

# Bolt Assessment inside Ansys

## New features - Highlights

### Version 2023.20

In partnership with **KISSsoft**

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**Ansys** /

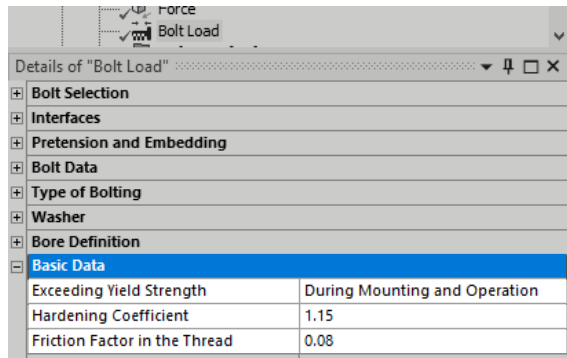
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## Workflow – Exceeding the yield point

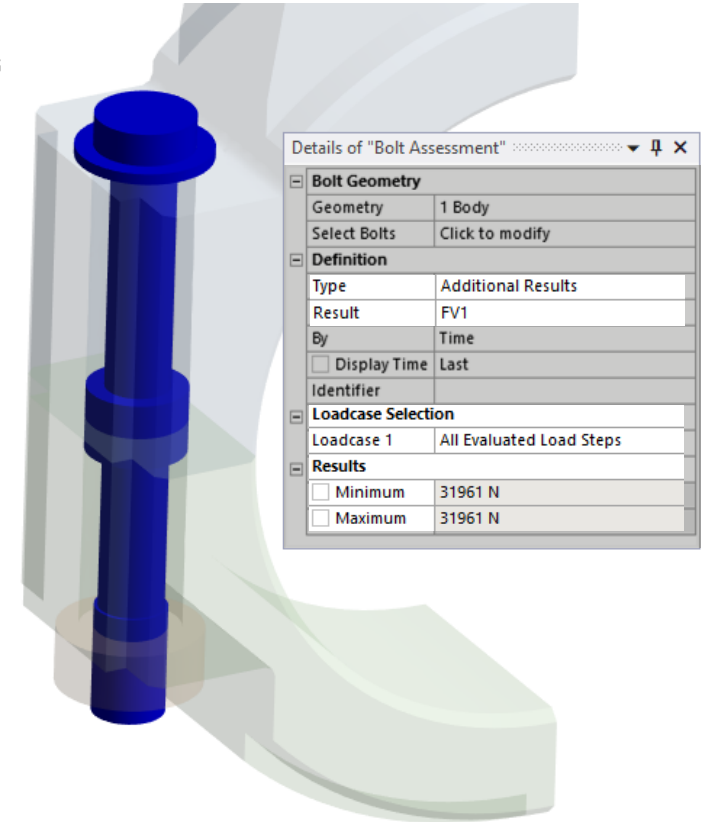
Calculation of the remaining preload  $F_{V1}$ , when exceeding the yield point during mounting and operation or only during operation is allowed.



This evaluation is supported with an elastic material model in the FE simulation.

**B: FMmax**  
Bolt Assessment  
Expression: RES1596  
Unit: N  
Time: 3 s

31961 Max  
31961 Min



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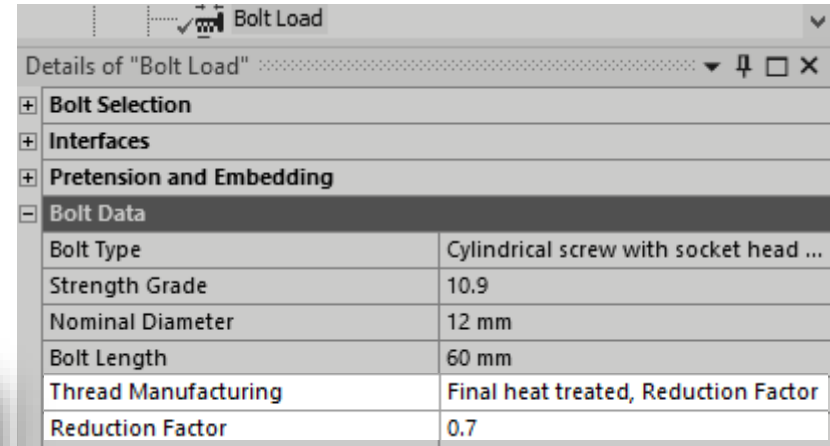
## Modification of endurance/fatigue limit

Endurance or fatigue limit can be modified.

- Multiply the reference values for the endurance or fatigue limit by a factor.
- Enter your own reference value.

This property can be set under *Bolt Data > Thread Manufacturing*.

Fatigue load (N/mm <sup>2</sup> )	[σa]	8.48
Fatigue life (N/mm <sup>2</sup> )	[σAzul]	48.88
Number of load cycles	[NZ]	>= 2000000
Safety against fatigue	[SD]	5.77



It is recommended to reduce these values in case of bolts made of austenitic steels and non-ferrous metals, or hot-galvanized bolts.

Fatigue load (N/mm <sup>2</sup> )	[σa]	8.48
Fatigue life (N/mm <sup>2</sup> )	[σAzul]	34.21
Number of load cycles	[NZ]	>= 2000000
Safety against fatigue	[SD]	4.04

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## New features - Highlights

### Version 2023.10

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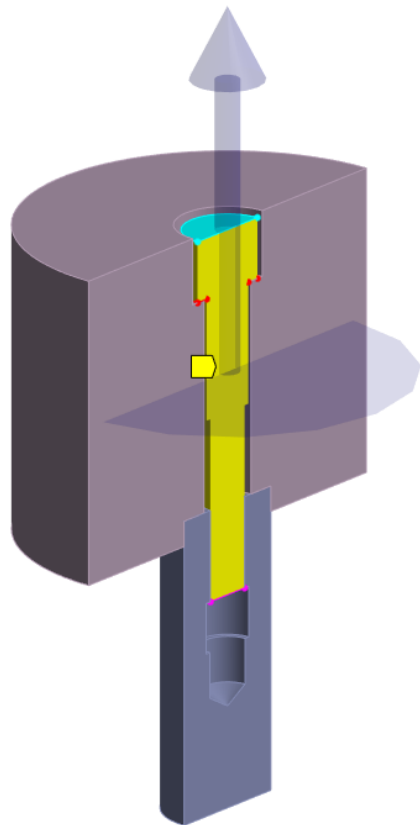


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## Evaluation of 1/n sector bolt – take advantage of symmetry

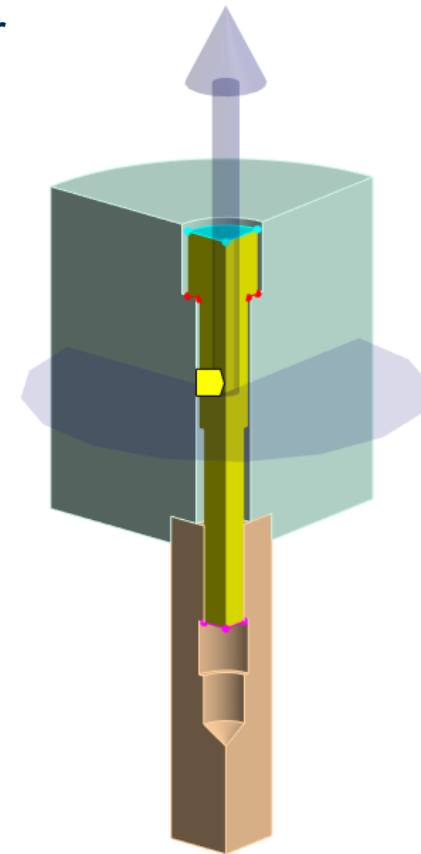
Simulation of a half model

Details of "Bolt Load"	
Bolt Selection	
Scoping Method	Geometry
Geometry	1 Body
Top Area	1 Face
Bottom Area	1 Face
Head Bearing Area	1 Face
Model divided by	2
Face of Symmetry	1 Face



Simulation of 1/4 sector model

Details of "Bolt Load"	
Bolt Selection	
Scoping Method	Geometry Sel
Geometry	1 Body
Top Area	1 Face
Bottom Area	1 Face
Head Bearing Area	1 Face
Model divided by	4
Axis of Symmetry	1 Edge

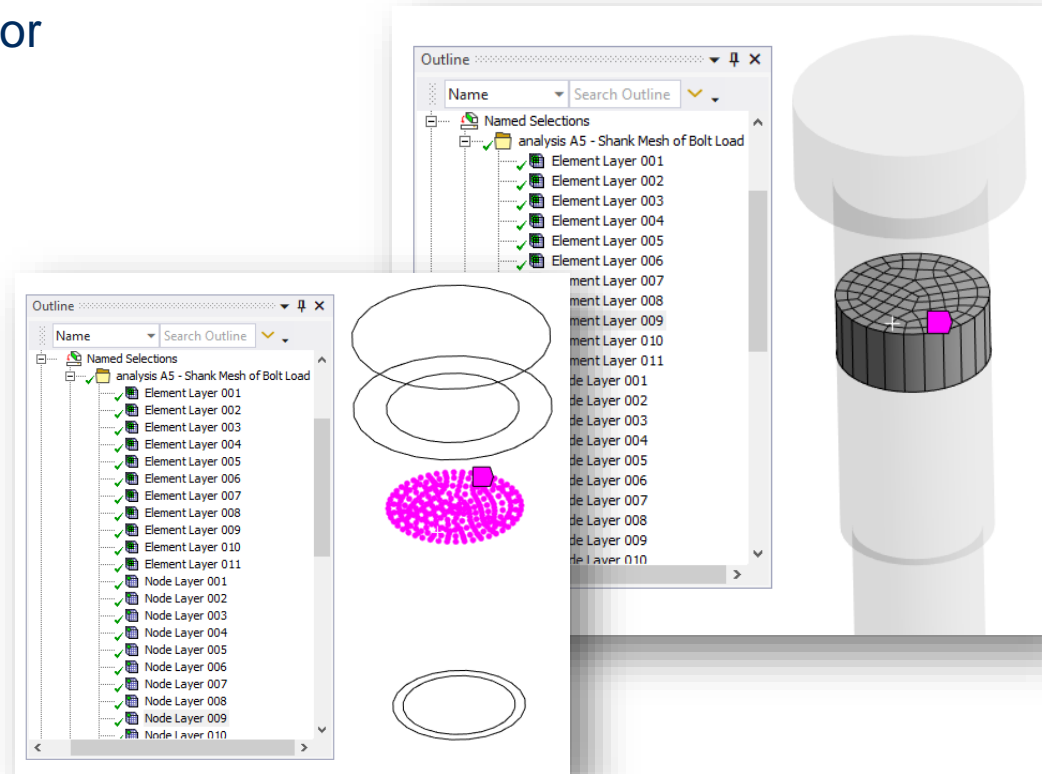
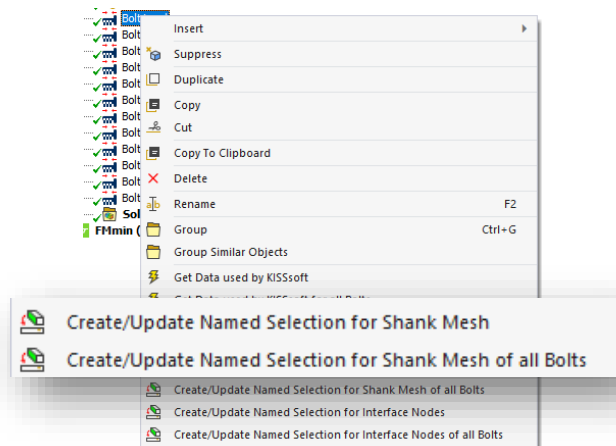


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## Create named selections for shaft nodes and elements

Additional bending moment is calculated for each node layer of the bolt shaft.

