

TARIM MAKİNALARI TASARIMI

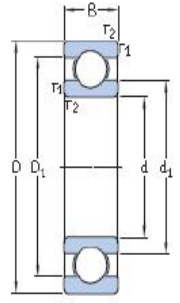
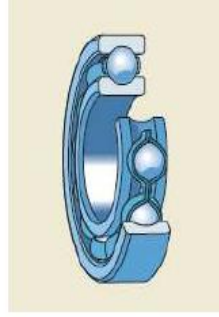
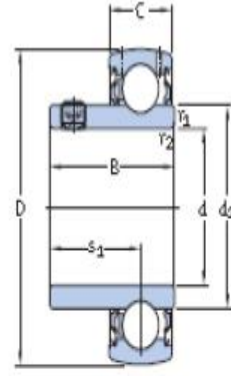
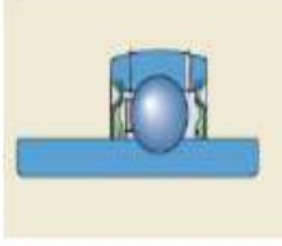
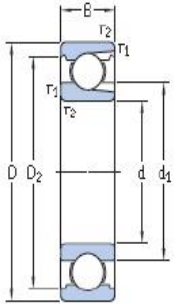

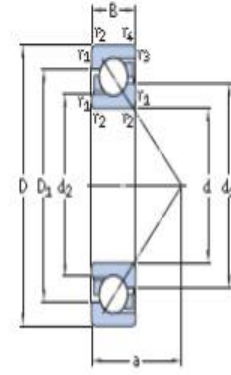
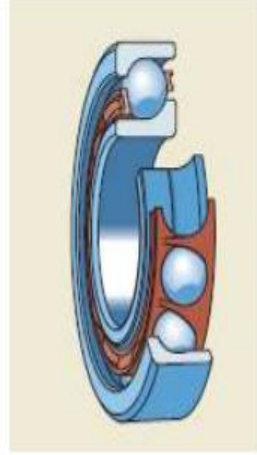
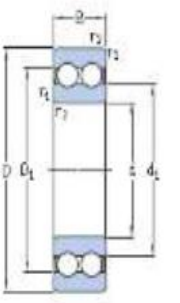
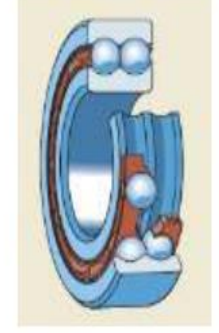


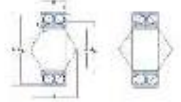
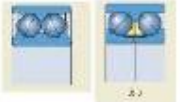
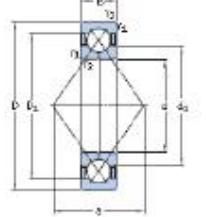

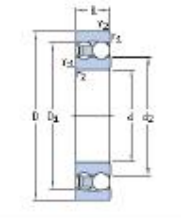



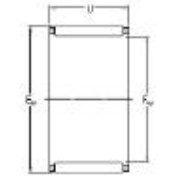


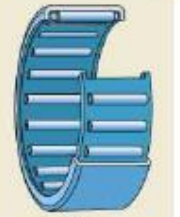
Prof.Dr. Ali İhsan Acar
Yrd.Doç.Dr.Caner Koç

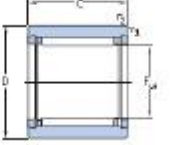

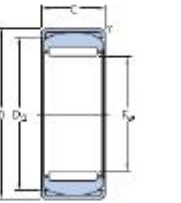
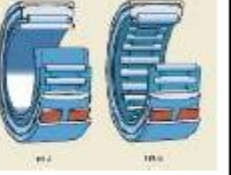


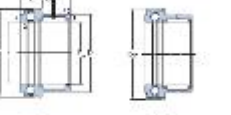

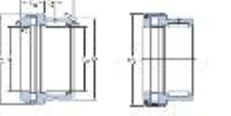

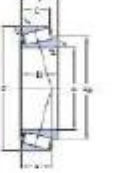

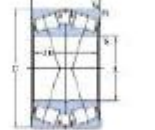
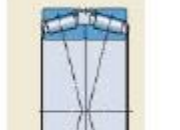


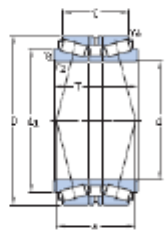

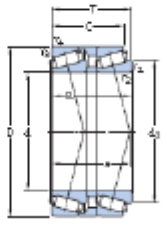
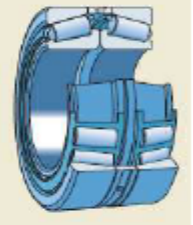
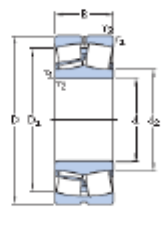

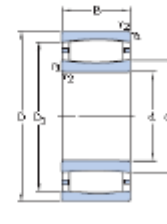

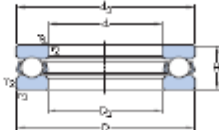

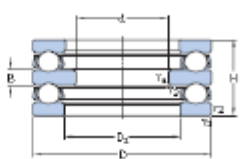
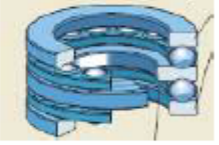
YATAKLAR

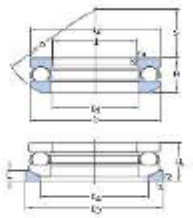
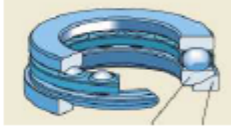
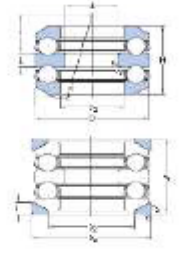
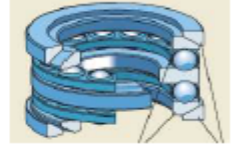
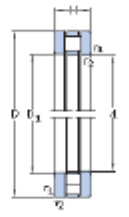
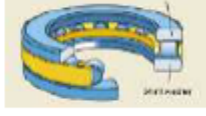


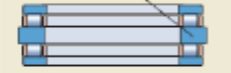
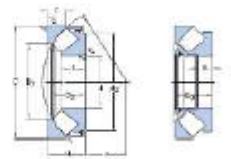
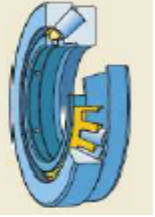
- Rulmanlı yatak çeşitleri (Kaynak: SKF)*

1	Sabit bilyeli yatak	Tek sıralı derin yivli			4	Y yataklar			
2		Tek sıralı derin yivli doldurma ağızlı			5	Eğik bilyeli yataklar	Tek sıralı		
3		Çift sıralı derin yivli							

6		Çift sıralı		
7		Dört nokta temaslı		
8	Oynak bilyeli			
9	Silindirik makaralı			
10		Bileziksiz		
11	İğneli yataklar	Dış bileziği kıvrılmış sac		

