

TARIM MAKİNALARI TASARIMI

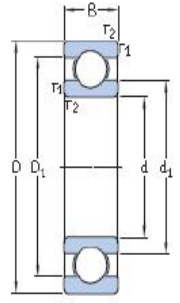
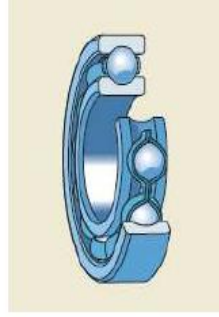
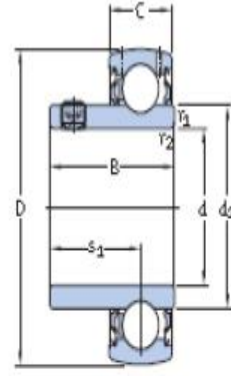
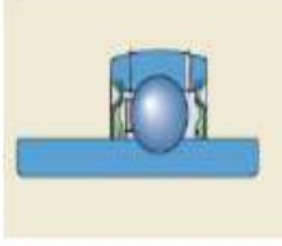
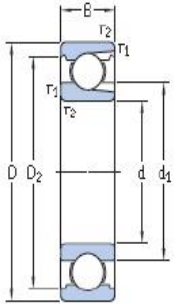

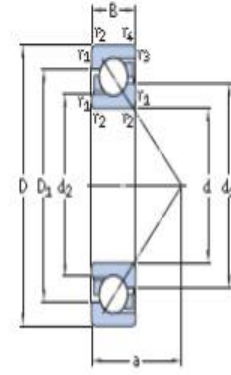
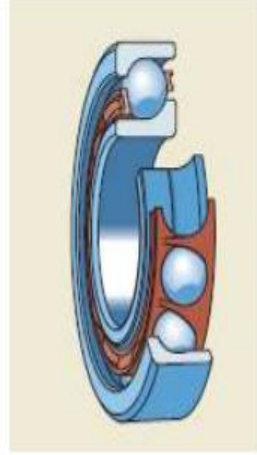
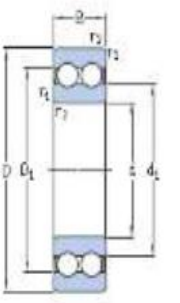
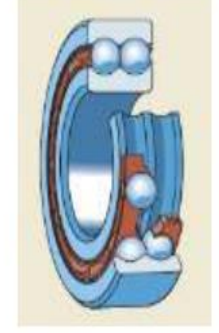


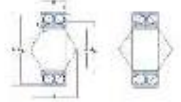
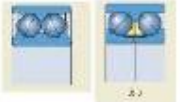
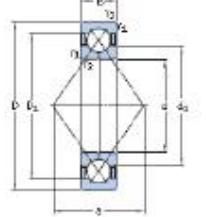

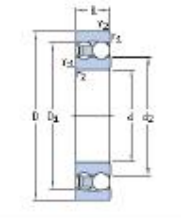



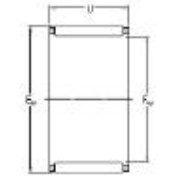


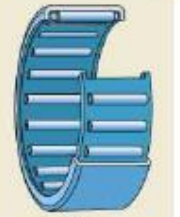
Doç.Dr.Caner Koç

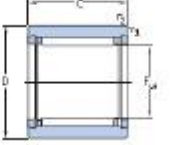

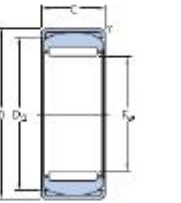
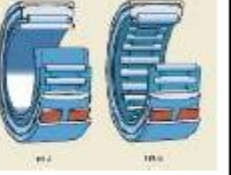


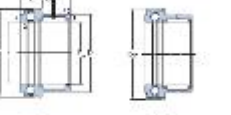

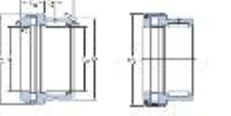

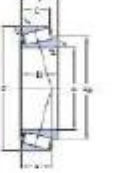

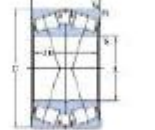
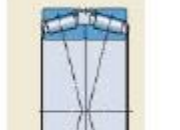


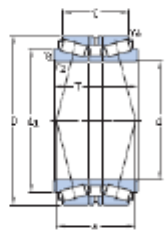

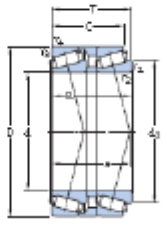
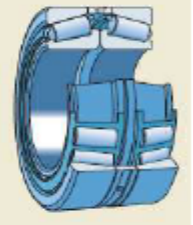
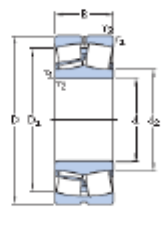

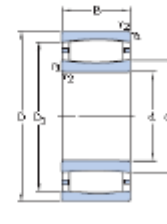

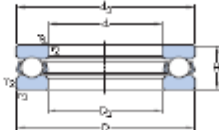

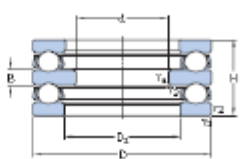
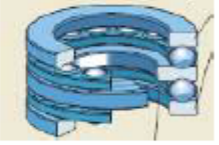
YATAKLAR

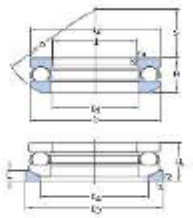
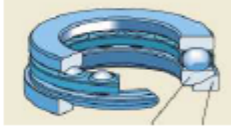
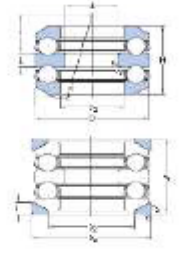
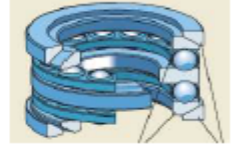
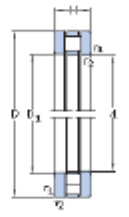
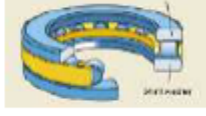


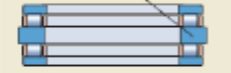
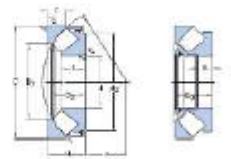
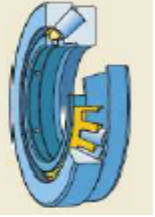
- Rulmanlı yatak çeşitleri (Kaynak: SKF)*