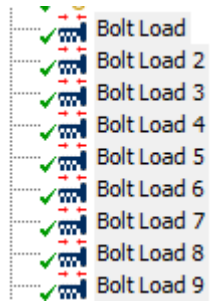
Named selections containing the corresponding nodes/elements can be created easily.



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## Evaluation sequence can be modified for several bolts with different preloads

Evaluation steps can be modified in the pretension history for several bolts with different preload or embedding values at once.



Bolt Pretension History

All

None

Invert

All

None

Invert

Step	Time [s]	Define By	Preload [N]	Preadjustment [mm]	Increment [mm]	Embedding [mm]	Evaluate Pretension	Evaluate Loss	Single Results	Pairwise Combined Results
1	1.0	Load (Force)		N/A	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	2.0	Embedding	N/A	N/A	N/A		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	3.0	Lock	N/A	N/A	N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	4.0	Lock	N/A	N/A	N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

OK

Cancel

# Bolt Assessment inside Ansys

## Top 3 features from older versions



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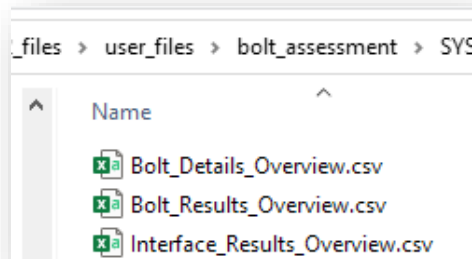
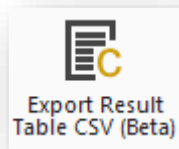


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## Export Result Table CSV (Beta)

### Export to CSV

- Bolt Data
- Bolt Result
- Interface Result



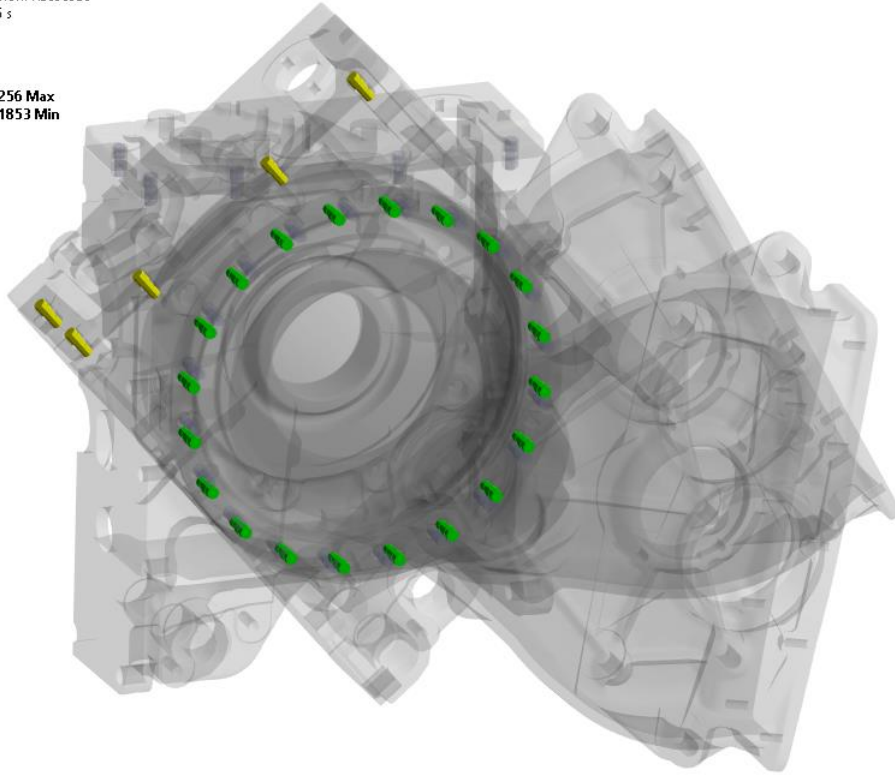
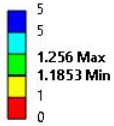
	A	B	C	D	E	F	G	H	I	J
1	Load ID	Load Name	Bolt Mode	Bolt type	d Referen	Bolt Leng	Bolt Stren	Rm Tensil	Rp02 Yielc	Rpmax
2	37800	Bolt Load 25	Beam	Hexagon f	10	45	10.9	1040	940	94
3	37553	Bolt Load 24	Beam	Hexagon f	10	45	10.9	1040	940	94
4	37306	Bolt Load 23	Beam	Hexagon f	10	45	10.9	1040	940	94
5	37059	Bolt Load 22	Beam	Hexagon f	10	45	10.9	1040	940	94
6	36812	Bolt Load 21	Beam	Hexagon f	10	45	10.9	1040	940	94
7	36565	Bolt Load 20	Beam	Hexagon f	10	45	10.9	1040	940	94

	A	B	C	D	E	F	G	H	I	J	K
1	Load ID	Load Nam	Bolt Mode	Pretensio	FZ [N] Los	Number o	Number o	FSA [N] at	MSA [Nm]	FSA [N] at	MSA [N]
2	37800	Bolt Load	Beam	43400.02	2910.641	3	3	-20.4023	0.610232	-35.6836	1.1620
3	37553	Bolt Load	Beam	43399.99	2929.672	3	3	-16.0938	0.315142	-23.0586	0.7002
4	37306	Bolt Load	Beam	43399.98	2878.199	3	3	-9.44141	1.295456	-9.30859	2.3684
5	37059	Bolt Load	Beam	43399.85	2815.035	3	3	18.12109	0.451088	22.44922	1.6287
6	36812	Bolt Load	Beam	43399.99	2918.957	3	3	-6.05469	0.327335	-15.6406	0.6674
7	36565	Bolt Load	Beam	43399.99	2761.719	3	3	-63.5547	0.477103	-75.1445	0.2503
8	36318	Bolt Load	Beam	43399.99	2818.879	3	3	-24.5898	0.318541	-39.2227	0.4644
9	36071	Bolt Load	Beam	43399.98	2798.449	3	3	-17.5547	0.438891	-62.6523	0.4566
10	35824	Bolt Load	Beam	43399.98	2826.234	3	3	27.5675	0.687528	-18.5252	0.3240
11	35577	Bolt Load	Beam	43399.98	2826.234	3	3	27.5675	0.687528	-18.5252	0.3245
12	35330	Bolt Load	Beam	43399.98	2826.234	3	3	27.5675	0.687528	-18.5252	0.5322
13	35083	Bolt Load	Beam	43399.99	2781.422	3	3	37199.34	492.0766	0.665653	0.5988
14	34836	Bolt Load	Beam	43399.99	2781.422	3	3	37199.34	492.0766	0.665653	0.548
15	34589	Bolt Load	Beam	43399.99	2790.023	3	3	135853.25	462.7097	0.299226	1.128
16	34342	Bolt Load	Beam	43399.99	2790.023	3	3	135853.25	462.7097	0.299226	
17	34095	Bolt Load	Beam	43399.85	2815.035	3	3	138298.67	367.8173	0.695729	
18	32613	Bolt Load	Beam	43399.98	2763.664	3	3	139154.71	116.6386	0.376205	
19	33848	Bolt Load	Beam	43399.97	2762.238	3	3	136687.43	258.1397	0.195208	
20	35083	Bolt Load	Beam	43399.99	2781.422	3	3	137199.34	492.0766	0.665653	
21	36318	Bolt Load	Beam	43399.99	2818.879	3	3	137816.89	151.0142	0.291066	
22	37553	Bolt Load	Beam	43399.99	2929.672	3	3	138572.82	294.0474	0.331194	
23	31872	Bolt Load	Beam	43399.97	2784.484	3	3	136818.73	180.3148	0.055939	
24	33107	Bolt Load	Beam	43399.96	2780.246	3	3	139150.38	295.6175	0.033138	

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## Support Large Rotations

Bolts Assessment - Yield Point  
Expression: RES38326  
Time: 5 s



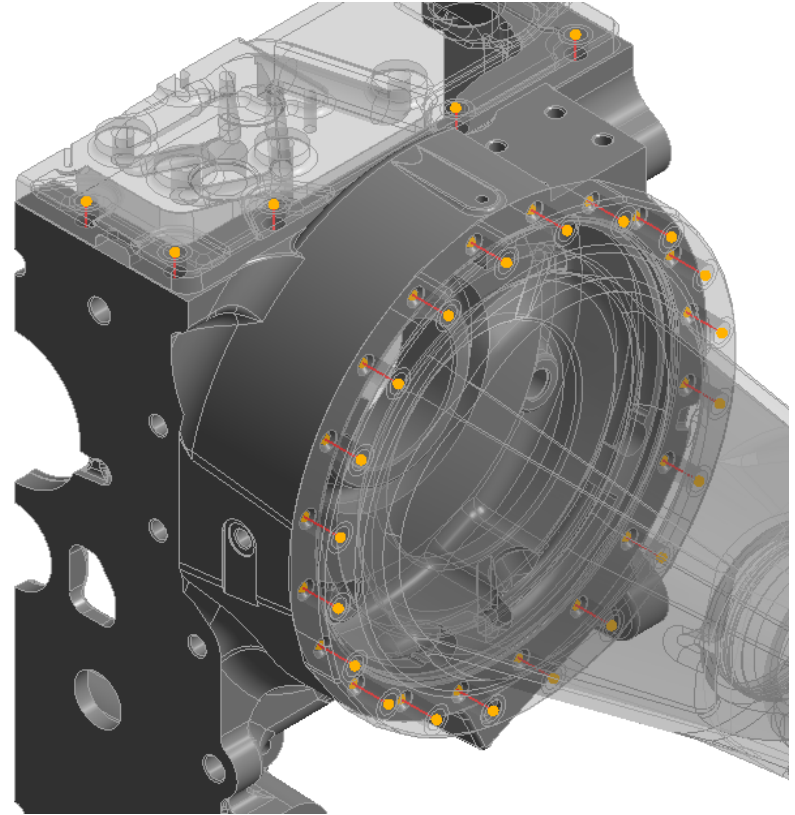
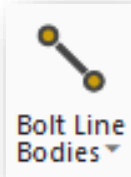
- New property allows to use MPC184 elements instead of PRETS179

Details of "Bolt Load"	
<b>Bolt Selection</b>	
Definition	Automatic geometry recognition
Scoping Method	Geometry Selection
Geometry	2 Bodies
<b>Interfaces</b>	
Evaluating Safety against Sliding	Yes
Number of Interfaces to evaluate	1
Interface 1	1 Face
Friction Coefficient 1	0.12
Pinball Parameter 1	0.9
<b>Pretension and Embedding</b>	
Pretension Model	Enable Rotations (Joint)
Cutting Plane Offset	6.51 mm
Definition	Standard
Define By	Force
Preload Force	43400 N
Embedding Definition	Manual
Embedding	0.01 mm
Pretension History	OK - Click to modify

2021.20

## Create line bodies and contacts in Mechanical

- Evaluation of bolts is possible for model class 2 (beams), even if the bolts are not modeled in the original CAD
- Quickly add **bolt line bodies** and **contacts** in Ansys Mechanical
- Preload and evaluate these new bolts as usual with Bolt Assessment inside Ansys



# CADFEM

Simulation is more than Software

[www.cadfem.net](http://www.cadfem.net)



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