

General Installation Instruction Manual SAF Intra Air suspension system



Edition 03/2014

For detailed instructions refer to safholland.com

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Overview of ride heights and weights for INTRADISC *plus* INTEGRAL rigid axles

air spring type 2619 V (code: **33**), total axle travel **180** mm

air suspension type	ride height range [mm]	hanger bracket [mm]	air spring bracket [mm]	weight ¹⁾ [kg]	
				axle version BI9-22S ²⁾	axle version BI9-19...
IU25/2000 33	230-270	200	0	398	391
IU28/2005 33	260-300	200	50	403	396
IU30/2505 33	280-320	250	50	407	400
IU33/2510 33	310-350	250	100	409	402
IU35/3010 33	330-370	300	100	413	406
IO35/2000 33	335-375	200	0	400	393
IO37/2500 33	355-395	250	0	403	396
IO40/2505 33	385-425	250	50	408	401
IO42/3005 33	405-445	300	50	412	405
IO45/3010 33	435-475	300	100	414	407
IO47/3510 33	455-495	350	100	417	410
IO50/3515 33	485-525	350	150	420	413

air spring type 2919 V (code: **42**), total axle travel **180** mm

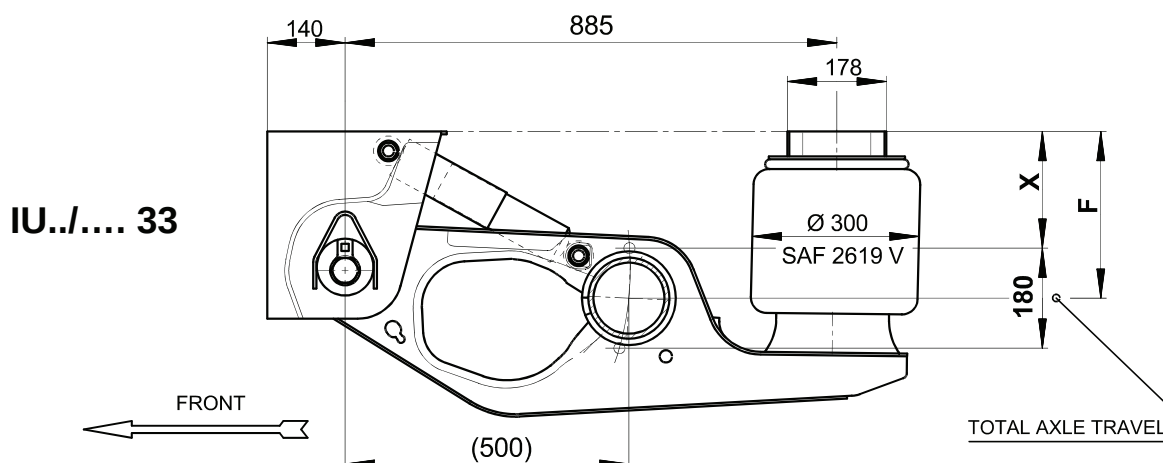
air suspension type	ride height range [mm]	hanger bracket [mm]	air spring bracket [mm]	weight ¹⁾ [kg]	
				axle version BI9-22S ²⁾	axle version BI9-19...
IU25/2000 42	225-265	200	0	402	395
IU28/2005 42	255-295	200	50	407	400
IU30/2505 42	275-315	250	50	411	404
IU33/2510 42	305-345	250	100	413	406
IU35/3010 42	325-365	300	100	417	410
IO35/2000 42	330-370	200	0	404	397
IO37/2500 42	350-390	250	0	407	400
IO40/2505 42	380-420	250	50	412	405
IO42/3005 42	400-440	300	50	416	409
IO45/3010 42	430-470	300	100	418	411
IO47/3510 42	450-490	350	100	421	414
IO50/3515 42	480-520	350	150	424	417

air spring type 2924 V (code: **41**), total axle travel **200** mm

air suspension type	ride height range [mm]	hanger bracket [mm]	air spring bracket [mm]	weight ¹⁾ [kg]	
				axle version BI9-22S ²⁾	axle version BI9-19...
IU29/2000 41	250-310	200	0	403	396
IU31/2500 41	270-330	250	0	407	400
IU34/2505 41	310-360	250	50	412	405
IU36/3005 41	320-380	300	50	416	409
IU39/3010 41	350-410	300	100	418	411
IU42/3015 41	375-435	300	150	420	413
IO44/3000 41	395-455	300	0	413	406
IO49/3505 41	445-505	350	50	421	414

Air suspension type IU with air spring 2619V (33)

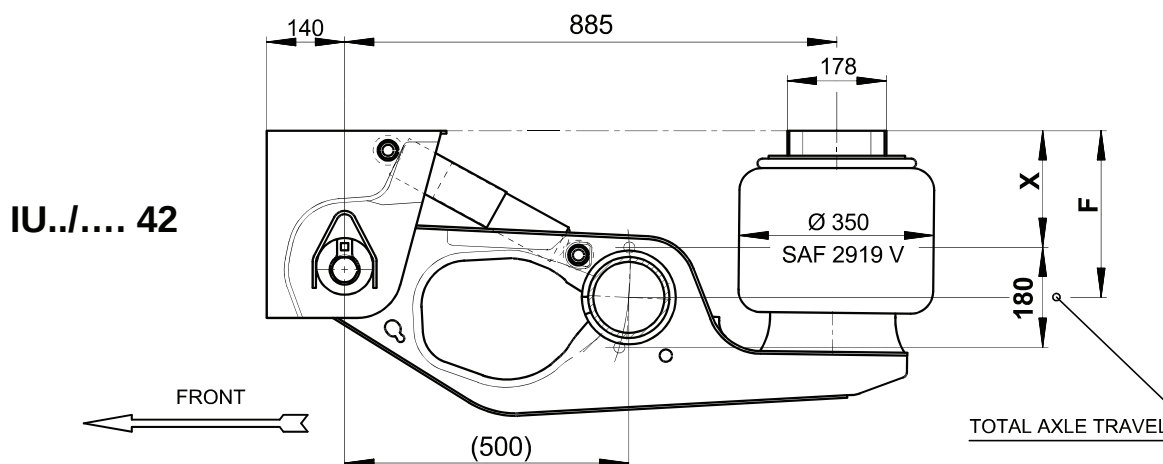
nominal ride heights 250 – 350 mm



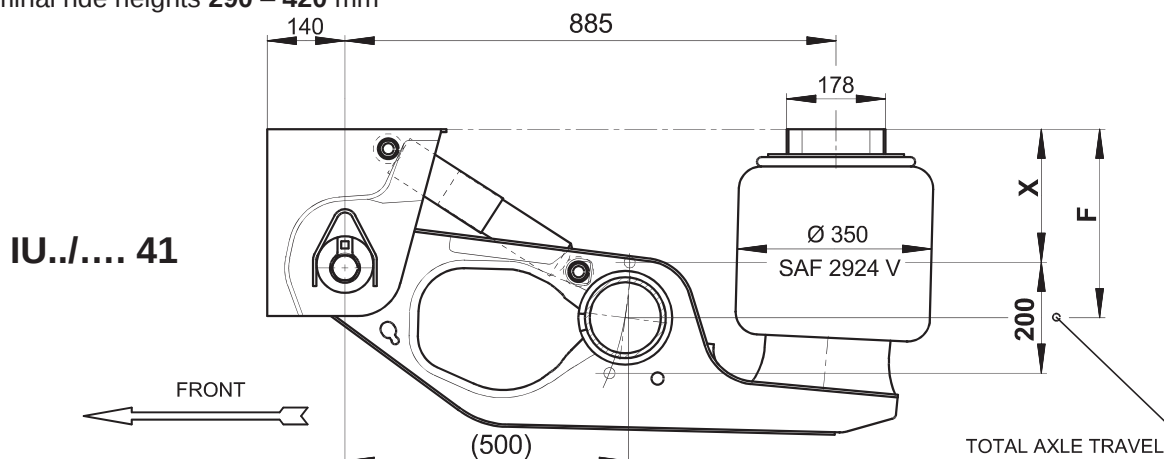
air suspension type	F; nominal ride height [mm]	ride height range [mm]	X; overall height	
			unladen without air [mm]	laden without air [mm]
IU25/2000 33	250	230-270	160	145
IU28/2005 33	280	260-300	190	175
IU30/2505 33	300	280-320	Ha	195
IU33/2510 33	330	310-350	240	225
IU35/3010 33	350	330-370	260	245

Air suspension type IU with air spring 2919V (42)

nominal ride heights 250 – 350 mm

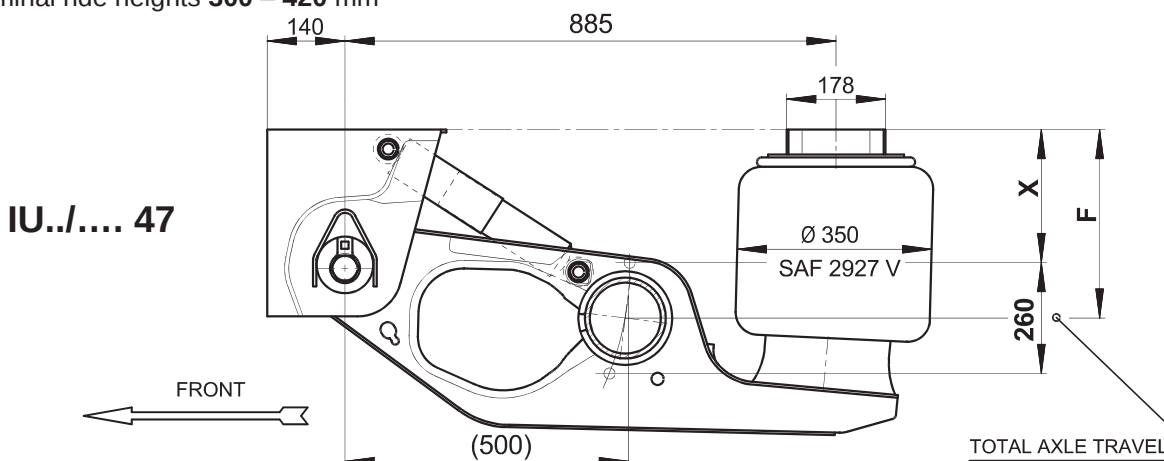


air suspension type	F; nominal ride height [mm]	ride height range [mm]	X; overall height	
			unladen without air [mm]	laden without air [mm]
IU25/2000 42	250	225-265	155	140
IU28/2005 42	280	255-295	185	170
IU30/2505 42	300	275-315	205	190
IU33/2510 42	330	305-345	235	220
IU35/3010 42	350	325-365	255	240

Air suspension type IU with air spring 2924V (41)
nominal ride heights **290 – 420 mm**

air suspension type	F; nominal ride height [mm]	ride height range [mm]	X; overall height unladen without air [mm]	laden without air [mm]
IU29/2000 41	290	250-310	180	165
IU31/2500 41	310	270-330	200	185
IU34/2505 41	340	300-360	230	215
IU36/3005 41	360	320-380	250	235
IU39/3010 41	390	350-410	280	265
IU42/3015 41 ¹⁾	420	375-435	305	290

1) in combination with self-steering axles the air suspension type IU41/3510 41 is used

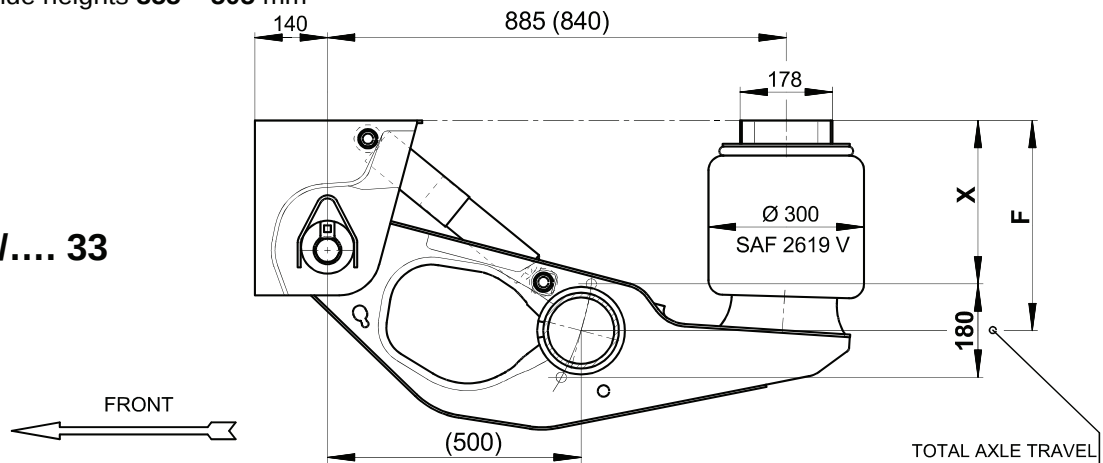
Air suspension type IU with air spring 2927V (47)
nominal ride heights **300 – 420 mm**

air suspension type	F; nominal ride height [mm]	ride height range [mm]	X; overall height unladen without air [mm]	laden without air [mm]
IU30/2000 47	300	270-350	200	185
IU32/2500 47	320	290-370	220	205
IU35/2505 47	350	320-400	250	235
IU37/3005 47	370	340-420	270	255
IU40/3010 47	400	370-450	300	285
IU42/3510 47	420	390-470	320	305

Air suspension type IO with air spring 2619V (33)

nominal ride heights 355 – 505 mm

IO../.... 33

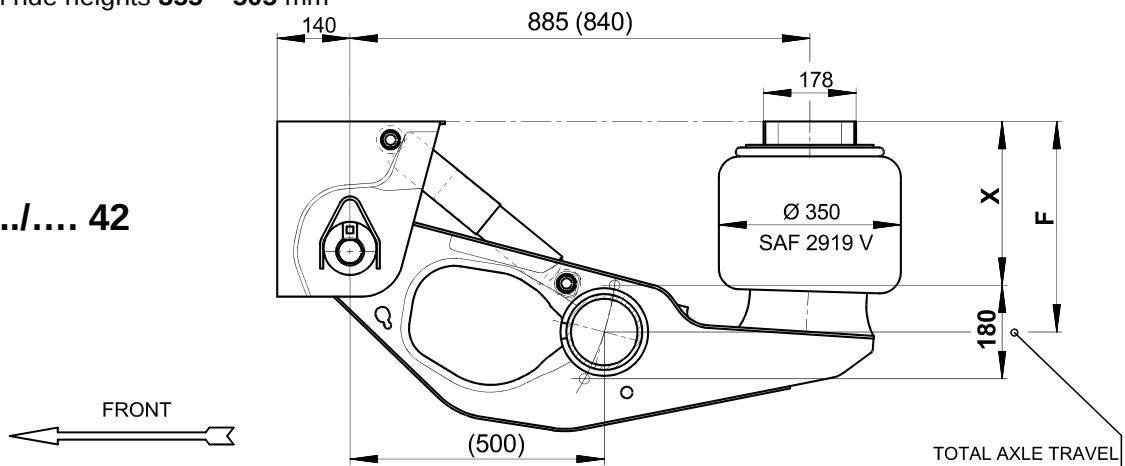


air suspension type	F; nominal ride height [mm]	ride height range [mm]	X; overall height	
			unladen without air [mm]	laden without air [mm]
IO35/2000 33	355	335-375	265	250
IO37/2500 33	375	355-395	285	270
IO40/2505 33	405	385-425	315	300
IO42/3005 33	425	405-445	335	320
IO45/3010 33	455	435-475	365	350
IO47/3510 33	475	455-495	385	370
IO50/3515 33	505	485-525	415	400