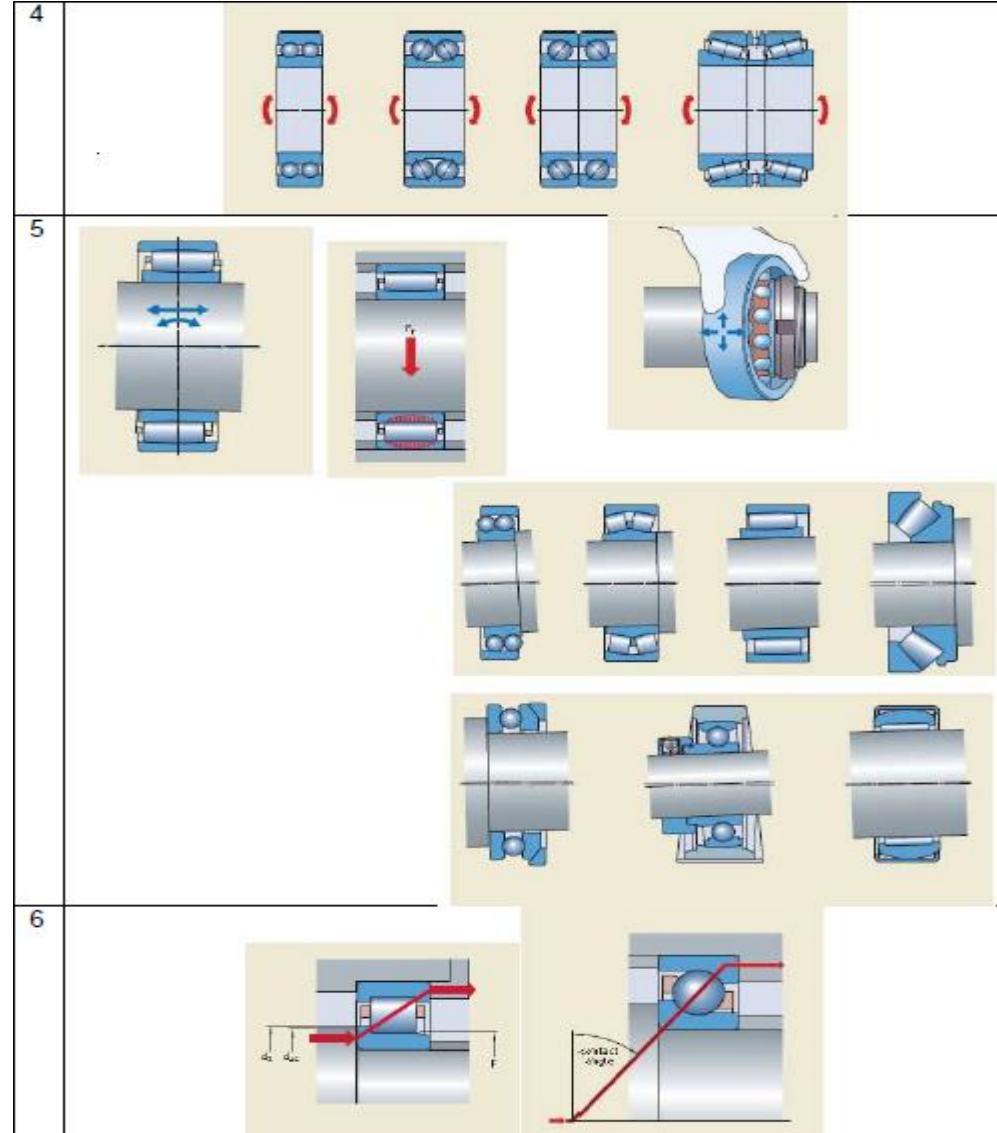
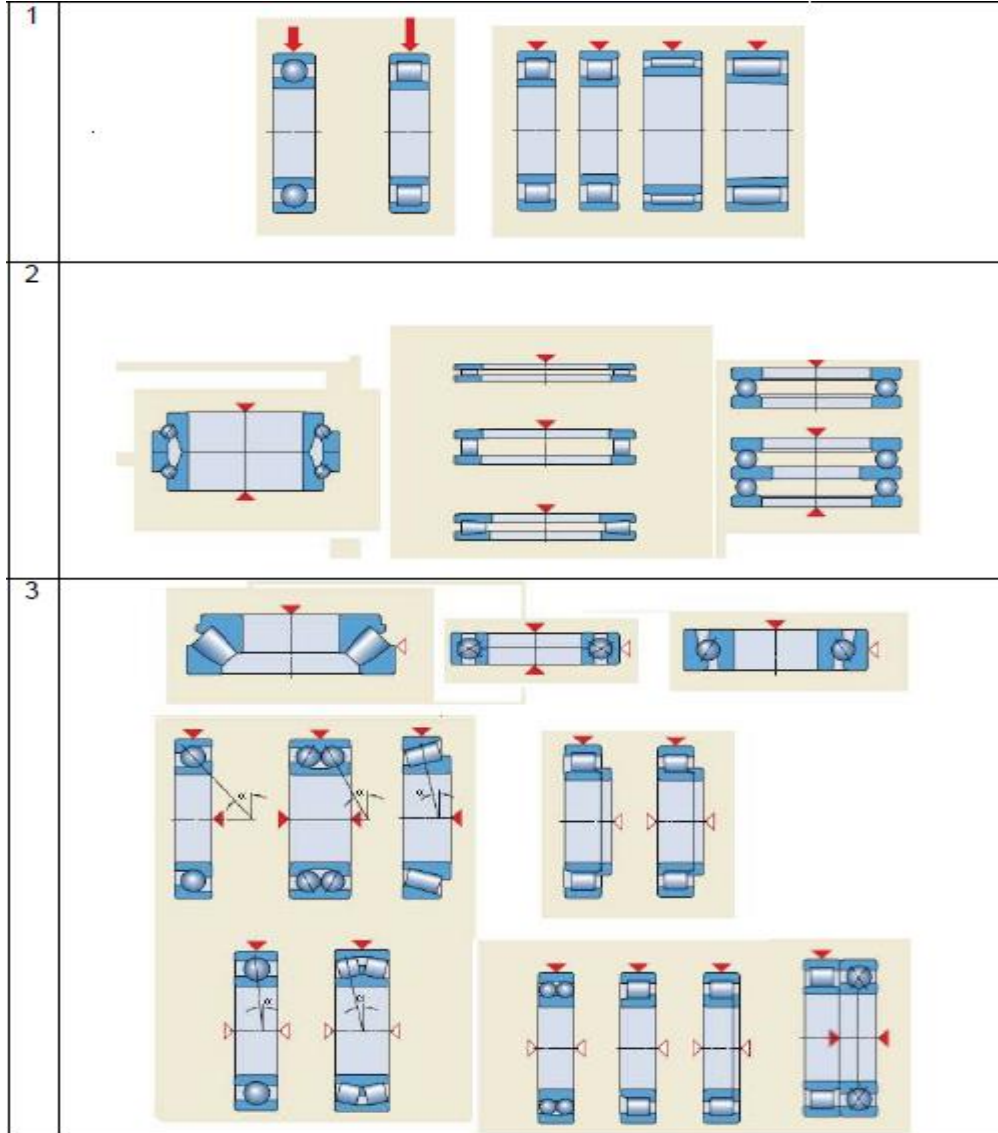
12		Dış bileziği tornalama ile yapılmış		
13				
14		Kombine		
15				
16				
17	Konik makaralı			
18		X düzeni		

19		O düzeni		
20		Tandem düzeni		
21	Oynak makaralı			
22	Tek sıralı oynak makaralı CARP			
23	Eksenel sabit biyelili	Tek yönlü		
24		Çift yönlü		

25		Tek yönlü küresel alt yataklı		
26		Çift yönlü küresel alt yataklı		
27	Eksenel makaralı yataklar	Tek yönlü Tek sıra makaralı		
28		Tek yönlü çift sıra makaralı		
29		Çift sıralı mil merkezlemeli		
30		Çift sıralı delik merkezlemeli		
31	Oynak makaralı eksenel yataklar			