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		

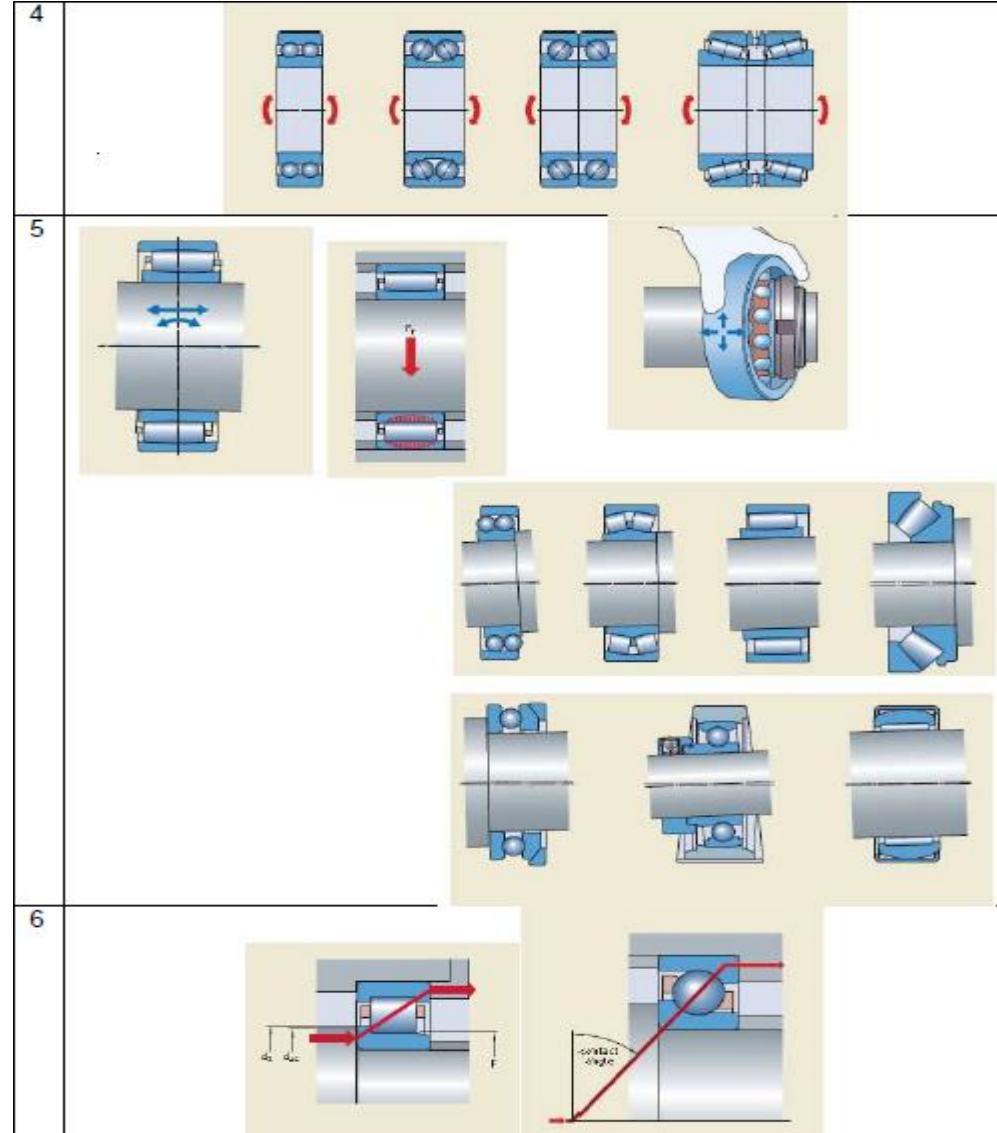
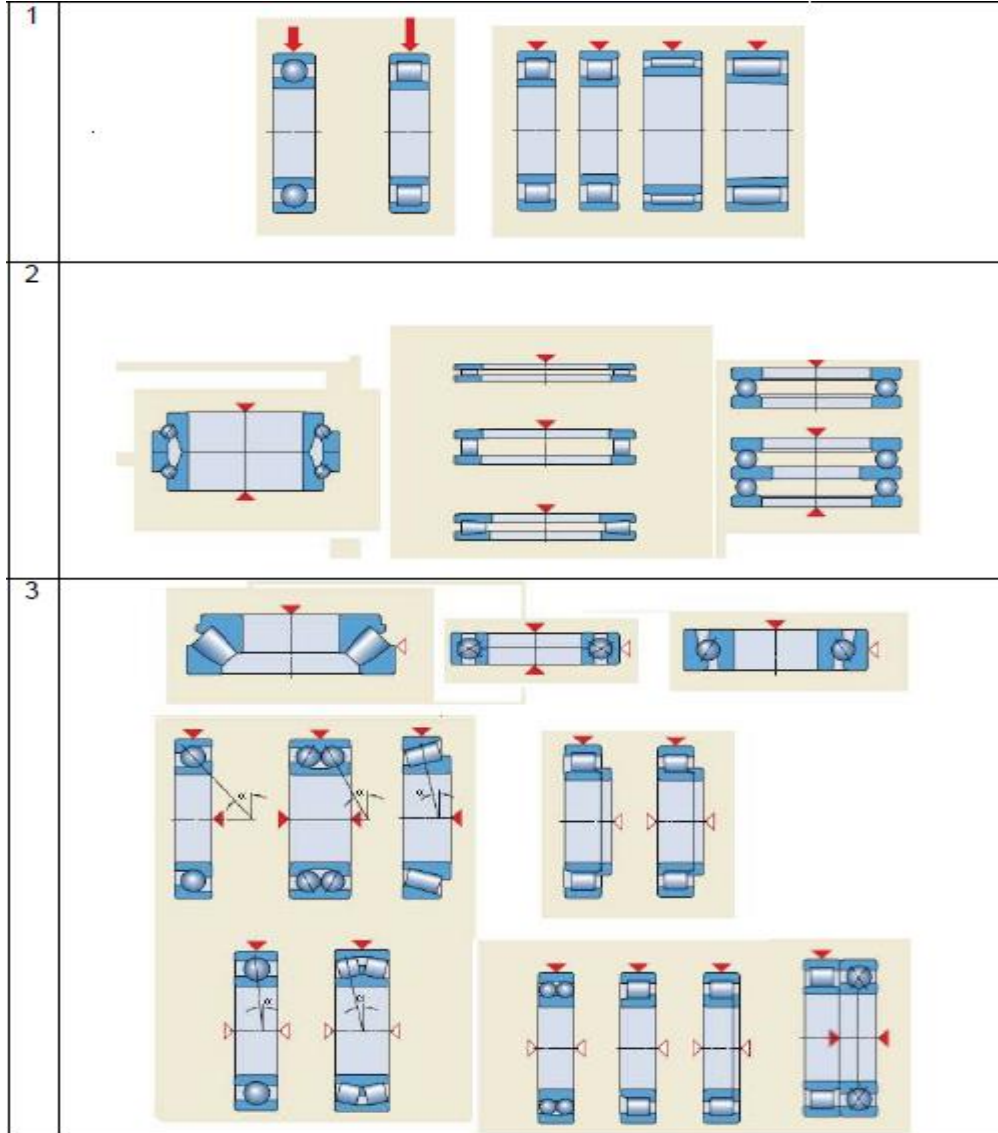
12		Dış bileziği tornalama ile yapılmış		
13				
14		Kombine		
15				
16				
17	Konik makaralı			
18		X düzeni		