Air suspension type IO with air spring 2919V (42)

nominal ride heights 355 – 505 mm

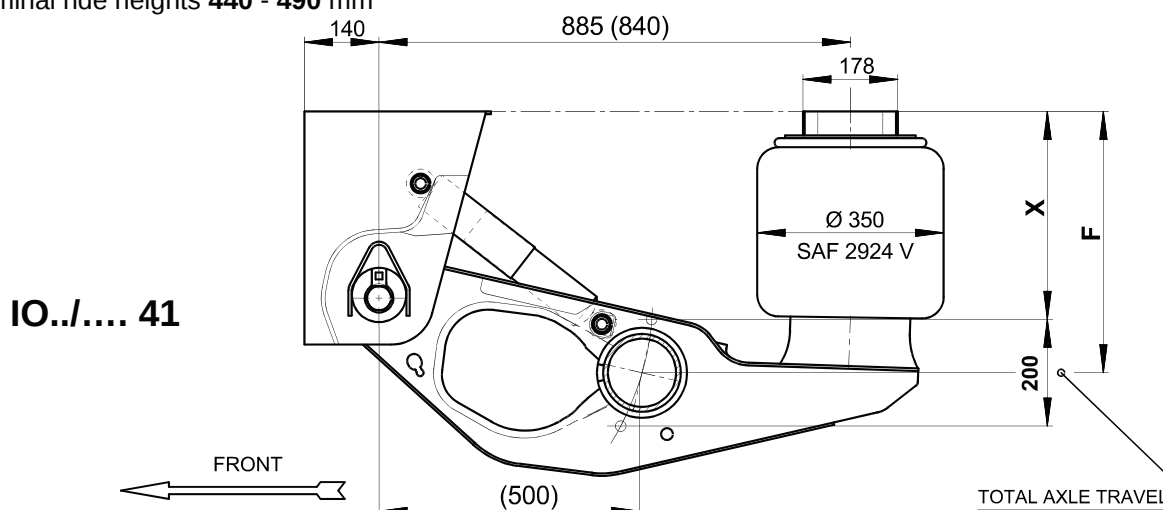
IO../.... 42



air suspension type	F; nominal ride height [mm]	ride height range [mm]	X; overall height	
			unladen without air [mm]	laden without air [mm]
IO35/2000 42	355	330-370	260	245
IO37/2500 42	375	350-390	280	265
IO40/2505 42	405	380-420	310	295
IO42/3005 42	425	400-440	330	315
IO45/3010 42	455	430-470	360	345
IO47/3510 42	475	450-490	380	365
IO50/3515 42	505	480-520	410	395

Air suspension type IO with air spring 2924V (41)

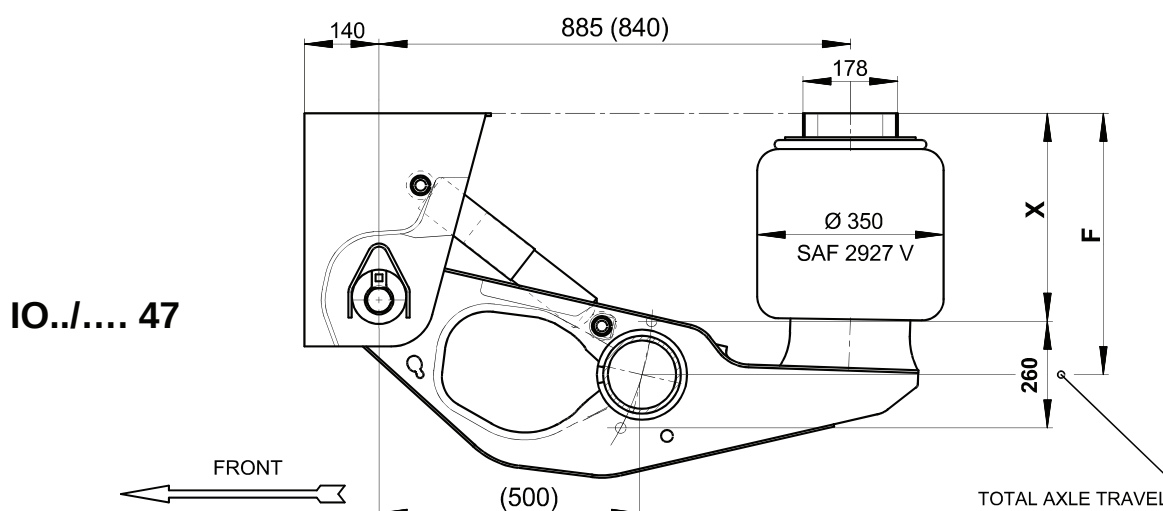
nominal ride heights 440 - 490 mm



air suspension type	F; nominal ride height [mm]	ride height range [mm]	X; overall height unladen without air [mm]	laden without air [mm]
IO44/3000 41	440	395-455	325	310
IO49/3505 41	490	445-505	375	360

Air suspension type IO with air spring 2927V (47) ¹⁾

nominal ride heights 450 - 500 mm

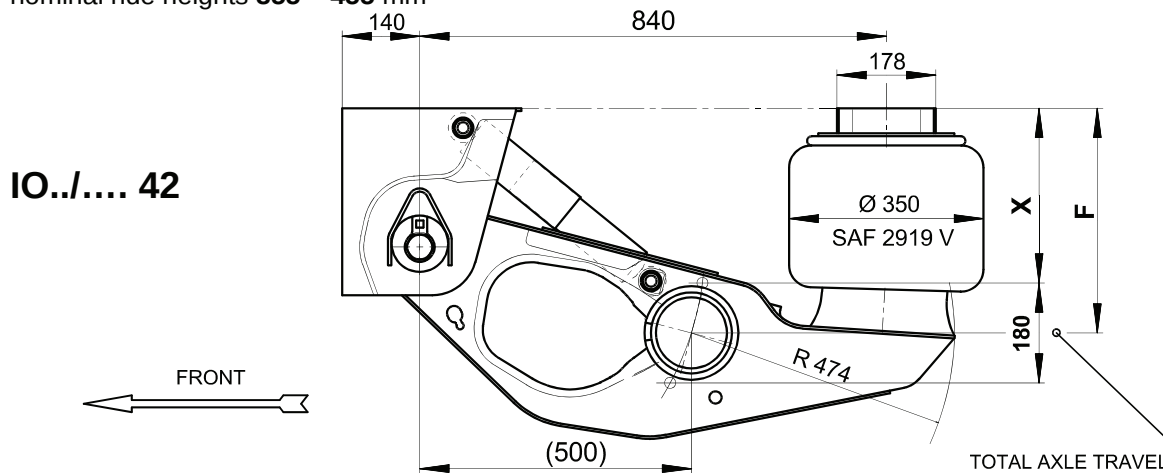


air suspension type	F; nominal ride height [mm]	ride height range [mm]	X; overall height unladen without air [mm]	laden without air [mm]
IO45/3000 47	450	415-495	345	330
IO50/3505 47	500	465-545	395	380

1) Cross member not possible

Trailing arm in pavers serie IO; only CD-Version
with air spring 2919V (42)

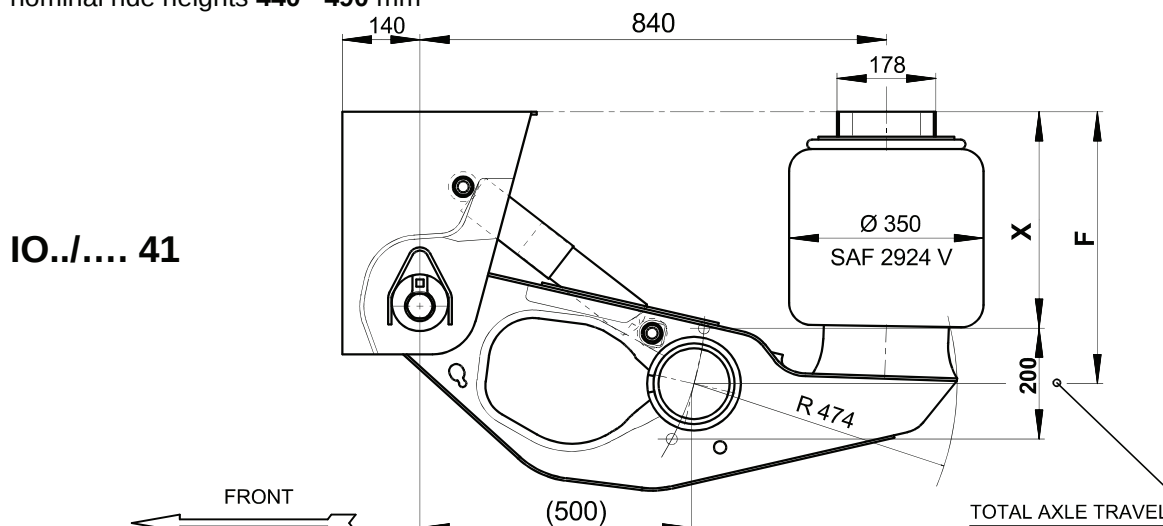
nominal ride heights 355 – 455 mm



air suspension type	F; nominal ride height [mm]	ride height range [mm]	X; overall height	
			unladen without air [mm]	laden without air [mm]
IO35/2000 42	355	325-365	255	240
IO37/2500 42	375	345-385	275	260
IO40/2505 42	405	375-415	305	290
IO42/3005 42	425	395-435	325	310
IO45/3010 42	455	425-465	355	340
IO47/3510 42	475	445-485	375	360
IO50/3515 42	505	475-515	405	390

with air spring 2924V (41)

nominal ride heights 440 - 490 mm



air suspension type	F; nominal ride height [mm]	ride height range [mm]	X; overall height	
			unladen without air [mm]	laden without air [mm]
IO44/3000 41	440	390-450	320	305
IO49/3505 41	490	440-500	370	355

Surface treatment of SAF-HOLLAND components

Corrosion protection of SAF-HOLLAND products:

To achieve a ideal corrosion protection on SAF-HOLLAND products, we use the following different coating methodes:

Cathodic dip coating (KTL):

Features:

- Complete corrosion protection in all areas of the component.
- High surface hardness with uniform coat thickness.
- Recoatable with all single-component or 2-component top coats.
- Coat thickness is max. **45 µm**.
- Min. **504 h**. salt spray test according to DIN EN ISO 9227.

Application example: trailing arm, axle beam.

Cathodic dip coating (KTL) thin layer:

Features:

- Complete corrosion protection in all areas of the component.
- High surface hardness with uniform coat thickness.
- Recoatable with all single-component or 2-component top coats.
- Coat thickness is max. **20 µm**.
- Min. **200 h**. salt spray test according to DIN EN ISO 9227.

Application example: wheelhub

Dip coating:

Features:

- Complete corrosion protection in all areas of the component.
- Recoatable with all single-component or 2-component top coats.
- Coat thickness is max. **30 µm**.
- Min. **100 h**. salt spray test according to DIN EN ISO 9227.

Application example: hanger bracket

Zinc-flake coating (Cr(VI)-free types):

Features:

- High quality corrosion protection for threaded fastening elements.
- Suitable for high-strength bolting elements.
- Adjustable friction coefficient for a reliable screwing process.
- Min. **480 h**. salt spray test according to DIN EN ISO 9227.

Application example: pivot bolt mounting, disc brake mounting.

Recommendation for users:

In principle, dip coating can be welded over. SAF-HOLLAND recommends, however, that these coats needs to be removed in the area of weld seams.

All contact surfaces of the pivot bolts and shock absorbers bolts are not allowed to have additional primer or paint coatings.

Wheel attachment faces are not allowed to be painted. The wheel attachment face must be clean and free of grease. In general the remarks of the wheel manufactures needs to be followed.

Geometry hanger bracket „steel“

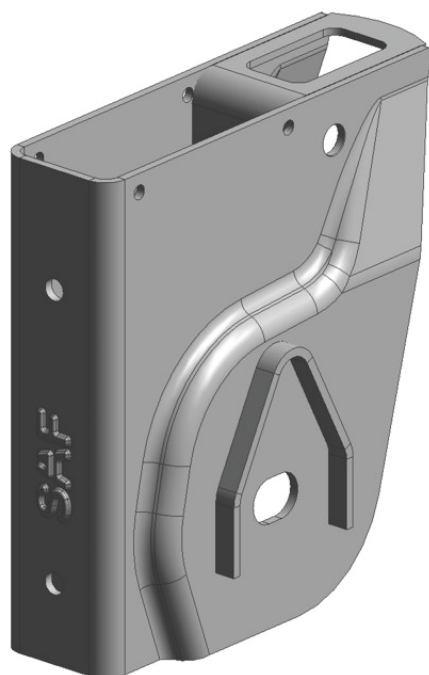
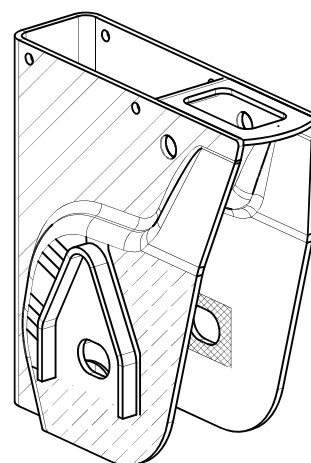
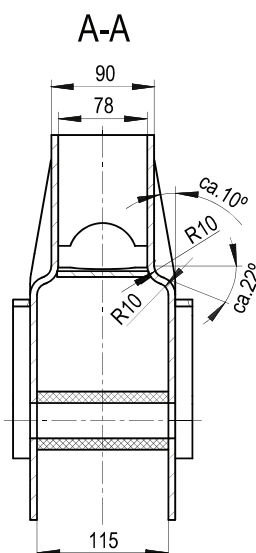
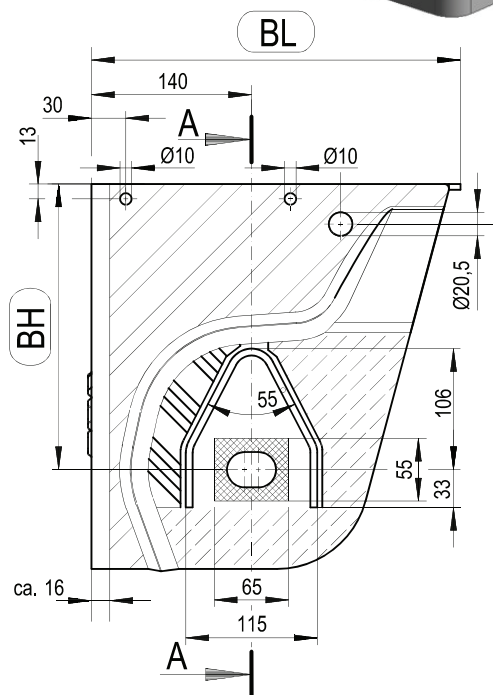


illustration 2 183 0826 00

90 mm frame connection width
symmetrical hanger brackets
standard with drain outlet holes



	MEASURING RANGE 1 = 90 ⁺²
	MEASURING RANGE 2 = 127±2
	MEASURING RANGE 3 = 115 ⁺²
	MEASURING RANGE 4 = 127 ⁺⁵

Dimension		Hanger bracket number		
BH [mm]	BL [mm]	in steel		in stainless steel
		non-primed	primed	primed
200	310	2 183 0825 90	2 183 0825 00	2 183 0843 00
250	323	2 183 0826 90	2 183 0826 00	2 183 0849 00
300	337	2 183 0827 90	2 183 0827 00	2 183 0850 00
350	350	2 183 0828 90	2 183 0828 00	-

Welding instruction for hanger bracket „steel“

Note

Cover the trailing arm to protect it from flying sparks. Welding and connecting the welding equipment ground cable to the trailing arm is not permissible. In order to avoid bearing damage, the welding equipment ground cable must also not be connected either to the wheel, wheelhub or wheelflange.