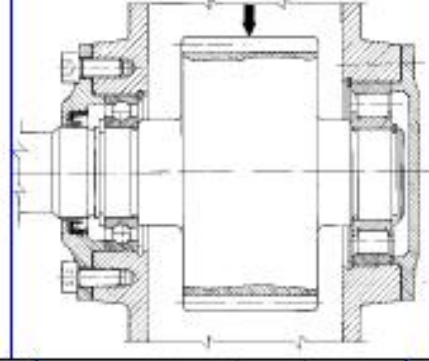
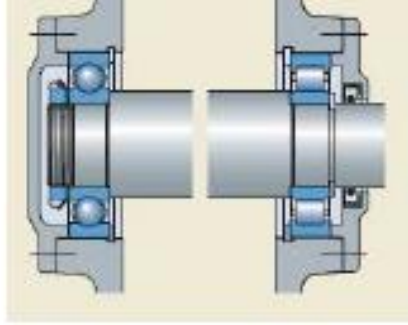
Rulmalı yatakların yük taşıma özellikleri

(Kaynak: SKF)

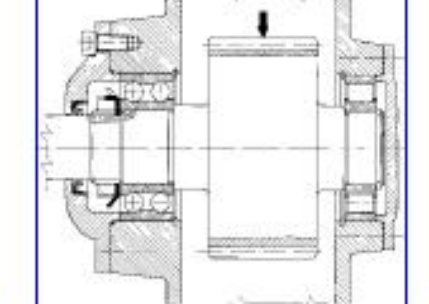
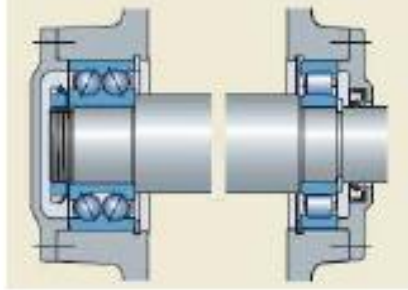


Mil yataklamalarına örnekler (Kaynak: SKF)

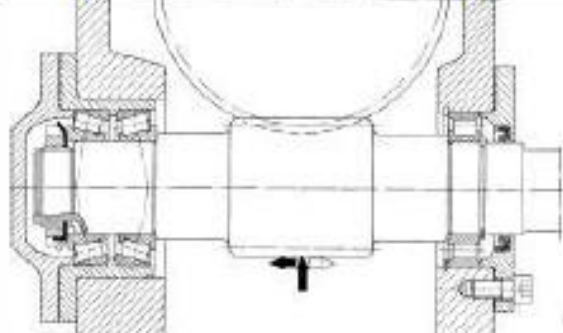
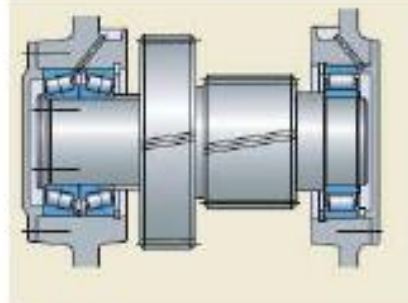
1



2

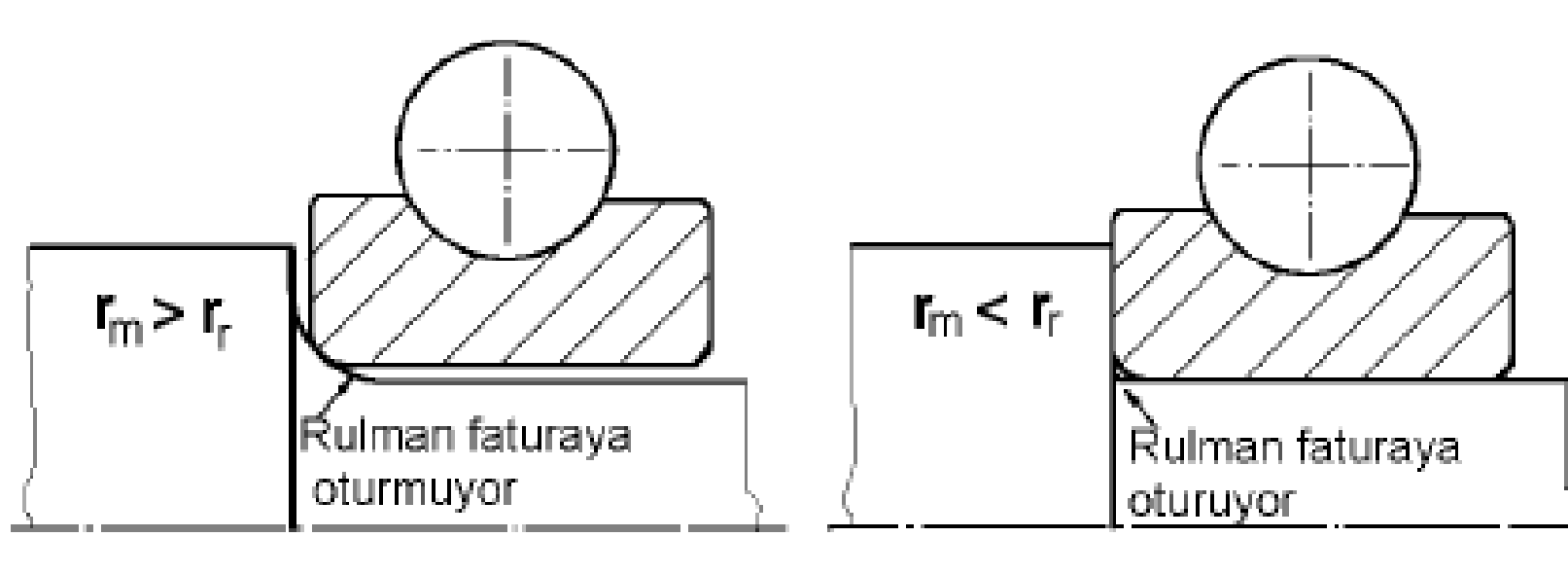


3



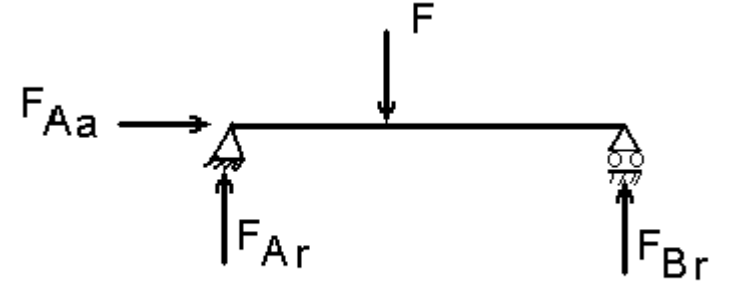
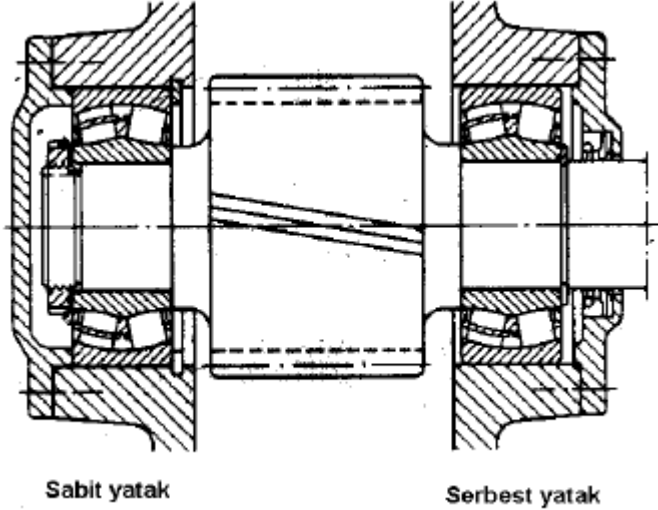
Rulmanlı Yatak Bileziklerinin Faturaya Montajı