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			

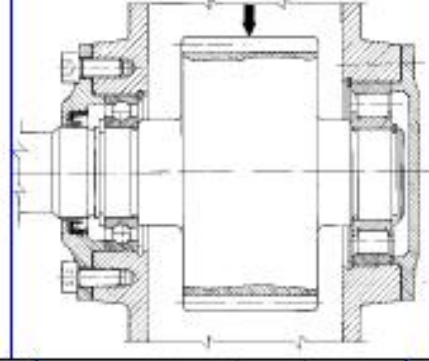
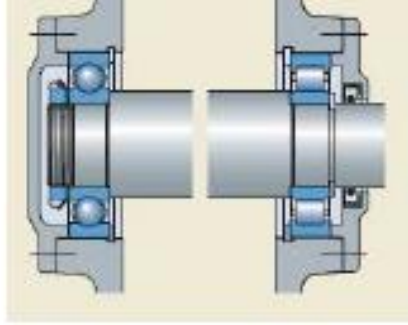
Rulmalı yatakların yük taşıma özellikleri

(Kaynak: SKF)

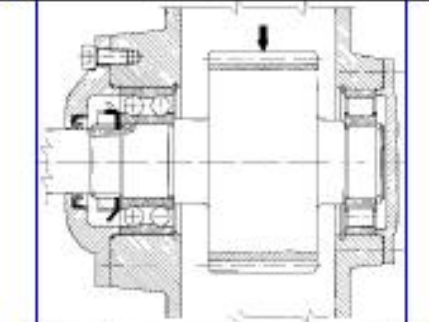
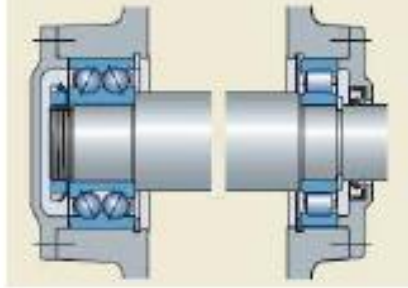


Mil yataklamalarına örnekler (Kaynak: SKF)

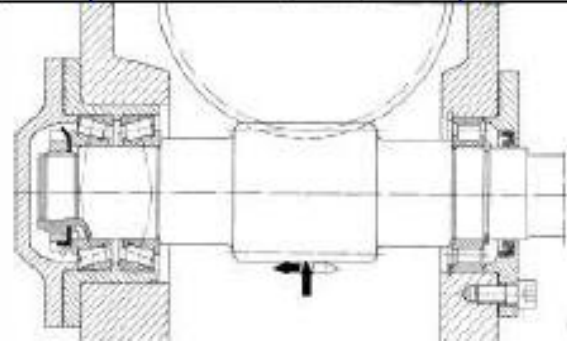
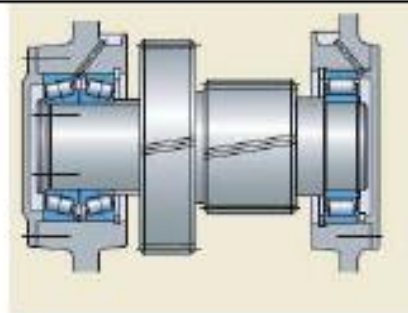
1



