



Audi RS 3 LMS

S U S P E N S I O N U S E R M A N U A L v 7

This document provides the main guidelines to handle the suspension set up of the Audi RS 3 LMS.

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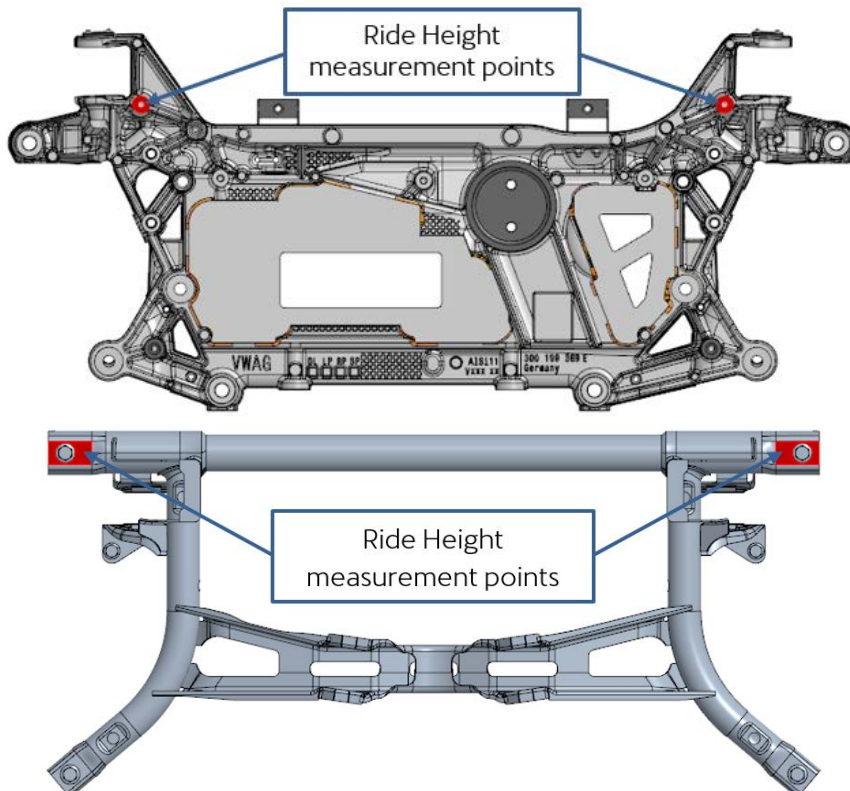
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1. SUSPENSION

1.1. MISCELLANEOUS

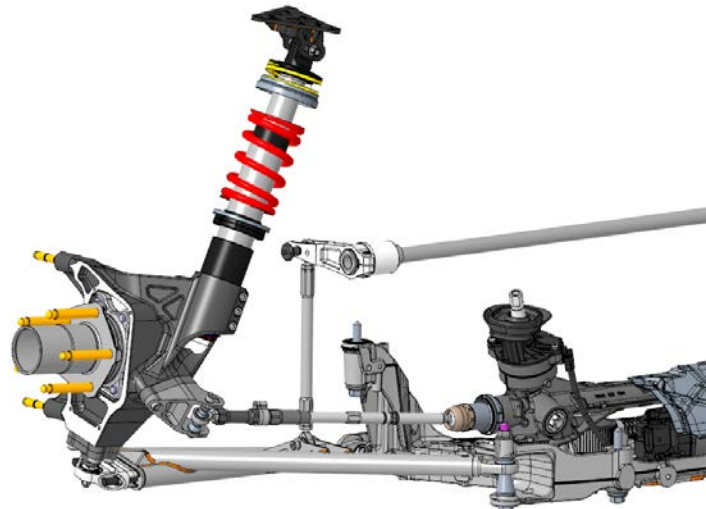
The main data of the car suspension is the following:

Parameter	Front Axle	Rear Axle	Comments
Wheelbase	2715 mm		
Track width	1770 mm	1740 mm	
Rim width x diameter	10" x 18"	10" x 18"	
Rim offset	26 mm	26 mm	E.T.
Baseline Ride height	80 mm	218 mm	Flat car
Motion Ratio	1.10	1.60	Wheel / damper
Baseline Camber angle	4.5°	4°	
Camber adjustment	2° - 7°	2° - 6°	Considered positive camber in the whole document
Baseline Toe	Parallel	Parallel	Toe out is positive
Steering rack ratio	4.725°/mm	-	Steering wheel angle / rack displacement
Max. rack bar travel	±44 mm	-	Limited by mechanical stop (36mm)
Max. steering angle at wheel (inner wheel)	22.4°	-	
Max. steering angle at wheel (outer wheel)	19.2°	-	
Turning radius	8.6 m	-	Wall to wall



1.2. FRONT SUSPENSION

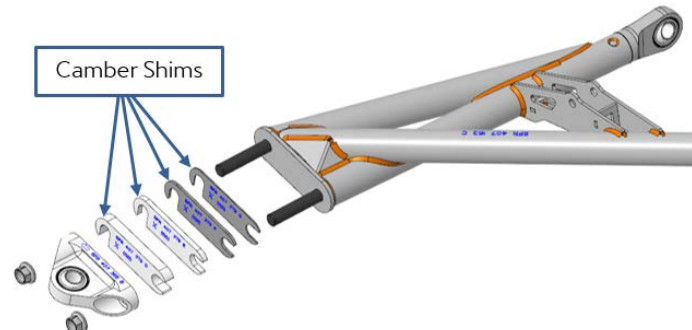
The front suspension is based on the McPherson strut and there are some possible adjustments.



1.2.1. CAMBER ADJUSTMENT

The camber setting can be made by the combination of shims with different thickness in order to get the required camber angle. The available shims are **1.2, 2.5, 5** and **10 mm** in thickness.

The maximum recommended thickness of camber shims is **37.5mm**.



The camber adjustment is causing a Ride Height and Toe change that should be corrected to keep these values on the previous setting.