- Rulmanlı Yatak Bileziklerinin Faturaya ve Omuza Montajı

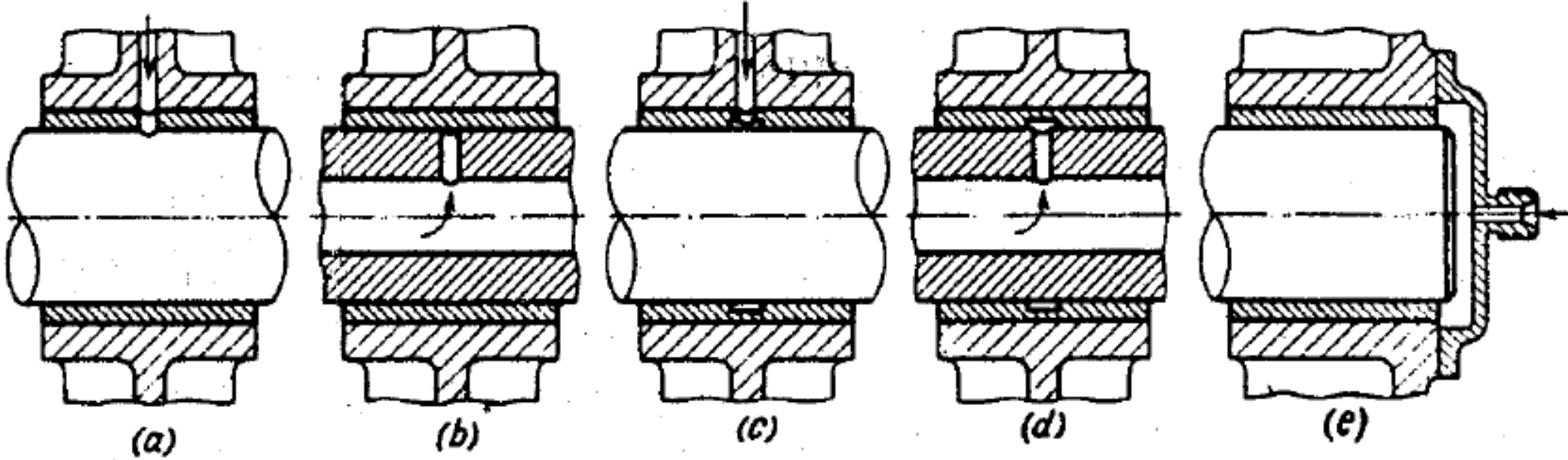


Millerin Yataklanması

- Miller dönen elemanlardır. Duran gövdenin üzerinde milin dönmesi durumunda sürtünme ve aşınma meydana gelir.
- Aşınmanın azaltılması için rulmanlı ve kaymalı yataklar kullanılır.



KAYMALI YATAK TASARIMI



a,b kural olarak yağlama yağı yatak yuvalarına veya millere açılan delikler vasıtası ile iletilir.

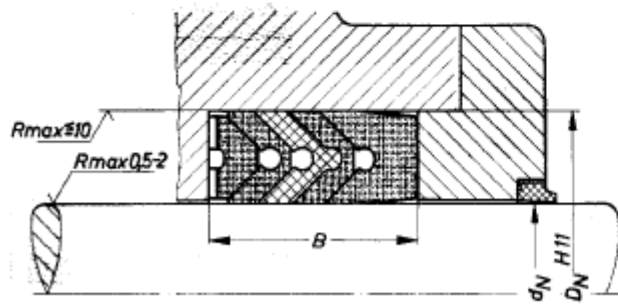
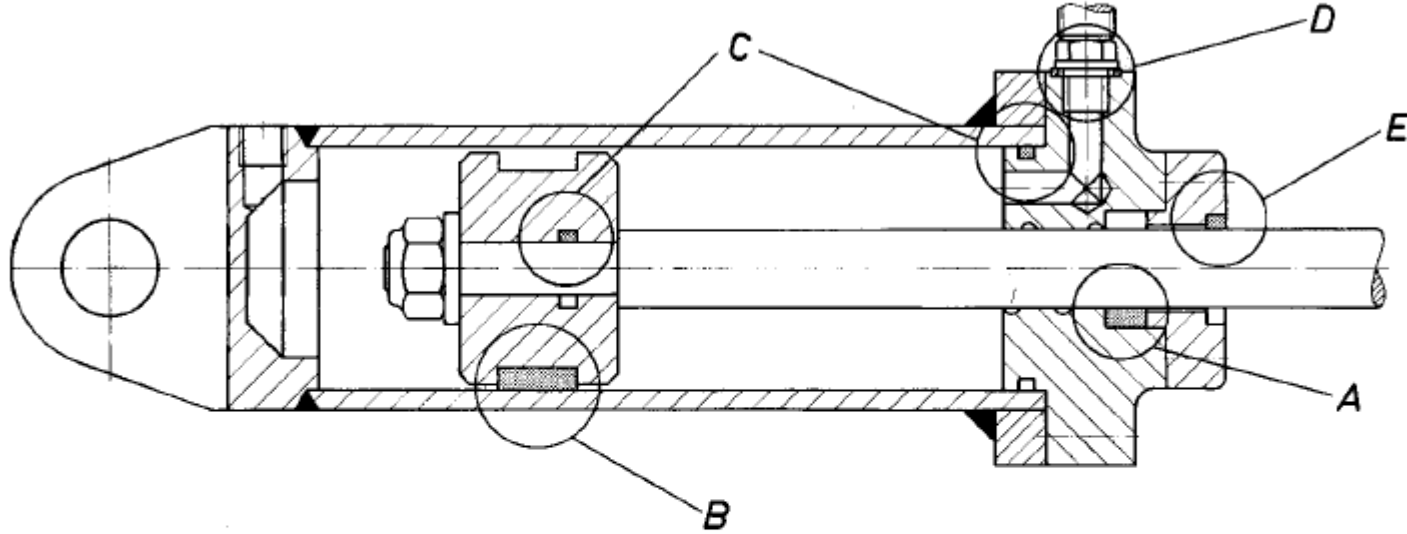
c,d) Yatağın içine yağ akımını kuvvetlendirmek için yağ kanalı açılır

e) Basınçlı yağ alından verilebilir.

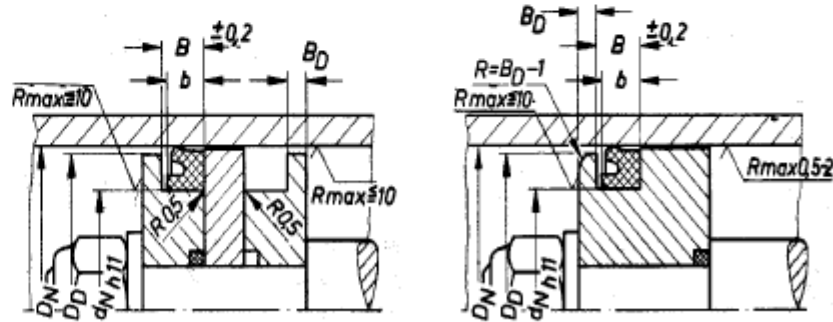
Kural olarak yağ, yatağın yüklenmediği bölgeden iletilir.