Welding recommendation

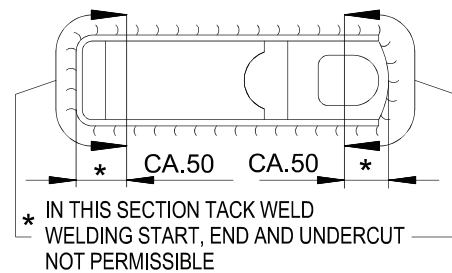
The high tensile steel (in accordance with DIN EN 10025 (class 3) used for the hanger brackets with a carbon content C of max. 0,2 % can easily be welded.

SAF-HOLLAND is using the gas metal arc welding procedure with the additional material G4 Si 1 (previous designation SG 3) in accordance with DIN EN ISO 14341, shielding gas in accordance with DIN EN ISO 14175, welding seams to DIN EN ISO 5817 "quality levels for imperfections" to "group C".

Design information

The chassis must be reinforced so that it can absorb the forces to which it is exposed. The hanger brackets need an additional reinforcement.

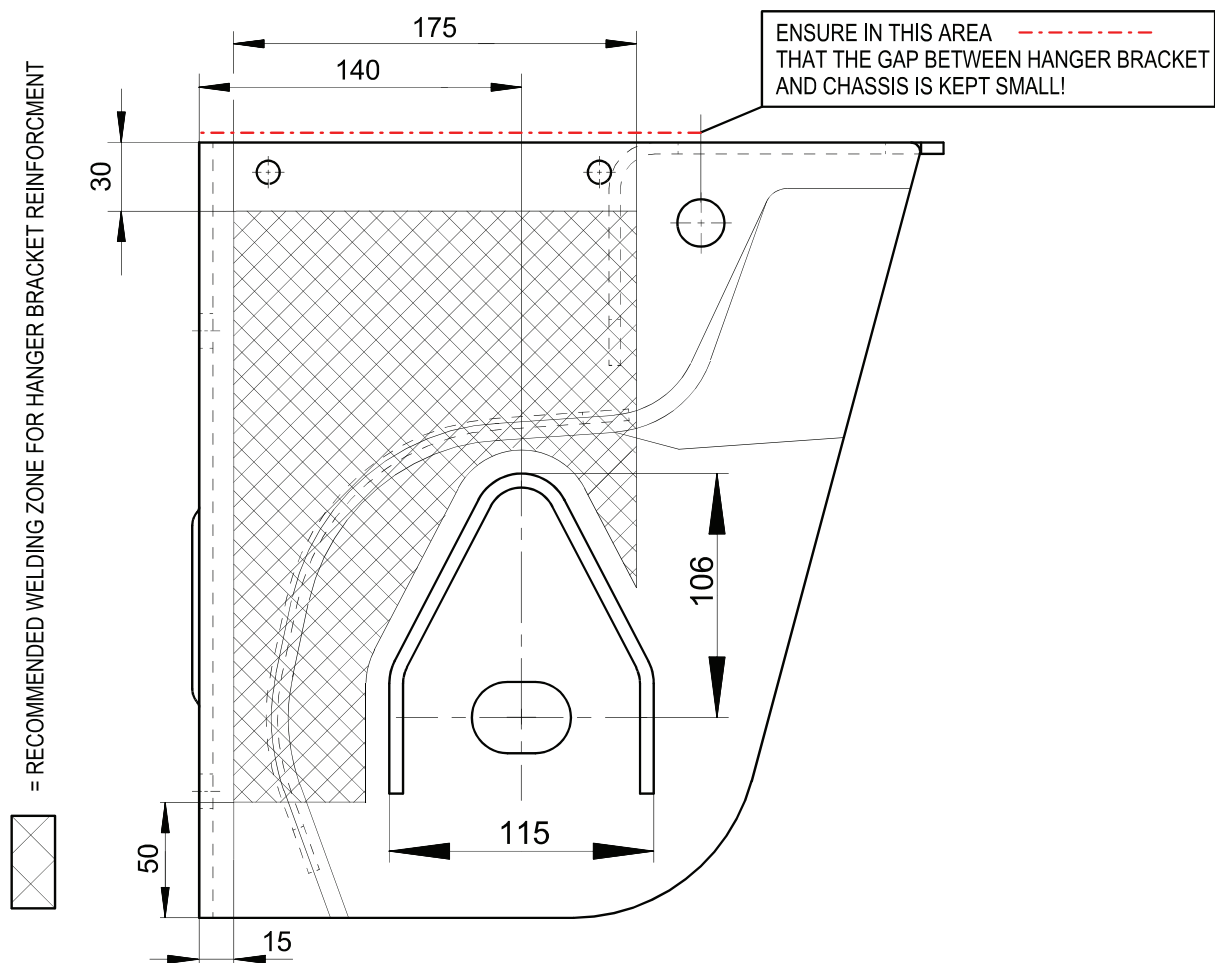
WELDING SEAM 5 



Recommendation for lateral reinforcement of the hanger brackets

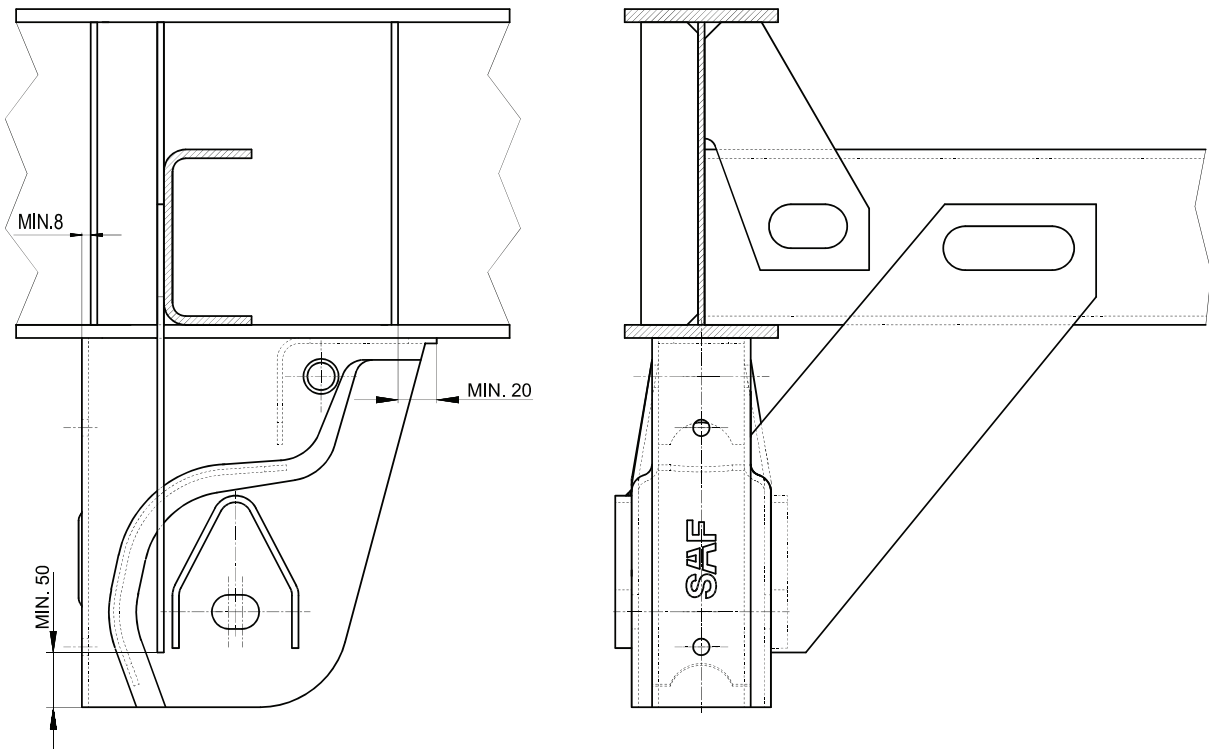
Overlapping of the lateral brace (gusset plate) and inner brace plate of the hanger bracket is necessary to avoid any diaphragm effect. The use of a cross member can replace the lateral brace, but this doesn't replace a crossmember in the chassis.

Geometry dimensions of the hanger bracket, see [page 10](#).

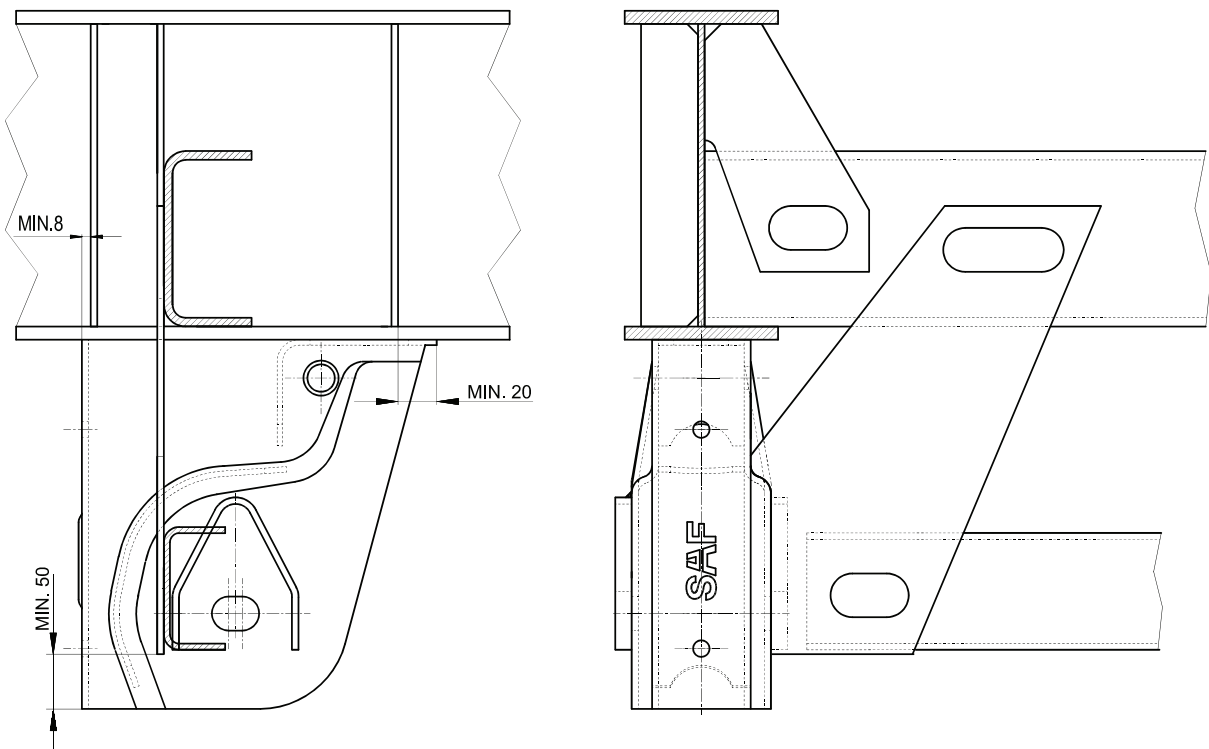


Recommendation for lateral reinforcement of hanger bracket „steel“

for torsionally flexibel chassis



for torsionally stiff chassis

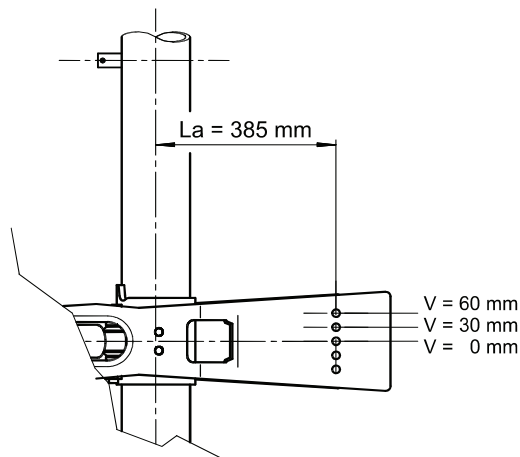
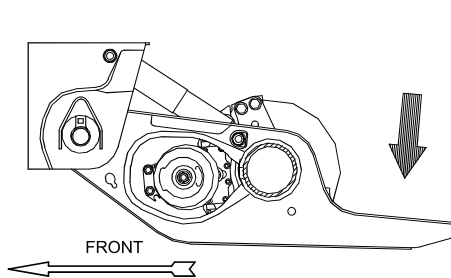


[Hanger bracket welding instruction see page 11.](#)

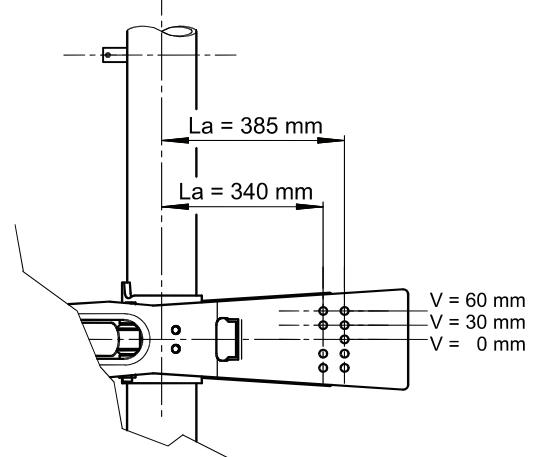
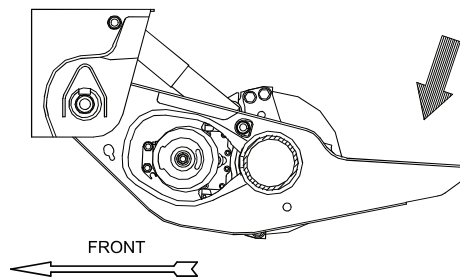
The design and dimensioning of the hanger bracket reinforcement is the responsibility of the trailer manufacturer, this depends on the type and operating conditions of the trailer.

Air spring fixing / trailing arm – air spring

trailing arm IU



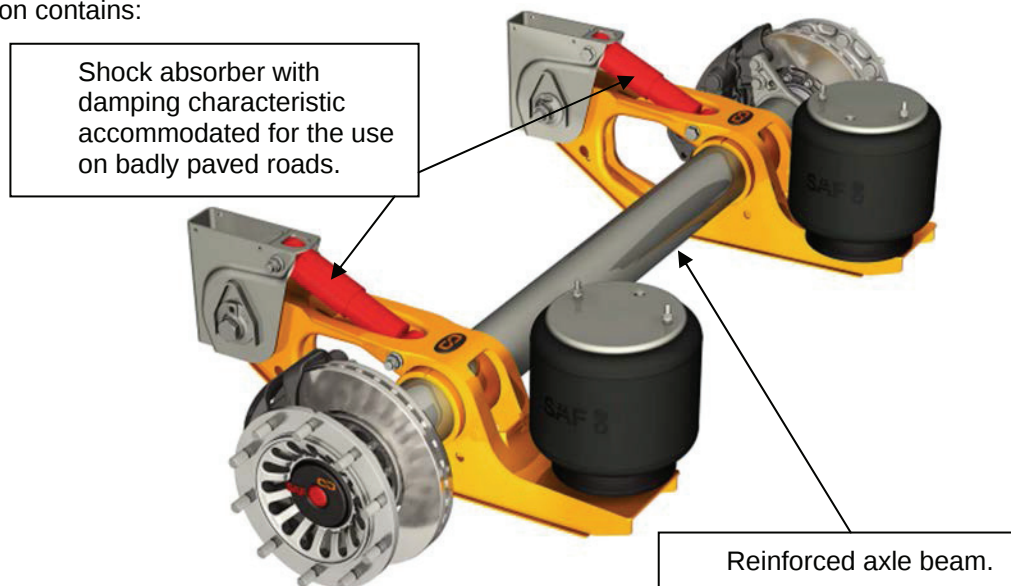
trailing arm IO



Custom Design Version

The INTRADISC *plus* INTEGRAL or INTRADRUM air suspension are also available as reinforced version named CD version. This version is preferably used for heavy application, for example off-road, and for trailers with torsionally stiff bodies as in tippers, pavers, tipping silo- and moving floor trailers, furthermore for trailers, which come to be used out of the “geographical” areas as named in our Guaranty of Competence.

The CD version contains:



The additional weight to the standard version is about 10 kg for rigid axles and for self-steering axles (B(I)L9..) about 24 kg

Overview air spring brackets

Standard air spring bracket „steel“

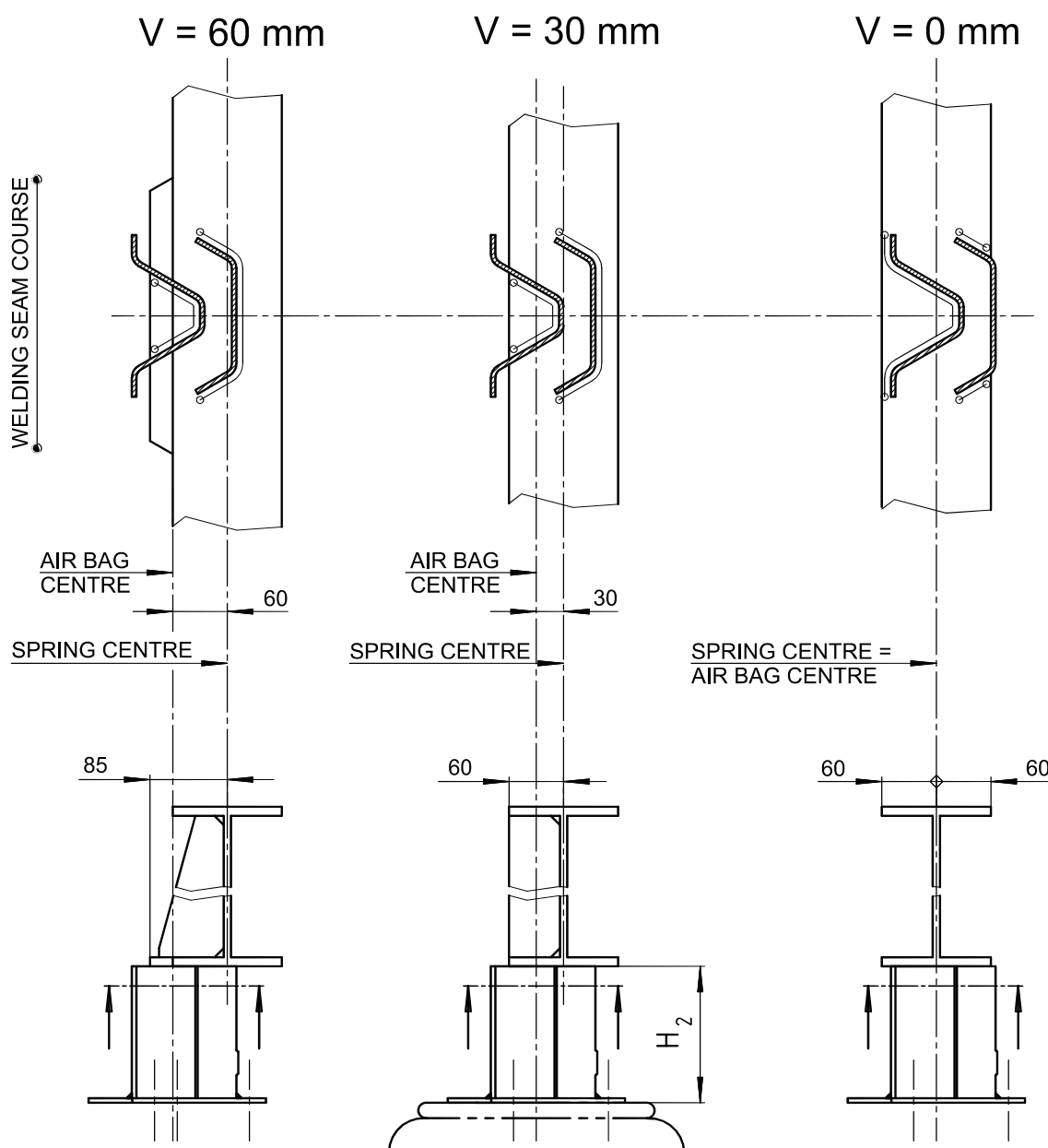
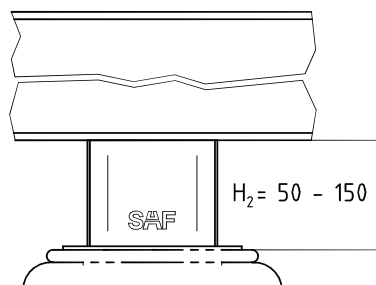
article number:		H [mm]	
primed	non-primed		
2 237 0081 01	2 237 0081 91	50	
2 237 0080 01	2 237 0080 91	100	
2 237 0082 01	2 237 0082 91	150	

air spring bracket „steel“ – screw-on

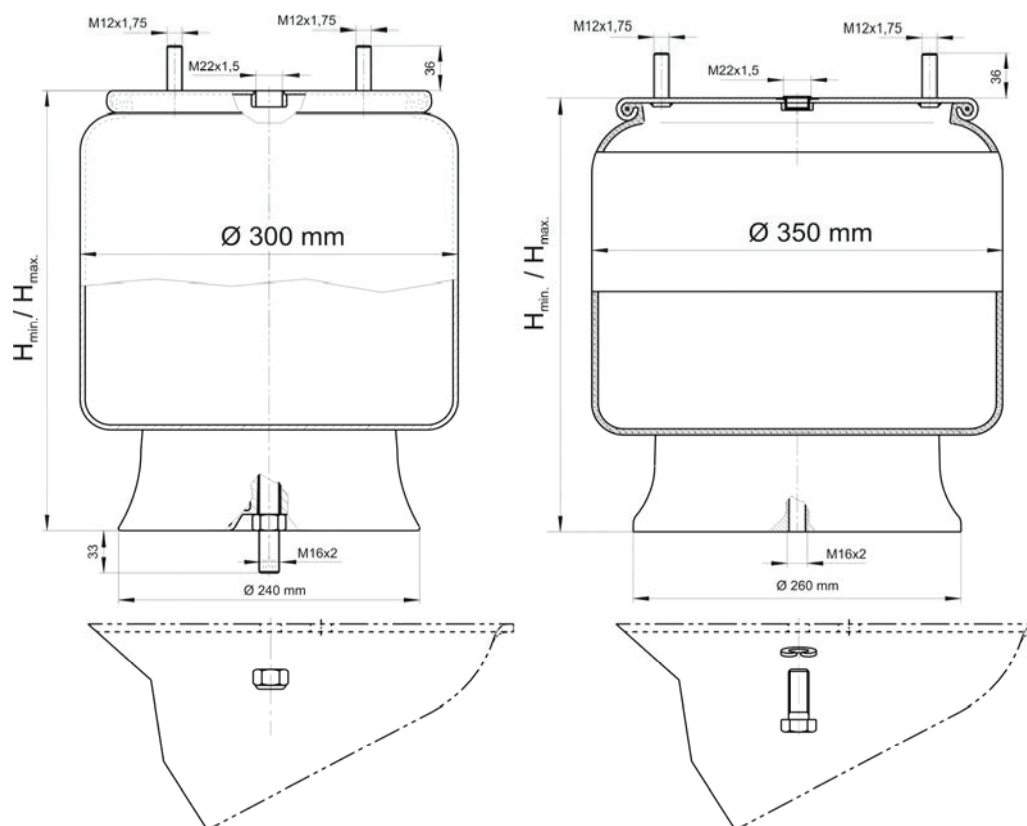
article number:	H		
	[mm]		
2 237 1081 01	55		
2 237 1080 01	105		
2 237 1082 01	155		

Welding recommendation for air spring bracket

Welding seam course and bracing are SAF-recommendations. Dimensions, design and implementation are under responsibility of the trailer manufacturer.



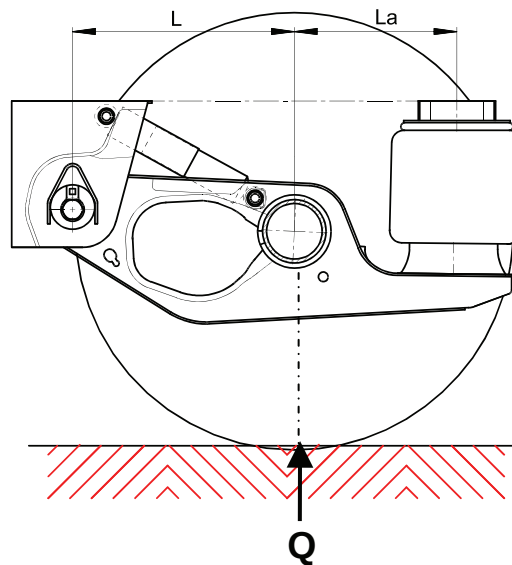
Air spring overview



Description	Article number - code:	Top view	Bottom view
2619V H _{min} = 190 mm H _{max} = 560 mm Ø 300 mm Plastic piston	3 228 1033 00 - 33		
2919V H _{min} = 190 mm H _{max} = 560 mm Ø 350 mm Plastic piston	3 228 1042 00 - 42		
2924V H _{min} = 230 mm H _{max} = 675 mm Ø 350 mm Plastic piston	3 228 1041 00 - 41		
2927V H _{min} = 250 mm H _{max} = 795 mm Ø 350 mm Plastic piston	3 228 1047 00 - 47		

All air spring with diameter Ø 350 also available with steel piston

Calculation of the air spring pressure



Formula to calculate the air pressure when fully laden:

$$P = \frac{(Q + A) \cdot i \cdot p}{2} \cdot 10^5 \text{ Pa} \quad (1 \text{ bar} = 10^5 \text{ N/m}^2 = 10^5 \text{ Pa} = 0,1 \text{ MPa})$$

P = air pressure in the air spring [Pa]

Q = permissible axle load on the ground [kg]

A = unsprung mass [kg]

$$i = \text{ratio} \quad i = \frac{L}{L + La}$$

p = air pressure in the air spring per kg load

air spring Ø 300mm (SAF 2619V)

air spring Ø 350mm (SAF 2919V / 2924V / 2927V)

$$p = 0,00244 \cdot 10^5 \text{ Pa/kg}$$

$$p = 0,00187 \cdot 10^5 \text{ Pa/kg}$$

Example with air suspension type IU30/2505 33 (air spring SAF 2619V)

Q = 9000 kg,

A = 750 kg

L = 500 mm , La = 385 mm

$$i = \frac{500}{500 + 385} = 0,565$$

$$p = 0,00244 \cdot 10^5 \text{ Pa/kg}$$

$$P = \frac{(9000 + 750) \cdot 0,565 \cdot 0,00244}{2} \cdot 10^5 \text{ Pa}$$

$$\underline{P = 5,69 \cdot 10^5 \text{ Pa}}$$

Formula to calculate the air pressure when partially loaded:

$$P_t = \frac{(Q_t + A) \cdot i \cdot p}{2} \cdot 10^5 \text{ Pa}$$

Q_t = axle load on the ground when partially loaded

Example with air suspension type IU30/2505 33 (air spring SAF 2619V)

Q_t = 2100 kg,

A = 750 kg

L = 500 mm , La = 385 mm

$$i = \frac{500}{500 + 385} = 0,565$$

$$p = 0,00244 \cdot 10^5 \text{ Pa/kg}$$

$$P_t = \frac{(2100 + 750) \cdot 0,565 \cdot 0,00244}{2} \cdot 10^5 \text{ Pa}$$

$$\underline{P_t = 0,93 \cdot 10^5 \text{ Pa}}$$

Force-pressure-diagram

The shown air pressure line in the diagramm (force-pressure-diagramm) shows the force-pressure-values of an ideal adjusted air suspension.

This can be influenced as follow:

- Utilization of the total ride height range, thereby changing the ratio i and the air spring length
- Anomaly of the real unsprung mass caused by different suspension types, wheels and tires
- Anomaly of the effective area of the air spring caused by the angled position (depending on the air suspension type)

Therefore we recommend for the adjusting of the EBS – installation a inspection to compare both values (theoretically and measured) to achieve a optimized utilization of suspension- and brake-characteristics.

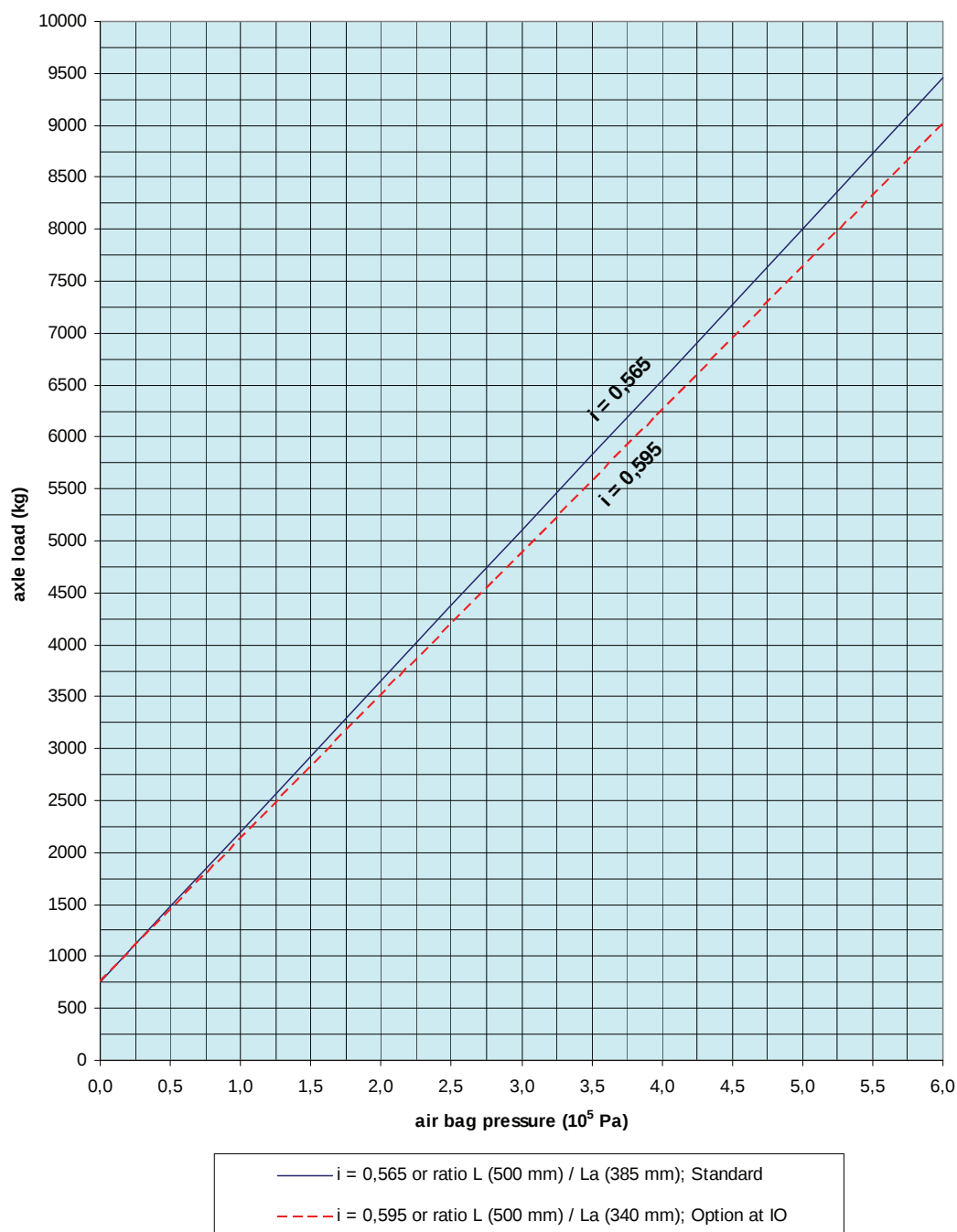
Possible inspection method:

1. position trailer on even ground
2. connect the air pressure gauge to the test-outlet of the carrying air spring
3. measurement to be done with unladen trailer
4. put the, to be measured axle, on a scale
5. measure the weight of the axle
6. read out of the air pressure in the air spring
7. compare the measured values with the values at the force-pressure diagram
8. if necessary EBS values needs re-adjusting to the measured values
9. conduct measurement with a partial- and full-load
10. repeat steps 4 – 8 for all carrying air springs

It is assumed that all measuring instruments are calibrated

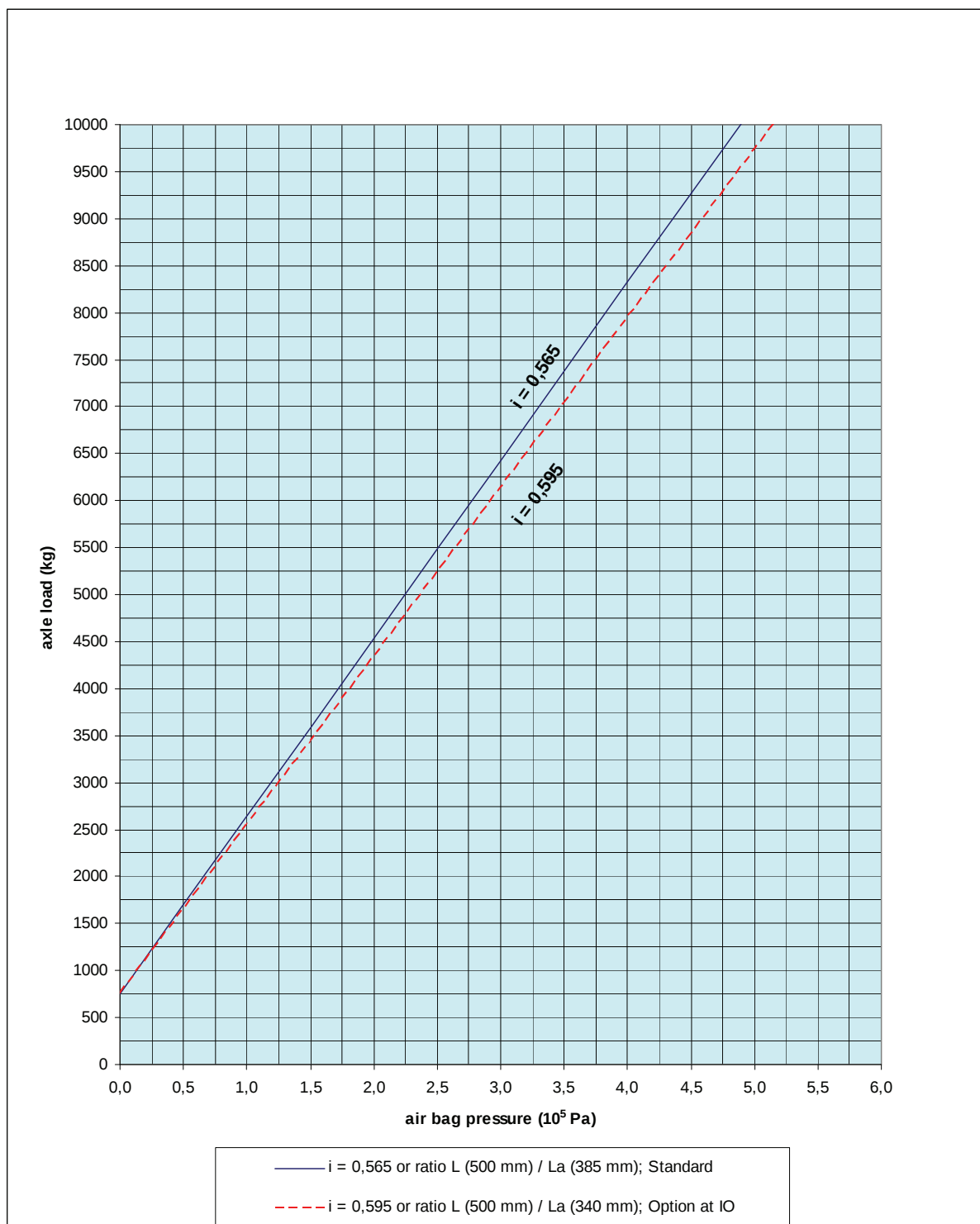
Force-pressure-diagram for air spring with diameter 300 mm

Air spring: SAF 2619V (33)



Force-pressure-diagram for air spring with diameter 350 mm

Air springs: **SAF 2919V (42)**
 SAF 2924V (41)
 SAF 2927V (47)



Technical details:

Attention: only install shock absorbers from the same manufacturer per axle!



Air suspension type	Shock absorber number		Air suspension type	Shock absorber number	
	Standard	CD		Standard	CD
IU25/2000 33	2 376 0070 01	2 376 0084 00	IU25/2000 42	2 376 0070 01	2 376 0084 00
IU28/2005 33	2 376 0070 01	2 376 0084 00	IU28/2005 42	2 376 0070 01	2 376 0084 00
IU30/2505 33	2 376 0071 01	2 376 0085 00	IU30/2505 42	2 376 0071 01	2 376 0085 00
IU33/2510 33	2 376 0071 01	2 376 0085 00	IU33/2510 42	2 376 0071 01	2 376 0085 00
IU35/3010 33	2 376 0071 01	2 376 0085 00	IU35/3010 42	2 376 0071 01	2 376 0085 00
IO35/2000 33	2 376 0071 01	2 376 0085 00	IO35/2000 42	2 376 0071 01	2 376 0085 00
IO37/2500 33	2 376 0071 01	2 376 0085 00	IO37/2500 42	2 376 0071 01	2 376 0085 00
IO40/2505 33	2 376 0072 01	2 376 0086 00	IO40/2505 42	2 376 0072 01	2 376 0086 00
IO42/3005 33	2 376 0071 01	2 376 0085 00	IO42/3005 42	2 376 0071 01	2 376 0085 00
IO45/3010 33	2 376 0072 01	2 376 0086 00	IO45/3010 42	2 376 0072 01	2 376 0086 00
IO47/3510 33	2 376 0071 01	2 376 0085 00	IO47/3510 42	2 376 0071 01	2 376 0085 00
IO50/3515 33	2 376 0072 01	2 376 0086 00	IO50/3515 42	2 376 0072 01	2 376 0086 00
IU29/2000 41	2 376 0070 01	2 376 0084 00	IU30/2000 47	2 376 0073 01	2 376 0087 00
IU31/2500 41	2 376 0071 01	2 376 0085 00	IU32/2500 47	2 376 0072 01	2 376 0086 00
IU34/2505 41	2 376 0071 01	2 376 0085 00	IU35/2505 47	2 376 0072 01	2 376 0086 00
IU36/3005 41	2 376 0071 01	2 376 0085 00	IU37/3005 47	2 376 0072 01	2 376 0086 00
IU39/3010 41	2 376 0071 01	2 376 0085 00	IU40/3010 47	2 376 0072 01	2 376 0086 00
IU42/3015 41	2 376 0072 01	2 376 0086 00	IU42/3510 47	2 376 0072 01	2 376 0086 00
IO44/3000 41	2 376 0072 01	2 376 0086 00	IO45/3000 47	2 376 0072 01	2 376 0086 00
IO49/3505 41	2 376 0072 01	2 376 0086 00	IO50/3505 47	2 376 0072 01	2 376 0086 00
			IU27/2000 47 V90	2 376 0073 01	2 376 0087 00

steel hanger bracket / cross member and trailing arm

Bolt kit 3 341 2803 10

Collared bolt M20 x 1.5 x 125 – 10.9

4 343 2803 10 - dacromet coated -

Collared nut M20 x 1.5 – 10

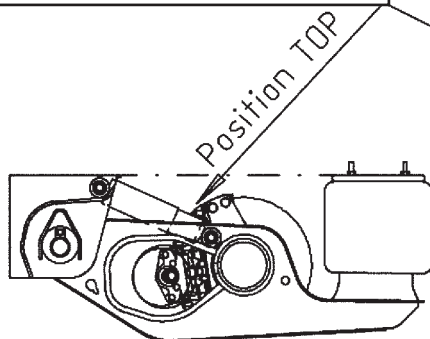
4 247 4044 10 - dacromet coated -

Tightening torque:

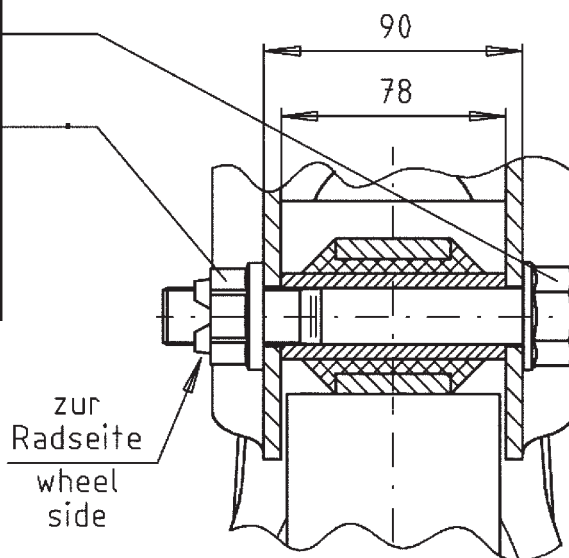
Contact surfaces dry: 600 Nm

ATTENTION:

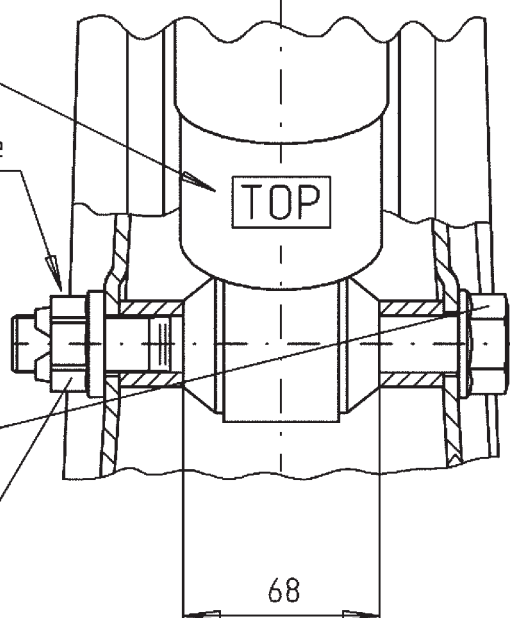
**TOP mark facing
upwards in working
position**



Hanger bracket, cross member



zur
Radseite
wheel
side



Trailing arm

Bolt kit 3 341 2802 10

Collared bolt M20 x 1.5 x 155 – 10.9

4 343 2802 10 - dacromet coated -

Collared nut M20 x 1.5 – 10

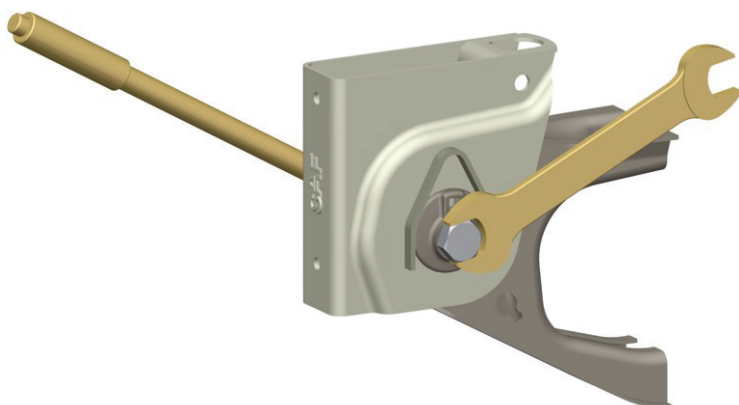
4 247 4044 10 - dacromet coated -

Tightening torque:

Contact surfaces dry: 600 Nm

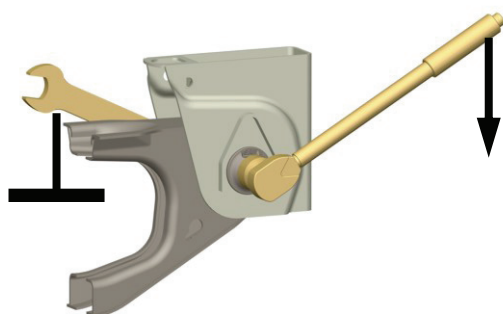
Tightening instructions for adjustable pivot bolt

Attention always within the specified ride height range!
No paint residues between eccentric washer and hanger bracket!
Threads are NOT to be oiled or greased.

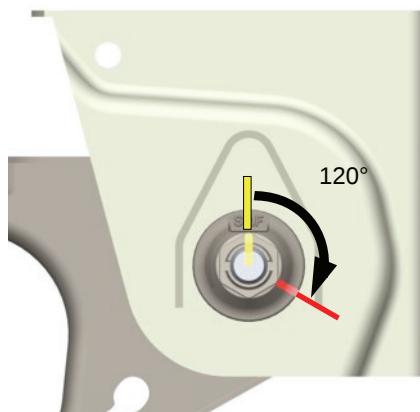


Bolt head always on the eccentric washer side

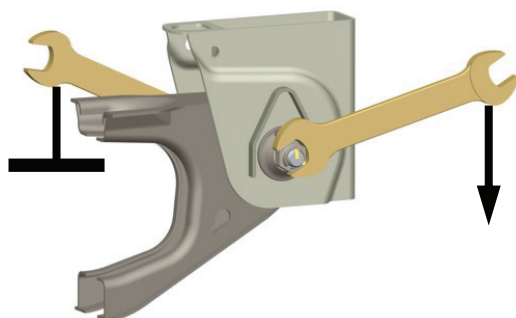
Pre tightening **400 Nm**
Use torque wrench



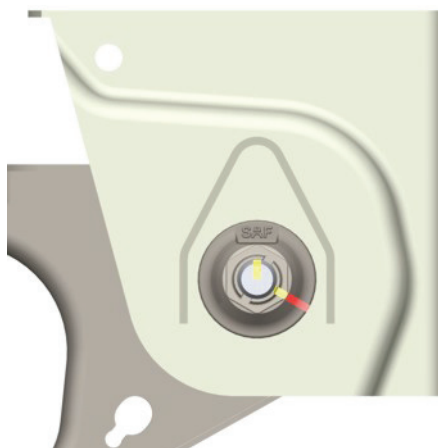
Marking for angle tightening



Angle tightening **120°**
Use impact wrench or extend lever to 2,5 Meter

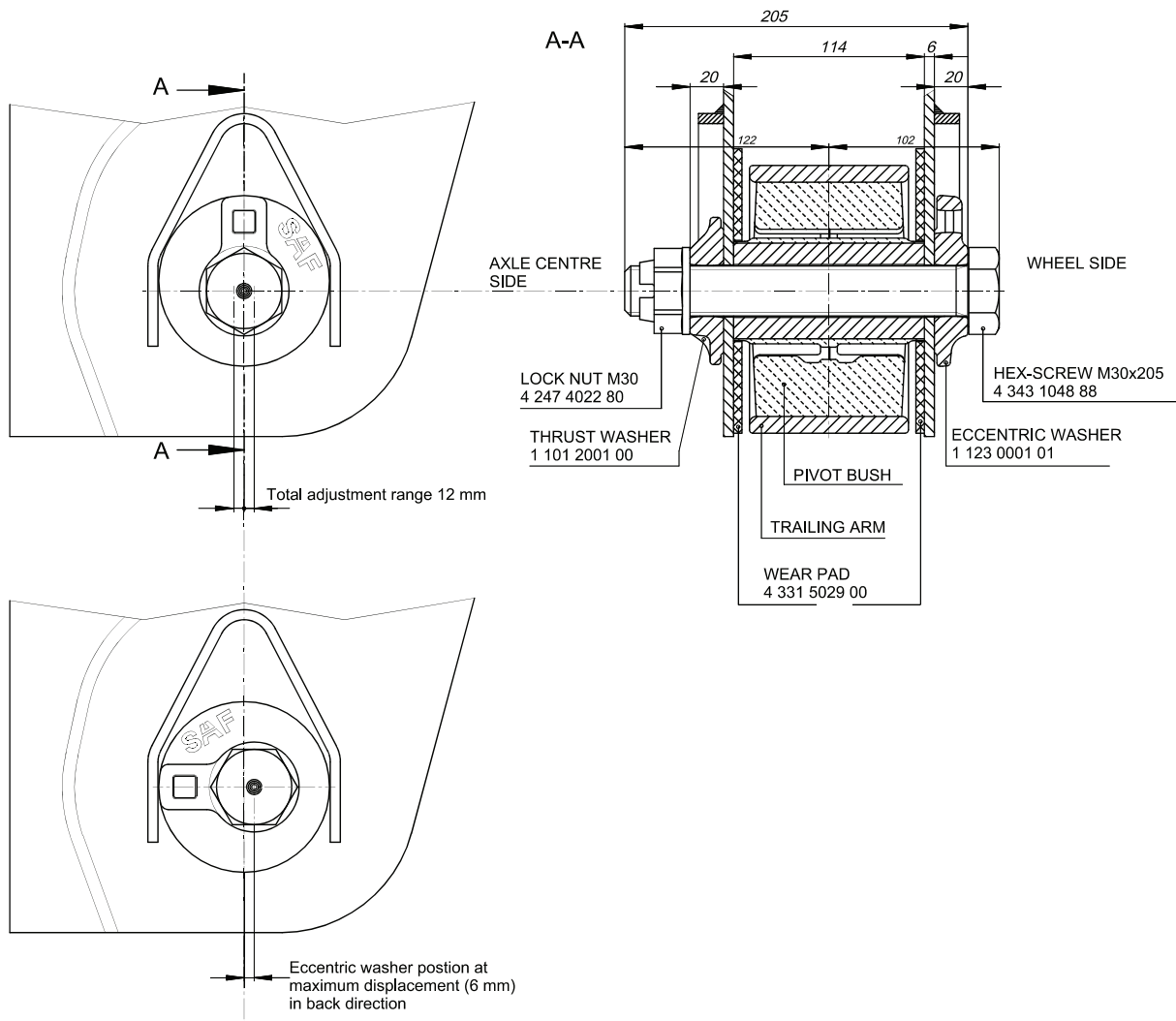


Visual inspection



Check torque @ 1200 Nm after 5000 kms. Use nut & bolt only once.

Adjustable pivot bolt for hanger bracket „steel“ and „cross member“



Ref.: 03 143 1010 00

Tightening torque : 400 Nm + 120°; tightening procedure page 23

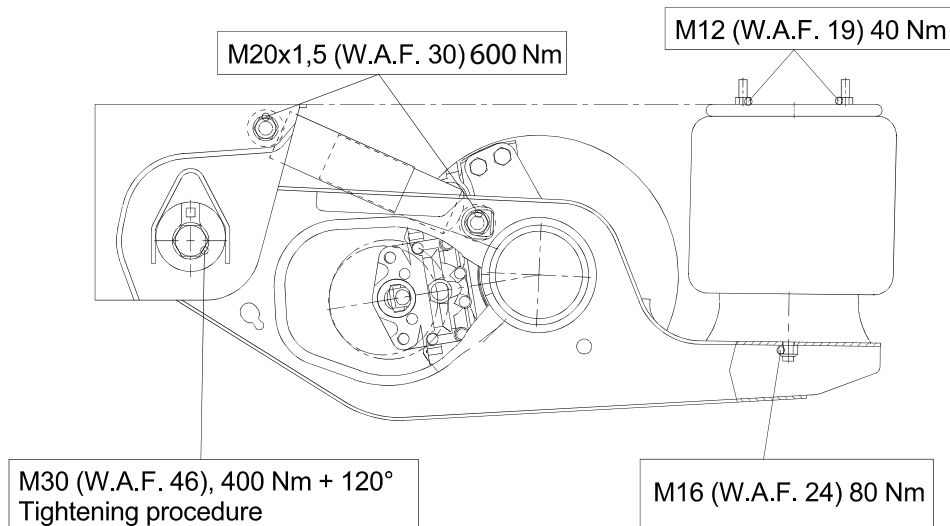
Attention:

Threads are not to be oiled or greased!
Must only be carried out at ride height.
Use nut & bolt only once. Inspect after first 5000 kms @ 1200 NM.

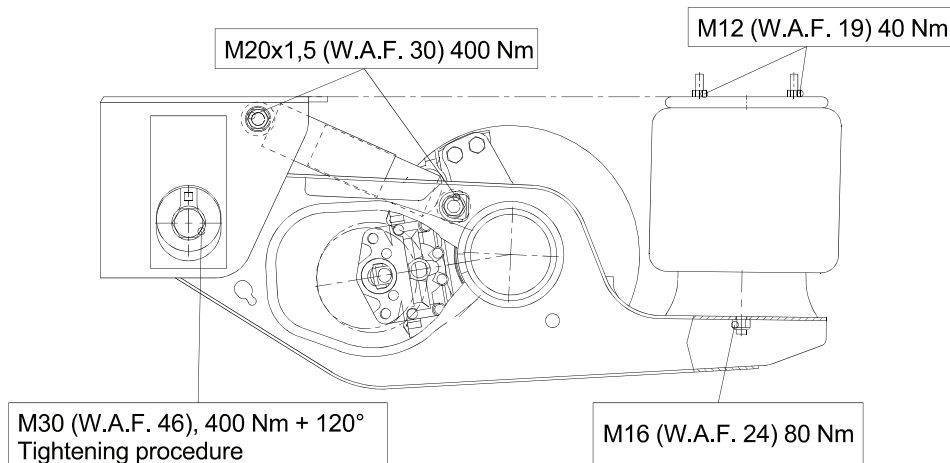
Tightening torques

The max. coating thickness on the contact surfaces (interfaces) of the trailing arm and shock absorber bolts must not surpass **45 µm**!

Hanger bracket „steel/ stainless steel“ – trailing arm – shock absorber – air spring



Hanger bracket „aluminium“ – trailing arm – shock absorber – air spring



Attention:

Threads are not to be oiled or greased!
 Check torques after first 5000 kms.
 Set and check only at correct ride height.
 Use only pivolt bolt & nut only once.
 Inspection torque 1200 Nm.

Adjustment of the air suspension system ride height

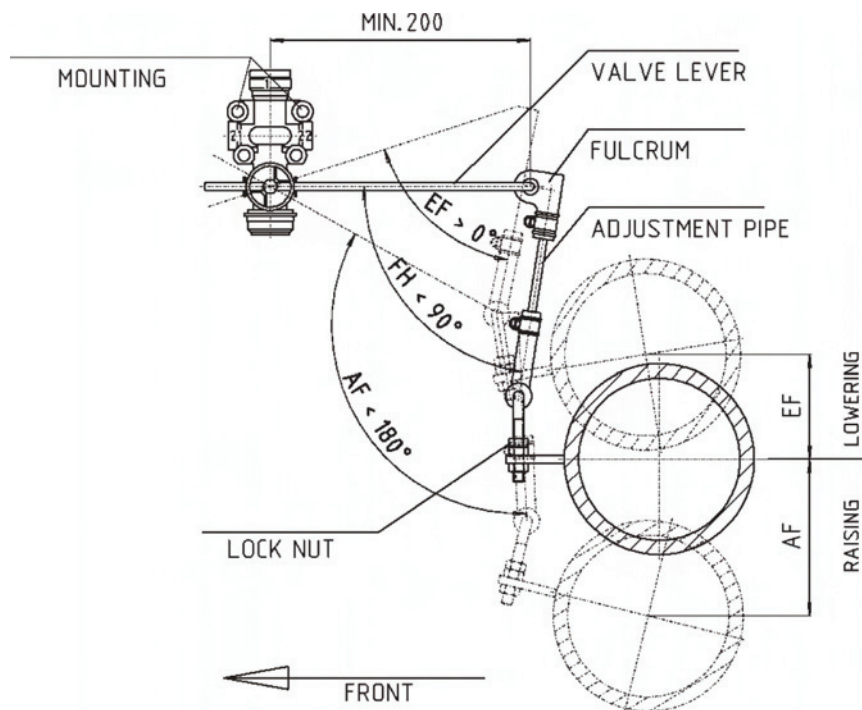
Air suspension valve

As standard's air suspension axles and system require only one air suspension valve.

The air suspension valve controls the air bag pressure in relation to the trailer load in order to maintain a constant ride height in every load condition.

The air suspension valve is fastened to the trailer frame with screws and connected to the axle via the pivot joint (valve lever and adjustment pipe). On Tri-axle trailers, the height control valve is generally connected to the middle axle (normally in the middle of the axle), on Tandem-axle group on the rear axle, and Quad axle trailers recommended axle No.3. In special cases (e.g. large trailer tilt angle), the air suspension valve can be installed in the rear axle

For trailers with axle lifting system, the axle to which the system is connected depends on the axle to be lifted



Installation

The valve lever should be at least 200 mm long and is horizontal when the trailer is in the driving position. As a function check, move the lever down slightly. Air must now escape via the venting cap into the atmosphere. If airflows into the air bags when the lever is pushed down, the valve lever has to be turned through 180° . For this the valve lever has to be disconnected. The ride height is set by adjusting the adjustment pipe in the fulcrums and by turning the lock nuts.

The adjustment must be carried out with the trailer standing on level ground. It can be carried out with the trailer either empty or loaded.

Note

For a final check, the air suspension system should be lowered to the suspension stop or raised to the limit (shock absorbers, stop ropes, air bag length). During this process, the specified angle between valve lever and adjustment pipe must not be exceeded in order that the valve lever does not move in the wrong direction.

Ride heights

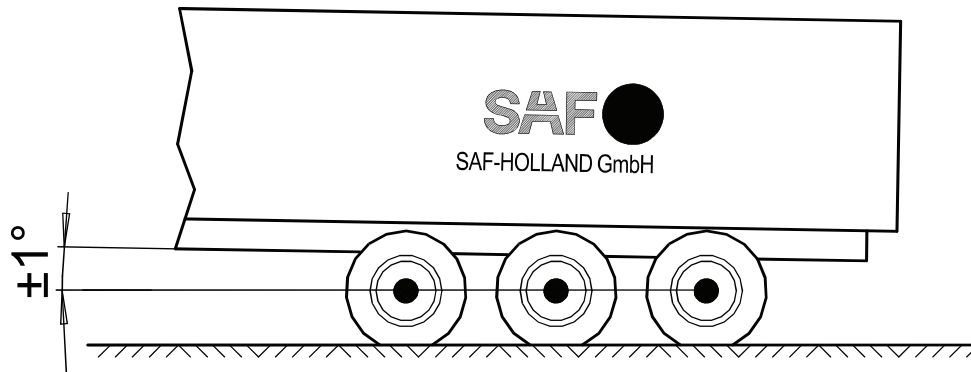
Adjust the ride height of the air suspension to the permissible range indicated in the corresponding SAF-HOLLAND documents

With single axles, a minimum lowering of **60** mm is allowed.
With multiple axles, a minimum lowering of **70** mm is allowed.

Exception:

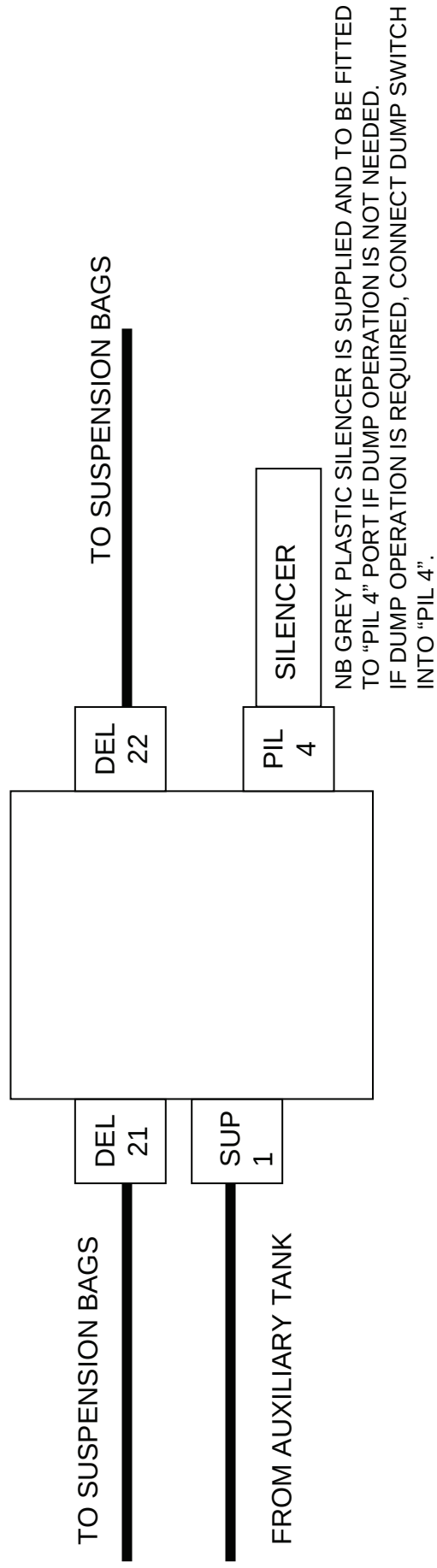
For multi-axle trailers with lift axles, the minimum lowering at the lift axle should not be less than **100** mm in order to ensure an adequate ground clearance

Semi-trailer tilt angle



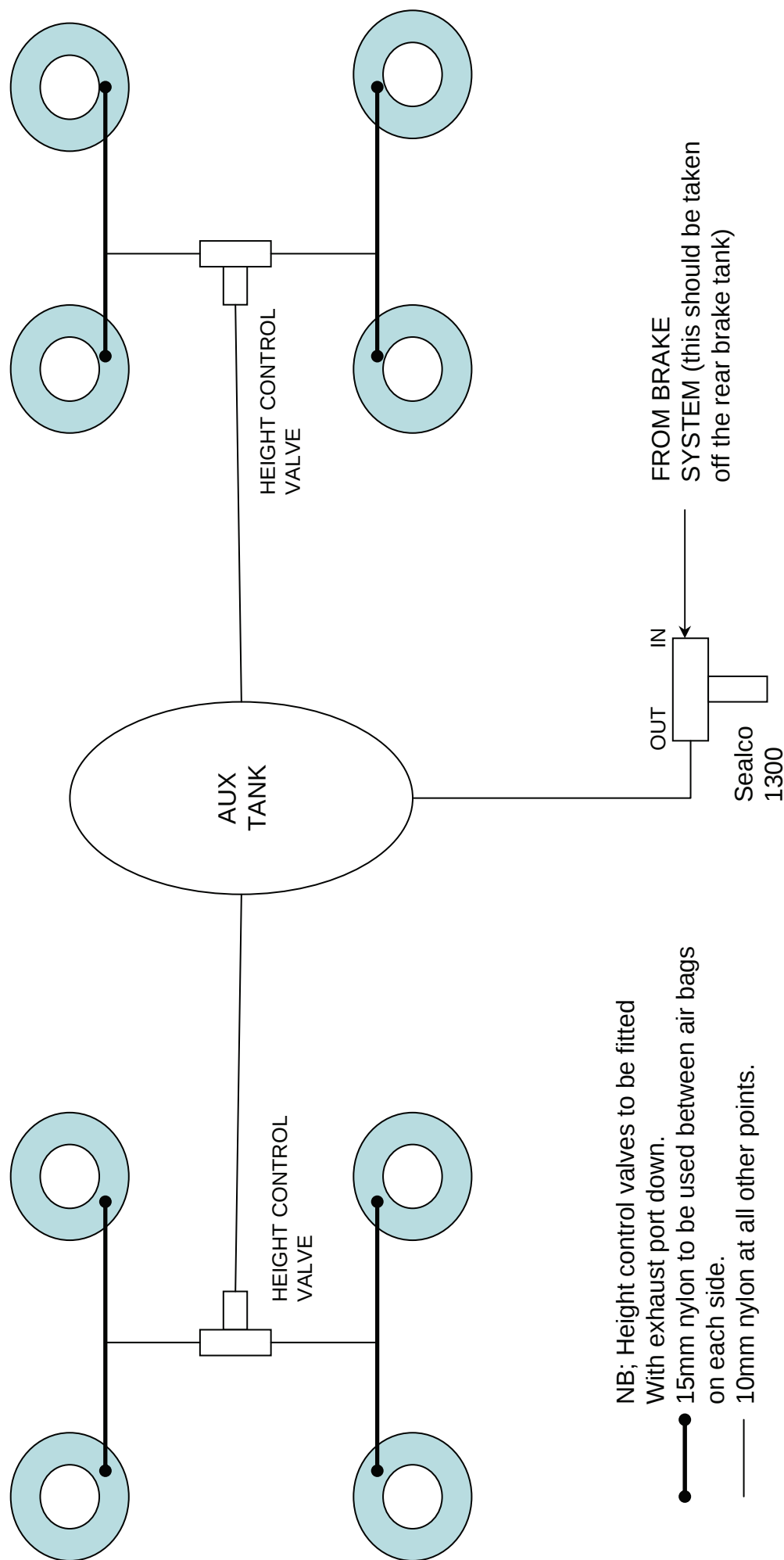
The maximum tilt angle of the semi-trailer can not be more than $\pm 1^\circ$ or 20 mm/m.

HC464 HEIGHT CONTROL VALVE PIPING DIAGRAM



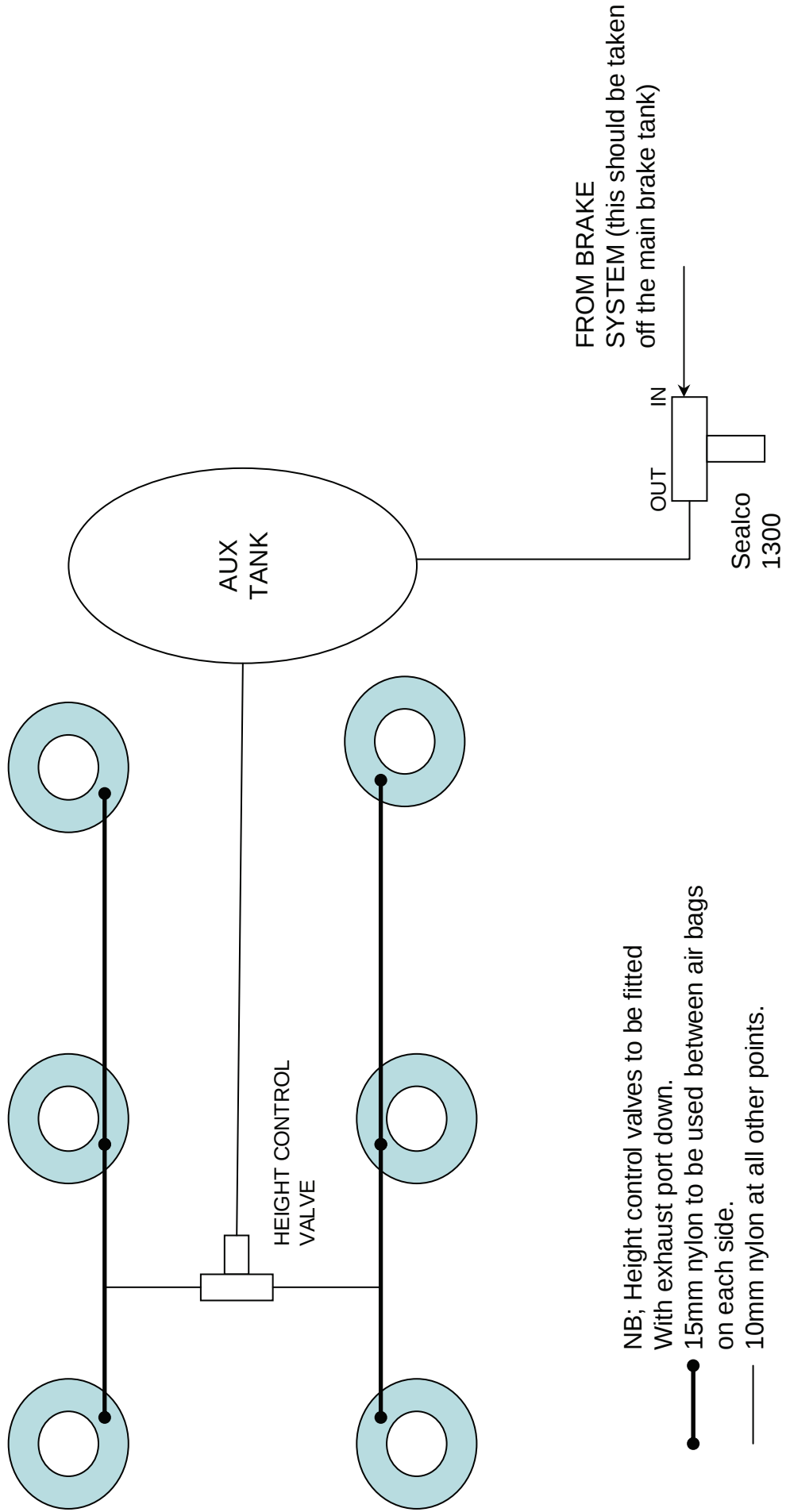
PORT 21 IS TO BE CONNECTED TO THE AIR BAGS ON ONE SIDE OF THE TRAILER AND PORT 22 TO THE BAGS ON THE OTHER SIDE. IT DOES NOT MATTER WHICH PORT GOES TO WHICH SIDE.

AIR SUSPENSION PIPING



NB; Height control valves to be fitted
 With exhaust port down.
 15mm nylon to be used between air bags
 on each side.
 10mm nylon at all other points.

AIR SUSPENSION PIPING 3 AXLE SEMI



Axle alignment

General

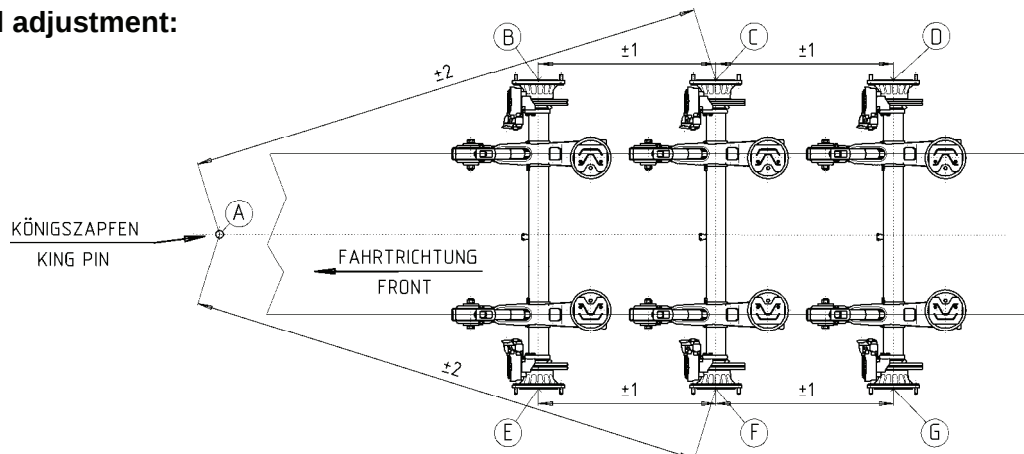
In order to compensate the production tolerances, an axle alignment and, if necessary, an adjustment should be carried out. The maximum permissible deviations (tolerances) of the alignment values are specified by the tire manufacturer.

The maximum possible wheelbase correction per axle is ± 6 mm.

Basic condition

The axle alignment must be done in unladen situation. With air suspension the trailer has to be adjusted in the right ride height.

Conventional adjustment:

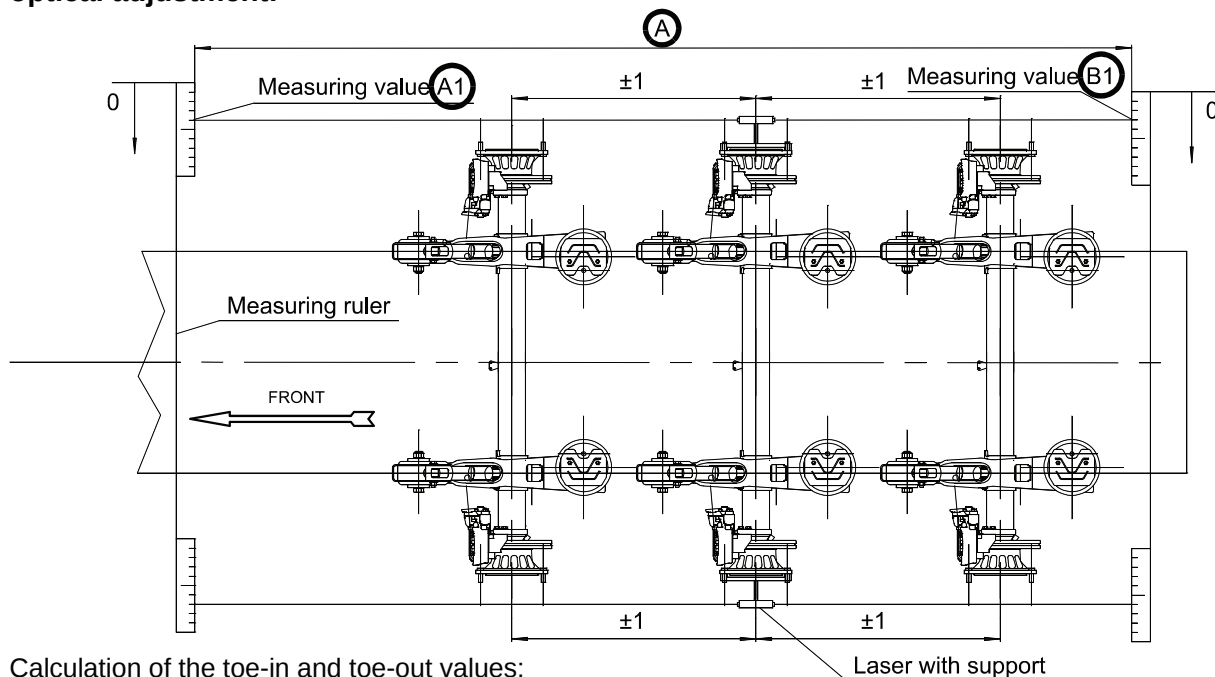


Procedure:

Determine the lengths of the diagonals **A - C** and **A - F** for the middle axle (reference axle) by comparison measurements, observing the tolerances ($\pm 2,0$ mm).

Check the wheelbases **B - C** and **E - F** for the front axle and **C - D** and **F - G** for the rear axle and correct, if necessary, observing the tolerances ($\pm 1,0$ mm).

optical adjustment:

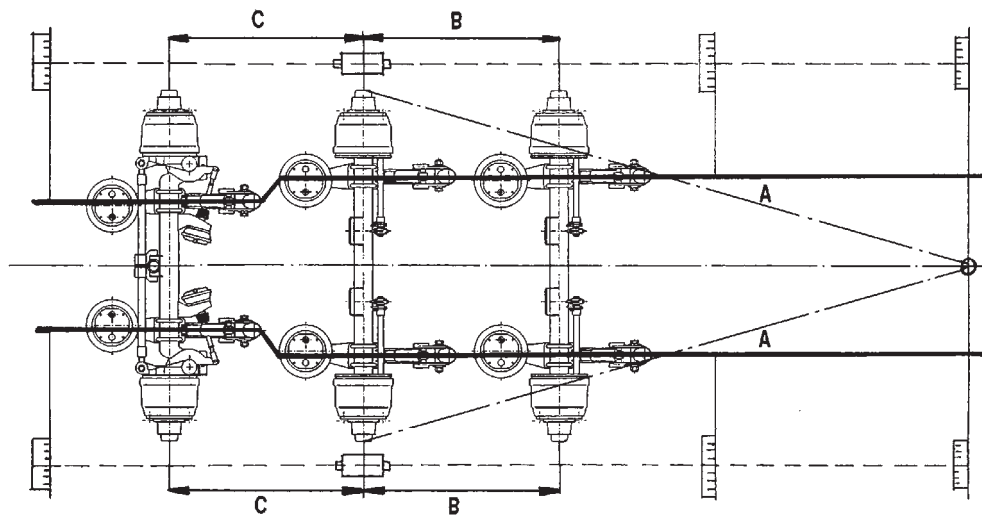


Calculation of the toe-in and toe-out values:

$$\frac{A1(\text{mm})}{A(\text{m})} \quad B1(\text{mm}) \quad C \quad \begin{array}{l} C \text{ (positive value) = toe-in} \\ C \text{ (negative value) = toe-out} \end{array}$$

Observe the operating and setting instructions of the measuring system manufacturer.

For axle alignment, the air suspension must be adjusted to the ride height specified by SAF.



Semi-trailers with self steering axle

Distance A, B, C max. permissible deviation 1.0 mm

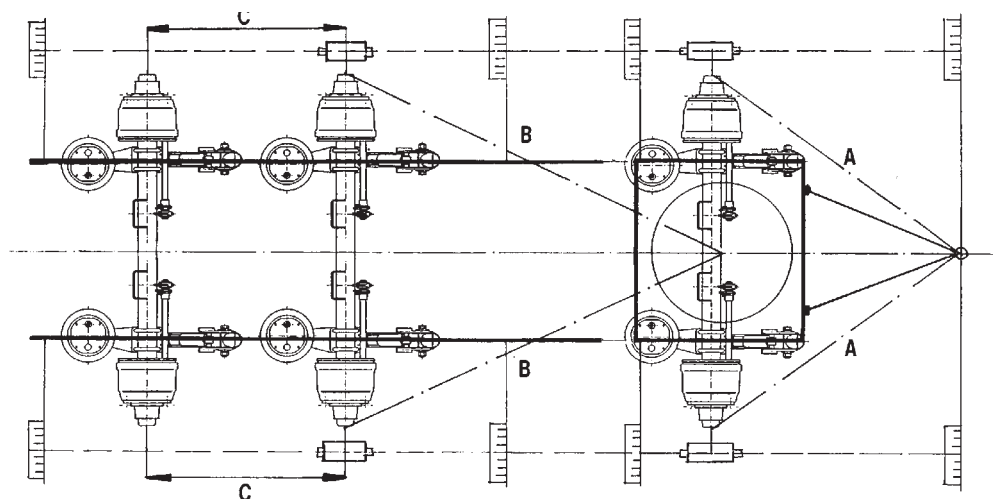
Toe setting $\pm 12' = \pm 3.0$ mm/m Camber $\pm 12'$

Values apply to unloaded vehicle.

Air suspension must be in Ride Height for axle alignment check and re-adjustment works.

In the case of self steering axles the stabilizing chambers must be pressurised to 2.0 bar.

Total toe-in 4.0 mm/m.



Trailer

Distance A, B, C max. permissible deviation 1.0 mm

Toe setting $\pm 12' = \pm 3.0$ mm/m Camber $\pm 12'$

Values apply to unloaded vehicle.

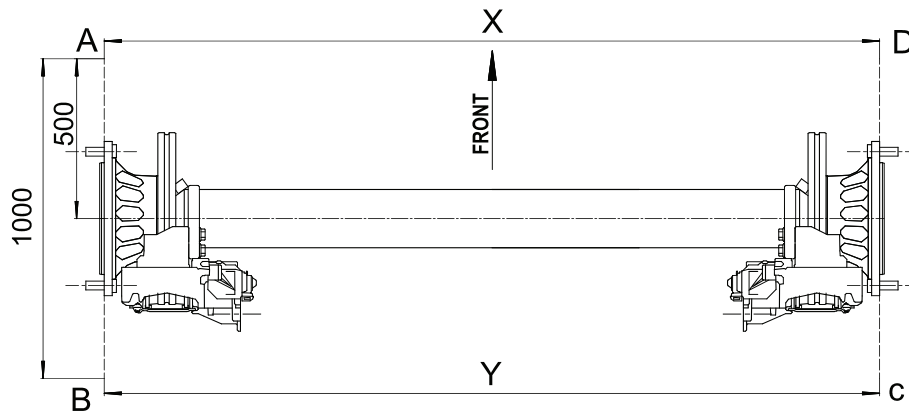
Air suspension must be in Ride Height for axle alignment check and re-adjustment works.

The max. permissible deviation values for axle alignment are according to the tyre manufacture specifications. To avoid excessive tyre wear we recommend having the alignment checked at regular intervals.

Deviations may be caused by:

- loose U-bolts
- spring guide bearing wear
- deformation of axle assembly components due to improper use

The relevant reference point for alignment is the hub cap centre or stub axle centre.

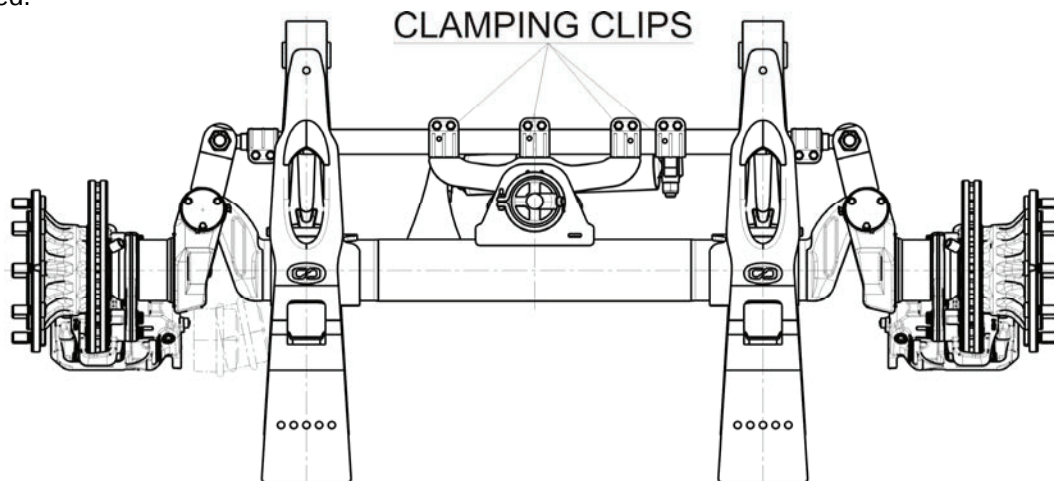
Positive toe-in/ toe-out:

Rigid axle:

Toe-in: $+0$ to $+12' = \text{max. } +3,5 \text{ mm/m}$ (Example: $Y - X = 0 + 3,5 \text{ mm}$)

Self-steering axle:

Toe-in: $+14$ to $+24' = \text{min. } +4 \text{ mm/m}$ to $\text{max. } +7 \text{ mm/m}$ (Example: $Y - X = 4 \text{ mm}$ to 7 mm)

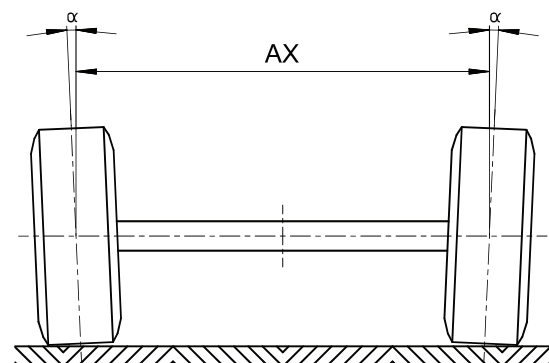
The setting is carried out by lengthening or shortening the steering tie rod. After all the clamping clips have been loosened, the required dimension is set by turning steering tie rod. The tie-rod ends are not affected.



Measuring the axle geometry: Deviations in the distances $AC - BD = 0 \pm 3 \text{ mm}$

Camber:

The wheel camber (α) has been designed fixed and cannot be adjusted. For the unloaded axle, the value is $\pm 12'$ positive camber (corresponds to $3,5 \text{ mm/m}$)



In order to avoid tire wear, we recommend that an axle alignment is performed at regular intervals. We recommend the use of an optical measuring system for carrying out the axle alignment. For alignment, only the centres of the middle of the wheel cap or the middle of the axle stub end are of interest as reference points. Possible causes of deviations in the axle alignment are:

- ✓ Wear of the pivot bush
- ✓ Deformation of the axle assembly components due to improper use.

Key

Summary	Explanation
A	Unsprung mass
AX	Distance wheel attachment faces left to right
B	Total width
BH	Hanger bracket height, distance centre pivot bolt to top side hanger bracket
BL	Hanger bracket length, distance top hanger bracket from front- to backside
BM	Air spring centre, distance air spring centre line between left- and right side
ET	Offset, distance wheel attachment face to centre tire
DP	Pivot point centre (steering axle), distance pivot bolts centre line between left- and right side
F	Nominal ride height, distance centre axle to bottom chassis in driving condition
G	Total axle width
H	Air spring bracket height
H ₂	Air spring bracket height at lift air spring
HM	Hanger bracket centre, distance hanger bracket centre line between left- and right side
Hmax	Air spring height maximum
Hmin	Air spring height minimum
i	Ratio
K	Brake chamber centre (with drum brake), centre distance brake chamber bracket between left- and right side
KTL	Cathodic dip coating
L	Trailing arm length (L1), distance centre pivot bolt to centre axle (standard 500 mm)
La	Distance centre axle to centre air spring (L2, standard 385 mm)
LM	Spring centre, centre distance spring between left- and rightside
Lmax	Shock absorber length maximum
Lmin	Shock absorber length minimum
P	Air pressure in the air spring (Mpa)
p	Air pressure in the air spring (Mpa/kg)
Pt	Air pressure in the air spring at partial load (Mpa)
Q	Axle load on the ground (kg)
Qt	Axle load on the ground at partial load (kg)
S	Track, centre distance tires between left- and right side
V	Air spring offset, distance centre air spring to centre spring
X	Overall height, distance centre axle to under side of chassis beam when air springs are without air
Y	Installation height of liftarm, when raised.

All measurements are given in mm if not specified otherwise.



SAF 's history begins in 1881 in a village forge in Germany with the invention of a new plough. The family business soon starts building steel axles for agricultural vehicles, and under the name Otto Sauer Achsenfabrik (SAF) develops into one of the leading manufacturers of trailer axles and suspension systems in Europe.

A safety coupling between plough and horse team can be found at the beginning of Holland's history. The Safety Release Clevis Company was founded in South Dakota, USA , in 1910. After its move to Holland, Michigan, the company emerges as one of the largest supplier companies to the commercial vehicles industry under the name The Holland Hitch Company.

The merger of the two companies to form SAF-HOLLAND in 2006 creates one of the leading global suppliers of high-quality components and services for the commercial vehicle industry. Alongside axle and suspension systems for trailers and semi-trailers, the product range also includes kingpins and landing gear as well as fifth wheels for tractors, air suspensions, coupling products and numerous other components for buses and trucks.

Today SAF -HOLLAND is represented on all continents and distributes its products and services worldwide under the brand names SAF and HOLLAND. It can boast of an extensive distribution network with global service and dealer locations.

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