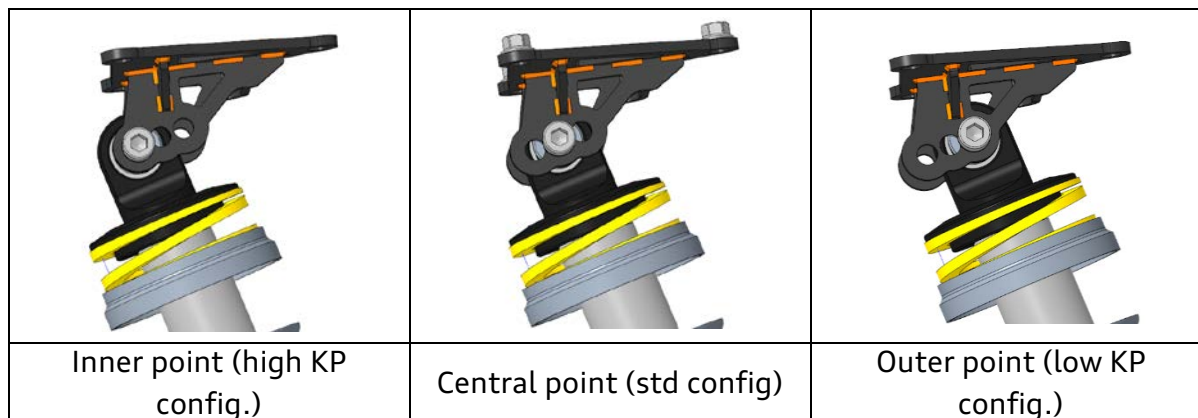
Δ Camber	Δ Camber shims	Ride height compensation on shock absorber	Toe shims compensation
+0.1°	+1.25mm	+3/8 turns preload	+1mm
+0.4°	+5.0mm	+1.5 turns preload	+4.2mm
+1.0°	+12.5mm	+3.75 turns preload	+10.5mm

The camber gain caused by the Ride Height variation is:

Δ Ride height	Δ Camber
+10mm	-0.3°
-10mm	+0.28°

1 . 2 . 2 . KINGPIN ADJUSTMENT

The Kingpin angle and the camber angle can be quickly modified by changing the position of the front shock absorber on the top mount.



There are three different positions on the top mount and the standard is the central one. These positions have been designed with the aim that the KP axis rotates around the centre of the outer driveshaft CV joint, to avoid its movement, so it means that the camber shims have to be also changed.

Top mount position	Δ camber shims	Δ camber and KP angle	Ride Height compens.	Toe shims compens.	Bumpsteer compens.
Outer	-5 mm	-1.5°	TBC	-2 mm	-4 mm
Inner	+5 mm	+1.5°	TBC	+2 mm	+6 mm

If the camber shims are not changed, the Camber and KP angle variations will be just $\pm 1.1^\circ$ from the previous angle and the toe shims have to be compensated ± 3 mm.

The maximum and minimum advisable camber angles on each position are:

Top mount position	Minimum camber angle	Maximum camber angle
Outer	2°	3.5°
Std	3.5°	5.0°
Inner	5°	7°

The position of the top-mount has an influence on the length of the drive-shafts. Check if the plunge of the tripods in the tripod-housings is well within the range and the tripod is not exceeding the slots in the tripod-housing under all driving situations.

IMPORTANT:

To keep the wheel covered by the fender (external measures certified), the overall bodywork width should be checked after camber modification.

Same control must be done if wheel spacers are added.

1 . 2 . 3 . T O E A D J U S T M E N T

The toe setting can be made by the combination of shims with different thickness in order to get the required toe at the wheel. The available shims are **0.8, 1, 1.2 mm** (fine-tuning), **2, 5** and **10 mm** in thickness.

Toe is always measured per wheel at the rim flange.

Δ Toe shims	Δ Toe per wheel at rim
+0.2mm	+0.7mm
+1.0mm	+3.5mm

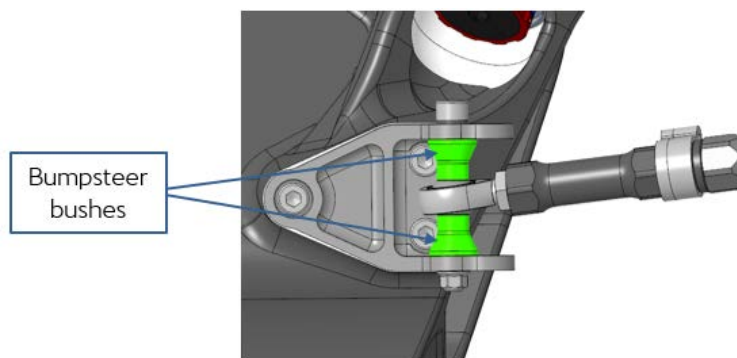
The maximum recommended thickness of toe shims is 26mm.



Additional fine tuning can be made by turning the outer ball joint.

1 . 2 . 4 . B U M P S T E E R A D J U S T M E N T

There are three combination of bumpsteer bushes available in order to adjust the toe gain with the wheel movement. The car is delivered with the symmetric bushes combination and the other ones are moving the steering point 4 and 6 mm upwards or downwards.

