

Feder-Dämpfer-Rocker





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1 Specification

1.1 Rules

Rule	Consequence for assembly/component
T2.3.1	Equipped with front and rear suspension systems, wheel travel of at least 50 mm with driver seated.
T2.3.2	Minimum static ground clearance of any portion of vehicle, including driver must be minimum of 30 mm.
T2.3.3	Suspension mounting points must be visible for technical inspection by direct or removing any covers
T10.1.2	All threaded fasteners must meet or exceed metric grade 8.8 or equivalent.
T10.2.3	Minimum two threads must project from any lock nut

Table 1 – Rules

1.2 Requirements

required	Requirement	Value	Unit
r	Force Transmission from pushrod to spring		
r	Force Transmission from pushrod to rocker arm		
r	Force from Pushrod to Rocker Bearing		

Table 2 – Requirements

1.3 Interfaces

I. Front Suspension

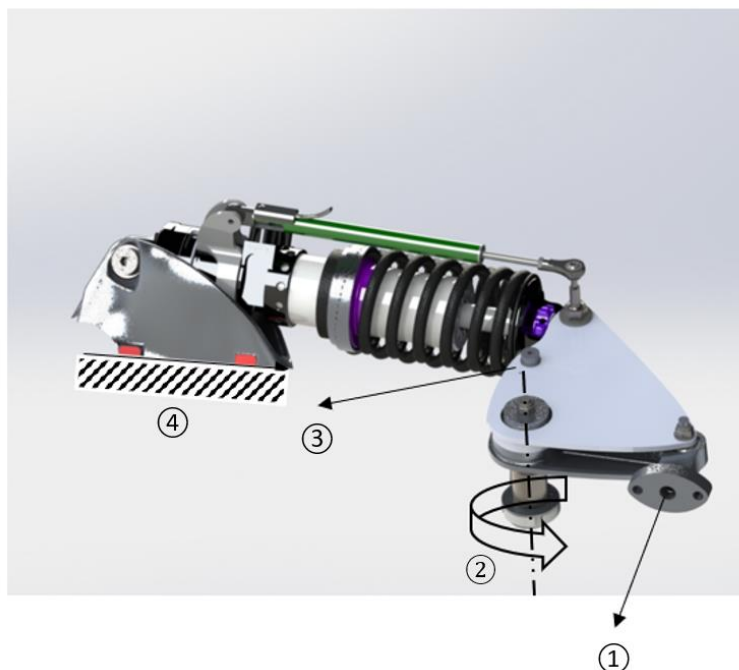


Fig 1 Front Suspension



II. Rear Suspension



Fig 2 Rear Suspension

- 1 Connected to Pushrod
- 2 Fixed in monocoque and rotates about its axis
- 3 Connected with Antiroll bars
- 4 Fixed in Monocoque

1.4 Design Space

1.4.1 Design

- Rocker for Front and Rear
 - o Topology optimized shape included
- Fixing of the antiroll bar position
- Rocker bearing fit and Rocker bolt for Front and Rear

1.4.2 Basic Conditions

- Kinematic point for
 - o Wishbone attachment in Rocker
 - o Antiroll bar attachment
 - o Rocker Bearing position



- Attachment point for the Front and Rear Suspension
- Position point for the Fixed area of Front and Rear Suspension

2 3D ASSEMBLY STRUCTURE

Required Components and Quantities

Assembly structure front:

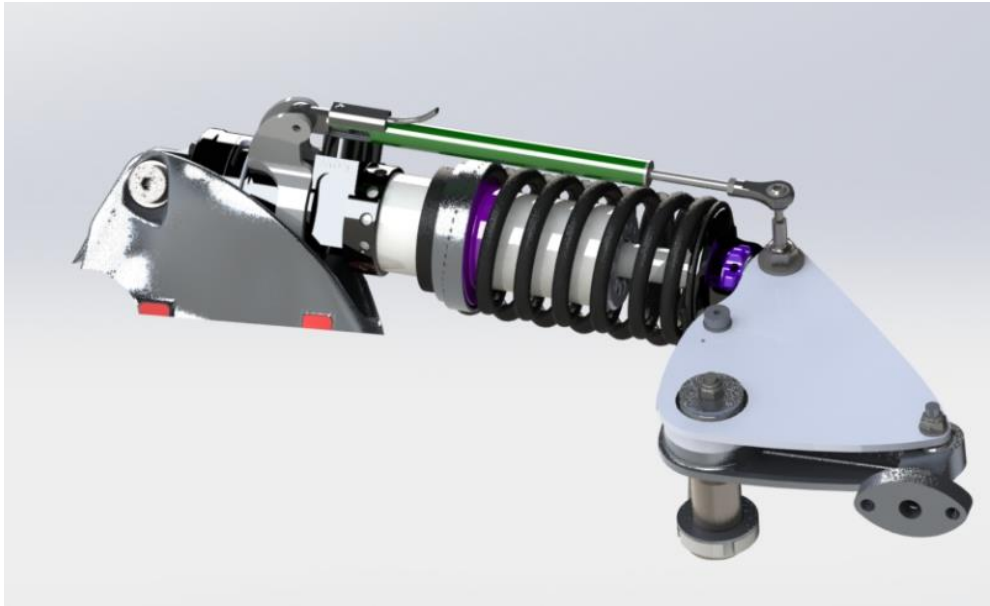




Fig 3 Front Suspension Assy

Part	Picture	Quantity	Material
Rocker VA		2	3.4365 (EN AW 7075-T6)
Rocker Bearing Bolt Front		2	Ti-6Al-4V Solution treated and aged (SS)






Unterlegscheibe Rockerbolzen VA		2	6061 Legierung
Shims VA		10	1023 Kohlenstoffstahlblech(SS)
Bolt Damper VA Rocker		2	Ti-6Al-4V Solution treated and aged (SS)

Table 4: Front Suspension assembly

Assembly structure Rear:



Fig 4 Rear Suspension Assy



Part	Pictures	Quantity	Material
Rocker HA		4	3.4365 (EN AW 7075-T6)
Spring Damper Locking Bolt Rear		2	AISI 1035 Steel (SS)
Rocker Bearing stopper rear		2	6061 Legierung
Rocker Bearing Bolt Rear		2	Ti-6Al-4V Solution treated and aged (SS)
Rear Rocker Bolt washer		2	6061 Legierung
Bolt Damper HA Atta.		2	Ti-6Al-4V Solution treated and aged (SS)

Table 5: Rear wheel hub assembly



3. Renderings

Front Suspension:

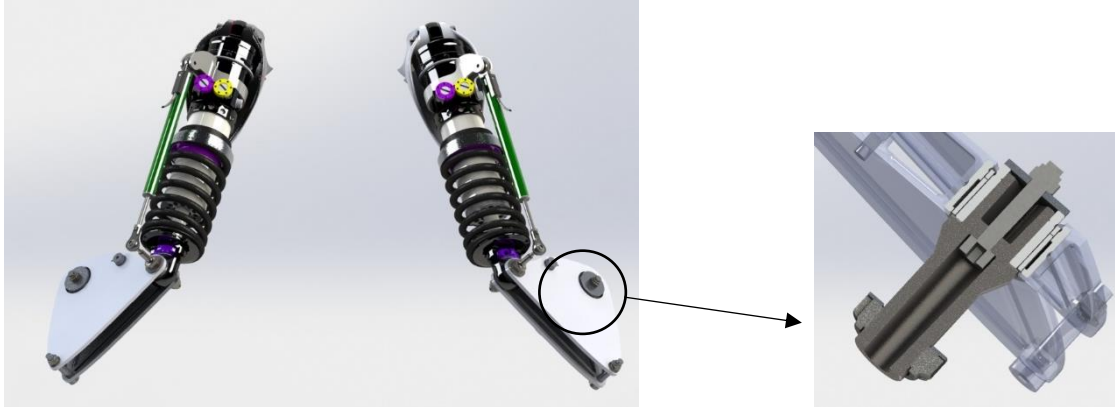


Fig 5 Front Suspension Assy & Rocker Bolt Assy Structure

Front bearing is locked by inserting a screw between the rocker bolt and the washer, which secure the Rocker Bearing without coming out (As mentioned in the above Fig 5). By this structure the weight of the Rocker Bolt is reduced from 57.71 grams to 49.14 grams.

Rear Suspension:



Fig 6 Rear Suspension Assy & Rocker Bolt Assy Structure

Rear Rocker Bearing is assembled between the screw and the washer to secure the coming out (in Fig 6). The weight of the Rocker Bolt is reduced from 35.05 grams to 26.47 grams.


