Assembly instructions

VOSS OBW 501 *SG sensor*

Strain gauge sensor for on-board weighing systems

Axle weight measuring –
at its most precise way

A. Important notices

Please observe before using the VOSS OBW 501 *SG sensor*

- VOSS OBW 501 *SG sensor* is suitable for axles in commercial vehicles, off-road vehicles and light duty vehicles.
- Only for assembly on axle. Any other use leads to the exclusion of warranty rights.
- Before starting with the assembly process of the VOSS OBW 501 *SG sensor*, carefully read these assembly instructions and make sure that you have understood these.
- Before starting with the assembly process, provide the required materials and tools, mentioned in chapter “C. Assembly instructions”.
- The sensor / system must be installed and connected in accordance with the regulations valid for the vehicle and country in question.
- Make sure ignition is switched off and battery is disconnected before starting any installation.
- The sensor has to be stored dry and free from humidity.
- Do not remove the sensor from the ESD protection bag before installing it in the vehicle.
- Do not use the sensor data to control safety-relevant vehicle functions, e.g., ABS or ESP.
- Liability:

  All damages (e.g., recalls, customer services, expenses, compensation, etc.) are limited by the respective order amount.

  Damages shall be paid if VOSS is solely liable (gross negligence or intent required). Only the actual damage will be compensated.

  Under no circumstances shall VOSS be liable to the purchaser for liquidated damages/contractual penalties and/or financial losses such as expected or lost profits, loss of production, interest, penalties or for incidental, consequential, special, exemplary or criminal damages in connection with the contract.

  Should VOSS be held liable by third parties (e.g., due to product liability claims), the purchaser shall indemnify VOSS against all claims.

  Any processing of vehicle components must be coordinated with the component manufacturer.

Please observe during the assembly of the VOSS OBW 501 *SG sensor*

- The assembly of the VOSS OBW 501 *SG sensor* must be conducted by professional mechanics subject to these assembly instructions.
- Incorrectly assembled sensors can result in failure of the system.
- Before using the sensor, components must be checked. They have to be clean and must not show any signs of damage. In case of any damage, the sensor has to be replaced.
- Handle sensor with care to avoid damage due to mechanical shock and electrostatic discharge.
- VOSS OBW 501 *SG sensor* is measuring the strain of the material. To make sure the sensor can measure correctly, the surface has to be clean, straight and free from grease or other release agents (see chapter “C. Assembly instructions 1. Grinding and cleaning of surfaces”).
- To protect the sensor, it hast to be covered by a protection cover and by sealing. The cable has always to be protected by a corrugated tube. Avoid bending the cable around sharp edges and below the specified minimum bending radius of 35 mm. The sensor will be adhesive bonded and the cable fixed on the chassis (see chapter “C. Assembly instructions 2. Assembly of VOSS OBW 501 *SG sensor*”). It is recommended to apply a first fixation of supply cable at a distance of 150 mm behind the protection cover.
- Attention: The sensor has a 3-wire harness. Incorrect connection of supply voltage to the sensor’s wires can damage or destroy the sensor! For connection and setup instructions see chapter “C. Assembly instructions 3. Setup of VOSS OBW 501 *SG sensor*”.
- Observe the manufacturer's safety instructions and handling of adhesive and sealing material.

System properties

- For detailed system properties and technical data please check latest available version of “Product information VOSS OBW 501 *SG sensor*” (Art. No. 7007734000) on www.voss-automotive.net/en/downloads.

B. Components and materials

1. VOSS OBW 501 *SG sensor*

Fig. 1: VOSS OBW 501 *SG sensor* with cable

Fig 2: VOSS OBW 501 *SG sensor* with metal protection cover and corrugated tube

2. Electrical connection possibilities

Fig 3: Connector Tyco HDSCS

- Pin1: V_{BAT}
- Pin2: GND
- Pin3: Signal

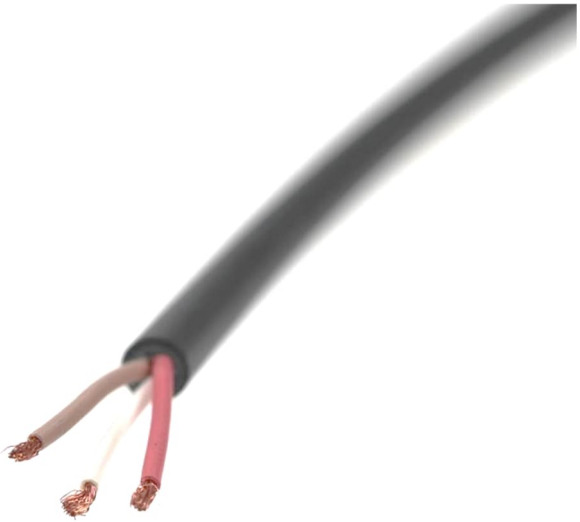

Fig 4: Open wire; wire configuration:

- V_{BAT} (Red)
- GND (Brown)
- Signal (White)

3. Complete sensor set

Fig 5: VOSS OBW 501 *SG sensor* with Tyco HDSCS and metal protection cover (complete sensor set)

C. Assembly instructions

Use of arrow symbols in pictures:

Indicates special points of interest described in the text.

Indicates required manual actions and their direction.

Indicates operations that should be avoided.

1. Grinding and cleaning of surfaces

Before starting cleaning, make sure that the vehicle is safely parked, the engine of vehicle is turned off (no voltage on electrical supply lines), and the vehicle axle is in a temperature range of +10 °C to +30 °C (+50 °F to +86 °F).

Provide the following materials/tools: angel grinder with grain 80, drilling machine with 60 and 120 grain, abrasive paper 120, abrasive paper 240, cleaning cloths, lint-free cloths and cleaning solvent: acetone + 2-propanol (mixing ratio 1:1).

Use the middle of the axle as assembly area for the VOSS OBW 501 *SG sensor*. Minimum 100 mm x 60 mm needed as installation space incl. protection cover. The surface of sensor installation (ca. 30 mm x 20 mm) has to be grinded flat.

Use gloves, while working. Prepare yourself with further personal protective equipment, if needed according to local regulations. We recommend wearing working gloves and safety goggles.

Step 1

Before starting the grinding process, area must be free from grease and release agents.
Polish the surface by using angle grinder with grain 80.

Do not grind an indentation.

Fig. 6: Polishing the surface with grinder

Step 2

Polish the surface by using drilling machine with grain 60.

Fig. 7: Polishing the surface using drilling machine with grain 60

Step 3

Continuously polish the surface by using drilling machine with grain 120.

Fig. 8: Polishing the surface using drilling machine with grain 120

Step 4

Grind the surface fine by hand by using abrasive paper with grain 120.

! This step should be performed on an area at least as large as the sensing part, ca. 30 mm x 20 mm.

Fig. 9: Fine grinding of the surface by hand by using abrasive paper with grain 120

Step 5

Grind the surface fine by hand by using abrasive paper with grain 240.

! This step should be performed on an area at least as large as the sensing part, ca. 30 mm x 20 mm.

Fig. 10: Fine grinding of the surface by hand by using abrasive paper with grain 240

Step 6

Final result of the grinding process.

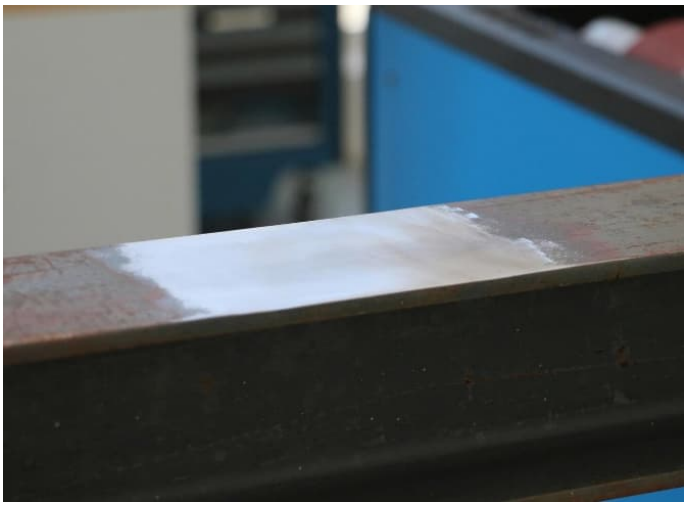

Fig. 11: Finally grinded surface

Step 7

Wipe clean the entire grinded surface with cleaning solvent and a cleaning cloth.

Fig. 12: Cleaning of surface

Step 8

Use lint-free cloth and cleaning solvent for the final cleaning.

During this process, you need to change the cloth, until the cloth remains white after wiping. This may take several attempts. Prepared surface has to be completely free of dirt, paint, dust, oil and grease.

Fig. 13: Cleaning of surface with lint-free cloth

Step 8.1

Use lint-free cloth and cleaning solvent for the final cleaning.

During this process, you need to change the cloth, until the cloth remains white after wiping. This may take several attempts. Prepared surface has to be completely free of dirt, paint, dust, oil and grease.

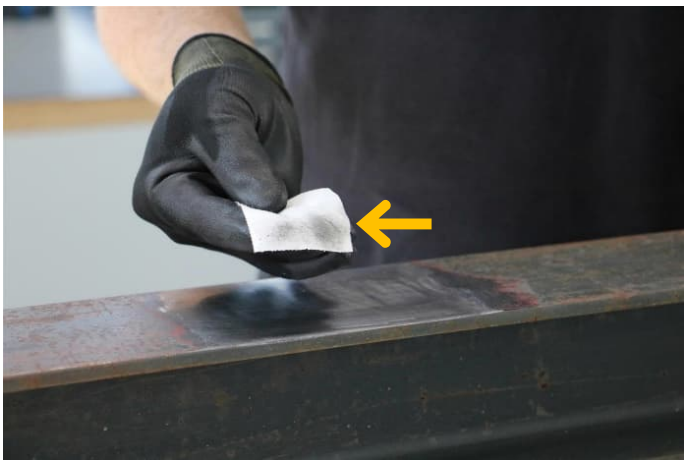

Fig. 14: Still dirty lint-free cloth during cleaning process

Step 9

Use lint-free cloth and cleaning solvent for the final cleaning.

During this process, you need to change the cloth, until the cloth remains white after wiping. This may take several attempts. Prepared surface has to be completely free of dirt, paint, dust, oil and grease.

Fig. 15: Final cleaning of surface

Step 9.1

Use lint-free cloth and cleaning solvent for the final cleaning.

During this process, you need to change the cloth, until the cloth remains white after wiping. This may take several attempts. Prepared surface has to be completely free of dirt, paint, dust, oil and grease.

Fig. 16: Finally white lint-free cloth after cleaning process

Step 10

Final result of the cleaning process.

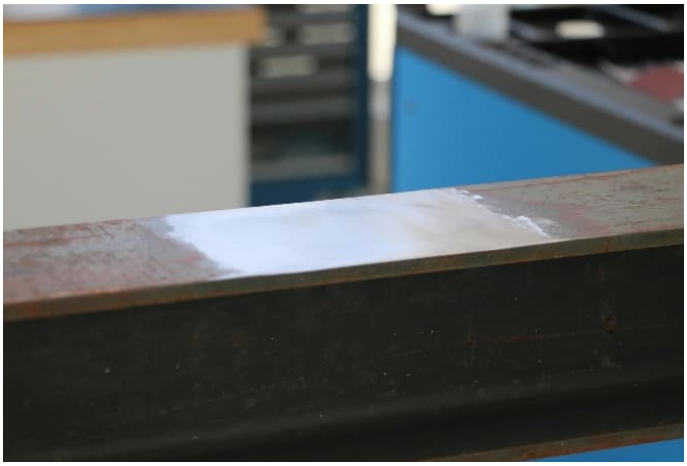

Fig. 17: Final result of the cleaning process

Step 11

Grind the protection cover by hand with abrasive paper with grain 120 or 240.

Fig. 18: Grinding of protection cover

Step 12

Wipe clean all grinded surfaces of the protection cover with a white lint-free cloth and cleaning solvent.

Fig. 19: Cleaning of protection cover

Step 13

Carefully wipe all the surface of the sensor with lint-free cloth and cleaning solvent.

