

System Wheels & Tires

**Assembly** Wheel Assembly

P/N Base WT A0100

Suffix AA

**Details** Complete Wheel Assembly

Back to BOM

**Car #** 81

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Asm Cost \$ 175,23 Qty 4

FileLink1 FileLink2 FileLink3

**Extended (** \$ 700,92

temOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Suk	Total
10	Wheel, 13", 1 Piece OZ, Aluminum	Rim	\$ 80,00		unit							1	\$	80,00
20	Tire, Hoosier, R25B, 13"-20.5 x 7.0	Tire	\$ 85,00		unit							1	\$	85,00
30	Valve Stem (and Tire Inflation)		\$ 1,00		unit							1	\$	1,00
	NA/haal NA/aighta (and Dalanaina)	Balancing and set up												
40	Wheel Weights (and Balancing)	the wheel	\$ 4,00		unit							1	\$	4,00
	S												\$	170,00

<b>ItemOrder</b>	Process	Use	Unit	Cost	Unit	Quantity	Multiplier	Mult. Val.	Sub	Total
10	Assemble, 5kg, Line-on-Line	Fix Wheel on Hubs	\$	0,63	unit	1		1	\$	0,63
20	Ratchet <= 25.4 mm	Tighten Lug Nuts	\$	0,75	unit	4		1	\$	3,00
								Sub Total	\$	3,63

ItemOrder	Fastener	Use	UnitCost	Size1	Unit1	Size2	Unit2	Quantity	Sub	Total
10	Nut, Lug	Fix Wheel on Hubs	\$ 0,40		unit			4	\$	1,60
								Sub Total	\$	1,60



Back to BOM

**Car #** 81

Asm Cost \$ 346,18 Qty 2

FileLink1
FileLink2
FileLink3

**Extended (** \$ 692,35

System Wheels & Tires

Assembly Front Hubs

P/N Base WT A0200

Suffix AA

**Details** Assembly of a part of the wheel with the hub, bearings and a part to mesure the speed of the wheel

<b>ItemOrder</b>	Part	Part Cost		Quantity	Sul	b Total
10	Front Hub	\$	63,51	1	\$	63,51
20	Front Bearing Spacer	\$	2,62	1	\$	2,62
30	Front Wheel Spacer	\$	20,03	1	\$	20,03
40	Speed Sensor Spacer	\$	0,95	1	\$	0,95
50	Speed Sensor Disc	\$	9,71	1	\$	9,71
				Sub Total	\$	96,81

<b>ItemOrder</b>	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub	Total
	Wheel Bearing, Ball, Angular													
10	Contact		\$ 118,75	72	mm	17	mm					2	\$	237,49
20	Locknut/L.P.///Steel/	Bearing Nuts	\$ 5,98	35	mm							1	. \$	5,98
	A dla acius	Wheel studs and hub assemble, cost												
30	Adhesive	included in process	\$ -										\$	-
			•	•	•	•		•				<b>Sub Total</b>	\$	243,47

ItemOrder	Process	Use	Uni	tCost	Unit	Quantity	Multiplier	Mult. Val.	Suk	Total
10	Assemble, 1kg, Loose	Bearing spacer assemble on the hub	\$	0,06	unit	1		1	\$	0,06
20	Assemble, 1 kg, Interference	Bearings Assemble	\$	0,19	unit	2		1	\$	0,38
30	Assemble, 1kg, Loose	Speed sensor spacer assemble on the hub	\$	0,06	unit	1		1	\$	0,06
40	Assemble, 1kg, Loose	Speed sensor disc assemble on the hub	\$	0,06	unit	1		1	\$	0,06
50	Assemble, 1kg, Loose	Lock nut washer assemble on the hub	\$	0,06	unit	1		1	\$	0,06
80	Assemble, 1 kg, Line-on-Line	Locknut on hub	\$	0,13	Unit	1		1	\$	0,13
60	Liquid Applicator Gun	Wheel studs and hub assemble	\$	0,02	cm	15,07		1	\$	0,30
70	Assemble, 1 kg, Line-on-Line	Wheel studs and hub assemble	\$	0,13	unit	4		1	\$	0,52
80	Assemble, 1 kg, Loose	Front Wheel Spacer on hub	\$	0,06	Unit	1		1	\$	0,06
								Sub Total	\$	1,63

ItemOrder	Fastener	Use	Unit	Cost	Size1	Unit1	Size2	Unit2	Quantity	Sub	Total
10	Stud, Grade 12.9	Wheel Studs	\$	1,07	12	mm	62	mm	4	\$	4,26
									<b>Sub Total</b>	\$	4,26