3.2 Design Process

- | | | |
|---|-----------------------|---|
| 1 | Topology optimization | Shape of the Rocker is fixed based on the best stiffness. |
| 2 | Construction | Implementation of the Optimized design in the Front and Rear Rocker |
| 3 | FEA | Checking of Displacements and Stress |
| 4 | Construction | Design Changes for the improvement of the stress and Displacement Results and Check for 2 nd FEA |

3.2.1 Topology Optimization:

3.2.1.1 Topology Optimization:

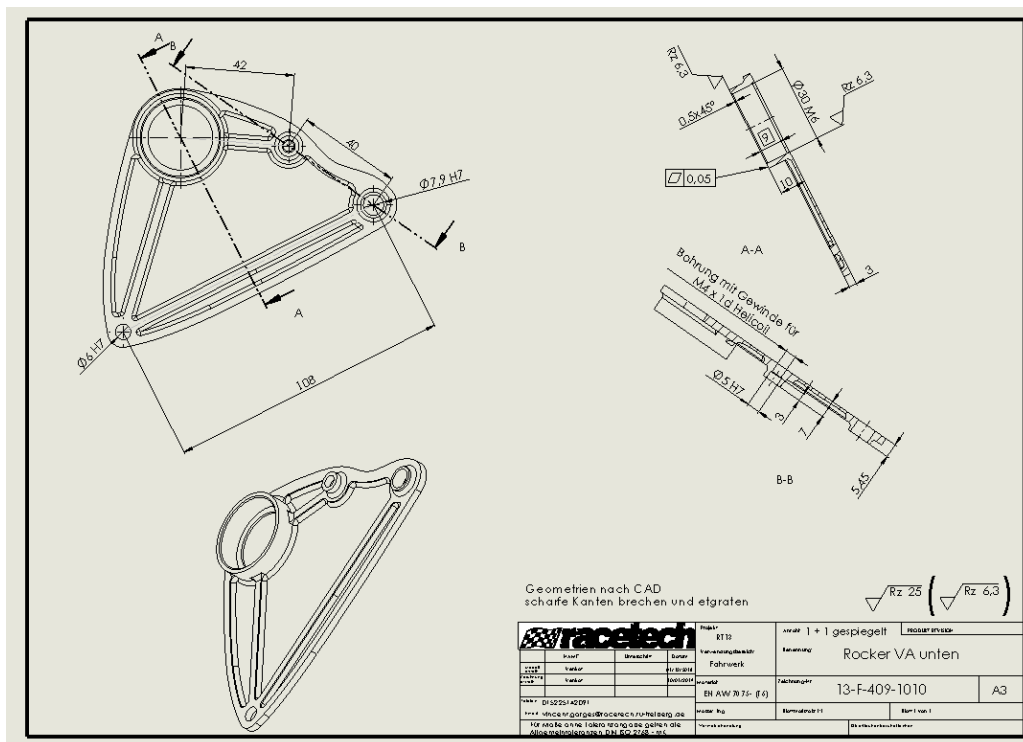
Rocker Arm:

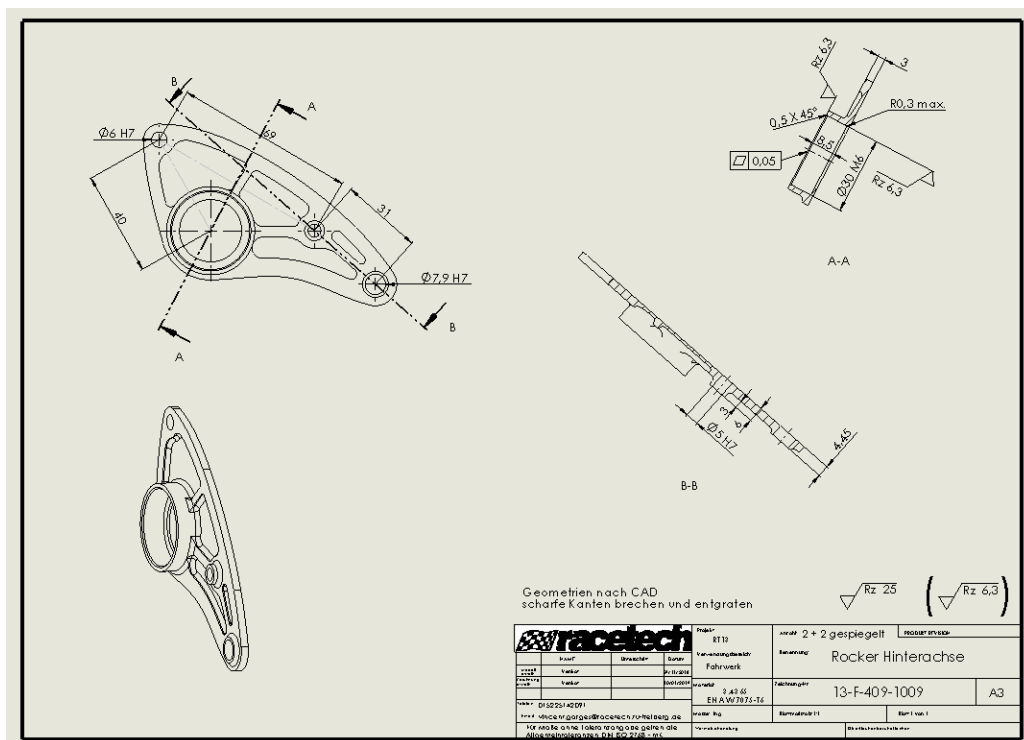
Cases and Description	Figure	Discussion
Stiffness ribs are bigger and the material inside of the two stiffness ribs are removed		Mass is increased and it may lead to break due to less support.