2

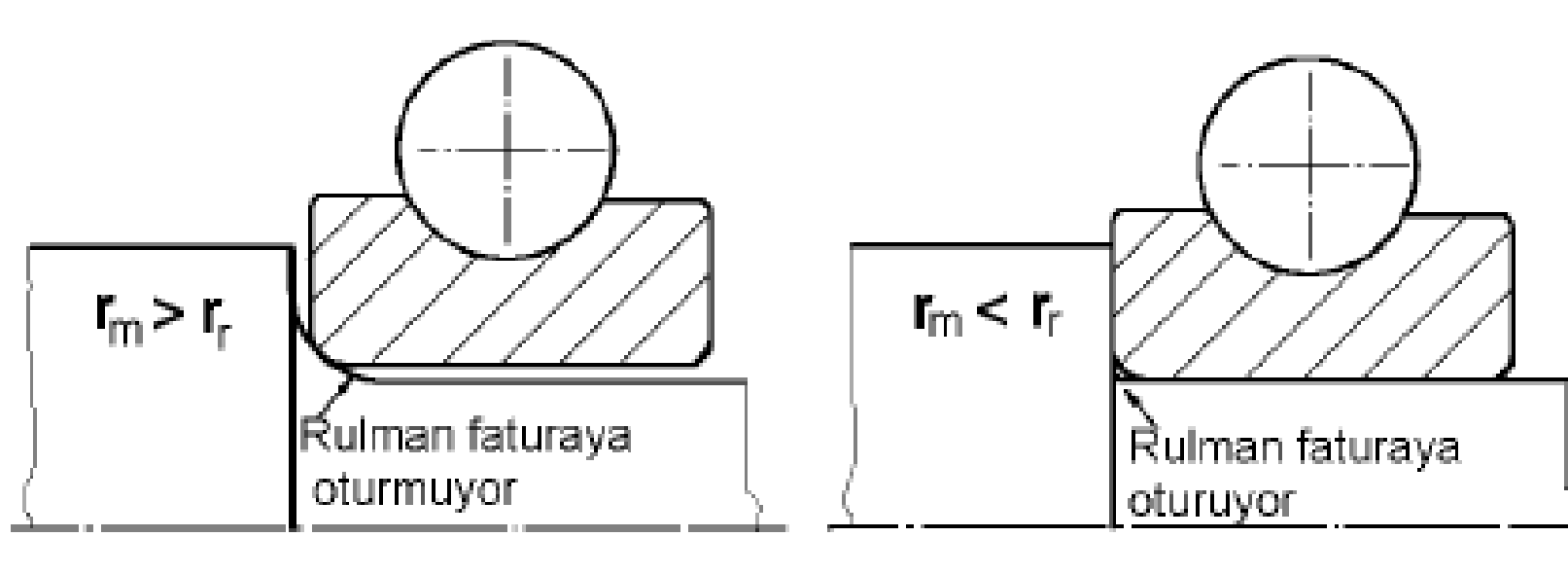


3



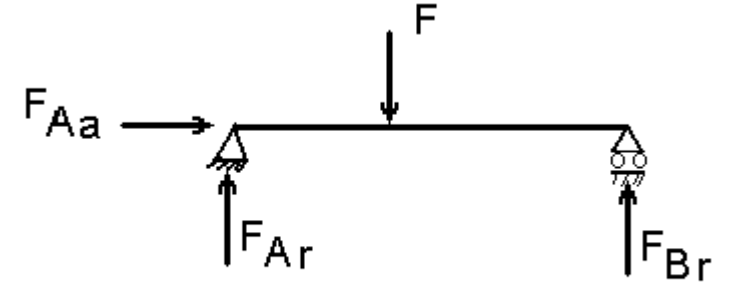
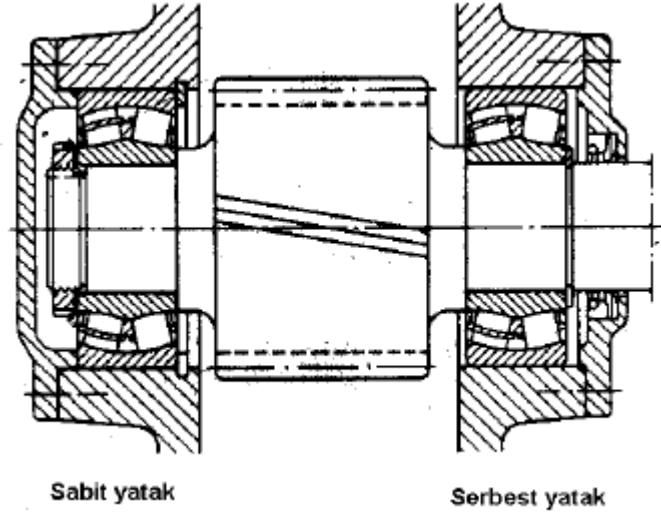
Rulmanlı Yatak Bileziklerinin Faturaya Montajı

- Rulmanlı Yatak Bileziklerinin Faturaya ve Omuza Montajı

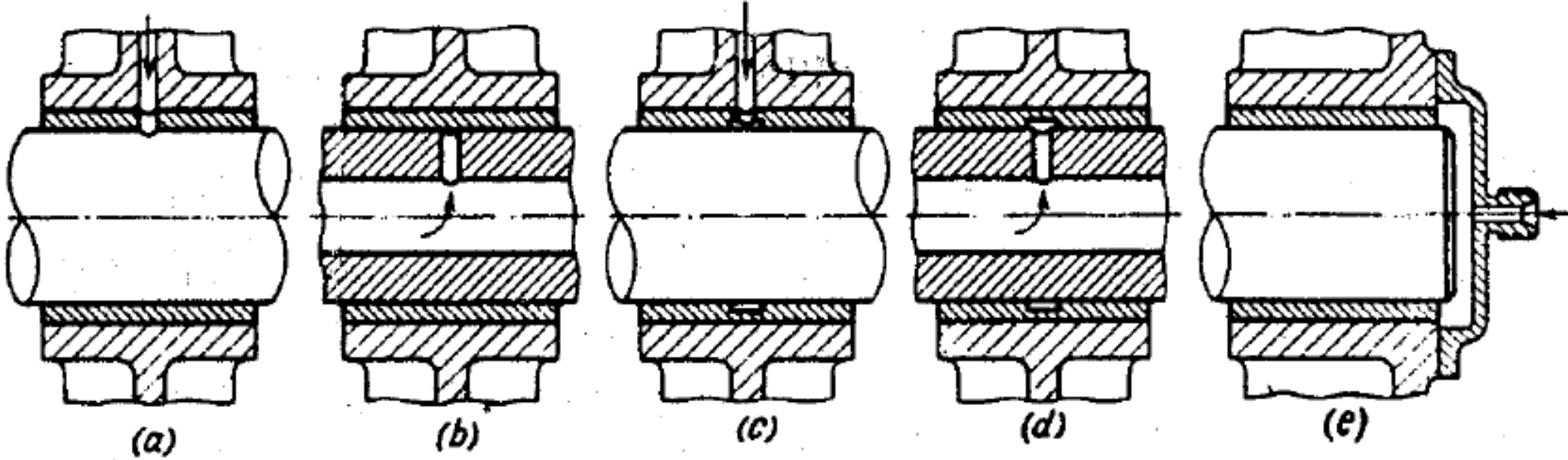


Millerin Yataklanması

- 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.

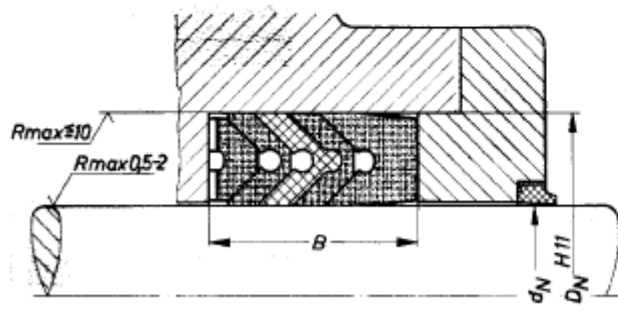
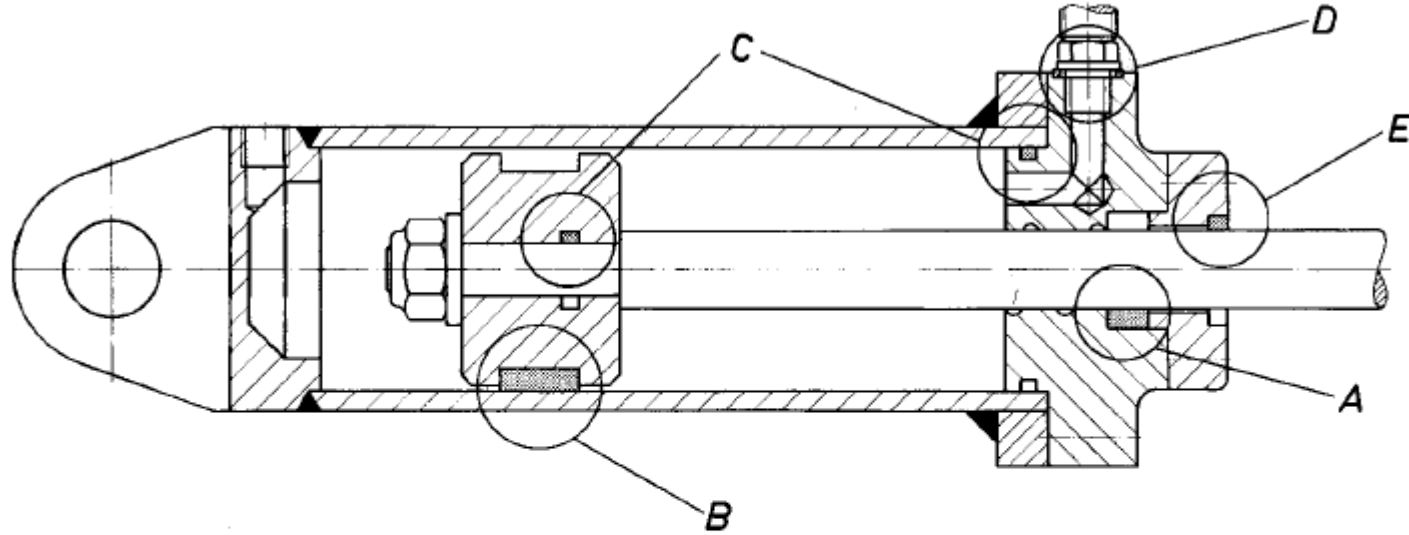
c,d) Yatağın içine yağ akımını kuvvetlendirmek için yağ kanalı açılır

