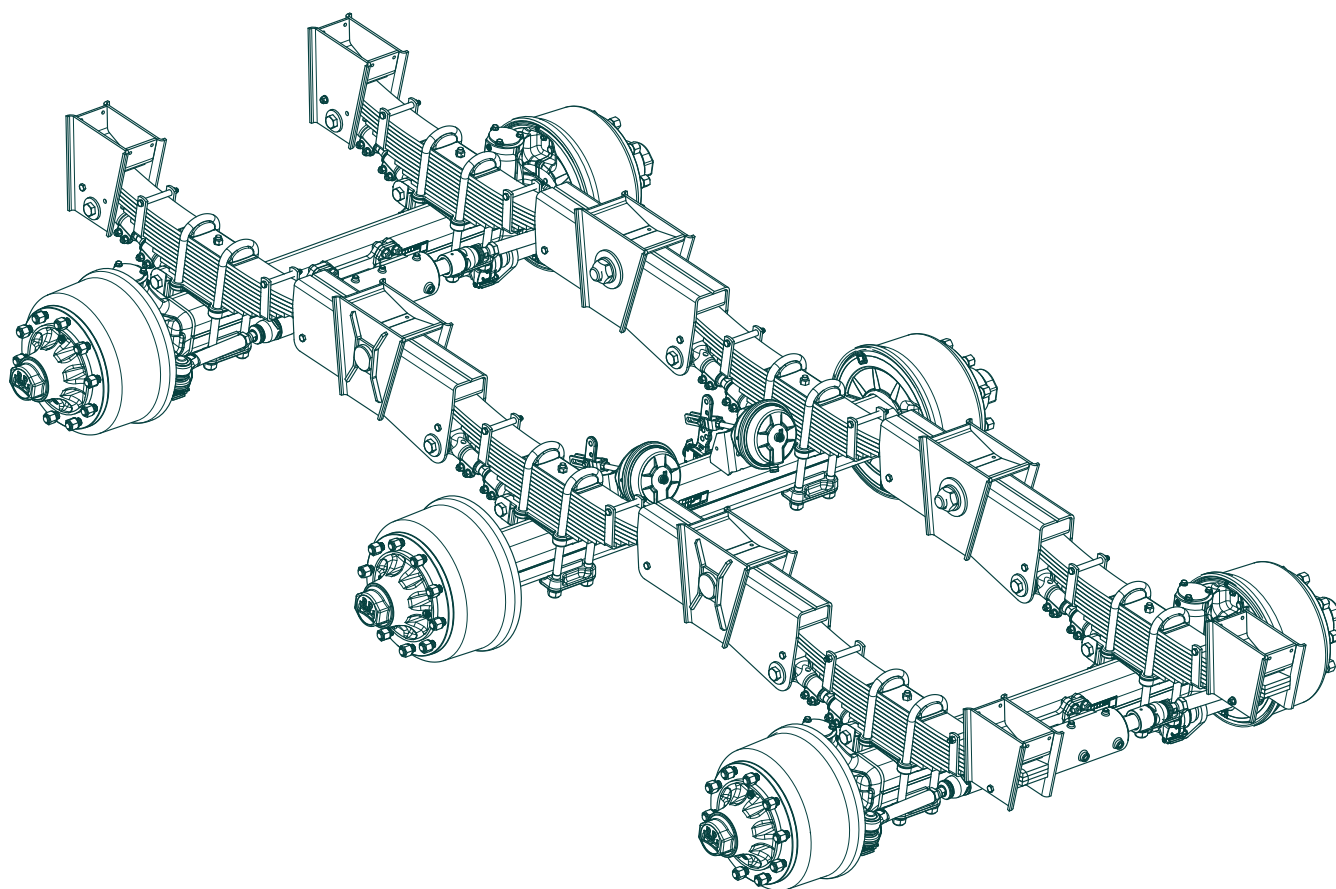




Installation Guidelines

Mechanical Suspension (VB)



BPW EA-VB 57232601e



Introduction, notes

Notes on the content:

In these installation instructions for BPW VB-Suspension units, we would like to outline the technical design guidelines and provide suggestions for installation.

Please note that the drawings accompanying these recommendations should be considered examples, and that dimensions depend exclusively on the vehicle type and its operating conditions.

This information is known to the vehicle manufacturer alone; they must take this into consideration in their designs.

The safety factors for the constructional design of the vehicle frame and substructure must be defined by the vehicle manufacturer.

Detailed design data of BPW suspension units, such as dimensions, spring deflections, etc., can be found in the technical documentation (standard programme and offer drawings).

The warranty shall lapse if installation of the BPW axle system does not correspond to technical guidelines as per relevant BPW installation instructions.

Read the instructions carefully before installing and operating the axle. This manual describes the functional elements and contains instructions for installation, assembly and commissioning.

When assembling the components and the axle correctly, the offer drawing of the axle must be taken into account.

Applicable legislation

Regulation (EU) No 167/2013 of the European Parliament and of the Council of 5 February 2013 on the approval and market surveillance of agricultural and forestry vehicles.

Commission Delegated Regulation (EU) 2015/68 of 15 October 2014 supplementing Regulation (EU) No 167/2013 of the European Parliament and of the Council with regard to vehicle braking requirements for the type-approval of agricultural and forestry vehicles.



Wheel connections for vehicle trailers are described in DIN 74361.

For the production of vehicles, the applicable national regulations must be taken into account.

Website / MyBPW

- ① QR code from the type plate with smartphone / Scan with a tablet or enter www.bpwagrar.com online.
- ① Customised information, such as operating instructions and maintenance information for axles, is available.
- ① Spare parts lists are available exclusively through MyBPW.

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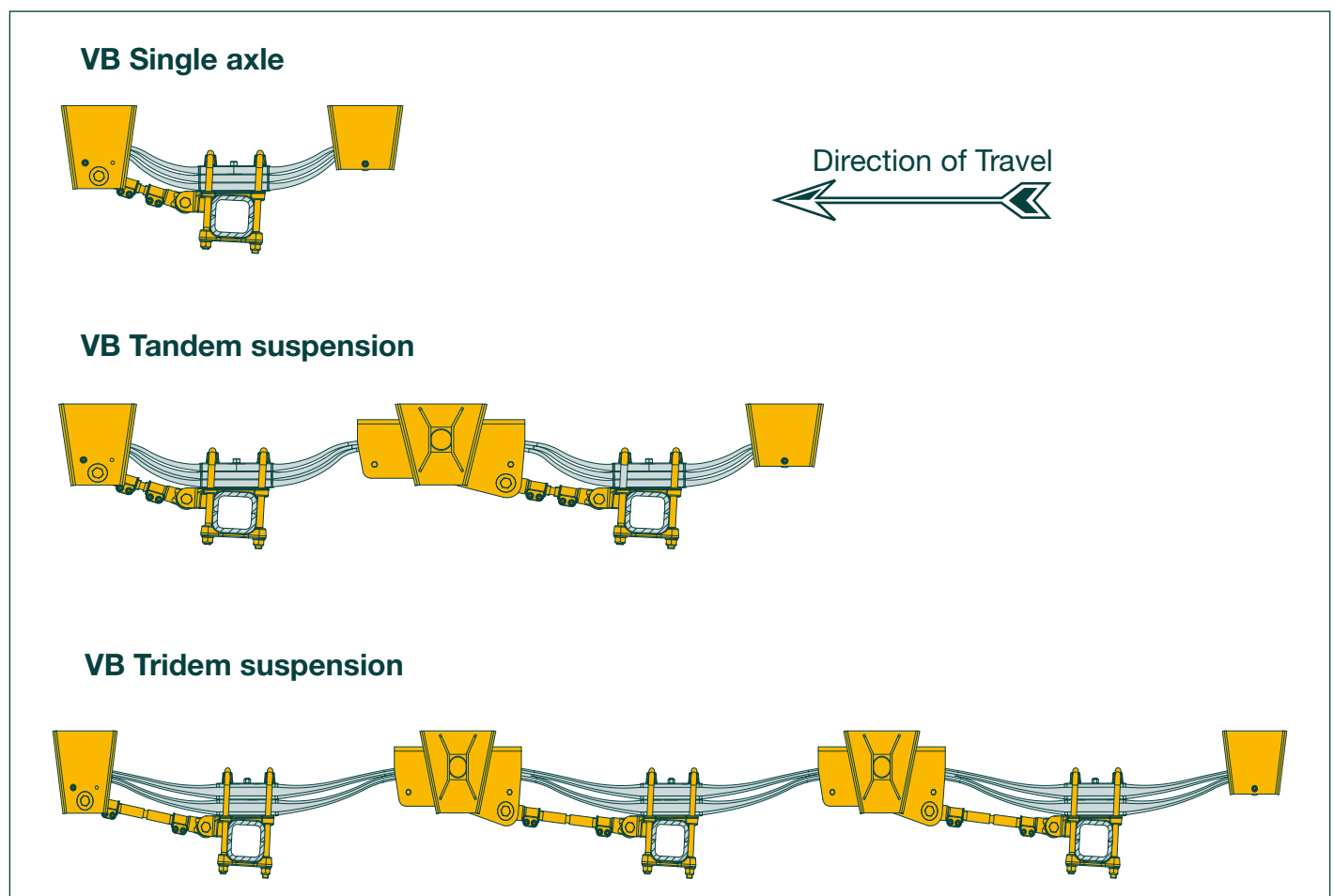
1 BPW VB-Suspension

1.1 General, Features

- ⦿ The VB suspension system is designed for axles with 120- and 150-mm square profiles
- ⦿ Available with parabolic springs or multi-leaf springs
- ⦿ Static axle load equalisation via equalising beams
- ⦿ Equalising beams with maintenance-free bearings
- ⦿ Precise axle-guidance via horizontally arranged, adjustable connecting rods
- ⦿ Easy axle tracking alignment by two adjustable torque arms per axle
- ⦿ Maintenance-free torque arm mounted in rubber-steel bushes

Leaf spring assembly:

VB Series: Leaf spring above the axle beam



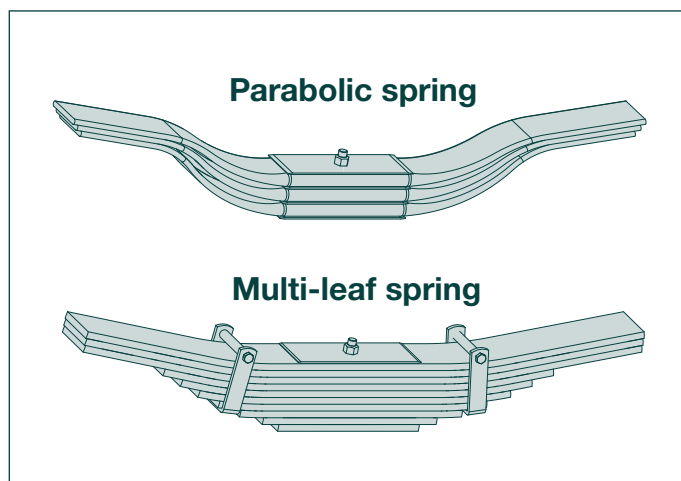
General, Features

1.1

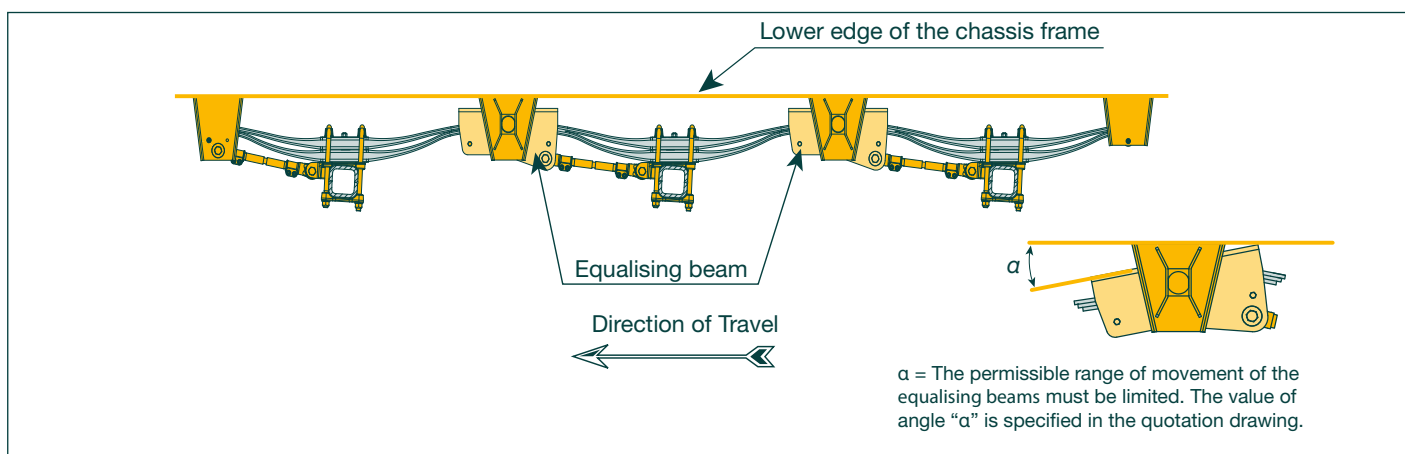
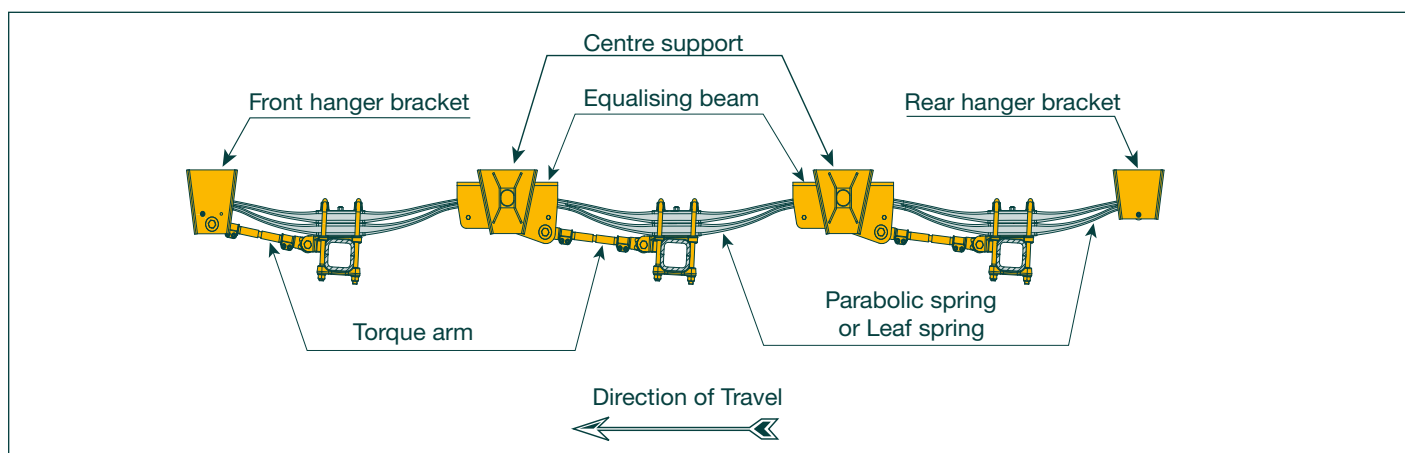
How It Works

BPW VB suspensions are fitted with parabolic or multi-leaf springs. Depending on the specific version, parabolic springs have either two or three spring layers. Thanks to the efficient use of material, they are lightweight with low installation height. Multi-leaf springs (trapezoidal springs) have multiple spring layers on top of one another, with a constant cross-section and lengths stepped in a trapezoidal shape. They are characterised by their robust nature and good emergency running properties. The spring ends in multi-leaf springs are mounted with spring sliders both in the hanger brackets and in the equalising beams.

This enables unhindered “lengthening” in operation. The axles are guided by separate torque arms, that can be adjusted to easily align the track (on the BPW VB, adjustable torque arms on both sides of the vehicle).



BPW VB suspensions feature inherent damping due to their design and do not require additional shock absorbers.



Installation Line

VB suspensions have a defined installation line (lower edge of the chassis frame) that the equalizing beams must not cross in order to ensure proper suspension function. The vehicle manufacturer must ensure compliance with this limitation.

1 BPW VB-Suspension

1.1 General, Features

General

The VB series sprung axles can be installed as single axles or as multi-axle suspension units (Tandem and Tridem). The axles are connected to the vehicle frame by torque arms, hanger brackets and equalising beams.

Longitudinal forces

Longitudinal forces are transmitted by torque arms between the axle and hanger bracket. Thanks to their horizontal arrangement, BPW torque arms guarantee precise axle guidance for minimal tyre wear.

Vertical forces

Vertical forces are transmitted into the vehicle frame by the hanger supports and equalising beams

Lateral forces

Lateral forces are transmitted to the frame exclusively through the brackets. The frame must therefore be braced appropriately to ensure that the allowable torsional loads on the frame's longitudinal member are not exceeded

If you have any further questions, your BPW contact person will be happy to assist you.

Welding:

- ⦿ For all welding activities, the springs, spring clamps and all other sensitive components must be protected against flying sparks and welding spatter.
- ⦿ The ground clamp must under no circumstances be attached to the leaf springs, spring U-bolts or hubs.
- ⦿ No welding at leaf springs!
- ⦿ It is not permitted for the hanger brackets to be heated for straightening work!

Welding methods:

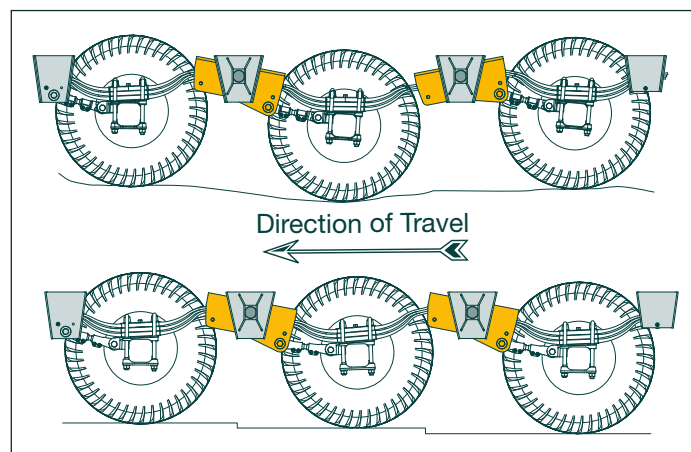
- ⦿ Inert gas welding
Welding wire quality: G 4 SI 1 – EN ISO 14341-A
- ⦿ Manual arc welding
Rod electrodes: E 46 5 B 32 H 5 -EN ISO 2560-A
- ⦿ Mechanical quality values must correspond to the basic material S 420 or S 355 J 2
- ⦿ Single sided fillet weld:
Seam quality according to DIN EN ISO 5817
Sheet thickness 6 mm → Weld thickness a4
Sheet thickness 8 mm → Weld thickness a6

General, Features

1.1

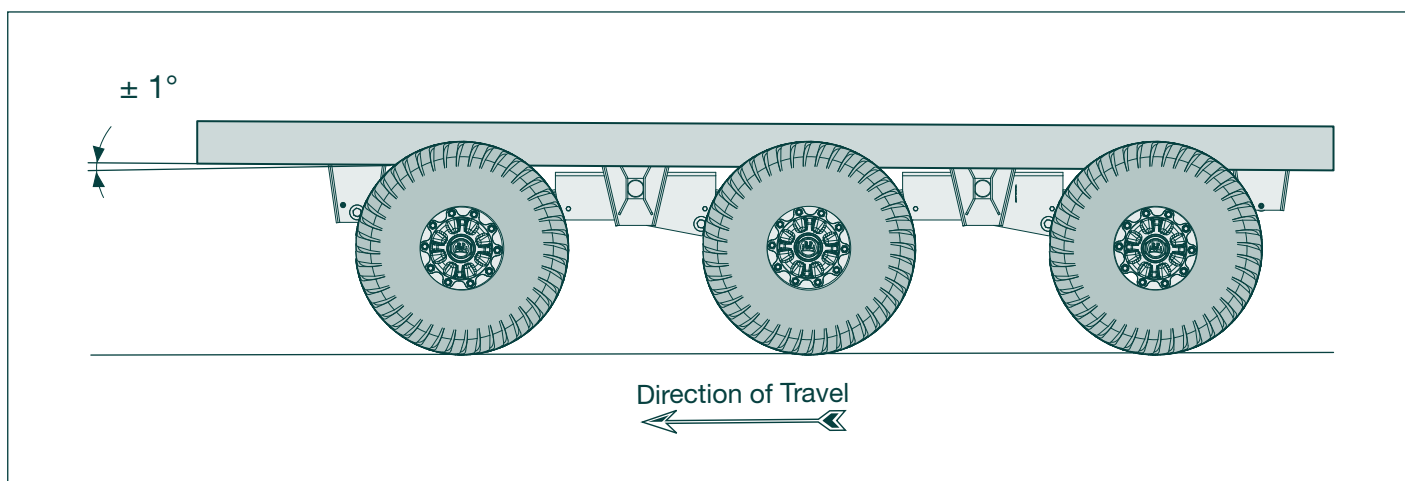
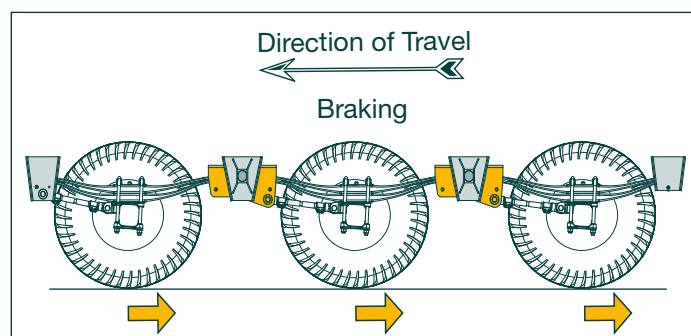
Axle load / brake load equalisation

For multi-axle suspension units, the central brackets feature rotating equalising beams. The spring ends, which slide into the equalising beams, together effect static axle load equalisation (even load distribution when stationary and in drive mode).



The torque arm is attached to the center support and to the equalising beam. Dynamic axle load compensation ensures optimal braking deceleration of the units.

Upon request, we can provide you with a braking analysis for your vehicle design.

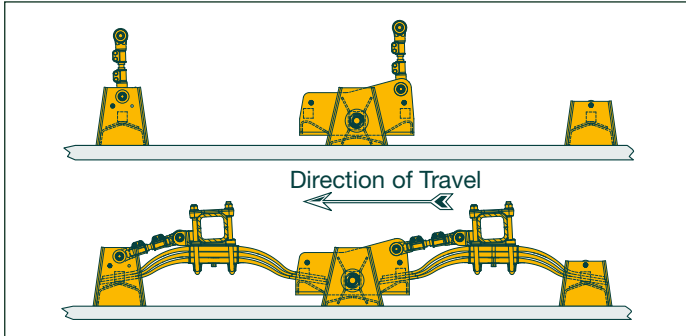


Due to the limited equalisation paths, the maximum body tilt of the semi-trailer may not exceed $\pm 1^\circ$. Otherwise it should be expected that axle loads will exceed limitations significantly on uneven terrain, which could result in damage to components.

2 Installation Guidelines

2.1 General

BPW VB suspension units are generally supplied unassembled, i.e. axles, hanger brackets and equalising beams are supplied separately on pallets. These suspension units are installed with the vehicle frame on its back.



Assembly

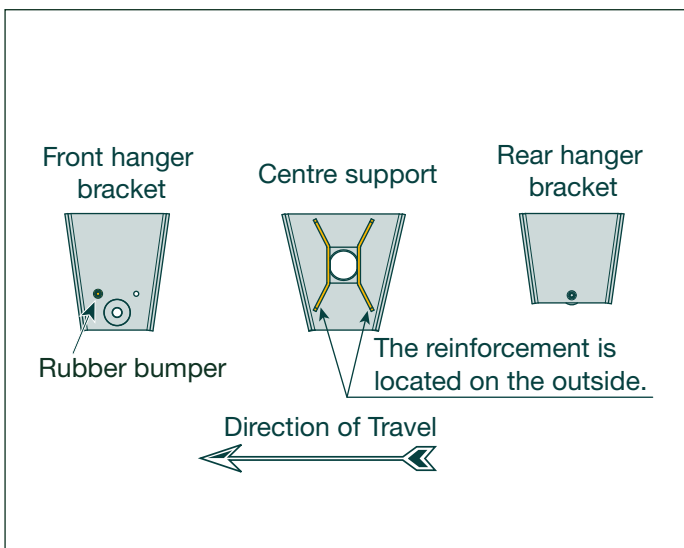
There must be a minimum of 30mm between the chassis and the tyres. Track width, tyre dimensions and longitudinal beam dimensions must be taken into consideration in this regard.

The clearance between brackets in the transverse direction must be within the tolerance range of the spring centre clearance (± 1) to prevent tensions in the axle unit. After the hanger brackets have been welded on and the axles mounted, an axle alignment check must be conducted and any corrections made as necessary (See "Alignment," Chapter 9).

Hanger brackets in BPW VB

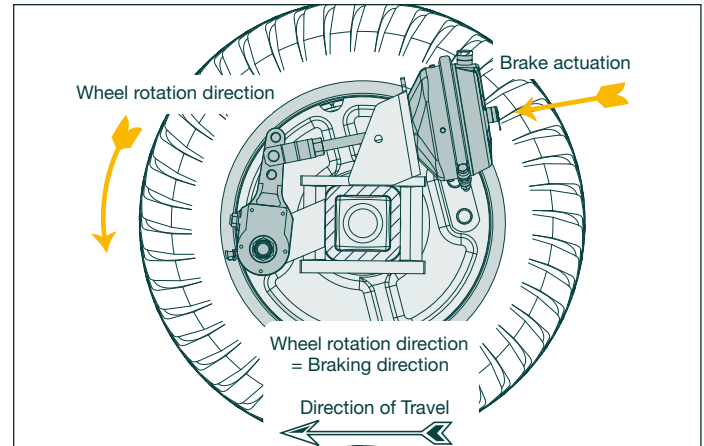
The front and rear hanger brackets on the BPW VB are symmetrical. When installing the rubber bumpers on the front hanger brackets, they must be mounted on the front side in the direction of travel.

During assembly, the braces must be aligned outward at the center supports.



Axle installation direction

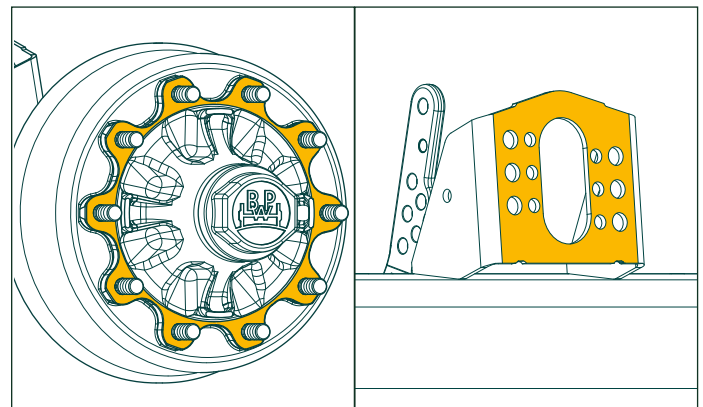
The brake application direction (rotational direction of the brake camshaft) must correspond to the rotational direction of the wheel when driving forwards.



Painting:

The following areas of drum brakes must be covered or masked off prior to any potential painting:

- ⊙ contact surface of the brake cylinder and fixing nuts for non-assembled brake cylinders.
- ⊙ wheel contact surfaces
wheel bolts and wheel nuts.

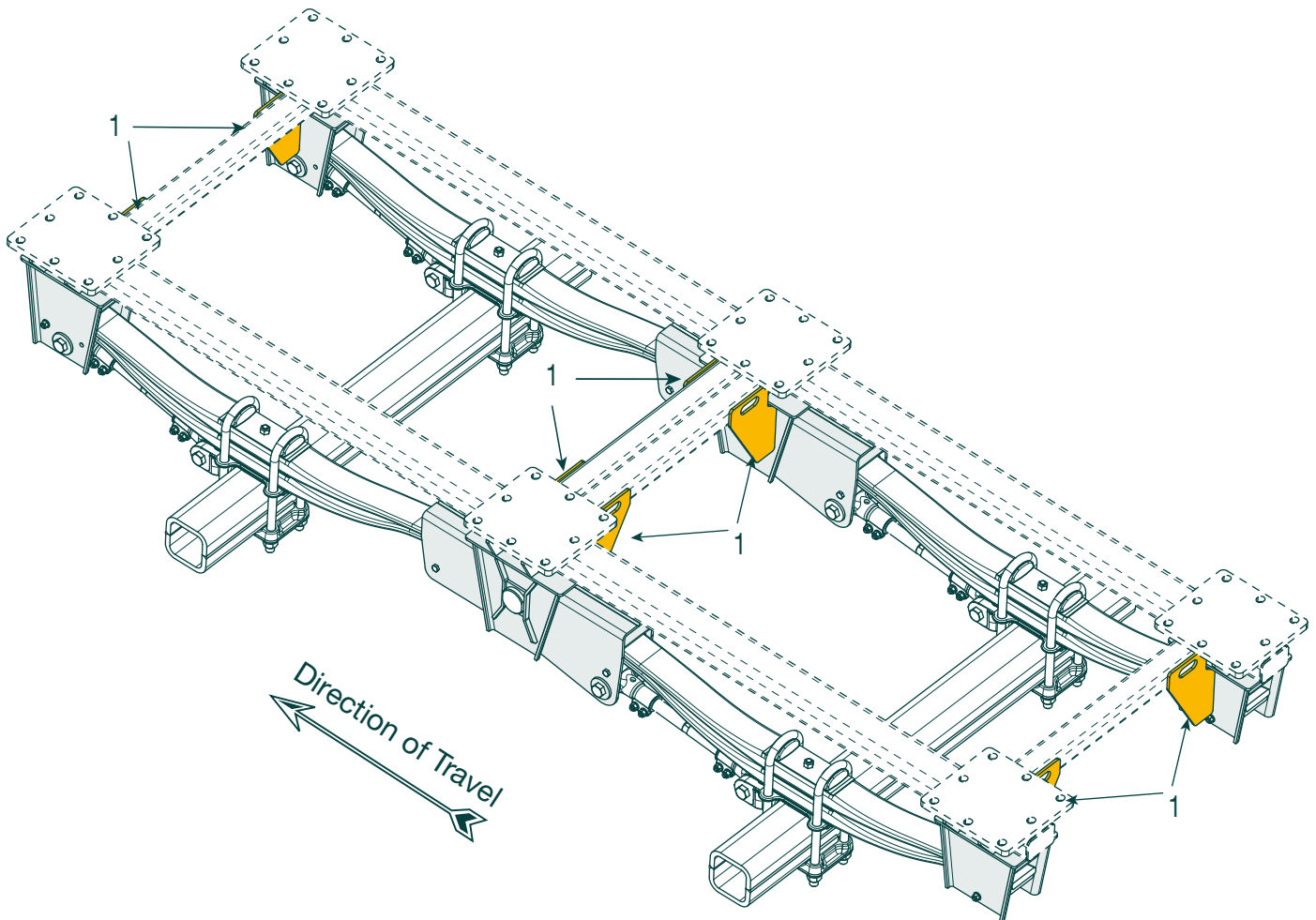


Reinforcement Instructions

3

General

The reinforcement instructions are solely to be understood as examples and component dimensions depend upon the respective vehicle type and its field of application.
This data is intended as a guide to be incorporated into the manufacturer's vehicle design.



① Gusset plates

The gusset plates do connect the supports with the cross-members and transmit transverse forces (e.g. turning). Suitable designs are described on the following pages.

4 Reinforcement Instructions for VB Suspensions

(is not supplied by BPW)

Example: reinforcement instructions for VB Tandem- and Tridem suspension.

Lateral reinforcement

BPW generally recommends bracing the supports. If these braces are not installed, the vehicle manufacturer must ensure that no impermissible stress peaks occur in the supports that could adversely affect the service life of the components.

The solutions presented here are merely suggestions, as the specific dimensions and designs depend on the vehicle. This information is known only to the vehicle manufacturer and has to be taken into account during the design process.

BPW recommends two different options:

1. Reinforcements between the supports:

BPW uses open profiles, such as U-profiles (see Figure 1.). Closed-section profiles should not be used as cross members (risk of cracks forming at the welded joints).
Recommended U-profile dimensions: 60 x 60 x 5 mm.

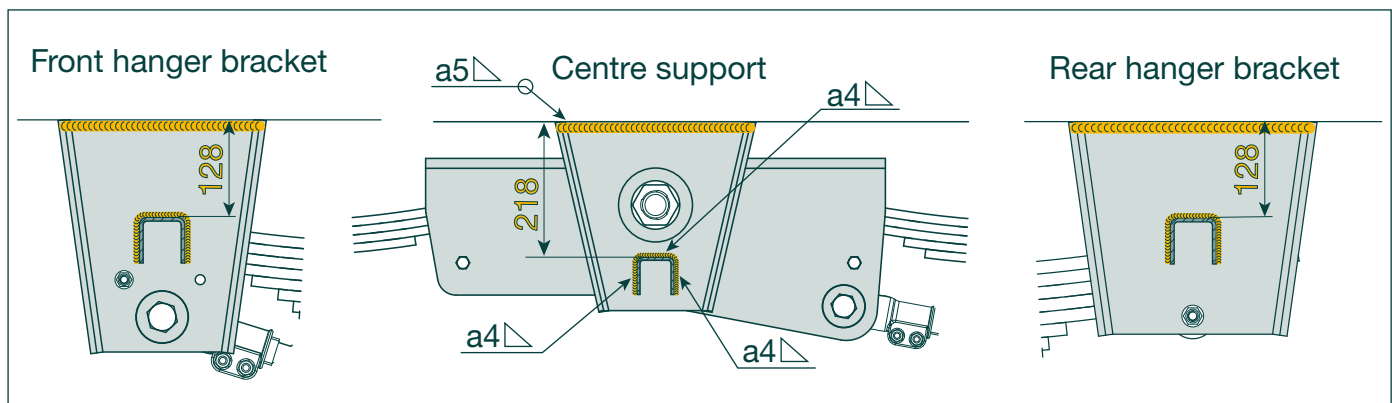


Figure 1: The correct position of the U-profile reinforcements.

When welding, the general regulations must be observed.

Functional surfaces free of weld spatter.

During all welding work, the leaf springs, steering cylinders, spring brackets, and plastic tubes must be protected from flying sparks and welding spatter.

The ground clamp must under no circumstances be attached to the leaf springs, spring U-bolts or hubs.

No welding of leaf springs!

Reinforcement Instructions for VB Suspensions

4

(is not supplied by BPW)

2. Hanger brackets with gusset plates:

If the reinforcements between the hanger brackets cannot be installed, gusset plates must be used (see Figure 2). Ideally, the cross-bracing of the chassis should be positioned above the supports. Recommended plate thickness: 8 mm.

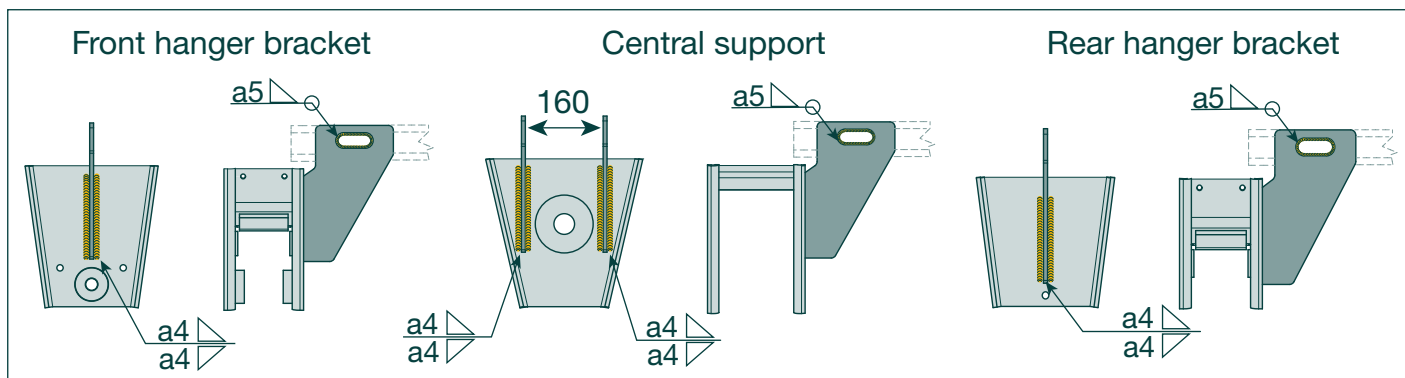
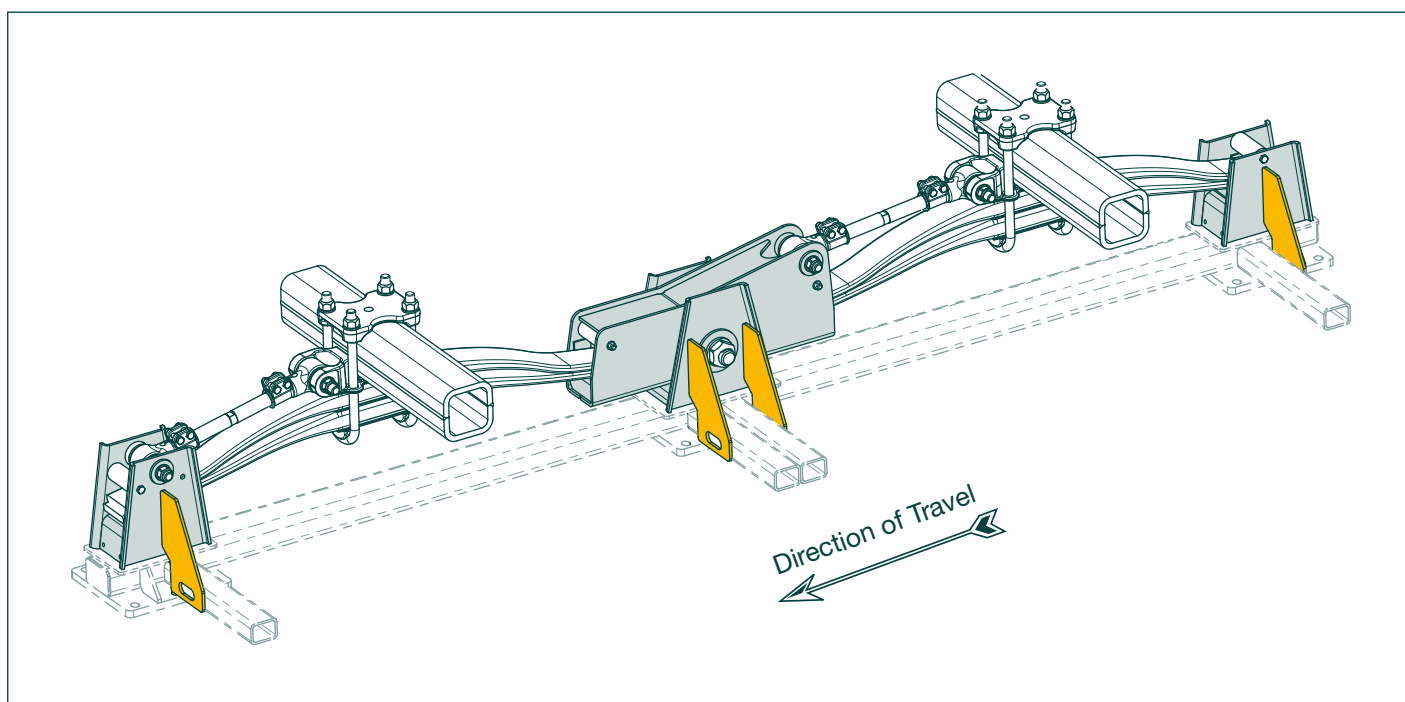


Figure 2: The correct position of the gusset plates.



5 Axle Body

5.1 Welding Guidelines for the Axle Body

General

When installing trailer axles, it may be necessary to weld components to the axle bodies afterwards. BPW axles are made of weldable material. The axle bodies do not need to be preheated before welding. The payload capacity and proper operation of BPW axles are not affected by welding work, provided the following points are observed.

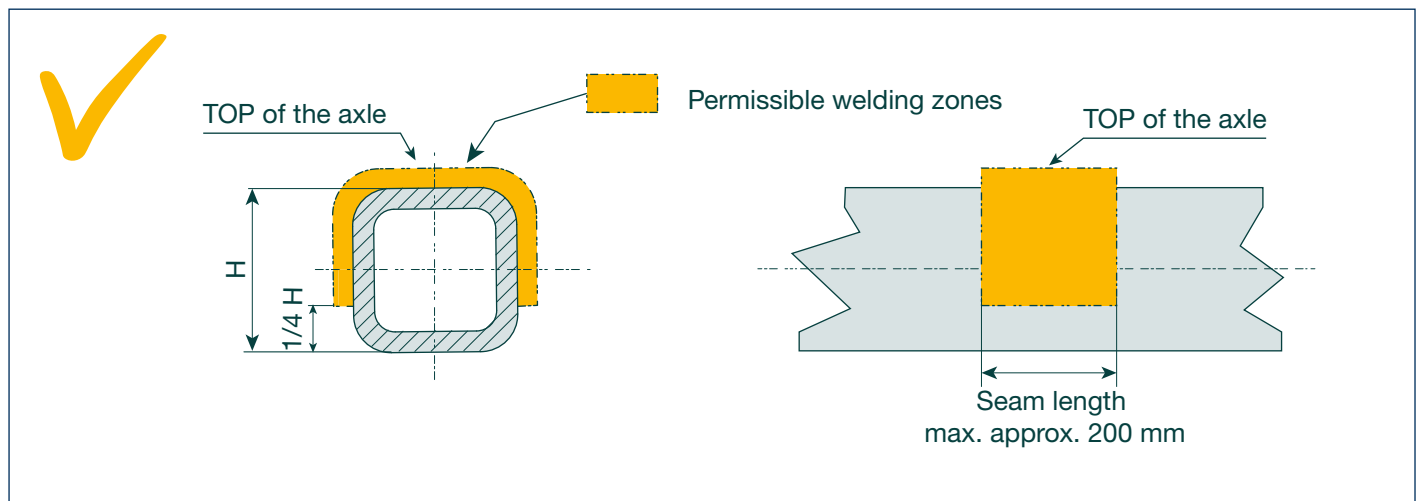
Welding processes

Inert gas welding:

- ⊙ Welding wire quality G 4 SI 1 – EN ISO 14341-A

Manual arc welding:

- ⊙ Rod electrodes E 46 5 B 32 H 5 -EN ISO 2560-A
- ⊙ Mechanical quality values must correspond to the basic material S 420 or S 355 J 2.
- ⊙ Single sided fillet weld:
Seam quality according to DIN EN ISO 5817
Sheet thickness 6 mm → Weld thickness a4 ▽
Sheet thickness 8 mm → Weld thickness a6 ▽
- ⊙ Craters and undercutting not permitted!
- ⊙ Functional surfaces free of weld spatter.



Note:

Welding must not result in any impermissible changes to the camber and lateral direction of the axis. Therefore, it is absolutely essential to adhere to the welding zones and weld lengths (see sketch).

During all welding work, the springs, U-bolts and all other sensitive components must be protected from sparks and weld spatter.

Under no circumstances should the ground clamp be attached to the spring, U-bolt, or hub.

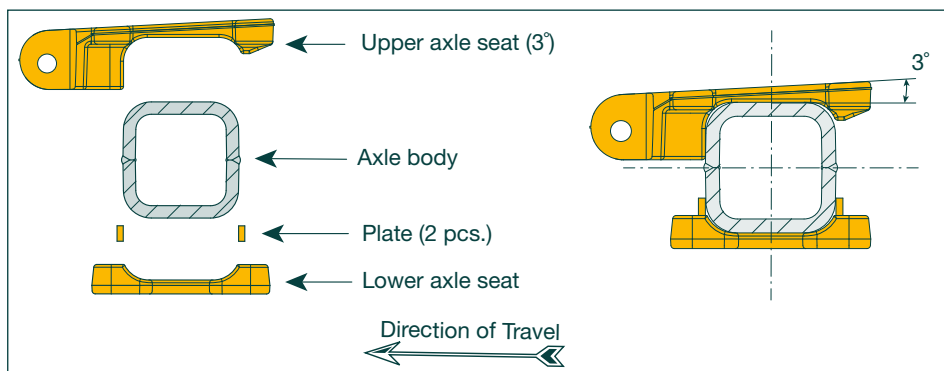
No welding of the springs!

Welding Guidelines for BPW Axle Seats 6

BPW axle seats with top-mounted VB suspension (axle mounting with spring bracket) 6.1

Components for axle clamping assembly:

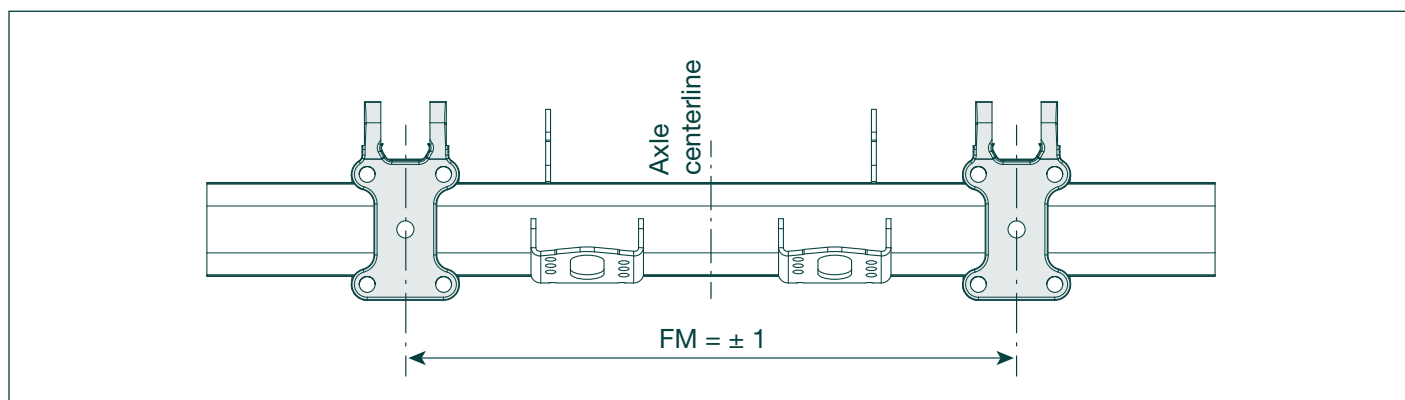
Axle seats with a 3° inclination are used for the axles. This design ensures optimal function and flawless steering behaviour of the steered axle.



Welding Guideline

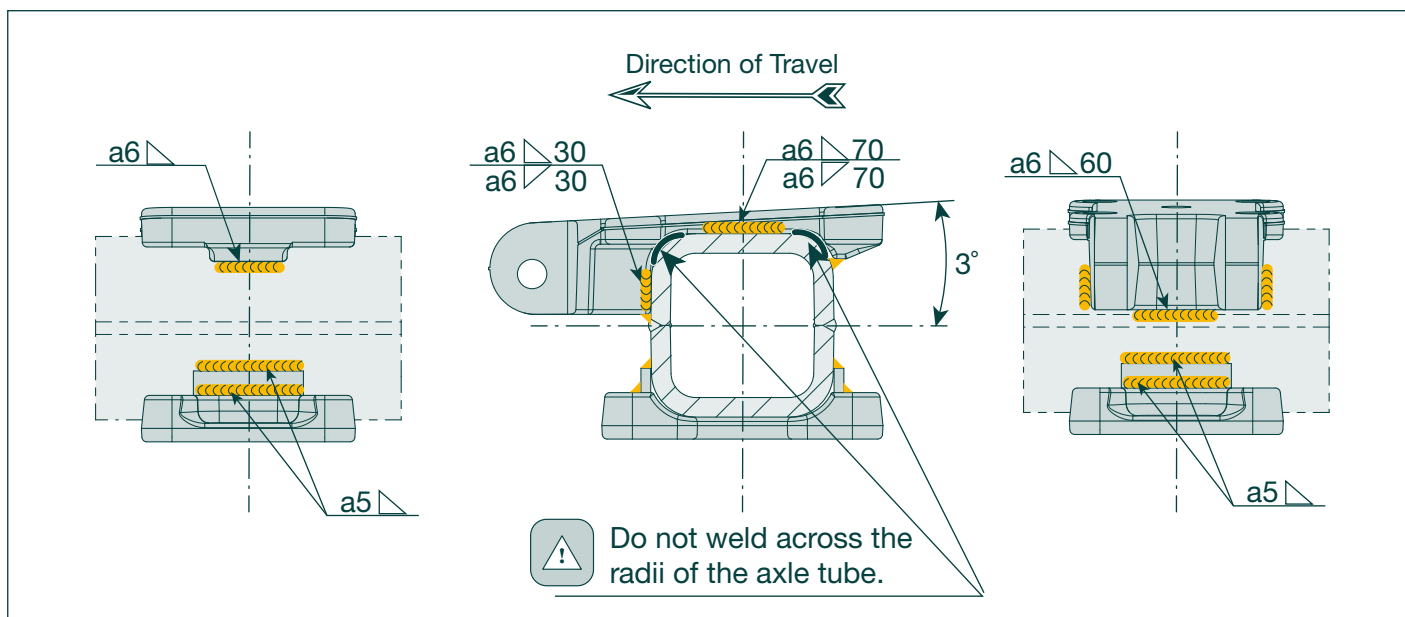
Ensure that sufficient clamping force is maintained between the axle beam and the axle seat during tack welding to prevent any clearance between the axle beam and the contact surfaces of the axle seat.

Specified tolerance for the center of the spring:



Welding sequence for axle attachment:

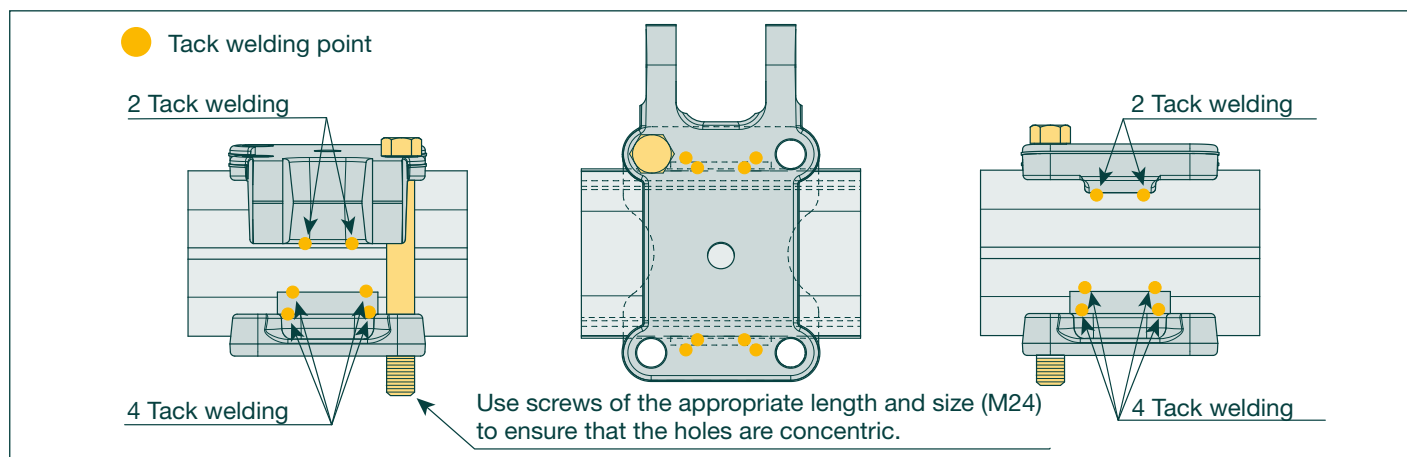
1. Tack weld upper axle pads, plates, and lower axle pads.
2. Welds between axle seats and axle body.
3. Welds between axle seats and plates.
4. Welds between plates and axle body.



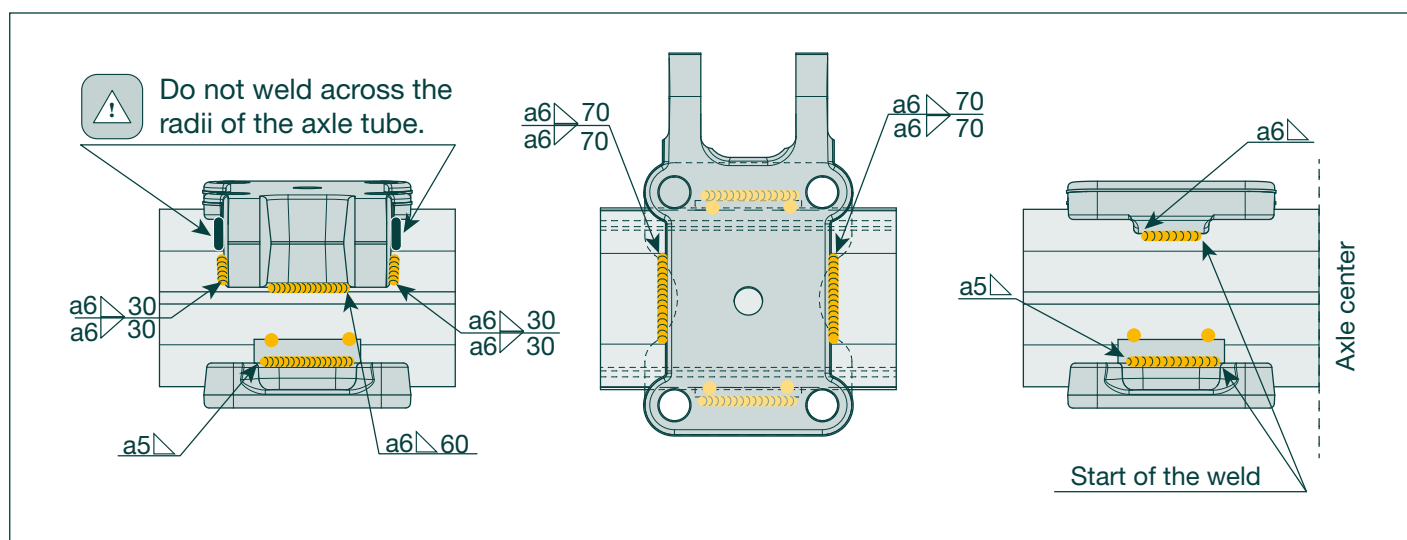
7 Welding Process for Axle Attachment

Welding methods for axle attachment:

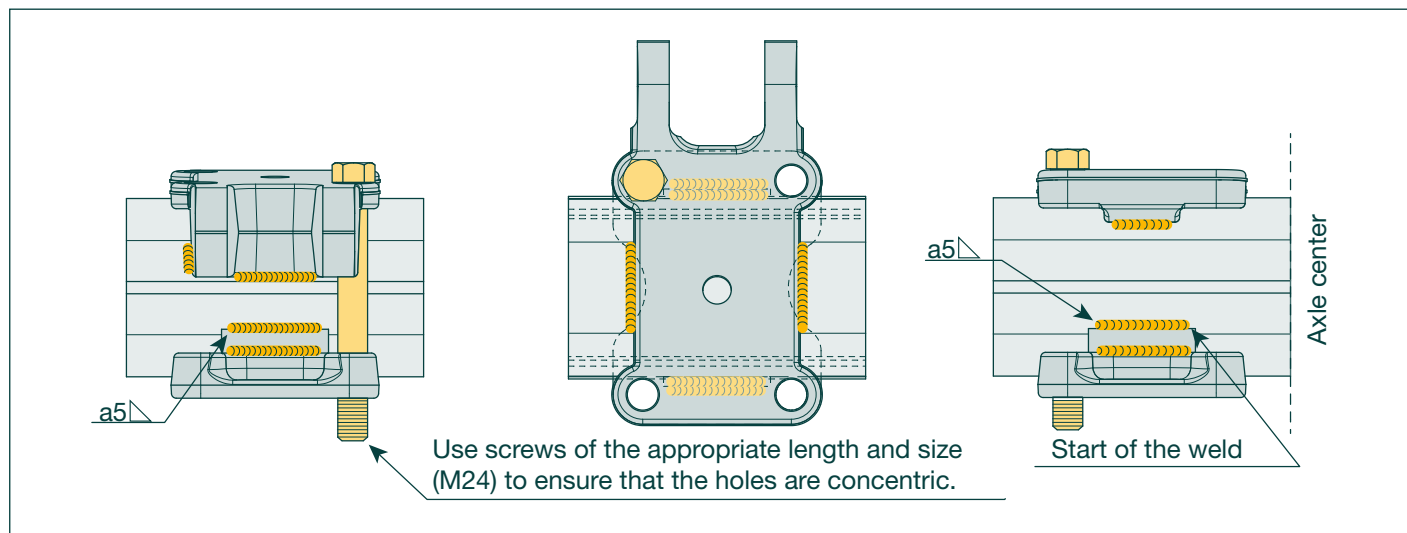
Step1:



Step 2:



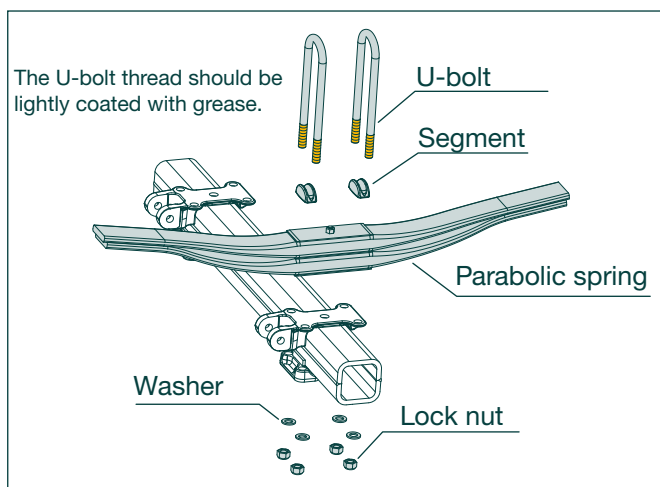
Step 3:



Installation Instructions for Axle Attachment

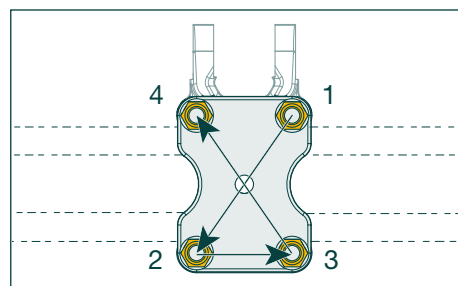
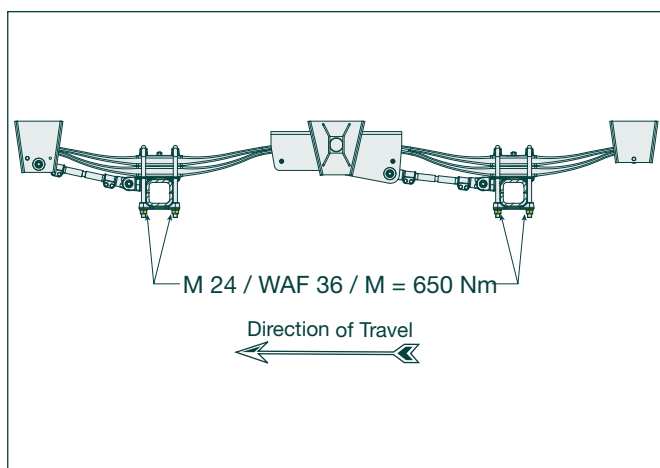
8

Top-mounted parabolic springs:



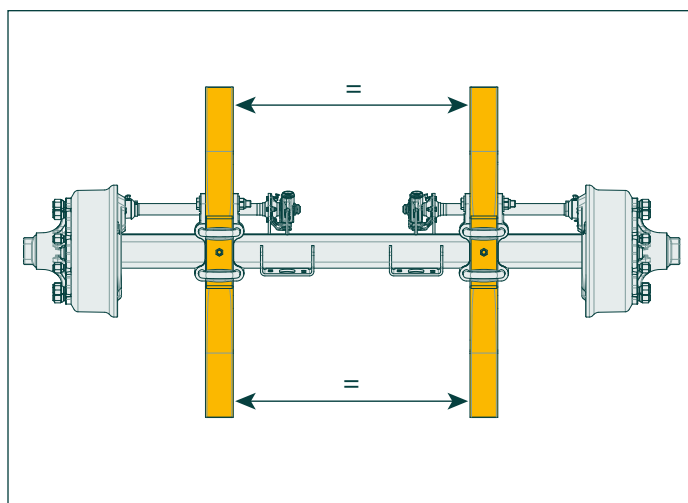
Instructions for fastening:

1. Place washer on U-bolt thread.
2. Lightly grease the U-bolt threads beforehand, then screw on the nuts.
3. Adjust the springs and tighten the lock nut crosswise in the sequence 1-2-3-4 to a tightening torque of 200 Nm.
4. Tighten the lock nut crosswise in the following steps until the final tightening torque of **650 Nm** is reached:
 1. 200 Nm
 2. 300 Nm
 3. 400 Nm
 4. 650 Nm
5. Thread ends must protrude evenly.



Instructions for fastening:

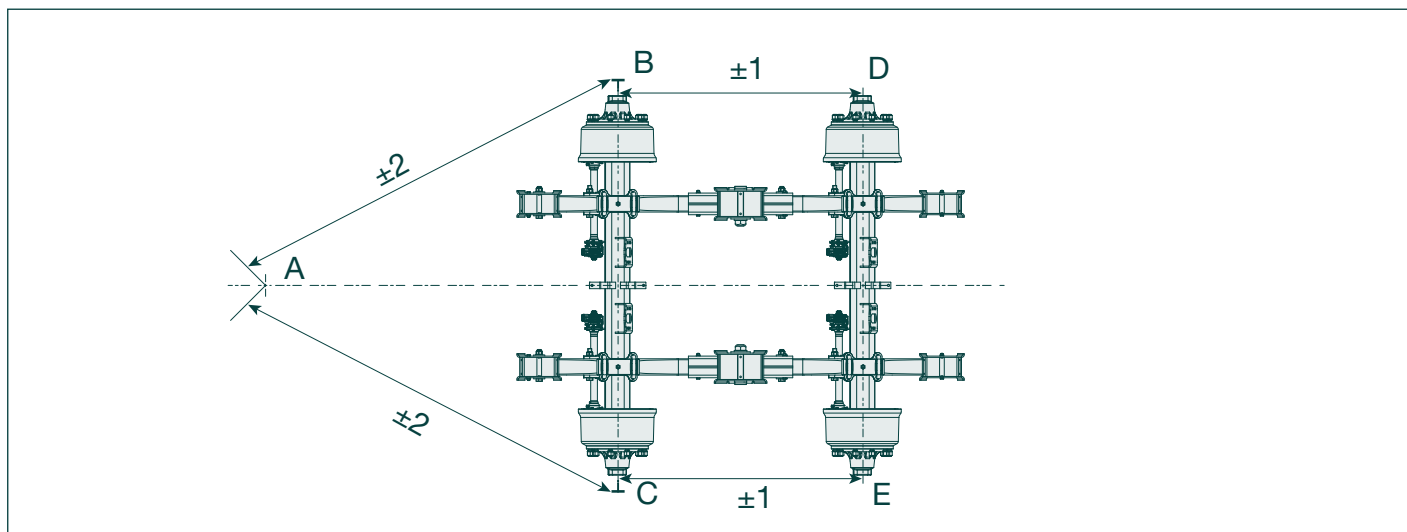
After tightening the lock nut, check the distance of the parabolic spring on both sides (in front of and behind the axle) and adjust if necessary.



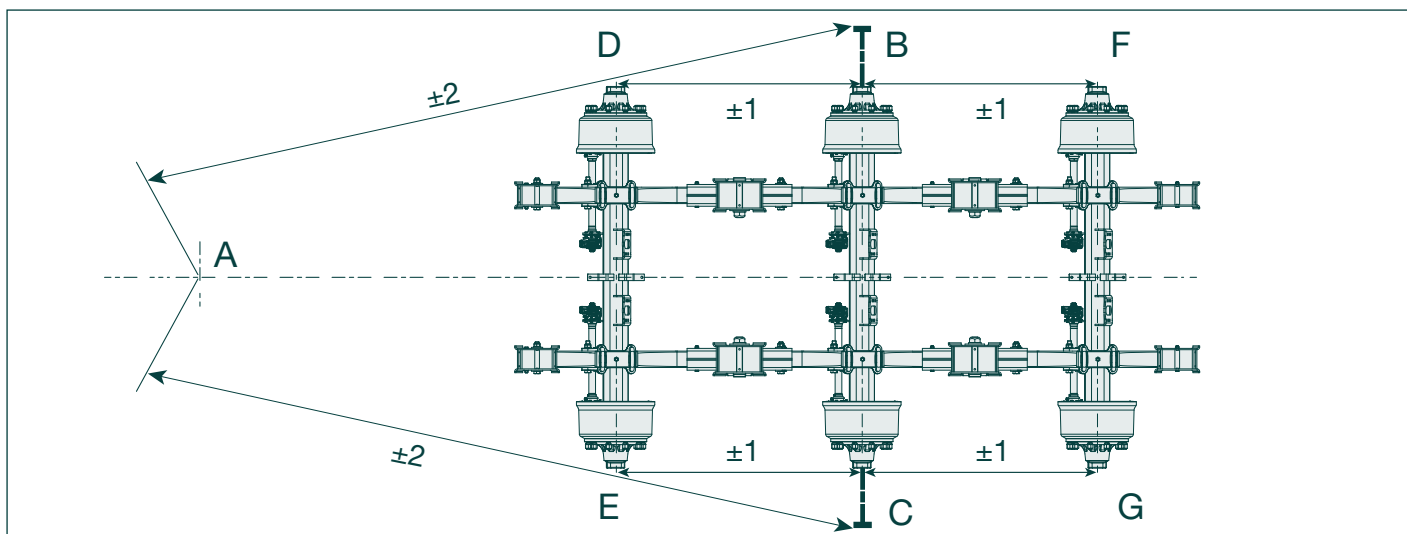
9 Tracking

9.1 Conventional Track Alignment Check

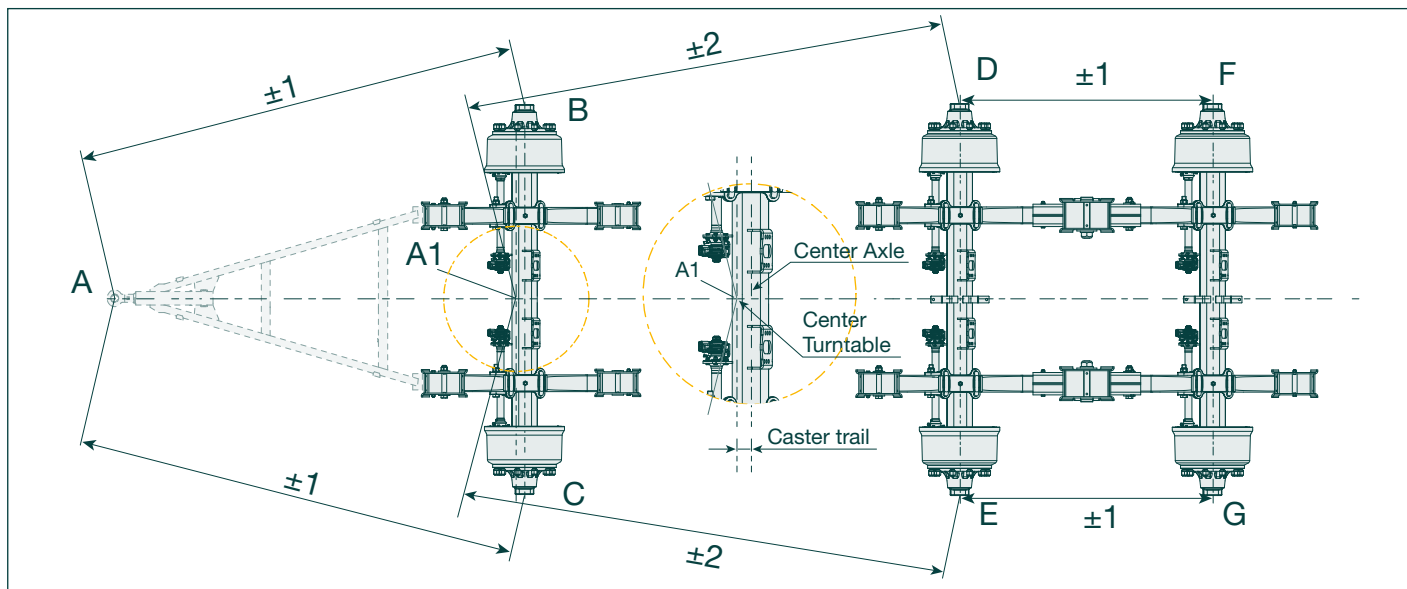
Tandem axle version:



Tridem axle version:



Turntable version:



Tracking 9

Conventional Track Alignment Check 9.1

To compensate for manufacturing tolerances, a track alignment check is recommended and if necessary adjustments made if required.

Tandem axle version

Determine the diagonal dimensions **A – B** and **A – C** for the front axle (reference axle) by comparative measurements and correct them if necessary. Check and, if necessary, correct wheelbase dimensions **B – D** and **C – E** for the rear axle.

Tridem axle version:

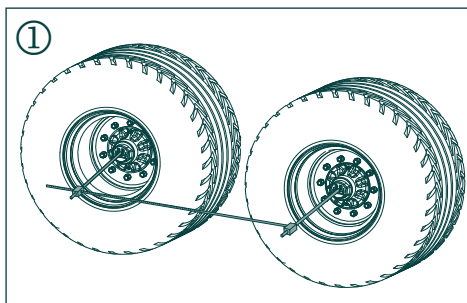
Determine the diagonal dimensions **A – B** and **A – C** or the middle axle (reference axle) by comparative measurements and correct them if necessary. Check and, if necessary, correct wheelbase dimensions **B – D** and **C – E** for the front axle and **B – F** and **C – G** for the rear axle.

Turntable version:

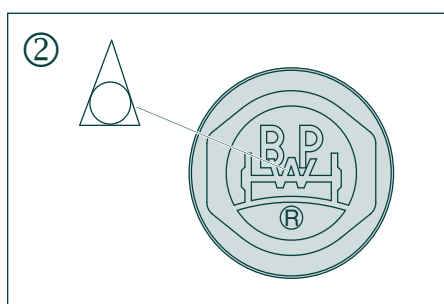
Determine the diagonal dimensions **A–B** and **A–C** for the front axle (reference axle) by taking comparative measurements and correct them if necessary. Determine the diagonal dimensions **A1–D** and **A1–E** for the center axle by taking comparative measurements and correct them if necessary. Check the wheelbase dimensions **D–F** and **E–G** for the rear axle and correct them if necessary.

Measurements are generally taken at the center of the hub cap (Fig. 1).

It can also be carried out using suitable distancing devices or screwed-on calibration tubes.



The triangle in the BPW logo is centrally located and suitable for holding a measuring instrument (Fig. 2).



Note:

The track tolerances specified by BPW, must be adhered to. Only adherence to these tolerances guarantees low-wear operation of the vehicle.

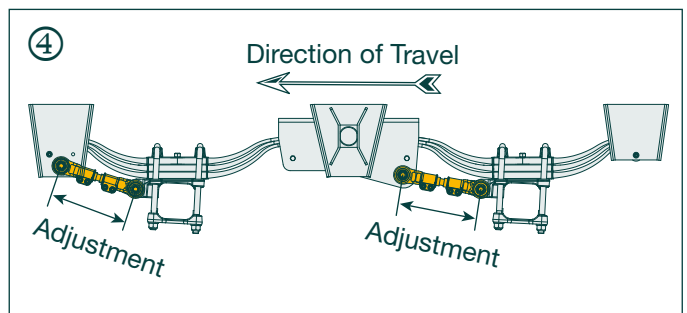
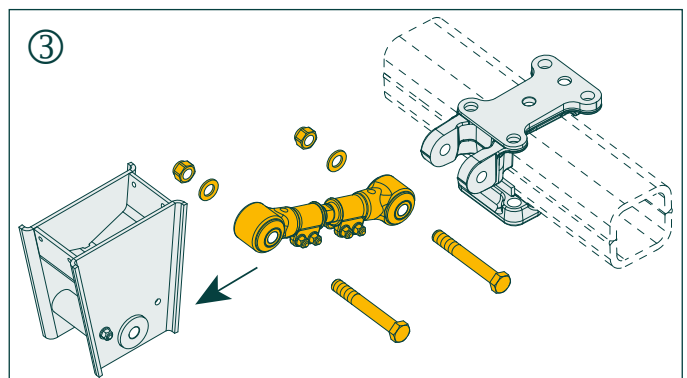
On steering axles, the track width is set at the factory; the tie-rod must not be adjusted.

Track alignment correction

The assemblies or axles use two adjustable torque rods. The adjustable torque rods on both sides make it easy to align the unit axles.

Adjust wheel alignment:

1. Raise and support the vehicle frame.
2. Loosen the M 12 lock nut on the clamping connections of the torque rod (Fig. 3).
3. Align the front axle first, then the other axles.
4. Align the axle by turning the adjusting spindle (left-right thread) (Fig. 4).
5. Tighten the M 12 lock nut to the specified tightening torque.
M 12 (SW 19) M = 66 Nm
6. Remove the supports from under the vehicle



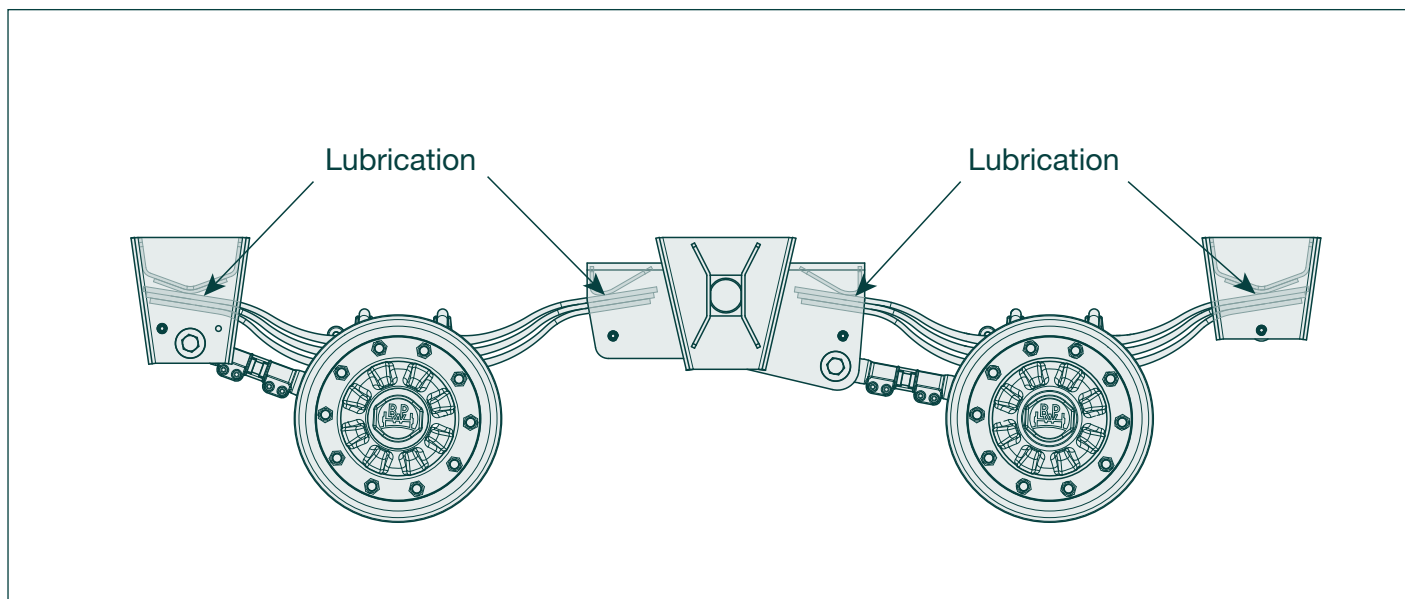
10 Tightening Torque / Lubrication Point

10.1 Lubrication Point

During initial installation, all lubrication points must be lubricated:

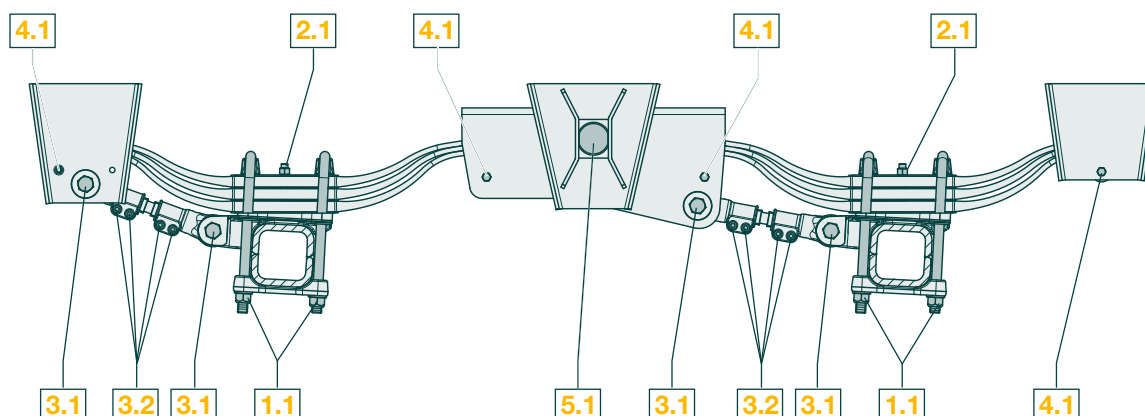
- ① Ends of the leaf springs and corresponding sliding seats in the suspension structure (fixed brackets and equalising beam)
- ① Lubricate the pivot pins in the equalising beams

Overview of Lubrication



Tightening Torque / Lubrication Point 10

Tightening Torque 10.2



Area	Item	Fastening	Thread	WAF	Tightening Torque
1 Federbügel					
	1.1	U-bolt ¹	M 24 - 8,8	36	650 Nm
2 Leaf Springs					
	2.1	Spring screw	M 16	24	163 Nm
3 Torque Rod					
	3.1	Lock nut of the axle linkage (Torque rod)	M 24 x 2	36	650 Nm
	3.2	Clamping screws on the torque rods	M 12	19	66 Nm
4 Sliding Pieces / Holders					
	4.1	Fastening sliding pieces	M 12	19	66 Nm
5 Equalising beam bearing					
	5.1	Lock nut of the equalising beam bearing	M 42 x 3	65	800 Nm
6 Wheel nuts					
		Wheel nuts - Stud centering	M 22 x 1,5	32	510 Nm
		Wheel nuts - Mixed centering	M 22 x 1,5	32	630 Nm

¹ Lightly lubricate the threads of the U-bolts and the nut seating surface with grease.



Attention!

Visual inspection of all components for damage after the first 500 operating hours and every 1,500 operating hours.

Check axle alignment after the first 10 km driven under full load.



BPW EA-VB 57232601e

BPW is a globally leading manufacturer of intelligent running gear systems for trailers and semi-trailers. As an international mobility and system partner, we offer a wide range of solutions for the transport industry from a single source, from axle to suspension and brake to user-friendly telematics applications. We thereby ensure outstanding transparency in loading and transport processes and facilitate efficient fleet management. Today, the well-established brand represents an international corporation with a wide product and service portfolio for the commercial vehicle industry. Offering running gear systems, telematics, lighting systems, composite solutions and trailer superstructures, BPW is the right system partner for automotive manufacturers.

BPW, the owner-operated company, consistently pursues one target: To always give you exactly the solution which will pay off. To this end, we focus our attention on uncompromising quality for high reliability and service life, weight and time-saving concepts for low operating and maintenance costs as well as personal customer service and a close-knit service network for quick and direct support. You can be sure that with your international mobility partner BPW, you always use the most efficient method.

Your partner on the path to economic viability



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