All materials are halogen-free, asbestos-free and are rustproof.
Environmentally hazardous or harmful materials such as PCB-bearing capacitors and materials are not used.

2.7 Information REACH regulation (EC) No. 1907/2006

The required information in accordance with Art. 33 of the REACH regulation (EC) No.1907/2006

How do the DEUTA-WERKE meet their obligation towards the customers:

- We ensure that the materials we use are registered.
- We principally instruct our suppliers to always provide current safety data sheets.
- We obliged our raw material suppliers to notify us immediately should they become aware of the existence of a substance of very high concern (SVHC) which exceeds a mass concentration of 0.1 % in the raw materials delivered to us.
- The EU suppliers of the products, which are processed in our products in a relevant scale, are also obliged to inform us voluntarily as soon as an SVHC substance of more than 0.1 mass percent is contained in the products they supply.
- We will inform our customers immediately and comprehensively if we in turn become aware of the presence of an SVHC substance in one of our processed pre-products.
- Our register of hazardous substances was supplemented by the item "REACH". The list of candidates of the European Chemicals Agency (ECHA) was included in the register.
- The procurement, handling and disposal of hazardous substances is clearly regulated in our integrated management system.

Based on the data currently available to us, we can confirm that none of the momentarily substances of very high concern (SVHC) specified in the list of candidates is contained in our products and in the products that they contain in a concentration of more than 0.1 mass percent.

3 Unit description

3.1 REDBOXtop-1pqb

3.1.1 Application

The REDBOX^{top}-1pqb is a multi-functional recorder for recording travel data in rail vehicles.

The integrated Protected Memory Unit PMU25b is a system for storing travel data in rail vehicles. It meets high mechanical or thermal requirements due to its special structure.



Fig. 3/1: REDBOX^{top}-1pqb

Further information: see Instruction Handbooks, chapter "Ancillary documents".

3.1.2 Overview system components

The REDBOX^{top}-1pqb unit consists of:

- an assembly rack
- a REDBOX^{flex}-3S11sqd multi-functional recorder
- a Protected Memory Unit PMU25b

3.2 Block diagram

See REDBOX^{flex}-3S11sqd and PMU25b instruction handbooks

Further information: "Ancillary Documents" chapter

3.3 Ordering code

The ordering code contains information about the features of the product:

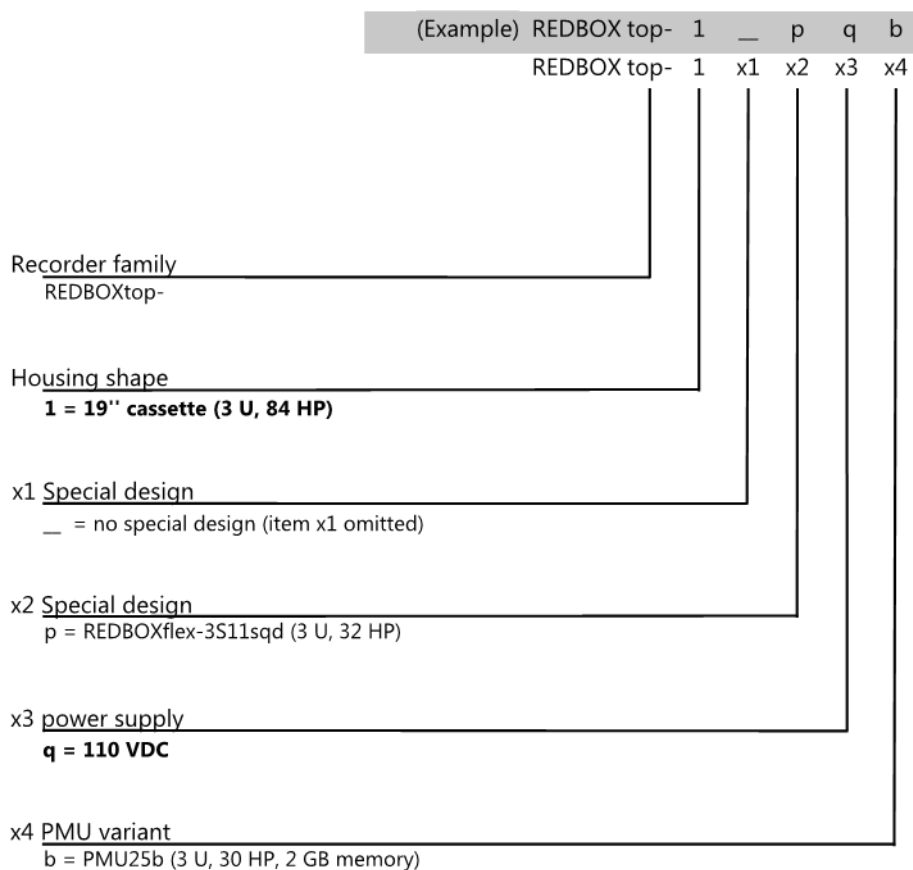


Fig. 3/2: Ordering code REDBOXtop-1pqb

3.4 Overview of variants

**Different features
of the product variants described in this document:**

3.4.1 Power supply

Product variant	24 VDC	74 VDC	110 VDC
REDBOXtop-1pqb			X

3.4.2 Memory

Compact Flash memory card:

Product variant	2 GByte
REDBOXtop-1pqb (REDBOXflex-3S11sqd)	X
PMU25b	X

3.4.3 System clock

To provide the time, the device is equipped with a real-time clock (RTC). The data is retained through a corresponding buffer of the RTC.

3.4.3.1 Buffering

RTC buffer:

Product variant	Goldcap ¹	Battery	none
REDBOXtop-1pqb	X		

¹ The buffer contains at least 7 days.