e) Basınçlı yağ alından verilebilir.

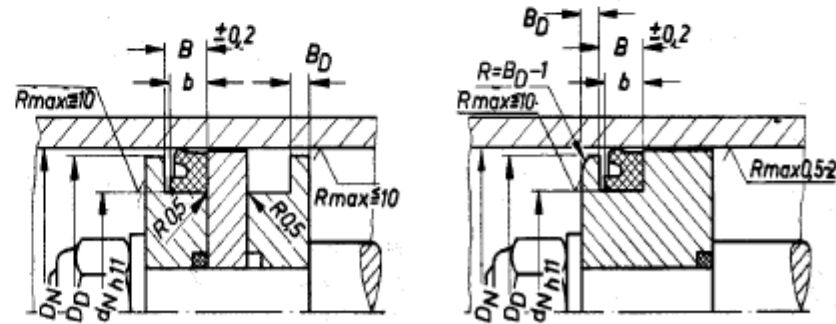
Kural olarak yağ, yatağın yüklenmediği bölgeden iletilir.

SIZDIRMAZLIK ELEMANLARININ TASARIMI

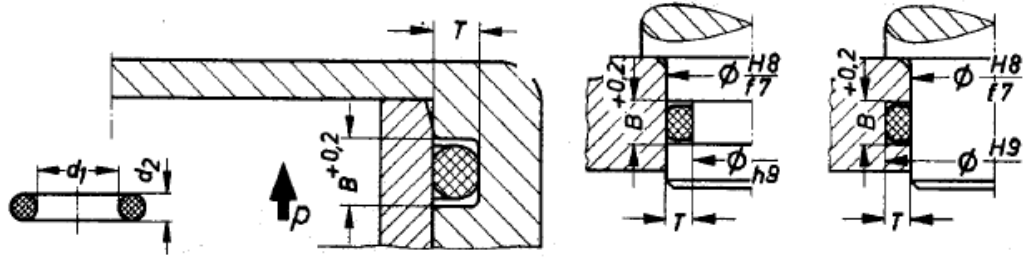
HİDROLİK KEÇELER



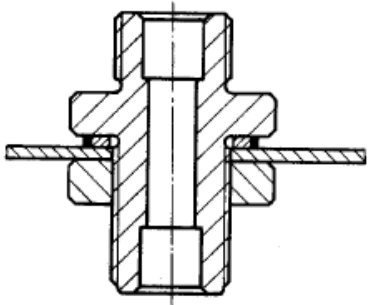
A) Boğaz takım keçesi



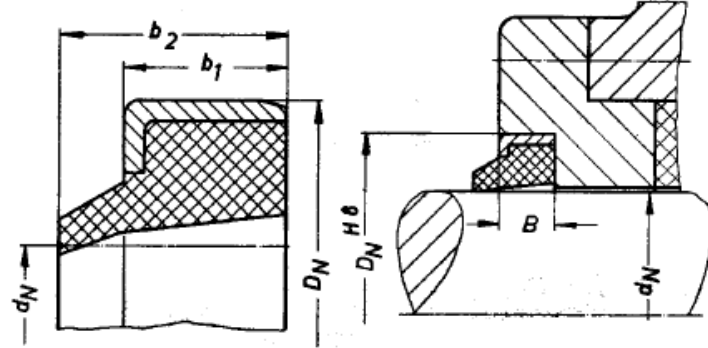
B) Piston başı keçesi



C) O halkaları



D) Lastikli rondela



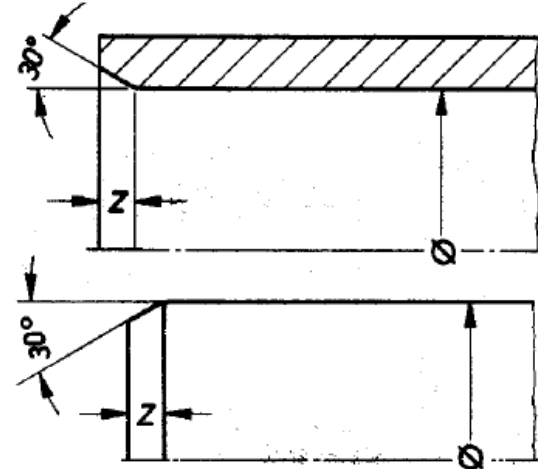
E) Toz sıyrıcı keçe

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.

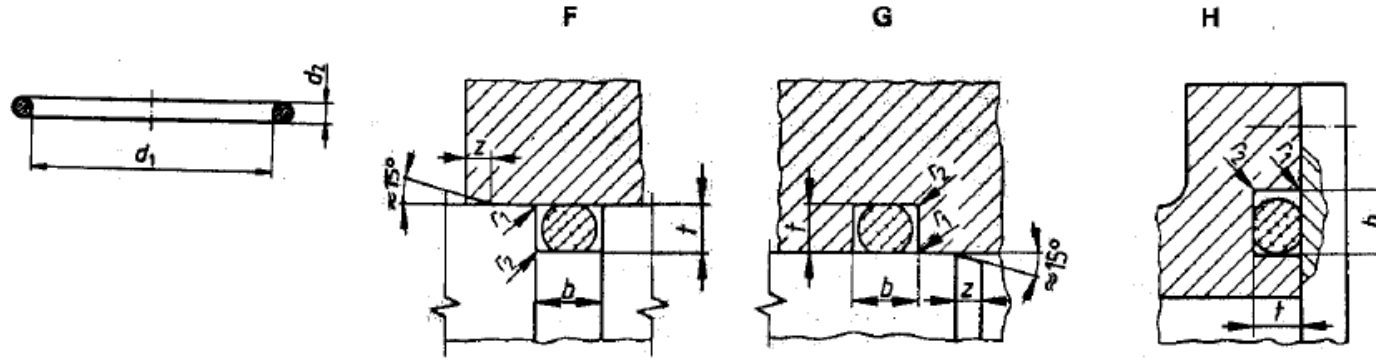
- Hidrolik silindir tasarımları için , piyasada taşlanmış ve sert krom kaplanmış borular ve miller kullanılmalıdır.
- Keçenin ağız kısmına yağın gelmesi sağlanmalıdır. Keçe ağızına gelen basınçlı yağ, keçenin sızdırmazlık sağlayan kenarına basınç uygulayarak yağın ters tarafa geçmesi sağlanabilecektir.