SIZDIRMAZLIK ELEMANLARININ TASARIMI

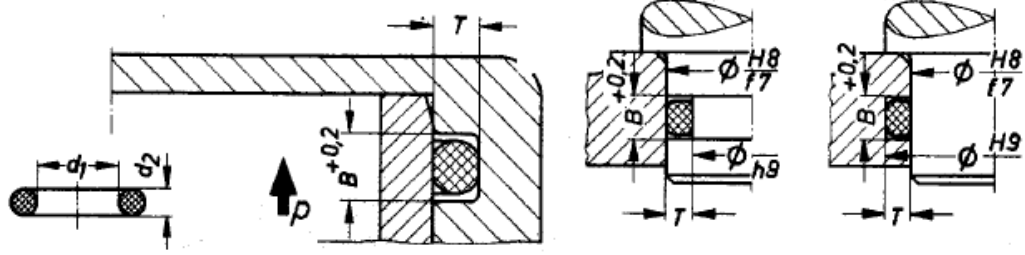
HİDROLİK KEÇELER



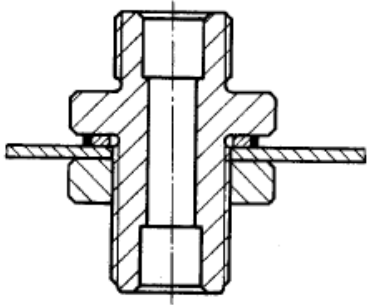
A) Boğaz takım keçesi



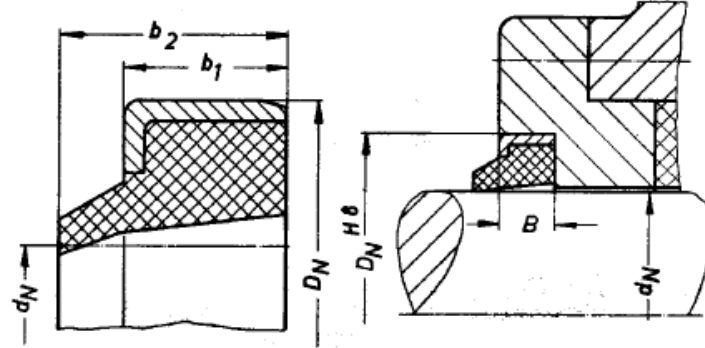
B) Piston başı keçesi



C) O halkaları



D) Lastikli rondela



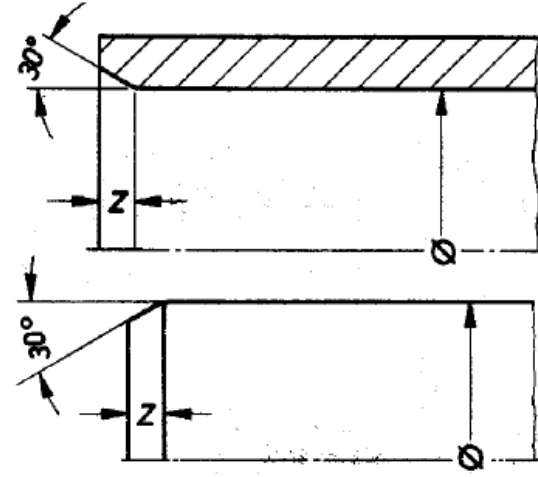
E) Toz sıyrıcı keçe

Şekil . Hidrolik silindirde keçelerin kullanıldığı yerler

Hidrolik Keçeler ile İlgili Temel Tasarım Kuralları

1-Keçelerin çalışacağı yüzeylerin en büyük pürüzlülük değerleri $R_{max}=R_t=0,5-2\mu m$ küçük olmalıdır.

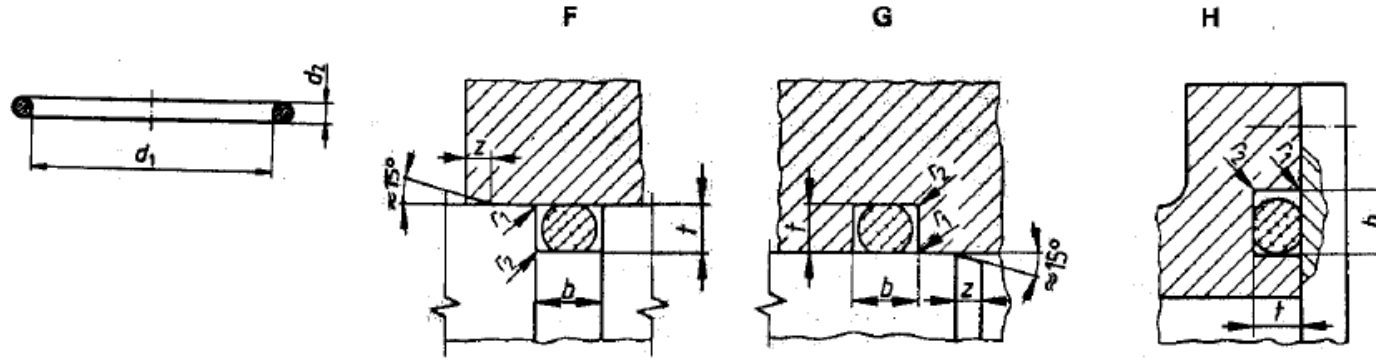
- Hidrolik silindir tasarımları için , piyasada taşlanmış ve sert krom kaplanmış borular ve miller kullanılmalıdır.
- Keçenin ağız kısmına yağın gelmesi sağlanmalıdır. Keçe ağızına gelen basınçlı yağ, keçenin sızdırmazlık sağlayan kenarına basınç uygulayarak yağın ters tarafa geçmesi sağlanabilecektir.



Çap	Pah genişliği Z
-80	4,5
80-140	6
140-225	8
225-400	10

O HALKALARI (RING)

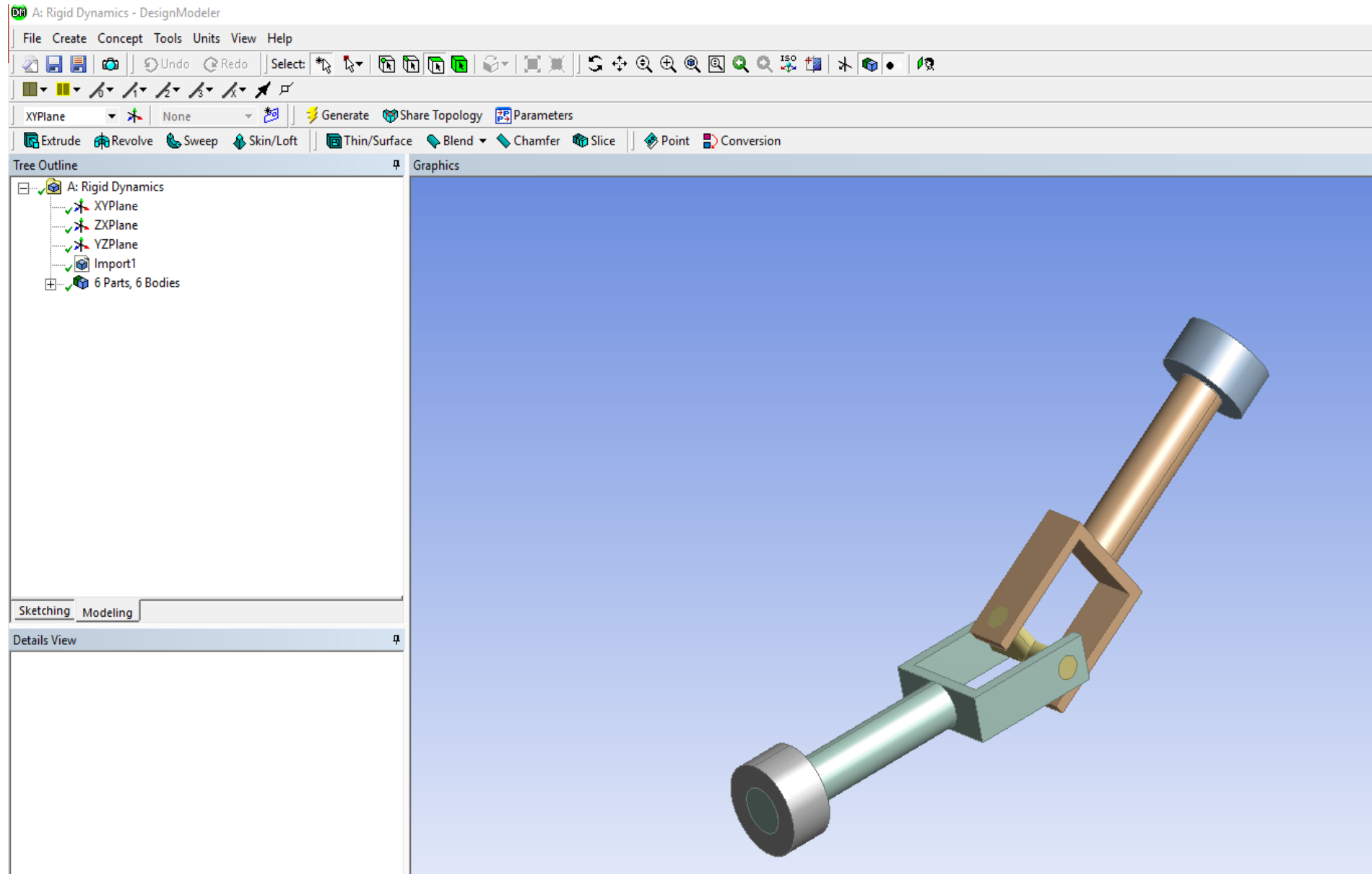
O HALKALARI



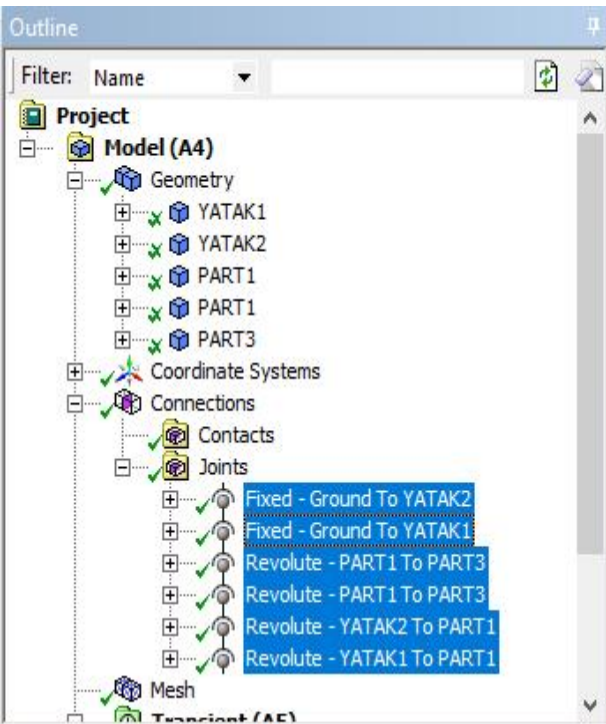
d ₂	b		r ₁	r ₂	t _{min}							
					Sabit			Hareketli				
	Tolerans	F			G	H	F	G	F	G	Z	
1,6	1,9	+0,1 0	0,1	0,25	1,334	1,330	1,3	1,414	1,416	1,426	1,428	1
2	2,3	+0,1 0			1,674	1,671	1,7	1,776	1,778	1,801	1,803	1,2
2,5	2,9	+0,15 0			2,099	2,099	2,1	2,229	2,234	2,273	2,277	1,4
3,15	3,6	+0,2 0	0,2	0,63	2,663	2,664	2,7	2,824	2,829	2,897	2,902	1,6
4	4,5	+0,2 0			3,422	3,403	3,4	3,605	3,611	3,719	3,724	2
5	5,5	+0,3 0			4,274	4,275	4,3	4,527	4,533	4,676	4,686	2,5
6,3	7	+0,3 0			5,408	5,413	5,5	5,720	5,728	5,926	5,938	3,2
8	8,6	+0,4 0			6,900	6,903	7	7,287	7,298	7,578	7,588	4
10	10,7	+0,5 0			8,626	8,638	8,7	9,136	9,148	9,525	9,537	4,5

RIJID DYNAMICS

- Mafsal Analizi :



Joint tanımlama:

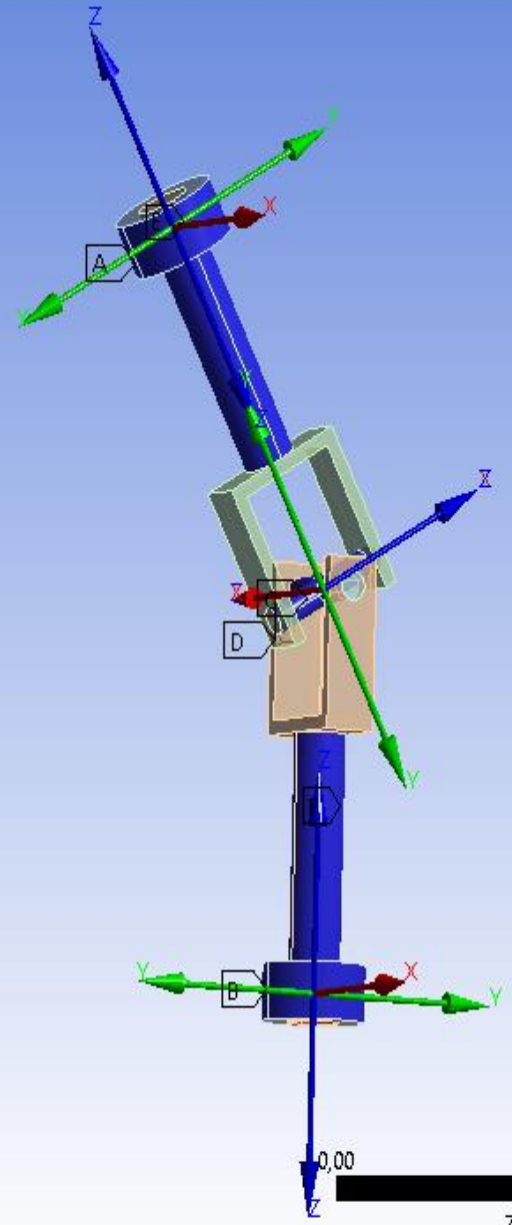


Details of "Multiple Selection"

Definition	
Connection Type	
Type	
Suppressed	No
Mobile	
Scoping Method	Geometry Selection
Applied By	Remote Attachment
Initial Position	Unchanged

Revolute - YATAK1 To PART1
7.02.2018 09:37

- A** Fixed - Ground To YATAK2
- B** Fixed - Ground To YATAK1
- C** Revolute - PART1 To PART3
- D** Revolute - PART1 To PART3
- E** Revolute - YATAK2 To PART1
- F** Revolute - YATAK1 To PART1