3.4.4 GPS

The device has a connection for a GPS antenna. After switching on the device, a GPS signal can be received after 1 to 2 minutes, depending on the local reception quality.



NOTICE

Connection of GPS antenna

Connecting the GPS antenna without pre-amplifier may cause damage to the GPS antenna input!

- The antenna must be connected via an appropriate antenna pre-amplifier.

1. Only use the prescribed antenna and pre-amplifier.

GPS connection:

Product variant	TNC socket (X3)
REDBOXtop-1pqb	X

3.4.5 DSUB fastening bolts

Threaded bolts of the DSUB plug connections

Product variant	4-40 UNC	M3
REDBOXtop-1pqb		X

3.5 Hardware

3.5.1 Housing and structure

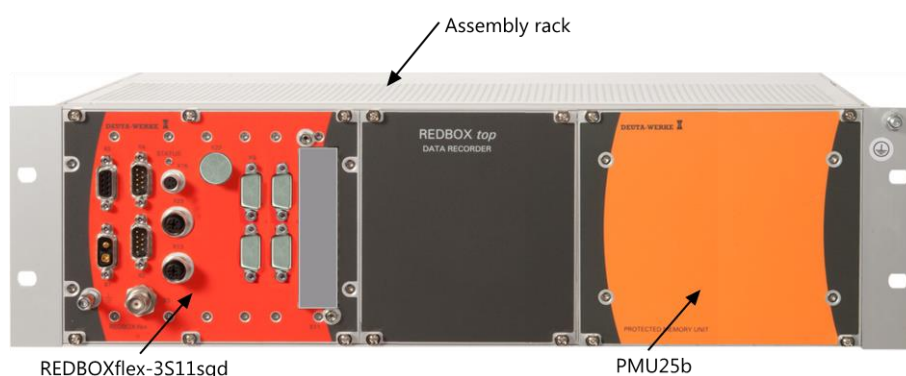


Fig. 3/3: Front view REDBOXtop-1pqb

3.5.2 Overview of front elements

See REDBOXflex-3S11sqd and PMU25b instruction handbooks.
Further information: see chapter "Ancillary documents".

3.5.3 Status LEDs

See REDBOXflex-3S11sqd Instruction Handbook
Further information: "Ancillary Documents" chapter.

3.5.4 Overview of rear view and connections

n/a

3.5.5 Inputs and outputs

See REDBOXflex-3S11sqd Instruction Handbook
Further information: "Ancillary Documents" chapter.

3.5.6 Interfaces

See REDBOXflex-3S11sqd Instruction Handbook
Further information: "Ancillary Documents" chapter.

3.6 Device labelling

3.6.1 Type plate

See REDBOXflex-3S11sqd or PMU25b instruction handbooks.
Further information: "Ancillary Documents" chapter.

3.7 Scope of delivery

REDBOXtop-1pqb
The connecting adapter cables must be ordered separately.

3.8 Accessories

See REDBOXflex-3S11sqd or PMU25b instruction handbooks.
Further information: "Ancillary Documents" chapter.

3.9 Additional DEUTA products

Function	Product
Evaluation	Evaluation software ADS4 The data registered by the REDBOXtop can be read out and evaluated using the ADS4 program. Further information: Manual ADS4
Speed sensor	Connection to frequency inputs ▪ DF series ▪ HS series
Speed display	Connection to analogue outputs ▪ ENG series ▪ EGS series ▪ ESG series
Counter	E.g. mileage recorder for connection to digital output ▪ ZE10/1 ▪ ZE12 ▪ ZE15

4 Mechanical drawings

4.1 Front view

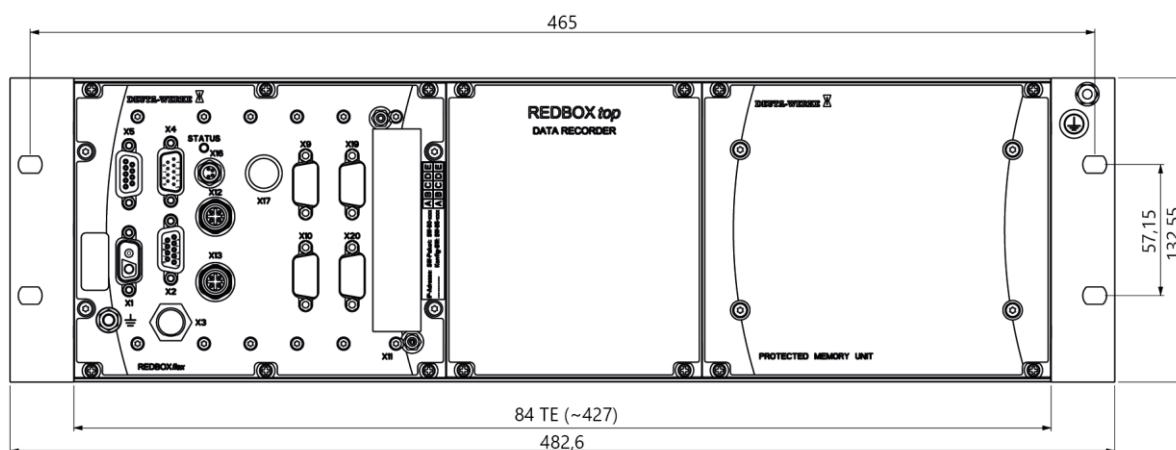


Fig. 4/1: Front view

4.2 Side view

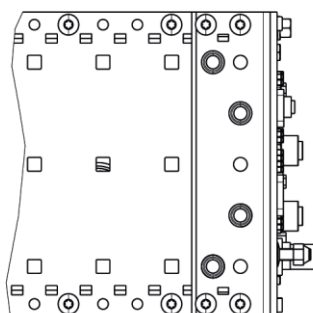


Fig. 4/2: Side view (section)

4.3 Top view

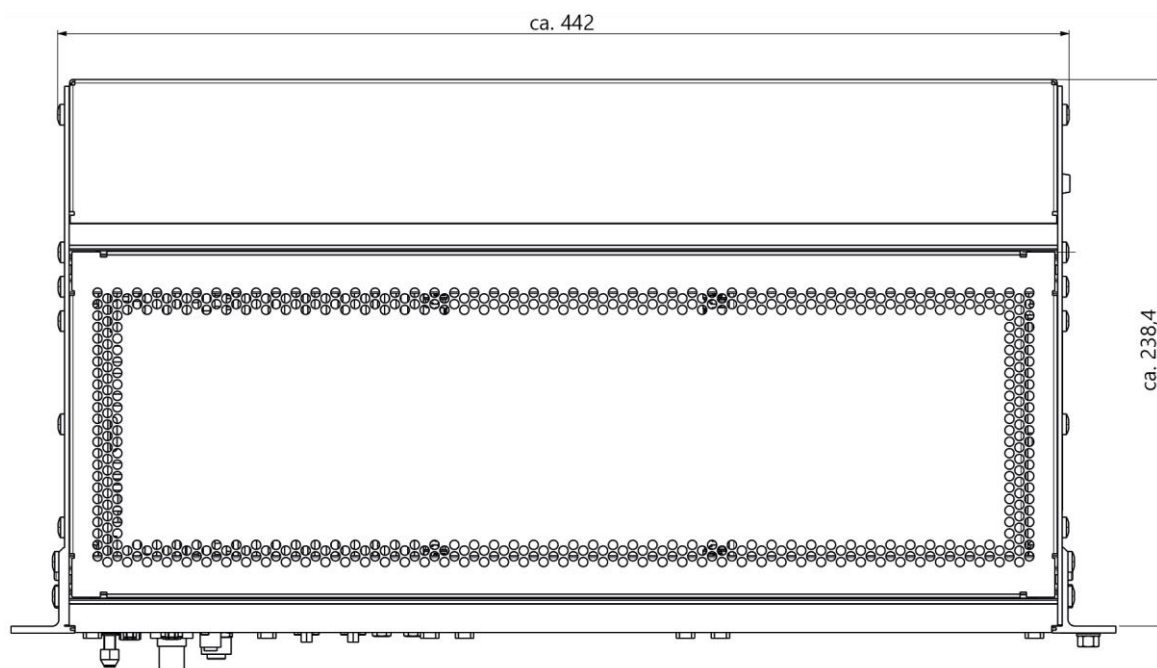


Fig. 4/3: Top view

5 Technical data

5.1 General



INFO

Project-specific device features

Device features and settings can deviate from the values described here project-specifically.

You will find project-specific information in the appropriate project configuration description.

5.2 Basic standards for product

5.2.1 EN50155

- The requirements from [EN 50155](#) are fulfilled.
- EN 50155, 6.2 Useful life (economic life):
The useful life is agreed in individual contracts with the user or customer;
- Replacement parts see Maintenance chapter.

5.2.2 EN50126, EN50128, EN50129

The safety requirements in accordance with [EN 50126](#), [EN 50128](#) and [EN 50129](#) are fulfilled.

5.3 Reliability

MTBF

219,600 hrs. (**forecast value**)

Calculation according to [DIN EN 61709](#) (SN 29500)

and manufacturer's specifications,
without replacement parts

Environmental conditions:

40°C ambient temperature,
operating time 8,760 hrs./year

5.4 Climate and environmental conditions

5.4.1 Operating temperature

<u>Operating temperature range</u>	-25 °C to +70 °C
------------------------------------	------------------

5.4.2 Storage temperature

<u>Storage temperature range</u>	-40 °C to +85 °C
----------------------------------	------------------

5.4.3 Humidity

Humidity:	acc. to <u>EN 50155</u> annual average: ≤ 75 % relative humidity on 30 successive days of the year: 95% relative humidity
-----------	---

5.4.4 Elevation (air pressure)

Elevation (air pressure)	acc. to <u>EN 50125-1</u> : Class A2: up to 1,000 m (with reference to sea level)
--------------------------	---

5.4.5 Shock/vibration

Shock/Vibration	acc. to <u>EN 61373</u> category 1, class B
-----------------	---

5.4.6 Fire protection

Fire protection	as per <u>DIN EN 45545-2</u>
-----------------	------------------------------

5.5 Mechanical data

5.5.1 Dimensions

Width	427 mm (84 <u>H</u> P)
Height	132.55 mm (3 <u>U</u>)
Depth	240 mm

5.5.2 Weight

Weight	Approx. 5.5 kg
--------	----------------

5.5.3 Protection category

On all sides:	IP20
---------------	------

5.6 Electrical data

See REDBOXflex-3S11sqd or PMU25b instruction handbooks
Further information: "Ancillary Documents" chapter.

6 Certificates

6.1 Declaration of Conformity REDBOXtop-1

CE

EC Declaration of Conformity
in accordance with the directives
2014/30/EU (Electromagnetic Compatibility)

We **DEUTA-WERKE GmbH**
PAFFRATHER STRASSE 140, D-51465 BERGISCH GLADBACH
hereby confirm on our sole responsibility that the product

Multi functional recorder REDBOXtop-1
(see reverse for variants)

complies with the essential safety requirements as prescribed by the Council Directive on harmonisation of legal requirements of the member states in respect of the here listed directives.
The following standards are applied:

• EN 50121-3-2:2006	European standard for electrical railways
• EN 55024:2010	European standard for information technology equipment, Immunity Characteristics
• EN 55032:2012+COR:2013	European standard for information technology equipment, Radio Disturbance Characteristics

This declaration applies to all products manufactured after the date specified in the following and becomes void if the unit(s) are modified without our approval or inappropriately repaired by the user.
Valid for products as from: **01.03.2016**

It is essential that the following operating and environmental conditions are respected:

- Application in/on rail vehicles
- The installation conditions ZU1396 must be observed.

This declaration is based on:

- Internal test reports and additional reports.

This declaration is issued on behalf of the manufacturer by:

Bergisch Gladbach, 16. 03. 2016


 Ralf Meuser
Head of Product Qualification

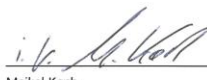

 Meikel Koch
Quality Assurance Manager

Fig. 6/1: EC Declaration of Conformity Page 1



INFO

If necessary, you can request a more current version of the Declaration of Conformity from DEUTA.

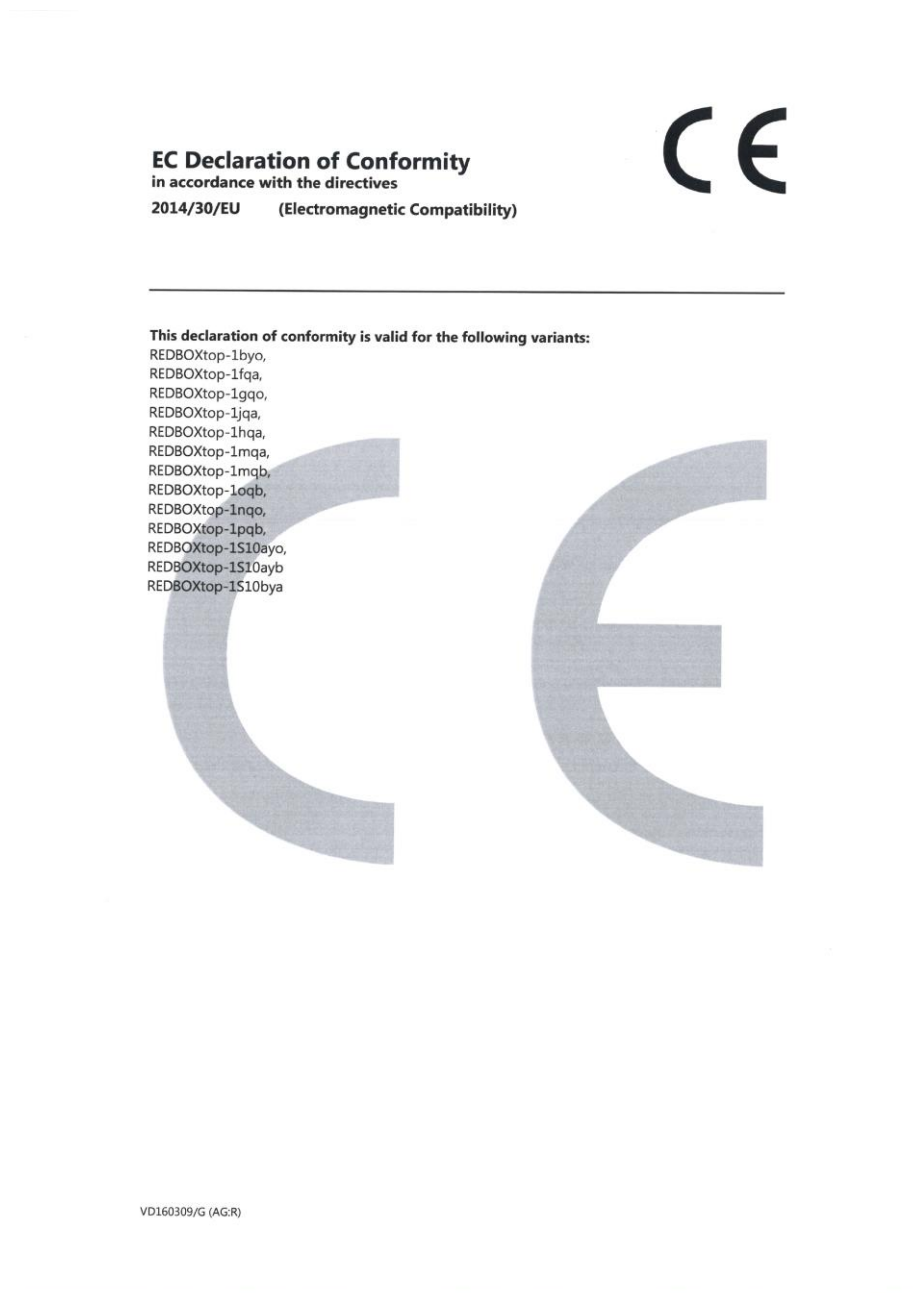


Fig. 6/2: EC Declaration of Conformity Page 2



INFO

If necessary, you can request a more current version of the Declaration of Conformity from DEUTA.

7 Important utilisation notes

7.1 Important notes

Check for complete delivery

Step	Description
1	Carefully unpack the device.
2	Check for completeness, correct type, correct connections as well as for possible signs of transport damage.
3	We recommend you keep some of the original packaging in the event of returns.
4	Only dispose of the packaging after you have completed these steps, if you do not intend to store the device.

7.2 Transportation

- **Transportation**

The device should only be transported in the originally supplied or similar packaging.

- **Returning**

When returning the device, sufficient protective measures must be taken to avoid damaging the device.

7.3 Storage

Storage temperature range -40 °C to +85 °C

Humidity: acc. to EN 50155
annual average: ≤ 75 % relative humidity
on 30 successive days of the year:
95% relative humidity

Elevation (Air pressure): acc. to EN 50125-1 :
Class AX: up to 2,000 m
(with reference to sea level)

Packaging: The device should only be stored in the
originally supplied or similar packaging.

7.4 Handling front membranes



NOTICE

Incorrect storage and cleaning

To avoid damaging the device, observe the following notes!

- Do not wedge the keys.
- Do not operate with pointed or sharp-edged devices.
- Do not permanently activate or weigh down.
- Do not store the device with the front side laid face down.
- Use only cleaning agents approved by DEUTA.
You can obtain a list of compatible chemicals from DEUTA.
- Do not use strong detergents.
- Do not permit contact with caustic chemicals.
- Do not use any organic solvents for cleaning.
- Do not use any fuels and oils for cleaning.
- You will find further information in the chapter "Maintenance"

8 Installation requirements



NOTICE

To avoid disturbances and damage:

1. Comply with all instructions given in this chapter.

8.1 Applicable EMC Standards

The multi-functional recorder REDBOXtop-1- designed for use on rail vehicles – is based on the following inspection specifications:

European Standard for Electrical Railways, EN 50121-3-2 with the basic standards:

<u>EN 55011</u>	Radio disturbance characteristics; Limits and methods of measurement
<u>EN 61000-4-2</u>	Electrostatic discharge immunity (ESD)
<u>EN 61000-4-3</u>	Radiated, radio-frequency, electromagnetic field immunity test
<u>EN 61000-4-4</u>	Electrical fast transient/burst immunity test
<u>EN 61000-4-5</u>	Immunity to powerful surges
<u>EN 61000-4-6</u>	Immunity to conducted disturbances, induced by radio-frequency fields

As well as

European standard for facilities of information technology, immunity properties EN 55024

European standard for facilities of information technology, radio noise properties EN 55032

Tolerable function impairments

The tolerable function impairments under the effects of interference (with respect to the evaluation criteria listed in the above product standard) are:

- **Evaluation criterion A**

Interference outside of the specifications must not affect signal information at the interfaces. As analog signals are always sensitive to electromagnetic disturbances, an additional deviation of up to 1 % is to be expected. The saving of travel data on the storage medium is guaranteed. Individual transmission errors on the serial interfaces do not lead to incorrect results.

- **Evaluation criterion B:**

Interference can lead to functional impairment, but afterwards the device

operates without error and without a person having to intervene (e.g. by switching off / on), except for retaining functions.

- **Evaluation criterion C:**
Not applicable

8.2 Installation instructions

Designated operational location

The equipment is intended for use on railway vehicles. It is installed in the engine room or the driver's cab.

For the read-out of travel data the equipment may also be used in factory environment and in small businesses.

Installation conditions

A permanently secured connection to the vehicle earth (operating earth) must be established at the prescribed connection (earthing bolts). A metal braid with a maximum length of 1 m and a minimum cross-section of 10 mm² should be used.

If a sufficient connection to the vehicle earth is ensured by the installation, a connection to the earthing bolt is not required.

To protect the operating resource, the service and maintenance personnel must be electrostatically discharged during disassembly and installation.

Wiring and signal requirements



INFO

The described signals are the superset of occurring signals, i.e. not all signals must also be included in the respective variant.

The supply voltage and all related signals may not be connected to the operating earth; otherwise the potential isolation in the device will be cancelled and safe operation cannot be guaranteed.

Reference to the vehicle battery is only permitted for the supply voltage and for digital input and outputs (not frequency outputs) and relay outputs.

Lines with signals referenced to the battery may not be laid as a group to the device with other signalling lines.

The lines with signals not referenced to the battery must be installed close to operating earth (e.g. vehicle earth, metallic and earthed cable shafts) along the entire course.

The device contains galvanically isolated power supply outputs for sensors (e. g. pulse generators). Its 0V-connections must be connected with operating earth (vehicle earth) close to the device. Existing ground connections in the connector may be used.

Connecting plugs and screens

Solid metal plug housings are prescribed for all connecting plugs. This does not include the service interfaces.

Unused DSUB plugs must be covered with a metallised cover / cap.

All signals not referenced to the battery must be connected with shielded cables throughout the total layout. All shielded cables must exhibit an optical range of at least 85 %.

Battery-related and not battery-related signals must be fed into the connector housing separately from each other.

The shield must be applied to both sides.

Exception: Observe the installation conditions of the connected devices, e.g. pulse generators. If the DEUTA pulse generators are connected directly to the frequency inputs, it may be necessary, for example, to apply the screen to only one side. In this case, the shield on the device (supply side) must be applied in the solid metal plug housing.

The connection of all shield screens shall be made appropriately in relation to EMC. The shield must be applied to the device side in the solid metal connector cover. Ensure a large contact surface for all shielding and earth connections. The plug housing connects the screen on the device side to the device housing. Equipotential bonding current may not flow through the screen.

Interfaces

The RS422/485 interface (ICOM, MODBUS, etc.) must be connected by a shielded twisted pair cable. Observe the corresponding termination.

The CAN interface must be connected by a shielded twisted pair cable. Observe the corresponding termination. The lines for the CAN connection must comply with CiA recommendation DS-102 Version 2.0.