System Wheels & Tires

Assembly Front Hubs

Part Front Hub
P/N Base WT 02001

Suffix AA

**Details** Main part of the assembly

Back to BOM

**Car #** 81

FileLink3

FileLink1
FileLink2

 Part Cost
 \$ 63,51

 Qty
 1

**Extended (** \$ 63,51

<b>ItemOrder</b>	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub To	tal
								round area, 130mm						
10	Aluminium, Premium		\$ 4,20	3,27	kg			diameter	0,013	0,091	2712	1	\$	13,75
												Sub Total	\$	13,75

emOrder	Process	Use	Uni	tCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total	
	Machining Setup,									
10	Install and Remove	Setup for turning	\$	1,30	Unit	1		1	\$	1,30
20	Machining	Turning	\$	0,04	cm^3	930,6	Material - Aluminium	1	\$	37,22
	Machining Setup,	Change the turning								
30	Change	setup	\$	0,65	Unit	1		1	\$	0,65
40	Machining	Turning	\$	0,04	cm^3	63,5	Material - Aluminium	1	\$	2,54
	Machining Setup,									
50	Change		\$	0,65	Unit	1		1	\$	0,65
60	Machining	Milling	\$	0,04	cm^3	149	Material - Aluminium	1	\$	5,96
	Machining Setup,									
70	Change		\$	0,65	Unit	1		1	\$	0,65
80	Machining	Milling	\$	0,04	cm^3	0,336	Material - Aluminium	1	\$	0,01
	Threading, Internal									
90	(machining)	For wheel studs	\$	0,10	cm	6	Material - Aluminium	1	\$	0,60
	Threading, External									
100	(machining)	For locknut	\$	0,10	cm	1,7	Material - Aluminium	1	\$	0,17
·		•	-			•		<b>Sub Total</b>	\$	49,76

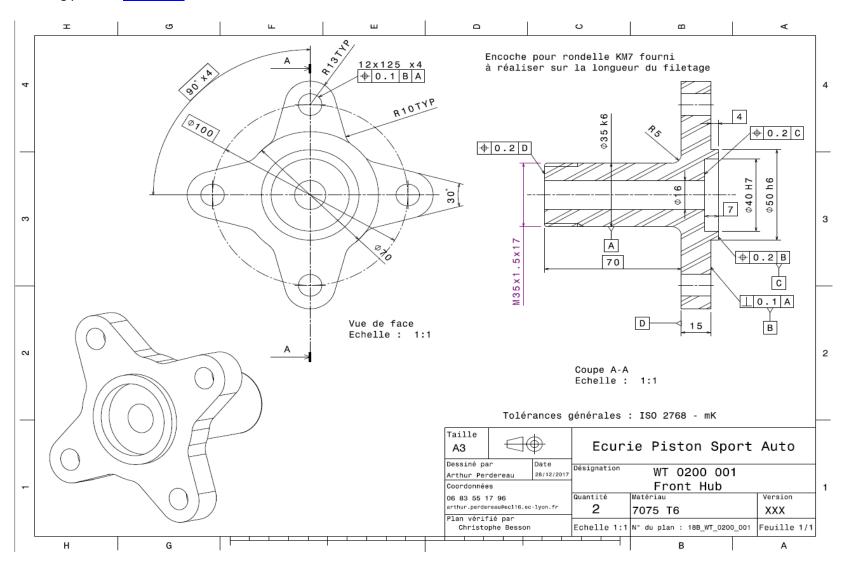
FileLink1 Drawing

FileLink2

FileLink3



Drawing part: WT 02001



System Wheels & Tires

Assembly Front Hubs
Part Wheel bearing spacer

**P/N Base** WT 02002

Suffix AA

**Details** Part to let a space beetween the hub and the first bearing

Back to BOM

**Car #** 81

FileLink1

FileLink2

FileLink3

 Part Cost
 \$ 2,62

 Qty
 1

**Extended (** \$ 2,62

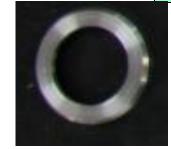
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	<b>Sub Total</b>	
								round area,						
10	Aluminium, Premium		\$ 4,20	0,06	kg			55mm diameter	0,002	0,009	2712	1		0,24
				•	•	•		•	•	•	•	Sub Total	\$ 0	0.24

ItemOrder	Process	Use	Unit	tCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total	
	Machining Setup, Install and									
10	Remove	Setup for turning	\$	1,30	Unit	1		1	\$	1,30
20	Machining	Turning	\$	0,04	cm^3	9,2	Material - Aluminium	1	\$	0,37
30	Machining Setup, Change	Change the turning setup	\$	0,65	Unit	1		1	\$	0,65
40	Machining	Turning	\$	0,04	cm^3	1,5	Material - Aluminium	1	\$	0,06
								Sub Total	\$	2,38

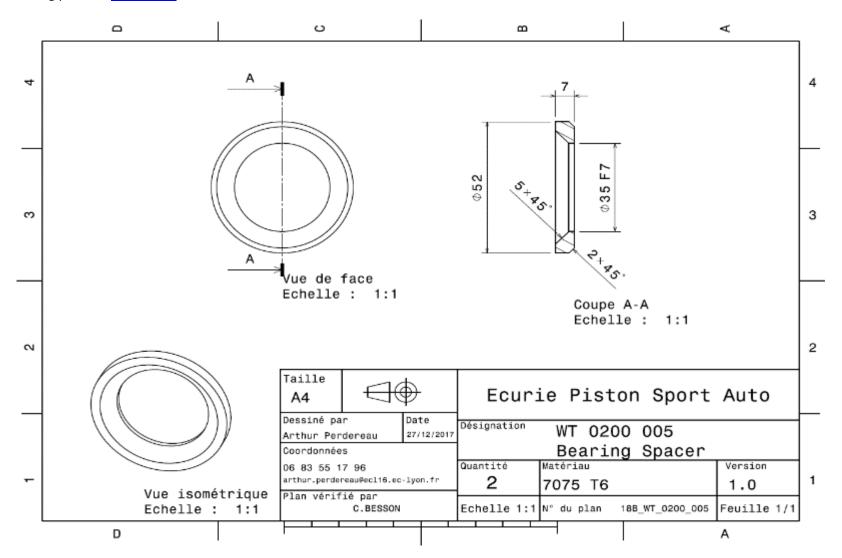
FileLink1 Drawing

FileLink2

FileLink3



Drawing part: WT\_02002



81 Car#

FileLink1

FileLink2

FileLink3

20,03 Part Cost Qty 1

Extended (\$ 20,03

FileLink1 **Drawing** FileLink2

FileLink3

**P/N Base** WT 02003

Assembly Front Hubs

University Ecole Centrale de Lyon

Wheels & Tires

Front Wheel Spacer

Suffix ΑА

System

Part

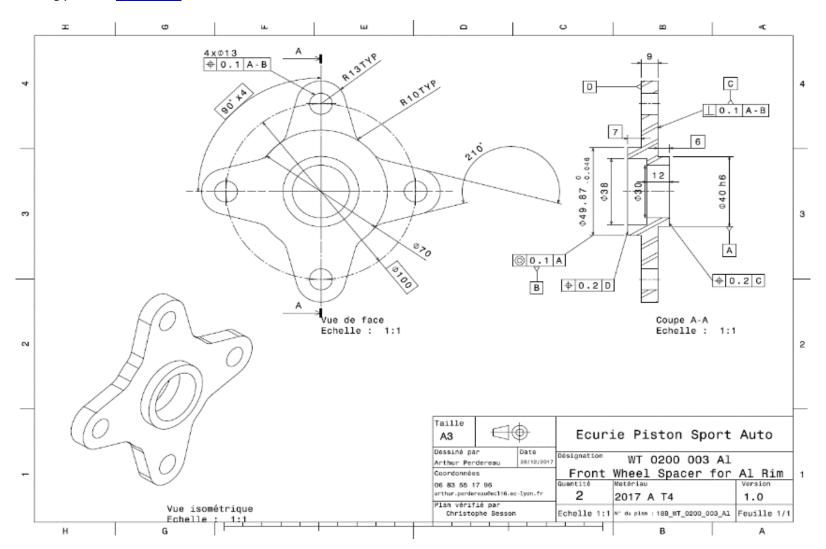
Details Part to position the wheel on the good position relative to the hub and upright assembly

ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
								round area, 130mm					
10	Aluminium, Premium		\$ 4,20	0,86	kg			diameter	0,013	0,024	2712	1	\$ 3,63
		_	•	•	•		•			•	•	Sub Total	\$ 3,63

<b>ItemOrder</b>	Process	Use	Unit	tCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total	
	Machining Setup,									
10	Install and Remove	Setup for turning	\$	1,30	Unit	1		1	\$	1,30
20	Machining	Turning	\$	0,04	cm^3	112	Material - Aluminium	1	\$	4,48
	Machining Setup,									
30	Change	Change the turning setup	\$	0,65	Unit	1		1	\$	0,65
40	Machining	Turning	\$	0,04	cm^3	84	Material - Aluminium	1	\$	3,36
	Machining Setup,									
50	Change		\$	0,65	Unit	1		1	\$	0,65
60	Machining	Milling	\$	0,04	cm^3	149	Material - Aluminium	1	\$	5,96
		-	-		-	-		Sub Total	Ś	16,40



Drawing part : WT 02003



Car# 81 Part Cost \$ 0,95 Qty 1

Extended (\$ 0,95

Wheels & Tires FileLink1 Drawing Assembly Front Hubs

FileLink2 FileLink3

FileLink1 FileLink2 FileLink3

Suffix Details Part to avoid the speed sensor disc to interfere with the Upright

University Ecole Centrale de Lyon

Speed sensor spacer

System

**P/N Base** WT 02004

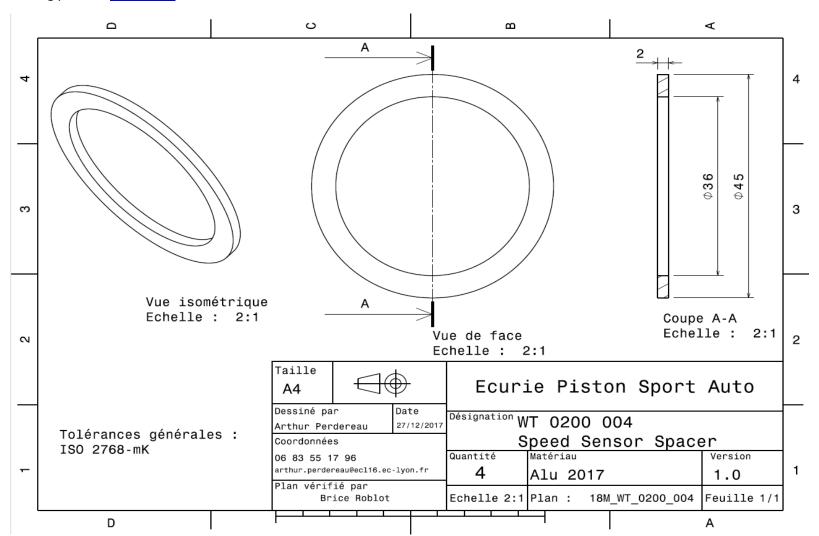
Part

ItemOrder Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10 Aluminum, Normal		\$ 4,20	0,011	kg			Square area 45x45mm	0,002	0,002	2712	1	\$ 0,05
									100		Sub Total	\$ 0,05

ItemOrder	Process	Use	UnitC	Cost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total	
	Machining Setup, Install and	Setup for								
10	Remove	turning	\$	1,30	Unit	1	one setup for 2 pieces	0,5	\$	0,65
20	Laser cut		\$	0,01	cm	25,4		1	\$	0,25
								Sub Total	\$	0,90



Drawing part: WT\_02004



Back to

FileLink1 Drawing

FileLink2

FileLink3

Back to BOM Car #

 Part Cost
 \$ 9,71

 Qty
 1

FileLink1
FileLink2
FileLink3

**Extended (** \$ 9,71

Assembly Front Hubs
Part Speed Sensor Disc

University Ecole Centrale de Lyon

Wheels & Tires

**P/N Base** WT 02005

Suffix AA

System

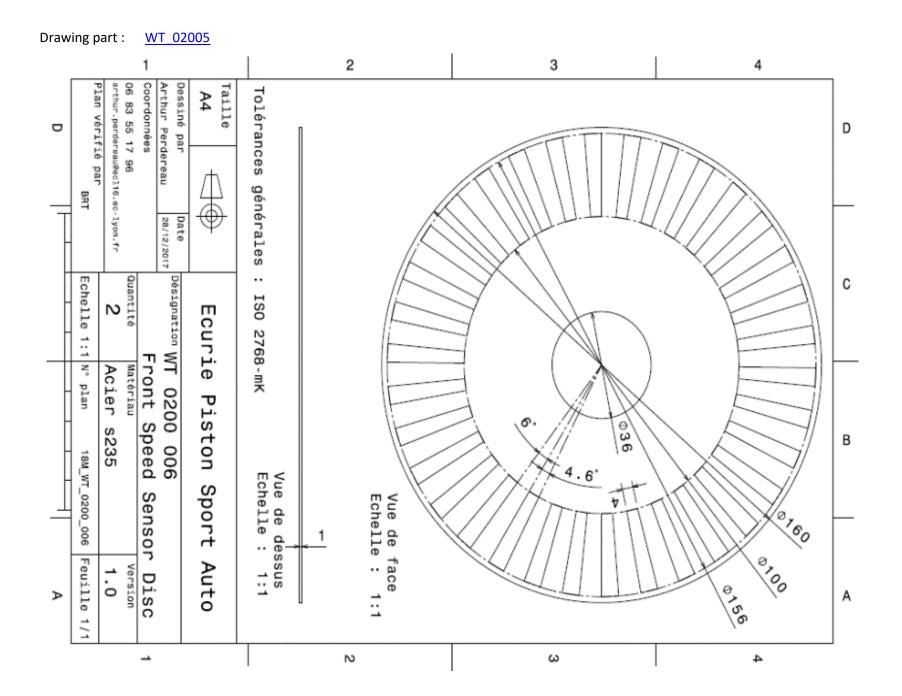
**Details** Disc use in combination with a sensor to obtain the speed of a wheel

ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
	Steel, Mild							rectangular area,					
10	Steel, Willa		\$ 2,25	0,20	kg			160mm*160mm	0,026	0,001	7 850	1,00	\$ 0,45
												Sub Total	\$ 0,45

ItemOrder	Process	Use	Unit	Cost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total	
		Setup for					one setup			
10	Machining Setup, Install and Remove	turning	\$	1,30	Unit	1	for 2 pieces	0,5	\$	0,65
							Material -			
20	Laser cut		\$	0,01	cm	286,8	steel	3	\$	8,60
								Sub Total	\$	9,25



81



System Wheels & Tires

**Assembly** Rear Hubs P/N Base WT A0300

Suffix AA

Assembly of a part of the wheel with the hub, bearings and a part to mesure the speed of the wheel Details

	Bac	k to	<b>BON</b>	
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Car# 81 **Asm Cost** \$ 346,18 Qty 2

FileLink1 FileLink2 FileLink3

**Extended (** \$ 692,35

<b>ItemOrder</b>	Part	Part Cost		Quantity	Sub	Total
10	Rear Hub	\$	52,08	1	\$	52,08
20	Rear Bearing Spacer	\$	3,97	1	\$	3,97
30	Rear Wheel Spacer	\$	21,67	1	\$	21,67
40	Tripod Housing Spacer	\$	3,90	1	\$	3,90
50	Speed Sensor Disc	\$	7,69	1	\$	7,69
				Sub Total	Ś	89.31

<b>ItemOrder</b>	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
	Wheel Bearing, Ball, Angular												
10	Contact		\$ 99,77	72	mm	12	mm					2,00	\$ 199,53
	Adhesive	Wheel studs and hub assemble, cost											
20	Adriesive	included in process	\$ -										\$ -
												<b>Sub Total</b>	\$ 199,53

<b>ItemOrder</b>	Process	Use	Uni	tCost	Unit	Quantity	Multiplier	Mult.	Val.	Sub	Total
10	Assemble, 1kg, Loose	Bearing spacer assemble on the hub	\$	0,06	unit	1			1	\$	0,06
20	Assemble, 1 kg, Interference	Bearings Assemble	\$	0,19	unit	2			1	\$	0,38
30	Assemble, 1kg, Loose	Tripod housing spacer assemble on the hub	\$	0,06	unit	1			1	\$	0,06
40	Assemble, 1kg, Loose	Speed sensor disc assemble on the hub	\$	0,06	unit	1			1	\$	0,06
50	Liquid Applicator Gun	Wheel studs and hub assemble	\$	0,02	cm	15,07			1	\$	0,30
60	Assemble, 1 kg, Line-on-Line	Wheel studs and hub assemble	\$	0,13	unit	4			1	\$	0,52
70	Assemble, 1 kg, Loose	Front Wheel Spacer on hub	\$	0,06	Unit	1			1	\$	0,06
•								Sub 1	Γotal	\$	1,44

ItemOrder Fastener	Use	UnitCost	Size1	Unit1	Size2	Unit2	Quantity	Sub	Total
10 Stud, Grade 12.9	Wheel Studs	\$ 1,07	12	mm	62	mm	4	\$	4,26
							<b>Sub Total</b>	\$	4,26

**Car #** 81

 Part Cost
 \$
 52,08

 Qty
 1

**Extended (** \$ 52,08

FileLink1 Drawing
FileLink2
FileLink3

FileLink1
FileLink2
FileLink3

**Details** Main part of the assembly

University Ecole Centrale de Lyon

Rear Hub

Wheels & Tires

System

Part

Suffix

**Assembly** Rear Hubs

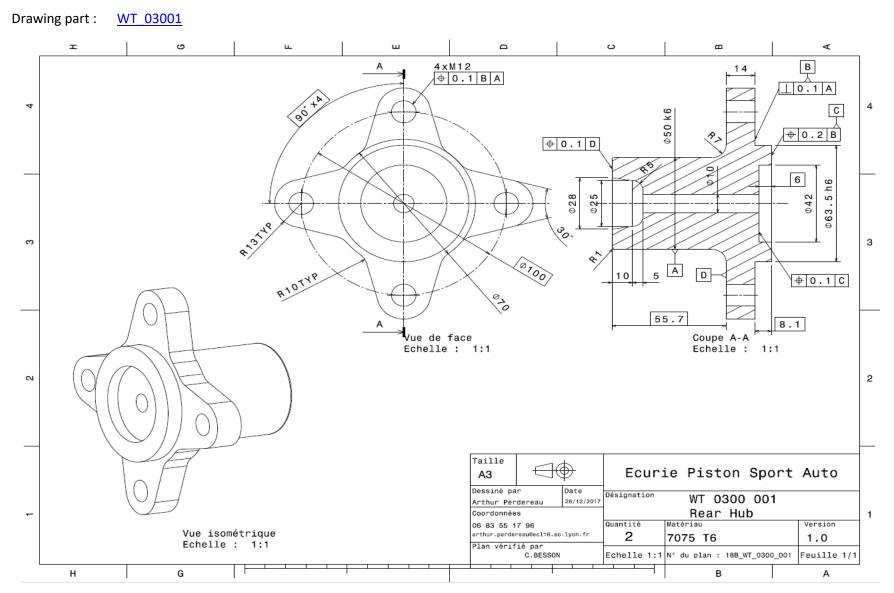
**P/N Base** WT 03001

ΑА

ItemOrder Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub To	tal
							round area, 130mm						
10 Aluminium, Premium		\$ 4,20	2,87	kg			diameter	0,013	0,080	2712	1	\$	12,06
											Sub Total	\$	12,06

emOrder	Process	Use	Un	itCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total	
	Machining Setup, Install and									
10	Remove	Setup for turning	\$	1,30	Unit	1		1	\$	1,30
20	Machining	Turning	\$	0,04	cm^3	652,3	Material - Aluminium	1	\$	26,09
		Change the								
30	Machining Setup, Change	turning setup	\$	0,65	Unit	1		1	\$	0,65
40	Machining	Turning	\$	0,04	cm^3	63,5	Material - Aluminium	1	\$	2,54
50	Machining Setup, Change		\$	0,65	Unit	1		1	\$	0,65
60	Machining	Milling	\$	0,04	cm^3	149	Material - Aluminium	1	\$	5,96
70	Machining Setup, Change		\$	0,65	Unit	1		1	\$	0,65
80	Threading, Internal (machining)	For wheel studs	\$	0,10	cm	6	Material - Aluminium	1	\$	0,60
		For tripod								
100	EDM - Wire	housing	\$	0,20	cm	7,9	Material - Aluminium	1	\$	1,58
		•	•		•			Sub Total	\$	40,02





Comment: Drawing before the EDM process for spline at the center

Ecole Centrale de Lyon Wheels & Tires

System Wheels & T
Assembly Rear Hubs

Part Wheel bearing spacer

**P/N Base** WT 03002

**Suffix** AA

**Details** Part to let a space beetween the hub and the first bearing

Back to BOM

**Car #** 81

FileLink1 FileLink2 FileLink3 
 Part Cost
 \$ 3,97

 Qty
 1

**Extended (** \$ 3,97

ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
								round area, 55mm					
10	Aluminium, Premium		\$ 4,2	0,16	kg			diameter	0,004	0,014	2712	1	\$ 0,67
												Sub Total	\$ 0,67

ItemOrder	Process	Use	Unit	Cost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total	
	Machining Setup, Install and									
10	Remove	Setup for turning	\$	1,30	Unit	1		1	\$	1,30
							Material -			
20	Machining	Turning	\$	0,04	cm^3	28,3	Aluminium	1	\$	1,13
30	Machining Setup, Change	Change the turning setup	\$	0,65	Unit	1		1	\$	0,65
							Material -			
40	Machining	Turning	\$	0,04	cm^3	5,5	Aluminium	1	\$	0,22
		-	•			•		Sub Total	\$	3,30

**Drawing** 

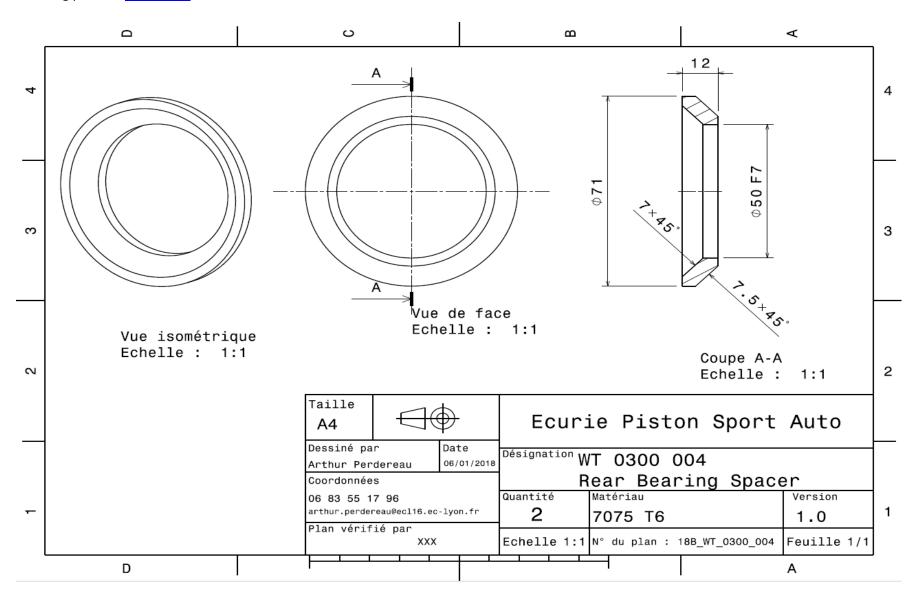
FileLink1

FileLink2

FileLink3



Drawing part: WT\_03002



FileLink1 Drawing

Car# 81

FileLink1

FileLink2

FileLink3

Part Cost \$ 21,67 Qty 1

Extended (\$ 21,67

FileLink2 FileLink3

Part to position the wheel on the good position relative to the hub and upright assembly

University Ecole Centrale de Lyon

Assembly Rear Hubs

**P/N Base** WT 03003

Wheels & Tires

Rear Wheel Spacer

System

Part

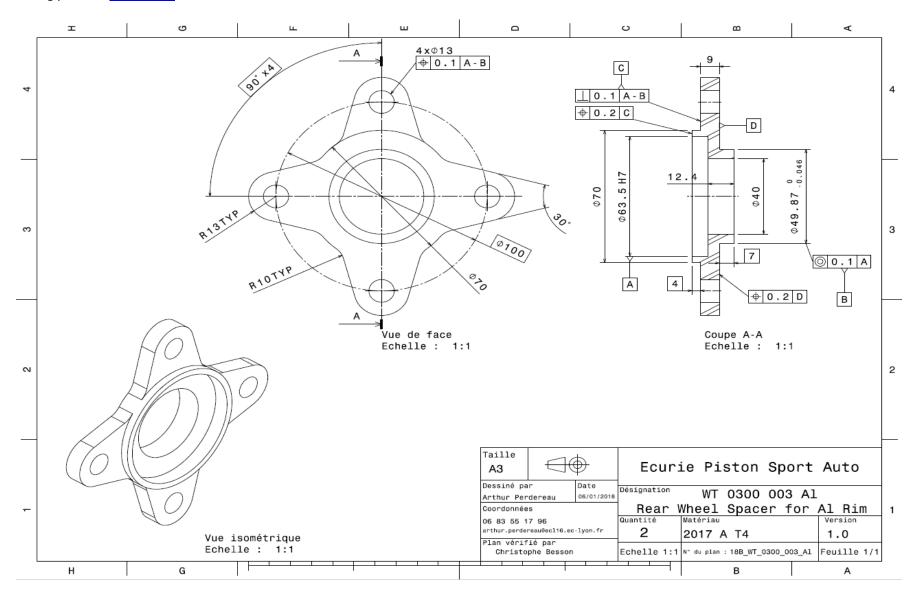
Suffix Details

ItemOrder Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Tot	tal
							round area,						
							130mm						
10 Aluminium, Premium		\$ 4,20	0,86	kg			diameter	0,013	0,024	2712	1	\$	3,63
											Sub Total	\$	3,63

ItemOrder	Process	Use	UnitCos	t	Unit	Quantity	Multiplier	Mult. Val.	Sub Total	
10	Machining Setup, Install and Remove	Setup for turning	\$ 1,3	30	Unit	1		1	\$ 1,	,30
20	Machining	Turning	\$ 0,0	)4	cm^3	135	Material - Aluminium	1	\$ 5,	,40
30	Machining Setup, Change	Change the turning setup	\$ 0,6	<u>5</u> 5	Unit	1		1	\$ 0,	,65
40	Machining	Turning	\$ 0,0	)4	cm^3	102	Material - Aluminium	1	\$ 4,	,08
50	Machining Setup, Change		\$ 0,6	55	Unit	1		1	\$ 0,	,65
60	Machining	Milling	\$ 0,0	)4	cm^3	149	Material - Aluminium	1	\$ 5,	,96
								Sub Total	\$ 18,	,04



Drawing part: WT\_03003



FileLink1 Drawing

**Car #** 81

 Part Cost
 \$ 3,90

 Qty
 1

**Extended (** \$ 3,90

FileLink2
FileLink3

University Ecole Centrale de Lyon

**Assembly** Rear Hubs

**P/N Base** WT 03004

AA

Wheels & Tires

Tripod housing spacer

System

Part

Suffix

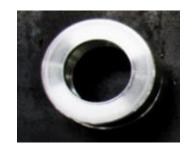
FileLink2 FileLink3

FileLink1

**Details** Part to allow the tripod housing to be used as locknut to prestress the bearings. Also used to separate the speedsensor disc from the upright

ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	<b>Sub Total</b>	
								round area, 130mm						
10	Aluminium, Premium		\$ 4,20	0,16	kg			diameter	0,003	0,022	2712	1	\$ (	0,66
	•	•		•	•	•	•	•			•	Sub Total	\$	0,66

<b>ItemOrder</b>	Process	Use	Uni	tCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total	
	Machining Setup, Install									
10	and Remove	Setup for turning	\$	1,30	Unit	1		1	\$	1,30
20	Machining	Turning	\$	0,04	cm^3	27,7	Material - Aluminium	1	\$	1,11
		Change the turning								
30	Machining Setup, Change	setup	\$	0,65	Unit	1		1	\$	0,65
40	Machining	Turning	\$	0,04	cm^3	4,6	Material - Aluminium	1	\$	0,18
								Sub Total	\$	3,24



Drawing part: WT 03004  $\circ$ Θ ⋖ 19.5 4 4 က œ. F7 92⊕ **⊕33** 20 3 က В Α Coupe A-A Vue isométrique Echelle: 1:1 Vue de face Echelle: 1:1 Echelle: 1:1 2  $^{\circ}$ 2.9 Taille Ecurie Piston Sport Auto Α4 Dessiné par Date 0.9 Désignation WT 0300 005 Arthur Perdereau 06/01/2018 Détail B Tripod Housing Spacer
| Matériau | Version Coordonnées Echelle : 2:1 Version Quantité 06 83 55 17 96 arthur.perdereau@ecl16.ec-lyon.fr 2 7075 T6 1.0 Plan vérifié par Echelle 1:1 N° du plan : 18B\_WT\_0300\_005 Feuille 1/1 C.BESSON D Α

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Wheels & Tires

Assembly Rear Hubs

Part Speed Sensor Disc P/N Base WT 03005

off:

**Suffix** AA

System

**Details** Disc use in combination with a sensor to obtain the speed of a wheel

Back to BOM

**Car #** 81

 Part Cost
 \$ 7,69

 Qty
 1

FileLink1
FileLink2

FileLink3

**Extended (** \$ 7,69

ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	<b>Sub Tot</b>	al
	Ctool Mild							rectangular area,						
10	Steel, Mild		\$ 2,25	0,15	kg			160mm*160mm	0,020	0,001	7 850	1,00	\$	0,35
						_				ATD	_	Sub Total	\$	0,35

ItemOrder	Process	Use	Unit	Cost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total	
	Machining Setup,						one setup for			
10	Install and Remove	Setup for turning	\$	1,30	Unit	1	2 pieces	0,5	\$	0,65
							Material -			
20	Laser cut		\$	0,01	cm	223	steel	3	\$	6,69
								Sub Total	\$	7,34

FileLink1 Drawing

FileLink2

FileLink3



Drawing part : WT 03005