The stress and the Displacement values are varying in different versions of the Rocker arm. And based on the simulation result the best model which has less displacement

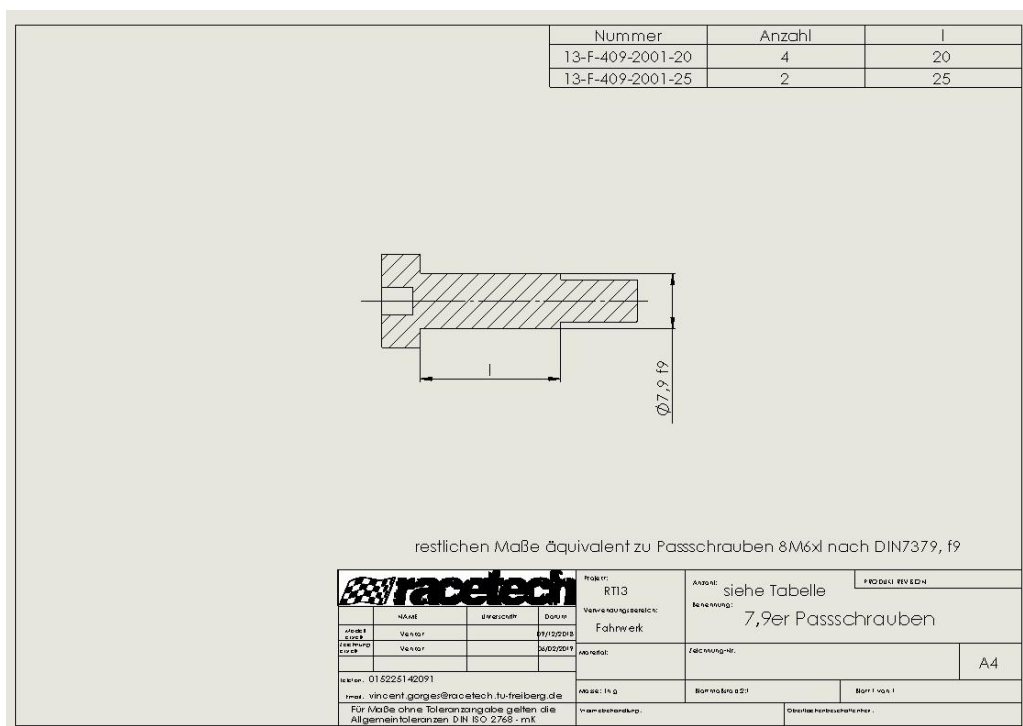
3.3 Technical Drawings

3.3.1 Rocker-Arm Front & Rear:

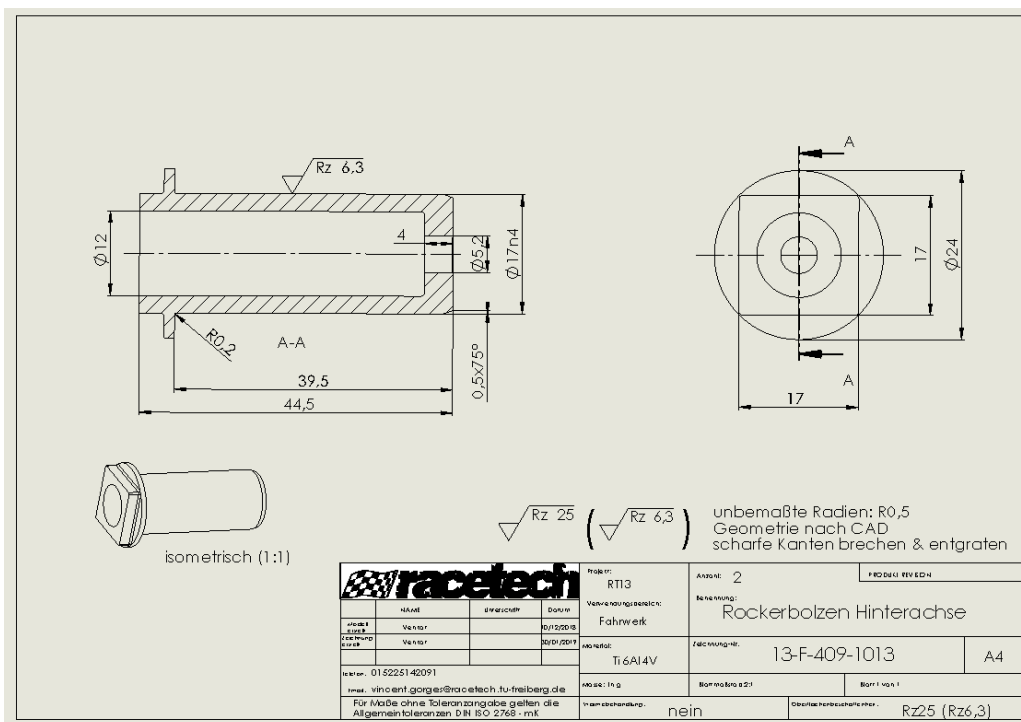
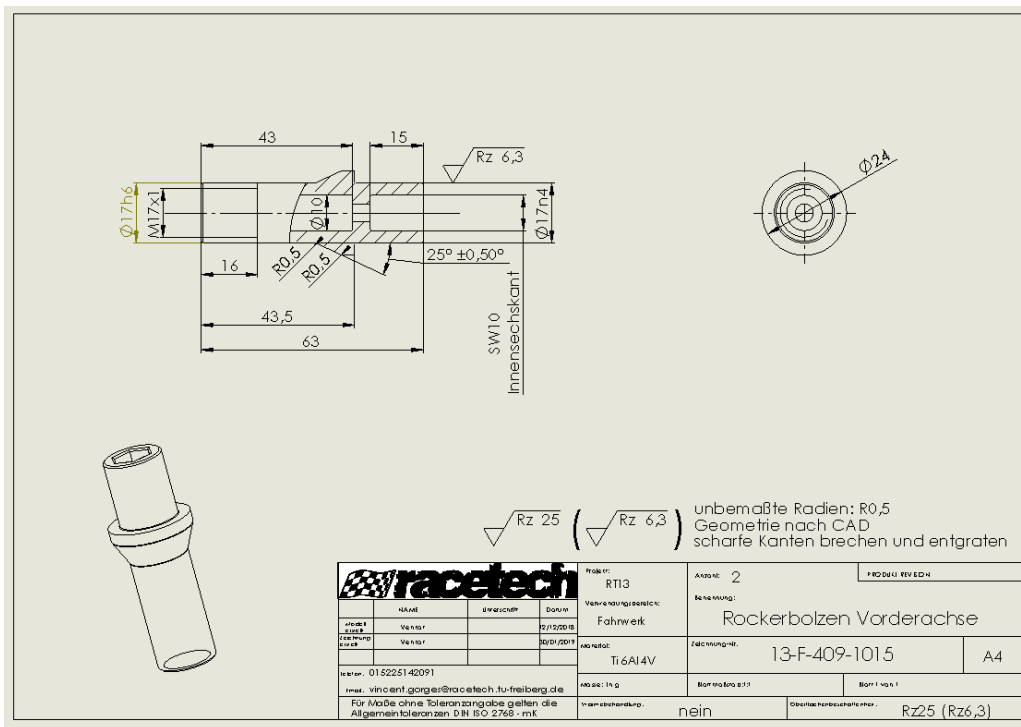




3.3.2 Damper Bolt:



3.3.3 Rocker Bearing Bolt Front & Rear:



3.3.4 Spring Damper Assy structure:

