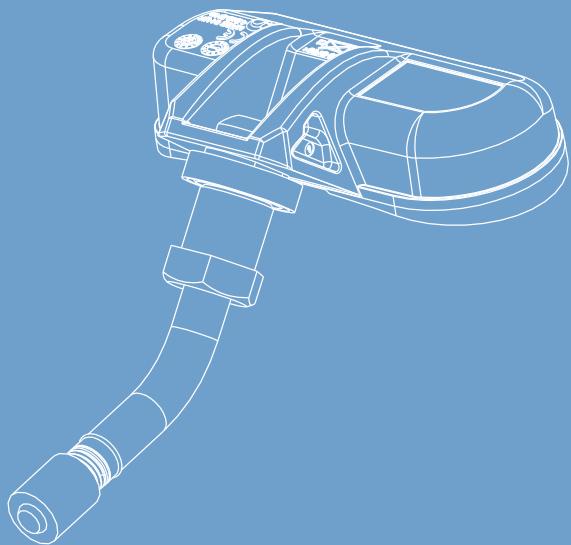




OPERATING INSTRUCTIONS

KRONE SMART TYRE MONITORING



515130182-01 EN

 KRONE

Dear Customer,

These are the instructions for the KRONE product you have purchased.

These instructions contain important information for the proper use and safe operation of the KRONE product.

If these instructions should become completely or partially unusable for any reason, you can order replacement instructions for your KRONE product by stating the item number.

KRONE Telematics Support

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www.krone-trailer.com



www.krone-trailerparts.com

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1 Information about this document

1.1 Introduction

These operating instructions are intended for the operators of the trailer and their staff. They are only valid in conjunction with the KRONE trailer's operating instructions. The operating instructions are designed to introduce you to the KRONE Smart Tyre Monitoring System, to use it within its intended scope of applicable and to perform proper installation.

It is mandatory that the operating instructions be read, understood and applied by every person who is tasked with the following work:

- Operation of the KRONE Smart Tyre Monitoring Systems
- Installing and removing the KRONE Smart Tyre Monitoring Systems
- Repairing the KRONE Smart Tyre Monitoring Systems

KRONE is not liable for damage and operational interference caused by failure to observe these instructions. The warranty conditions can be found in our general terms and conditions of business.

INFO

If you have any questions, please contact KRONE customer service (see "9.2 KRONE Customer Service", pg. 24).

1.2 Product identification

For product identification, the type plate is laser-
ed in the surface of the electronic control unit.

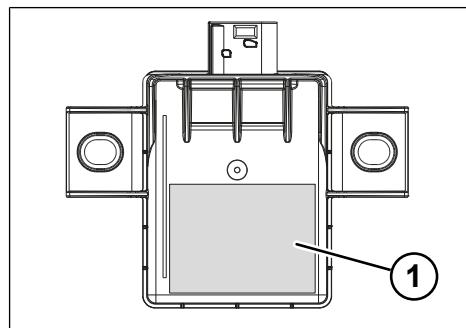


Fig. 1-1: Type plate

1 Lasered type plate

1.3 Retention of documents

- ▶ Store these instructions and all other applicable documents in a safe place.
- ▶ Pass the complete documentation on to the next driver or owner.

1.4 Symbols used in these instructions

Various markings and symbols are used in the text in these instructions. These are explained below.

- Bullet list
 - Sub-list
- 1. Numbered list
- Prerequisite for action
- ▶ Action step
 - ⇒ Intermediate action result
- ✓ Result of the action

INFO

Additional information and tips.

: Also observe the enclosed supplier documentation.

1.5 Copyright

These instructions represent an official document within the meaning of laws against unfair competition. They incorporate texts and drawings which, in their entirety or partly, without written consent of the manufacturer, are not to be

- copied (except attached copy originals),
- published, or
- made public by other means.

The copyright to these instructions remains with

Fahrzeugwerk Bernard KRONE

GmbH & Co. KG, D-49757 Werlte

Violations oblige compensation for damages.

2 Safety

This manual contains instructions for your safety and for safe operation.

The action-related warnings warn you about residual hazards and are found before a dangerous action.

- ▶ Follow all the instructions to prevent personal injury, environmental or property damage.

2.1 Warnings

Design and structure

The action-related warnings are structured as follows:

⚠ WARNING

Type and source of the danger!

Explanation of the type and source of the danger.

- ▶ Measures to avert the danger.

Hazard level

The warnings are classified according to the severity of the danger. The following explains the danger levels with their associated signal words and warning symbols.

⚠ DANGER

Direct danger to life or serious injuries

⚠ WARNING

Possible danger to life or serious injuries

⚠ CAUTION

Possible slight injuries, environmental damage or property damage

NOTE

Possible environmental damage or property damage

2.2 Intended use

The KRONE Smart Tyre Monitoring is intended exclusively for the purpose of measuring the inflation pressure and temperature of trailer tyres and to transmit the values to the KRONE Telematics unit and, depending on the vehicle equipment, to the display in the tractor unit.

Any other use is not intended and can result in dangerous situations as well as damage to the vehicle and the device.

- ▶ The device is only to be operated if in perfect condition and only as intended, with awareness of safety and hazards, and in compliance with the operation instructions.
- ▶ Have any faults that could impair safety immediately repaired by an authorised specialist workshop.

Operational reliability of the vehicle is guaranteed only if all applicable instructions, settings, laws, rules, regulations, and limitations are fully complied with.

Fahrzeugwerk Bernard KRONE GmbH & Co. KG is not liable for damage resulting from non-intended use. Risks deriving from such infractions are exclusively borne by the operator.

2.3 General safety instructions

To preserve the operational and road safety of the Smart Tyre Monitoring System, observe the following general safety instructions:

- Observe the safety instructions of the vehicle manufacturer.
- Wear suitable protective clothing and remove all rings or necklaces before installing and removing the system.
- If possible, choose a dry, well-lit and well-ventilated workplace to install and remove the system.
- Observe regional or national occupational health and safety regulations.
- If the system is damaged, immediately disconnect the power supply. Failure to do so could result in electric shock.

The system should be examined immediately by repair personnel for technical safety and proper functioning.

- Damaged cables, plugs and other components must only be replaced with original spare parts and spare parts authorised by KRONE.
- During operation of the Smart Tyre Monitoring System, check all of the bolted and plug connections at regular intervals.
- Use a high-impedance multi-function measuring device.
- Storage and transport must take place in the original packaging, dry and dust-free.

3 Product description

3.1 Function description

The KRONE Smart Tyre Monitoring System is a tyre pressure control system that measures the inflation pressure and temperature of trailer tyres. The system transmits the values to the KRONE telematics unit and, depending on the vehicle equipment, to the display in the tractor unit.

The system consists of the electronic control unit and the wheel sensors. On each axle, two wheel sensors are attached onto the tyre valves inside the rim.

The sensors measure the tyre pressure and temperature on each wheel and transmit them to an electronic control unit, which transmits the signals in real time to the telematics unit.

The tyre statuses are displayed in the Krone Telematics Portal and, with certain vehicle equipment, on the display of the tractor unit. If there are deviations from the pre-set values, the system alerts the dispatcher and the driver.

3.2 components

INFO

The KRONE Smart Tyre Monitoring System can only be operated in conjunction with the KRONE KSC Pro Plus telematics unit.

The KRONE Smart Tyre Pressure Monitoring System consists of the following components:

- Wheel sensors (see "3.2.1 Wheel sensors", pg. 9)
- Electronic control unit (see "3.2.2 Electronic control unit", pg. 10)
- Bracket (see "3.2.3 Bracket", pg. 10)
- Cabling (see "3.2.4 Cable", pg. 10)
- Valves (suitable for the wheel sensor)

3.2.1 Wheel sensors

The wheel sensor consists of a pressure sensor, a temperature sensor, a circuit for evaluation, a radio transmitter, and a lithium battery. The housing of the sensor is made of plastic and is attached directly to the rim on a valve that is designed for the sensor (see "4.1 Installing the wheel sensor", pg. 12).

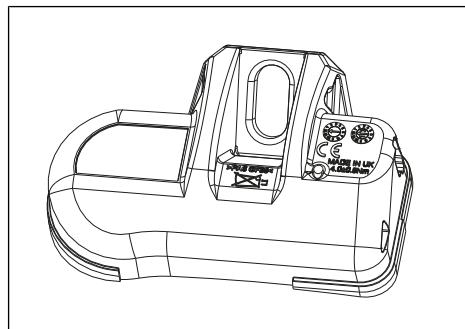


Fig. 3-1: Wheel sensor

Under normal operating conditions, the service life of the battery is at least five years. The battery status is displayed in the KRONE Telematics Portal. When the battery is depleted, the wheel sensor must be replaced with a new one.

Each wheel sensor can be clearly assigned to a wheel using its identification number. This identification number is defined during production of the sensors and cannot be changed. It is printed on the housing for commissioning. Moreover, a barcode sticker with the identification number is supplied with each wheel sensor, which can be applied onto the rim for commissioning.

The identification number can be read with a standard diagnosis reading device for tyre pressure control systems.

3.2.2 Electronic control unit

The wheel sensor transmits the measured values from the tyres via radio to the electronic control unit. The radio connection is established by an antenna that is integrated in the housing.

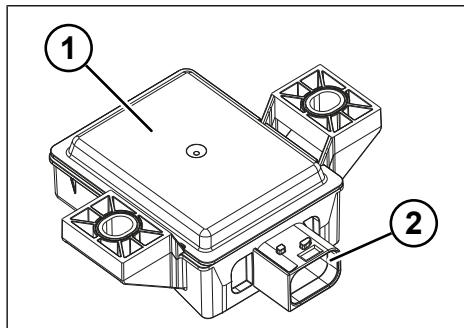


Fig. 3-2: Electronic control unit

- 1 Housing
- 2 Connection socket

The electronic control unit is installed with a bracket on the second axle transverse beam of the chassis (see "4.3 Installing the electronic control unit", pg. 15).

The electronic control unit is suitable for operation on 12 and 14 volts according to ISO 16750-2.

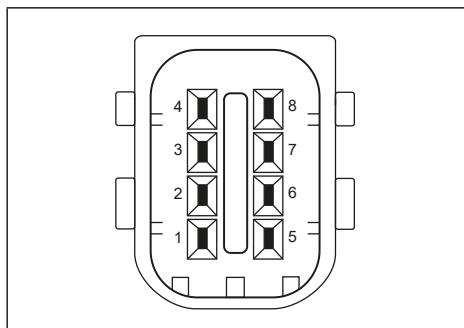


Fig. 3-3: Control unit connection socket

- 1 Power supply (KL-15)
- 2 Permanent power (+ 24 V)
- 3 Data transmission line (CAN-L)
- 4 Data transmission line (CAN-H)
- 5 Ground (KL-31)

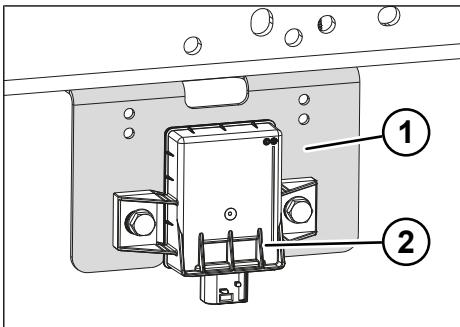
6 Ground

7 Data transmission line (CAN-L)

8 Data transmission line (CAN-H)

3.2.3 Bracket

To attach the electronic control unit to the chassis, a special bracket is required to ensure a good radio connection between the control unit and the wheel sensors.



- 1 Bracket
- 2 Electronic control unit

The bracket is installed with a self-tapping screw on the second axle transverse beam of the chassis (see "4.3 Installing the electronic control unit", pg. 15).

3.2.4 Cable

To install the KRONE Smart Tyre Monitoring System (STMS) on the trailer, the following cables are required:

- KRONE STMS wiring harness: The wiring harness serves to supply power to the Smart Tyre Monitoring System and connects the electronic control unit to the KSC wiring harness.
- KSC wiring harness: The wiring harness is used as a communication interface and connects the telematics unit to the KRONE STMS wiring harness, among other things.
- Brake system cable: The cable connects the EBS modulator that supplies energy for the STMS to the KRONE STMS wiring harness.

The basic principle of the cabling on the trailer is shown in the following figure:

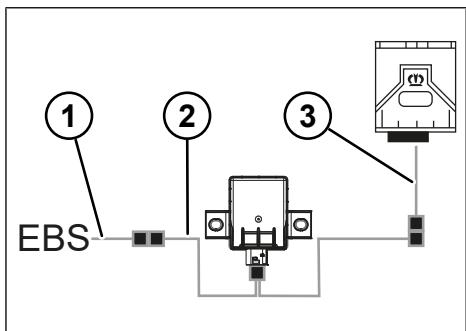


Fig. 3-4: Basic principle Smart Tyre Monitoring System cabling

- 1 Cable to the brake system
- 2 KRONE STMS wiring harness
- 3 KSC wiring harness

4 Assembly

NOTE

Material damage due to short circuit!

There is a risk of short circuit when working on the vehicle electrical system.

- ▶ All electric consumers must be switched off before disconnecting the connection terminals from the battery.
- ▶ Remove the negative terminal before the positive terminal.
- ▶ Observe the safety instructions of the vehicle manufacturer.

General safety instructions

- The KRONE Smart Tyre Monitoring System must only be installed by appropriately qualified personnel.
- The wheel sensor must only be installed on rims approved by KRONE.
- The tyres must only be installed on the rim when proper installation of the valve and wheel sensor is ensured.
- Do not install defective components. Defective components must be immediately replaced.
- Only use original spare parts and spare parts authorised by KRONE.
- Never use valve inserts twice.
- Do not bend cables, do not route under tension and over sharp edges.
- Do not install cables in the area of rotating, moving or hot parts.
- For plug connections, ensure that they are clean, dry and correctly locked after they are plugged.
- Installation of the KRONE Smart Tyre Monitoring System on the trailer must not affect the functioning of other systems, such as the brake and lighting system.

4.1 Installing the wheel sensor

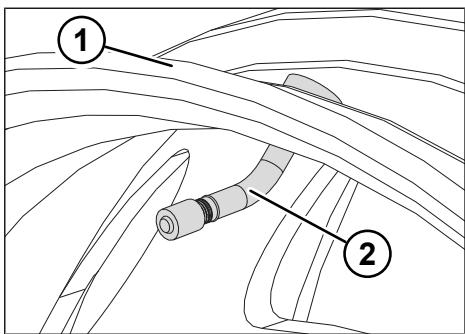


Fig. 4-1: Inserting the valve in the rim

- 1 Rim
2 Valve

- ▶ Insert the valve in the valve hole in the rim.

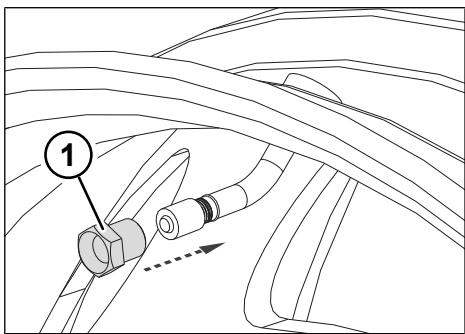


Fig. 4-2: Slide the union nut onto the valve

- 1 Union nut

- ▶ Slide the union nut onto the valve and tighten by hand.

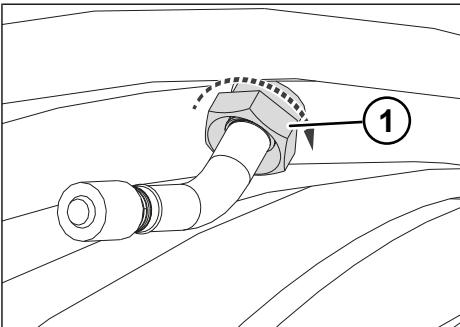


Fig. 4-3: Tightening the union nut

1 Union nut

- Tighten the union nut with a torque of $12 \pm 1 \text{ Nm}$.

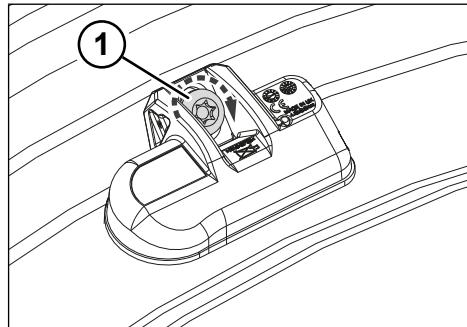


Fig. 4-5: Tightening the screws

1 Screw

- Hold the wheel sensor firmly on the rim well and tighten the screw with $4 \pm \text{Nm}$.

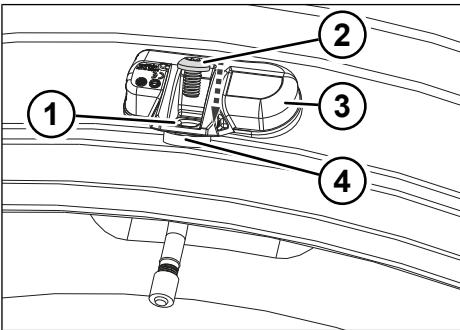


Fig. 4-4: Screwing the screw in the valve thread

1 Hole
2 Screw
3 Wheel sensor
4 Valve thread

- Place the wheel sensor with the hole on the valve thread.
- Screw the screw through the hole of the wheel sensor into the valve thread.

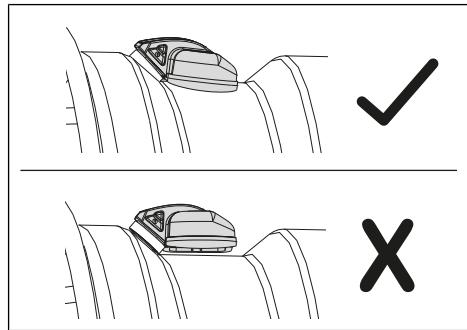


Fig. 4-6: Wheel sensor position

- ✓ The wheel sensor is installed.

4.2 Mounting the tyres

NOTE

Material damage to the wheel sensor due to improper mounting of the tyres!

Improperly installed tyres can lead to damage to the wheel sensor.

- Make sure that when mounting the tyres, the wheel sensor is never clamped between the tyre bead and the rim.
- Never soil the wheel sensor with assembly paste.
- Clean the rim in the bead area.

ASSEMBLY

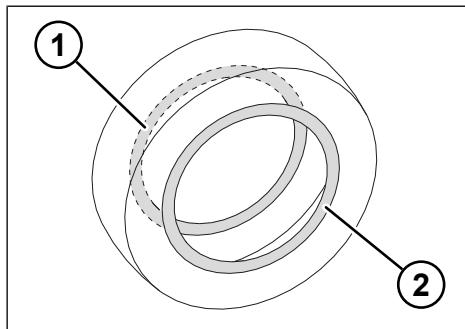


Fig. 4-7: Applying assembly paste

- 1 Top tyre bead
- 2 Bottom tyre bead

- Apply assembly paste on the top and bottom tyre bead.
- Clamp the rim in the mounting device such that the wheel sensor is located on the opposite side of the mounting head and at least 15 cm in front of the traction point of the tyre (180°).
- Push the bottom tyre bead over the rim flange.
- Adjust the mounting head on the rim flange.

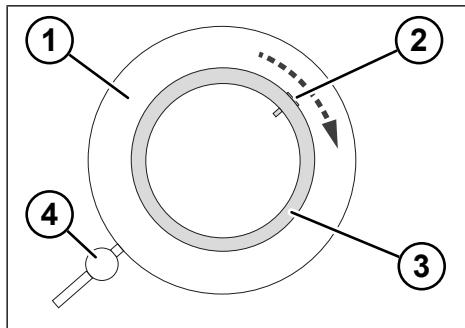


Fig. 4-8: Installation of the bottom tyre bead

- 1 Tyres
- 2 Wheel sensor
- 3 Rim
- 4 Mounting head

- Mount the bottom tyre bead on the rim by turning clockwise. In doing so, press the top bead down to prevent strain on the wheel sensor.
 - ⇒ The bottom tyre bead is mounted on the rim.
- Before mounting the top tyre bead, position the wheel such that the wheel sensor is located on the opposite side of the mounting head (180°) and at least 15 cm in front of the traction point of the tyre.
- Mount the top tyre bead on the rim by turning clockwise.
 - ⇒ The top tyre bead is Mounted on the rim.
- Remove the valve cap.

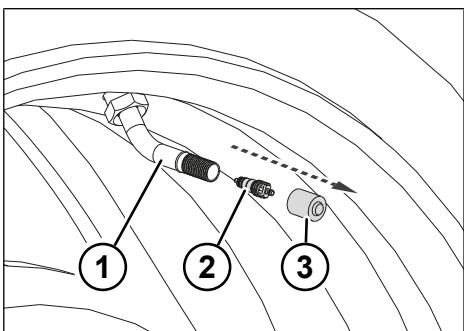


Fig. 4-9: Removing the valve insert

- 1 Valve
- 2 Valve insert
- 3 Valve cap

- Remove the valve insert and inflate the tyre until the tyre passes the bead humps.
- Insert the valve insert in the valve.
- Inflate the tyres according to the type plate or manufacturer recommendation.
- Put on the valve cap.
- ✓ The tyre is mounted.

4.3 Installing the electronic control unit

The electronic control unit is installed with a bracket on the second axle of the trailer in the direction of travel. A hole pattern can be found on the transverse beam for installation.

Installing the electronic control unit on the bracket

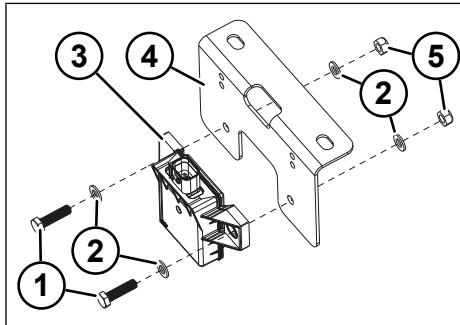


Fig. 4-10: Installation of the control unit

- 1 Hexagon bolts
- 2 Washers
- 3 Control unit
- 4 Bracket
- 5 Nuts

- ▶ Align the holes on the control unit with the holes on the bracket.
- ▶ Screw hexagonal bolts with the washer through the holes in the control unit and the bracket.

- ▶ Screw the nuts with washers onto the bolts and tighten with 20.1 Nm.
- ✓ The control unit is installed on the bracket.

Installing the bracket on the transverse beam

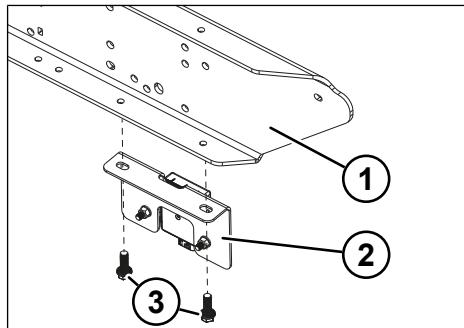


Fig. 4-11: Installation bracket

- 1 Transverse beam
- 2 Bracket
- 3 Self-tapping screws

- ▶ Align the holes on the bracket with the holes on the transverse beam.
- ▶ Screw self-tapping screws through the holes in the bracket and the transverse beam with 30 Nm.
- ✓ The bracket is installed on the transverse beam.

4.4 Cabling

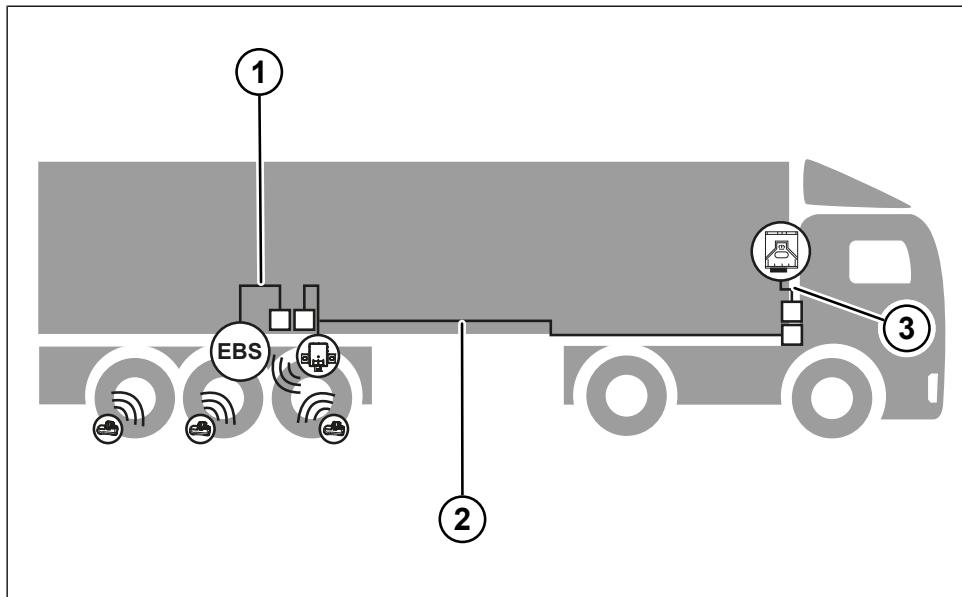


Fig. 4-12: Cable routing

- 1 Cable to the brake system
- 2 KRONE Smart Tyre Monitoring System (STMS) wiring harness
- 3 KSC wiring harness

The routing of the required wiring harnesses (see "3.2.4 Cable", pg. 10) can be oriented on the wiring harnesses already installed on the trailer. If necessary, fasten the cables to the chassis with cable ties.

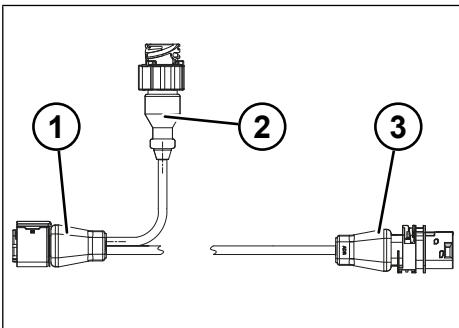


Fig. 4-13: KRONE Smart Tyre Monitoring System wiring harness

- 1 Socket plug to the electronic control unit (STMS)
- 2 Male connector for the cable to the brake system
- 3 Male connector for the KSC wiring harness

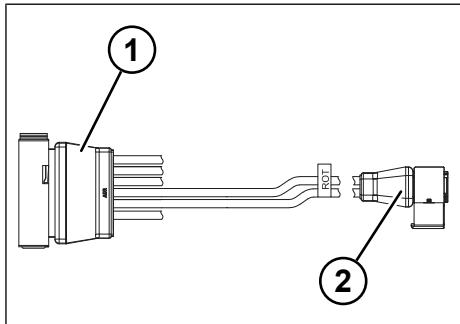


Fig. 4-14: KSC wiring harness

- 1 Telematics unit connection socket
- 2 KRONE STMS connection socket

The arrangement of the cables and plugs can vary, this does not limit the function.

Connecting the electronic control unit to the EBS modulator for power supply

- ▶ Insert the cable of the brake system in slot of the EBS modulator defined by KRONE. The slot can be found in the brake data sheet.
- ▶ Insert the socket plug of the KRONE STMS wiring harness in the connection socket of the electronic control unit.
- ▶ Connect the male connector of the KRONE STMS wiring harness to the socket plug of the cable for the brake system.
- ✓ The EBS modulator is connected to the electronic control unit.

Connecting the electronic control unit to the telematics unit

- ▶ Insert the telematics unit connection socket of the KSC wiring harness in the telematics unit.
- ▶ Connect the male connector of the KRONE STMS wiring harness to the KRONE STMS connection socket of the KSC wiring harness.
- ✓ The electronic control unit is connected to the telematics unit.

5 Commissioning

The wheel sensors are assigned to the electronic control unit through the commissioning process of the telematics unit.

Initial commissioning is performed by Fahrzeugwerk Bernard KRONE GmbH & Co. KG.

When retrofitting or replacing the KRONE Smart Tyre Monitoring Systems, commissioning is performed by KRONE Customer Service (see "9.2 KRONE Customer Service", pg. 24).

6 Operation

Warning signals

If there are deviations in the inflation pressure and temperature values in the respective tyres, the dispatcher and driver are alerted by the KRONE Telematics Portal either per SMS or email.

Warning signals are sent for the following tyre statuses:

- Warning in case of **low pressure**: The tyre pressure falls below the pre-set minimum value.
- Warning in case of **high pressure**: The tyre pressure exceeds the pre-set maximum value.
- Warning in case of **high temperature**: The tyre temperature exceeds the pre-set maximum value.

KRONE Telematics Portal

The KRONE Smart Tyre Monitoring System sends the measured inflation pressure and temperature values from the tyres to the telematics unit in real time. The data is displayed in the KRONE Telematics Portal.

The screenshot shows the KRONE Telematics Portal interface. At the top, there are tabs: DATEN, KOMMUNIKATION, ANALYSE, and SEITENSTEFEN. The DATEN tab is highlighted. Below it, there's a section for 'Neueste Daten' (Latest Data) with a dropdown menu showing values like Spannung [V] 25.10, Gebe Wairnacate An, EBS Achse1 [t] 22.60, Retarding [t] 22.80, Beladungszustand EBS nicht beladen, and TPMS. A callout '1' points to the DATEN tab. A callout '2' points to the TPMS section where it lists TPMS data for all four tyres.

	TPMS	Krone TPMS
Achse 1, links innen	10.72 bar 35.0 °C	
Achse 1, links außen	10.4 bar 34.0 °C	
Achse 2, rechts innen	10.5 bar 36.0 °C	
Achse 2, rechts außen	9.52 bar 33.0 °C	
Achse 3, links innen	9.88 bar 37.0 °C	
Achse 3, rechts innen		

Fig. 6-1: Smart Tyre Monitoring System data (screenshot of the KRONE Telematics Portal)

1 Data tab

2 Tyre pressure and temperature data

The values for the warning signals can be defined through the Portal.

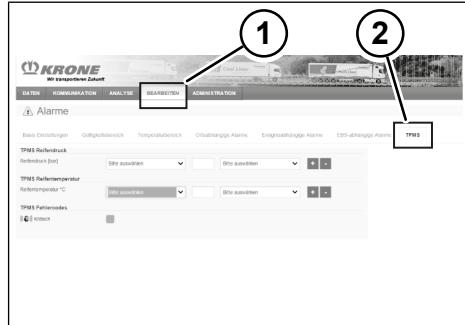


Fig. 6-2: Defining the warning signals (screenshot of the KRONE Telematics Portal)

1 Edit tab

2 TPMS tab

7 Disassembly and disposal

7.1 Disassembly

NOTE

Material damage due to short circuit!

There is a risk of short circuit when working on the vehicle electrical system.

- ▶ All electric consumers must be switched off before disconnecting the connection terminals from the battery.
- ▶ Remove the negative terminal before the positive terminal.
- ▶ Observe the safety instructions of the vehicle manufacturer.

The KRONE Smart Tyre Monitoring System must only be disassembled by appropriately qualified specialist personnel.

Before disassembly of the electronic control unit and the wheel sensors, perform the following work steps:

- ▶ Disconnect all plug connections from the wiring harnesses.
- ▶ If necessary, remove the cable ties.
- ▶ Remove the wiring harnesses.
- ▶ Seal plugs and slots that are disconnected from each other with dummy caps.

7.1.1 Disassembly of the tyres

Disassembly of the tyres

CAUTION

Risk of injury due to valve inserts under pressure!

The valve inserts can be under pressure and therefore cause injuries during disassembly.

- ▶ Slowly unscrew the valve insert out of the valve thread.
- ▶ The valve insert must only be completely removed when most of the pressure has escaped from the tyre.

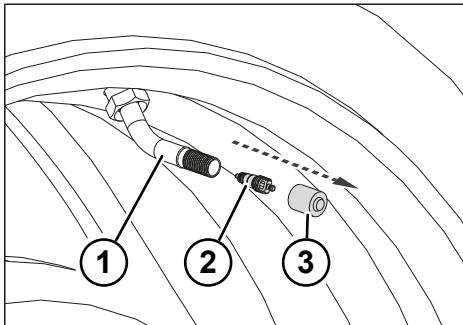


Fig. 7-1: Removing the valve insert

- 1 Valve
- 2 Valve insert
- 3 Valve cap

- ▶ Remove the valve cap.
- ▶ Disassemble the valve insert and allow the tyre to deflate completely.
- ▶ Position the wheel with the wheel sensor at the 12 o'clock position (shifted by 90° to the bead press) on the bead breaker.
- ▶ Carefully press off the tyre by turning. In doing so, the tyre bead may not touch the well of the rim close to the wheel sensor.
- ▶ Repeat the procedure on the other wheel side of the rim.

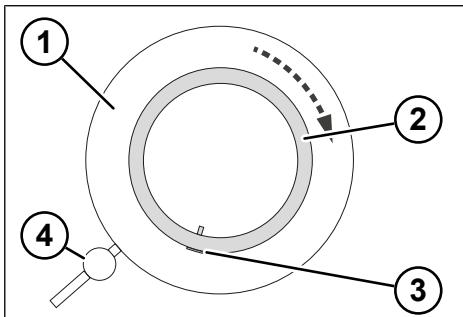


Fig. 7-2: Disassembly of the top tyre bead

- 1 Tyres
- 2 Rim
- 3 Wheel sensor
- 4 Mounting head

- ▶ To dismount the top tyre bead, clamp the wheel in the mounting device such that the wheel sensor is positioned just before the mounting head.
- ▶ Press down the top tyre bead opposite to the mounting head into the well of the rim.
- ▶ Using the tyre lever, slowly pull the top tyre bead over the mounting head.
- ▶ Slowly turn the wheel clockwise and dismount the top tyre bead using the tyre lever.
- ⇒ The top tyre bead is dismounted.

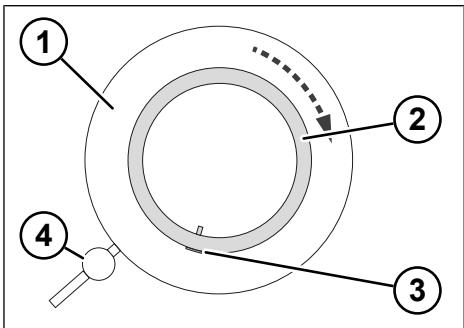


Fig. 7-3: Disassembly of the bottom tyre bead

- 1 Tyres
- 2 Rim
- 3 Wheel sensor
- 4 Mounting head

- ▶ To disassemble the bottom tyre bead, position the wheel such that the wheel sensor lies just before the mounting head.
- ▶ Press down the bottom tyre bead opposite to the mounting head into the well of the rim.
- ▶ Using the tyre lever, slowly pull the bottom tyre bead over the mounting head.
- ▶ Slowly turn the wheel clockwise and dismount the bottom tyre bead using the tyre lever.
- ▶ The bottom tyre bead is disassembled.

- ▶ Check the valve and wheel sensor for proper fastening and any damage.
- ✓ The tyre is disassembled.

7.1.2 Removing the wheel sensor

Removing the wheel sensor

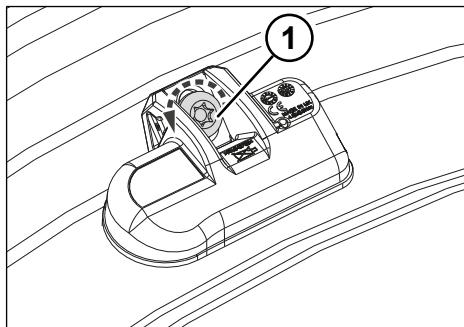


Fig. 7-4: Removing the screw

- 1 Screw

- ▶ Remove the screw.
- ▶ Remove the wheel sensor.

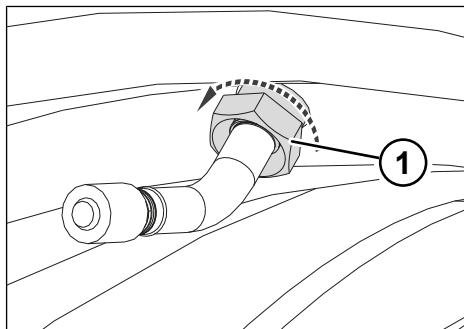


Fig. 7-5: Removing the union nut

- 1 Union nut

- ▶ Remove the union nut.
- ▶ Remove the valve.
- ✓ The wheel sensor is removed.

A used, undamaged wheel sensor can be fastened to a rim again with a new nut, new valve insert, new valve and new screw.

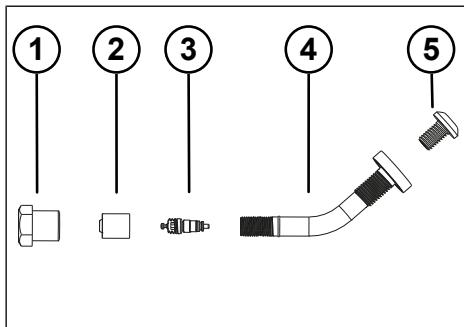


Fig. 7-6: Replacing components

- 1 Union nut
- 2 Valve cap
- 3 Valve insert
- 4 Valve
- 5 Screw

- To reuse the wheel sensor, replace the nut, valve insert, valve and screw.

7.1.3 Removing the electronic control unit

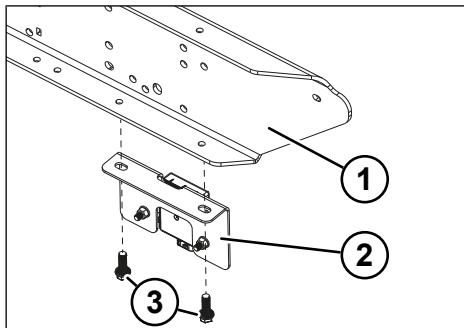


Fig. 7-7: Removing the bracket

- 1 Transverse beam
- 2 Bracket
- 3 Self-tapping screws

- Remove the self-tapping screws.
- Remove the bracket from the transverse beam.

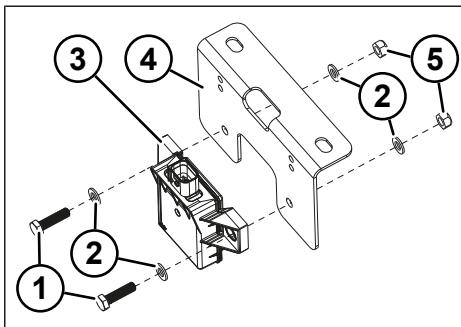


Fig. 7-8: Dismounting the control unit

- 1 Hexagon bolts
- 2 Washers
- 3 Control unit
- 4 Bracket
- 5 Nuts

- Remove the nuts and washers.
- Remove the bolts and washers.
- Take the electronic control unit off of the bracket.
- ✓ The electronic control unit is dismantled.

7.2 Disposal

The wheel sensors contain a lithium battery that is firmly installed in the housing and cannot be replaced. After the maximum service life of the wheel sensor has been reached, dispose of it properly in compliance with all applicable national and regional laws and regulations.

The electronic control unit can be disposed of as normal electronic scrap according to the national provisions.

To ensure proper disposal or recycling, please contact the local authorities or consult the information available on the website of the Electronics Industries Alliance: <http://www.eiae.org>.

8 Technical data

Dimensions of the electronic control unit	125 mm x 105 mm x 38 mm
Weight of the electronic control unit	115 g
Power supply	Compatible with on-board power supply, 8 V ... 36 V DC
Housing degree of protection	Resistant to immersion and high-pressure cleaners (IP69K) according to ISO 20653 and IEC 60529
Operating temperature	-40 °C +- 85 °C
Transmission frequency	433.92 MHz
Baud rate	9.6 kb
Inflation pressure	Value range: 0 ... 13,915 mBar Accuracy: +- 220 mBar
Temperature	Value range: -40 °C ... 120 °C Accuracy: +- 5 °C

9 Spare parts and customer service

9.1 Spare parts

NOTE

Property damage caused by incorrect spare parts!

The use of non-approved or incorrect spare parts affects safety and can result in voiding of the operating permit.

- ▶ Only use original spare parts.

The original spare parts are regularly checked for safety and functionality. The use of original spare parts guarantees road and operating safety and the operating permit is retained.

You can order spare parts by phone under +49 (0) 59 51 / 209-302 or from the KRONE website. An electronic spare parts catalogue is available on the website:
www.krone-trailer.com

9.2 KRONE Customer Service

KRONE Telematics Support

Telephone: +49 5951 209-220
email: telematics.nfz@krone.de

Customer Service

Telephone: +49 (0) 59 51 / 209-320
Fax: +49 (0) 59 51 / 209-367
email: kd.nfz@krone.de

Spare Parts

Telephone: +49 (0) 59 51 / 209-302
Fax: +49 (0) 59 51 / 209-238
email: Ersatzteile.nfz@krone.de



www.krone-trailer.com



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