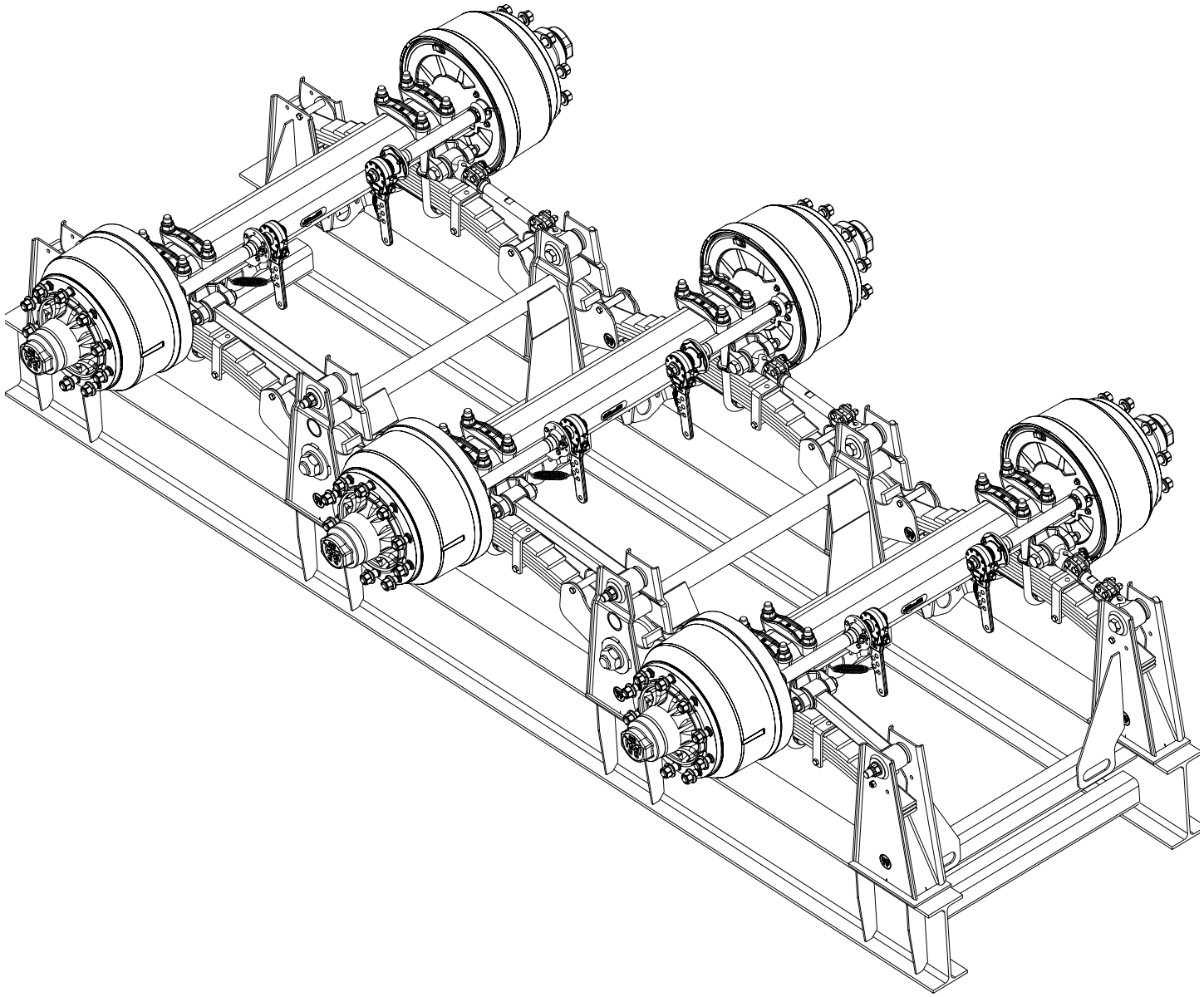


Installation instructions

Mechanical suspension (VB)

BPW-II-VBIN

we think transport
हमारी सोच परिवहन

Contents

Released on: 01.03.2022
2nd Revision

Subject to change (without notice).
Current version and additional information can be found online at www.bpw.in.

Information on the content:

In these installation instructions for BPW mechanical suspension (type VB), we would like to outline the technical design guidelines and provide suggestions for the installation.

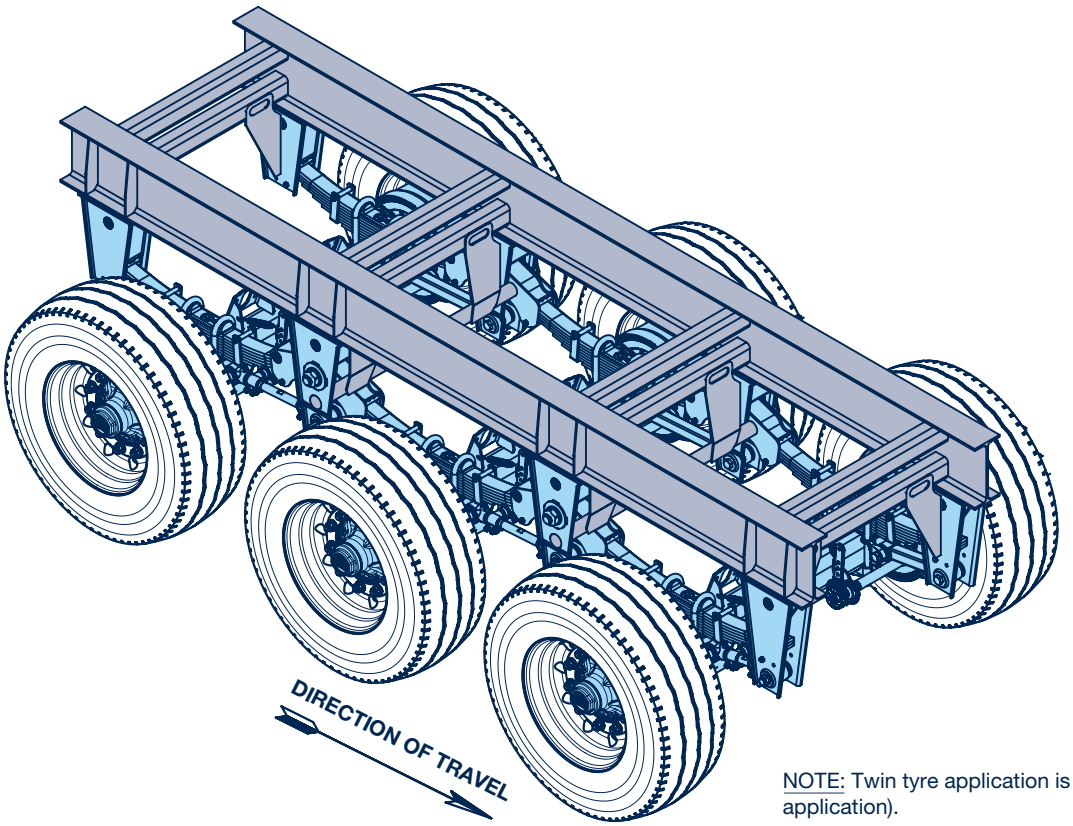
Please note that the drawings accompanying these recommendations should be considered as examples and that dimensions depend exclusively on the vehicle type and its operating conditions.

Those details are known by the vehicle manufacturer and must be considered.

The safety factors for the 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 provided by BPW.

The warranty shall lapse if installation of the BPW system does not correspond with the BPW installation instructions.



NOTE: Twin tyre application is possible (figure shows single tyre application).

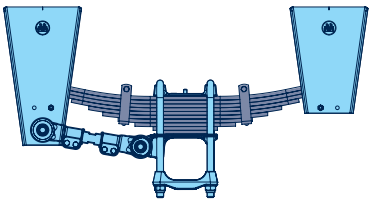
2 General Information

Type of suspension models

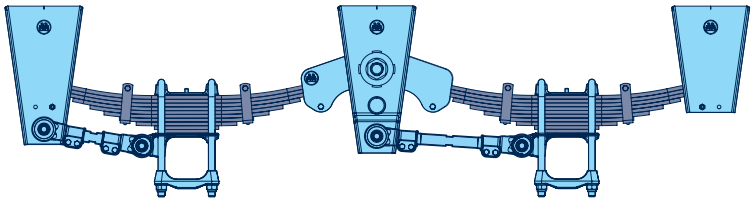
- Available with multi-leaf springs for axle loads upto 12 t.
- Deployable with one to three axles.
- Static axle load equalisation via equalising beams.
- Equalising beams supplied with maintenance-free steel-rubber bushes.
- Low-wear, replaceable spring wear pad.
- Precise axle-guidance through horizontally arranged connecting rods.
- Easy axle tracking through one rigid and one adjustable connecting rod per axle.
- Connecting rods supplied with maintenance-free steel-rubber bushes.
- Supports with high weldability.

Single Suspension

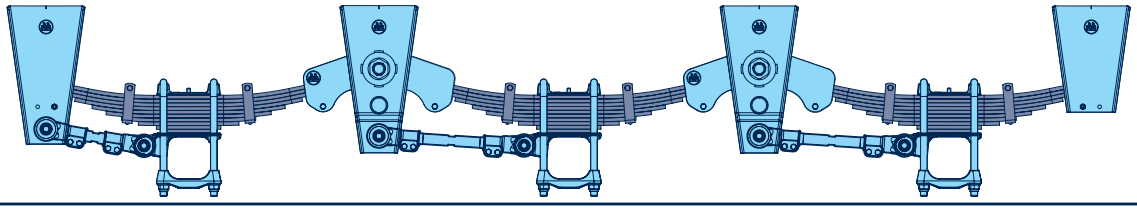
DIRECTION OF TRAVEL



Tandem Suspension



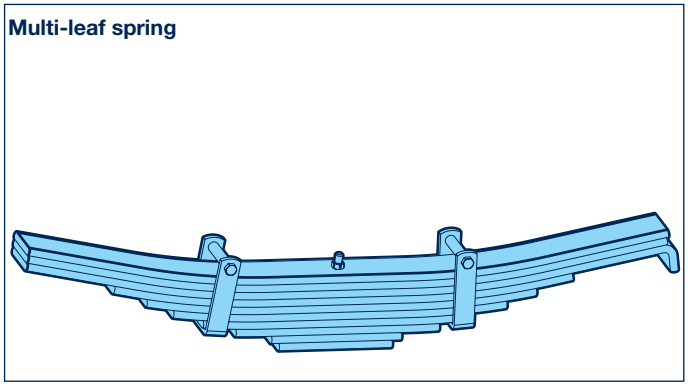
Tridem Suspension



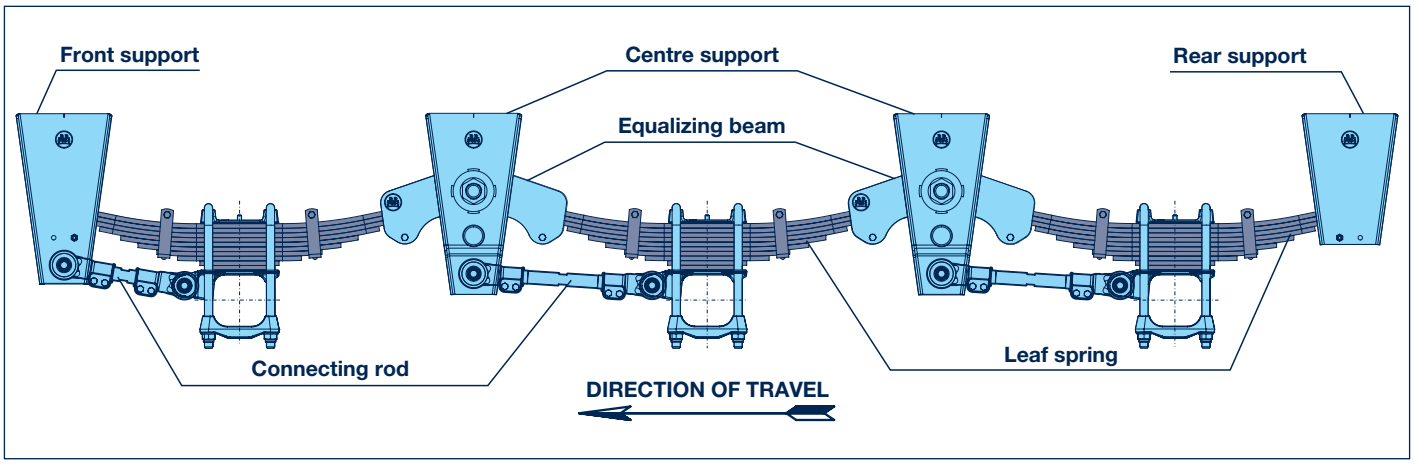
Function

BPW mechanical suspension units (type VB) are fitted with multi-leaf springs. They are robust and have good emergency running properties, while it is also easy to replace individual spring layers. The multi-leaf spring is guided through wear pads in the support (and equalizing beam). Those wear pads reduce the downtime while servicing.

The axles are guided by separate connecting rods, which are adjustable to enable a precise wheel alignment.



BPW multi-leaf spring suspensions have in-built self-dampening and do not require additional shock absorbers.



2 General Information

Features

General

BPW mechanical suspension (type VB) units can be installed as multi-axle running gears. The axles are connected to the vehicle frame by connecting rods, supports and equalising beams.

Longitudinal forces

Longitudinal forces are transmitted by connecting rods between the axle and supports. Thanks to their horizontal arrangement, BPW connecting rods guarantee precise axle guidance for minimal tyre wear.

Vertical forces

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

Transverse forces

The transverse forces are exclusively transmitted into the vehicle frame via the supports. They are reinforced to reduce the permissible torsion loads of the frame's longitudinal beam.

Additional features

Further features and system solutions can be provided by BPW.

Your BPW contact partner will be glad to answer any further questions you may have.

Welding:

- For all welding activities, the springs, U-Bolt and all other sensitive components must be protected against flying sparks and welding spatter.
- Do not attach the earth terminal to the leaf springs, U-bolts or wheel hubs.
- No welding at leaf springs!
- It is not permitted for the supports to be heated for straightening work!
- Use new bolts and lock nuts when changing the supports.

Welding method:

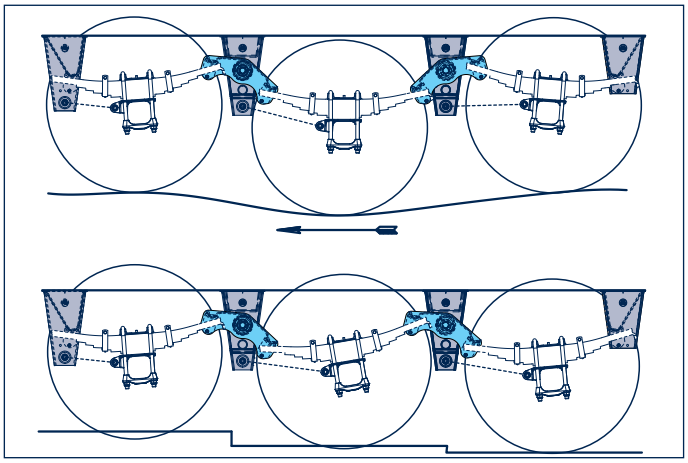
- Inert gas welding
  Welding wire quality G 4 Si 1 (DIN EN 440)
- Manual arc welding
  Rod electrodes E 46 2 (DIN EN 499)

Mechanical quality values must be equivalent to basic material S420, S355J2 (St 52-3) or BSK 46.

Avoid end cavities and undercutting!

Axle load

Multi-axle suspension units are equipped with oscillating equalizing beams. This guarantees an even load distribution in stationary and driving mode.

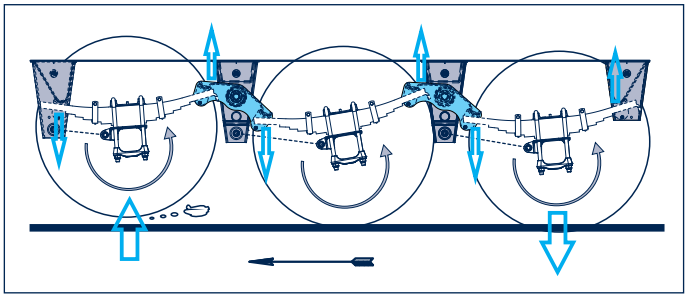


Brake load equalisation

Mechanical suspension systems (type VB) do not provide dynamic axle load equalisation. This results in an uneven load distribution while braking (axle load on the first axle decreases and axle load on the last axle increases).

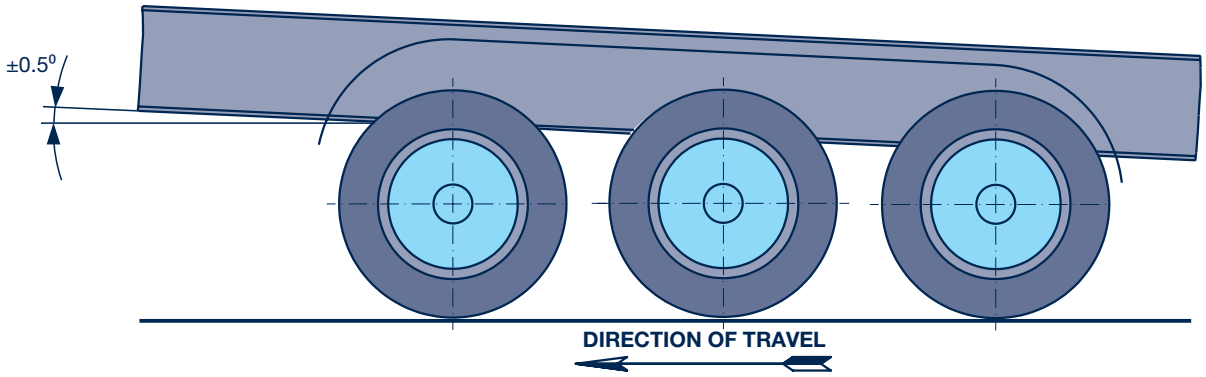
This can cause over-braking on the first axle in case all axles have the same brake settings (same brake chamber size and same slack adjuster lever length). Over-braking results in tire skidding and consequently in tire wear.

To avoid over-braking, the axles require different brake settings (different brake chamber sizes and/or different slack adjuster lever lengths). BPW is glad to provide a brake calculation for your vehicle configuration.



The following ABS configurations are recommended:

Tandem suspension	recommended	Front and rear axle	4S / 2M or 4S / 3M
	simplified	Front axle	2S / 2M
Tridem suspension (no steering axle)	recommended	Front and rear axle	4S / 2M or 4S / 3M
	simplified	Central axle	2S / 2M



Trailer inclination:

Due to the limited equalisation travel, the maximum body tilt of the semi-trailer may not exceed ± 0.5°.

Otherwise, axle loads increase on uneven terrain which may damage the components.

Axle load:

The specified axle load is a maximum value on the road up to 100 km/h. The axle load can be increased in case of lower maximum permitted speed:

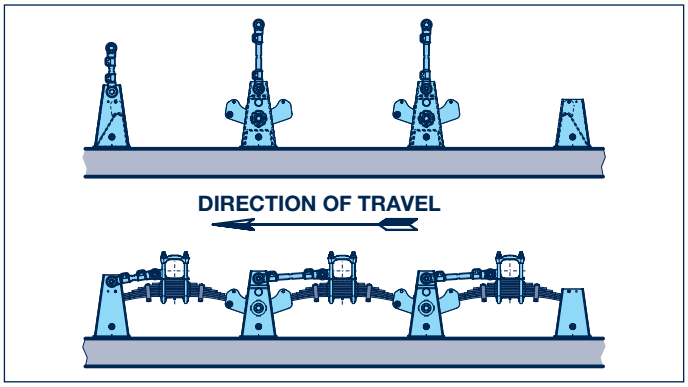
V max. 40 km/h + 10%
V max. 25 km/h + 25%
V max. 10 km/h + 40%

Reinforced multi-leaf springs must be used if the axle load increases by 10% or above.

3 Installation Guidelines

General

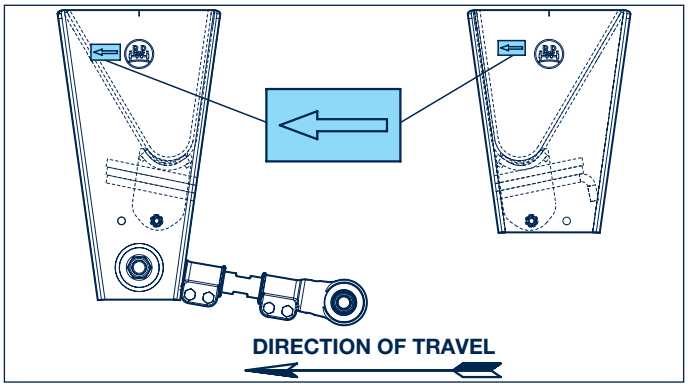
It is recommended to install running gears in upside down position. There must be a minimum gap of 30 mm between the chassis and the tyres. Track width, tyre dimensions and frame rail (e.g. I-beam) dimensions must be considered.



Support installation direction:

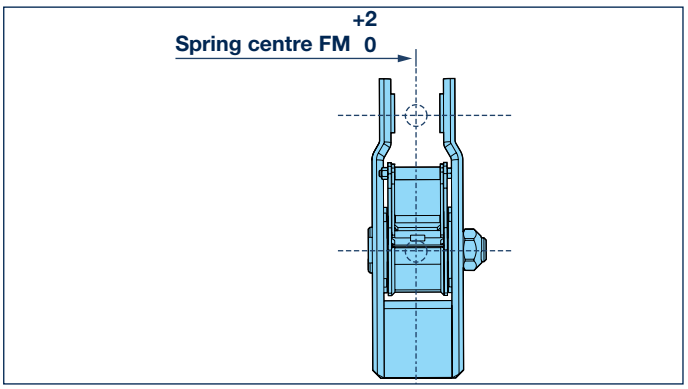
The front and the rear supports are unsymmetrical and must be installed according to the direction of travel.

The decal indicates the direction of travel.



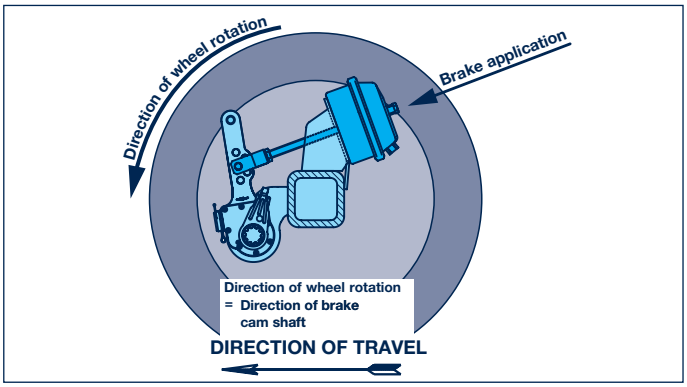
Spring centre:

The centre distance of the supports and the spring centre of the axle must match. To avoid tension in the axle unit, the tolerance range of the supports must be 0/+2. The wheel alignment has to be checked and corrected after installation of supports and axle.



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.

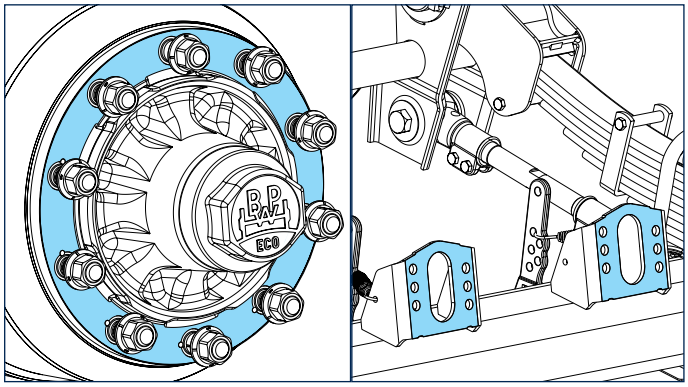


Painting:

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

- Contact surface of the brake cylinder and fixing nuts for non-assembled brake cylinders
- Wheel contact surfaces

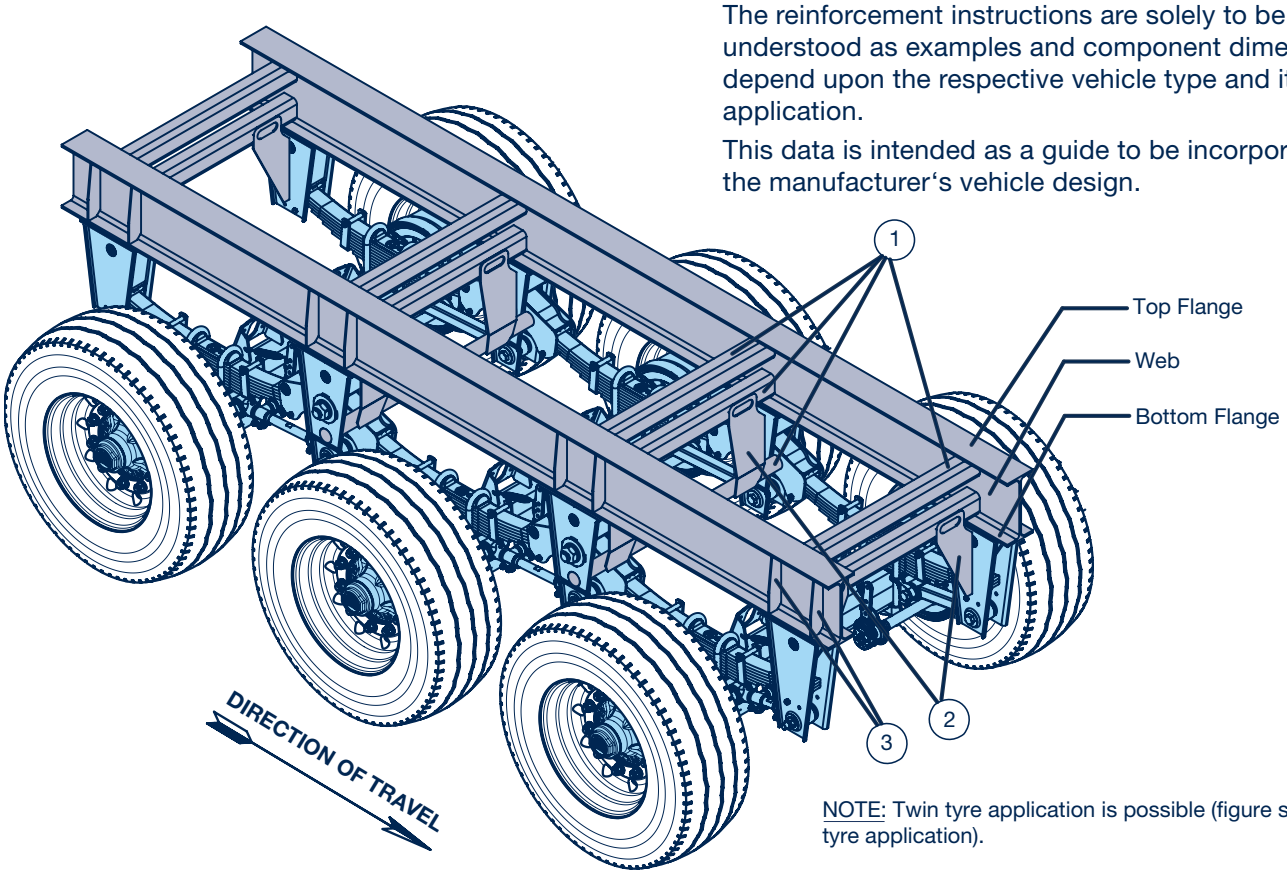
A maximum paint coat thickness of 30 µm must not be exceeded in the area of bolt contact surfaces.



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.



NOTE: Twin tyre application is possible (figure shows single tyre application).

① Crossmembers

Transverse forces (e.g. during cornering) are transmitted as bending forces via supports and reinforcement plates into the crossmembers. The crossmembers must be dimensioned accordingly.

Flexible vehicles (longitudinal torsion):
For such vehicles (e.g. flatbed, low loading or tipper) torsional flexible crossmembers (e.g. C-channel) must be used.

Rigid vehicles (longitudinal torsion):
For such vehicles (e.g. tankers, box trailer) torsional resistant crossmembers (e.g. box channel) must be used. The crossmembers should be connected to the frame rail (e.g. I-beam) via the web and not via the flange.

The reinforcement pipe between the centre supports must be always torsional resistant (flexible and rigid vehicles).

② Reinforcement plates

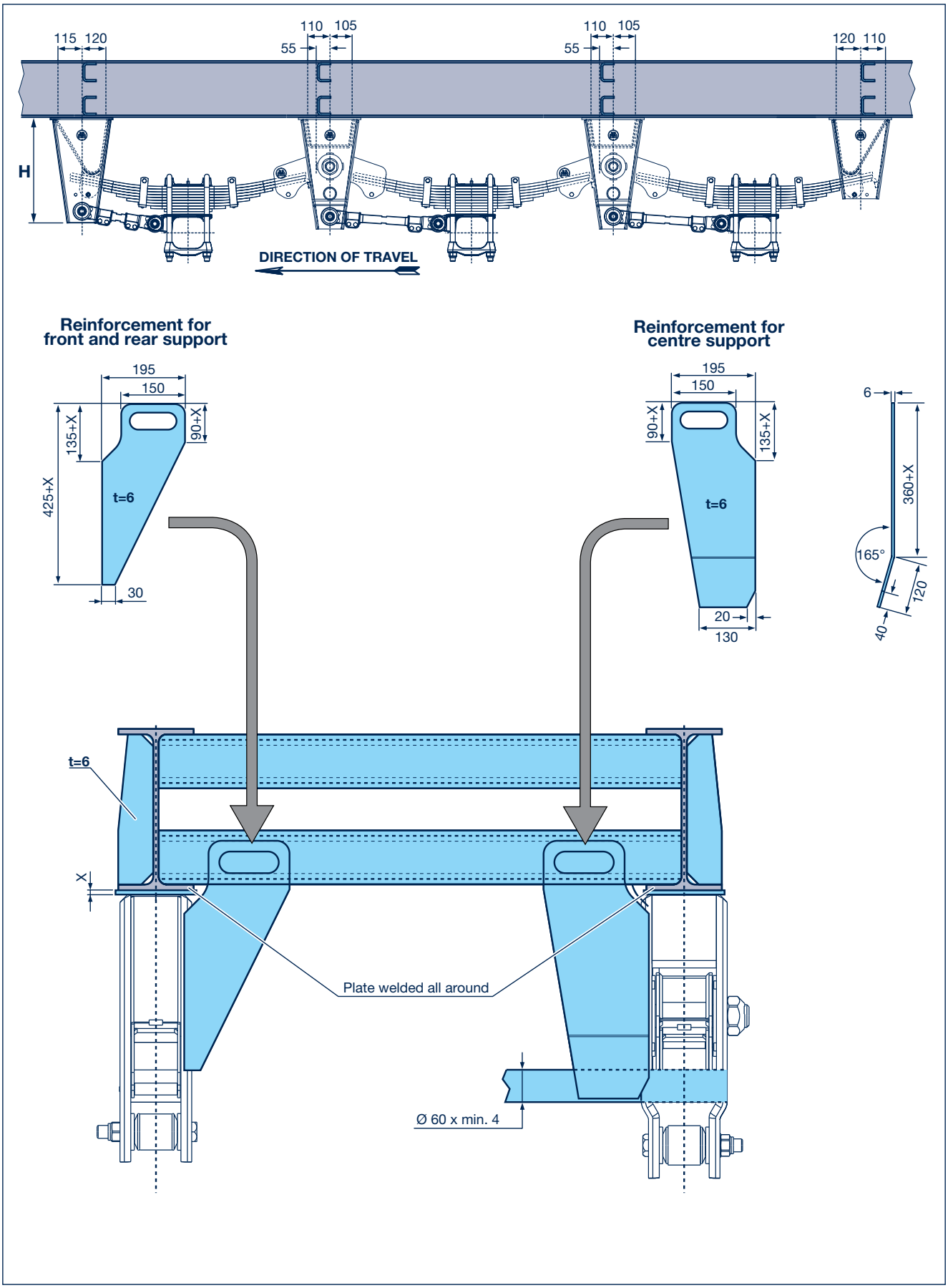
The reinforcement plates do connect the supports with the cross-members and transmit transverse forces (e.g. turning). Suitable designs are described on the following pages.

③ Vertical plates

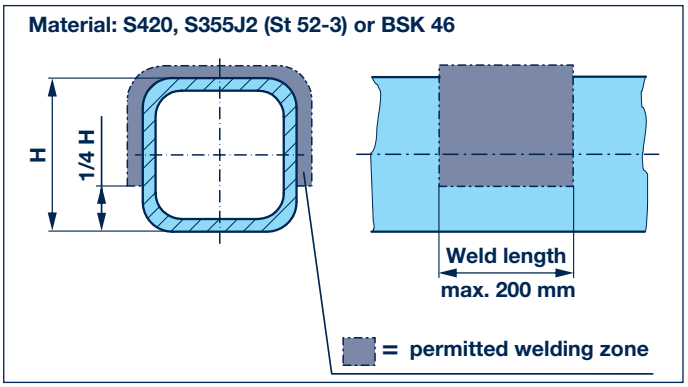
Vertical plates (e.g. ribs) are located above the supports and provide local reinforcement on the frame rails (e.g. I-beam).

4 Reinforcement Instructions

(is not supplied by BPW)



Welding Guidelines



General

When installing trailer axles, it may be necessary to subsequently weld components onto the axle beam.

BPW axles are therefore made of weldable material. The axle beams do not need to be heated prior to welding.

The load strength and perfect functioning of the BPW axles are not affected by welding work if the following points are observed.

Welding methods:

- Inert gas welding
  Welding wire quality G 4 Si 1 (DIN EN 440)
- Manual arc welding
  Rod electrodes E 46 2 (DIN EN 499)

Mechanical quality values must be equivalent to basic material S420, S355J2 (St 52-3) or BSK 46.

Avoid end cavities and undercutting!

IMPORTANT:

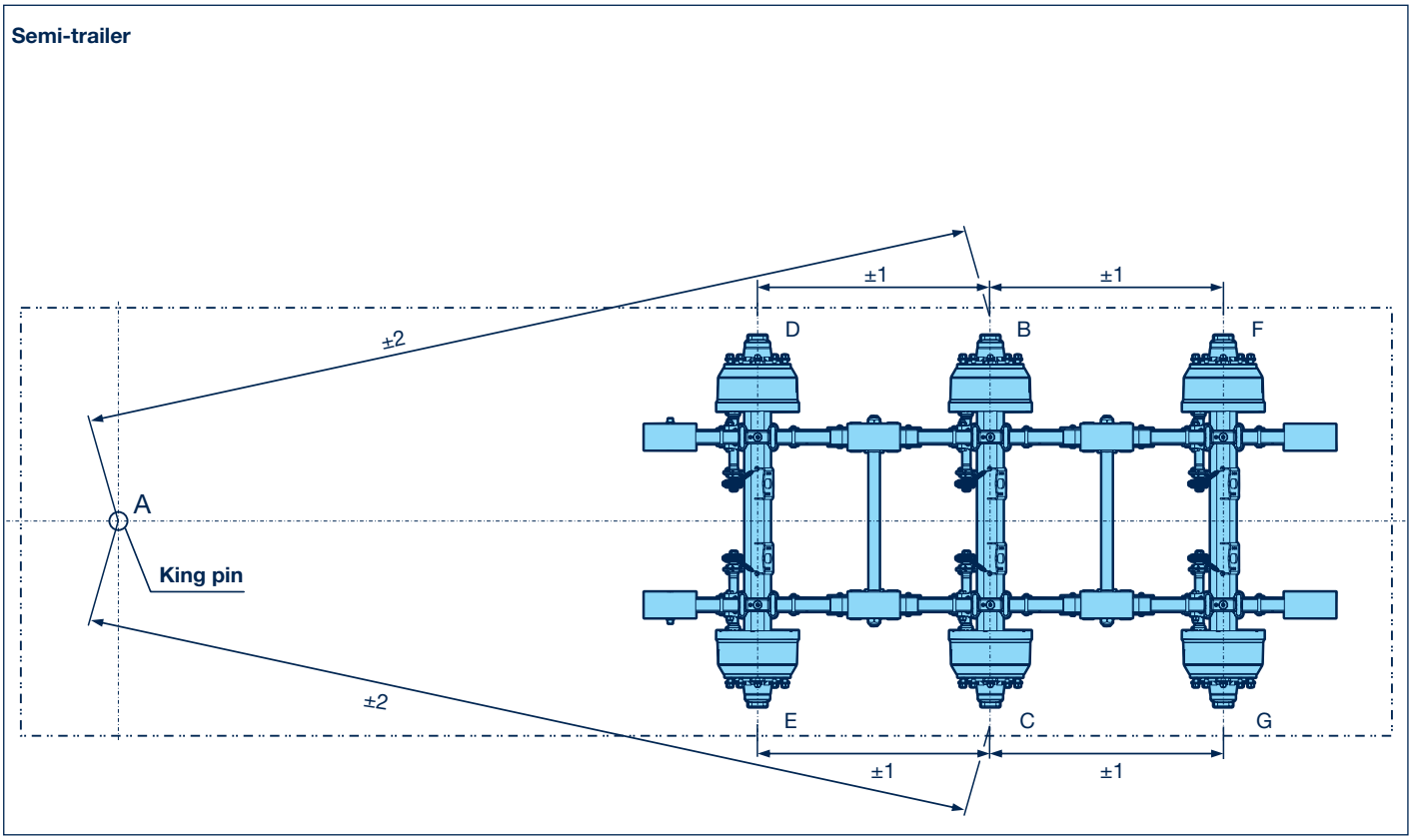
Above mentioned welding instructions have to be followed. Otherwise the camber and toe-in might change and affect the function of the axle.

Observe the welding zones and weld lengths shown in the adjacent diagram.

No welding in the tensile zone of the axle beam (bottom side).

6 Axle Alignment

6.1 Conventional system



To compensate manufacturing tolerances, an axle alignment check must be done before the vehicle starts to operate.

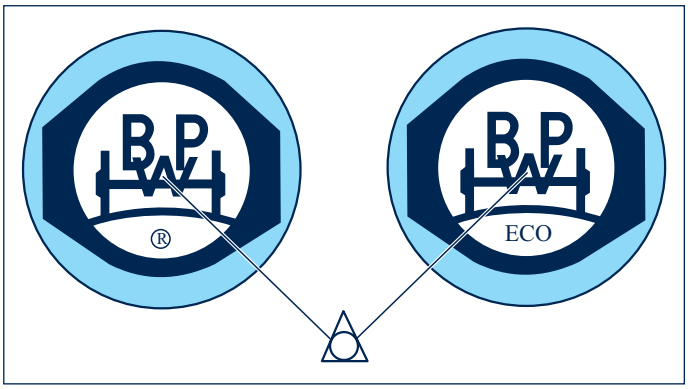
Semi-trailer:

Determine diagonal dimensions **A - B** and **A - C** for the centre axle (reference axle) using comparative measurements and correct if necessary.

Check wheel base measurements **B - D** and **C - E** for the front axle and **B - F** and **C - G** for the rear axle and correct if necessary.

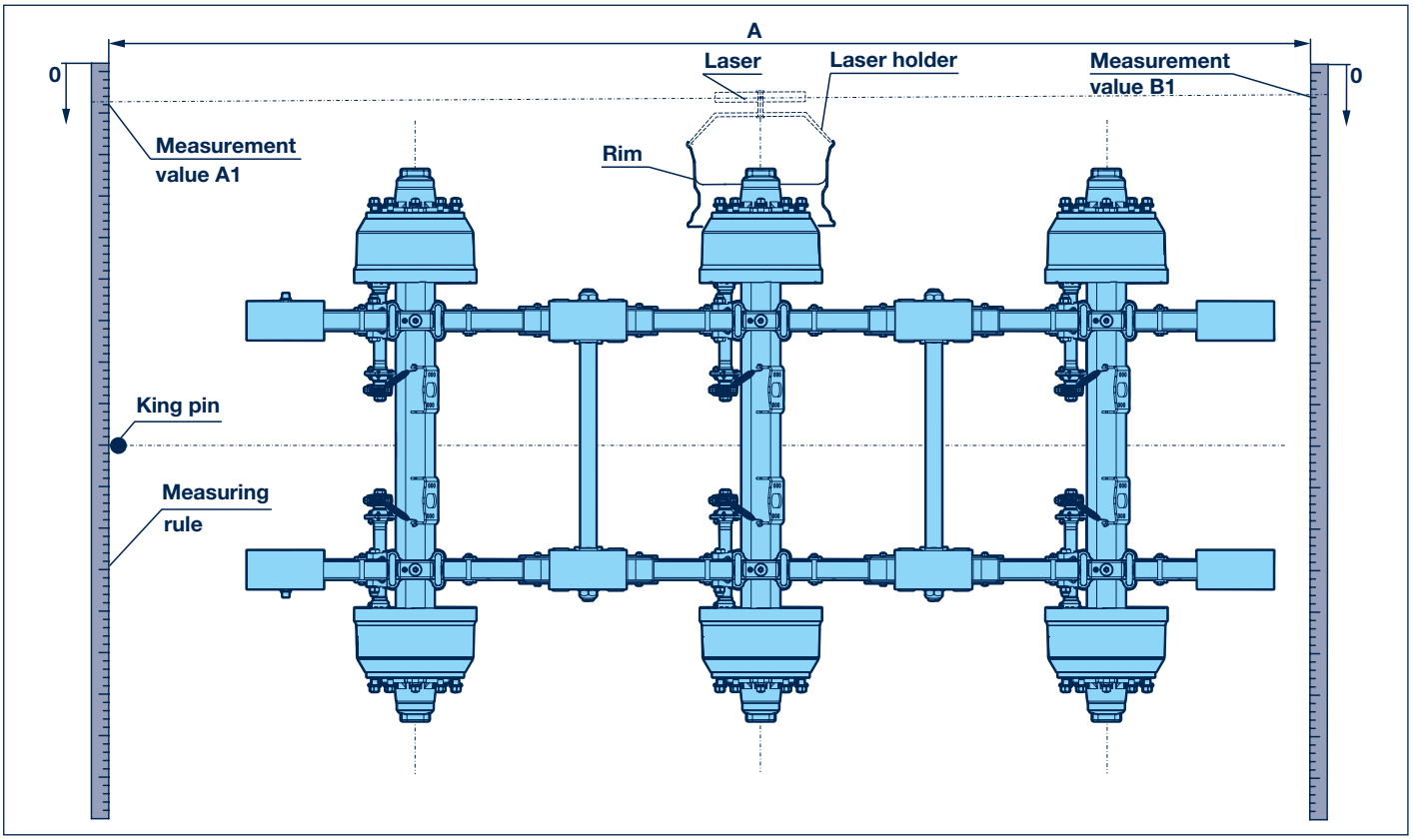
Measurements are generally taken from the centre of the hub cap (Fig.).

The triangle in the BPW logo is in the centre of the axle.



IMPORTANT:

The tracking tolerances defined by BPW must be maintained. Only by maintaining these tolerances, low-wear operation of the vehicle can be assured.



Make sure that the axle is aligned horizontally to the base, if a laser measuring system is used. Otherwise the camber values will affect the result.

The operating and setting instructions of the system manufacturer must be considered.

Calculation of the toe-in and toe-out settings:

$$\frac{\text{A1 - B1 (mm)}}{\text{A (m)}} = \text{track width}$$

Positive value = toe-in
Negative value = toe-out

The measurement must be performed on both sides of the axle. The measurement values are then added together.

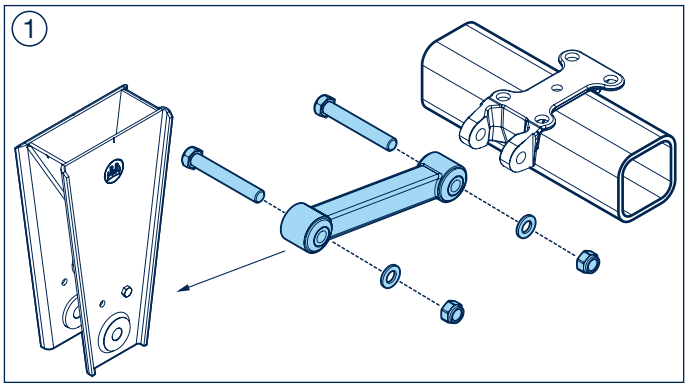
The Sum of values is the toe-in/toe-out value of the axle and must be within the permitted tolerance range (-1 to +5 mm/m).

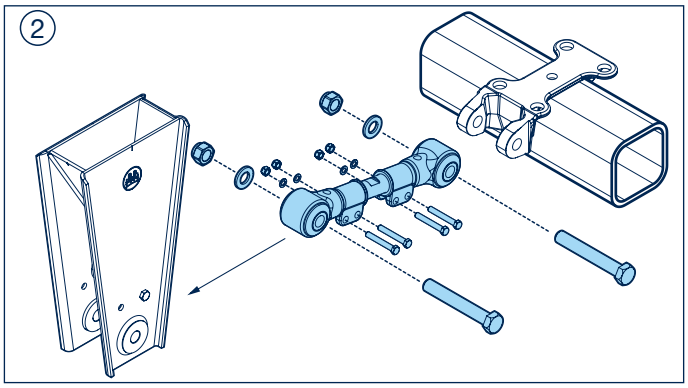
IMPORTANT:

The tracking tolerances defined by BPW must be maintained. Only by maintaining these tolerances, low-wear operation of the vehicle can be assured.

6 Axle Alignment

The maximum possible wheel base correction per axle is +/- 25 mm.



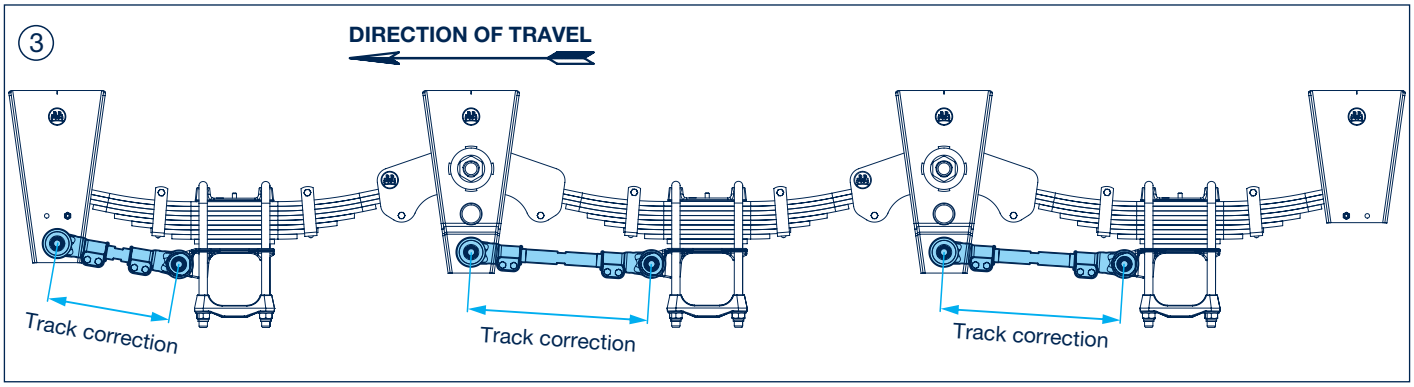


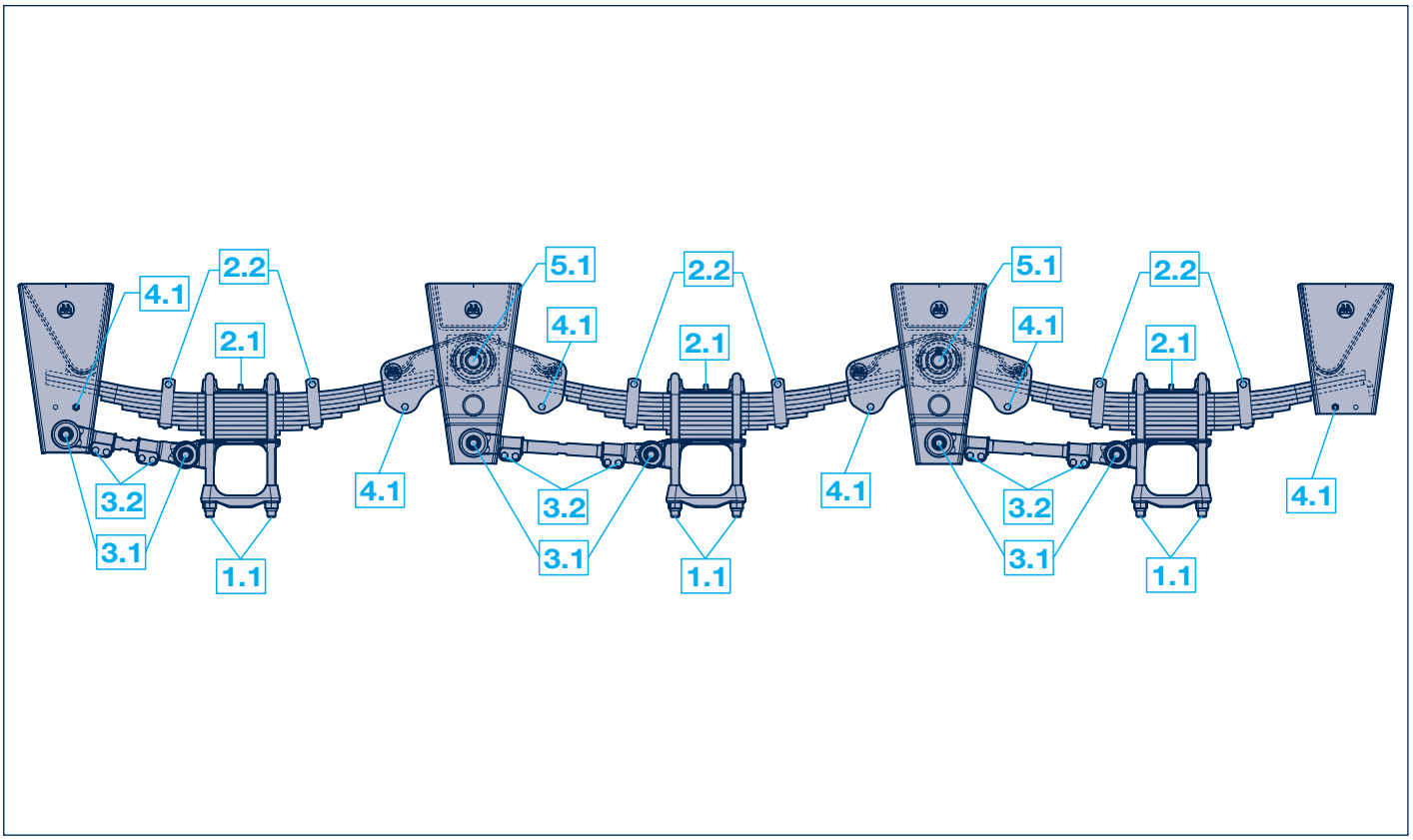
Axle alignment procedure:

1. Lift and support the vehicle frame.
2. Loosen the M12 locking nuts from the clamping heads (Fig. ②).
3. Align the axles (centre axle first, then the remaining axles).
4. Align the axles by turning the connecting rod bolt M36 with left-right threads (Fig. ③).
5. Tighten M12 locking nuts with below mentioned tightening torque.
   M12 M=85 Nm
6. Lower the vehicle and remove the chassis jacks.

IMPORTANT:

Make sure that the thread engagement (M 36) is at least 70 mm.





Area	Item.	Description	**Thread**	**SW**	**Tightening torque** (thread lightly greased)
1 U-bolts					
	1.1	U-bolts [1)]	M 24-10.9	36	600 - 650 Nm
2 Leaf springs					
	2.1	Centre bolt of leaf spring	M 12-10.9	19	123 Nm
	2.2	Nuts of the leaf spring clamps	M 12-8.8	19	85 Nm
3 Connecting rods					
	3.1	Locking nut of the connecting rod	M 24 x 2-10.9	36	650 Nm
	3.2	Locking nut of the clamping head	M 12-8.8	19	85 Nm
4 Wear pad					
	4.1	Wear pad	M 12-8.8	19	85 Nm
5 Equalizing beam					
	5.1	Locking nuts	M 42 x 3	65	1300 Nm

[1)] Apply grease to the threads of the U-bolts and nut contact surfaces.

Notes :

BPW-II-VBIN

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 the 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

BPW Trailer Systems India Private Limited

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