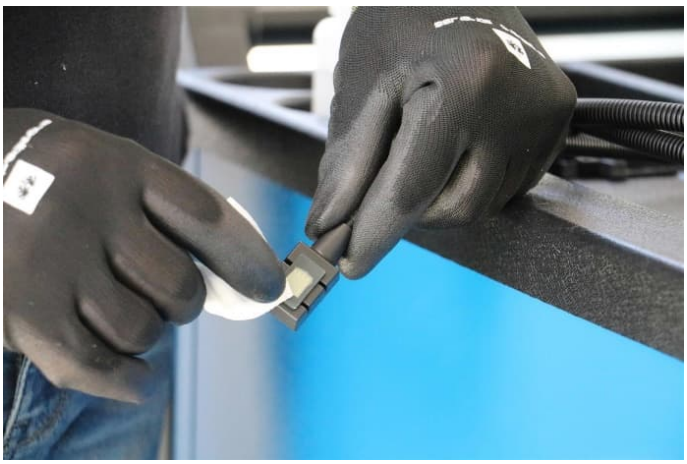

Fig. 20: Wiping of sensor

2. Assembly of VOSS OBW 501 *SG sensor*

- Before using the VOSS OBW 501 *SG sensor*, components must be checked. They have to be clean and must not show any signs of damage.
- To make sure the sensor can measure correctly, the surface has to be flat, clean and completely free from dirt, paint, dust, oil and grease (see chapter “C. Assembly instructions, 1. Grinding and cleaning of surfaces”).
- Provide the following materials/tools: scriber, adhesive Panacol GTH-T with two-part adhesive applicator, an adhesive and sealing compound (CARSYSTEM® UNIFLEX PU with single part cartridge press is recommended, or comparable products), spray paint (with corrosion protection; varies depending on individual vehicle) and cable ties.
- Use new, clean gloves, while working with mentioned chemicals. Prepare yourself with further personal protective equipment, if needed according to local regulations.

Step 1

Mark at the edges center position of prepared surface for sensor with scriber.

- Do not use pencil or pen. Surface will not be clean anymore.
- Do not contaminate the cleaned surface.

Fig. 21: Marking center position

Step 2

Carefully place the sensor on the center position of the cleaned surface.

- Do not contaminate the cleaned surface and the sensor.

Fig. 22: Placing the sensor on the cleaned surface

Step 3

Align the sensor and prefix the cable with cable ties.

- Do not completely fix the cable ties for final aligning later (see step 7).
- Do not contaminate the cleaned surface and the sensor.

Fig. 23: Aligning the sensor and prefixing the cable ties

Step 4

Prepare the adhesive: use the shown pieces on the right (Fig. 24): Panacol GTH-T with mixer tip and two-part adhesive applicator.

- Use only one mixer tip for one sensor assembly. For two sensors only if adhesive is added to both sensors in less than one minute. Remember to order extra mixer tips if needed.
- The storage temperature of the adhesive must be in accordance with the manufacturer's recommendations.

Fig. 24: Panacol GTH-T with mixer tip and two-part adhesive applicator

Step 4.1

Prepare the adhesive: keep the cartridge in an upright position for at least 2 minutes, then remove the cap and attach the mixer tip.

Fig. 25: Preparing the adhesive: attaching mixer tip

Step 4.2

Prepare the adhesive: insert the adhesive in the two-part adhesive applicator

Fig. 26: Inserting the adhesive in the two-part adhesive applicator

Step 4.3

Prepare the adhesive: start dispensing the adhesive upwards until the air bubbles in mixer tip have gone.

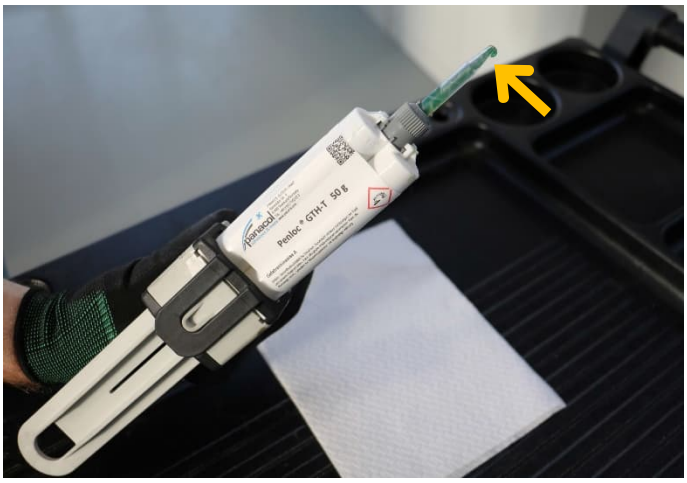

Fig. 27: Preparing the adhesive: dispending adhesive

Step 4.4

Prepare the adhesive: discard a certain amount of the adhesive, which should be as long and wide as the mixer tip to guarantee a good mixture of the adhesive.

Fig. 28: Preparing the adhesive: discarding adhesive

Step 5

Before applying the adhesive do a final cleaning of the sensor installation surfaces with cleaning solvent and lint-fee cloth as a precaution.
Apply the adhesive to the sensor.

- Apply enough adhesive to only one area, so that it can spread over the surface from there. Do not distribute it with mixer tip.
- When adhesive bonding, temperature of the axle should be above +10 °C (+50 °F).

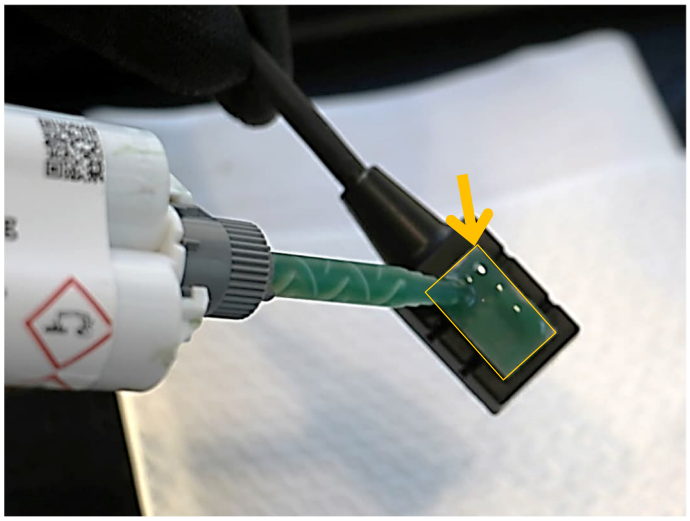

Fig. 29: Applying the adhesive

Step 6

Immediately after applying the adhesive, attach the sensor to the prepared surface, and apply pressure with your thumb for a minimum of 5 minutes @+20 °C (+68 °F).

- The assembly takes place with the main deformation direction with 0 ° or 180 °.

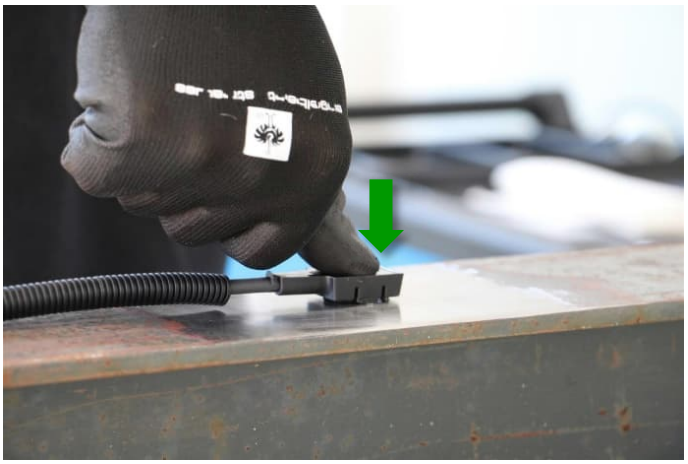

Fig. 30: Attaching the sensor

Step 7

Finally, carefully align the cable and fix the cable ties to avoid mechanical stress to the sensor.

- Do not apply pressure to sensor.

Fig. 31: Aligning the cables and fixing the cable ties

Axle temperature	Time after sensor is adhesive bonded with Panacol GTH-T			
+10 °C to +30 °C (+50 °F to +86 °F)	T1	T2	T3	T4
	15 min	30 min **	5 hours	24 hours
	T1 - You can do first test of sensor. One or two persons can enter the vehicle. T2 - Protection cover can be mounted. One hour later paint or corrosion spray can be added. T3 - Vehicle can be driven for LO and HI calibration.**** T4 - Vehicle can be driven with normal load - recommandation. ** - Vehicle can be moved without any problems. **** - We recommend vehicle to be unloaded after HI calibration until next day.			

Table 1: Time after sensor(s) are adhesive bonded with Panacol GTH-T

Step 8

Prepare the adhesive and sealing compound for connecting the sensor to the axle.

- We recommend CARSYSTEM® UNIFLEX PU for best performance.
- Optional Teroson MS 9399 can be used (shown in Fig. 33 – 37).

Fig. 32: CARSYSTEM® UNIFLEX PU

Step 9

Carefully apply the adhesive and sealing compound completely underneath the sensor to fill up the whole space between the surface and the sensor.

- Do not apply pressure to sensor.

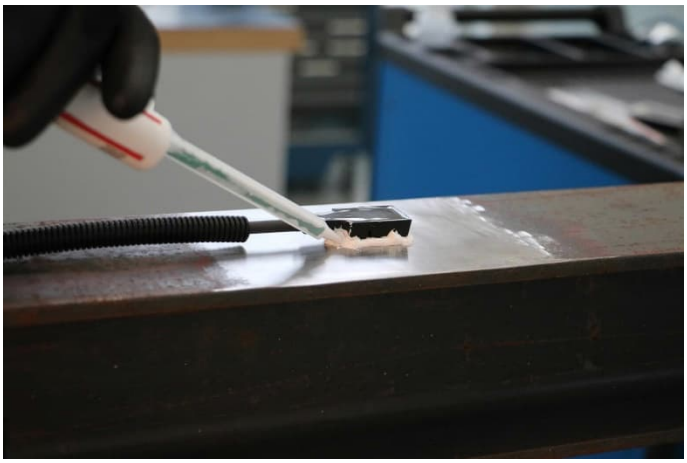

Fig. 33: Applying the adhesive and sealing compound underneath the sensor

Step 10

Apply the adhesive and sealing compound underneath the end of the sensor and underneath the cable.

- Do not fix and fill up the corrugated tube with the adhesive and sealing compound to ensure that water could drain later in operation.

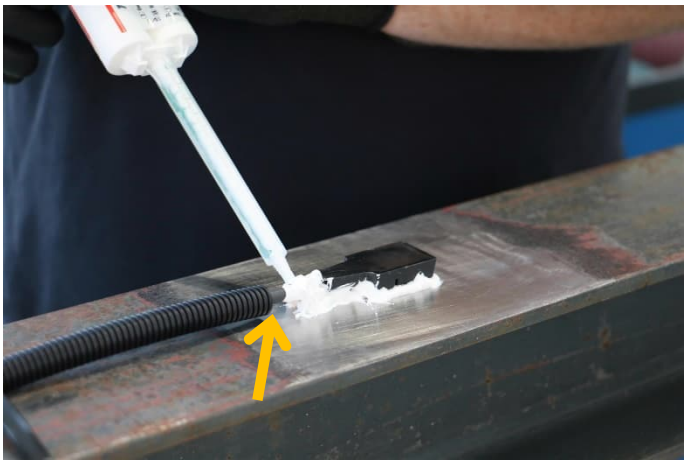

Fig. 34: Applying the adhesive and sealing compound underneath the cable

Step 11

Completely fill up the protection cover, including shoulders, with the adhesive and sealing compound.

- Avoid air bubbles, if possible. Hold the nozzle inside the adhesive and sealing compound during filling.
- Nozzle can be shortened with knife to make it easier and faster to fill up the protection cover with the adhesive and sealing compound

Fig. 35: Filled up cover

Step 12

Carefully put the cover over the sensor.

- Distance between surface and cover can vary from 2-5 mm. Do not try to push it completely to the surface. Make sure that no adhesive and sealing compound reaches the corrugated tube to ensure that water could drain later in operation.

Fig. 36: Fixing the cover

Step 13

Carefully smooth out the sealant and remove the excess of adhesive and sealing compound.

Distance between surface and cover can vary from 2-5 mm. Do not try to push it completely to the surface. Make sure that no adhesive and sealing compound reaches the corrugated tube to ensure that water could drain later in operation.

Fig. 37: Smoothing out the sealant

Step 14

At least 1 hour after fixing, paint the cover with corrosion protection.

Fig. 38: Painting the cover

Step 15

Completely assembled VOSS OBW 501 *SG sensor* installation

Fig. 39: Completely assembled VOSS OBW 501 *SG sensor* installation

3. Setup of VOSS OBW 501 *SG sensor*

3.1 Pre-calibration

Before using VOSS OBW 501 *SG sensor* a pre-calibration according to the used application is needed.

The pre-calibration can be carried out by the associated ECU used in the vehicle or by a separate Sensor Control Unit (SCU). For pre-calibration by an ECU, please proceed with the ECU manual. For pre-calibration by the Kimax-SCU a detailed description and manual is available on: www.kimax.com/support/#usermanuals.

Before start, please make sure that the correct calibration unit – Kimax-SCU (Sensor Control Unit) – is available.

Use the instructions from the software for a proper set up.

Step 1

Connect the VOSS OBW 501 *SG sensor* to the Kimax-SCU by using the following cable connection (Fig. 40):

- V_{BAT} (Red)
- GND (Brown)
- Signal (White)

or with the corresponding counter part of the Tyco HDSCS connector:

- Pin1: V_{BAT}
- Pin2: GND
- Pin3: Signal

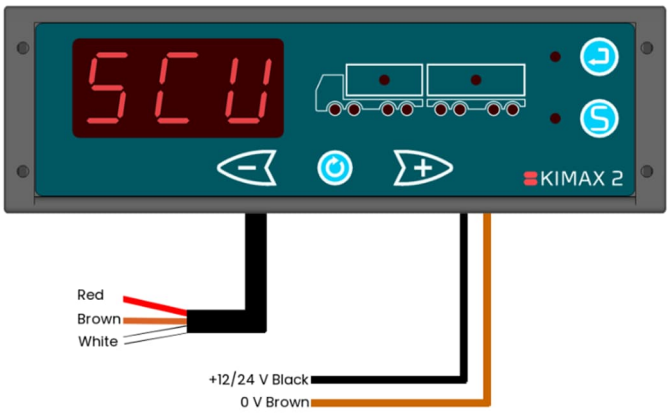

Fig. 40: Kimax-SCU

Step 2

Connect the Kimax-SCU to power supply, it can be +12/24 V from vehicle battery or sourced by +12 V DC. Connect the adapter to the main 120/230 V supply (Fig. 40).

Step 3

Select the “polarity” for the sensor to offer an increasing output signal at increasing axle load. This can be realized by selecting positive or negative slope.

Set, whether a positive slope of the analog output voltage is required, when the sensor is strained or compressed. This option depends on the installation direction of the sensor (Fig. 41). All further details are presented in the Kimax-SCU manual.

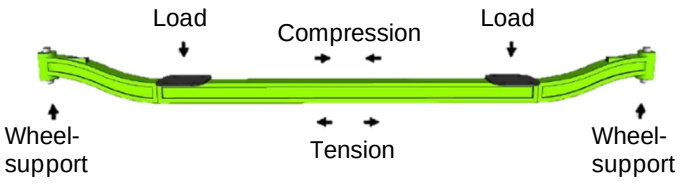

Fig. 41: Vehicle front axle

Step 4

Adjust the offset setting of the output signal at empty vehicle to a value in a range of >0.5 V to <1.3 V by the offset function (e.g., 1 V). For this, the Kimax-SCU offers a simple way to carry out an automatic adjustment of slope and offset (Fig. 42).

Step 5

In case the analog output voltage has already saturated at 4.5 V, although the maximum total weight of the vehicle has not yet been reached, the gain must be reduced.

Caution: If the gain is changed in this step, step 4 must be performed again. Therefore, the Kimax-SCU offers a simple way to carry out an automatic adjustment of slope, offset and gain (Fig. 42), also explained in detail in the Kimax-SCU manual.

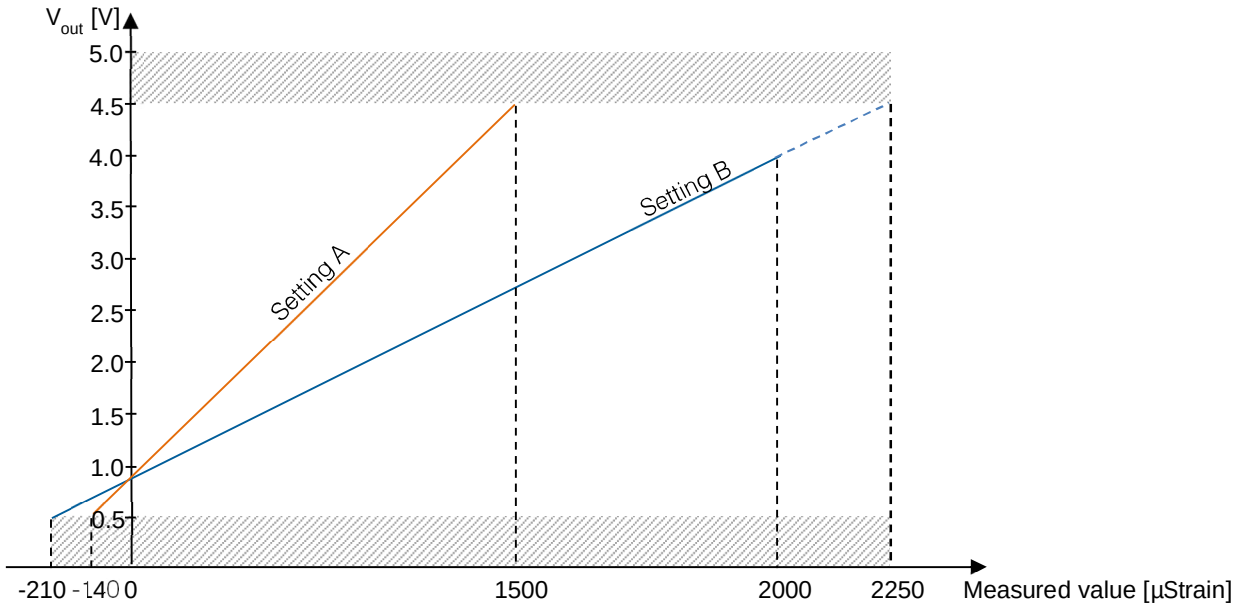

Fig. 42: Sensor characteristics

3.2 Calibration of LO and HI values

Before using the VOSS OBW 501 *SG sensor*, do a 2-point (LO and HI) calibration for the weight calculation curve in the used ECU of the vehicle. Please refer to the user manual of the used on-board weighing ECU. Regular measurement signal comparison with a suitable vehicle scale and/or recalibration is recommended. The determination of the adjustment or recalibration intervals is the responsibility of the operator.

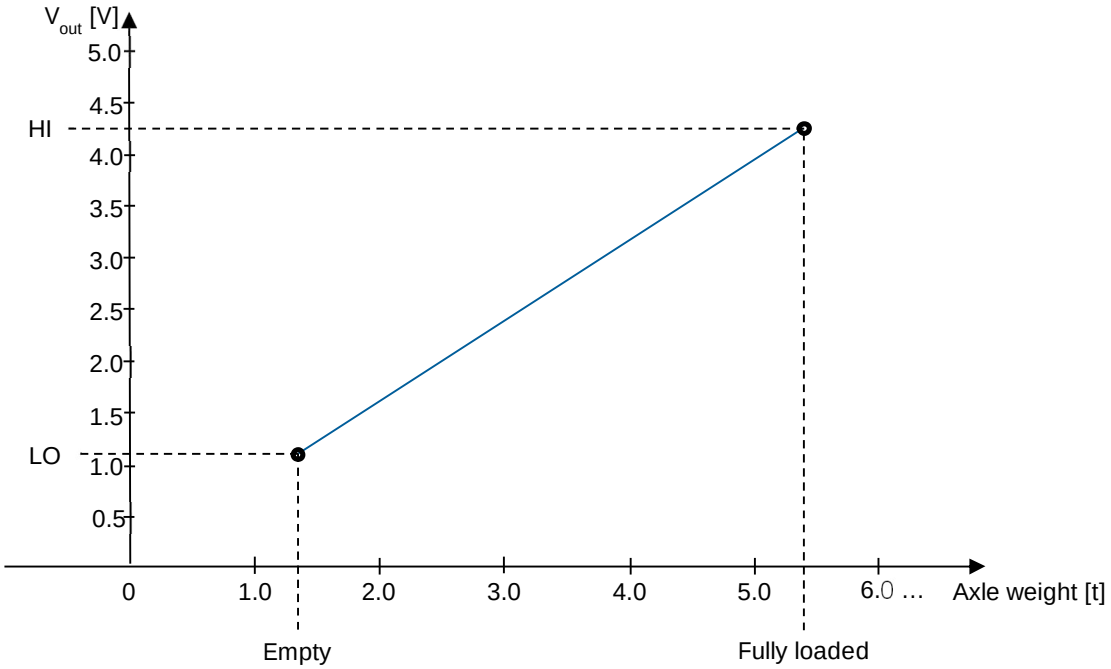

Fig. 43: 2-point calibration diagram (example)

Customer service

Contact VOSS for questions concerning VOSS OBW 501 *SG sensor* and assembly instructions.

Property rights

Technical modifications and errors excepted.

Contact

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