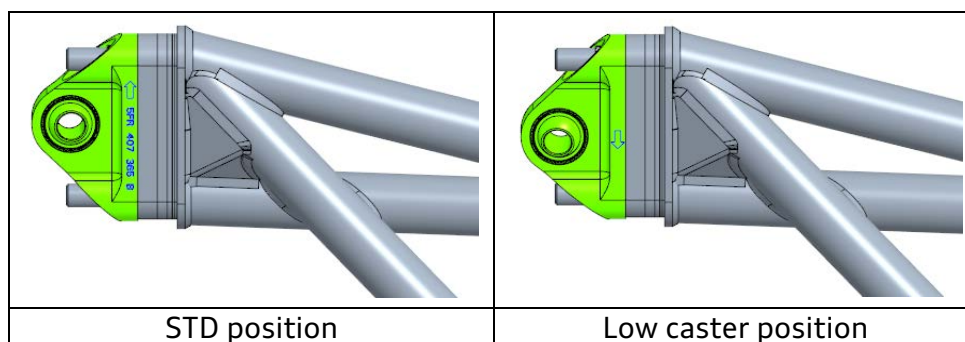


These combinations will also affect to other parameters like Roll Centre Height, %Anti-dive and %Anti-lift as follows:

Δz steering point	Δ Roll Centre height (mm)	Δ Bumpsteer (mm/30mm wheel bump movement)	$\Delta\%$ Anti-dive	$\Delta\%$ Anti-lift
+6 mm	-4.3	-0.9	-0.2	-4.0
+4 mm	-2.0	-0.5	-0.15	-2.2
-4 mm	+2.0	+0.5	+0.2	+2.4
-6 mm	+4.3	+0.95	+0.3	+4.5

1.2.5. CASTER ADJUSTMENT

The wishbone outer joint housing is marked with a forward arrow to show the standard position. This part can be mounted on the opposite side (arrow backwards) and the caster will be reduced.

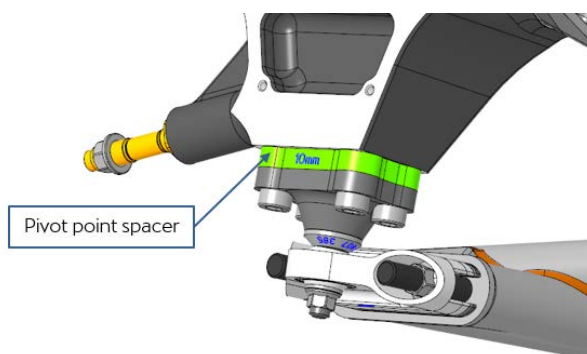


This adjustment will affect to the Roll Centre Height, bumpsteer, % anti-dive, % anti-lift and wheelbase in the following way:

	Δ Roll Centre height (mm)	Δ Bumpsteer (mm/30mm wheel bump movement)	Δ % Anti-dive	Δ % Anti-lift	Wheelbase reduction (mm)
Reversed wishbone outer joint (arrow backwards)	+3.7	-0.27	-1.8	+0.8	-5

1.2.6. ROLL CENTRE ADJUSTMENT

The upright pivot point can be mounted with or without the 10 mm spacer.

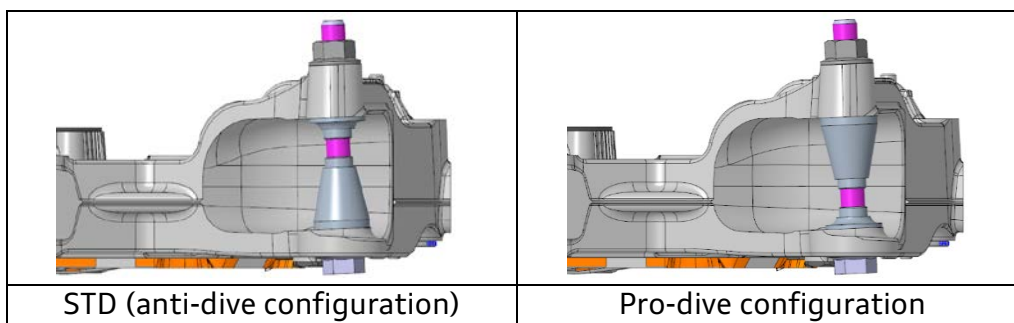
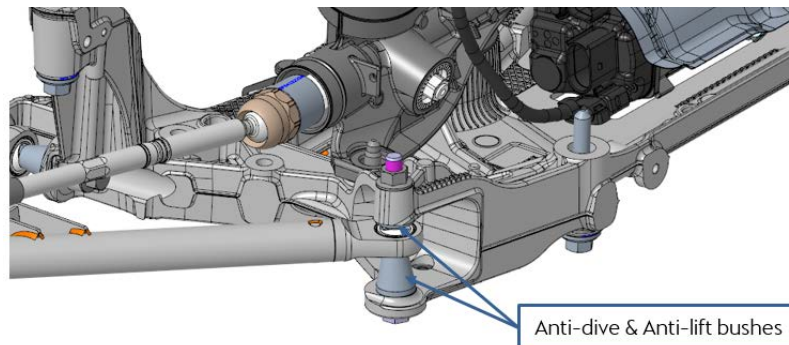


This will affect to the Roll Centre Height, but also to the bumpsteer, the % anti-dive and the % anti-lift in the following way:

	Δ Roll Centre height (mm)	Δ Bumpsteer (mm/30mm wheel bump movement)	Δ % Anti-dive	Δ % Anti-lift
NO pivot point spacer	-11.5	+1.58	+1.7	+8.5

1.2.7. ANTI-DIVE & ANTI-LIFT BUSHES

The bushes on the rear wishbone joint are fitted, on the car delivery, as anti-dive and anti-lift configuration, but they can be fitted reversed, reducing the anti effects.

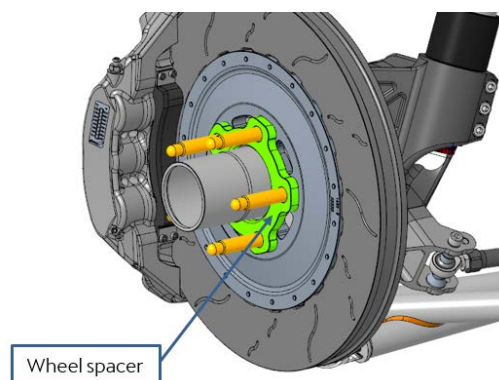


If this configuration is fitted, it will affect also to the Roll Centre Height and the bumpsteer in the following way:

	Δ Roll Centre height (mm)	Δ Bumpsteer (mm/30mm wheel bump movement)	$\Delta\%$ Anti-dive	$\Delta\%$ Anti-lift
Pro-dive bushes	+12.8	+0.8	-39.0	-27.3

1.2.8. TRACK WIDTH ADJUSTMENT

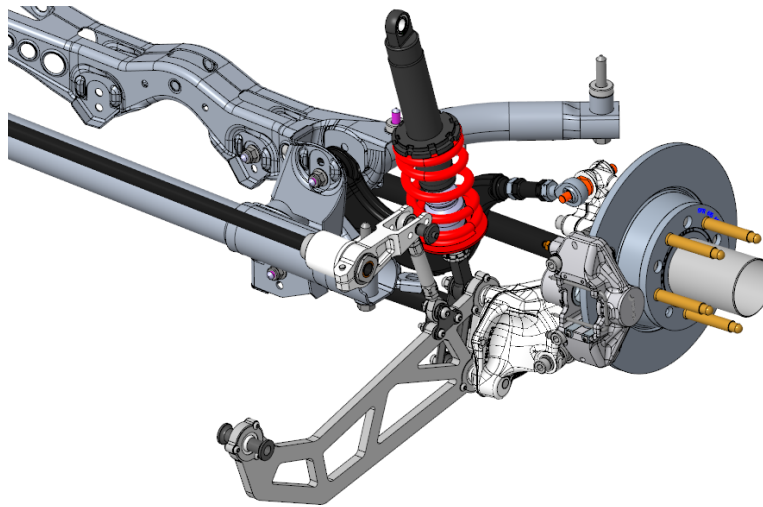
The Track width can be easily adjusted by the addition or the removal of wheel spacers. The available wheel spacers are **2, 3, 5** and **10 mm** in thickness.



The maximum recommended thickness of wheel spacers is 20 mm.

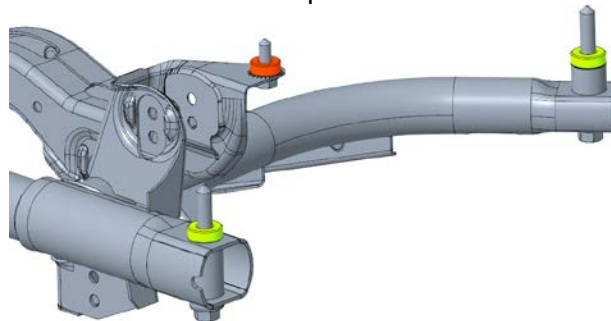
1 . 3 . R E A R S U S P E N S I O N

The rear suspension has been designed using a multi-link concept with 4 arms.



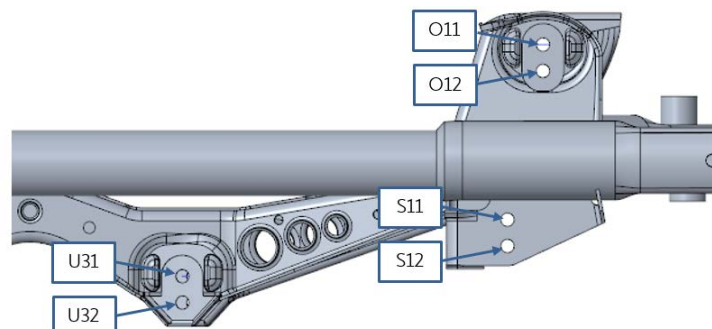
1 . 3 . 1 . S U B F R A M E S P A C E R S

There are 6 spacers at the fixing points of the subframe to the bodyshell in order to keep the same suspension geometry in case that the minimum Ride height changes. The baseline is using the 10mm thick. They have a centering function and can be placed upward or downward in case that are not useful. On the spare parts catalogue, there are available an option of 20mm thick.



1 . 3 . 2 . R E A R K I N E M A T I C S A D J U S T M E N T

There are two different fixing points on the subframe for each arm, to be able to adjust the suspension geometry in different ways.



U point	O point	S point	Bumpsteer	Camber gain	Δ Roll Centre height
U31	O12	S12	Low	Mid	Baseline
U31	O11	S12	Low	Low	-41mm
U32	O12	S12	Mid	Mid	-15mm
U32	O11	S12	Mid	Low	-57mm
U31	O12	S11	Mid	High	+53mm
U31	O11	S11	Mid	Mid	+15mm
U32	O12	S11	High	High	+39mm
U32	O11	S11	High	Mid	-1mm

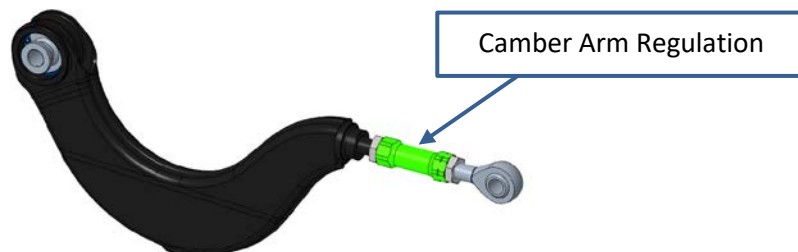
Car delivery

The camber and toe can be adjusted without relation with each other. After changing any of these kinematic points the setup has to be checked.

1 . 3 . 3 . C A M B E R A D J U S T M E N T

The camber angle can be set by adjusting the length of the camber arm through the rod.

Arm regulation	Δ Arm length	Δ Camber	Ride height compensation on shock absorber
1 turn	-2.5mm	+0.86°	+1.7 turns preload
1 turn + 1 notch	-2.9mm	+1.00°	+2.0 turns preload



The camber gain caused by the Ride Height variation depends on which kinematic configuration is used:

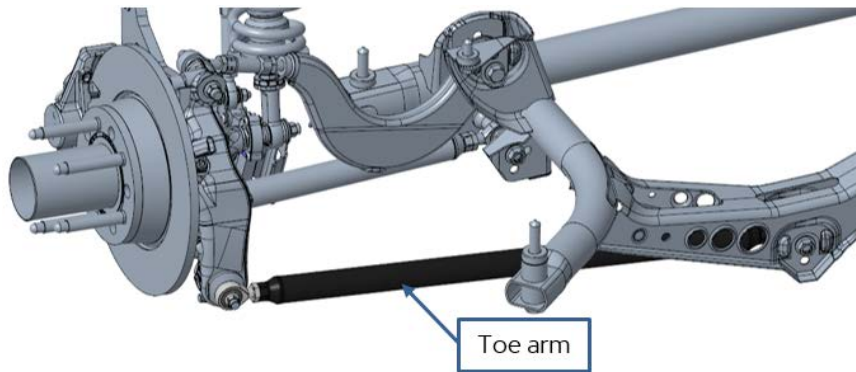
Camber gain configuration	Δ Ride height	Δ Camber
Low	+10mm	-0.27°
	-10mm	+0.30°
Mid	+10mm	-0.39°
	-10mm	+0.41°
High	+10mm	-0.50°
	-10mm	+0.52°

In order to keep the wheel covered by the fender, the track width should be adjusted using wheel spacers.

1.3.4. TOE ADJUSTMENT

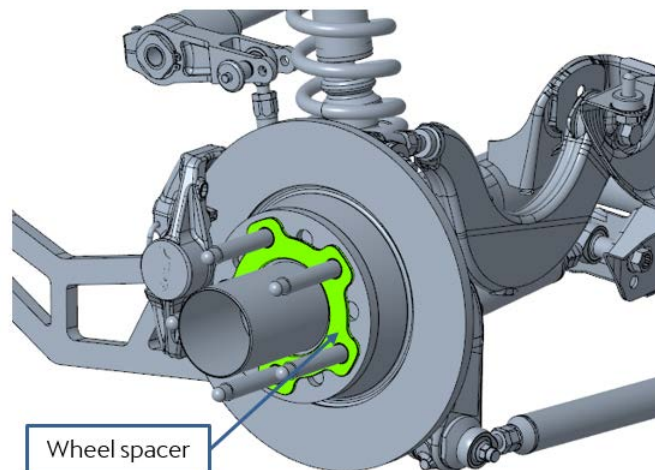
The toe setting can be made by enlarging or shortening the toe arm through the rod.

Arm regulation	Δ Arm length	Δ Toe per wheel at rim
1 notch	0.42mm	1mm
1 turn	2.5mm	6mm



1.3.5. TRACK WIDTH ADJUSTMENT

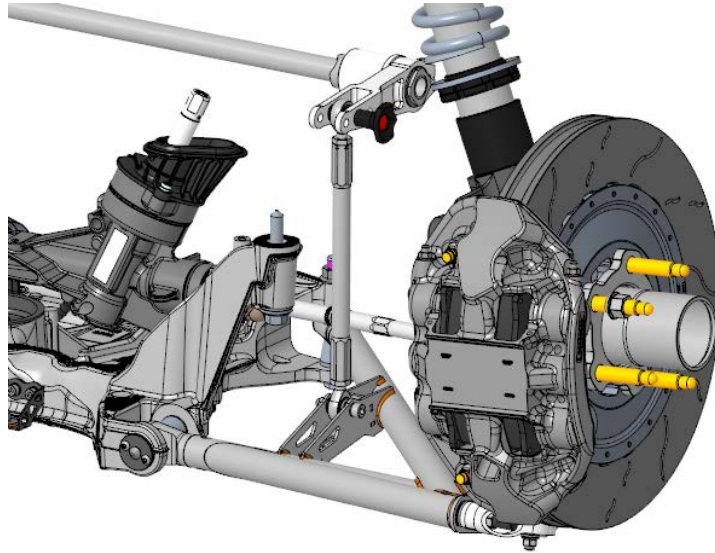
The Track width can be easily adjusted by the addition or the removal of wheel spacers. The available wheel spacers are **2, 3, 5** and **10 mm** in thickness.



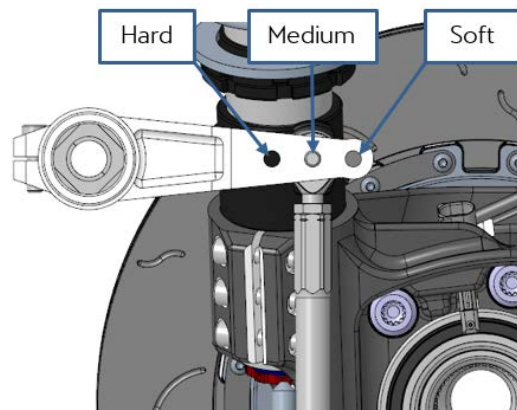
2. ANTI-ROLL BAR

2.1. FRONT ANTI-ROLL BAR

Three different bars with diameters of $\varnothing 22$ (car delivery), $\varnothing 25$ and $\varnothing 35$ mm are available to modify the stiffness that the anti-roll bar is giving to the suspension.



Each lever has been designed with three holes in order to be able to change the stiffness in smaller steps. The fixation to the drop link can be made with the quick-release pin (car delivery) for quick changes or a standard bolt can replace it.

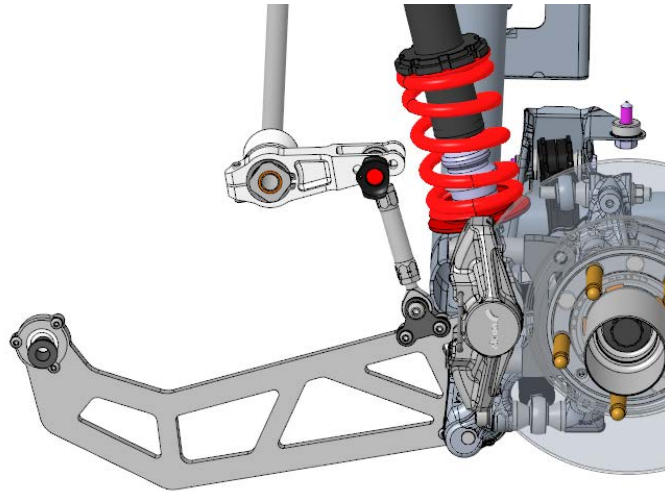


The stiffness values from the ARB, according to the different bar diameters and different positions are the following ones:

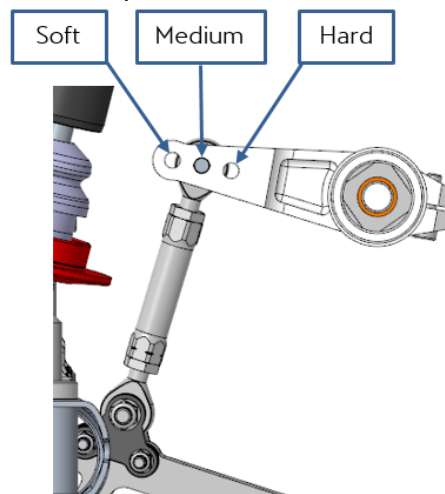
Δ Front ARB Stiffness (%)			
External Diameter (mm)	22	25	35
Thickness (mm)	2.0	3.0	3.0
Hard-Hard	0	101	514
Medium-Medium	-33	35	311
Soft-Soft	-52	-3	194

2.2. REAR ANTI-ROLL BAR

Two different bars with diameters of $\varnothing 18$ (car delivery), $\varnothing 22$ mm and $\varnothing 25$ mm are available to modify the stiffness that the anti-roll bar is giving to the rear suspension.



In the same way as on the front axle, each lever has been designed with three holes in order to be able to change the stiffness in smaller steps. The fixation to the drop link can be made with the quick-release pin (car delivery) for quick changes or a standard bolt can replace it.



The stiffness values from the ARB, according to the different bar diameters and different positions are the following ones:

Δ Rear ARB Stiffness (%)			
External Diameter (mm)	18	22	25
Thickness (mm)	2.0	2.0	3.0
Hard	0	94	291
Medium	-31	35	172
Soft	-49	-1	100

3 . D A M P E R S

The front and rear dampers are BILSTEIN MDS specifically designed for the CUPRA Leon Competition.

3 . 1 . F R O N T D A M P E R S

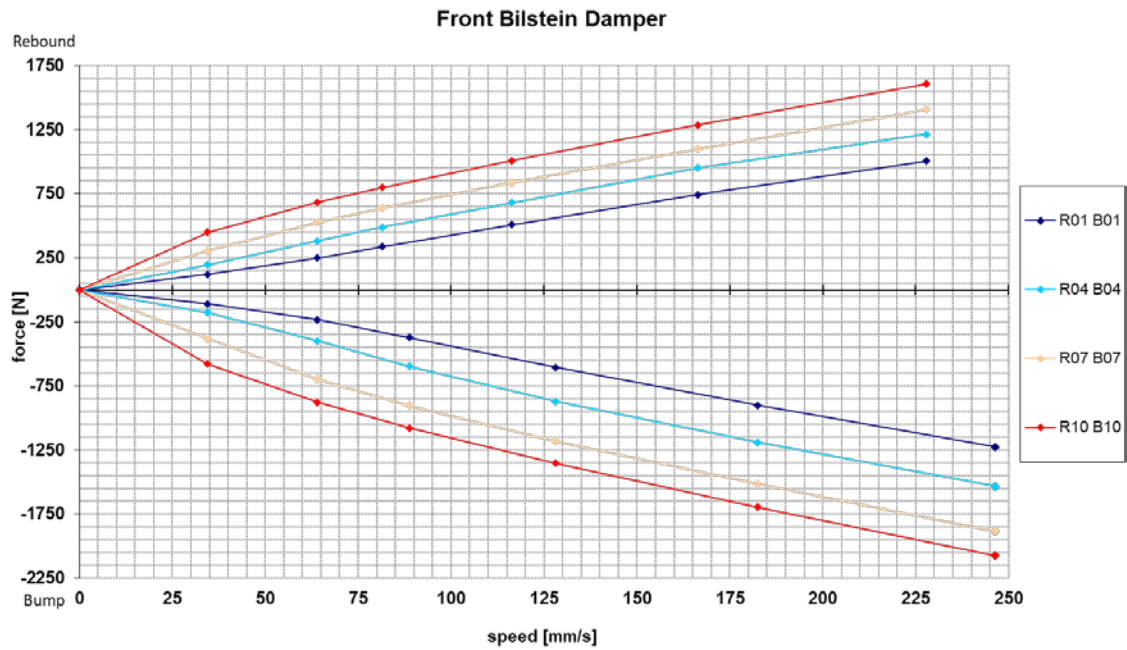
Front dampers characteristics
Motorsport BILSTEIN MDS damper
Aluminum outer housing and inner steel chrome tube
2-way adjuster for separate adjustment of the bump and rebound phases
10 adjustment clicks for each bump and rebound phases
20 mm upright height regulation
115mm stroke (75mm free stroke + 30mm bump-stop (5KN / 7mm) + 10mm packer)

The damper position on the upright clamp (clamping length) can be adjusted through the Upright height Adjuster in order to modify the bump and rebound travels. This action will change the static ride height, so it should be adjusted.



Following, the Force vs Speed data and curves for bump and rebound phases.

FRONT BUMP					FRONT REBOUND				
Speed (mm/s)	Force (N)				Speed (mm/s)	Force (N)			
	Clicks					Clicks			
	1	4	7	10		1	4	7	10
0	0	0	0	0	0	0	0	0	0
34	-109	-179	-380	-580	34	122	193	305	449
64	-234	-399	-698	-878	64	247	382	526	683
89	-372	-596	-903	-1077	81	335	488	637	796
128	-605	-870	-1183	-1353	116	509	680	836	1006
182	-901	-1190	-1516	-1696	166	740	950	1098	1284
246	-1226	-1534	-1885	-2075	228	1005	1213	1405	1607



3 . 2 . R E A R D A M P E R S

Rear dampers characteristics
Motorsport BILSTEIN MDS damper
Aluminum outer housing and steel chrome axle
2-way adjuster for separate adjustment of the bump and rebound phases
10 adjustment clicks for each bump and rebound phases
113mm stroke (48mm free stroke + 35mm bump-stop (5KN / 7mm) + 3x10mm packer)



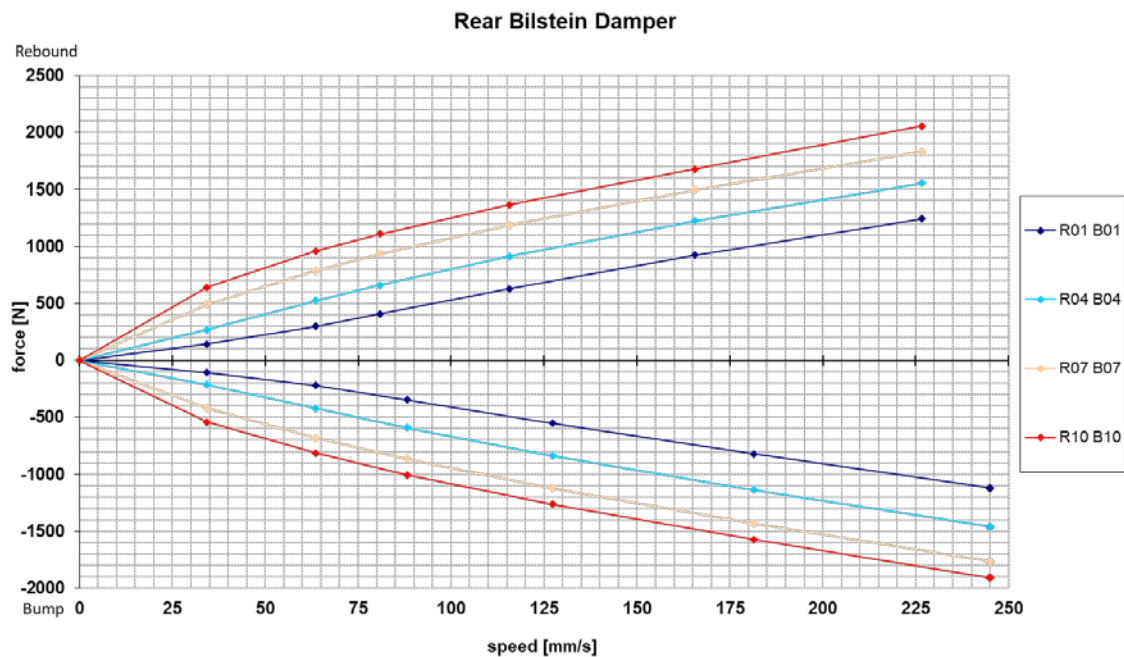
FORCE ADJUSTMENT

Red Adjuster (Rebound)
 Blue Adjuster (Bump - Compression)
 Pos 1-soft to 10-hard.



Rebound (Red ---> Rebound)
 Compression (Blue ---> Bump)

REAR BUMP					REAR REBOUND				
	Force (N)					Force (N)			
	Clicks					Clicks			
Speed (mm/s)	1	4	7	10	Speed (mm/s)	1	4	7	10
0	0	0	0	0	0	0	0	0	0
34	-107	-212	-421	-542	34	1434	268	490	641
64	-221	-424	-682	-815	64	300	524	788	959
88	-347	-593	-864	-1006	81	409	662	935	1110
127	-553	-837	-1124	-1262	116	626	914	1187	1365
181	-820	-1139	-1433	-1572	166	921	1223	1493	1676
245	-1119	-1460	-1764	-1908	227	1244	1555	1831	2058



4 . S P R I N G S

The springs are characterized by the following format:

"Length of the spring" - "Inner diameter of the spring"- "Stiffness"

Where the length and the inner diameter are expressed in millimeters and the stiffness is expressed in N/mm.

The front springs at the **car delivery** are:

Front **200-60-0100**

Rear **200-60-0200**

To make easier the springs fitting on the damper and to prevent that the main spring becomes loose at full droop, the assembly is combined with the helper **60-60-0002**.

4 . 1 . R I S C O F C O I L B I N D I N G

Coil binding means that the coils are in contact to the next upper and lower coil when reaching the maximum designed travel (block length).

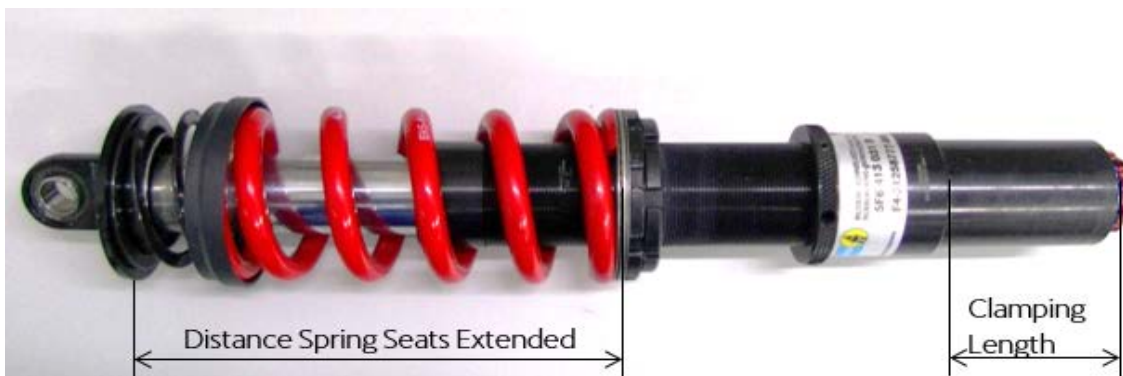
Coil binding should be avoided on the main springs as it could lead to spring failure or at least to a loss of length and/or rate. The most helper springs are designed to be used in block situation.

The parameters which can be adjusted and have an influence on the safety of the spring length are **Ride Height, Spring rate, Spring block length, Damper stroke** and **Damper compressed length**.

In general, the limit can be defined with the value of “Minimum Distance Spring Seats extended”, if following values are known:

- Main Spring Block Length
- Helper Spring Block Length
- Spring Separator Height
- Damper Stroke

The setup is safe, if the distance of the spring seats on the extended damper is higher than the addition of the values above.



The table below is showing a few examples of calculated values for “Minimum Distance Spring Seats Extended” with different main springs.

Spring Length 200mm							
Main Spring Rate (Eibach)	N/mm	70	80	90	100	110	120
Main Spring Block Length	mm	71.50	76.48	81.60	80.85	87.34	87.75
Helper Spring Type (Eibach)	-	60-60-2					
Helper Spring Block Length	mm	12.50					
Spring Separator Height	mm	2					
Damper Stroke (Bilstein Front)	mm	105					
Min Distance Spring Seats Extended FRONT	mm	191.0 0	195.9 8	201.1 0	200.3 5	206.8 4	207.2 5
Damper Stroke (Bilstein Rear)	mm	83.2					
Min Distance Spring Seats Extended REAR	mm	169.2 0	174.1 8	179.3 0	178.5 5	185.0 4	185.4 5

Spring Length 170mm									
Main Spring Rate (Eibach)	N/mm	120	140	160	180	200	220	240	260
Main Spring Block Length	mm	69.83	77.35	80.33	78.38	81.94	87.03	86.25	91.45
Helper Spring Type (Eibach)	-	60-60-2							
Helper Spring Block Length	mm	12.50							
Spring Separator Height	mm	2							
Damper Stroke (Bilstein Front)	mm	105							
Min Distance Spring Seats Extended FRONT	mm	189.3 3	196.8 5	199.8 3	197.8 8	201.4 4	206.5 3	205.7 5	210.9 5
Damper Stroke (Bilstein Rear)	mm	83.2							
Min Distance Spring Seats Extended REAR	mm	167.5 3	175.0 5	178.0 3	176.0 8	179.6 4	184.7 3	183.9 5	189.1 5

My spring setup is not safe. What can I do?

- Decrease the ride height
- Reduce bump travel by reducing the clamping length with the Upright height adjuster
- Use longer springs

5. BASIC SETUP

Basic setup as the cars are leaving the production

Audi RS 3 LMS		SET-UP		Audi Sport	
CAR INFORMATION		TRACK INFORMATION		DATE	25/06/2020
Chassis	MK4-	Circuit	-	FROM	-
Engine	DNF-	Length	-	TO	-
Gearbox	CFT-	Driver	-		
CAR CONFIGURATION		CONSTANTS			
RIDE HEIGHT SUBFRAME	FRONT	REAR	WHEELBASE	2715 mm	
MIN RH SPLITTER / RAKE	82/82	220/220	MOTION RATIO (W/D)	Front 1.1 / Rear 1.6	
DAMPER SETTINGS	FRONT		FRONT KINEMATICS		
MAIN SPRING	200/60/100	200/60/200	TOP MOUNT POSITION	Mid	
TENDER	60/60/2	60/60/2	CASTER	STD	
ASSEMBLY LENGTH	215/215	229/229	PIVOT POINT SPACER	Yes	
DAMPER POSITION - UPRIGHT	84 mm from bottom	-	STEERING ARM SPACER	Yes	
BUMP STOPS	STD	STD	STEERING ARM POINT	Outer (STD)	
PACKERS	10 mm	30 mm	STEERING ARM BUSHES	Mid	
CLICKS BUMP	Bilstein 380 (5)	Bilstein 380 v2 (5)	ANTI-DIVE	Max (STD)	
CLICKS REBOUND	Bilstein 380 (5)	Bilstein 380 v2 (5)	REAR KINEMATICS		
ARB SETTINGS	FRONT		SUBFRAME BUSHES	10 mm	
TYPE	22x2	18x2	SHORT ARM POSITION	Up	
POSITION	M - M	M - M	CAMBER ARM POSITION	Up	
WHEELS SETTINGS	FRONT		TOE ARM POSITION	Down	
RIMS	CMS 18x10_ET26	CMS 18x10_ET26	ENGINE & POWERTRAIN		
WHEEL SPACER	5 mm	0 mm	RPM MAX	7100	R_efect
TYRES	Hankook	Hankook	POWER	100%	324
SET-UP TYRE PRESSURE	1.5	1.5	TOP SPEED	6th gear	274 km/h
BRAKE SETTINGS	FRONT		DIFFERENTIAL		
MASTER CYLINDERS	Tilton Ø17,8 (7/10")	Tilton Ø20,6 (13/16")	RAMPS [ACC/BRK]	45/30	
BRAKE PADS	WINMAX W6.5	WINMAX N143	PRELOAD	50 Nm	
BRAKE DISCS	Alcon 378x33	VAG 272x10	CLUTCH		
BRAKE BALANCE	15/12	AP Racing 7P (P3)	MASTER CYLINDER	Tilton Ø15,9 mm	
AERO			HAND BRAKE		
SPLITTER / WING / BLANKING	0°	0°	0 mm	MASTER CYLINDER Tilton Ø15,9 mm	
ALIGNMENT		WEIGHT (kg)			
FRONT	LEFT	RIGHT	DRIVER	FUEL	20 L
CAMBER (SHIMS)	4,5° (- mm)	4,5° (- mm)	LEFT	RIGHT	TOTAL
TOE (SHIMS)	0 (- mm)	0 (- mm)			
REAR	LEFT	RIGHT	FWD%	59% - 61%	CROSS
CAMBER	4°	4°	RWD%		LEFT
TOE	0	0			

6. CHANGE INDEX

Version	Date	Change / amendment	Page
V1	07.10.2021	General amendments	
V2	15.10.2021	General amendments	
V3	21.10.2021	General amendments	
V4	08.12.2021	General amendments	
V5	02.03.2022	Basic Setup amended Change index added	20 21
V6	24.06.2022	Delivery spec rear kinematics amended	10
V7	30.01.2023	Camber range for top-mount positions amended	5