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

O HALKALARI (RING)

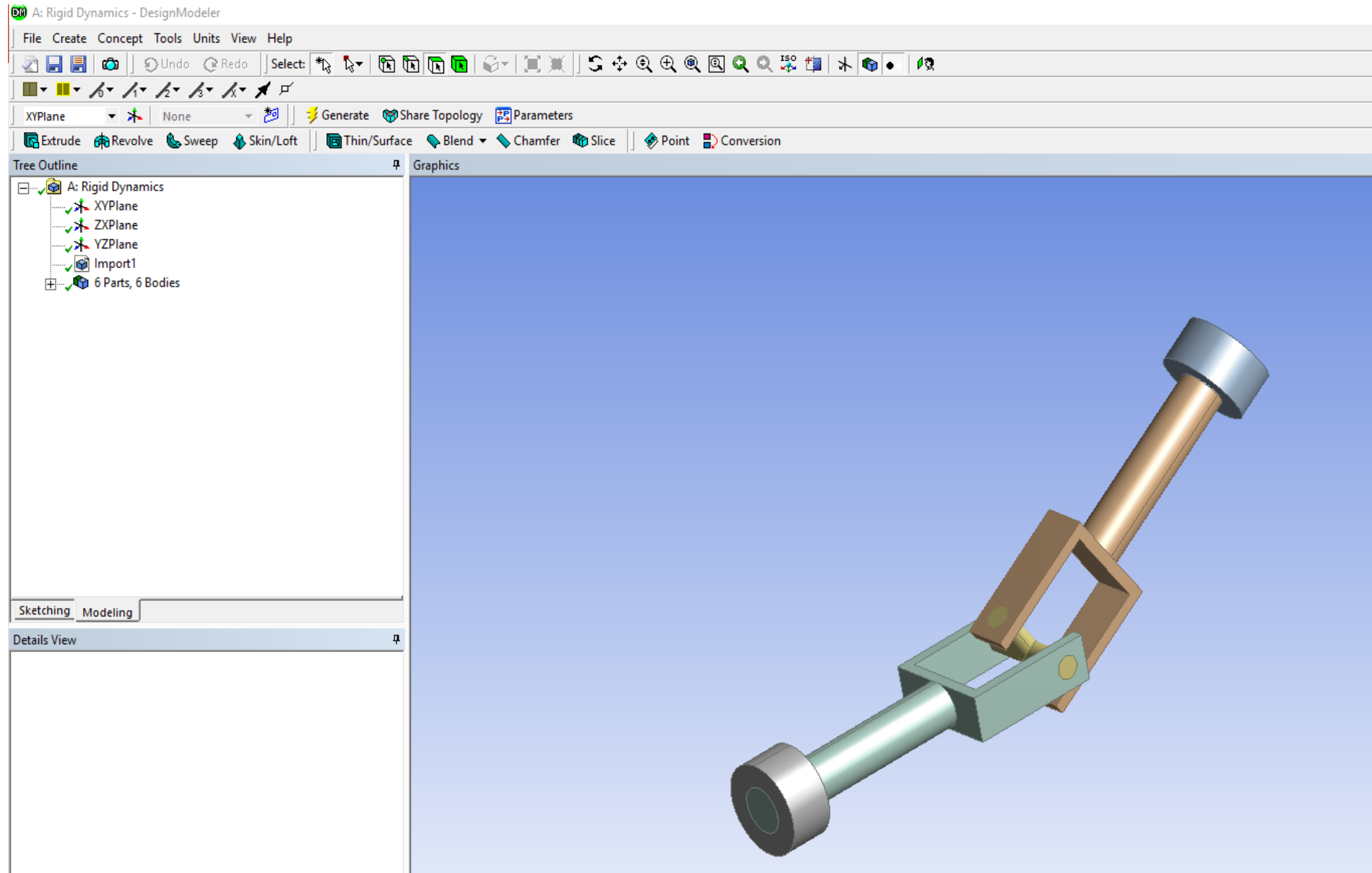
O HALKALARI



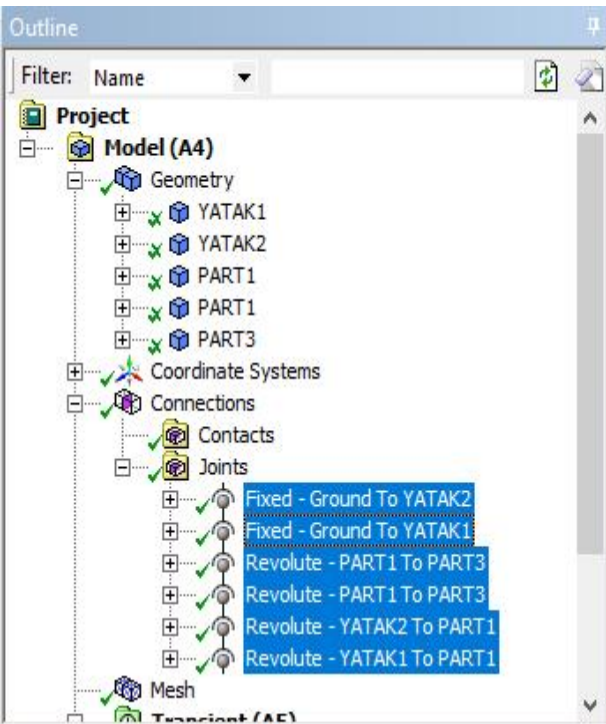
d ₂	b		r ₁	r ₂	t _{min}							
					Sabit			Hareketli				
	Tolerans	F			G	H	F	G	F	G	Z	
1,6	1,9	+0,1 0	0,1	0,25	1,334	1,330	1,3	1,414	1,416	1,426	1,428	1
2	2,3	+0,1 0			1,674	1,671	1,7	1,776	1,778	1,801	1,803	1,2
2,5	2,9	+0,15 0			2,099	2,099	2,1	2,229	2,234	2,273	2,277	1,4
3,15	3,6	+0,2 0	0,2	0,63	2,663	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:

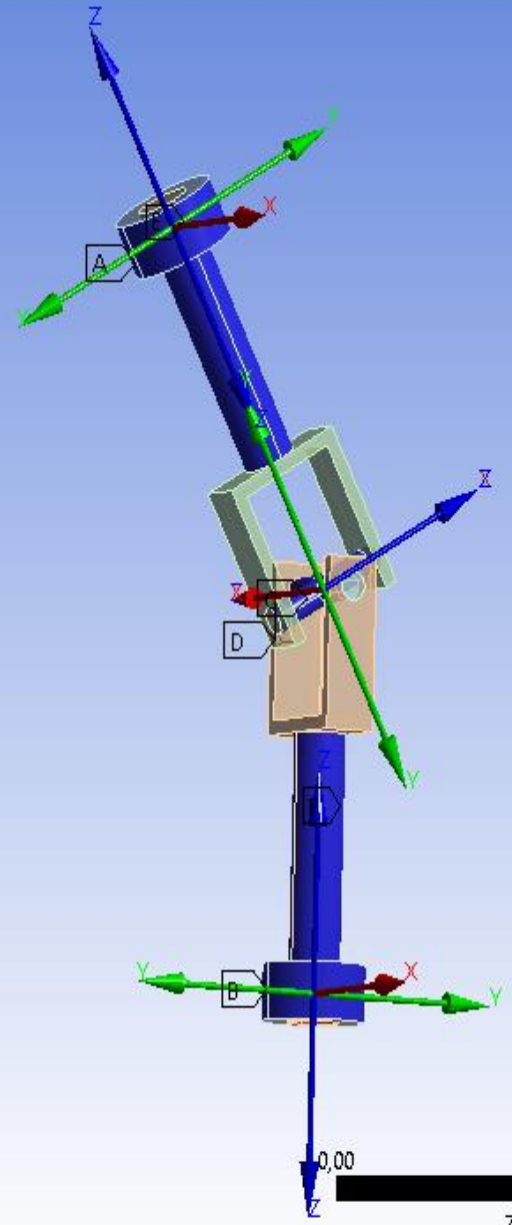


Details of "Multiple Selection"

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 | Solve ?/ Show Errors | Worksheet

Show Vertices Wireframe Show Mesh Random Colors Annotation Preferences | Edge Coloring

Environment Inertial Loads Supports Conditions Direct FE

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	Revolute - YATAK2 To PART1
Joint	Revolute - YATAK2 To PART1
Definition	Revolute - PART1 To PART3
DOF	Revolute - PART1 To PART3
Type	Revolute - YATAK2 To PART1
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

0,00 75,00 150,00 225,00 300,00 (mm)

RIJID DYNAMICS : PISTON ANALIZI

The screenshot displays the ANSYS Workbench software interface. The title bar reads "den - Workbench". The menu bar includes "File", "View", "Tools", "Units", "Extensions", and "Help". Below the menu bar is a toolbar with icons for "Project", "Import...", "Reconnect", "Refresh Project", and "Update Project".

The left sidebar, titled "Toolbox", contains a list of analysis systems under the "Analysis Systems" category:

- 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)

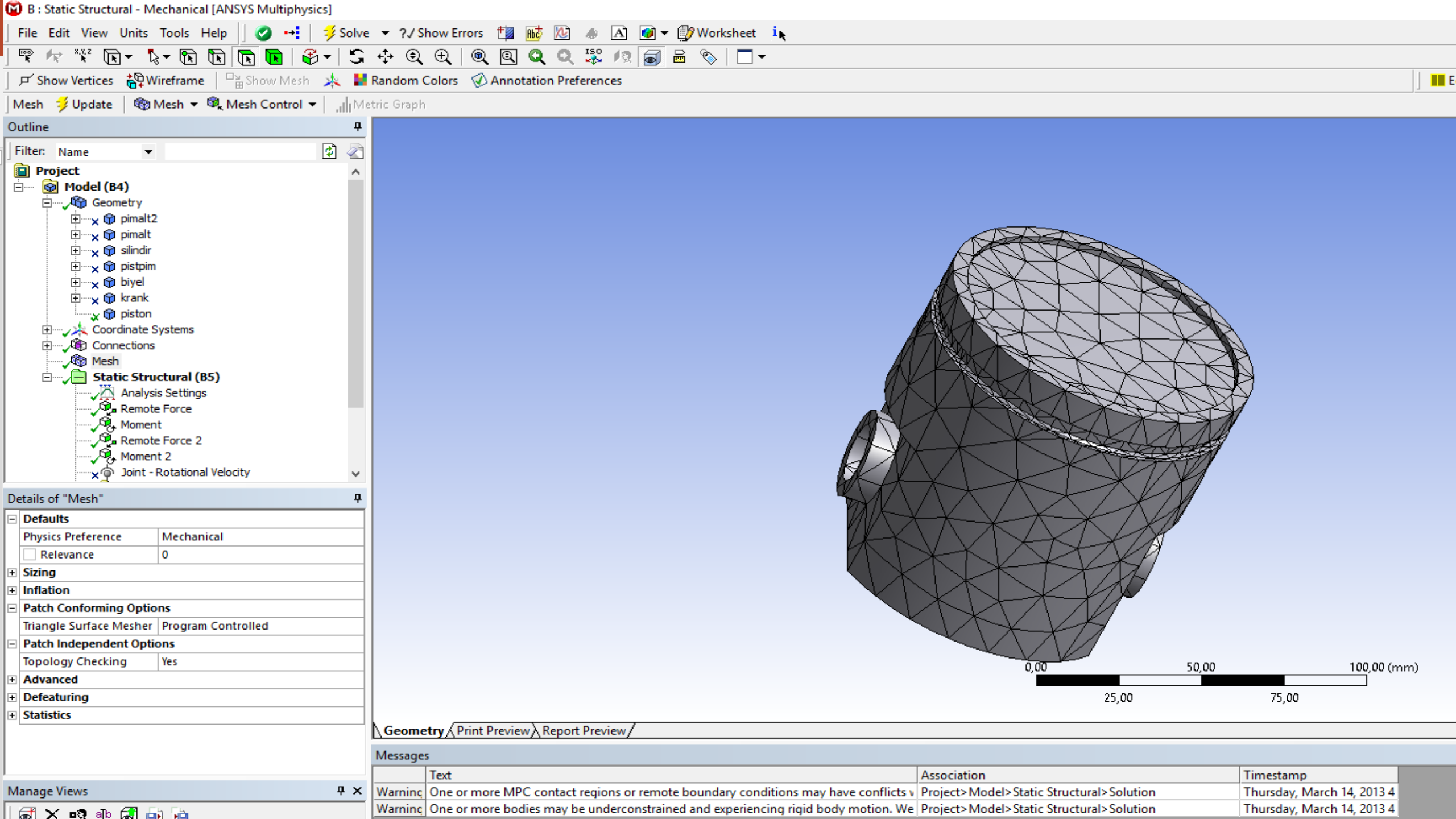
The main workspace, titled "Project Schematic", shows two analysis systems, A and B, each with a list of steps:

System A: Rigid Dynamics

Step	Item	Status
1	Rigid Dynamics	
2	Engineering Data	✓
3	Geometry	✓
4	Model	✓
5	Setup	✓
6	Solution	✓
7	Results	✓

System B: Static Structural

Step	Item	Status
1	Static Structural	
2	Engineering Data	✓
3	Geometry	✓
4	Model	✓
5	Setup	✓
6	Solution	✓
7	Results	✓



B : Static Structural - Mechanical [ANSYS Multiphysics]

File Edit View Units Tools Help

Solve ?/ Show Errors

Show Vertices Wireframe Show Mesh Random Colors Annotation Preferences

Mesh Update Mesh Mesh Control Metric Graph

Outline

Filter: Name

Project

- Model (B4)
 - Geometry
 - pimalt2
 - pimalt
 - 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

Details of "Mesh"

Defaults

Physics Preference	Mechanical
Relevance	0

Sizing

Inflation

Patch Conforming Options

Triangle Surface Mesher	Program Controlled
-------------------------	--------------------

Patch Independent Options

Topology Checking	Yes
-------------------	-----

Advanced

Defeaturing

Statistics

Geometry | Print Preview | Report Preview

Messages

	Text	Association	Timestamp
Warning	One or more MPC contact regions or remote boundary conditions may have conflicts v	Project> Model> Static Structural> Solution	Thursday, March 14, 2013 4
Warning	One or more bodies may be underconstrained and experiencing rigid body motion. We	Project> Model> Static Structural> Solution	Thursday, March 14, 2013 4

Manage Views

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

MOTION LOADS:

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

Environment Inertial Loads Supports Conditions Direct FE

Outline

- Filter: Name
- silindir
- pistpim
- biyel
- krank
- piston
- Coordinate Systems
- Connections
- Mesh
- Static Structural
- Analysis
- Remote Force
- Moment
- Remote Force
- Moment
- Joint - R
- Solution (B6)
- Solution Information
- Total Deformation
- Equivalent Stress
- Fatigue Tool

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

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)

Manage Views

Section Planes

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

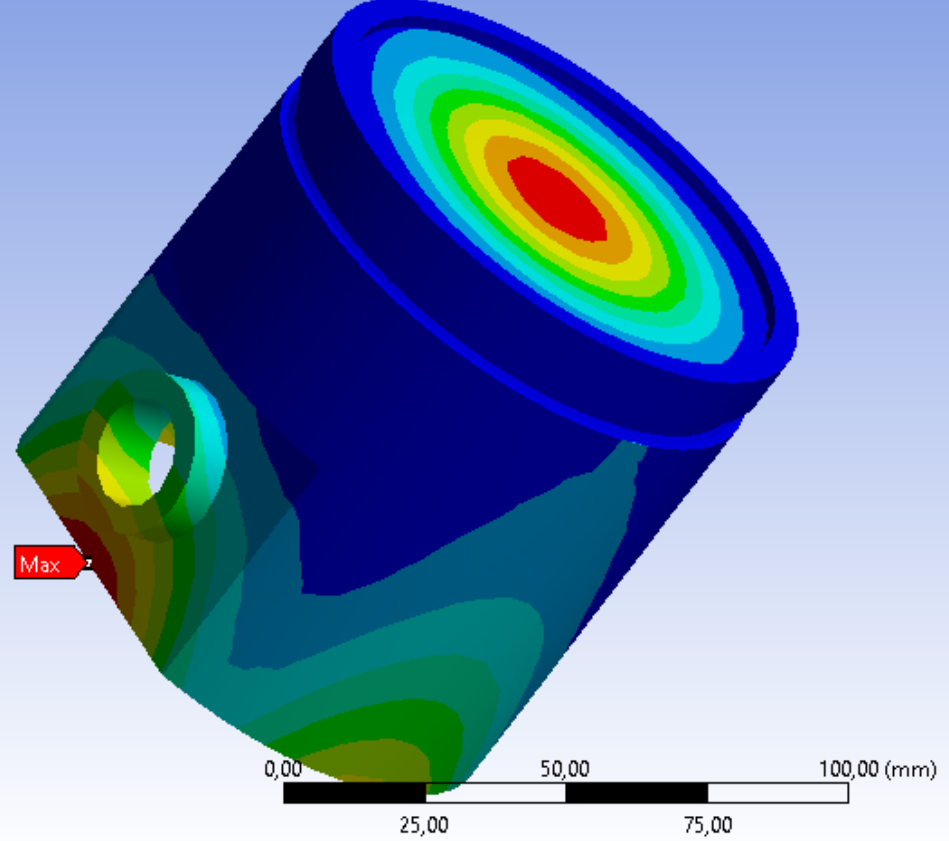
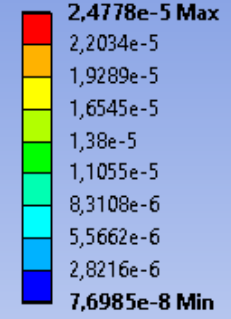
Edge Color

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:

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 | Edge Color

Result 1.0 (True Scale) | MAX MIN I23 Probe Display All Bodies

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

Details of "Equivalent Stress"

Scope

Scoping Method	Geometry Selection
Geometry	All Bodies

Definition

Type	Equivalent (von-Mises) Stress
By	Time
<input type="checkbox"/> Display Time	Last
Calculate Time History	Yes
Identifier	
Suppressed	No

Integration Point Results

Display Option	Averaged
Average Across Bodies	No

Results

<input type="checkbox"/> Minimum	4,9749e-004 MPa
----------------------------------	-----------------

Manage Views

B: Static Structural
Equivalent Stress
Type: Equivalent (von-Mises) Stress
Unit: MPa
Time: 1
7.02.2018 09:55

0,030259 Max
0,026952
0,023645
0,020339
0,017032
0,013725
0,010418
0,0071112
0,0038043
0,00049749 Min

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

Geometry | Print Preview | Report Preview

Graph

Animation | 10 Frames | 2 Sec (Auto) | 3 Cycles

Tabular Data

1.