1 General Information

1.1 Analysis Environment

Software Product:	Flow Simulation 2017 SP2.0. Build: 3731
CPU Type:	Intel(R) Core(TM) i3-5005U CPU @ 2.00GHz
CPU Speed:	2000 MHz
RAM:	8102 MB / 134217727 MB
Operating System:	Windows 10 (or higher) (Version 10.0.17134)

1.2 Model Information

Model Name:	TURBIN TESLA 10.SLDASM
Project Name:	Project 10

1.3 Project Comments:

Unit System:	Custom Units
Analysis Type:	Internal

1.4 Size of Computational Domain

Size

X min	-0.078 m
X max	0.109 m
Y min	0 m
Y max	0.186 m
Z min	0.079 m
Z max	0.177 m

1.5 Simulation Parameters

1.5.1 Mesh Settings

1.5.1.1 Basic Mesh

Basic Mesh Dimensions

Number of cells in X	22
Number of cells in Y	22
Number of cells in Z	12

1.5.1.2 Analysis Mesh

Total Cell count:	62636
Fluid Cells:	62636
Solid Cells:	102605
Partial Cells:	50482
Trimmed Cells:	0

1.5.1.3 Additional Physical Calculation Options

Heat Transfer Analysis: Heat conduction in solids: Off
Flow Type: Laminar and turbulent
Time-Dependent Analysis: Off
Gravity: Off
Radiation:
Humidity:
Default Wall Roughness: 0 micrometer

1.5.2 Material Settings

Material Settings

Fluids

Water

1.5.3 Initial Conditions

Initial Conditions

Thermodynamic parameters	Static Pressure: 34474.00 Pa Temperature: 293.20 K
Velocity parameters	Velocity vector Velocity in X direction: 1.730 m/s Velocity in Y direction: 0 m/s Velocity in Z direction: 0 m/s
Turbulence parameters	

1.5.4 Boundary Conditions

Boundary Conditions

Inlet Volume Flow 1

Type	Inlet Volume Flow
Faces	Face<1>@LID1-1
Coordinate system	Face Coordinate System
Reference axis	X
Flow parameters	Flow vectors direction: Normal to face Volume flow rate: 6.6000e-005 m^3/s Fully developed flow: No Inlet profile: 0
Thermodynamic parameters	Temperature: 293.20 K
Turbulence parameters	Boundary layer parameters
Boundary layer type: Turbulent	

Environment Pressure 1

Type	Environment Pressure
Faces	
Coordinate system	Global coordinate system
Reference axis	X
Thermodynamic parameters	Environment pressure: 23118.00 Pa Temperature: 293.20 K

Turbulence parameters	Boundary layer parameters
Boundary layer type: Turbulent	

Real Wall 1

Type	Real wall
Faces	
Coordinate system	Global coordinate system
Reference axis	X

Inlet Velocity 1

Type	Inlet Velocity
Faces	
Coordinate system	Global coordinate system
Reference axis	X
Flow parameters	Flow vectors direction: Normal to face Velocity normal to face: 1.730 m/s Fully developed flow: No
Thermodynamic parameters	Temperature: 293.20 K
Turbulence parameters	Boundary layer parameters
Boundary layer type: Turbulent	

1.5.5 Engineering Goals

Goals

Global Goals

GG Min Velocity (X) 1

Type	Global Goal
Goal type	Velocity (X)
Calculate	Minimum value
Coordinate system	Global coordinate system
Criteria	1.000 m/s
Use in convergence	On

GG Av Velocity (X) 1

Type	Global Goal
Goal type	Velocity (X)
Calculate	Average value
Coordinate system	Global coordinate system
Criteria	1.000 m/s
Use in convergence	On

GG Max Velocity (X) 1

Type	Global Goal
Goal type	Velocity (X)
Calculate	Maximum value
Coordinate system	Global coordinate system
Criteria	1.000 m/s
Use in convergence	On

Surface Goals

SG Av Static Pressure 1

Type	Surface Goal
Goal type	Static Pressure
Calculate	Average value
Faces	LID1-1@NEW TURBINE Assy
Coordinate system	Global coordinate system
Criteria	1.00 Pa
Use in convergence	On

SG Mass Flow Rate 1

Type	Surface Goal
Goal type	Mass Flow Rate
Faces	LID1-1@NEW TURBINE Assy
Coordinate system	Global coordinate system
Criteria	1.0000 kg/s
Use in convergence	On

SG Mass Flow Rate 2

Type	Surface Goal
Goal type	Mass Flow Rate
Faces	LID2-1@NEW TURBINE Assy LID6-1@NEW TURBINE Assy LID5-1@NEW TURBINE Assy LID7-1@NEW TURBINE Assy LID3-1@NEW TURBINE Assy LID4-1@NEW TURBINE Assy
Coordinate system	Global coordinate system
Criteria	1.0000 kg/s
Use in convergence	On

Equation Goals

Power

Type	Equation Goal
Formula	(Torque*8.73)/(9.81*10*SG Mass Flow Rate 1)*8.73*(SG Av Static Pressure 1*0.000013*0.03)*19
Dimensionality	No units
Criteria	1.0000000
Use in convergence	On

Efficiency

Type	Equation Goal
Formula	(Torque*8.73)/(9.81*10*SG Mass Flow Rate 1)
Dimensionality	No units
Criteria	1.0000000
Use in convergence	On

Torque

Type	Equation Goal
Formula	(SG Av Static Pressure 1*0.000013*0.03)*19
Dimensionality	No units

Criteria	1.0000000
Use in convergence	On

1.6 Analysis Time

Calculation Time: 819 s
Number of Iterations: 50

2 Results

2.1 Analysis Goals

Goals

Name	Unit	Value	Progress	Criteria	Delta	Use in convergence
GG Min Velocity (X) 1	m/s	-1.303	0	0	6.49518535	On
GG Av Velocity (X) 1	m/s	0.050	0	0	0.655203577	On
GG Max Velocity (X) 1	m/s	11.066	0	0	0.976104675	On
SG Av Static Pressure 1	Pa	33989.62	0	0	9735.13214	On
SG Mass Flow Rate 1	kg/s	0.0659	0	0	3.00956237e-007	On
SG Mass Flow Rate 2	kg/s	-0.0659	0	0	0.00174757149	On
Torque	N.m	0.2518631	0	0	0.0721373291	On
Power	Watt	0.7479276	0	0	0.343695166	On
Efficiency	%	0.3401580	0	0	0.0974256253	On

2.2 Global Min-Max-Table

Min/Max Table

Name	Minimum	Maximum
Density (Fluid) [kg/m^3]	5.77	998.94
Mass Fraction of Condensate [ ]	0	0
Mass Fraction of Vapour [ ]	0	0.0013329
Pressure [Pa]	1038.15	75889.80
Temperature [K]	280.00	293.87
Temperature (Fluid) [K]	280.00	293.87
Velocity [m/s]	0	8.009
Velocity (X) [m/s]	-1.259	7.431
Velocity (Y) [m/s]	-2.976	1.853
Velocity (Z) [m/s]	-2.034	0.839
Volume Fraction of Vapour [ ]	0	0.9501352
Domain Index [ ]	0	8
Domain Index (Fluid) [ ]	0	7
Normal [ ]	1.0000000	1.0000000
Normal (X) [ ]	-1.0000000	1.0000000
Normal (Y) [ ]	-0.9999999	1.0000000
Normal (Z) [ ]	-1.0000000	1.0000000
Radius r (cylindrical) [m]	0.003	0.214

Wall Distance [m]	-1.000	-1.000
Mach Number [ ]	0	1.94
Velocity RRF [m/s]	0	8.009
Velocity RRF (X) [m/s]	-1.259	7.431
Velocity RRF (Y) [m/s]	-2.976	1.853
Velocity RRF (Z) [m/s]	-2.034	0.839
Vorticity [1/s]	0	6872.33
Vorticity (X) [1/s]	-1134.87	1535.68
Vorticity (Y) [1/s]	-4068.85	4391.72
Vorticity (Z) [1/s]	-5350.44	2018.32
Relative Pressure [Pa]	-22079.85	52771.80
Shear Stress [Pa]	0	352.94
Real Gas State [ ]	1.0000000	12.0000000
Bottleneck Number [ ]	0	1.0000000
Heat Transfer Coefficient [W/m^2/K]	0	0
ShortCut Number [ ]	0	1.0000000
Surface Heat Flux [W/m^2]	0	0
Surface Heat Flux (Convective) [W/m^2]	-2.572e+009	2.284e+009
Acoustic Power [dB]	7.38e-041	0.44

3 Appendix

3.1 Material Data

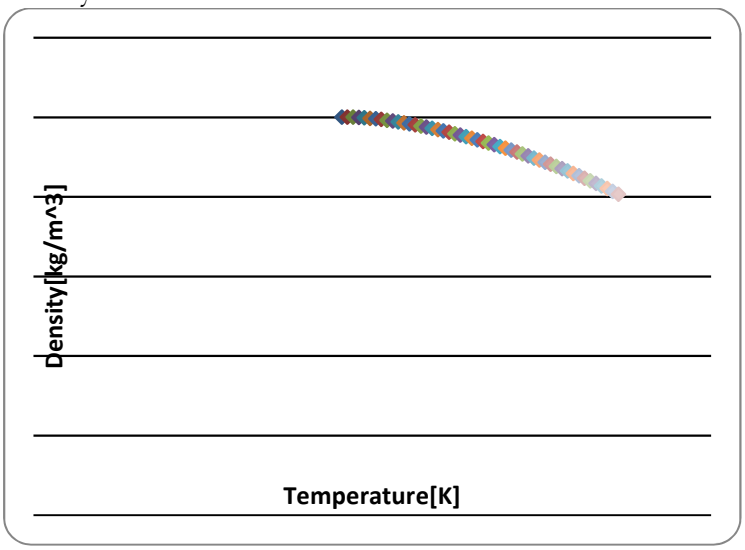
Engineering Database

Liquids

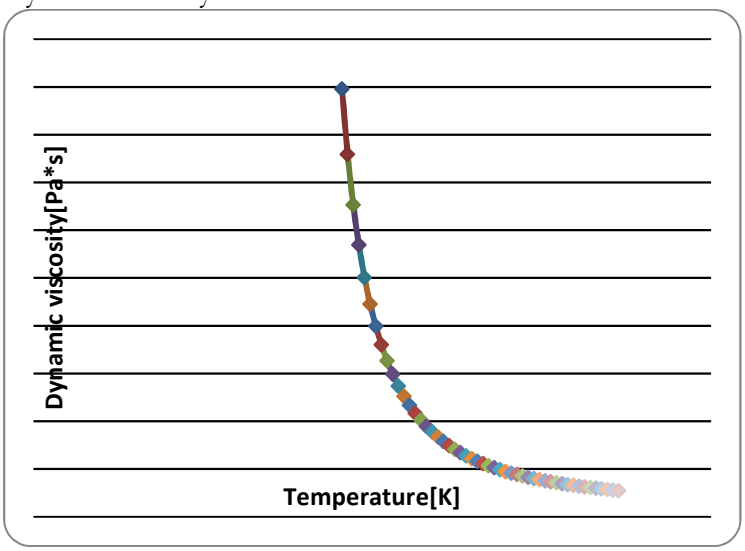
Water

Path: Liquids Pre-Defined

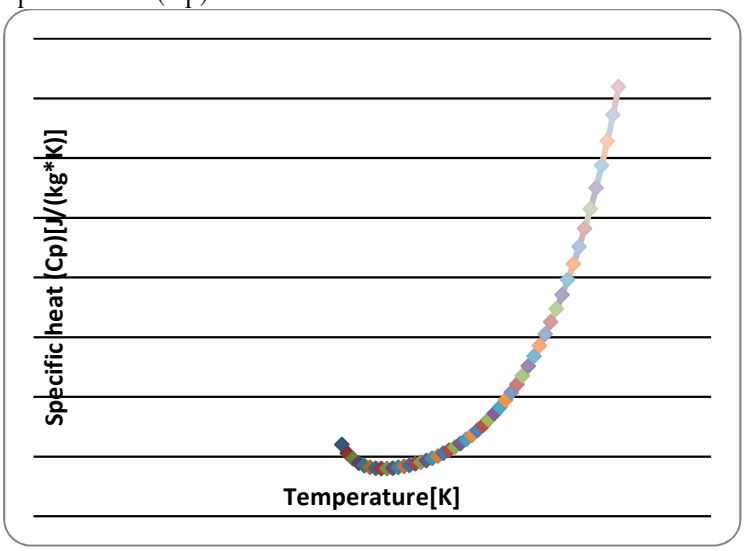
Density



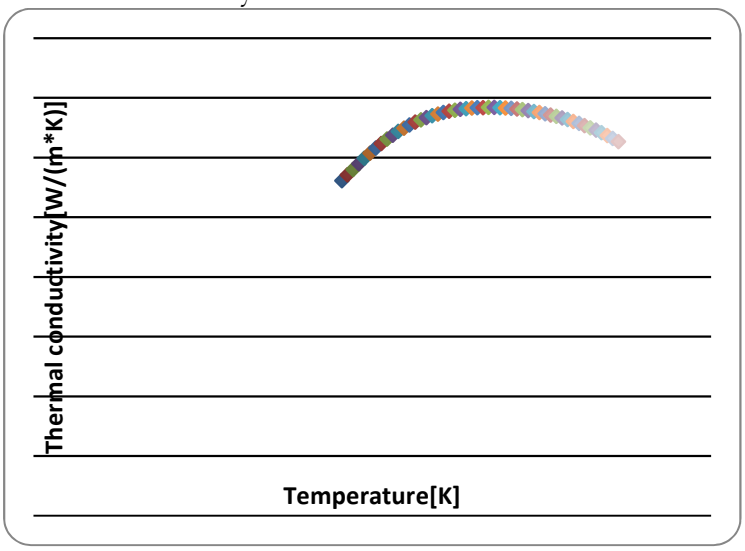
Dynamic viscosity



Specific heat (Cp)



Thermal conductivity



Cavitation effect: Yes
Temperature: 0 K
Saturation pressure: 0 Pa
Radiation properties: No

1 General Information

1.1 Analysis Environment

Software Product:	Flow Simulation 2017 SP2.0. Build: 3731
CPU Type:	Intel(R) Core(TM) i3-5005U CPU @ 2.00GHz
CPU Speed:	2000 MHz
RAM:	8102 MB / 134217727 MB
Operating System:	Windows 10 (or higher) (Version 10.0.17134)

1.2 Model Information

Model Name:	TURBIN TESLA 20.SLDASM
Project Name:	Project 20

1.3 Project Comments:

Unit System:	Custom Units
Analysis Type:	Internal

1.4 Size of Computational Domain

Size

X min	-0.075 m
X max	0.134 m
Y min	0 m
Y max	0.193 m
Z min	0.043 m
Z max	0.193 m

1.5 Simulation Parameters

1.5.1 Mesh Settings

1.5.1.1 Basic Mesh

Basic Mesh Dimensions

Number of cells in X	26
Number of cells in Y	24
Number of cells in Z	18

1.5.1.2 Analysis Mesh

Total Cell count:	69858
Fluid Cells:	69858
Solid Cells:	119402
Partial Cells:	54874
Trimmed Cells:	0

1.5.1.3 Additional Physical Calculation Options

Heat Transfer Analysis: Heat conduction in solids: Off
Flow Type: Laminar and turbulent
Time-Dependent Analysis: Off
Gravity: Off
Radiation:
Humidity:
Default Wall Roughness: 0 micrometer

1.5.2 Material Settings

Material Settings

Fluids

Water

1.5.3 Initial Conditions

Initial Conditions

Thermodynamic parameters	Static Pressure: 34474.00 Pa Temperature: 293.20 K
Velocity parameters	Velocity vector Velocity in X direction: 1.730 m/s Velocity in Y direction: 0 m/s Velocity in Z direction: 0 m/s
Turbulence parameters	

1.5.4 Boundary Conditions

Boundary Conditions

Inlet Velocity 1

Type	Inlet Velocity
Faces	
Coordinate system	Global coordinate system
Reference axis	X
Flow parameters	Flow vectors direction: Normal to face Relative to rotating frame: No Velocity normal to face: 1.730 m/s Fully developed flow: No
Thermodynamic parameters	Temperature: 293.20 K
Turbulence parameters	Boundary layer parameters
Boundary layer type: Turbulent	

Environment Pressure 1

Type	Environment Pressure
Faces	Face<383>@LID10-1 Face<385>@LID11-1 Face<384>@LID13-1 Face<387>@LID15-1 Face<386>@LID12-1 Face<388>@LID14-1
Coordinate system	Global coordinate system

Reference axis	X
Thermodynamic parameters	Environment pressure: 23118.00 Pa Temperature: 293.20 K
Turbulence parameters	Boundary layer parameters
Boundary layer type: Turbulent	

Inlet Volume Flow 1

Type	Inlet Volume Flow
Faces	Face<380>@LID9-1
Coordinate system	Face Coordinate System
Reference axis	X
Flow parameters	Flow vectors direction: Normal to face Volume flow rate: 6.6000e-005 m^3/s Relative to rotating frame: No Fully developed flow: No Inlet profile: 0
Thermodynamic parameters	Temperature: 293.20 K
Turbulence parameters	Boundary layer parameters
Boundary layer type: Turbulent	

Real Wall 1

Type	Real wall
Faces	
Coordinate system	Global coordinate system
Reference axis	X

1.5.5 Engineering Goals

Goals

Global Goals

GG Min Velocity (X) 1

Type	Global Goal
Goal type	Velocity (X)
Calculate	Minimum value
Coordinate system	Global coordinate system
Criteria	1.000 m/s
Use in convergence	On

GG Av Velocity (X) 1

Type	Global Goal
Goal type	Velocity (X)
Calculate	Average value
Coordinate system	Global coordinate system
Criteria	1.000 m/s
Use in convergence	On

GG Max Velocity (X) 1

Type	Global Goal
Goal type	Velocity (X)
Calculate	Maximum value

Coordinate system	Global coordinate system
Criteria	1.000 m/s
Use in convergence	On

Surface Goals

SG Mass Flow Rate 1

Type	Surface Goal
Goal type	Mass Flow Rate
Faces	LID9-1@TURBIN 20 ASSEMBLY
Coordinate system	Global coordinate system
Criteria	1.0000 kg/s
Use in convergence	On

SG Mass Flow Rate 2

Type	Surface Goal
Goal type	Mass Flow Rate
Faces	LID9-1@TURBIN 20 ASSEMBLY LID14-1@TURBIN 20 ASSEMBLY LID13-1@TURBIN 20 ASSEMBLY LID15-1@TURBIN 20 ASSEMBLY LID11-1@TURBIN 20 ASSEMBLY LID12-1@TURBIN 20 ASSEMBLY LID10-1@TURBIN 20 ASSEMBLY
Coordinate system	Global coordinate system
Criteria	1.0000 kg/s
Use in convergence	On

SG Av Static Pressure 1

Type	Surface Goal
Goal type	Static Pressure
Calculate	Average value
Faces	LID9-1@TURBIN 20 ASSEMBLY
Coordinate system	Global coordinate system
Criteria	1.00 Pa
Use in convergence	On

Equation Goals

Torque

Type	Equation Goal
Formula	(SG Av Static Pressure 1*0.000013*0.03)*19
Dimensionality	No units
Criteria	1.0000000
Use in convergence	On

Efficiency

Type	Equation Goal
Formula	(Torque*8.73)/(9.81*10*SG Mass Flow Rate 1)
Dimensionality	No units
Criteria	1.0000000
Use in convergence	On

Power

Type	Equation Goal
Formula	(Torque*8.73)/(9.81*10*SG Mass Flow Rate 1)*8.73*(SG Av Static Pressure 1*0.000013*0.03)*19
Dimensionality	No units
Criteria	1.0000000
Use in convergence	On

1.6 Analysis Time

Calculation Time: 1221 s
Number of Iterations: 50

2 Results

2.1 Analysis Goals

Goals

Name	Unit	Value	Progress	Criteria	Delta	Use in convergence
GG Min Velocity (X) 1	m/s	-4.859	0	0	17.4056721	On
GG Av Velocity (X) 1	m/s	1.006	0	0	0.709185909	On
GG Max Velocity (X) 1	m/s	9.408	0	0	4.13031304	On
SG Mass Flow Rate 1	kg/s	0.0659	0	0	1.11651155e-007	On
SG Mass Flow Rate 2	kg/s	0.0293	0	0	0.0918852451	On
SG Av Static Pressure 1	Pa	19791.85	0	0	3878.56985	On
Torque	N.m	0.1466576	0	0	0.0287402026	On
Efficiency	%	0.1980730	0	0	0.0388159625	On
Power	Watt	0.2535970	0	0	0.111837794	On

2.2 Global Min-Max-Table

Min/Max Table

Name	Minimum	Maximum
Density (Fluid) [kg/m^3]	5.74	998.96
Mass Fraction of Condensate [ ]	0	0
Mass Fraction of Vapour [ ]	0	0.0014249
Pressure [Pa]	1037.26	344146.08
Temperature [K]	279.99	298.39
Temperature (Fluid) [K]	279.99	298.39
Velocity [m/s]	0	10.568
Velocity (X) [m/s]	-4.859	9.408
Velocity (Y) [m/s]	-7.149	6.210
Velocity (Z) [m/s]	-6.758	7.976
Volume Fraction of Vapour [ ]	0	0.9532091
Domain Index [ ]	0	10
Domain Index (Fluid) [ ]	0	9
Normal [ ]	1.0000000	1.0000000
Normal (X) [ ]	-0.9999999	1.0000000
Normal (Y) [ ]	-1.0000000	0.9999968
Normal (Z) [ ]	-1.0000000	1.0000000
Radius r (cylindrical) [m]	0.001	0.232
Wall Distance [m]	-1.000	-1.000

Mach Number [ ]	0	2.27
Mach Number RRF [ ]	0	2.27
Velocity RRF [m/s]	0	10.568
Velocity RRF (X) [m/s]	-4.859	9.408
Velocity RRF (Y) [m/s]	-7.149	6.210
Velocity RRF (Z) [m/s]	-6.758	7.976
Vorticity [1/s]	0	18840.10
Vorticity (X) [1/s]	-10652.66	8986.33
Vorticity (Y) [1/s]	-18175.59	16363.51
Vorticity (Z) [1/s]	-15765.80	13502.44
Relative Pressure [Pa]	-22132.34	317242.74
Shear Stress [Pa]	0	2116.81
Real Gas State [ ]	1.0000000	12.0000000
Bottleneck Number [ ]	0	1.0000000
Heat Transfer Coefficient [W/m^2/K]	0	0
ShortCut Number [ ]	0	1.0000000
Surface Heat Flux [W/m^2]	0	0
Surface Heat Flux (Convective) [W/m^2]	-1.451e+010	1.585e+010
Acoustic Power [dB]	1.23e-024	8267969.47

3 Appendix

3.1 Material Data

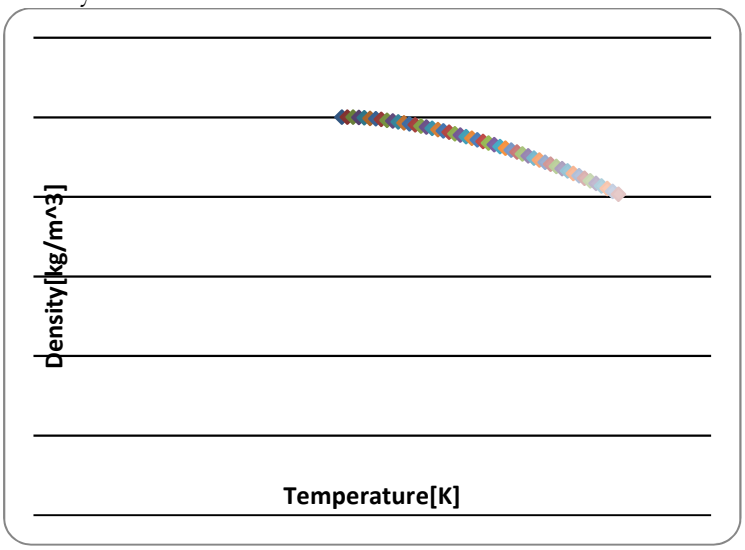
Engineering Database

Liquids

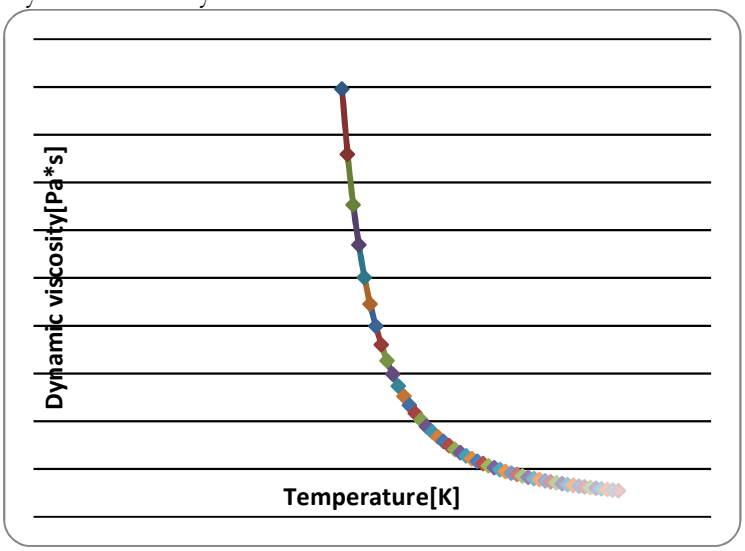
Water

Path: Liquids Pre-Defined

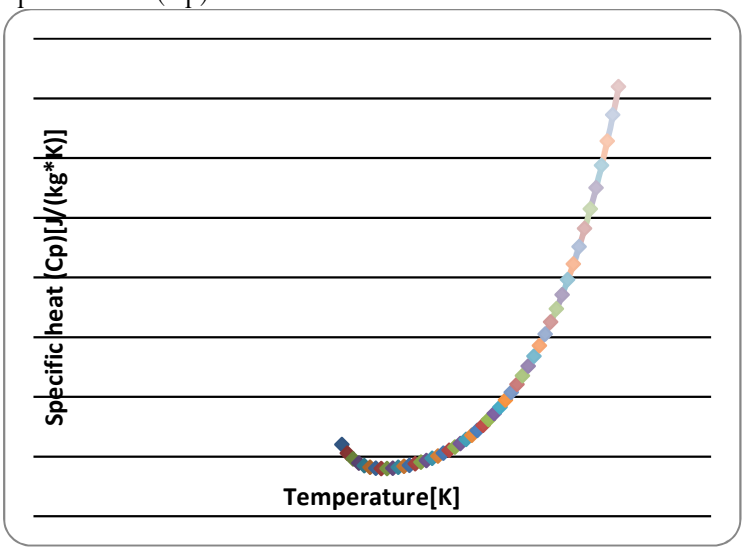
Density



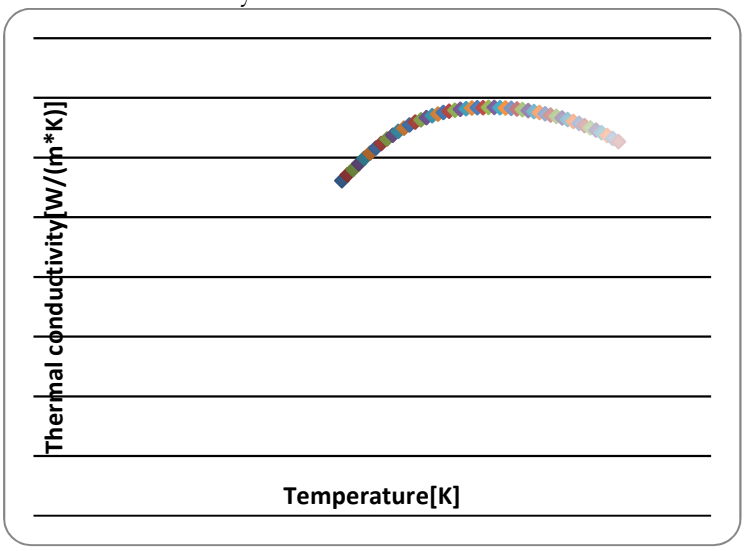
Dynamic viscosity



Specific heat (Cp)



Thermal conductivity



Cavitation effect: Yes
Temperature: 0 K
Saturation pressure: 0 Pa
Radiation properties: No

1 General Information

1.1 Analysis Environment

Software Product:	Flow Simulation 2017 SP2.0. Build: 3731
CPU Type:	Intel(R) Core(TM) i3-5005U CPU @ 2.00GHz
CPU Speed:	2000 MHz
RAM:	8102 MB / 134217727 MB
Operating System:	Windows 10 (or higher) (Version 10.0.17134)

1.2 Model Information

Model Name:	TURBIN TESLA 30 ASSEMBLY.SLDASM
Project Name:	Project(30)

1.3 Project Comments:

Unit System:	Custom Units
Analysis Type:	Internal

1.4 Size of Computational Domain

Size

X min	-0.079 m
X max	0.132 m
Y min	0 m
Y max	0.199 m
Z min	0.079 m
Z max	0.178 m

1.5 Simulation Parameters

1.5.1 Mesh Settings

1.5.1.1 Basic Mesh

Basic Mesh Dimensions

Number of cells in X	24
Number of cells in Y	24
Number of cells in Z	12

1.5.1.2 Analysis Mesh

Total Cell count:	65337
Fluid Cells:	65337
Solid Cells:	106398
Partial Cells:	51397
Trimmed Cells:	0

1.5.1.3 Additional Physical Calculation Options

Heat Transfer Analysis: Heat conduction in solids: Off
Flow Type: Laminar and turbulent
Time-Dependent Analysis: Off
Gravity: Off
Radiation:
Humidity:
Default Wall Roughness: 0 micrometer

1.5.2 Material Settings

Material Settings

Fluids

Water

1.5.3 Initial Conditions

Initial Conditions

Thermodynamic parameters	Static Pressure: 34474.00 Pa Temperature: 293.20 K
Velocity parameters	Velocity vector Velocity in X direction: 1.730 m/s Velocity in Y direction: 0 m/s Velocity in Z direction: 0 m/s
Turbulence parameters	

1.5.4 Boundary Conditions

Boundary Conditions

Inlet Velocity 1

Type	Inlet Velocity
Faces	
Coordinate system	Global coordinate system
Reference axis	X
Flow parameters	Flow vectors direction: Normal to face Relative to rotating frame: No Velocity normal to face: 1.730 m/s Fully developed flow: No
Thermodynamic parameters	Temperature: 293.20 K
Turbulence parameters	Boundary layer parameters
Boundary layer type: Turbulent	

Environment Pressure 1

Type	Environment Pressure
Faces	Face<364>@LID5-1 Face<365>@LID2-1 Face<366>@LID1-1 Face<369>@LID6-1 Face<368>@LID4-1 Face<367>@LID3-1
Coordinate system	Global coordinate system
Reference axis	X

Thermodynamic parameters	Environment pressure: 23118.00 Pa Temperature: 293.20 K
Turbulence parameters	Boundary layer parameters
Boundary layer type: Turbulent	

Inlet Volume Flow 1

Type	Inlet Volume Flow
Faces	Face<363>@LID8-1
Coordinate system	Face Coordinate System
Reference axis	X
Flow parameters	Flow vectors direction: Normal to face Volume flow rate: 6.6000e-005 m^3/s Relative to rotating frame: No Fully developed flow: No Inlet profile: 0
Thermodynamic parameters	Temperature: 293.20 K
Turbulence parameters	Boundary layer parameters
Boundary layer type: Turbulent	

Real Wall 1

Type	Real wall
Faces	
Coordinate system	Global coordinate system
Reference axis	X

1.5.5 Engineering Goals

Goals

Global Goals

GG Min Velocity (X) 1

Type	Global Goal
Goal type	Velocity (X)
Calculate	Minimum value
Coordinate system	Global coordinate system
Criteria	1.000 m/s
Use in convergence	On

GG Av Velocity (X) 1

Type	Global Goal
Goal type	Velocity (X)
Calculate	Average value
Coordinate system	Global coordinate system
Criteria	1.000 m/s
Use in convergence	On

GG Max Velocity (X) 1

Type	Global Goal
Goal type	Velocity (X)
Calculate	Maximum value
Coordinate system	Global coordinate system

Criteria	1.000 m/s
Use in convergence	On

Surface Goals

SG Mass Flow Rate 1

Type	Surface Goal
Goal type	Mass Flow Rate
Faces	LID8-1@TURBIN TESLA 30 ASSEMBLY
Coordinate system	Global coordinate system
Criteria	1.0000 kg/s
Use in convergence	On

SG Mass Flow Rate 2

Type	Surface Goal
Goal type	Mass Flow Rate
Faces	LID6-1@TURBIN TESLA 30 ASSEMBLY LID4-1@TURBIN TESLA 30 ASSEMBLY LID1-1@TURBIN TESLA 30 ASSEMBLY LID5-1@TURBIN TESLA 30 ASSEMBLY LID3-1@TURBIN TESLA 30 ASSEMBLY LID2-1@TURBIN TESLA 30 ASSEMBLY
Coordinate system	Global coordinate system
Criteria	1.0000 kg/s
Use in convergence	On

SG Av Static Pressure 1

Type	Surface Goal
Goal type	Static Pressure
Calculate	Average value
Faces	LID8-1@TURBIN TESLA 30 ASSEMBLY
Coordinate system	Global coordinate system
Criteria	1.00 Pa
Use in convergence	On

Equation Goals

Torque

Type	Equation Goal
Formula	(SG Av Static Pressure 1*0.000013*0.03)*19
Dimensionality	No units
Criteria	1.0000000
Use in convergence	On

Efficiency

Type	Equation Goal
Formula	(Torque*8.73)/(9.81*10*SG Mass Flow Rate 1)
Dimensionality	No units
Criteria	1.0000000
Use in convergence	On

Power

Type	Equation Goal
Formula	(Torque*8.73)/(9.81*10*SG Mass Flow Rate 1)*8.73*(SG Av Static Pressure 1*0.000013*0.03)*19
Dimensionality	No units
Criteria	1.0000000
Use in convergence	On

1.6 Analysis Time

Calculation Time: 1046 s
Number of Iterations: 50

2 Results

2.1 Analysis Goals

Goals

Name	Unit	Value	Progress	Criteria	Delta	Use in convergence
GG Min Velocity (X) 1	m/s	-4.934	0	0	12.5194645	On
GG Av Velocity (X) 1	m/s	1.020	0	0	0.67912719	On
GG Max Velocity (X) 1	m/s	14.167	0	0	3.27777903	On
SG Mass Flow Rate 1	kg/s	0.0657	0	0	4.76538589e-005	On
SG Mass Flow Rate 2	kg/s	-0.0633	0	0	0.034724576	On
SG Av Static Pressure 1	Pa	11127.90	0	0	8641.52001	On
Torque	N.m	0.0824578	0	0	0.0640336632	On
Efficiency	%	0.1116841	0	0	0.0864018638	On
Power	Watt	0.0803965	0	0	0.189698472	On

2.2 Global Min-Max-Table

Min/Max Table

Name	Minimum	Maximum
Density (Fluid) [kg/m^3]	5.74	998.96
Mass Fraction of Condensate [ ]	0	0
Mass Fraction of Vapour [ ]	0	1.0000000
Pressure [Pa]	-1346.17	535083.84
Temperature [K]	279.99	299.55
Temperature (Fluid) [K]	279.99	299.55
Velocity [m/s]	0	8.971
Velocity (X) [m/s]	-4.849	7.579
Velocity (Y) [m/s]	-4.594	4.297
Velocity (Z) [m/s]	-8.893	8.114
Volume Fraction of Vapour [ ]	0	1.0000000
Domain Index [ ]	0	10
Domain Index (Fluid) [ ]	0	9
Normal [ ]	1.0000000	1.0000000
Normal (X) [ ]	-0.9999955	0.9999968
Normal (Y) [ ]	-1.0000000	1.0000000
Normal (Z) [ ]	-1.0000000	1.0000000
Radius r (cylindrical) [m]	0.004	0.237

Wall Distance [m]	-1.000	-1.000
Mach Number [ ]	0	2.66
Mach Number RRF [ ]	0	2.66
Velocity RRF [m/s]	0	8.971
Velocity RRF (X) [m/s]	-4.849	7.523
Velocity RRF (Y) [m/s]	-4.594	4.297
Velocity RRF (Z) [m/s]	-8.893	8.114
Vorticity [1/s]	0	21516.63
Vorticity (X) [1/s]	-13152.94	10525.71
Vorticity (Y) [1/s]	-14891.96	16507.07
Vorticity (Z) [1/s]	-15512.94	15554.08
Relative Pressure [Pa]	-28249.51	508180.51
Shear Stress [Pa]	0	10161.46
Real Gas State [ ]	1.0000000	12.0000000
Bottleneck Number [ ]	0	1.0000000
Heat Transfer Coefficient [W/m^2/K]	0	0
ShortCut Number [ ]	0	1.0000000
Surface Heat Flux [W/m^2]	0	0
Surface Heat Flux (Convective) [W/m^2]	-1.726e+010	1.805e+010
Acoustic Power [dB]	3.93e-024	9.38e+008

3 Appendix

3.1 Material Data

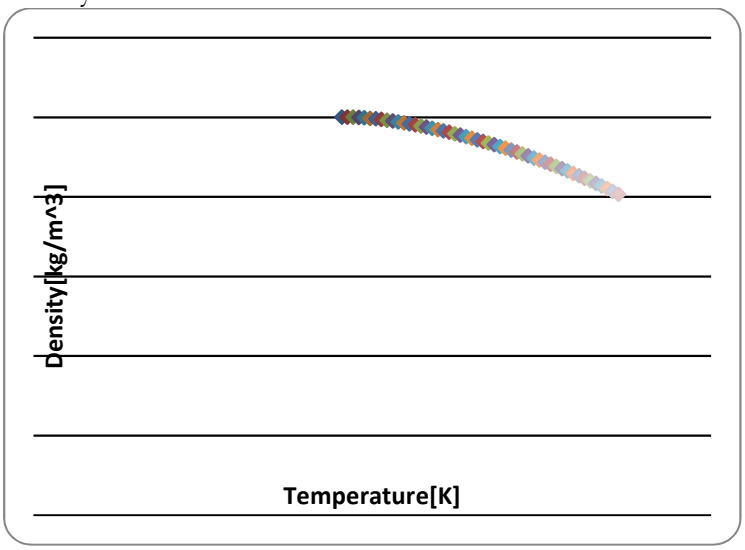
Engineering Database

Liquids

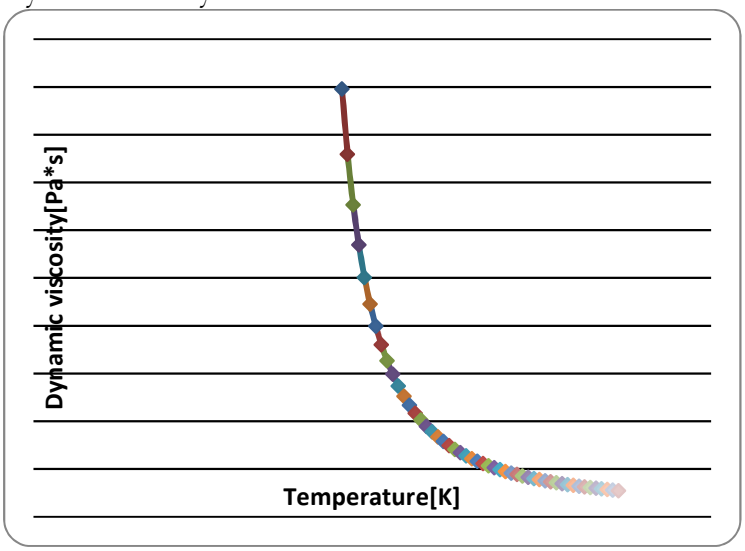
Water

Path: Liquids Pre-Defined

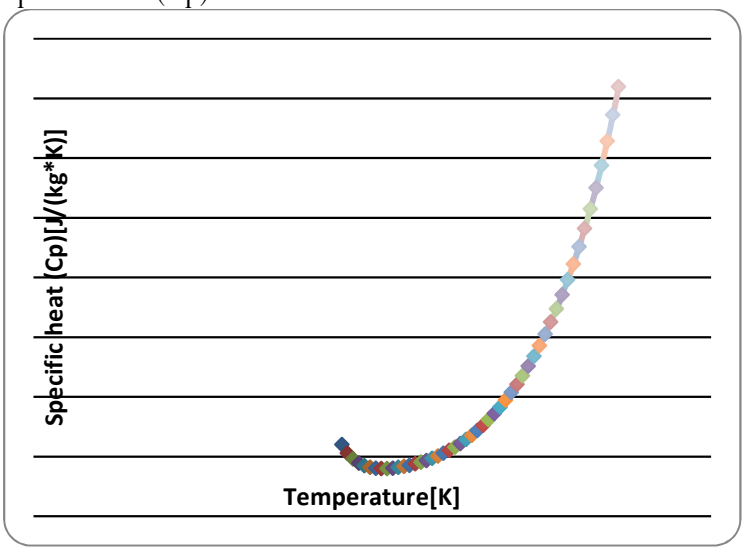
Density



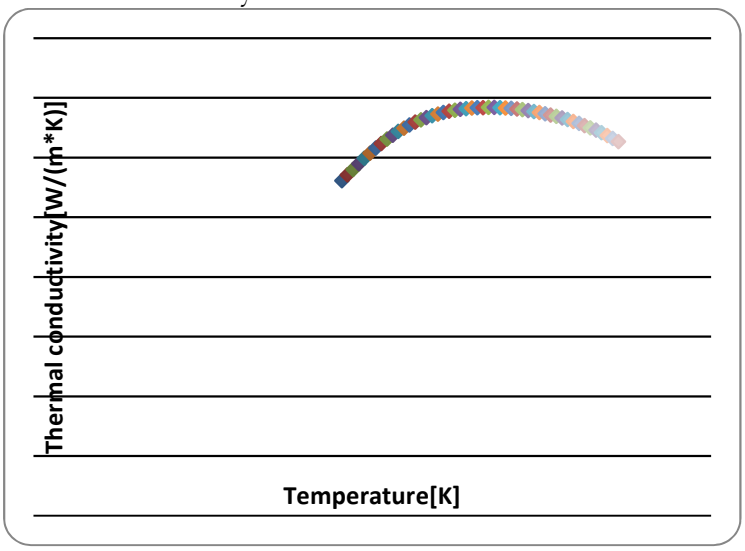
Dynamic viscosity



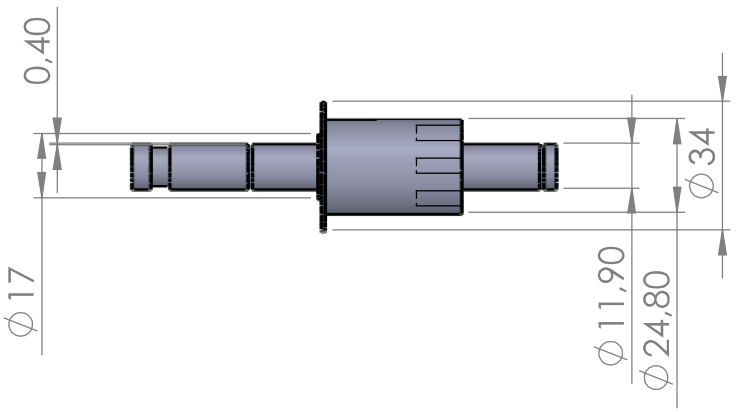
Specific heat (Cp)

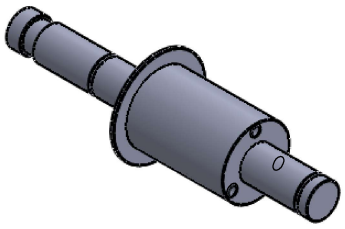


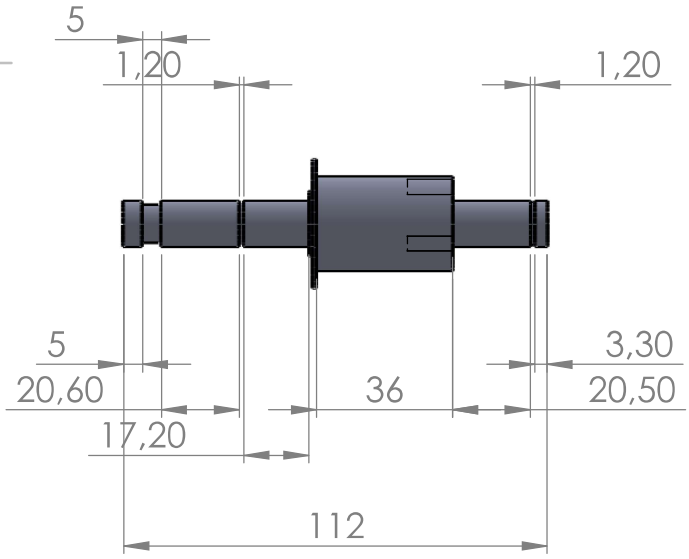
Thermal conductivity

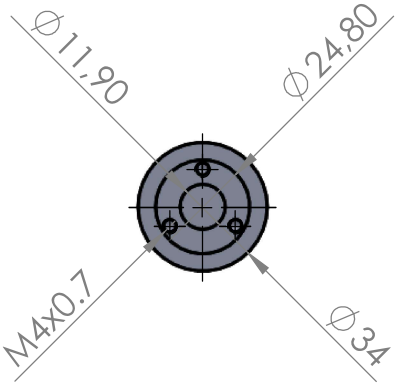


Cavitation effect: Yes
Temperature: 0 K
Saturation pressure: 0 Pa
Radiation properties: No







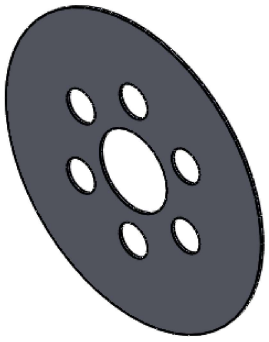


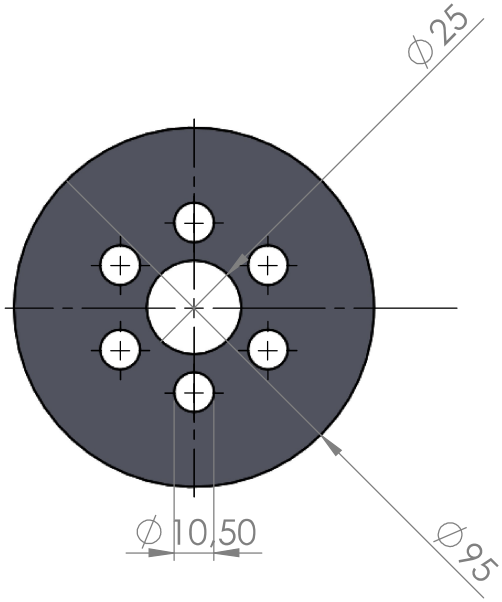
NO.	PART NUMBER	QTY.	DESCRIPTION	MATERIAL

TITLE:

rotor shaft

FAKULTAS TEKNIK UNIVERSITAS MUHAMMADIYAH SURABAYA	SCALE:1:2	DRAWN: DANUR RISWANTO	DOCUMENT TYPE: PART
		APPV'D: A. HANIF FIRDAUS, ST., MT., Msc.	IDENTIFICATION NO.
	UNIT MM	DATE: 24/01/2019	REVISION





NO.	PART NUMBER	QTY.	DESCRIPTION	MATERIAL

TITLE: **Disc**

FAKULTAS TEKNIK
UNIVERSITAS MUHAMMADIYAH SURABAYA

DRAWN: DANUR RISWANTO		DOCUMENT TYPE: PART
APPV'D: A. HANIF FIRDAUS, ST., MT., Msc.		IDENTIFICATION NO.
SCALE:1:1		REVISION
UNIT MM	DATE: 24/01/2019	SHEET 2 OF 16

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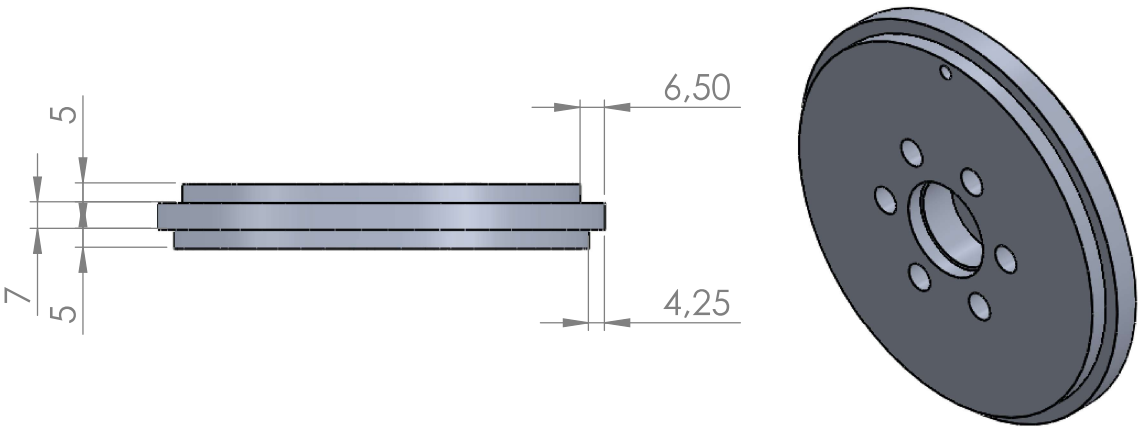
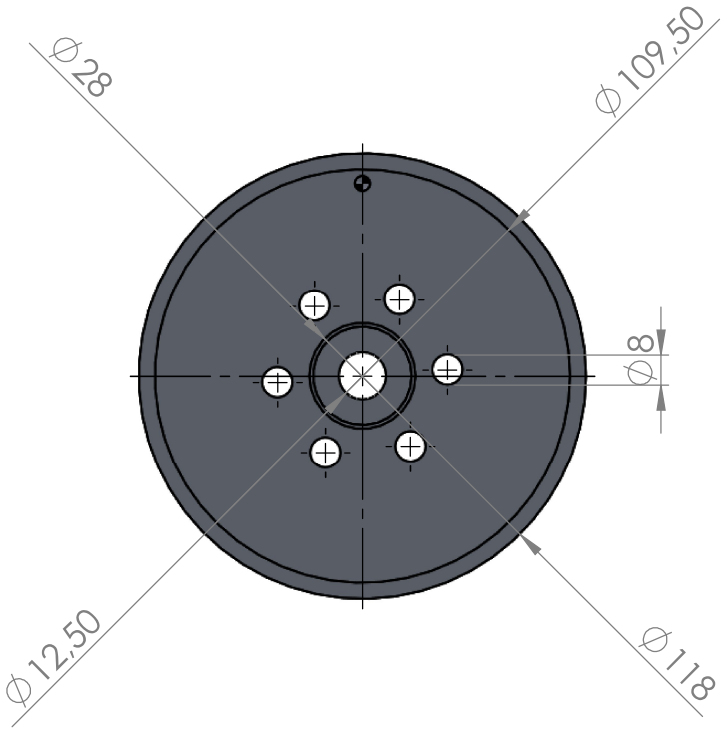
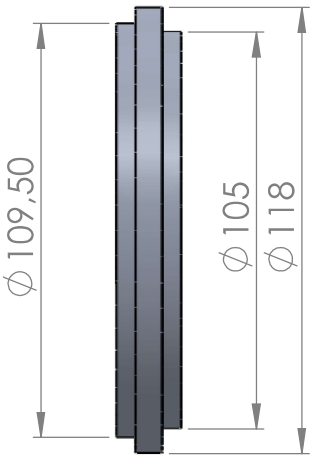




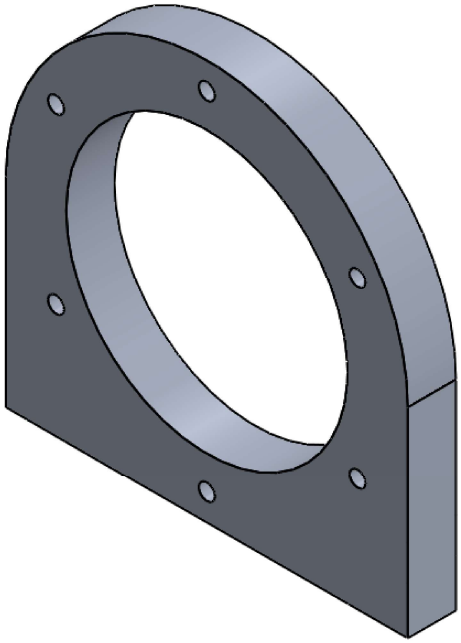


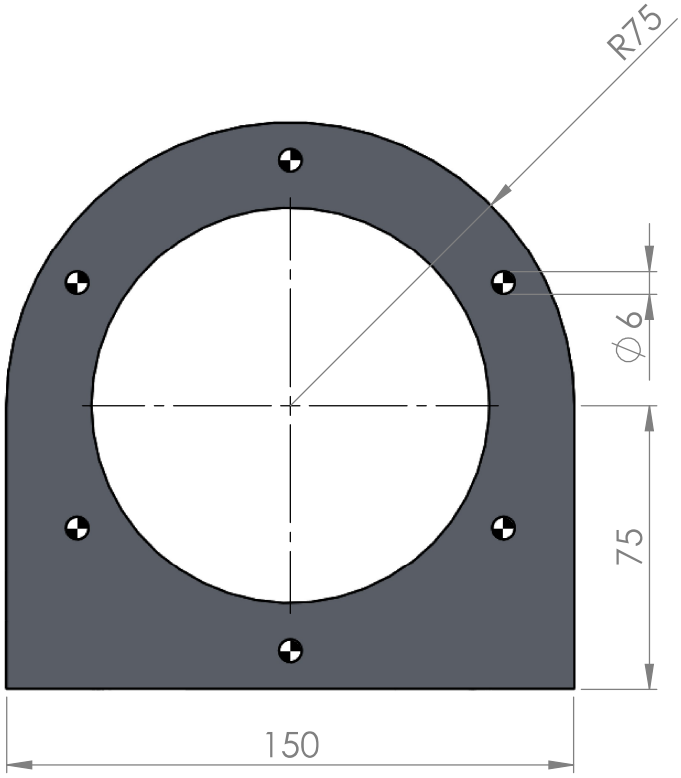
NO.	PART NUMBER	QTY.	DESCRIPTION	MATERIAL

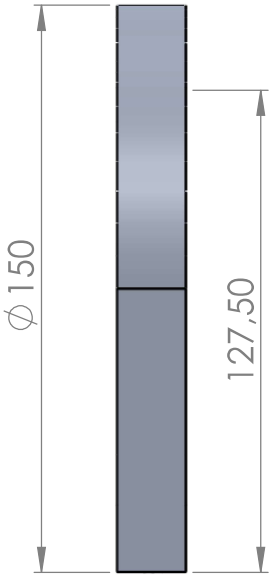
TITLE: **End Cap**

FAKULTAS TEKNIK
UNIVERSITAS MUHAMMADIYAH SURABAYA

DRAWN	DANUR RISWANTO
APPV'D	A. HANIF FIRDAUS, ST., MT., Msc.
DATE	24/01/2019
SCALE	1:2
UNIT	MM
DOCUMENT TYPE.	PART
IDENTIFICATION NO.	
REVISION	







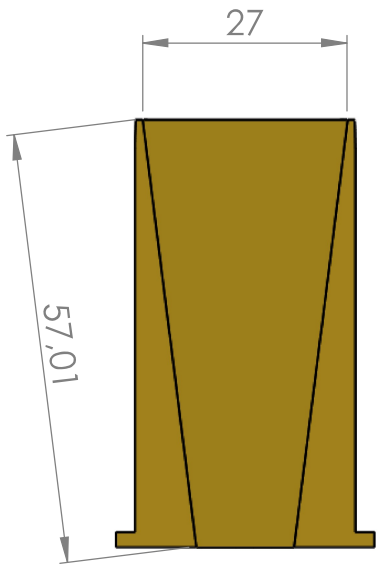
NO.	PART NUMBER	QTY.	DESCRIPTION	MATERIAL

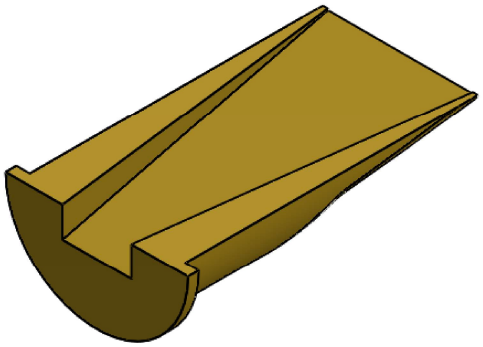
TITLE:

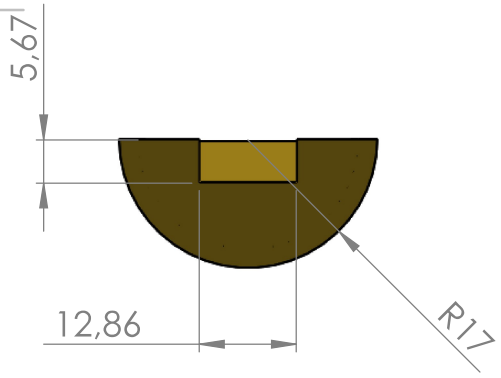
End Clamp

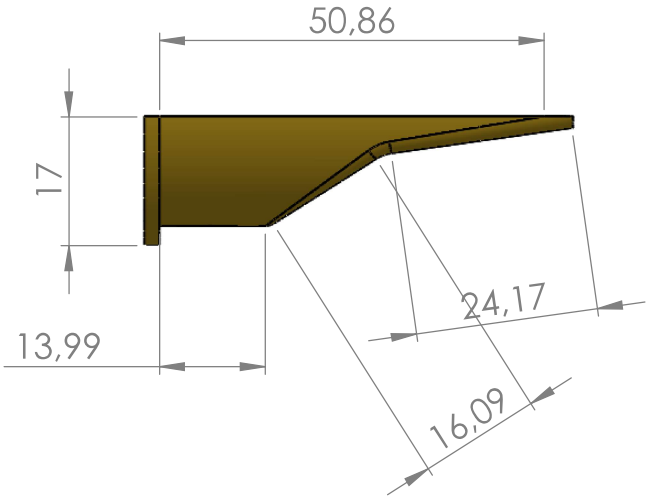
FAKULTAS TEKNIK
UNIVERSITAS MUHAMMADIYAH SURABAYA

SCALE:1:2	DRAWN: DANUR RISWANTO	DOCUMENT TYPE: PART
UNIT MM	APPV'D: A. HANIF FIRDAUS, ST., MT., Msc.	IDENTIFICATION NO.
	DATE: 24/01/2019	REVISION









NO.	PART NUMBER	QTY.	DESCRIPTION	MATERIAL

TITLE: **Nozzle**

FAKULTAS TEKNIK
UNIVERSITAS MUHAMMADIYAH SURABAYA

SCALE:1:1

UNIT MM

DRAWN: DANUR RISWANTO

APPV'D: A. HANIF FIRDAUS, ST., MT., Msc.

DATE: 24/01/2019

DOCUMENT TYPE: PART

IDENTIFICATION NO.

REVISION

SHEET 5 OF 16

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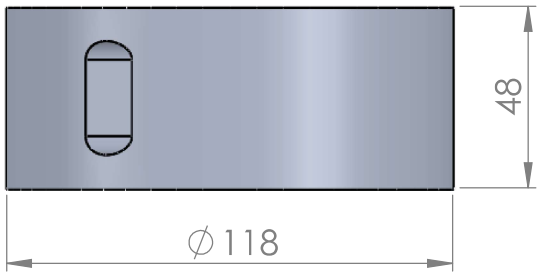

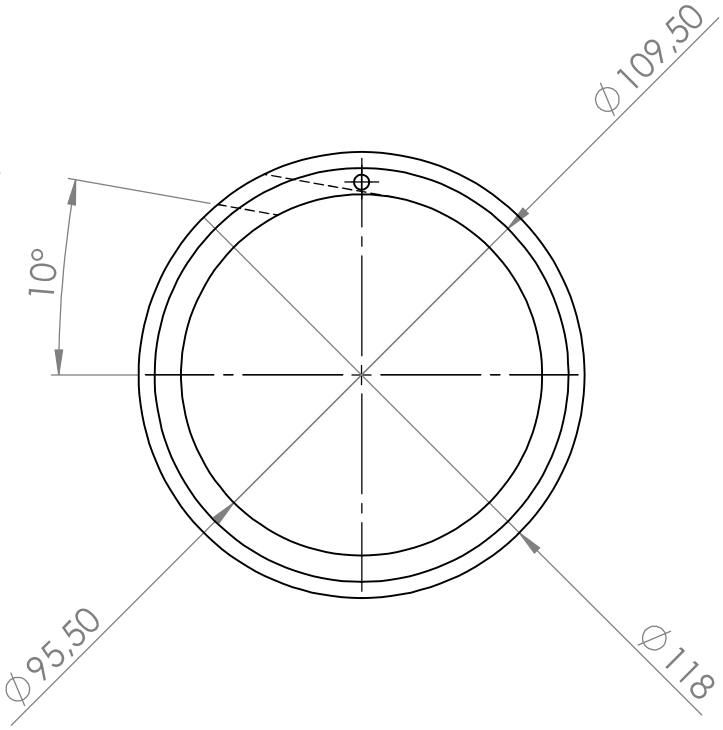

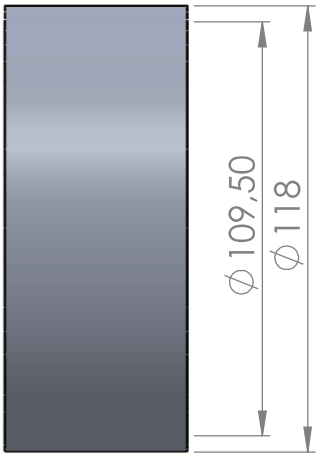

NO.	PART NUMBER	QTY.	DESCRIPTION	MATERIAL

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Housing 10

FAKULTAS TEKNIK
UNIVERSITAS MUHAMMADIYAH SURABAYA

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		APPV'D: A. HANIF FIRDAUS, ST., MT., Msc.	IDENTIFICATION NO.
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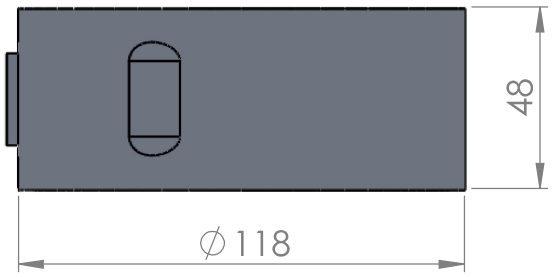
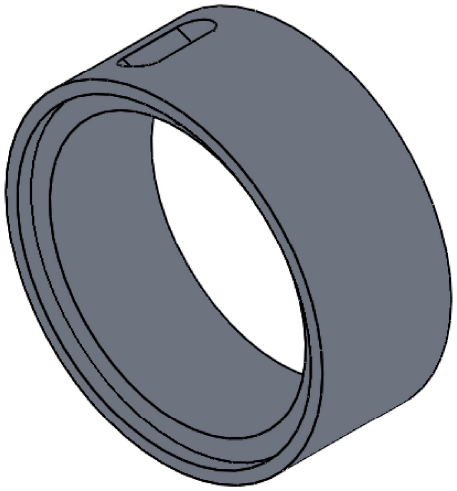
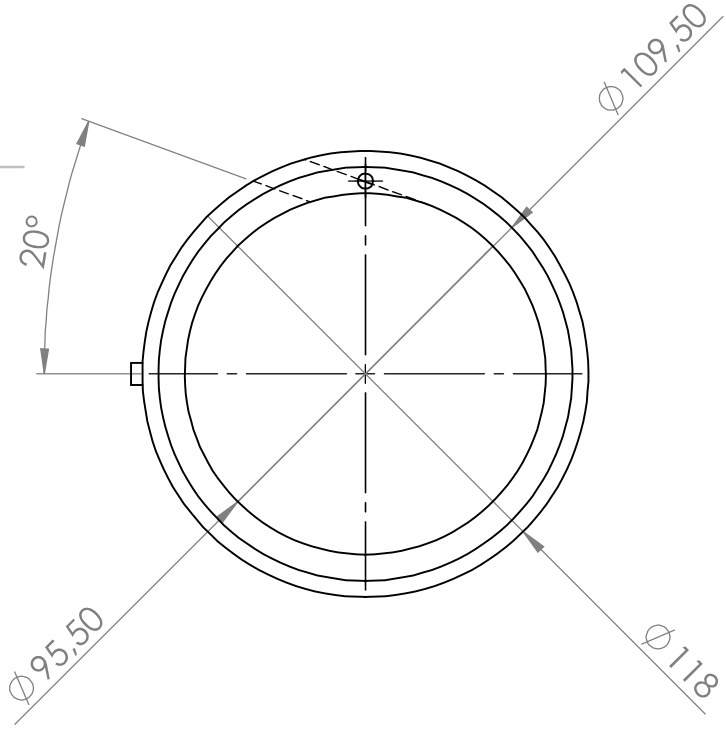
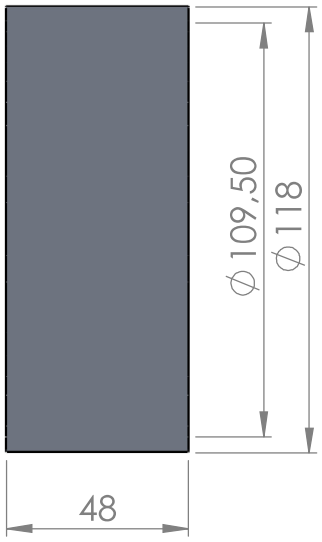
	UNIT MM		SHEET 6 OF 16

A4









NO.	PART NUMBER	QTY.	DESCRIPTION	MATERIAL

TITLE:

Housing 20

FAKULTAS TEKNIK
UNIVERSITAS MUHAMMADIYAH SURABAYA

SCALE:1:2

UNIT MM

DRAWN: DANUR RISWANTO

APPV'D: A. HANIF FIRDAUS, ST., MT., Msc.

DATE: 24/01/2019

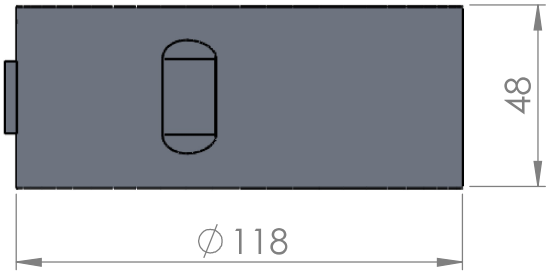
DOCUMENT TYPE: PART

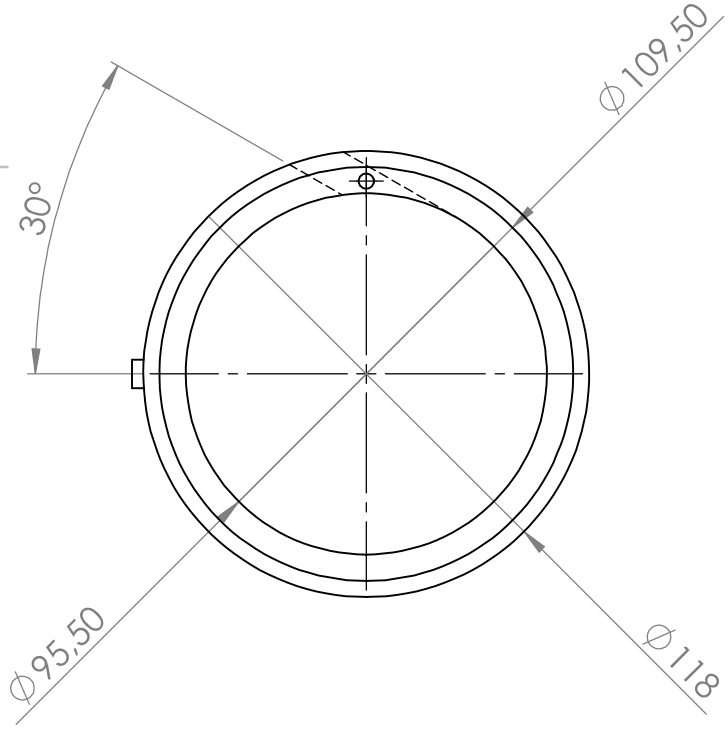
IDENTIFICATION NO.

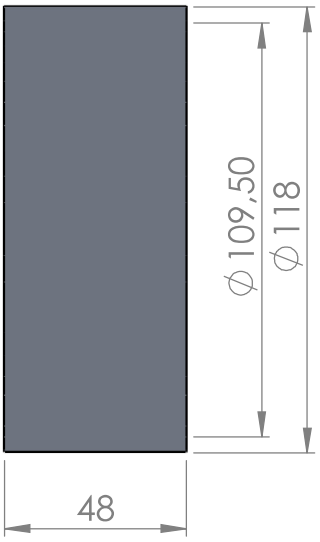
REVISION

SHEET 7 OF 16

A4







NO.	PART NUMBER	QTY.	DESCRIPTION	MATERIAL

TITLE: Housing 30

FAKULTAS TEKNIK
UNIVERSITAS MUHAMMADIYAH SURABAYA

SCALE:1:2

UNIT MM

DRAWN: DANUR RISWANTO

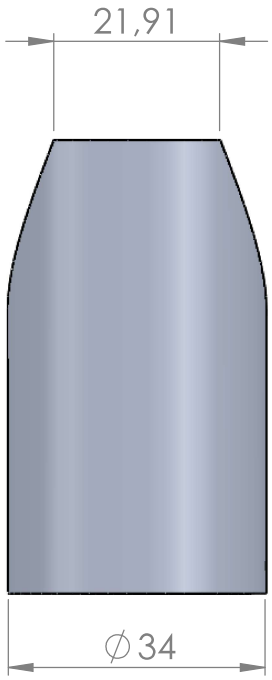
APPV'D: A. HANIF FIRDAUS, ST., MT., Msc.

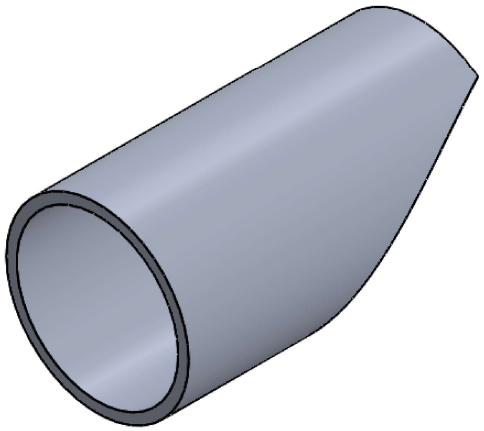
DATE: 24/01/2019

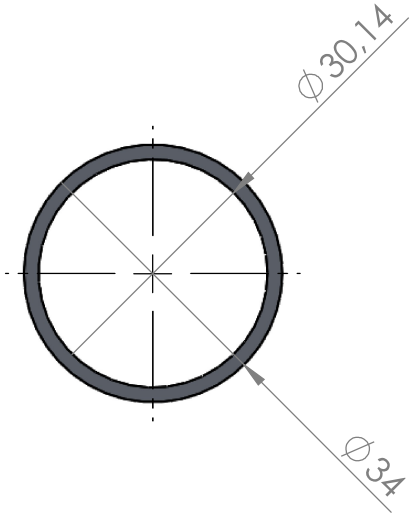
DOCUMENT TYPE: PART

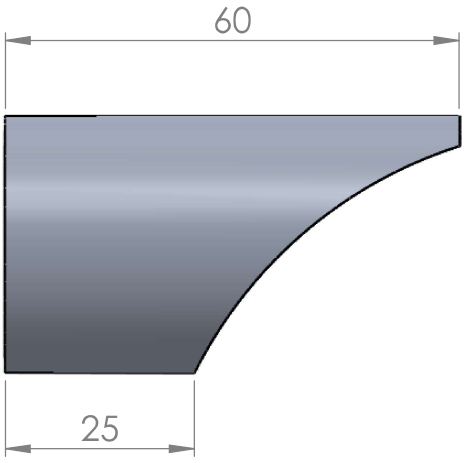
IDENTIFICATION NO.

REVISION









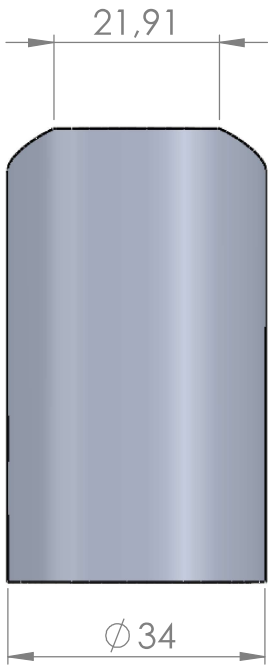
NO.	PART NUMBER	QTY.	DESCRIPTION	MATERIAL

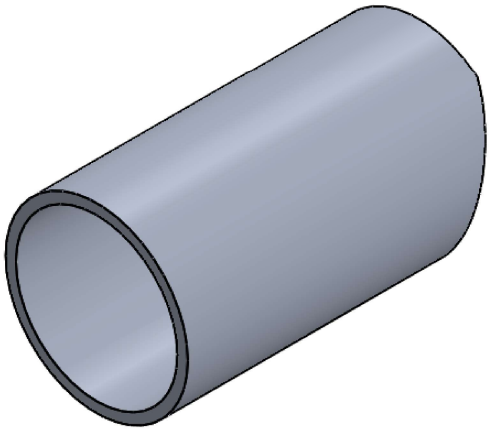
TITLE:

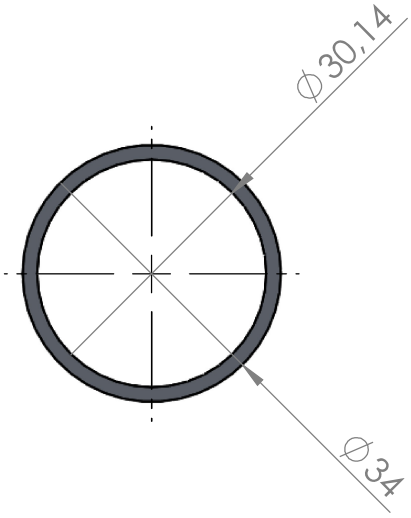
Pipa 10 & 20

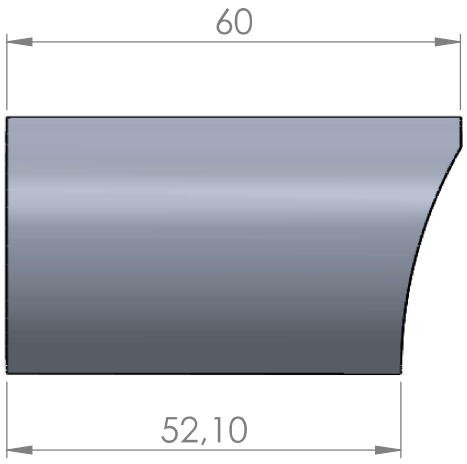
FAKULTAS TEKNIK
UNIVERSITAS MUHAMMADIYAH SURABAYA

DRAWN: DANUR RISWANTO		DOCUMENT TYPE: PART
APPV'D: A. HANIF FIRDAUS, ST., MT., Msc.	SCALE:1:1	IDENTIFICATION NO.
DATE: 24/01/2019	UNIT MM	REVISION









NO.	PART NUMBER	QTY.	DESCRIPTION	MATERIAL

TITLE: Pipa 30

FAKULTAS TEKNIK
UNIVERSITAS MUHAMMADIYAH SURABAYA

SCALE:1:1

UNIT MM

DRAWN: DANUR RISWANTO

APPV'D: A. HANIF FIRDAUS, ST., MT., Msc.

DATE: 24/01/2019

DOCUMENT TYPE: PART

IDENTIFICATION NO.

REVISION

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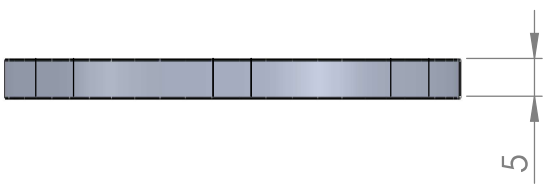

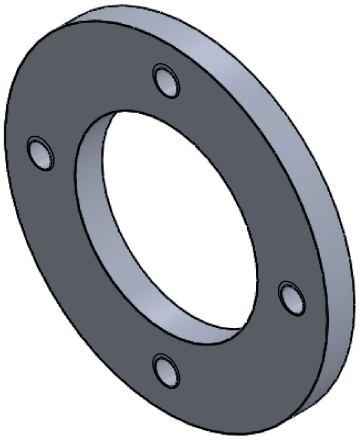

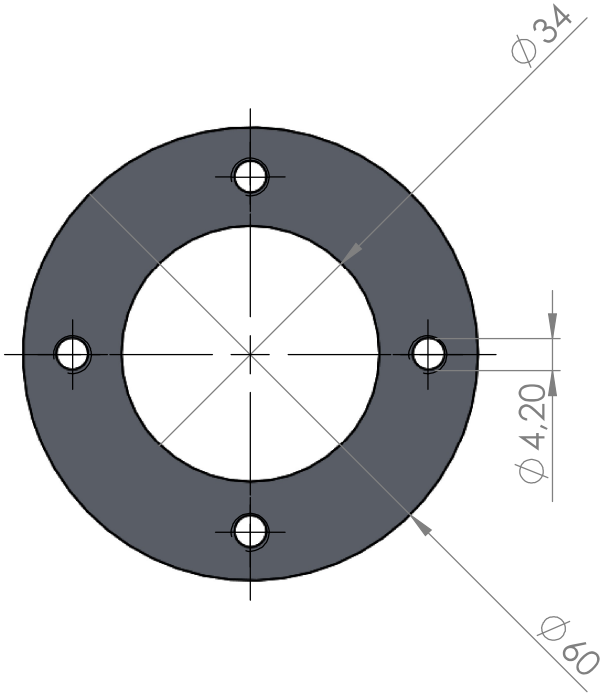

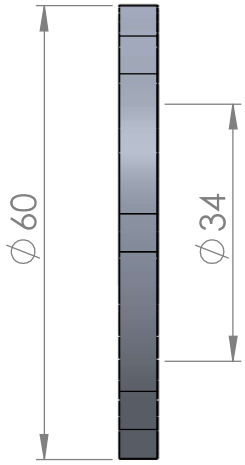

NO.	PART NUMBER	QTY.	DESCRIPTION	MATERIAL

TITLE:

Flange A

FAKULTAS TEKNIK
UNIVERSITAS MUHAMMADIYAH SURABAYA

SCALE:1:1	DRAWN: DANUR RISWANTO	DOCUMENT TYPE: PART	
UNIT MM	APPV'D: A. HANIF FIRDAUS, ST., MT., Msc.	IDENTIFICATION NO.	
	DATE: 24/01/2019	REVISION	SHEET 11 OF 16

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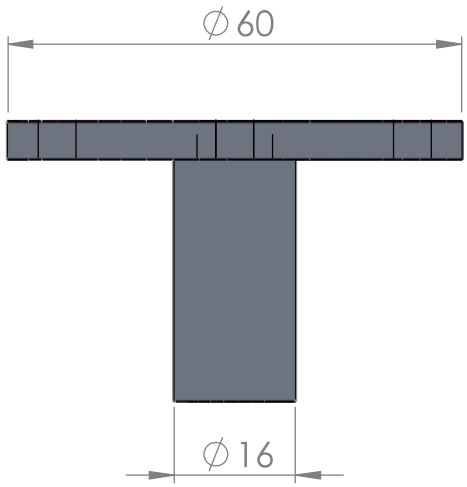

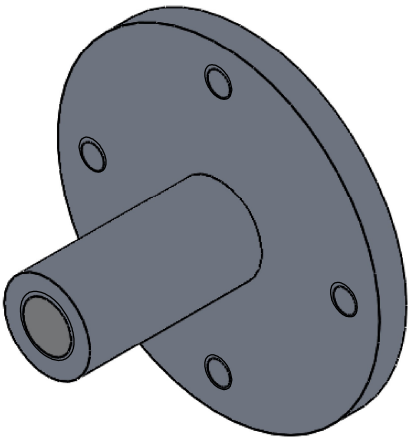

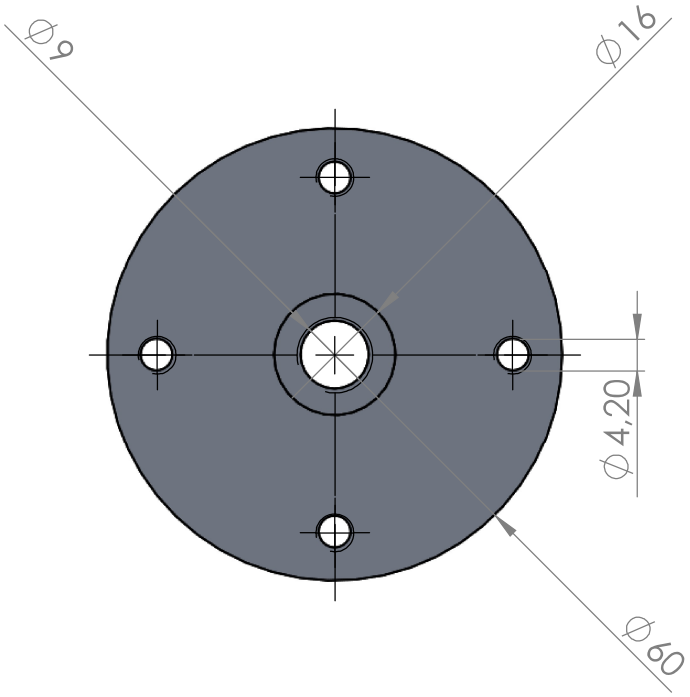

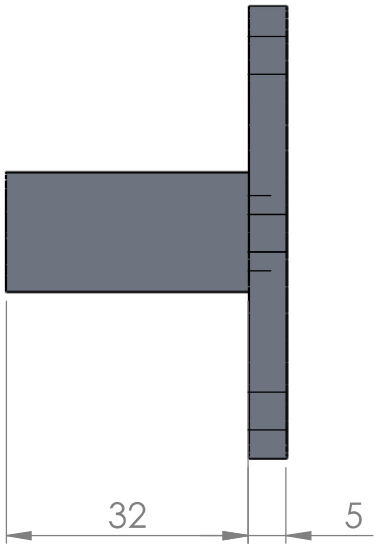

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FAKULTAS TEKNIK
UNIVERSITAS MUHAMMADIYAH SURABAYA

SCALE:1:1

UNIT MM

DRAWN: DANUR RISWANTO

APPV'D: A. HANIF FIRDAUS, ST., MT., Msc.

DATE: 24/01/2019

DOCUMENT TYPE: PART

IDENTIFICATION NO.

REVISION

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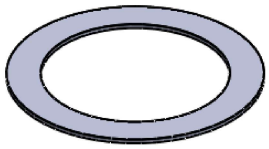

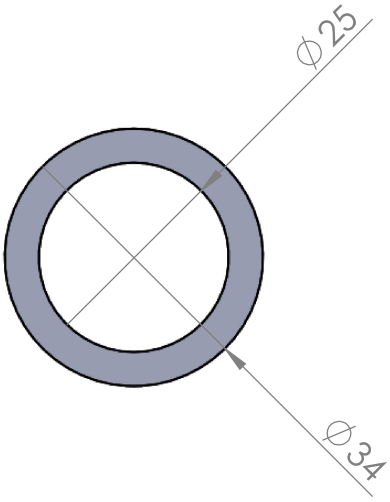

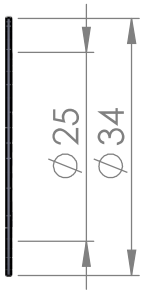

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FAKULTAS TEKNIK
UNIVERSITAS MUHAMMADIYAH SURABAYA

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UNIT MM	APPV'D: A. HANIF FIRDAUS, ST., MT., Msc.	IDENTIFICATION NO.	
	DATE: 24/01/2019	REVISION	SHEET 13 OF 16

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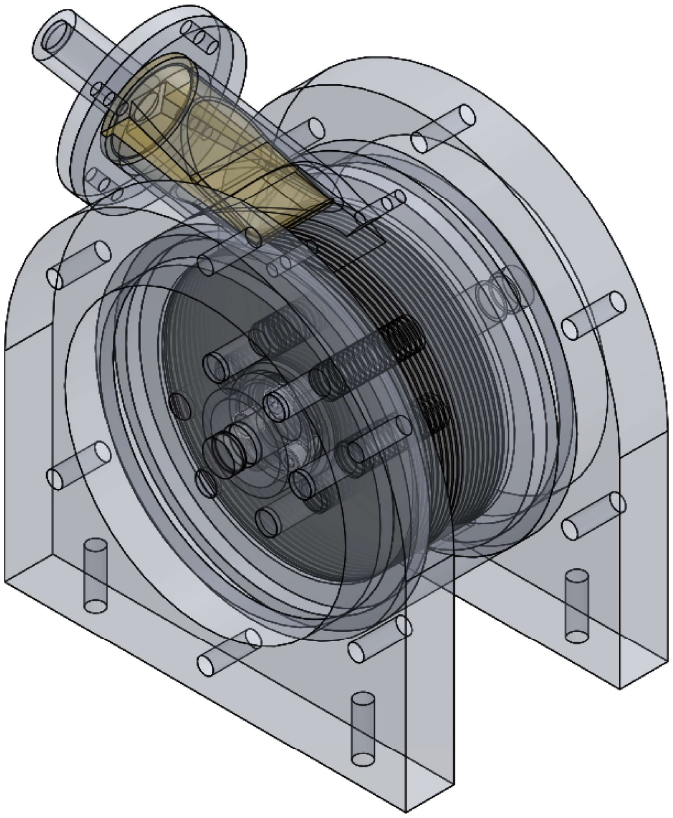

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FAKULTAS TEKNIK
UNIVERSITAS MUHAMMADIYAH SURABAYA

SCALE:1:5	DRAWN: DANUR RISWANTO	DOCUMENT TYPE: ASSEMBLY
UNIT MM	APPV'D: A. HANIF FIRDAUS, ST., MT., Msc.	IDENTIFICATION NO.
	DATE: 24/01/2019	REVISION

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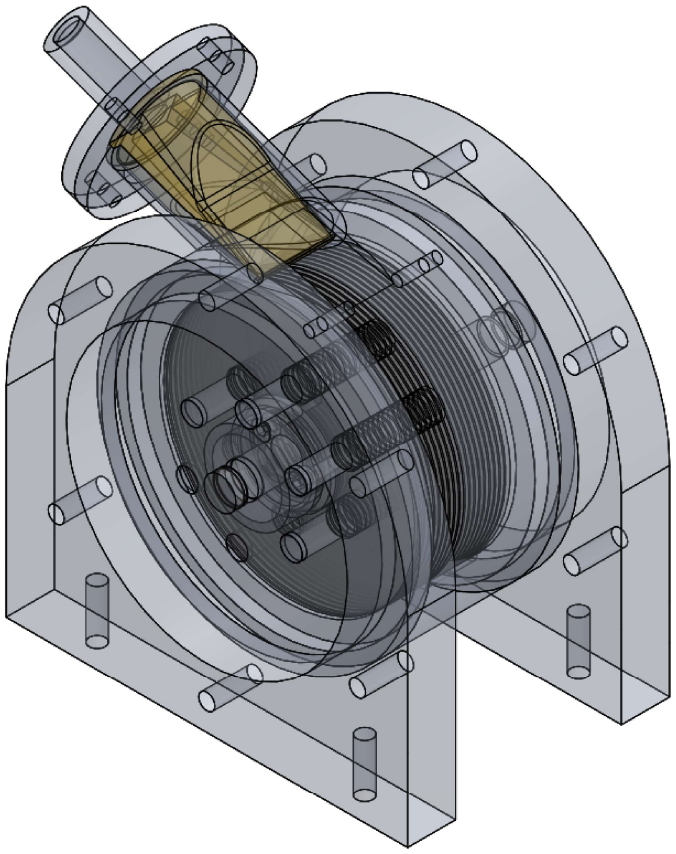

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Turbin Tesla 20

FAKULTAS TEKNIK
UNIVERSITAS MUHAMMADIYAH SURABAYA

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UNIT MM	APPV'D: A. HANIF FIRDAUS, ST., MT., Msc.	IDENTIFICATION NO.
	DATE: 24/01/2019	REVISION

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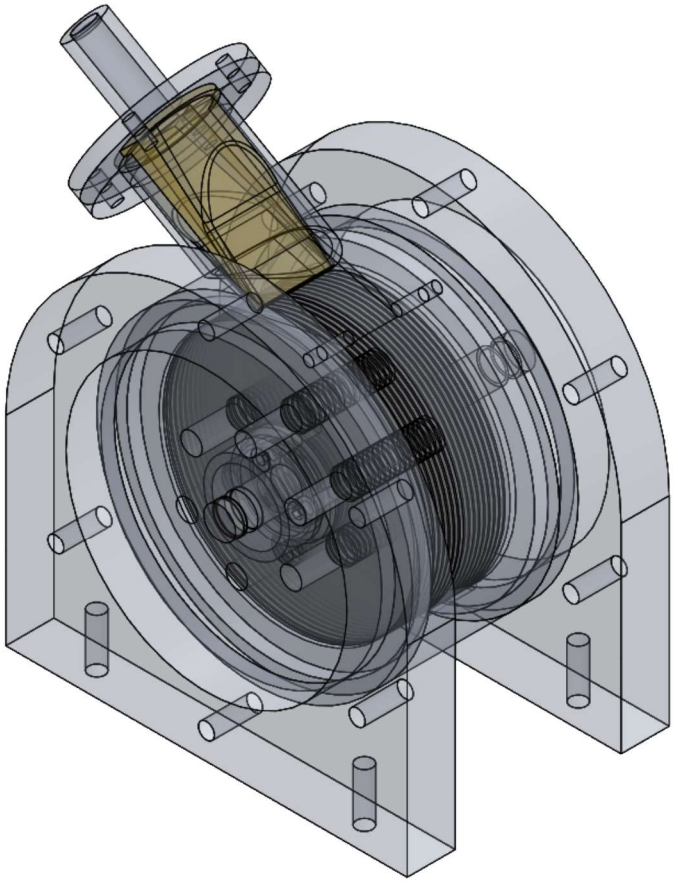

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FAKULTAS TEKNIK
UNIVERSITAS MUHAMMADIYAH SURABAYA

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UNIT MM	APPV'D: A. HANIF FIRDAUS, ST., MT., Msc.	IDENTIFICATION NO.
	DATE: 24/01/2019	REVISION

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