Hareket Tanımlama:

A : Rigid Dynamics - Mechanical [ANSYS Dynamics]

File Edit View Units Tools Help | Worksheet

Show Vertices Wireframe Show Mesh Random Colors Annotation Preferences

Environment Inertial Loads Supports Conditions Direct FE

Edge Coloring

Outline

Filter: Name

- PART1
- PART1
- PART3
- Coordinate Systems
- Connections
 - Contacts
 - Joints
 - Fixed - Ground To YATAK2
 - Fixed - Ground To YATAK1
 - Revolute - PART1 To PART3
 - Revolute - PART1 To PART3
 - Revolute - YATAK2 To PART1
 - Revolute - YATAK1 To PART1
- Mesh
- Transient (A5)
 - Analysis Settings
 - Joint - Rotational Velocity
 - Solution (A6)
 - Solution Information
 - Total Deformation

Details of "Joint - Rotational Velocity"

Scope	
Joint	Revolute - YATAK2 To PART1
Definition	
DOF	Revolute - PART1 To PART3 Revolute - PART1 To PART3 Revolute - YATAK2 To PART1
Type	Revolute - YATAK1 To PART1
<input type="checkbox"/> Magnitude	60, rad/s (step applied)
Suppressed	No

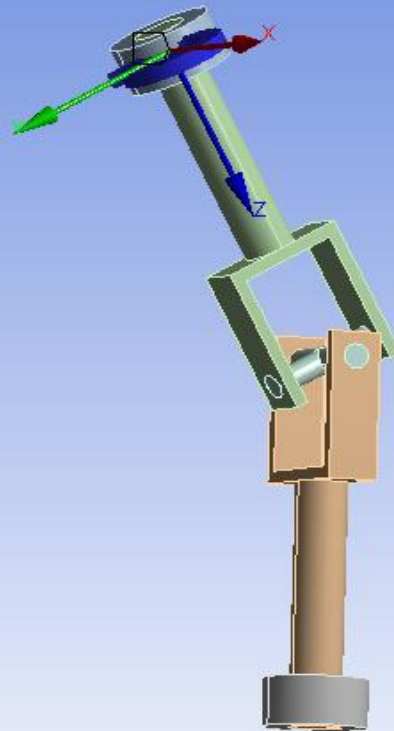
A: Rigid Dynamics

Joint - Rotational Velocity

Time: 1, s

7.02.2018 09:38

Joint - Rotational Velocity: 60, rad/s



RIJID DYNAMICS : PISTON ANALIZI

The screenshot displays the ANSYS Workbench interface. The top menu bar includes File, View, Tools, Units, Extensions, and Help. Below the menu is a toolbar with icons for Project, Import..., Reconnect, Refresh Project, and Update Project. The left sidebar, titled 'Toolbox', lists various analysis systems under 'Analysis Systems', 'Component Systems', 'Custom Systems', and 'Design Exploration'. The 'Analysis Systems' list includes Design Assessment, Electric, Explicit Dynamics, Fluid Flow (Blow Molding, Extrusion, CFX, Fluent, Polyflow), Harmonic Response, Hydrodynamic Diffraction, Hydrodynamic Time Response, IC Engine, Linear Buckling, Linear Buckling (Samcef), Magnetostatic, Modal, Modal (Samcef), Random Vibration, Response Spectrum, Rigid Dynamics, Static Structural, Static Structural (Samcef), Steady-State Thermal, Steady-State Thermal (Samcef), Thermal-Electric, Throughflow, Transient Structural, Transient Structural (Samcef), Transient Thermal, and Transient Thermal (Samcef). The 'Project Schematic' window shows two analysis systems, A and B. System A is 'Rigid Dynamics' and System B is 'Static Structural'. Both systems have a similar hierarchy: 1. Rigid Dynamics / Static Structural, 2. Engineering Data, 3. Geometry, 4. Model, 5. Setup, 6. Solution, and 7. Results. The 'Results' step in System B is highlighted with a blue selection bar.

den - Workbench

File View Tools Units Extensions Help

Project

Import... Reconnect Refresh Project Update Project

Toolbox

Analysis Systems

- Design Assessment
- Electric
- Explicit Dynamics
- Fluid Flow - Blow Molding (Polyflow)
- Fluid Flow - Extrusion (Polyflow)
- Fluid Flow (CFX)
- Fluid Flow (Fluent)
- Fluid Flow (Polyflow)
- Harmonic Response
- Hydrodynamic Diffraction
- Hydrodynamic Time Response
- IC Engine
- Linear Buckling
- Linear Buckling (Samcef)
- Magnetostatic
- Modal
- Modal (Samcef)
- Random Vibration
- Response Spectrum
- Rigid Dynamics
- Static Structural
- Static Structural (Samcef)
- Steady-State Thermal
- Steady-State Thermal (Samcef)
- Thermal-Electric
- Throughflow
- Transient Structural
- Transient Structural (Samcef)
- Transient Thermal
- Transient Thermal (Samcef)

Component Systems

Custom Systems

Design Exploration

Project Schematic

A

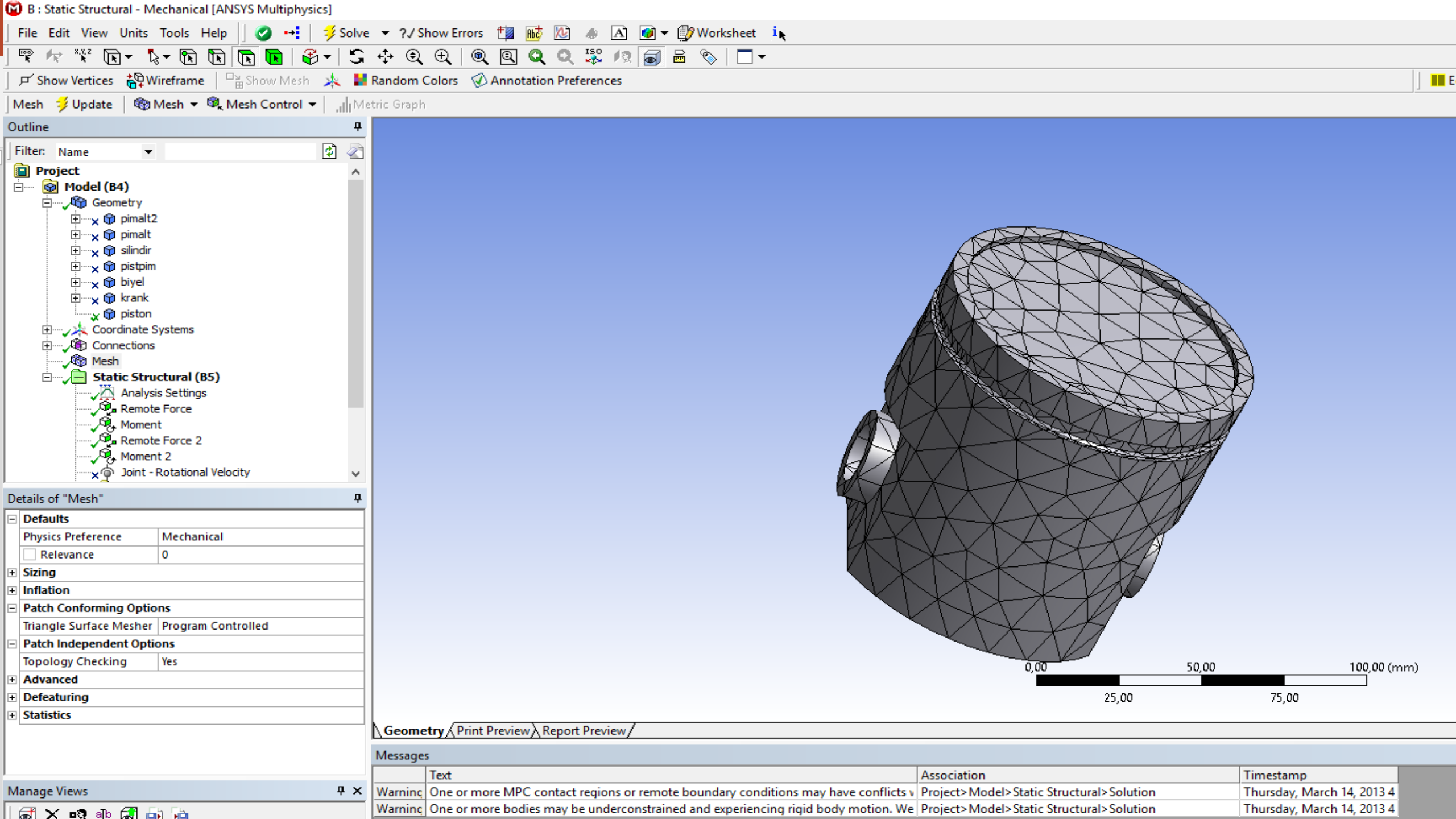
- 1 Rigid Dynamics
- 2 Engineering Data ✓
- 3 DM Geometry ✓
- 4 Model ✓
- 5 Setup ✓
- 6 Solution ✓
- 7 Results ✓

