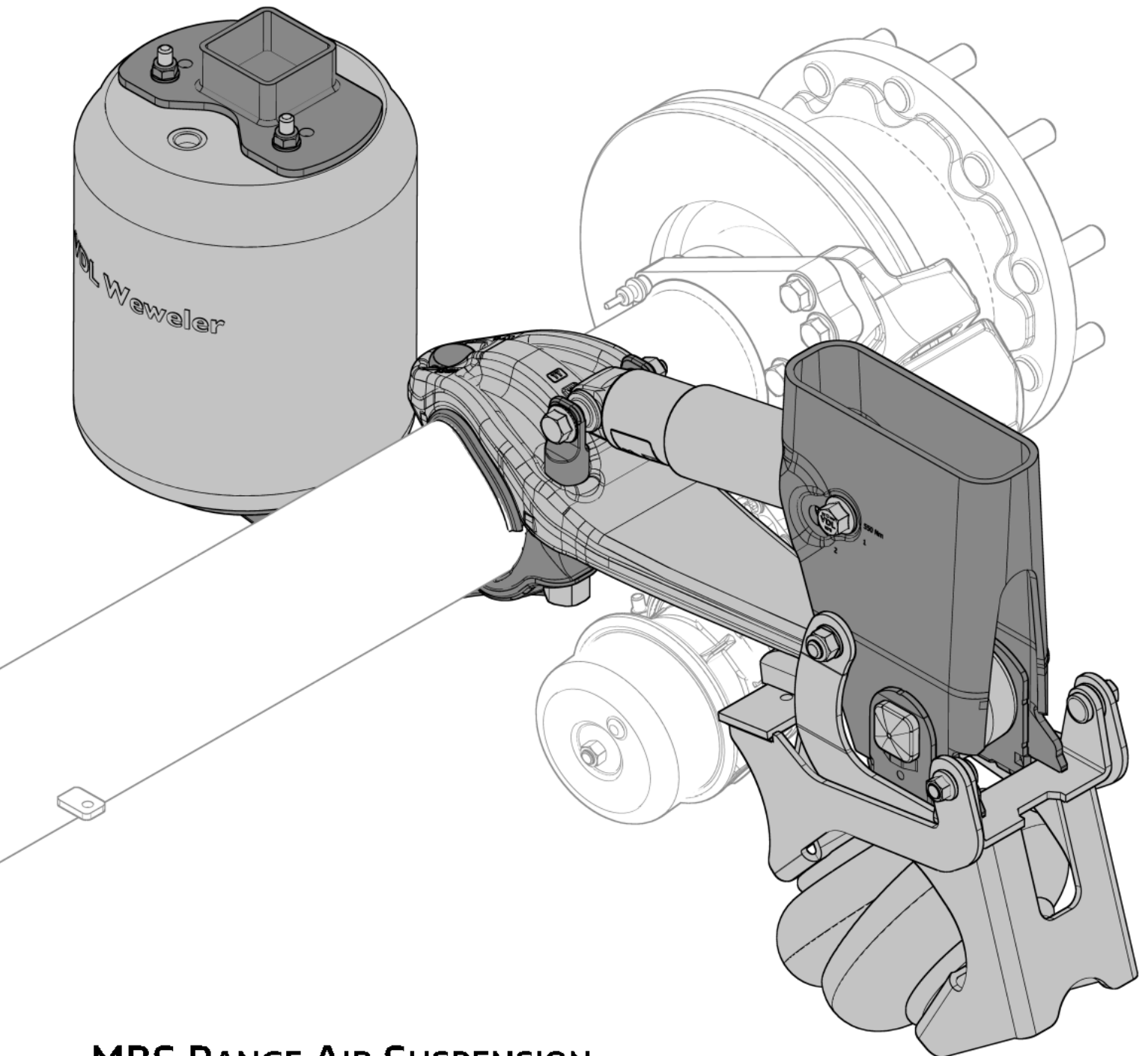


SUSPENSION INSTALLATION GUIDE



MBS RANGE AIR SUSPENSION FOR GROOVED VALX / FUWA AXLES

DOCUMENT: SIG-MBS-EN
DATE: 02-2023
REVISION: B

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Revision summary

Date	Revision	Comment	Author
July 2020	-	Initial version. Replaces manual 'WSM-MBSA-EN'.	RTS
April 2021	A	Welding instruction casted bracing improved (section 4.6).	RTS
February 2023	B	Closed (HD) hanger bracket eliminated from standard program. Air spring mounting clarified (Section 14.14).	RTS

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Contents

	General notes.....	4
	Welding remarks.....	4
	Warranty and liability.....	4
	Pictograms & symbols.....	5
1	MBS Air suspension range overview.....	6
2	Axle & air suspension combinations.....	7
3	Technical specifications / design information.....	8
4	Hanger brackets & pedestals.....	9
	4.1 Dimensions of hanger brackets & pedestals.....	9
	4.2 Alignment of hanger bracket	9
	4.3 Welding of standard hanger bracket.....	10
	4.4 Welding of pedestal.....	10
	4.5 Welding of casting for hanger bracket bracing.....	11
	4.6 Hanger bracket chassis bracing recommendation.....	12
5	Air springs.....	13
	5.1 Standard Ø300 & Ø335.....	13
	5.2 Long stroke Ø335.....	14
	5.3 Short stroke Ø300 & Ø335.....	14
	5.4 Load-pressure diagram Ø300 air springs.....	15
	5.5 Load-pressure diagram Ø335 air springs.....	15
6	Shock absorber overview.....	16
7	External bump stop.....	17
	7.1 Bump stop overview.....	17
	7.2 Bump stop mounting.....	17
	7.3 Bump stop chassis bracing recommendation.....	17
8	Alignment of system & axle	18
	8.1 Alignment of air suspension versus axle.....	18
	8.2 Alignment of trailing arm eye height.....	18
	8.3 Alignment of axles.....	19
	8.4 Adjusting the hanger bracket alignment.....	19
9	Paint instruction.....	20
10	Axle lifts.....	21
	10.1 Axle lift versions.....	21
	10.2 Axle lift clearance.....	21
11	Splitter.....	22
	11.1 Splitter overview.....	22
	11.2 Splitter specifications.....	22
12	Torque settings MBS-V/F Air suspension.....	23
13	Air suspension assembly.....	24
14	Chassis mounting.....	28

General notes

The installation instructions in this manual are specific for the VDL Weweler MBS air suspension and not valid for other systems. The used assembly jig(s) are examples that can assist with proper installation. The illustrated chassis and cross bracings are solely drawn as examples for installation as cross bracing and component dimensions depend upon the respective vehicle type and its field of application. The data is intended as a guideline for the trailer builders vehicle design.

The design of the vehicle chassis is always the responsibility of the trailer builder.

Further desired or required data for the VDL Weweler air suspensions such as additional dimensions, permitted centre of gravity heights, etc. can be found in the additional technical documents (f.e. the standard and/or application system drawings).

Welding remarks

The trailing arms, air bags and plastic shock absorber covers are to be protected against welding sparks and weld spatter when carrying out all welding work. The earth clamp must never be connected to the trailing arm or the axle hub.

No welding is allowed on the trailing arms!

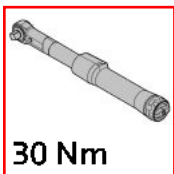
Warranty and liability

VDL Weweler B.V. warrants all in house manufactured products and all non VDL Weweler components needed to complete a VDL Weweler product, for a period as per listed in the "Warranty tables" in the "VDL Weweler General Defects Liability Statement Trailer" or otherwise agreed in writing.

The "VDL Weweler General Defects Liability Statement Trailer" can be downloaded from our website www.vdlweweler.nl.

Pictograms & symbols

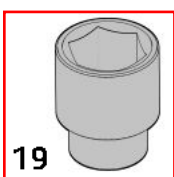
In this manual the following pictograms and symbols are used to illustrate specific instructions or warnings:



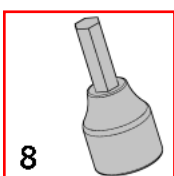
Use an appropriate calibrated torque wrench.
Tighten the fastener to the torque in Nm given in the left-hand corner.



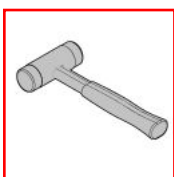
Use an appropriate calibrated torque wrench.
Tighten the fastener to the torque in Nm + the additional specified turn of the fastener in degrees given in the left-hand corner .



Use a socket wrench.
The value in the left-hand corner is the socket wrench size.



Use a hex socket wrench.
The value in the left-hand corner is the hex socket wrench size.



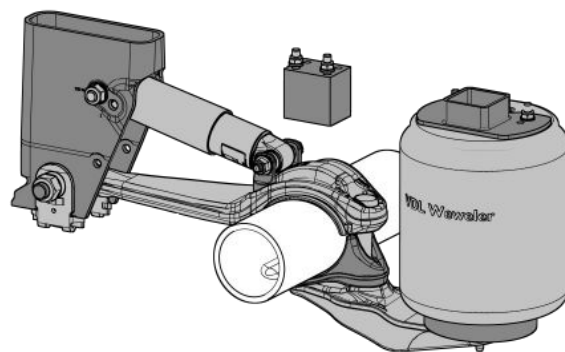
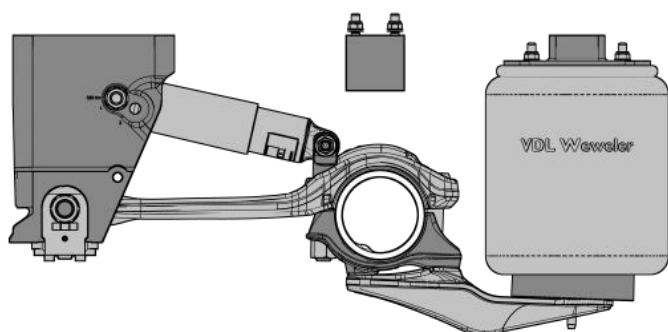
Use a rubber or plastic hammer.



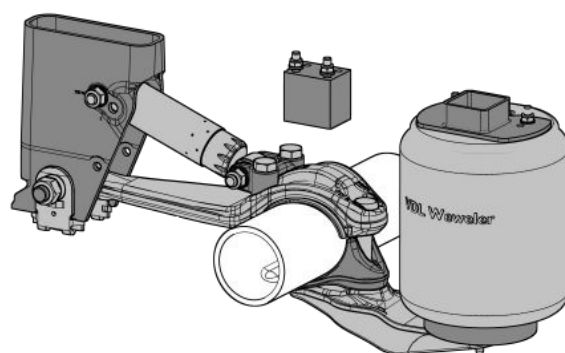
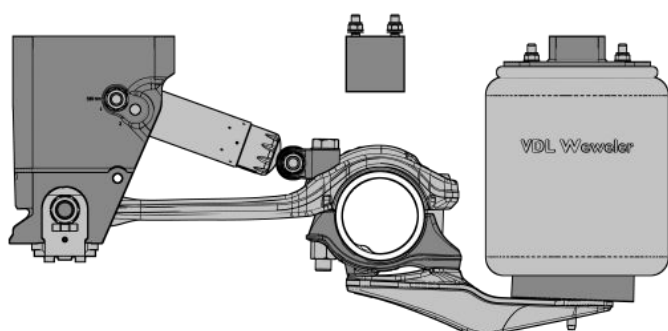
CAUTION
Weight exceeds 25 kg.

1. MBS Air Suspension range overview

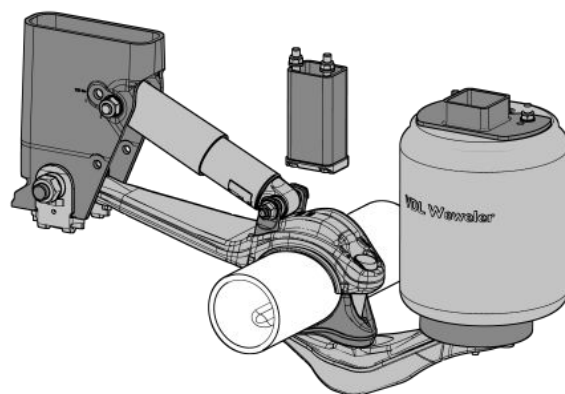
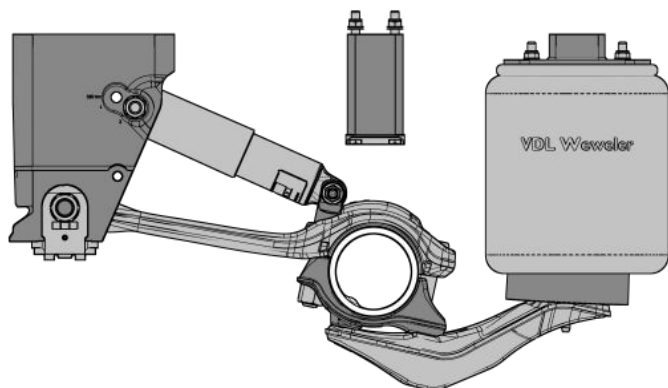
1.1 MBS-100 Range – M16 bottom shock connection (two-piece)



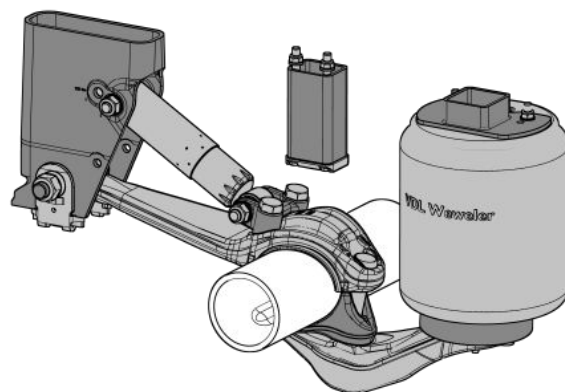
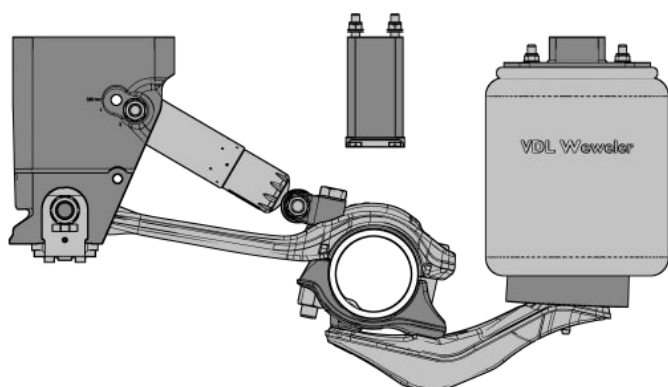
1.2 MBS-100 Range – M20 bottom shock connection (one-piece)



1.3 MBS-200 Range – M16 bottom shock connection (two-piece)



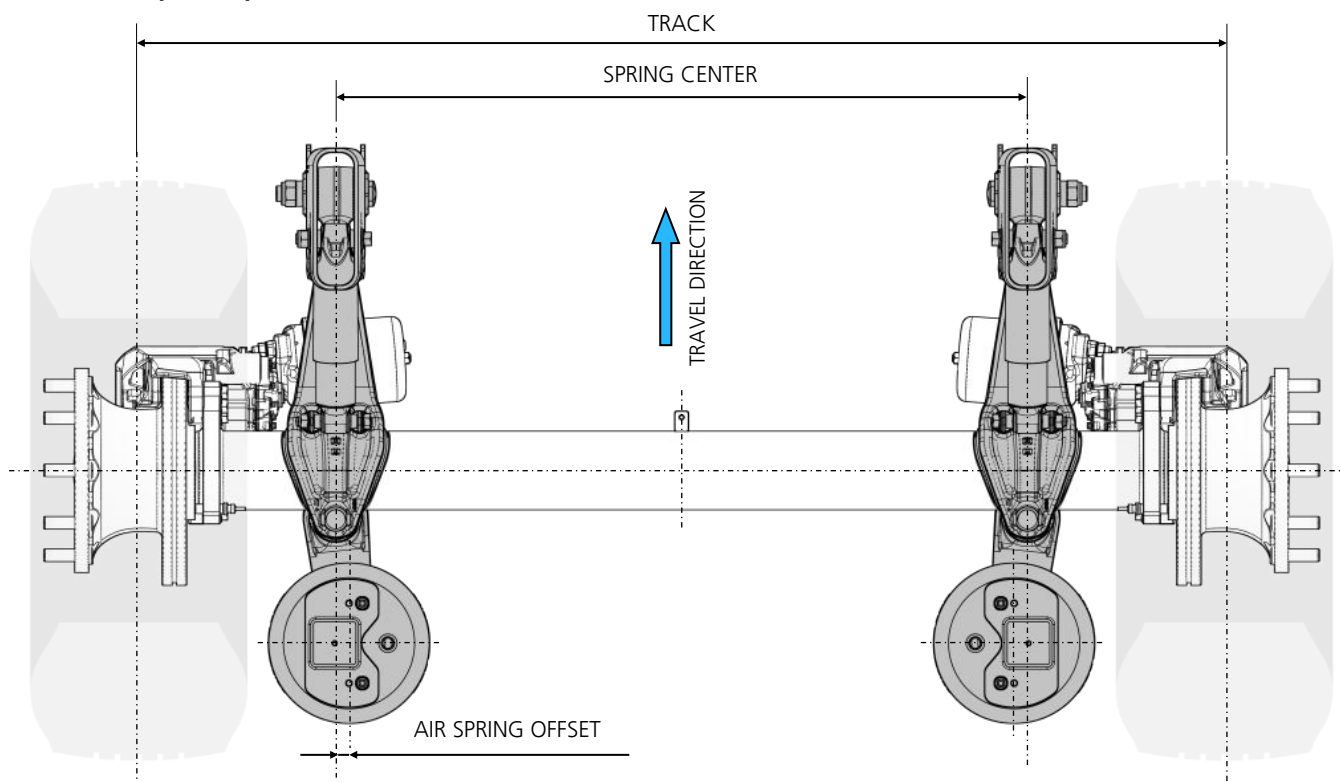
1.4 MBS-200 Range – M20 bottom shock connection (one-piece)



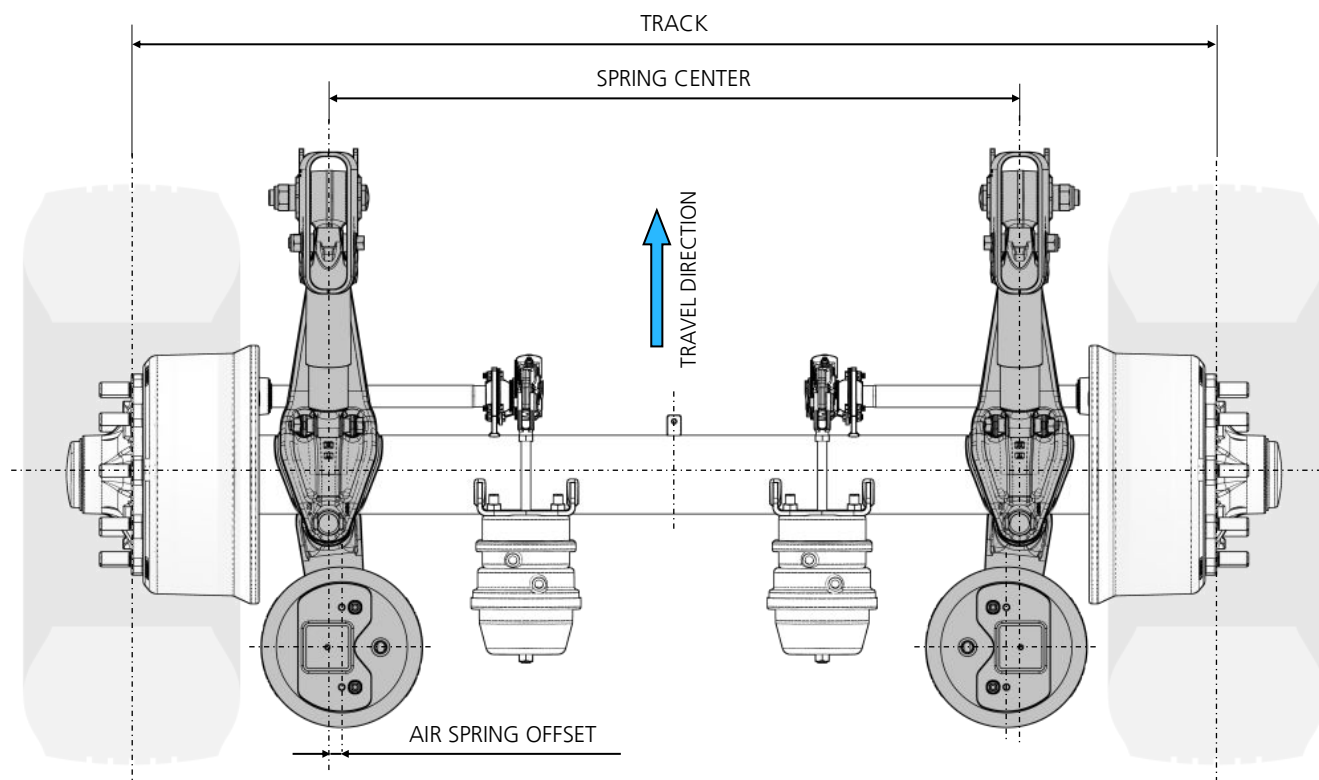
2. Axle & air suspension combinations

The VDL Weweler MBS air suspension is specifically designed for the VALX / FUWA groove axle range. Therefore it is only suitable for the VALX / FUWA disc and drum brake axles equipped with the patented groove for single and twin tire applications. For specific (technical) information concerning the axle we refer to the VALX / FUWA documentation and instructions.

Disc brake axle (ET 120)

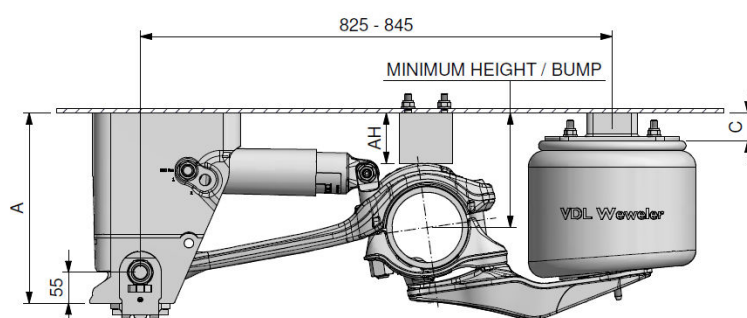


Drum brake axle (ET 0)



3. Technical specifications / design information

MBS air suspension system layout and overall system dimensions.



Bump & Minimum height:

As standard external bump stops mounted on the chassis are used to limit the upward suspension stroke.

Special MBS applications can be equipped with air springs with internal bump stops instead of using the external bump stops (see specific system or application drawing).

Bump

When the vehicle is empty without air the system rests on the bump stop. This gives the system "Bump" dimension. In case of external bump stops this is also the minimum height (MH).

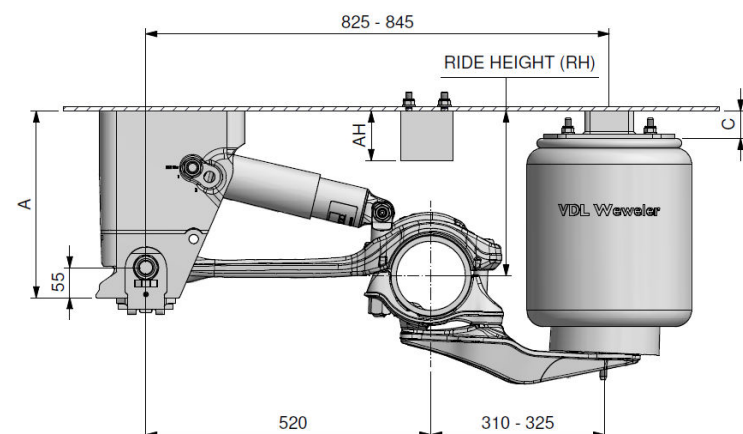
The dimension bump also determines the lift height.

Minimum height (MH)

When the vehicle is fully laden without air the bump is compressed by a certain distance depending on the type of air spring (only valid when using the air springs internal bump stop).

This gives the system "Minimum Height" dimension (MH).

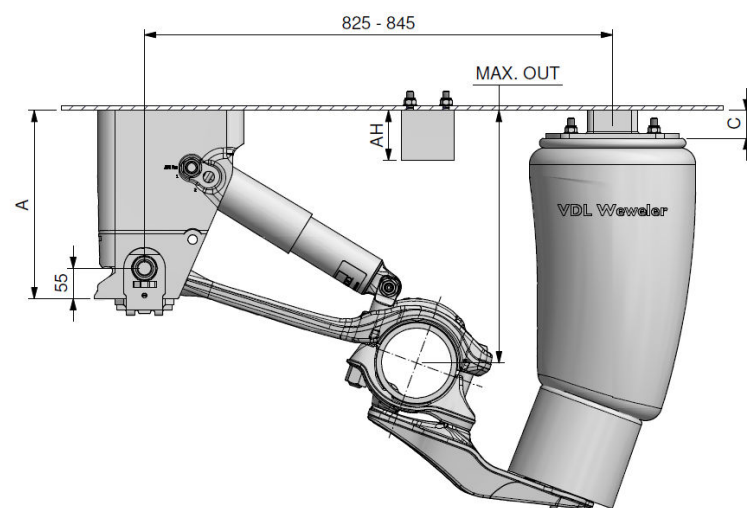
When an air spring failure occurs the external internal bump stops enables the user to run (without air pressure) at very low speed for a short period of time to get to the nearest service station. To prevent further damage, always make sure that there is enough clearance for all moving parts.



Ride height (RH):

The ride height can be set with the levelling valve within a certain range. The indicated L2 dimension (f.e. 310mm) and total length depends on the system configuration and the used air spring offset. Check the specific system or application drawing for detailed dimensions and settings.

If the vehicle is equipped with a raise/lower valve it is only allowed to use this valve for loading and unloading. Driving with the valve engaged may cause damage to the load, trailer, brakes and suspension system.



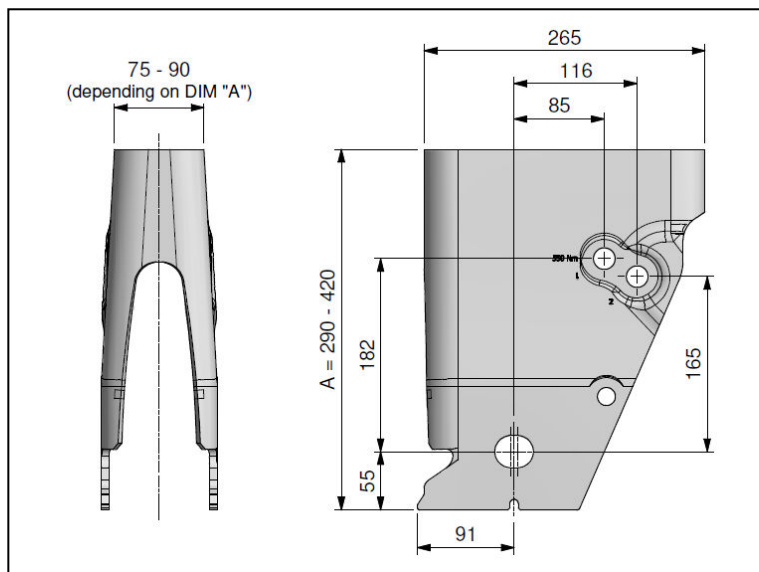
Max. out:

The VDL Weweler air suspension systems have been engineered so that the shock absorber acts as the outbound stroke limitation. This obviates the need for check straps or other suspension stops.

The maximum shock absorber length and the air spring height at this maximum outward position are in relation to each other. Therefore the system configuration (hanger bracket height "A" and pedestal "C") may not be changed without the approval of VDL Weweler.

4. Hanger brackets & pedestals

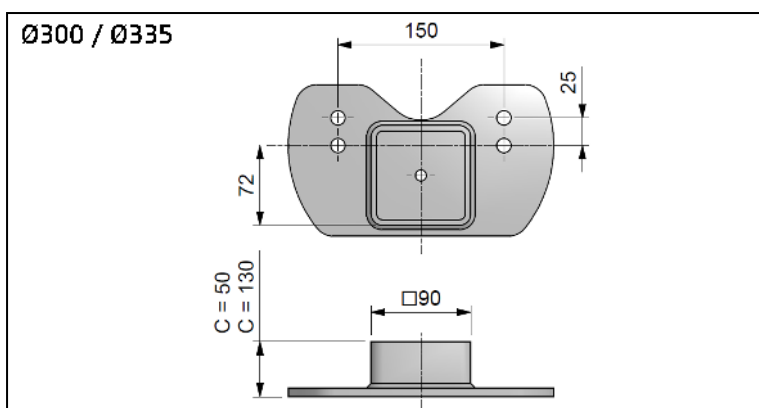
4.1 Dimensions of hanger brackets & pedestals



Hanger bracket height $A = 290-420$ mm

Standard hanger bracket available in heights: 290, 340, 380 and 420 mm.

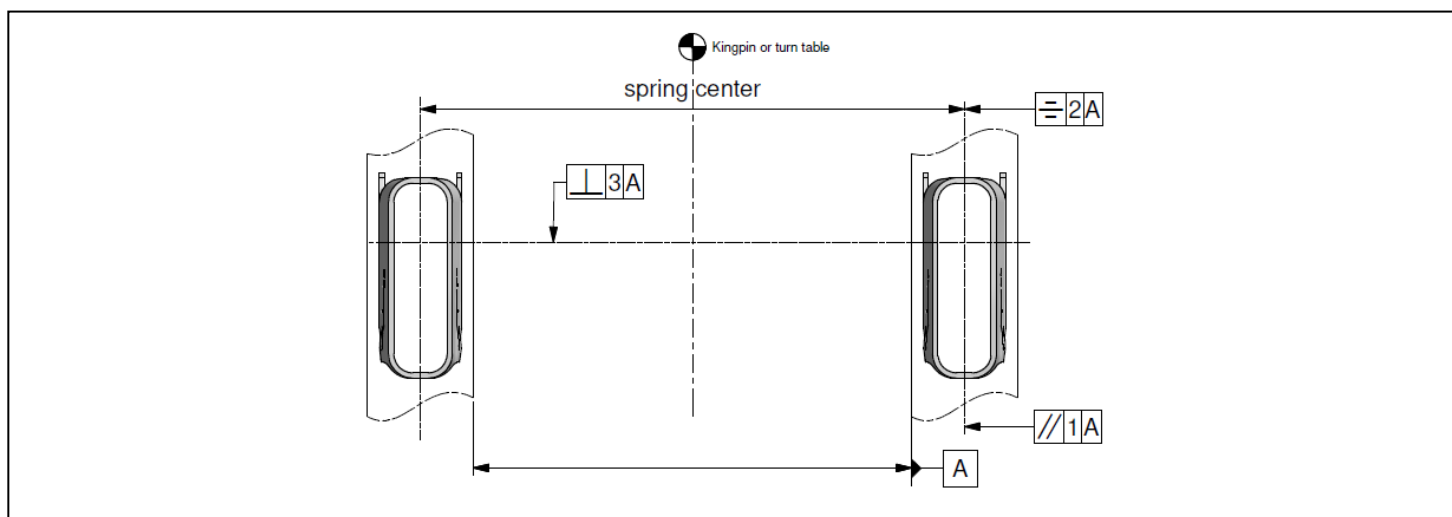
Can only be used in combination with the bolted or welded casted bracing.



Pedestal for Ø300 & Ø335 air springs

Standard pedestal available in heights 50 and 130 mm.

4.2 Alignment of hanger bracket

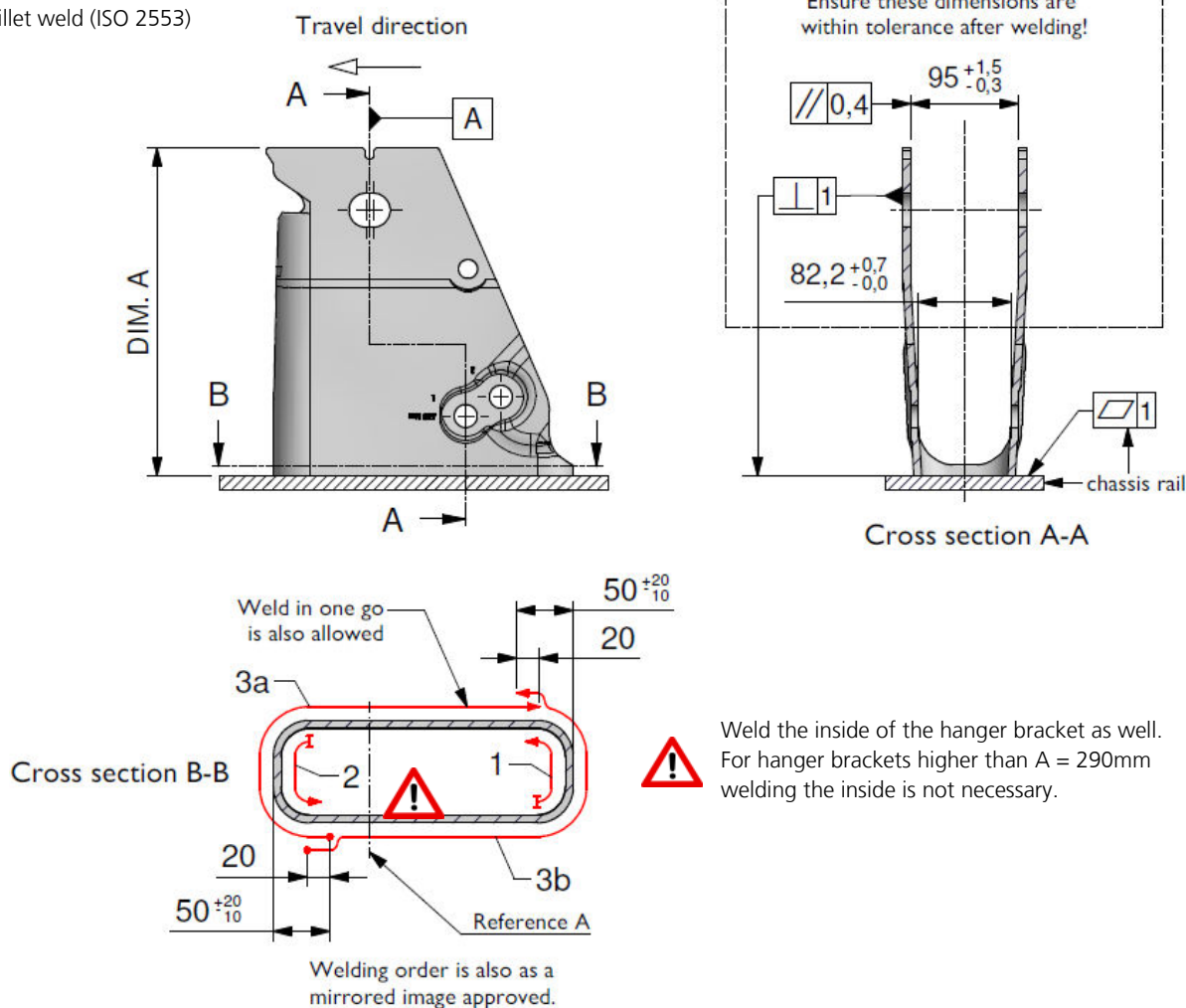


4. Hanger brackets & pedestals

4.3 Welding of standard hanger bracket

Weld thickness:

S8a5 min. fillet weld (ISO 2553)



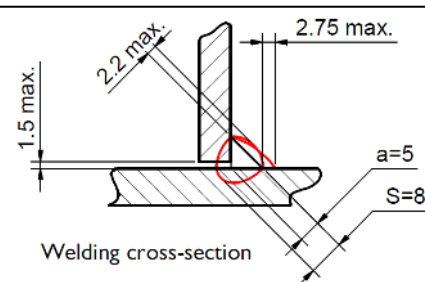
Welding order:

— Tack weld ● Begin → End

Material chassis = CEV ≤ 0.47%

CEV = C + (Mn/6) + ((Cr+Mo+V)/5) + ((Ni+Cu)/15)

Item	Specifications
Welding wire	Acc. DIN EN ISO 14341. Material-Nr 1.5125, Ø1.2 mm
Supply	1-wire technique
Gas mixture	92-8 Argon / O ₂ or Sagox2 84-13-3 Argon / CO ₂ / O ₂ or Sagox10 90-10 Argon / CO ₂
Welding parameters	Current: 240 - 340 A Puls voltage: 26 - 40 V



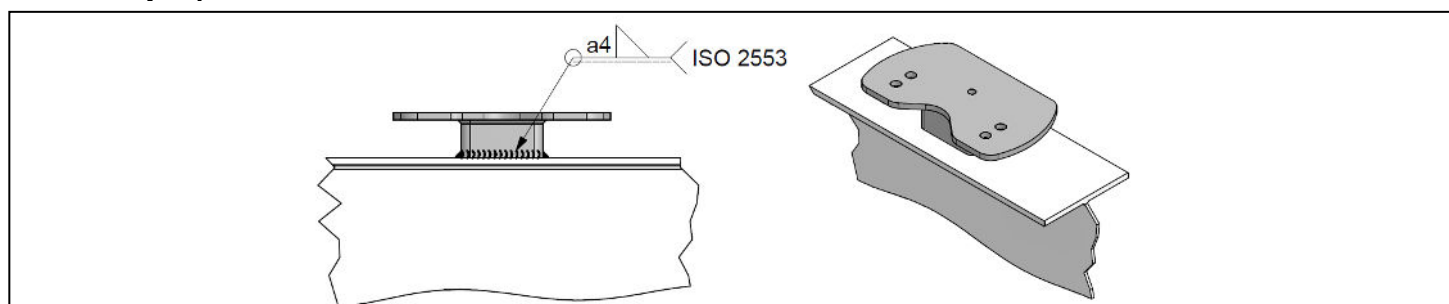
Check up:

1. Demands and qualification according DIN EN ISO 15614-1.

2. Judgement of craters according DIN EN ISO 5817 acc. class C.

Except for the numbers: 2011, 2012, 2016, 2017, 5012, 5213. Those should be judged according DIN EN ISO 5817 acc. **class B**.

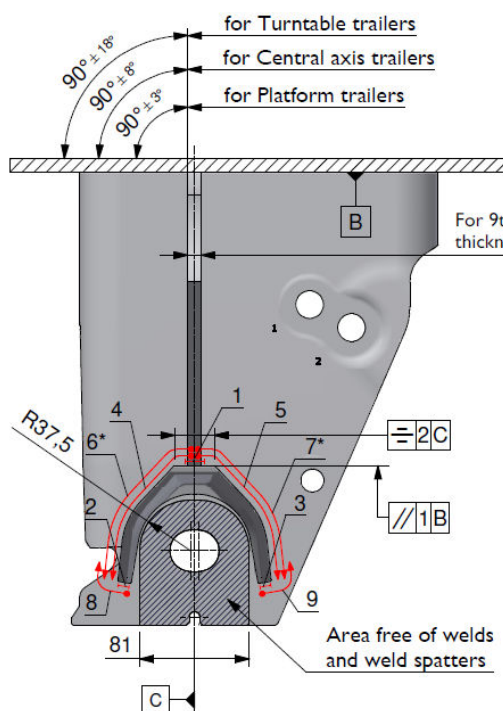
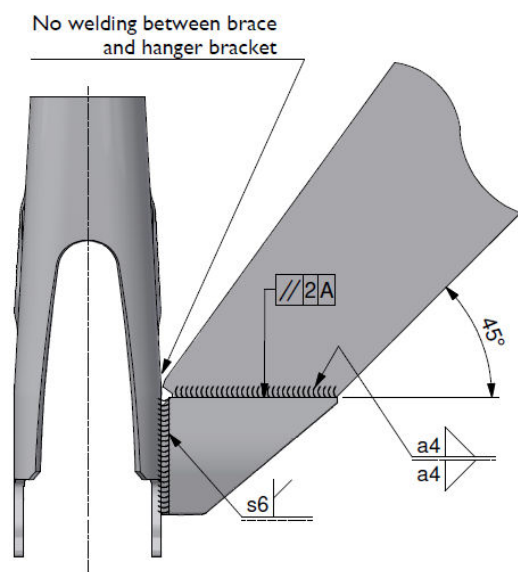
4.4 Welding of pedestal



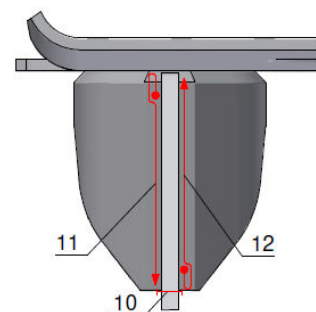
4. Hanger brackets & pedestals

4.5 Welding of casting for hanger bracket bracing

The standard hanger bracket is as standard provided including the casting already welded.



For 9t application min. 7.5 mm thickness is advised



CASTED PART - HANGER BRACKET:

Throat thickness $s = \text{min. } 6\text{mm}$ (ISO 2553)

Weld casting to the hanger bracket after tack welding as indicated by the sequence numbers 1-9 (* steps 6 & 7 only when necessary).

BRACE - CASTED PART:

Throat thickness $a = \text{min. } 4\text{mm}$ (ISO 2553)

Weld bracing plate to the casted part after tack welding as indicated by the sequence numbers 10-12.

Check acc. DIN EN ISO 15614-1

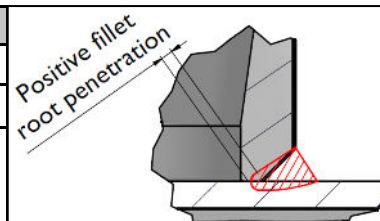
Welding order:

— Tack weld — Begin — End

Material brace = $\text{CEV} \leq 0.47\%$

$\text{CEV} = C + (\text{Mn}/6) + ((\text{Cr} + \text{Mo} + \text{V})/5) + ((\text{Ni} + \text{Cu})/15)$

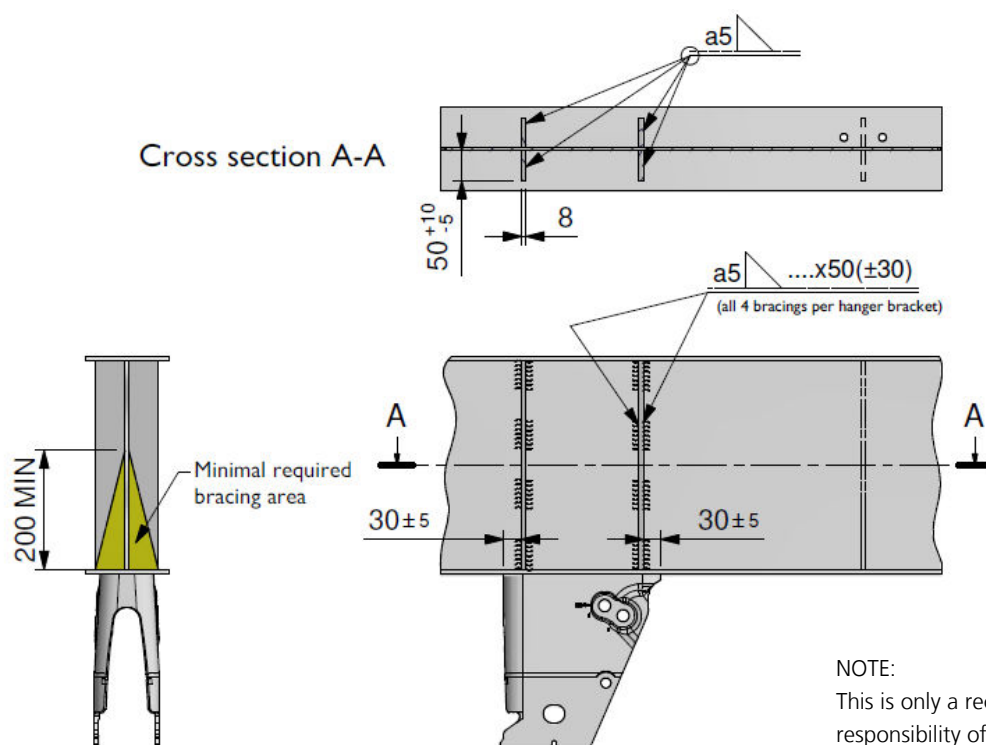
Item	Specifications
Welding wire	Acc. DIN EN ISO 14341. Material-Nr 1.5125, $\varnothing 1.2\text{ mm}$
Supply	1-wire technique
Gas mixture	92-8 Argon / O_2 or 84-13-3 Argon / CO_2 / O_2 or 90-10 Argon / CO_2
Welding parameters	Current: 240 - 340 A Puls voltage: 26 - 40 V



- Ensure good penetration but avoid undercutting at the edges of the weld.
- Tack welds or craters should be fully filled.

4. Hanger brackets & pedestals

4.6 Hanger bracket chassis bracing recommendation

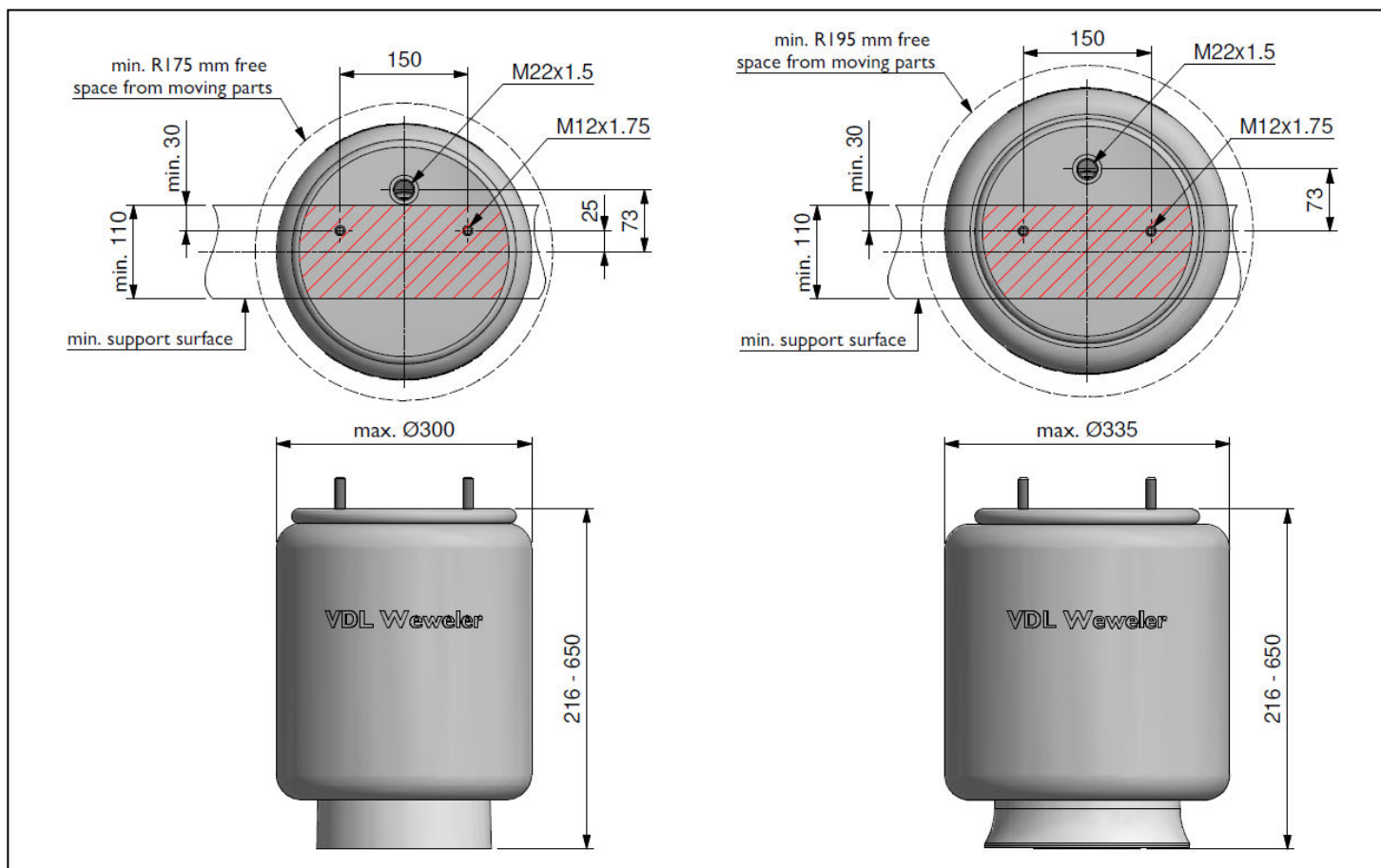


NOTE:

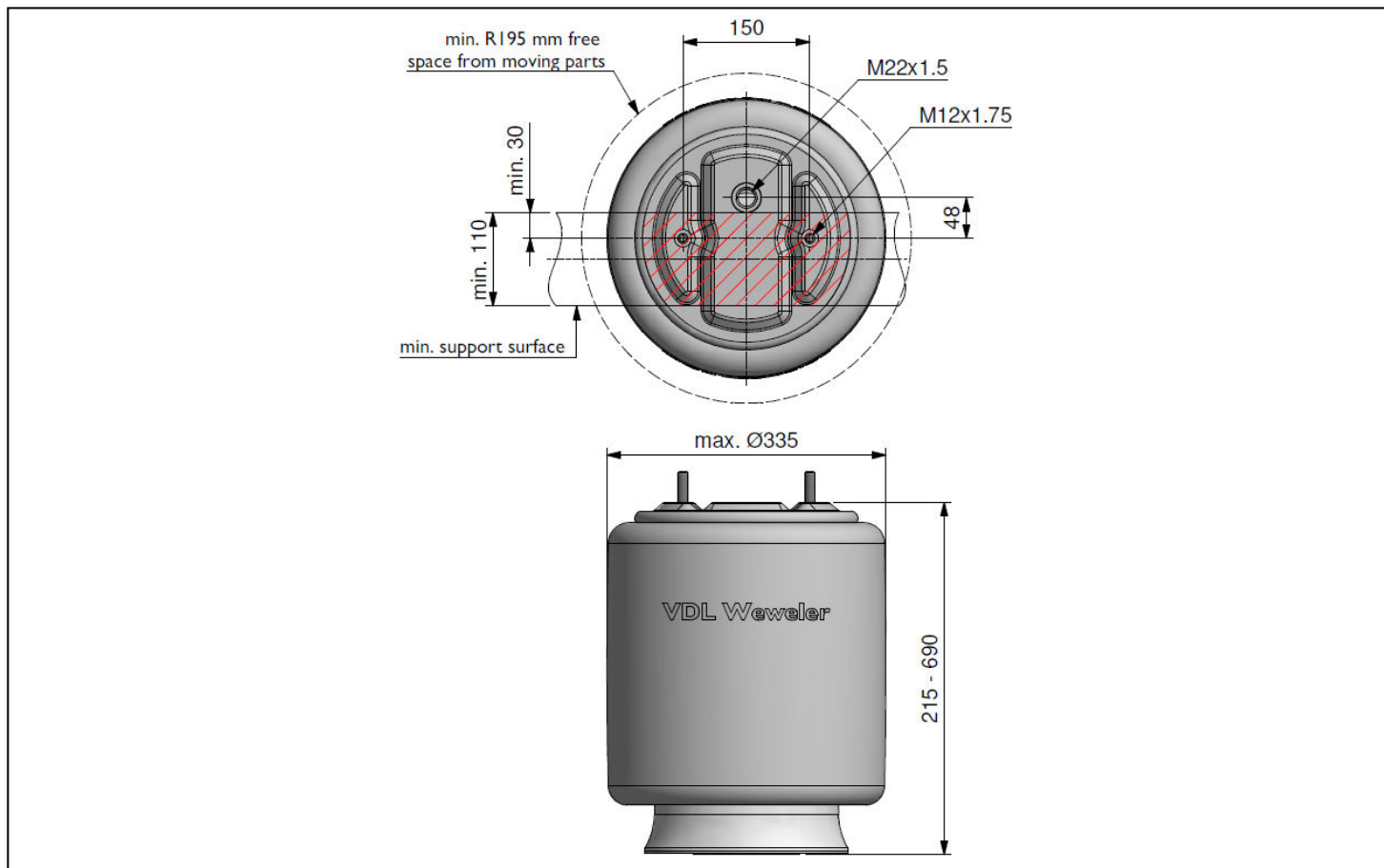
This is only a recommendation, the final bracing is the responsibility of the trailer manufacturer.

5. Air springs

5.1 Standard Ø300 & Ø335



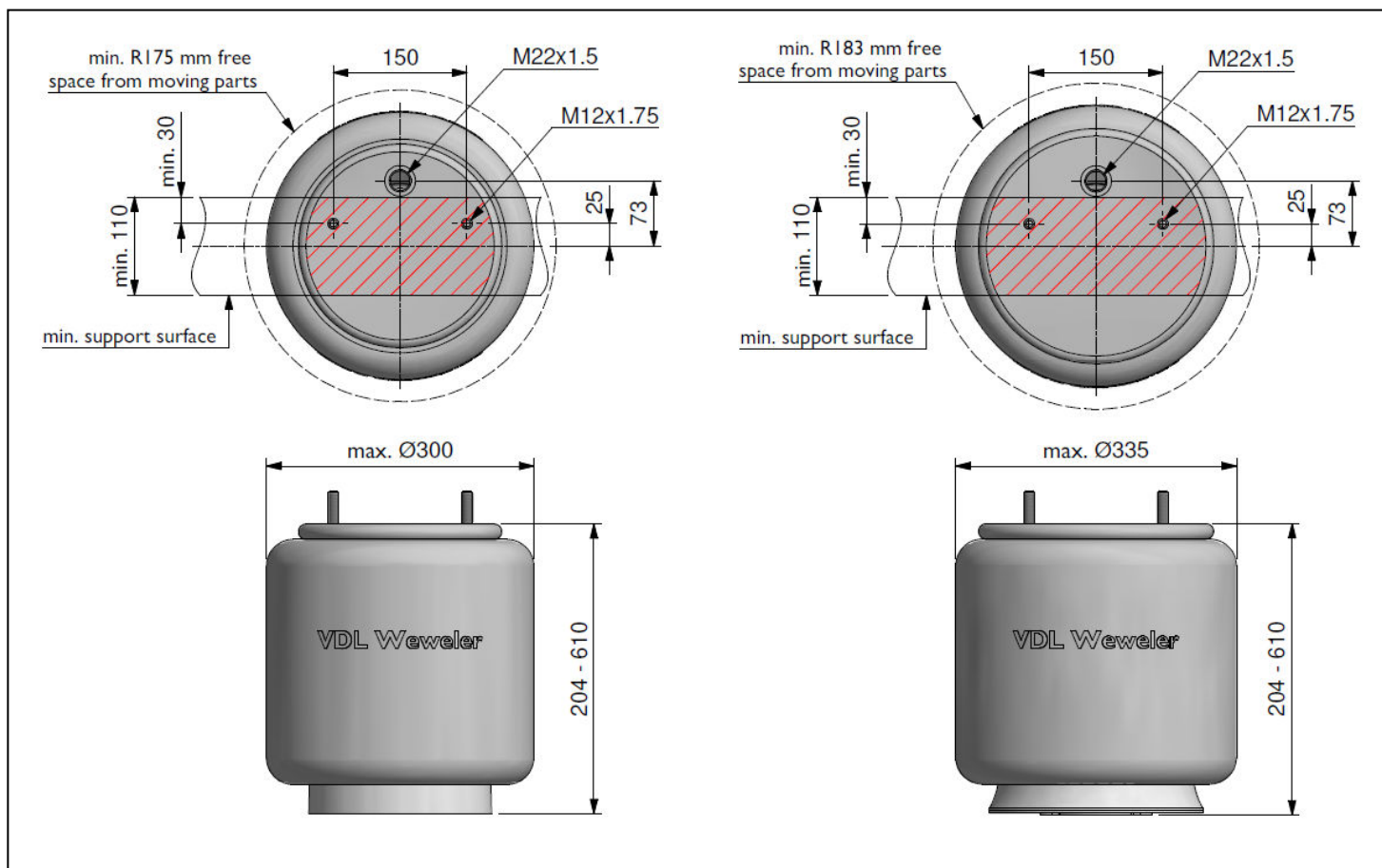
5.2 Long stroke Ø335



If the minimum support surface is less than 110mm an additional support plate has to be added.

5. Air springs

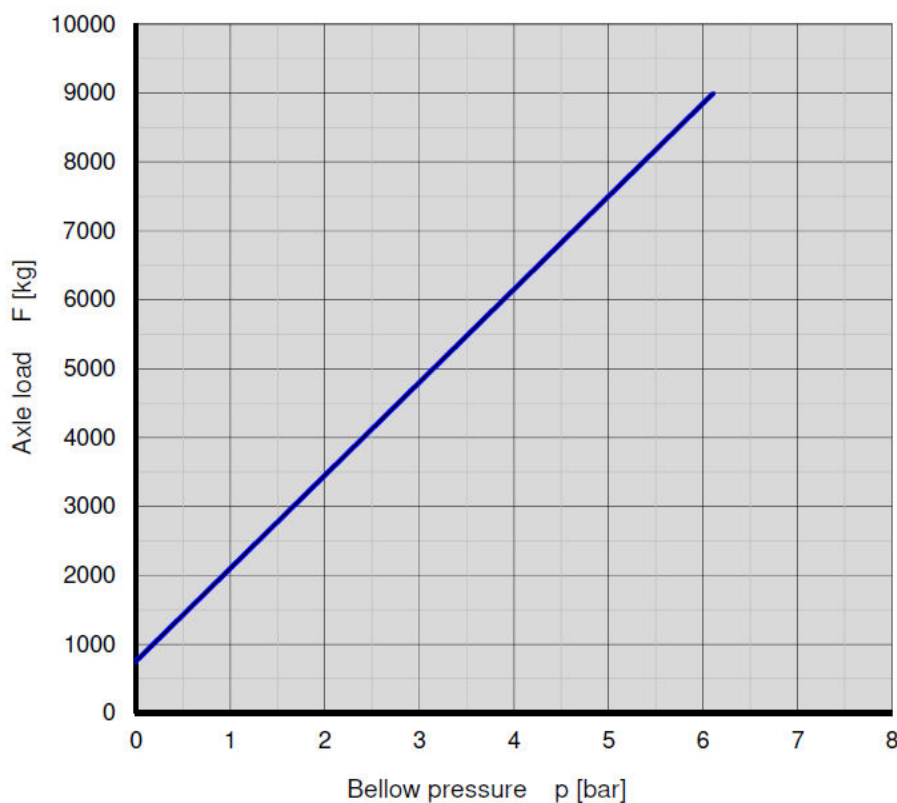
5.3 Short stroke Ø300 & Ø335



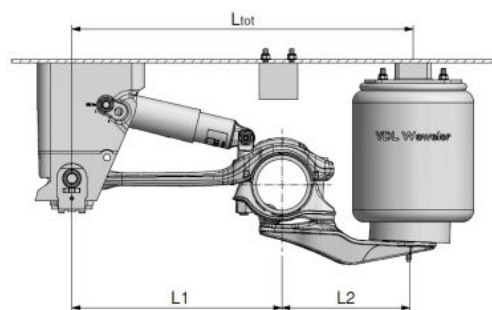
If the minimum support surface is less than 110mm an additional support plate has to be added.

5. Air springs

5.4 Load-pressure diagram Ø300 air springs



Assumed unsprung mass: 750 kg
 Maximum axle load: 9 t
 Reference numbers: US04100.
 US04200.

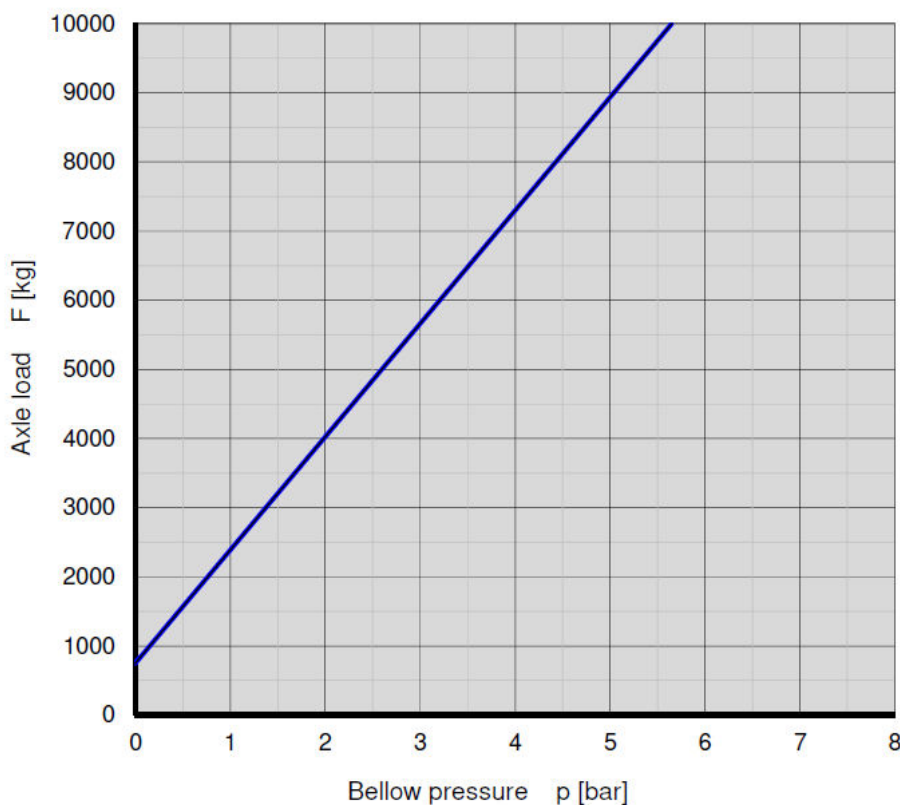


$$p = \frac{\text{axle load} - \text{unsprung mass}}{\text{geometry and air spring factor}} = \frac{F - 750}{1350}$$

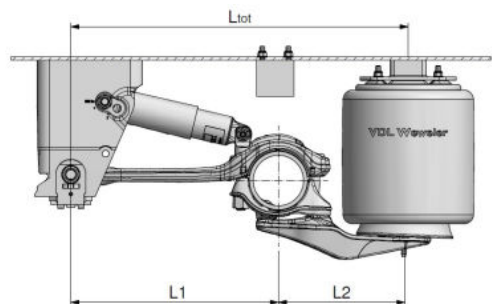
Ltot = 835mm
 L1 = 520 ± 10 mm
 L2 = 315 ± 10 mm (average tail end length)

This diagram is theoretical.
 No rights can be claimed.

5.5 Load-pressure diagram Ø335 air springs



Assumed unsprung mass: 750 kg
 Maximum axle load: 9 t (10t special)
 Reference numbers: US04110.
 US04235.
 US04335.

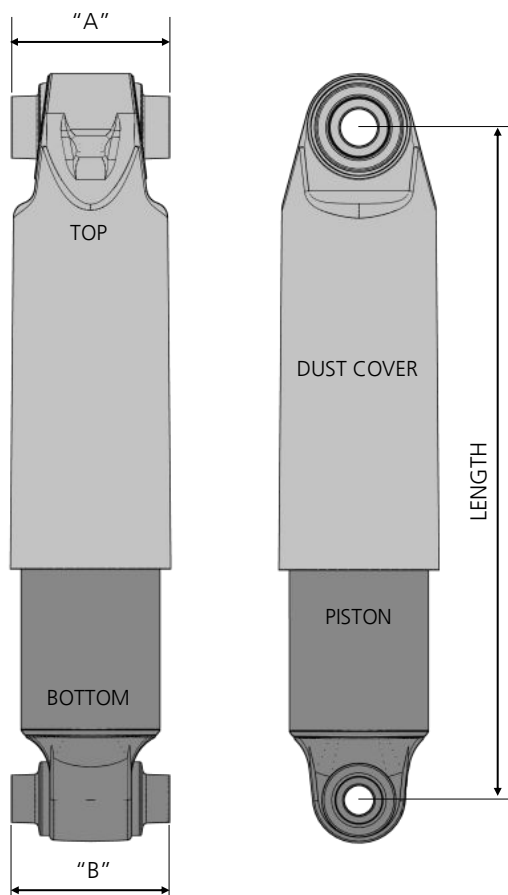


$$p = \frac{\text{axle load} - \text{unsprung mass}}{\text{geometry and air spring factor}} = \frac{F - 750}{1637}$$

Ltot = 835mm
 L1 = 520 ± 10 mm
 L2 = 315 ± 10 mm (average tail end length)

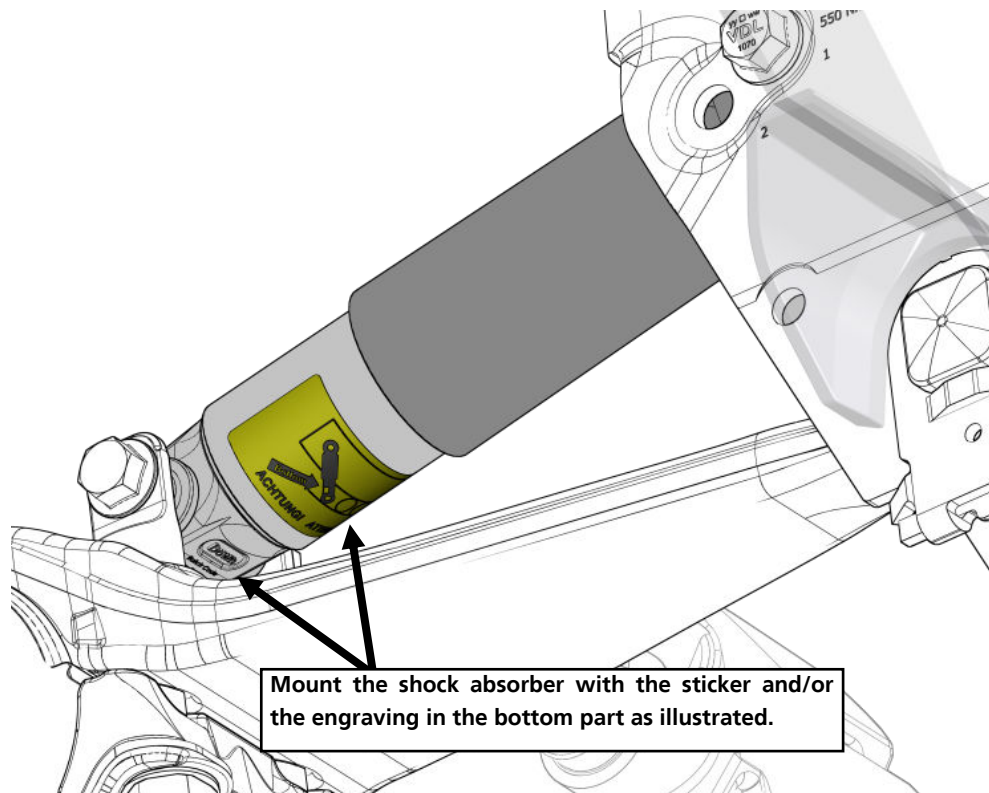
This diagram is theoretical.
 No rights can be claimed.

6. Shock absorber overview



For the MBS air suspension range are four shock absorbers available. These can be identified based on the type number and in one case a different color as black. The plastic dust cover is always black. The deviating color is applied means of a colored sticker on the shock absorber.

Type	Color	Min. length	Max. length	Width "A"	Width "B"	Mounting Top / Bottom
9524W	Black	294 ± 3 mm	429 ± 3 mm	82 mm	82 mm	M20 / M16
9526W	Black	267 ± 3 mm	383 ± 3 mm	82 mm	62 mm	M20 / M20
9531W	Black	289.5 ± 3 mm	420 ± 3 mm	82 mm	82 mm	M20 / M16
9533W	Red	265 ± 3 mm	368 ± 3 mm	82 mm	62 mm	M20 / M20



7. External bump stop

7.1 Bump stop overview

Composite	Steel

7.2 Bump stop mounting

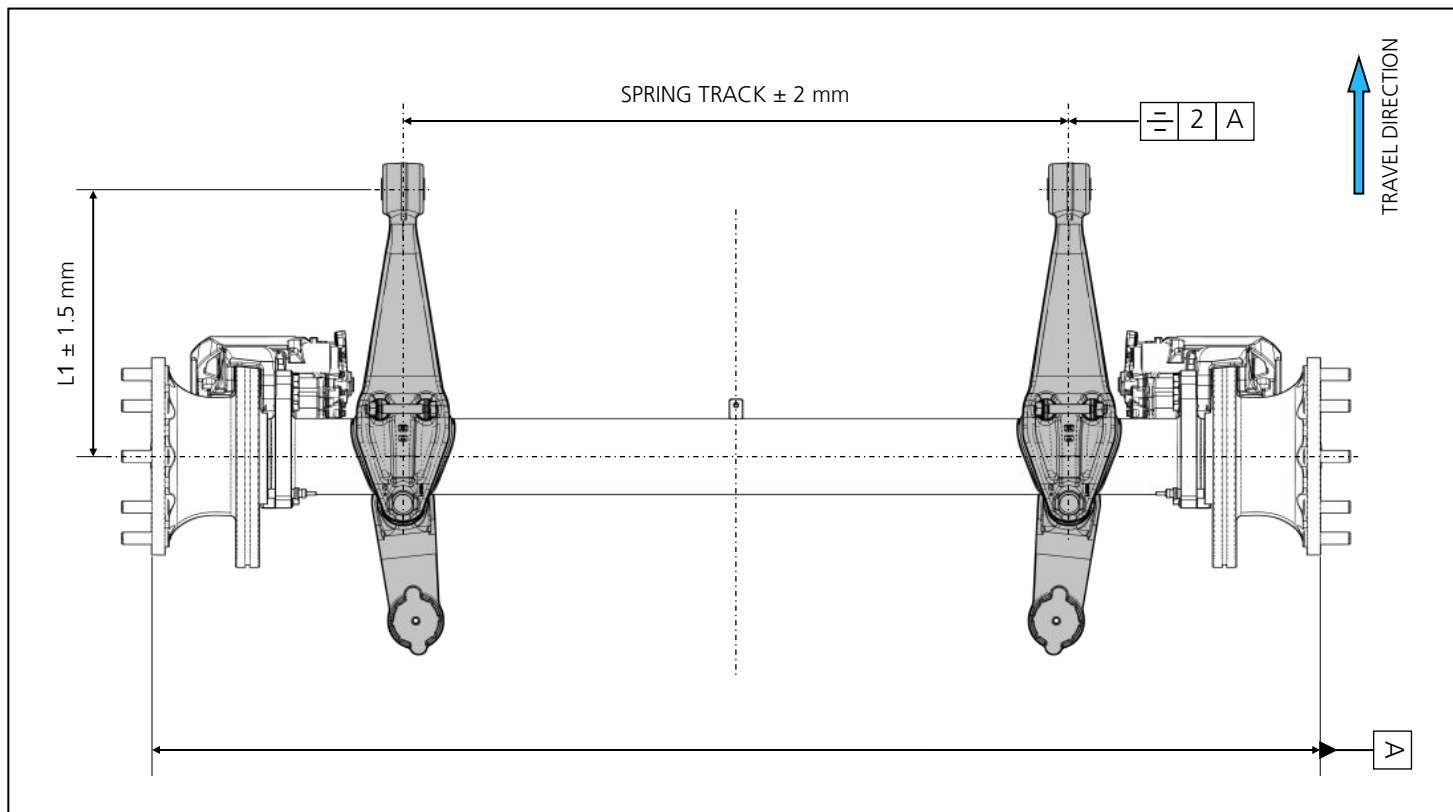
Composite The long side of the bump must be positioned parallel to the chassis beam.	
Steel The long side of the bump must be positioned parallel to the chassis beam.	

7.3 Bump stop chassis bracing recommendation

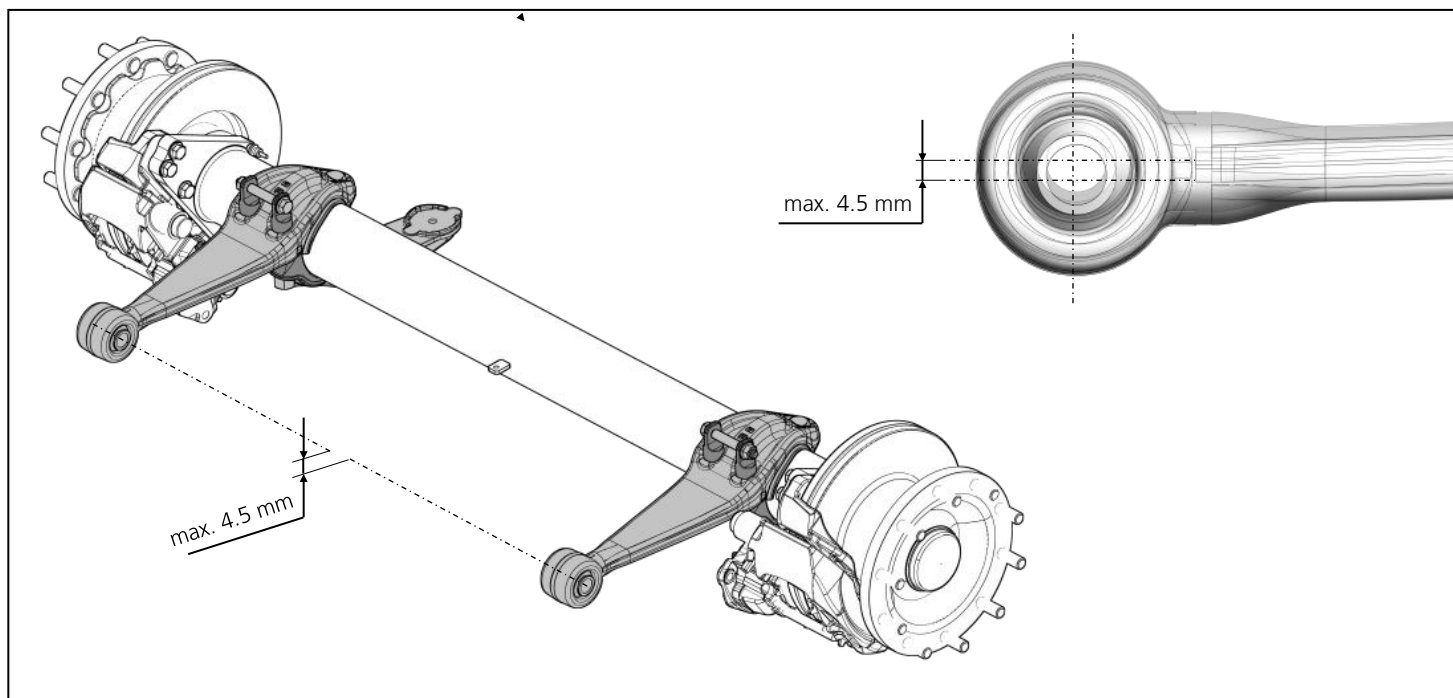
Cross section A-A	NOTE: This is only a recommendation, the final bracing is the responsibility of the trailer manufacturer.
---------------------------------	---

8. Alignment of system & axle

8.1 Alignment of air suspension versus axle

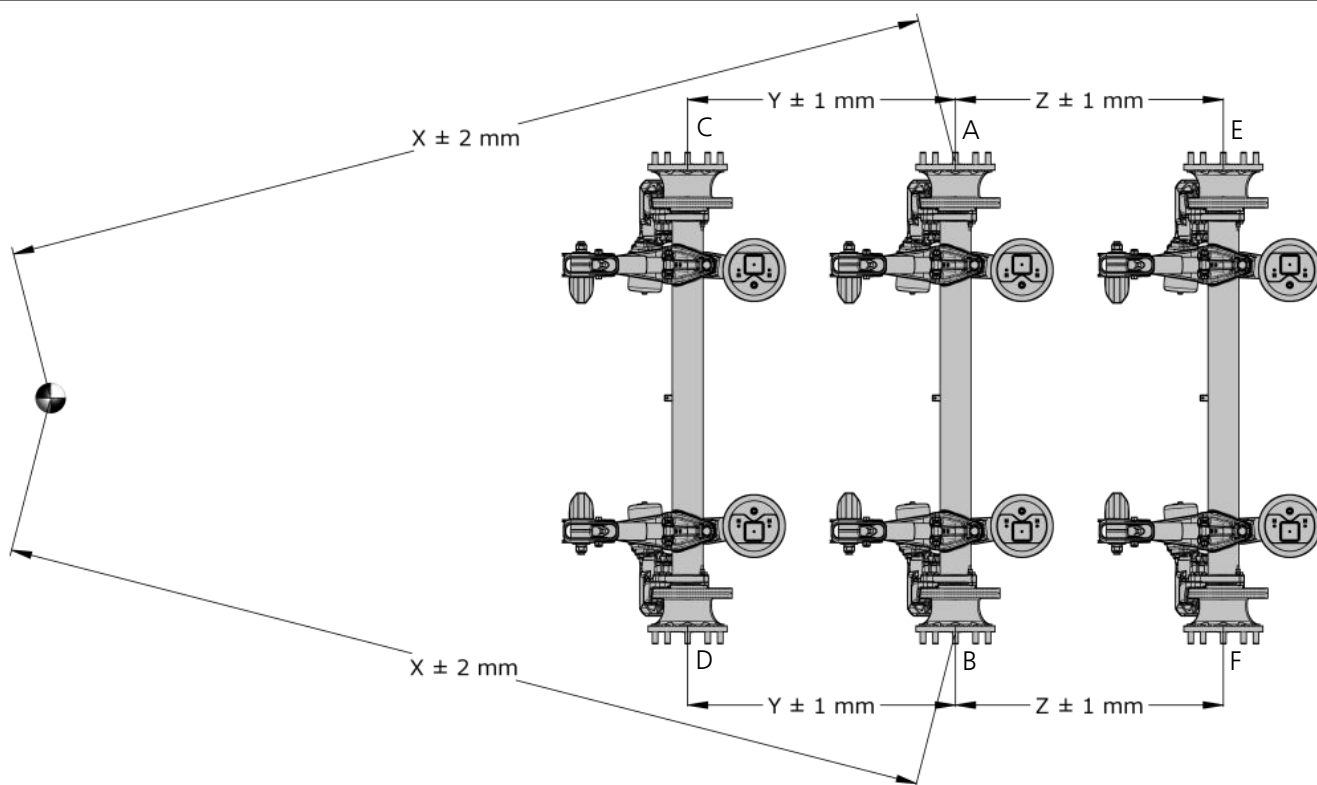


8.2 Alignment of trailing arm eye height



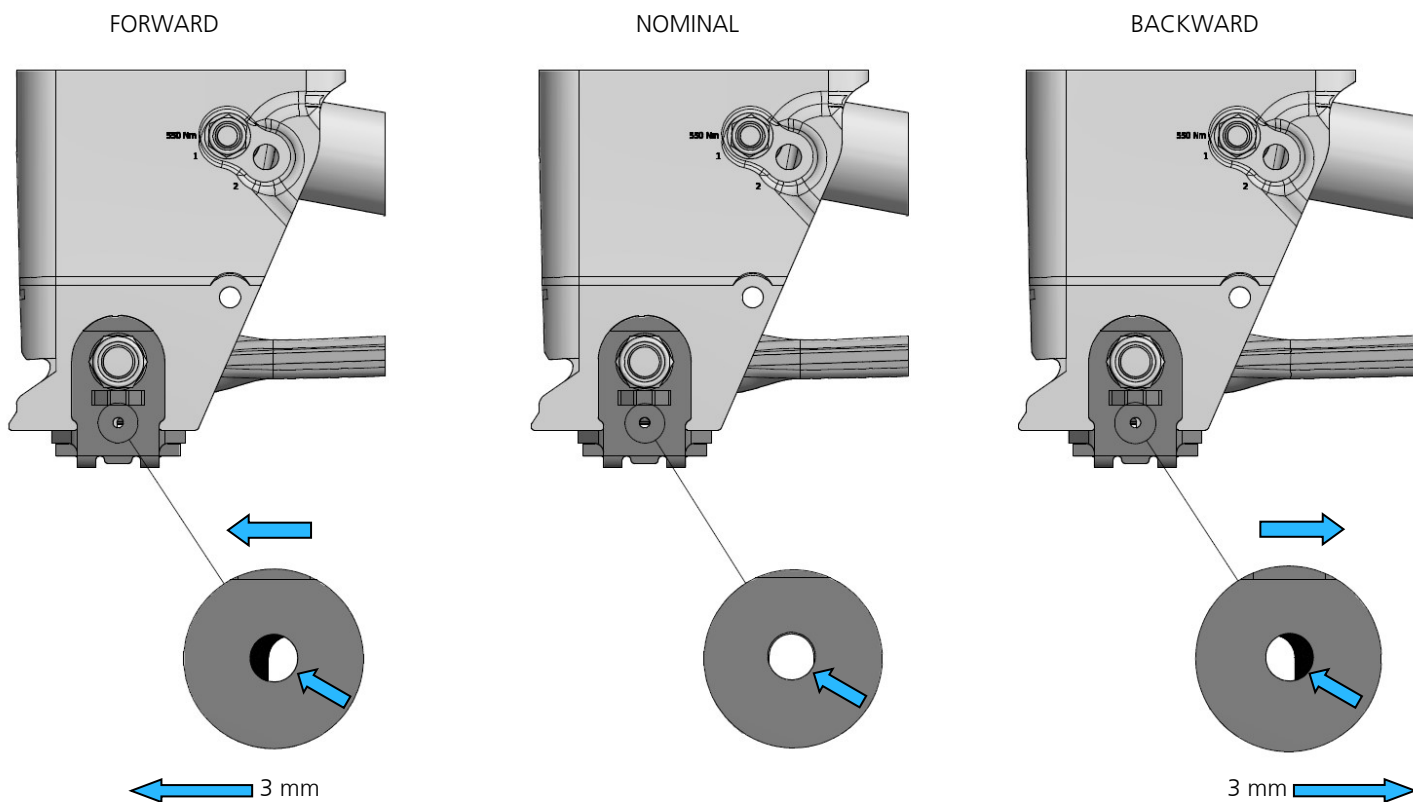
8. System & axle alignment

8.3 Alignment of axles



Align all axles (disc or drum) within the tolerances given, taken the second axle as a reference.
The same tolerances apply for alignment using a laser. A through F are the axle centres.

8.4 Adjusting the hanger bracket alignment

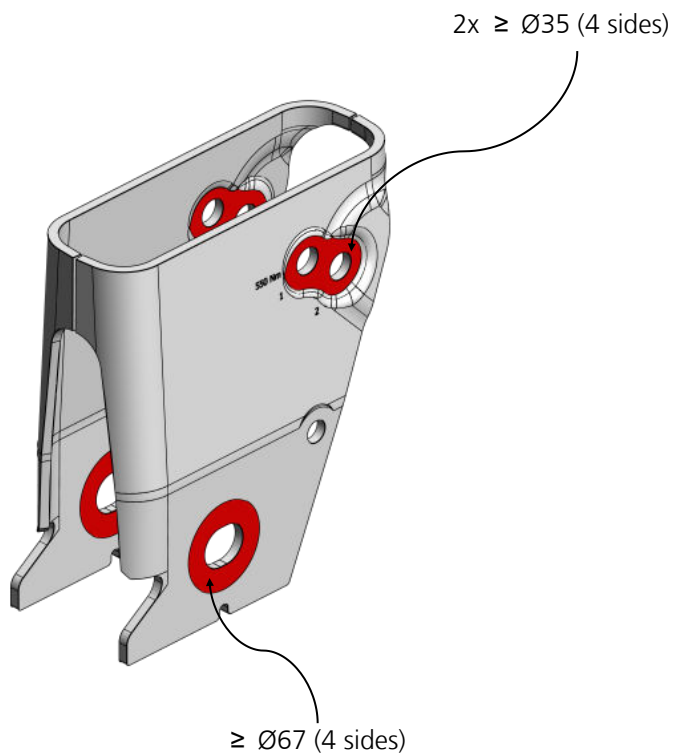


Due to slotted holes in the hanger bracket the pivot bolt and wear plates can move over 6 mm.

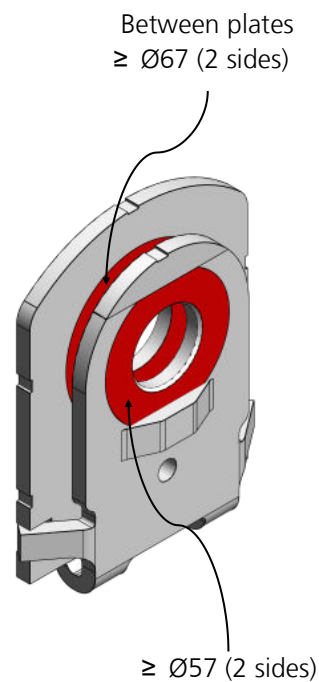
9. Paint instruction

The red market areas are only allowed to be primered, KTL coated (max. 30µm) or zinc dipped (50 - 100µm).

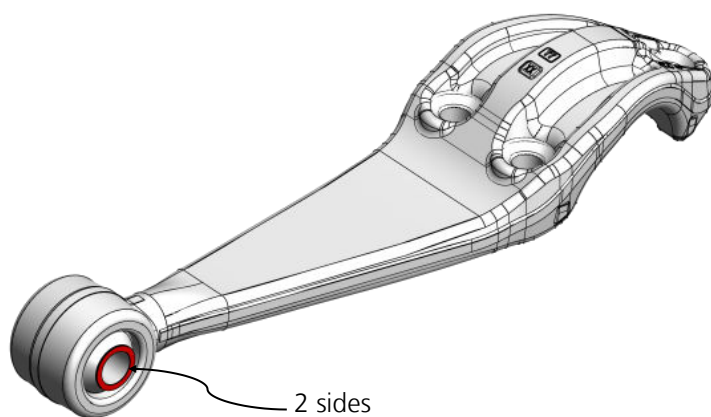
Hanger bracket



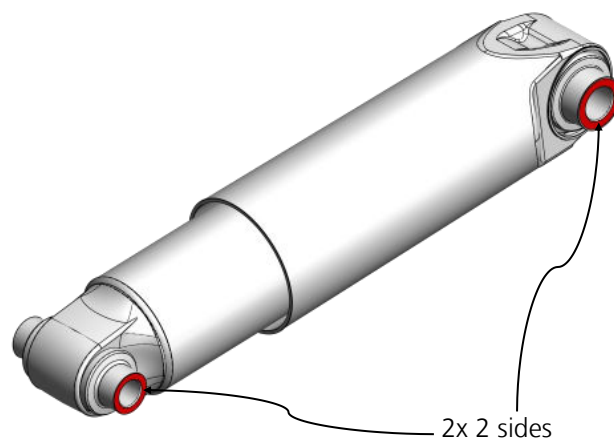
Wear plate (standard already KTL coated)



Trailing arm



Shock absorber

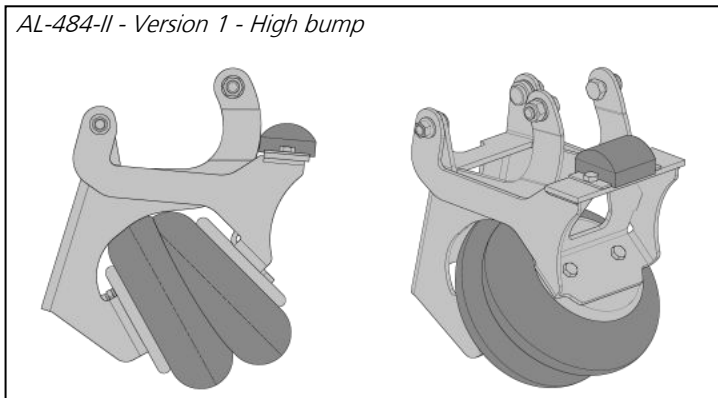


10. Axle lift

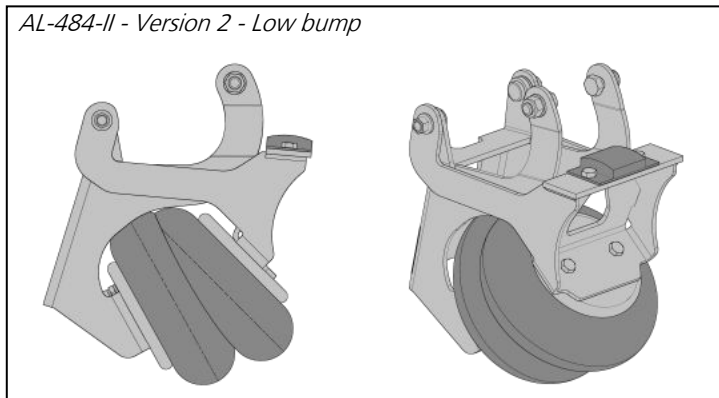
For the MBS air suspension range there is one axle lift, AL-484-II, available in two configurations (high and low bump). The axle lift can be retro-fitted. Version 1 with the high bump is for the MBS-100 range and version 2 with the low bump is for the MBS-200 range. Both versions are suitable for disc and drum brake axles. Maximum allowed pressure is 8,5 bar. No residual pressure is needed when the axle is not lifted. Per axle two axle lifts are required.

10.1 Axle lift versions

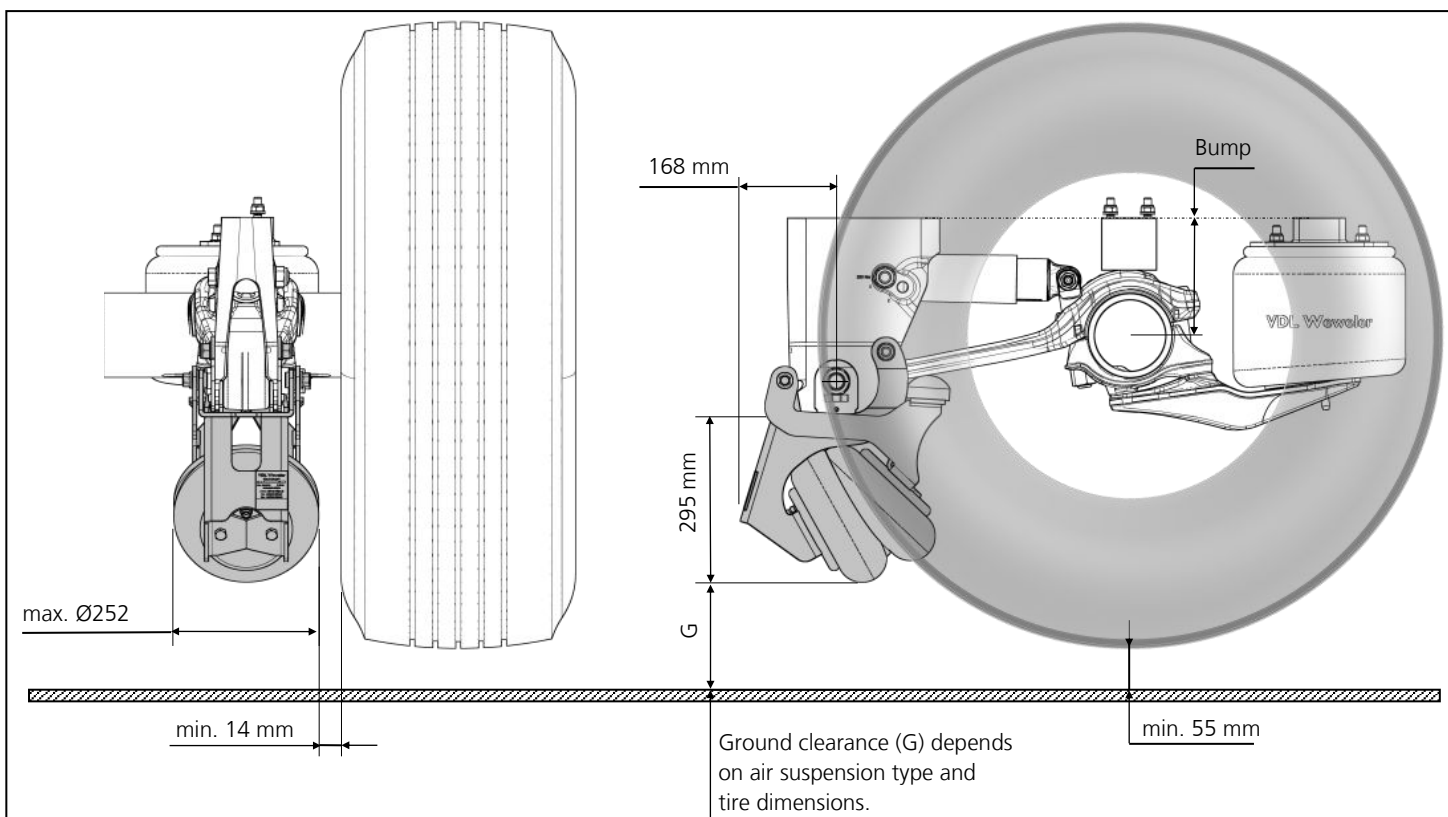
AL-484-II - Version 1 - High bump



AL-484-II - Version 2 - Low bump



10.2 Axle lift clearance



Always check the ground clearance (G). Minimum allowed ground clearance is 50mm when the vehicle is standing level and on the suspension bump. The clearance between the road and tyre when the axle is lifted is the inbound axle travel minus the deformation of the tyre (min.55 mm).

11. Splitter

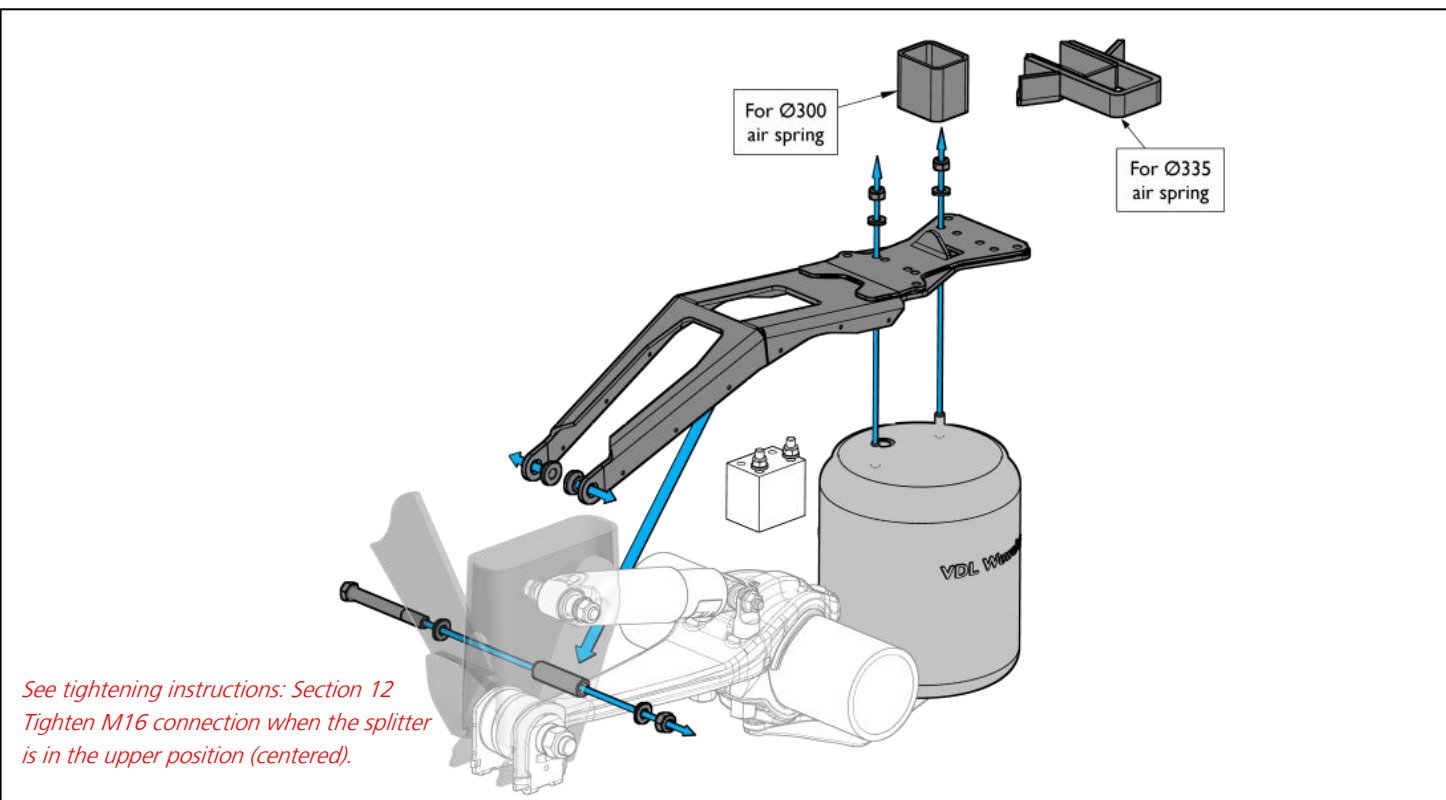
For the MBS air suspension range there is a Splitter available, the SPL-23.

The Splitter can be used at with all available air springs:

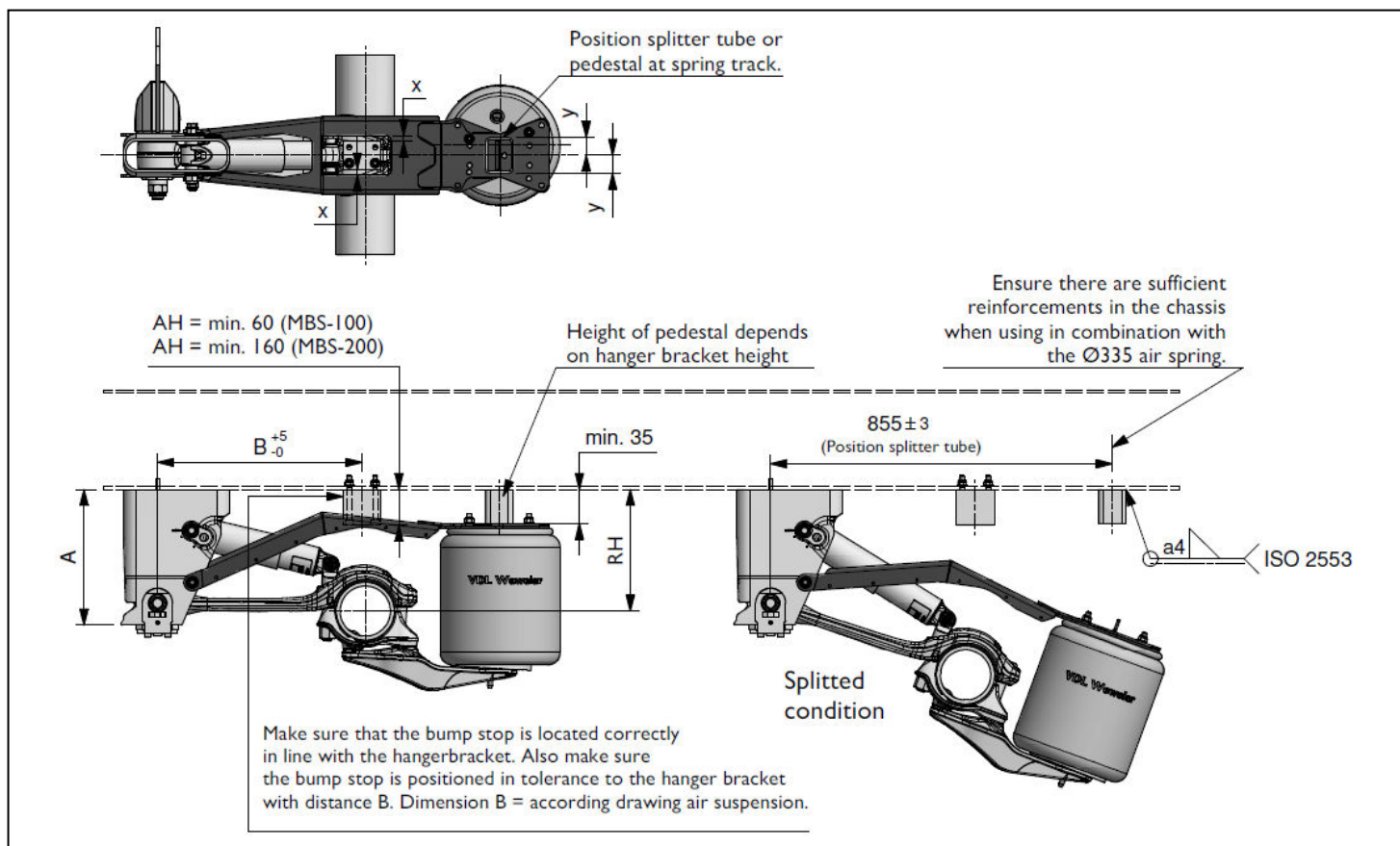
- Ø300 & Ø335 (standard & short stroke) at 0 & 25mm offset.
- Ø335 (long stroke) at 25mm & 50mm offset.

Check individual Splitter drawing for additional information.

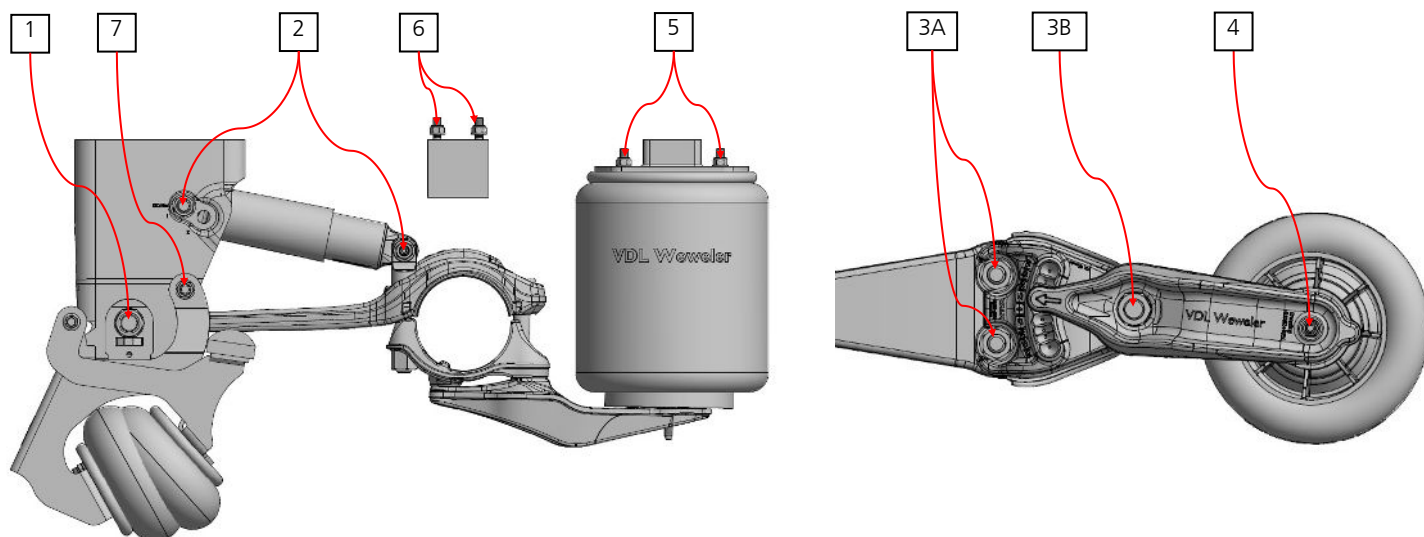
11.1 Splitter overview



11.2 Splitter specifications



12. Torque settings MBS Air Suspension



	Item	Size	Width across flats (A/F)	Torque **		Inspection Field check (maintenance)
				Step 1 : Torque	Step 2 : Angle	
1	Pivot bolt ^{1) 2)}	M27	41	250 Nm (+25 / -0) + apply grease on 1/4 of thread surface *	250° (+27° / -13°)	1000 Nm
2	Shock absorber bolt M16 ^{1) 2)}	M16	24	170 Nm (+17 / -0)	270° (+27° / -13°)	350 Nm
	Shock absorber bolt M20 ^{1) 2)}	M20	24 (bolt) / 30 (nut)	550 Nm (+50 / -0)	-	550 Nm
3A	Clamping bolts / studs front ³⁾	M24	36	800 Nm (+50 / -0)	-	800 Nm
3B	Clamping bolt rear	M27	41	750 Nm (+50 / -0)	180° (+18° / -9°)	1000 Nm
4	Air spring (bottom)	M12	19	65 Nm (+10 / -0)	-	65 Nm
5	Air spring (top)	M12	19	30 Nm (+10 / -0)	-	30 Nm
6	External bump stop	M12	19	30 Nm (+10 / -0)	-	30 Nm
7	Axle lift (pre-assembled) / Splitter	M16	24	200 Nm (+/- 20)	-	200 Nm

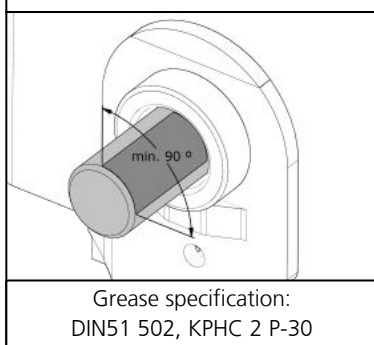
¹⁾ Tighten at ride height.

²⁾ During angle tightening of the nut/bolt it is essential to secure the counterside.

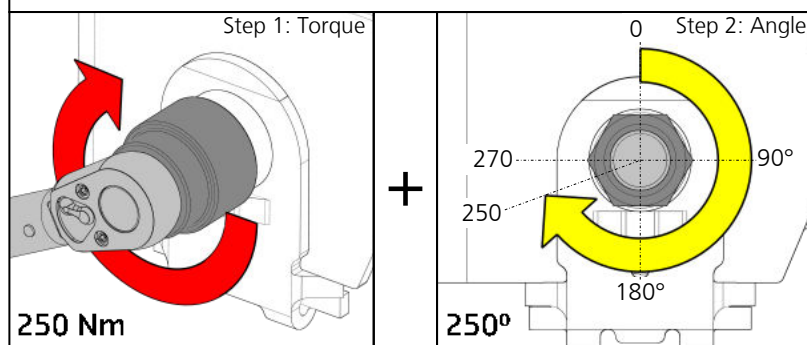
³⁾ Tighten clamping bolts/studs evenly and alternately.

Always tighten or check the fasteners with a calibrated torque wrench.

* 1/4 THREAD SURFACE GREASE



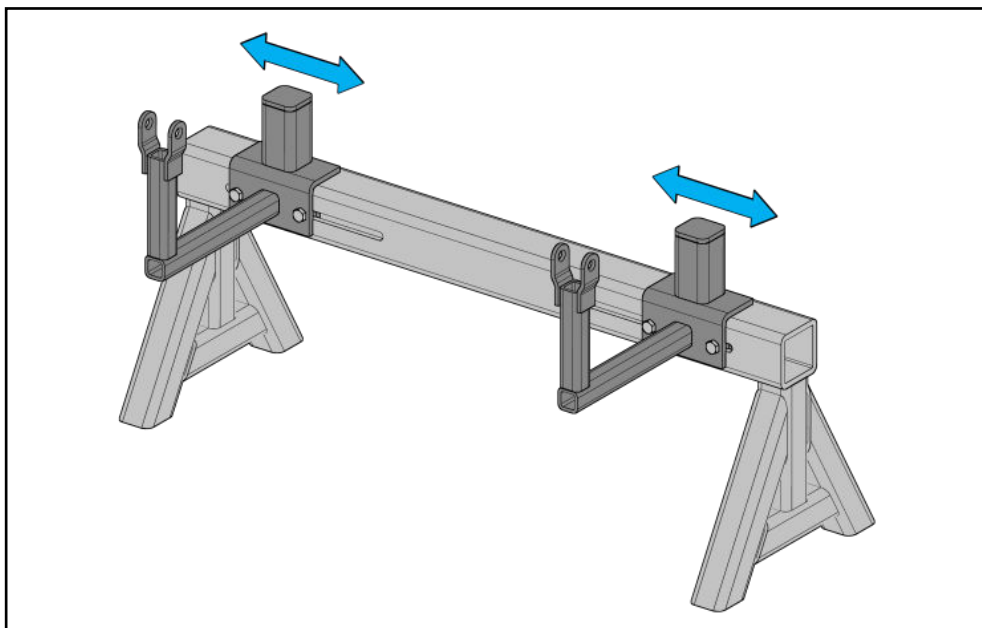
** ANGLE TIGHTENING METHOD (example pivot bolt)



13. Air Suspension Assembly

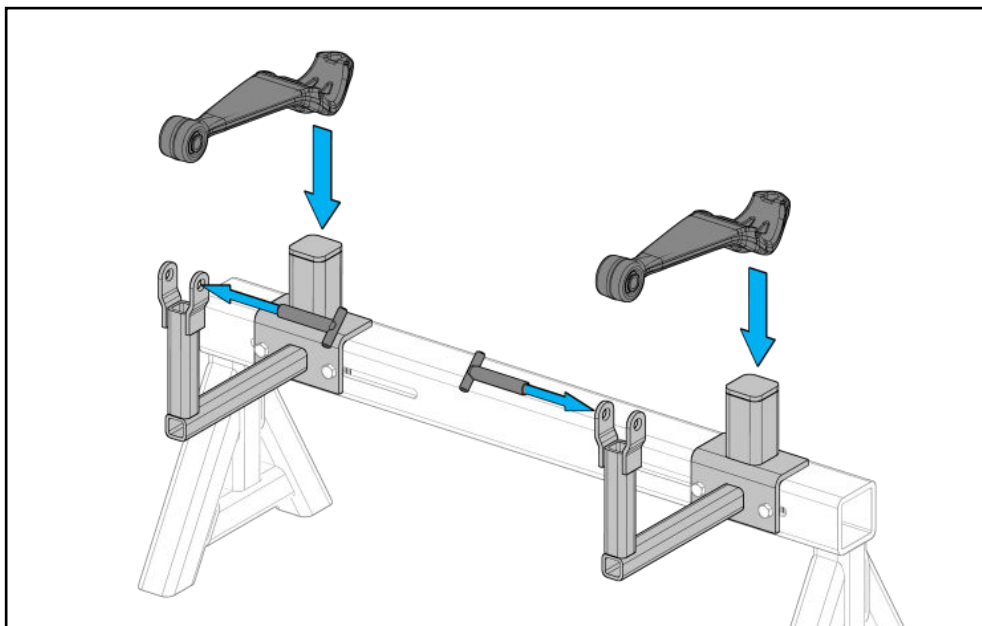
13.1 Assembly Jig

Set up the assembly jig for the corresponding axle. Adjust the two trailing arm supports to the correct spring track.



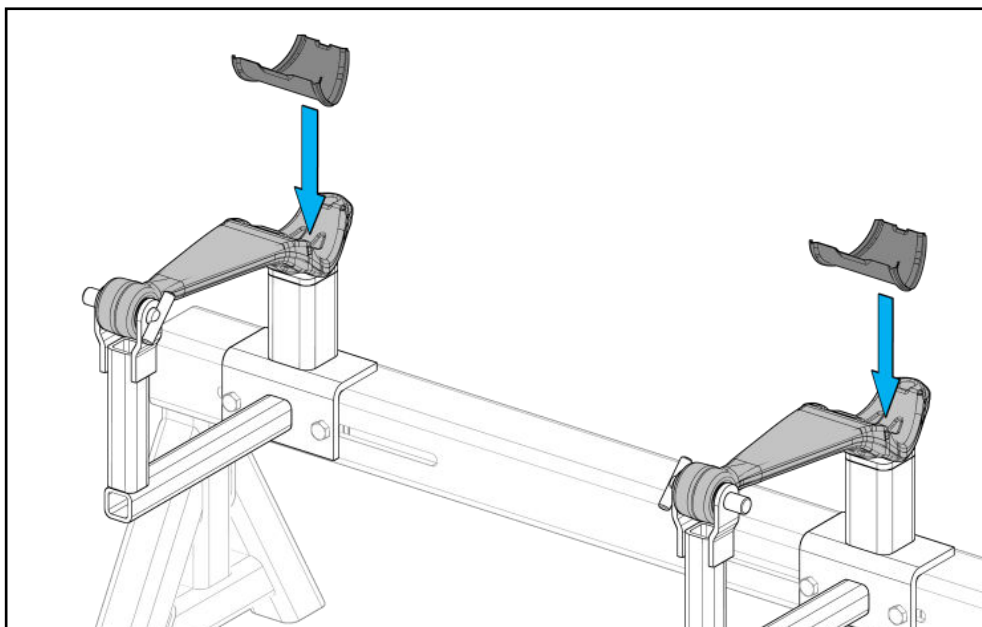
13.2 Trailing arms

Place both trailing arms on the assembly jig as illustrated and place the Ø30mm support pins through the support bracket and the pivot bush. This ensures the correct spring track.



13.3 Zinc plates

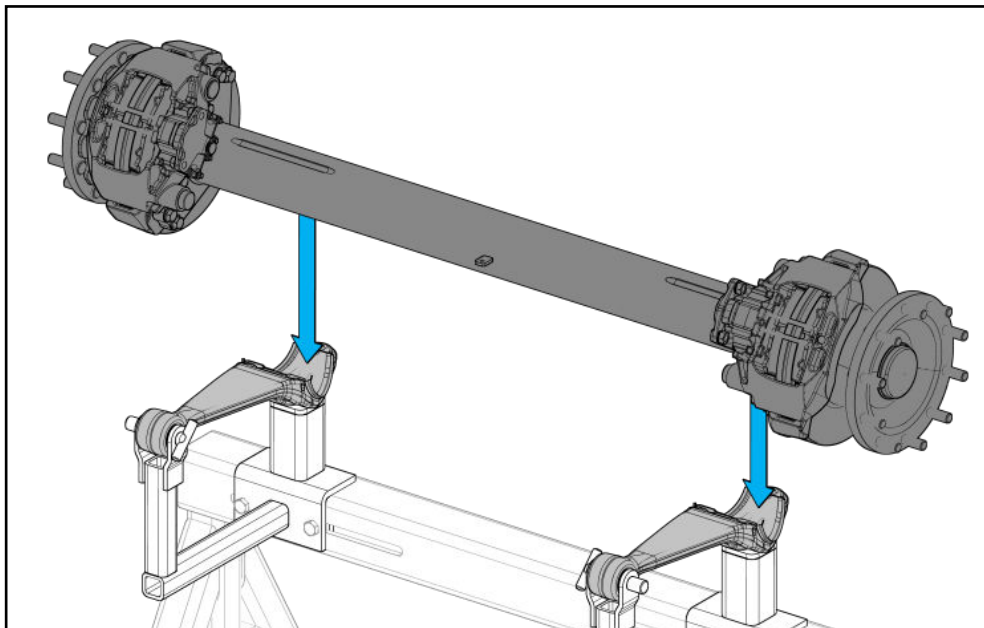
Place the zinc plates on the trailing arms.



13. Air Suspension Assembly

13.4 Axle

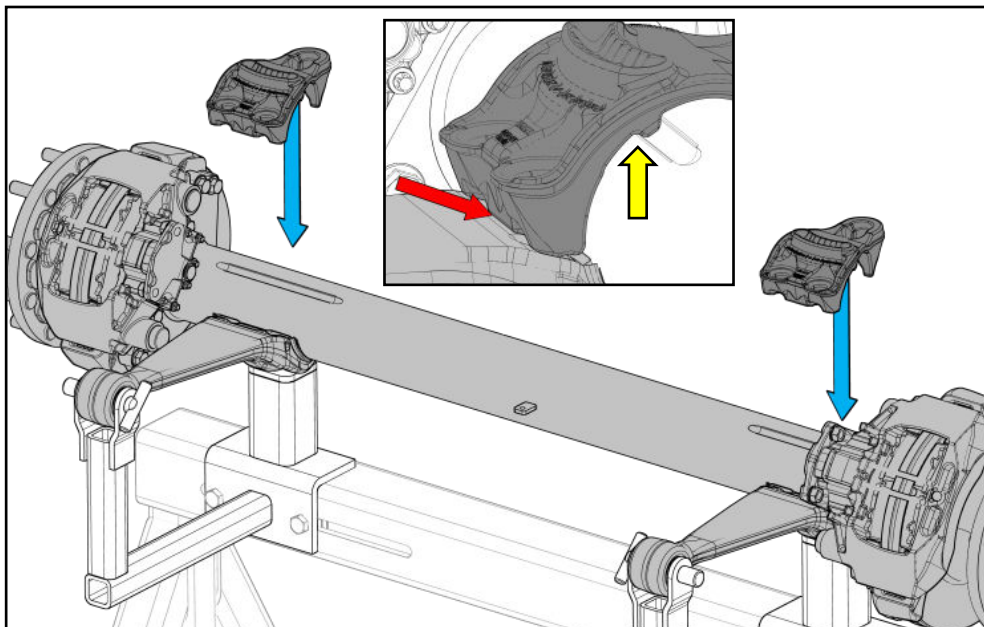
Place the axle on the trailing arms + zinc plates. Make sure the axle is positioned in the correct driving direction.



13.5 Axle seat

Place the axle seats onto the axle. Rotate the axle if necessary to position the groove in the axle so that the key of the axle seat locks in. See yellow arrow.

Make sure the trailing arm and the axle seat make contact at the surfaces marked with the red arrow.



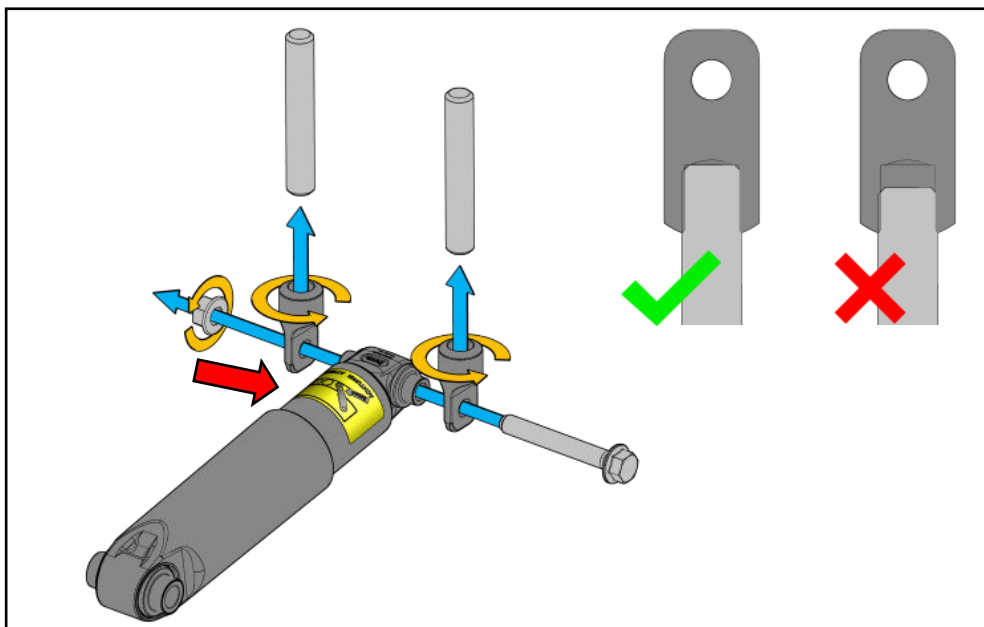
13.6 Shock support brackets

In case of a single shock absorber support bracket proceed to step 13.7.

In case of the axle clamping with two separate shock absorber support brackets: Pre-assemble the support brackets with the M24 studs and the shock absorber.

Make sure the studs are fully screwed into the support brackets. Next hand tighten the M16 shock absorber connection.

Make sure the sticker and/or the engraving on the shock absorber points towards the road/trailing arm (see Section 6).



11. Air Suspension Assembly

13.7 Clamping studs / bolts

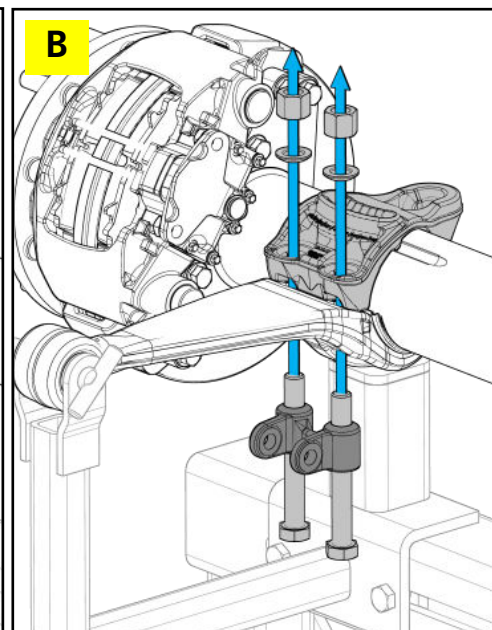
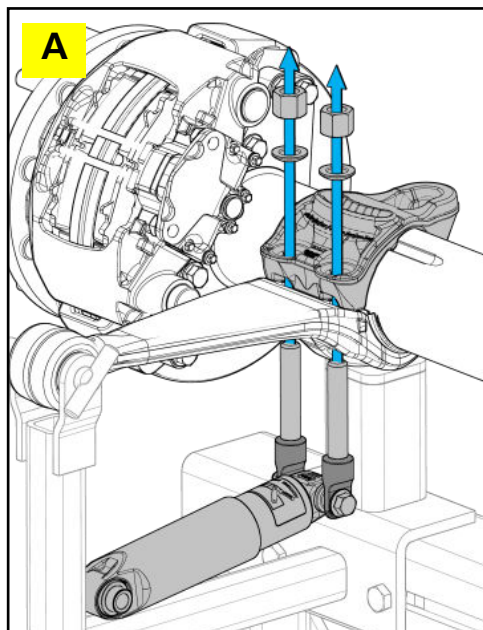
A. Two piece shock absorber support:

Place the conical washers on the axle seat.
Guide the studs of pre-assembly through the trailing arm and axle seat.
Hand tighten the M24 nuts.

B. One piece shock absorber support:

Place the conical washers on the axle seat.
Use the M24 bolts to position and mount the one piece shock absorber support.
Hand tighten the M24 nuts.

The following steps of this section will only show the clamping with the two-piece bottom shock absorber connection (A).

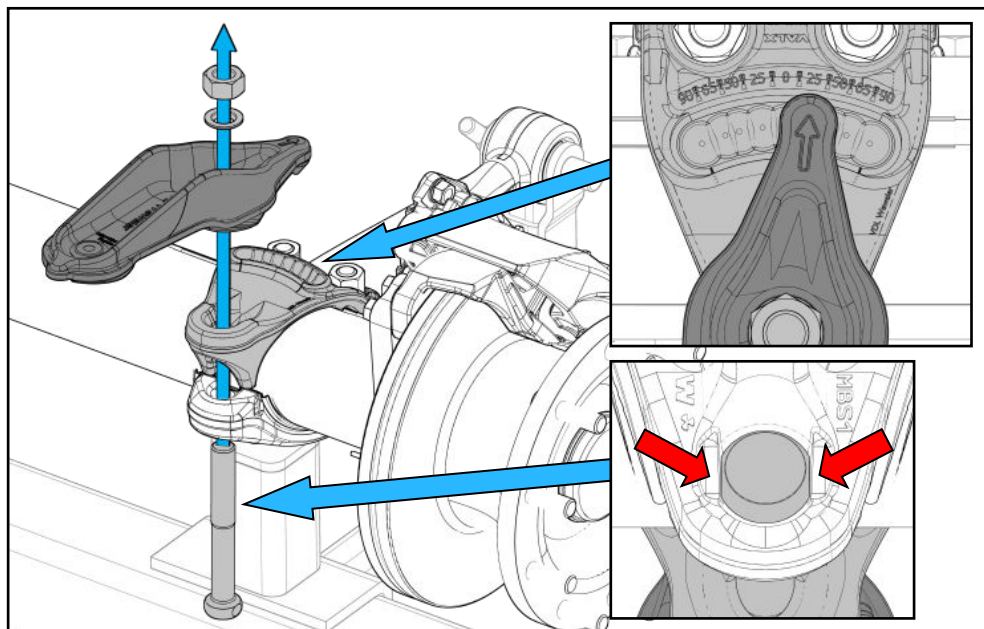


13.8 Tailend

Place the tailend on the clamping. Guide the M27 bolt through the eye at the back of the trailing arm and through the axle seat and tailend. Place the conical washer. Hand tighten the M27 nut.

Make sure to place the tailend on the correct air spring offset. Check application or system drawing. In this example 25mm inwards is used. The adjustable tailend is able to create the following air spring offsets: 0, 25, 50, 65 and 90mm.

Make sure the flat sides of the M27 bolt are positioned correctly in the trailing arm.

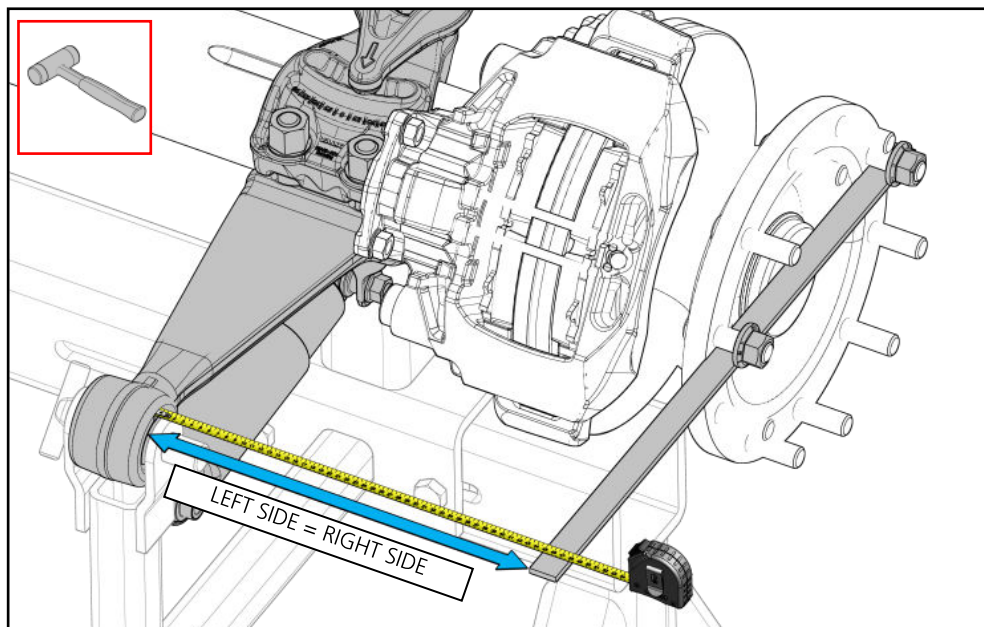


13.9 Alignment suspension to axle

Check the distance between the trailing arm eye and the hubface on both sides of the axle. This dimension should be the same on both sides.

If necessary adjust the alignment by moving both clamping sides left or right over the groove.

See instructions: Section 8.1 & 8.2



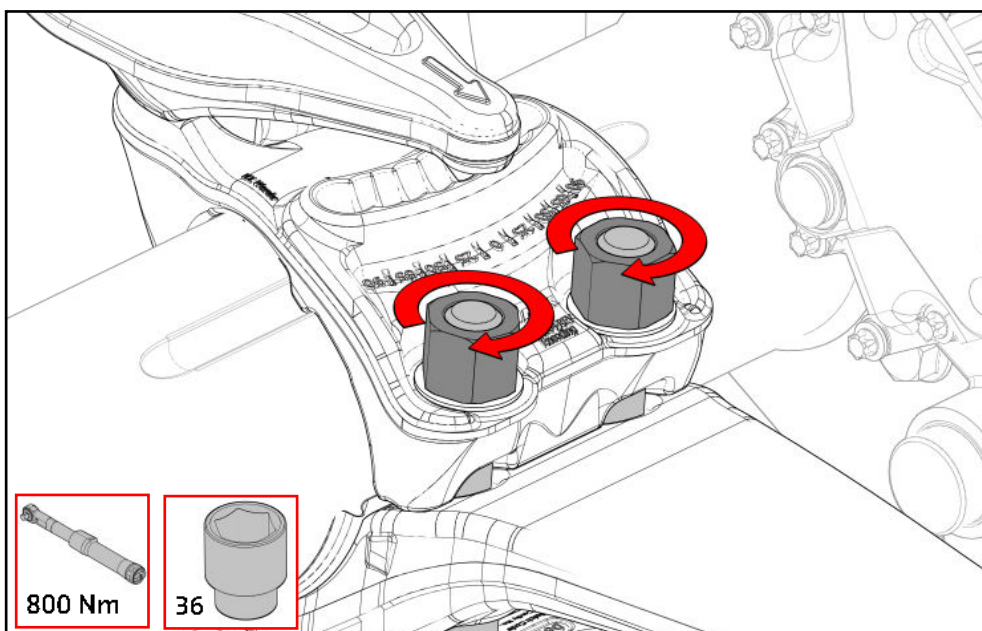
13. Air Suspension Assembly

13.10 Axle clamping front M24

First tighten the front M24 nuts (preferred simultaneously otherwise alternately and evenly) to the specified torque.

See tightening instructions: Section 12

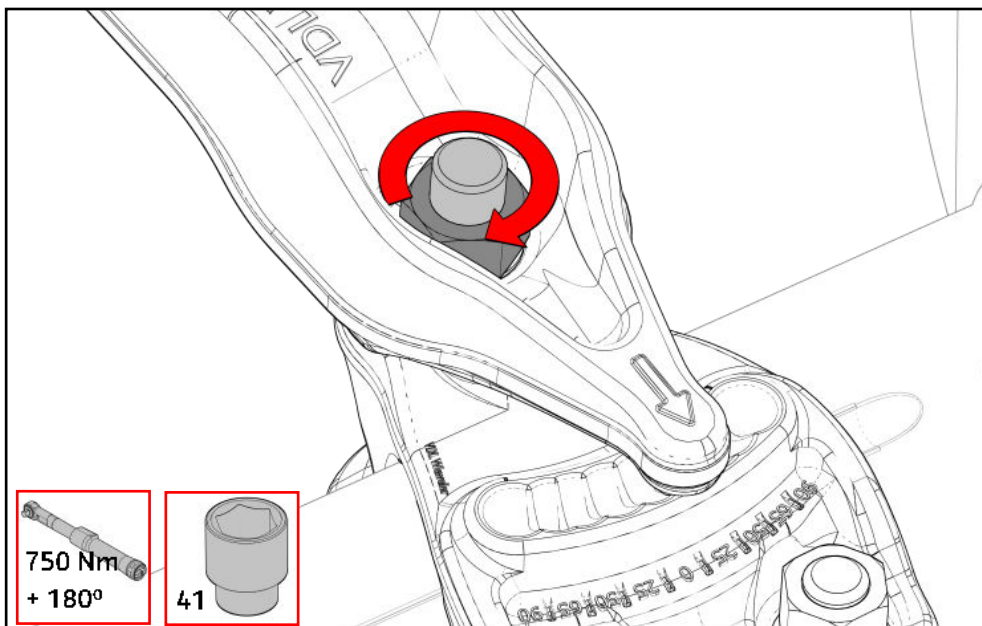
IMPORTANT TO TIGHTEN THE FRONT M24 NUTS BEFORE THE M27 REAR NUT



13.11 Axle clamping rear M27

Tighten the rear M27 nut to the specified torque.

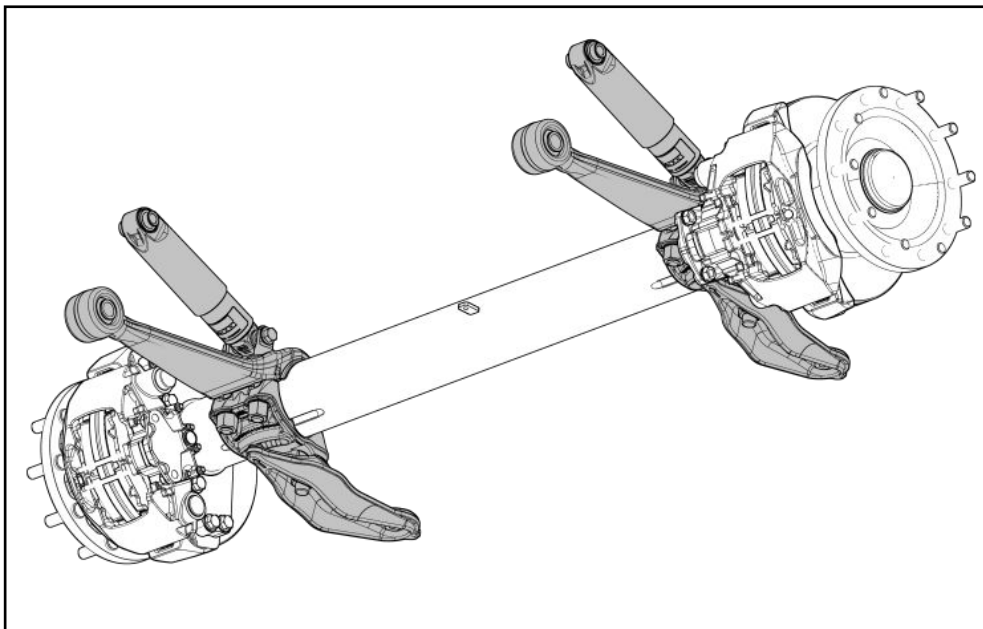
See tightening instructions: Section 12



13.12 Axle + suspension sub assembly

Air suspension (sub) assembly on the grooved axle complete and ready for mounting on the chassis.

(In the assembly with the one piece bottom shock absorber bracket the shock absorber is not yet mounted.)



14. Chassis Mounting

Two types of hanger brackets with different bracing options are possible (see section 4). This assembly manual shows the standard option with the casted bracing.

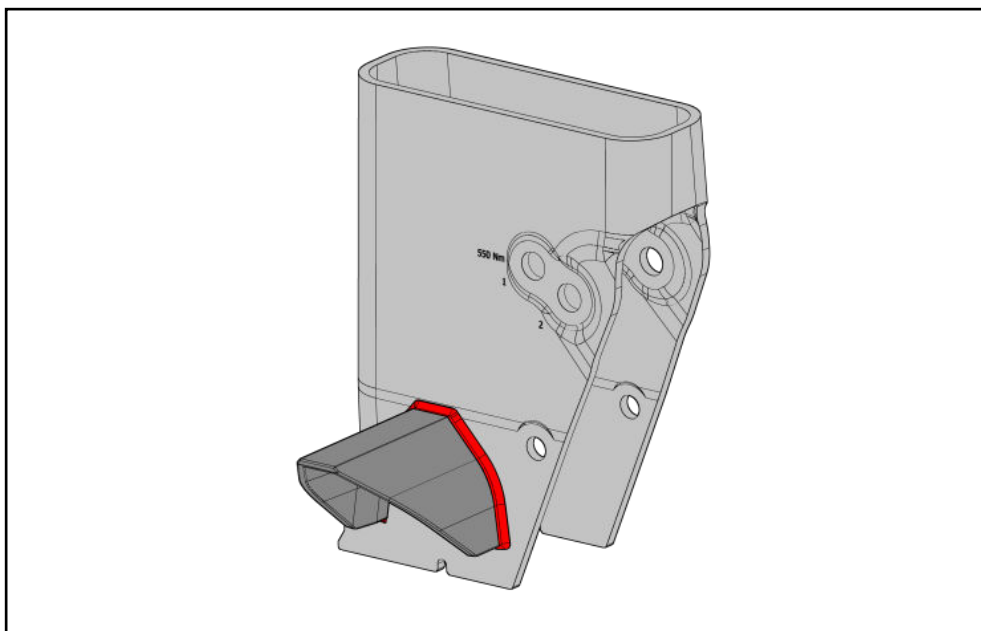
14.1 Hanger bracket & casting

If the hanger brackets are not supplied with the castings attached.

Weld the casted bracing part to the hanger bracket according instructions.

Make per axle a lefthand and righthand version.

See instructions: Section 4.6

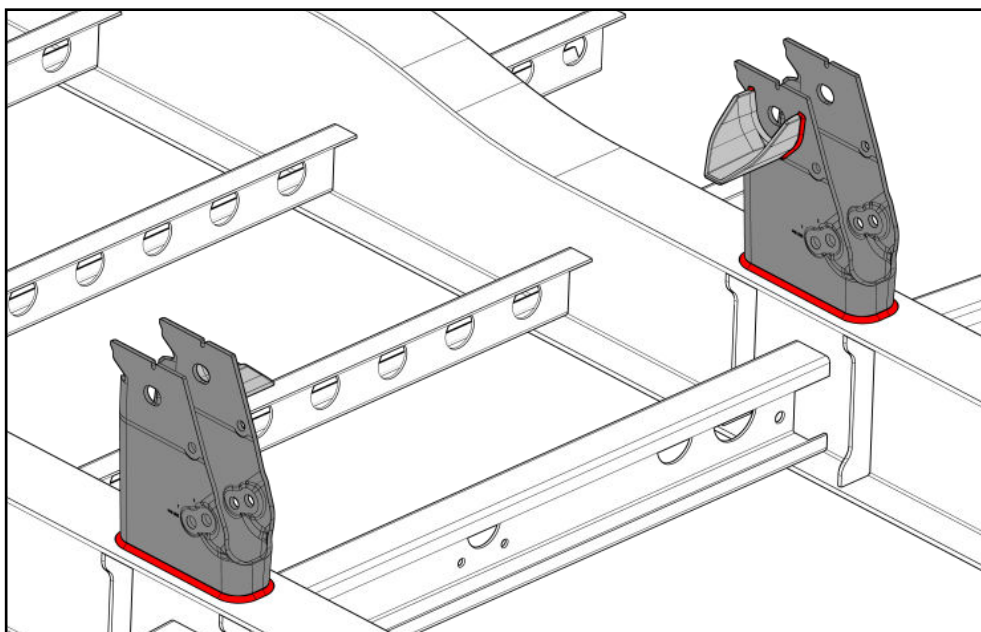


14.2 Hanger brackets

Align and weld the hanger brackets to the chassis rails according instructions at the correct spring track.

The trailer builder is responsible that there are sufficient reinforcements in the vehicle chassis to guide the occurring forces on the hanger brackets (*see recommendation in Section 4.8*).

See instructions: Section 4.3 / 4.4 / 4.8

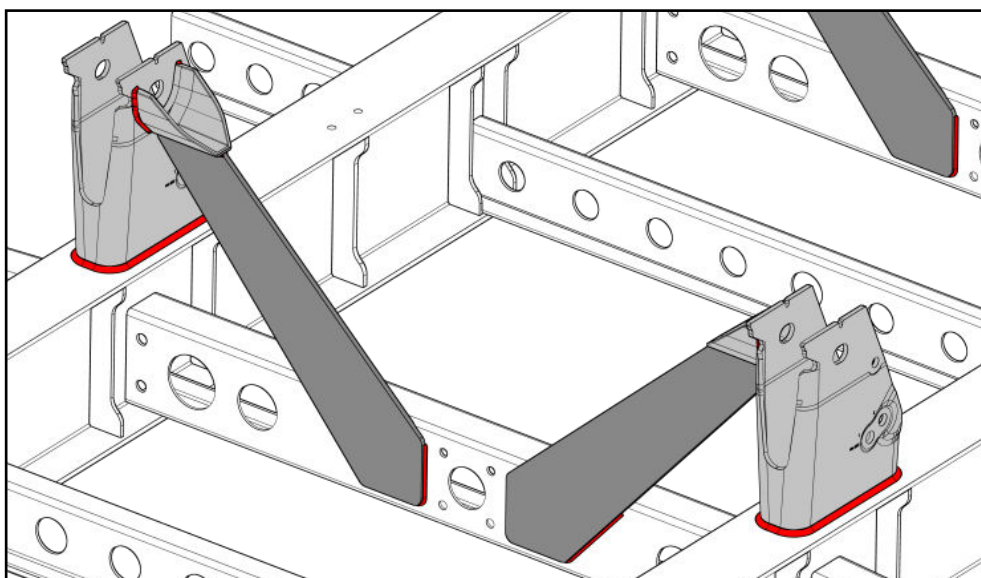


14.3 Bracing plates

Weld the bracing plates to the casted bracing parts and the cross members in the chassis according instructions.

The plates must be straight and are not allowed to be bended.

See instructions: Section 4.6



14. Chassis Mounting

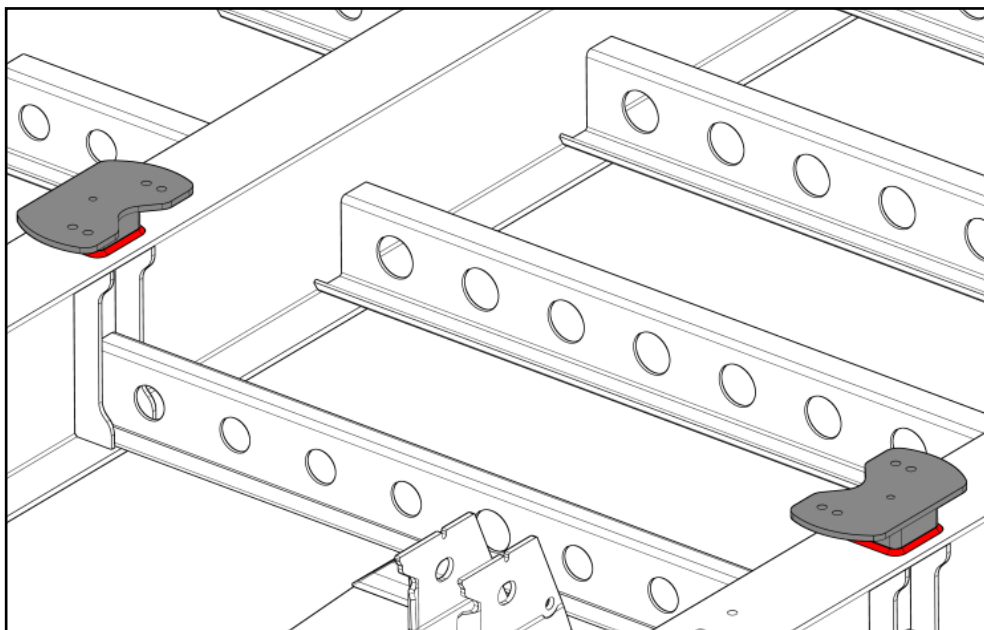
14.4 Pedestals

Weld the pedestals (if present in the suspension assembly) to the chassis rails according instructions.

The universal pedestal is suitable for the Ø300 and Ø335 air spring. Check the system drawing for the correct air spring offset.

The trailer builder is responsible that there are sufficient reinforcements in the vehicle chassis to guide the occurring forces on the pedestals.

See instructions: Section 4.5

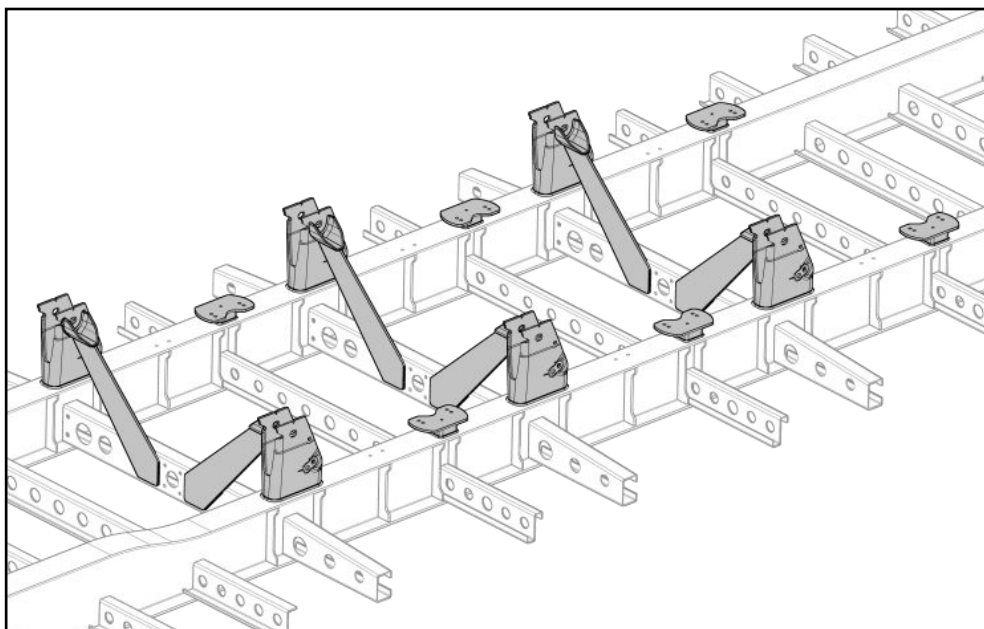


14.5 Coating / painting

The complete chassis can be painted/coated before mounting the assembled suspension.

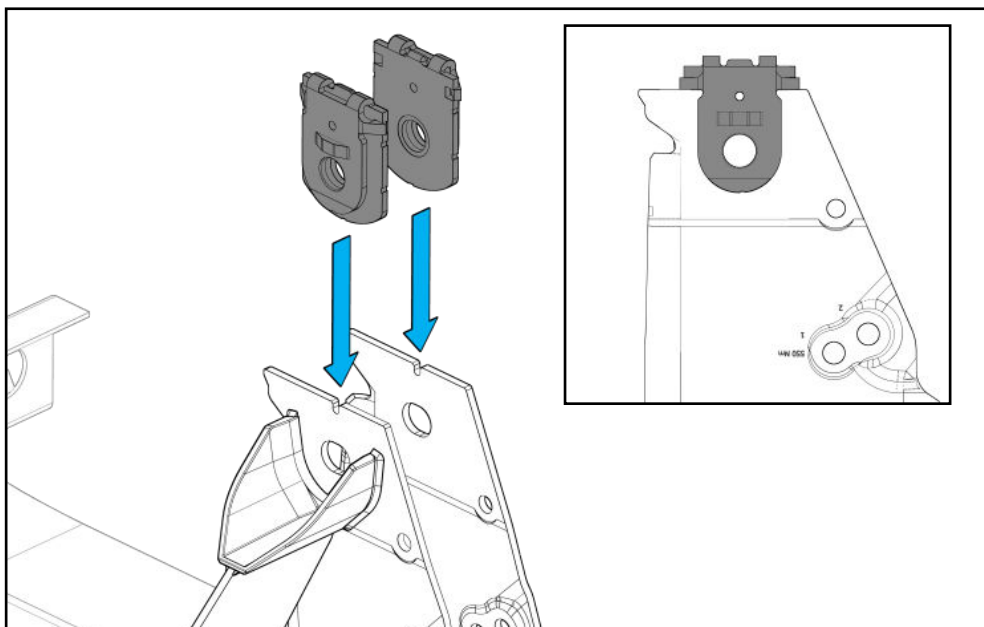
See instructions for areas which must be free from paint/coating or only can be primed.

See instructions: Section 9



14.6 Wear/alignment plates

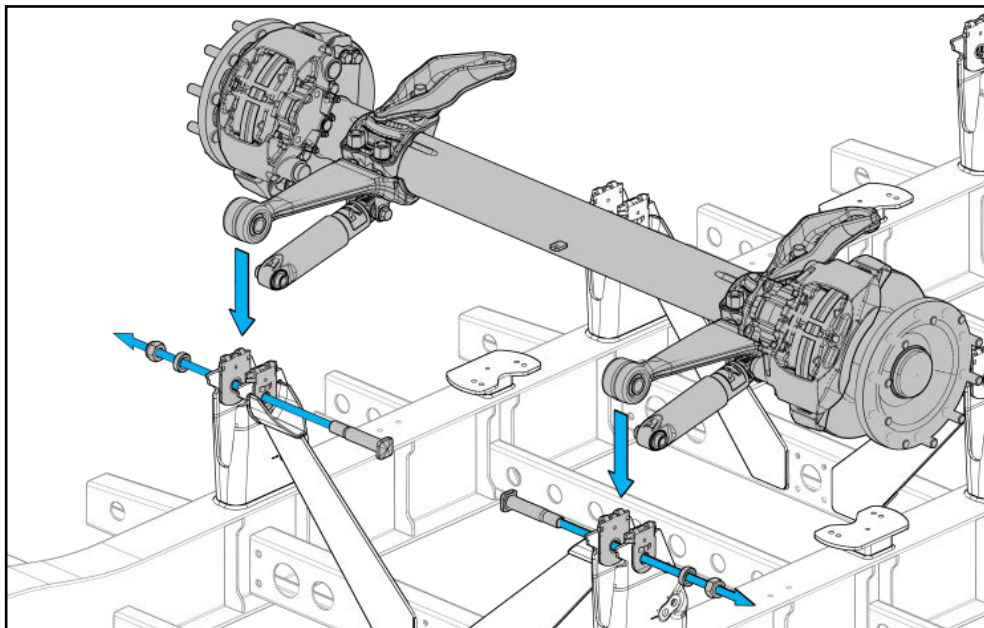
Place the wear/alignment plates over bottom edges of the hanger brackets.



14. Chassis Mounting

14.7 Axle placement

Place the assembled axles in the hanger brackets between the wear plates and place the pivot bolt connection. Hand tighten the nut. After alignment (step 14.8) the connection can be torqued.



14.8 Axle alignment

Align all axles (disc or drum) within the tolerances given, taken the second axle as a reference.

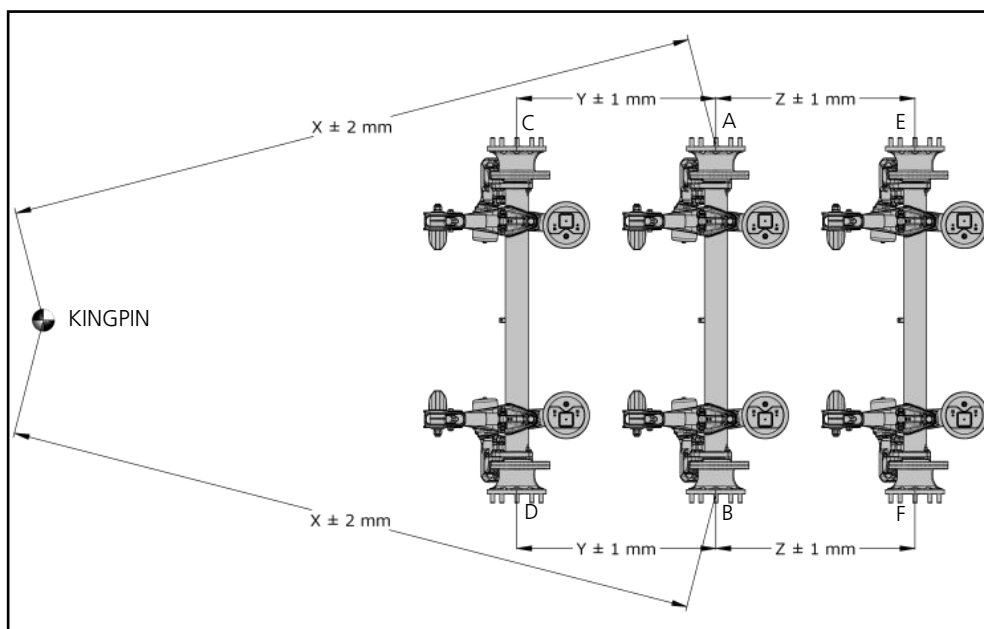
The same tolerances apply for alignment using a laser.

A through F are the axle centres.

See instructions: Section 8.3

Follow instructions for adjusting the alignment in the hanger bracket.

See instructions: Section 8.4

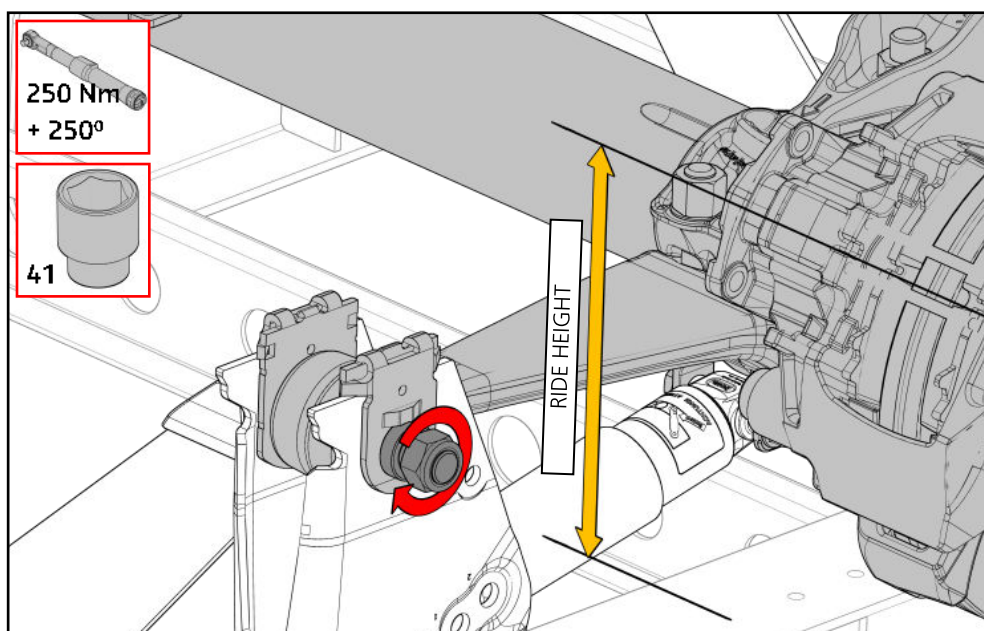


14.9 Pivot bolt connection

Apply grease on ¼ of the thread surface.

Tighten the pivot bolt connection **at ride height** according instructions to torque.

See tightening instructions: Section 12



14. Chassis Mounting

14.10 Shock absorber top

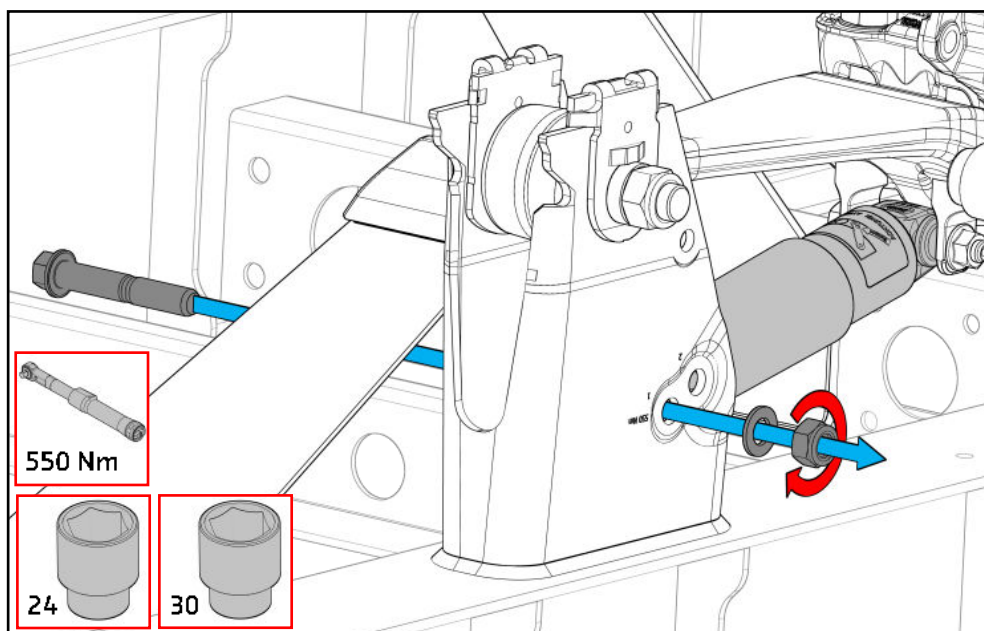
For the one-piece bottom shock absorber connection go to step 14.12.

Two-piece shock absorber connection:

Align the shock absorber top bush with the correct hole in the hanger bracket (see system or application drawing) and place the M20 bolt, washer and nut.

Tighten the top connection **at ride height** to torque according instructions.

See tightening instructions: Section 12

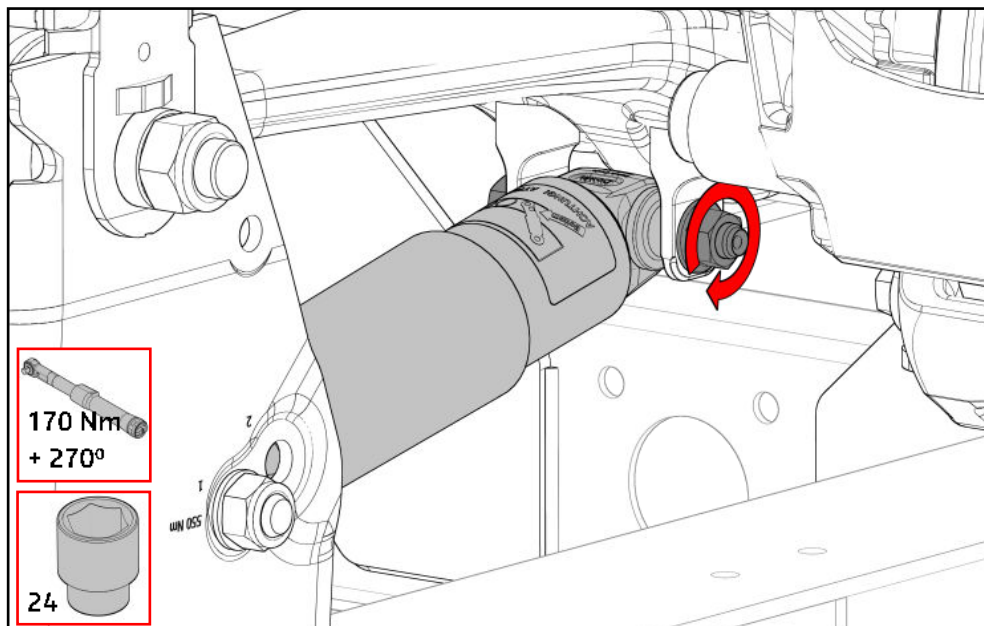


14.11 Shock absorber bottom

Tighten the bottom M16 connection **at ride height** to torque according instructions.

See tightening instructions: Section 12

Proceed to step 14.13

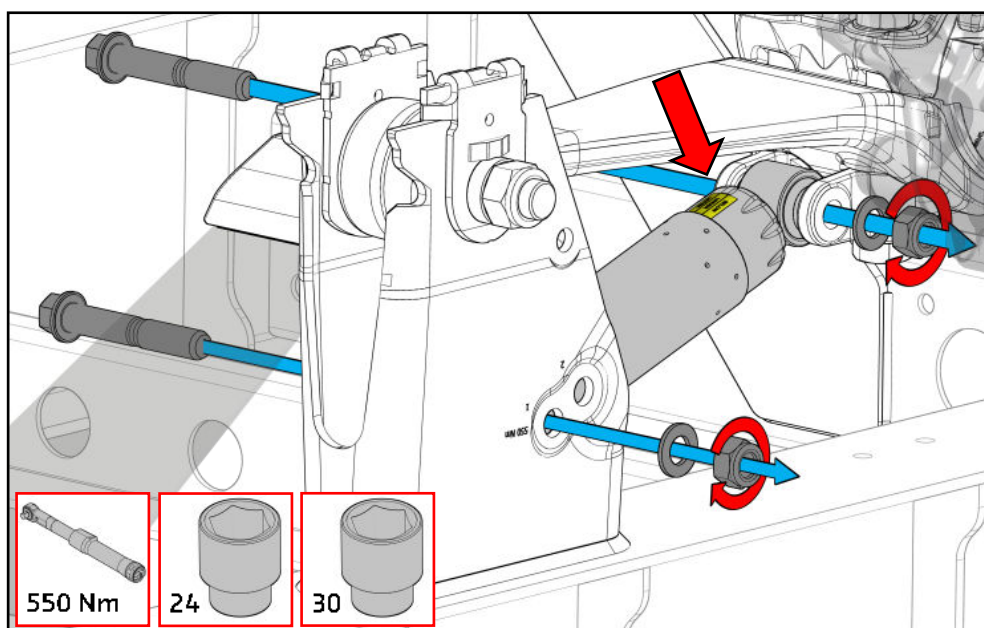


14.12 Shock absorbers

Place the shock absorbers in the correct hanger bracket position/hole (see system or application drawing) with the sticker and/or engraving in the bottom pointing towards the trailing arm (*see Section 6*).

Tighten the top and bottom M20 connection **at ride height** to torque according instructions.

See tightening instructions: Section 12



14. Chassis Mounting

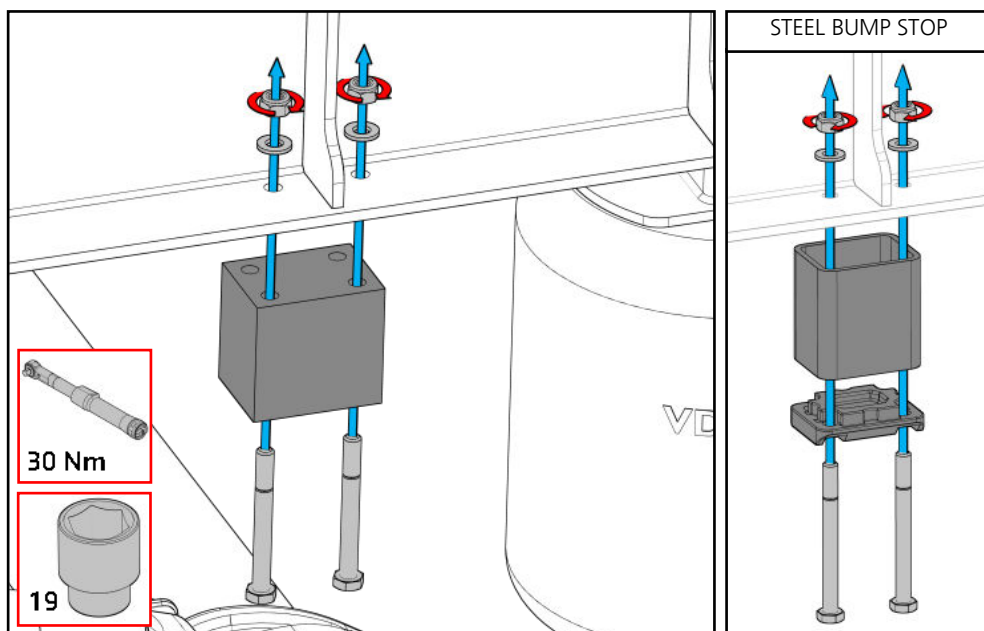
14.16 Bump stop

Mount the external (composite or steel) system bump stops on the chassis in the correct location if present (see system or application drawing). See [Section 7](#) for allowed mounting positions.

Tighten the M12 connection according to instructions.

The trailer builder is responsible that there are sufficient reinforcements in the vehicle chassis to guide the occurring forces on the bump stops (see [recommendation in Section 7.3](#)).

See [tightening instructions: Section 12](#)



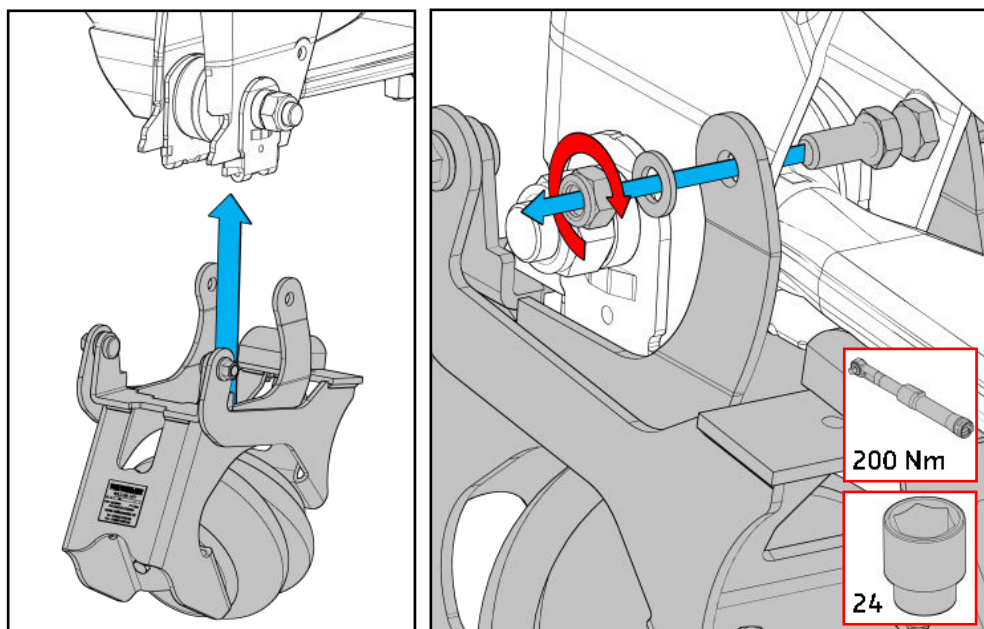
14.17 Axle lift (& Splitter)

Place the axle lift around the hanger brackets on both sides of the vehicle.

Tighten per axle lift both M16 bolts to torque according to instructions.

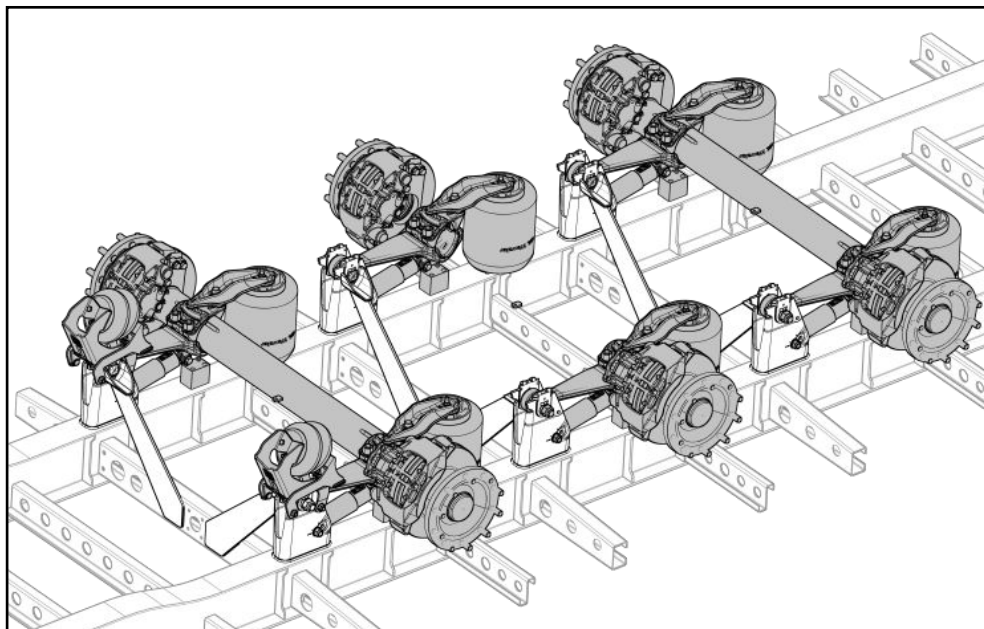
(See [Section 11 for Splitter information](#)).

See [tightening instructions: Section 12](#)



14.18 Complete assembly

System assembly complete. Ready for brake booster and wheel mounting.



Notes