The profibus interface must be connected by a shielded twisted pair cable (the relevant pair of cables must be twisted). A standard bus cable as per EN 50170 Type A with screening must be used for the profibus wiring. Observe the corresponding termination.

The lines of the MVB interface must be fabricated to meet the TCN standard (shielded cables, metallised connector covers, two-sided, flat-surface screen application, etc.). Observe the corresponding termination.

The Ethernet interfaces (10/100 Base T, M12 D-coded) must be connected by a shielded cable. At the Ethernet interface, cables may be connected without a terminal device. However, the cable length is then to be limited to 3 m.

The service interface USB (M8) must be connected by a shielded cable. The cable length at the USB connection is to be limited to less than 1 meter.

Cables may be connected without a terminal device. Apart from that the interface may not be in use or connected while the vehicle is in operation.

The service interface RS232 may not be in use or connected while the vehicle is in operation.

The GPS antenna and the prescribed antenna pre-amplifier must be connected by a cable that satisfies at least the requirements of an RG58 cable. Laying the antenna cable with an EMC perspective in mind is of particular importance. The cable length must be limited to 15 m.

For the read-out of travel data in factory environment or in small businesses, only the supply voltage, the Ethernet interface, the RS232 interface and the USB interface may be connected. Only the plug power units and adapter cables prescribed by DEUTA must be used (for type designation, see Instruction Handbook or upon request).

Evaluation and peripheral device requirements

All connected devices must comply with the technical specifications given in the instruction handbook and have sufficient interference immunity for the corresponding ambient conditions to guarantee correct function.

As analog signals are always sensitive to electromagnetic disturbances, particular attention is to be paid to wiring, cabling and signal evaluation.

The interfaces require a protocol safeguard, e.g. through error detection and transmission repetition.

Restricted operating behaviour caused by electromagnetic interferences

This resource is suitable for the electromagnetic ambient conditions as designated in the test basics. A deviating behaviour from the data in the evaluation criteria is not expected.

Scope and frequency of EMC relevant maintenance procedures

(Note in acc. with § 4, EMC Law)

EMC relevant maintenance measures (maintenance of EMC protective components, definition of the term "maintenance" see DIN 31051, IEC 60050-191) shall not be performed. If operating behaviour occurs which deviates from the evaluation criteria of the relevant product norm or from the specified permitted impairments [→ Page 33], the device must be tested at DEUTA and repaired if necessary.

General notes

To guarantee the operating quality, basic EMC measures to avoid unnecessary interference coupling mechanisms are assumed and are therefore not mentioned in detail. These include the selection of suitable lines and components, approved and permanently assured connections, sensible routing and arrangement of cables, awareness of possible potential differences, the shortest possible connections, the separation of critical signal groups, range of interference sources, etc.

Enclosed installation material (see scope of supply, appropriate spare parts or accessories or other prescribed material such as lines, cables or connectors) must be used.

In consideration of the stated installation specifications, compliance with the specified standards shall be guaranteed. Deviations from the installation specifications can only be implemented at own responsibility.

The pertinent fire safety standards with regard to lines, cables or connectors must be observed in the installation.

9 Installation

9.1 Important notes



IMPORTANT

Requirements for error-free installation and trouble-free operation

For the installation, comply with the following notes:

- To achieve the optimum performance of this device, we recommend implementing the initial start-up with DEUTA customer.
- Unused equipment connectors must always be provided with suitable covers as protection against contamination, contact, damage and fault.



INFO

When planning the installation please remember:

The device must be installed so that the display and operating elements as well as the readout and service interfaces are freely accessible to the service personnel without obstruction and without the risk of touching live parts. One or more LEDs for signalling are available on the front.

Make sure that they are visible.

A possible blink code or different colours in the case of multi-coloured LEDs provide you with further information about the device's operating state.



INFO

Please note

Only applies in combination with the appropriate REDBOX/lex-3S11sqd (4AB1581) Instruction Handbook.

Full documentation of this product includes a project configuration description. The documentation of this product is incomplete without these documents.

9.2 Assembly/Installation

- Insert the assembly rack (84 TE width) in the designated space and tighten the four M6 fastening screws to prevent the rack from falling out or being pulled out.
- Carry out the connection according to the wiring recommendation.
- Use shielded cables and attach the shields as shown in the wiring recommendation.

Additional installation conditions you must observe:

- Select the best possible **dry, dust-free** and **low vibration** installation location.
- Observe the temperature range.
- Carefully check the electric connections before switching on the operating voltage.
- If you must change individual connecting wires or move them to other terminals: **always shut off the operating voltage first.**

The removal of the device is described in Disassembly [→ Page 44] .

9.2.1 System requirements

9.2.1.1 Ventilation

**IMPORTANT****Faults due to impermissible operating temperature**

Exceeding the permissible operating temperature due to accumulated heat can lead to malfunctions or even to damage when exceeded strongly and for a long time.

Operation outside the operating temperature range is not permissible.

- Since the device dissipates waste heat entirely passively (via convection), heat accumulation may not occur around the device housing. A sufficient supply of air must be provided to the device.
1. For project planning, installation and operation, the system integrator must ensure that a sufficient air volume and a corresponding air circulation is guaranteed. We recommend cooling or ventilation by the customer.
 2. The air circulation or air volume at the rear or at the top and bottom sides of the respective device must be sufficient to dissipate the heat loss (typical heat capacity, see Technical Data: power consumption) of the device so that the permitted operating temperature is not exceeded.

9.2.1.2 Special installation condition for installation in 19" technique

The maximum operating temperature is decisively influenced by the installation situation.

It must be ensured that the limit values for the internal device temperatures are observed in accordance with EN 50155.

To guarantee safe function at high temperatures a sufficient vertical air circulation according to the 19" technique is required. An air speed of at least 0.5 m/s is required for sufficient ventilation.

9.2.2 Permissible installation position 19"

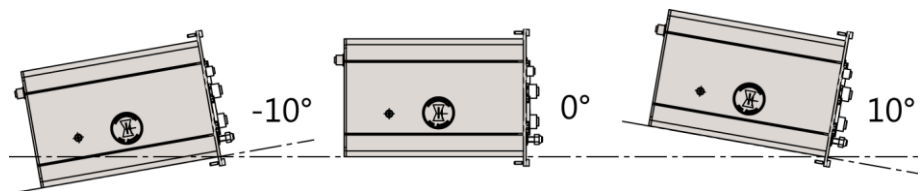
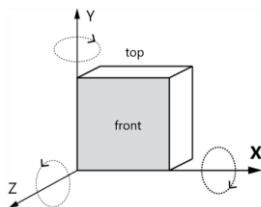


Fig. 9/1: 19" installation position (side view)

- The installation position in acc. with the 19" construction (DIN EN 60297-3-100) must be observed.
- The device must be installed horizontally in general. The direction of rotation around the Y axis is any direction. The top side of the device must be up.
- The device may be installed with a maximum deviation of $\pm 10^\circ$ to the X axis from the horizontal position (see Figure above).
- Mounting must be done at all designated 19" mounting points. Only the prescribed or appropriate and suitable 19" mounting devices must be used.



9.3 Wiring and earthing concept

The function cards are arranged in a metal 19" cassette that is connected to the vehicle earth. The external signals are galvanically isolated from the signals fed in and out, including the supply voltage. An exception is the service interface on the data storage card.

The power voltage supply and the digital inputs can be connected to the vehicle battery using unshielded lines.

9.4 Plug pin assignment

See REDBOXflex-3S11sqd or PMU25b instruction handbooks

Further information: "Ancillary Documents" chapter.

10 Commissioning and system parameters

10.1 Commissioning

After the installation and connection of all plug-type connectors, the REDBOXtop-1pqb is immediately ready for operation (see REDBOXflex-3S11sqd or PMU25c instruction handbooks).

Further information: "Ancillary Documents" chapter.

11 Operation

11.1 Function and operating principles

REDBOX*top*-1pqb consists of an assembly rack with a REDBOX*flex*-3S11sqd and a PMU25b.

- The data to be registered are stored to a Compact Flash® card for subsequent evaluation.
- The operating states of the REDBOX*top*-1pqb are displayed by a LED on the front.
- The travel data of the REDBOX*flex*-3S11sqd can be read out via Ethernet or USB.
- The travel data of the PMU25b can be read out via the USB interface, see PMU25b Instruction Handbook.

Further information: "Ancillary Documents" chapter.

11.2 Status displays



INFO

Project-specific status display

The display of the operating states by LEDs can be modified by a project-dependent unit configuration. The changed Blink Code is documented in the corresponding project configuration description.

See REDBOX*flex*-3S11sqd Instruction Handbook, 4AB1581.

12 Diagnostics and service functions

12.1 Important notes

The Service WEB Interface (see DEUTA document 4AB1130) provides support when commissioning this unit by offering tests, querying internal statuses and the option of displaying process values "online".

The REDBOX^{top}-1pqb has an LED to display several operating states.

Blink codes:

- See REDBOX^{flex}-3S11sqd Instruction Handbook, 4AB1581.
- See the corresponding project configuration description

13 Maintenance

13.1 Smallest exchangeable unit

The entire REDBOX^{top}-1 is the smallest exchangeable unit.

13.2 Preventive maintenance

The REDBOX^{top}-1 multi-functional unit is maintenance free.

13.3 Corrective maintenance

REDBOX^{top}-1 does not contain any parts which can be replaced by the customer. Repairs can only be done at DEUTA.

13.4 Spare parts

None

14 Shutting down

14.1 Important notes



ATTENTION

Danger of electric shock

The installation or removal during switched on power supply is strictly prohibited.

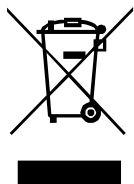
14.2 Disassembly

To disassemble the REDBOX^{top}-1 carry out the following steps:

- De-energize the device
- Remove the front face plug-type connectors
- Remove the fastening screws (4 units) of the assembly rack
- Carefully pull the assembly rack out of the switch cabinet.

15 Disposal

15.1 Instructions for disposal



The disposal of old devices should be carried out based on the 04.07.2012 Directive 2012/19/EU of the European Parliament and Council regarding electrical and electronic appliances.

The complete devices are delivered to a certified disposal plant that breaks the devices down into their constituent materials and disposes of them.

In case the user disposes of the devices himself, the devices must be disassembled and also disposed of according to their materials (for example metals, plastics, electronics waste and glass). (This must be done in accordance with the Directive 2012/19/EU mentioned above).

For example,

- Metals may be handed over to a scrap metal dealer
- Plastics and glass can be recycled.

The electronic scrap must be delivered to a certified disposal plant. In this context, the respective applicable national laws and regulations must be observed each time material is disposed of. The devices may also be disposed of by returning them to **DEUTA** in connection with a corresponding agreement.

15.2 Disposal of accumulators and batteries



The scope of delivery of the products we supply can include accumulators or batteries.

As covered by the EU Directive 2006/66/EC, worn out, used or defective accumulators or batteries must be returned to retail outlets or to collecting points set up by public waste management organizations (e.g. hazardous substance vehicles and recycling yards). The end user is obliged to dispose of worn out, used or defective accumulators or batteries as per national laws, to hand them over to the corresponding collecting points or retail outlets.



Accumulators or batteries, which you are obliged to return, are identified by a mark consisting of a crossed out dustbin and the chemical symbol of the decisive heavy metal that classifies it as contaminant-laden (Cd for cadmium, Hg for mercury or Pb for lead).

It is prohibited by law to dispose of worn out, used or defective accumulators or batteries otherwise or with other waste.

Worn out, used or defective accumulators or batteries supplied by DEUTA-WERKE GmbH can be returned free of charge to DEUTA-WERKE GmbH.

Outside the scope of the EU Directive 2006/66/EC we recommend disposing of used or defective accumulators or batteries in an environmentally compatible manner at a suitable place.

**⚠ CAUTION****Risk of combustion and explosion of waste batteries**

There is danger of burning through heated waste batteries.

1. To avoid short-circuits and the related warming, lithium batteries must never be stored or transported in bulk without any protection.

Appropriate measures against short-circuits are e.g. covering the poles with adhesive tape.

15.3 Material list/notes

A list of the utilised materials is available from **DEUTA** upon request.

16 Appendix

16.1 Terms of the license

16.1.1 Note!: Linux Kernel

NOTE!

This copyright does **not** cover user programs that use kernel services by normal system calls - this is merely considered normal use of the kernel, and does **not** fall under the heading of "derived work". Also note that the GPL below is copyrighted by the Free Software Foundation, but the instance of code that it refers to (the Linux kernel) is copyrighted by me and others who actually wrote it.

Also note that the only valid version of the GPL as far as the kernel is concerned is *_this_* particular version of the license (ie v2, not v2.2 or v3.x or whatever), unless explicitly otherwise stated.

Linus Torvalds

16.1.2 Note!: Bootloader (U-Boot)

NOTE!

This copyright does **not** cover the so-called "standalone" applications that use U-Boot services by means of the jump table provided by U-Boot exactly for this purpose - this is merely considered normal use of U-Boot, and does **not** fall under the heading of "derived work".

The header files "include/image.h" and "include/asm-*/u-boot.h" define interfaces to U-Boot. Including these (unmodified) header files in another file is considered normal use of U-Boot, and does **not** fall under the heading of "derived work".

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Wolfgang Denk

16.1.3 Note!: BusyBox

NOTE!

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Glossary

Ambient temperature

in acc. with EN 50155: a) Outside ambient temperature; b) temperature inside the cabinet (ambient temperature of device); c) temperature of the air surrounding the PCB assembly (temperature inside the device)

DIN 31051

DIN 31051 issue status: 2003

DIN EN 45545-2

DIN EN 45545-2 issue status: 2013

DIN EN 60297-3-100

DIN EN 60297-3-100 issue status: 2009

DIN EN 61709

DIN EN 61709 issue status:
2012+Rep.:2012-7

DIN VDE 0105

DIN VDE 0105 issue status: 2005

ECHA

The European Chemicals Agency ECHA is an agency of the European Union which manages the technical, scientific and administrative aspects of the registration, evaluation and authorisation of chemicals system. ECHA is the central coordination point of REACH.

EMC

Electromagnetic compatibility

EN 50110

EN 50110 issue status: 2005

EN 50121-3-2

EN 50121-3-2 issue status: 2006

EN 50125-1

EN 50125-1 issue status: 2014

EN 50126

EN 50126 issue status:
1999+COR2006+COR2010

EN 50128

EN 50128 issue status: 2001+COR2010

EN 50129

EN 50129 issue status: 2003+COR2010

EN 50155

EN 50155 issue status: 2008+Cor:2010

EN 55011

EN 55011 issue status: 2009+A1:2010

EN 61000-4-2

EN 61000-4-2 issue status: 2009

EN 61000-4-3

EN 61000-4-3 issue status:
2006+A1:2008+A2:2010

EN 61000-4-4

EN 61000-4-4 issue status: 2004+A1:2010

EN 61000-4-5

EN 61000-4-5 issue status: 2006

EN 61000-4-6

EN 61000-4-6 issue status: 2009

EN 61373

EN 61373 issue status: 2010

ESD

Immunity to electrostatic discharge

Glossary

Explanation and definition of terms and abbreviations used

HP

Horizontal pitch. Standard width measurement which defines the width for plug-in modules in 19" construction systems. (1 HP = 5.08 mm = 1/5")

IEC 60050-191

IEC 60050-191 issue status: 2002

IEC 60364

IEC 60364 issue status: 2005

MTBF

Mean Time Between Failures (mean operating time between two failures)

NSR

Low voltage directive

Operating temperature

Air temperature (in max. and min. limits) in the immediate vicinity of the device at which the device may be operated.

REACH

Regulation (EC) No 1907/2006 (REACH Regulation) is an EU chemicals regulation

which entered into force on 1 July 2007.
REACH stands for Registration, Evaluation,
Authorisation and Restriction of Chemicals.

RoHS

Restriction of certain Hazardous Substances,
EU directive 2011/95/EC for restricting the
use of certain hazardous substances in
electrical and electronic devices

Storage temperature

Air temperature (in max. and min. limits) in
the vicinity of the device at which the device
may be stored. Important: Device is voltage-
free!

SVHC

SVHCs (substances of very high concern)
are chemical compounds (or part of a group
of chemical compounds) which are
identified under the REACH Regulation as
substances with particularly dangerous
properties.

U

Unit. Standard height measurement which
defines the vertical height for plug-in
modules in the 19" construction system (1 U
= 44.45 mm = 1 3/4")

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