Rigid Dynamics

B

- 1 Static Structural
- 2 Engineering Data ✓
- 3 DM Geometry ✓
- 4 Model ✓
- 5 Setup ✓
- 6 Solution ✓
- 7 Results ✓

Static Structural



MOTION LOADS:

B : Static Structural - Mechanical [ANSYS Multiphysics]

File Edit View Units Tools Help | Solve ?/ Show Errors Worksheet

Environment Inertial Loads Supports Conditions Direct FE

Outline

- Filter: Name
- silindir
- pistpim
- biyel
- krank
- piston
- Coordinate Systems
- Connections
- Mesh
- Static Structural
- Solution (B6)

Details of "Static Structural (B5)"

Definition	
Physics Type	Structural
Analysis Type	Static Structural
Solver Target	Mechanical APDL

Options	
Environment Temperature	22, °C
Generate Input Only	No

B: Static Structural

Static Structural

Time: 1, s

7.02.2018 09:51

- A Remote Force: 0,24597 N
- B Moment: 30,819 N-mm
- C Remote Force 2: 7,9734 N
- D Moment 2: 34,549 N-mm

Insert

- Acceleration
- Standard Earth Gravity
- Rotational Velocity
- Pressure
- Hydrostatic Pressure
- Force
- Remote Force
- Bearing Load
- Bolt Pretension
- Moment
- Line Pressure
- Thermal Condition
- Joint Load
- Fluid Solid Interface
- Fixed Support
- Displacement
- Remote Displacement
- Frictionless Support
- Compression Only Support
- Cylindrical Support
- Elastic Support
- Constraint Equation
- Nodal Orientation
- Nodal Force
- Nodal Pressure
- Nodal Displacement
- EM Transducer
- Motion Loads...
- Commands

0,00 25,00 50,00 75,00 100,00 (mm)

Graphics Annotations Messages Graph

Tabular Data

Total Deformation:

M B : Static Structural - Mechanical [ANSYS Multiphysics]

File Edit View Units Tools Help Solve ?/ Show Errors Worksheet

Show Vertices Wireframe Show Mesh Random Colors Annotation Preferences

Result 1.0 (True Scale) Display All Bodies

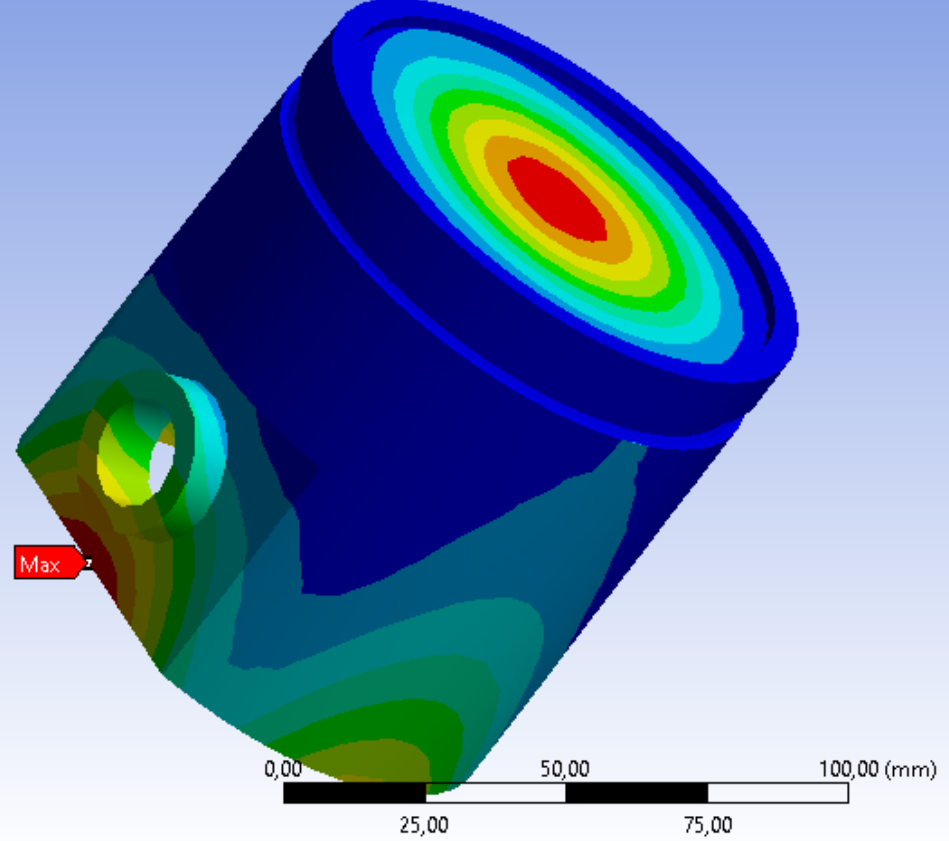
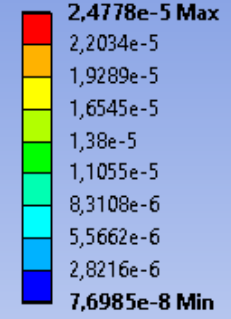
Edge Color

Outline

Filter: Name

- silindir
- pistpim
- biyel
- krank
- piston
- Coordinate Systems
- Connections
- Mesh
- Static Structural (B5)**
 - Analysis Settings
 - Remote Force
 - Moment
 - Remote Force 2
 - Moment 2
 - Joint - Rotational Velocity
 - Solution (B6)**
 - Solution Information
 - Total Deformation
 - Equivalent Stress
 - Fatigue Tool

B: Static Structural
Total Deformation
Type: Total Deformation
Unit: mm
Time: 1
7.02.2018 09:53



Details of "Total Deformation"

Scope	
Scoping Method	Geometry Selection
Geometry	All Bodies
Definition	
Type	Total Deformation
By	Time
<input type="checkbox"/> Display Time	Last
Calculate Time History	Yes
Identifier	
Suppressed	No
Results	
<input type="checkbox"/> Minimum	7,6985e-008 mm

Equivalent Stress:

