



CAR #81



ÉCOLE
CENTRALE LYON

SUSPENSION SYSTEM

University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Asm Cost	\$ 80,97							
System	Suspension & Shocks		Qty	2									
Assembly	Upper Front A-arm		FileLink1										
P/N Base	SU A0100		FileLink2										
Suffix	AA		FileLink3										
Details			Extended C	\$ 161,93									
ItemOrder	Part	Part Cost	Quantity	Sub Total									
10	Upper Front Bearing Support	\$ 15,09	1	\$ 15,09									
20	Inner Bearing Support	\$ 1,87	2	\$ 3,75									
30	Upper Front A-arm tube (Front) Carbon Fiber Tube	\$ 8,88	1	\$ 8,88									
40	Upper Front A-arm tube (Back) Carbon Fiber Tube	\$ 7,19	1	\$ 7,19									
50	Spacer 1	\$ 0,99	2	\$ 1,98									
60	Spacer 2	\$ 0,32	4	\$ 1,30									
70	Outboard A-arm Insert	\$ 0,56	2	\$ 1,11									
80	Front up bracket	\$ 1,35	1	\$ 1,35									
90	Front down bracket	\$ 1,32	1	\$ 1,32									
100	Rear up bracket	\$ 1,28	1	\$ 1,28									
110	Rear down bracket	\$ 0,38	1	\$ 0,38									
			Sub Total	\$ 43,62									
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Sperical bearing		\$ 6,92		8 mm							3	\$ 20,76
20	Adhesive	Glue for Ball Joint – Cost Included in Processes	\$ -		95								\$ -
30	Adhesive	Epoxy resin for Tube/insert assembly – Cost Included in Processes	\$ -										\$ -
40	Paint	To paint brackets	\$ 10,00		0,01 m ²								\$ 0,10
												Sub Total	\$ 20,86
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Hand Finish - Surface Preperation	Solvent degreasing on Upper Front Bearing Support	\$ 0,02	cm ²	8,66	Repeat 2	2	\$ 0,35					
20	Brush Apply	Glue applying on on Upper Front Bearing Support	\$ 0,02	cm ²	8,66	Repeat 2	2	\$ 0,35					
30	Hand Finish - Surface Preperation	Solvent degreasing on Outboard A-arm insert	\$ 0,02	cm ²	8,66	Repeat 2	2	\$ 0,35					
40	Assemble, 1kg, loose	Outboard A-arm Insert in Upper front bearing support	\$ 0,06	Unit	1	Repeat 2	2	\$ 0,12					
50	Hand Finish - Surface Preperation	Solvent degreasing on Inner Bearing support	\$ 0,02	cm ²	12,43	Repeat 2	2	\$ 0,50					
60	Brush Apply	Glue applying on Inner Bearing support	\$ 0,02	cm ²	12,43	Repeat 2	2	\$ 0,50					
70	Hand Finish - Surface Preperation	Solvent degreasing on carbon tube	\$ 0,02	cm ²	12,43	Repeat 2	2	\$ 0,50					
80	Assemble, 1kg, loose	Inner Bearing support in Carbon Tube	\$ 0,14	Unit	1	Repeat 2	2	\$ 0,28					
90	Hand Finish - Surface Preperation	Solvent degreasing on Outboard A-arm Insert	\$ 0,02	cm ²	12,43	Repeat 2	2	\$ 0,50					
100	Brush Apply	Glue applying on Outboard A-arm Inserts	\$ 0,18	cm ²	12,43	Repeat 2	2	\$ 4,47					
110	Hand Finish - Surface Preperation	Solvent degreasing on carbon tube	\$ 0,02	cm ²	12,43	Repeat 2	2	\$ 0,50					
120	Assemble, 1kg, loose	Outboard A-arm Insert in Carbon Tube with Inner Bearing support	\$ 0,22	Unit	1	Repeat 2	2	\$ 0,44					
130	Hand Finish - Surface Preperation	Solvent degreasing on bearing bores	\$ 0,02	cm ²	4,01	Repeat 3	3	\$ 0,24					
140	Brush Apply	Glue applying on bearing bores	\$ 0,02	cm ²	4,01	Repeat 3	3	\$ 0,24					
150	Assemble, 1kg, loose	Bearing in Insert Bores	\$ 0,30	Unit	1	Repeat 3	3	\$ 0,90					
160	Aerosol Apply	Steel mounts painting	\$ 5,25	m ²	0,01			\$ 0,05					
170	Weld	Steel mounts welding	\$ 0,15	cm	22			\$ 3,30					
180	Assemble, 1kg, loose	A-Arm Positionning	\$ 0,14	Unit	1			\$ 0,14					
190	Assemble, 1kg, Line on line	Spacers installation	\$ 0,13	Unit	4			\$ 0,52					
200	Assemble, 1kg, Line on line	Washers installation	\$ 0,13	Unit	8			\$ 1,04					
210	Ratchet <= 25,4mm	M8 bolts installation	\$ 0,13	Unit	2			\$ 0,26					
220	Reaction tool <=25,4mm	M8 nut blocking	\$ 0,25	Unit	2			\$ 0,50					
			Sub Total	\$ 16,03									



ItemOrder	Fastener	Use	UnitCost	Size1	Unit1	Size2	Unit2	Quantity	Sub Total
10	Bolt, Grade 8,8 (SAE 5)	A-Arm Fixing Bolts on Frame Side	0,16	8	mm	40	mm	2	\$ 0,32
20	Nut, Grade 8,8 (SAE 5)	A-Arm Fixing Nuts	0,04	8	mm			2	\$ 0,09
30	Washer, Grade 8,8 (SAE 5)	A-Arm Fixing Washers	0,01	8	mm			4	\$ 0,04

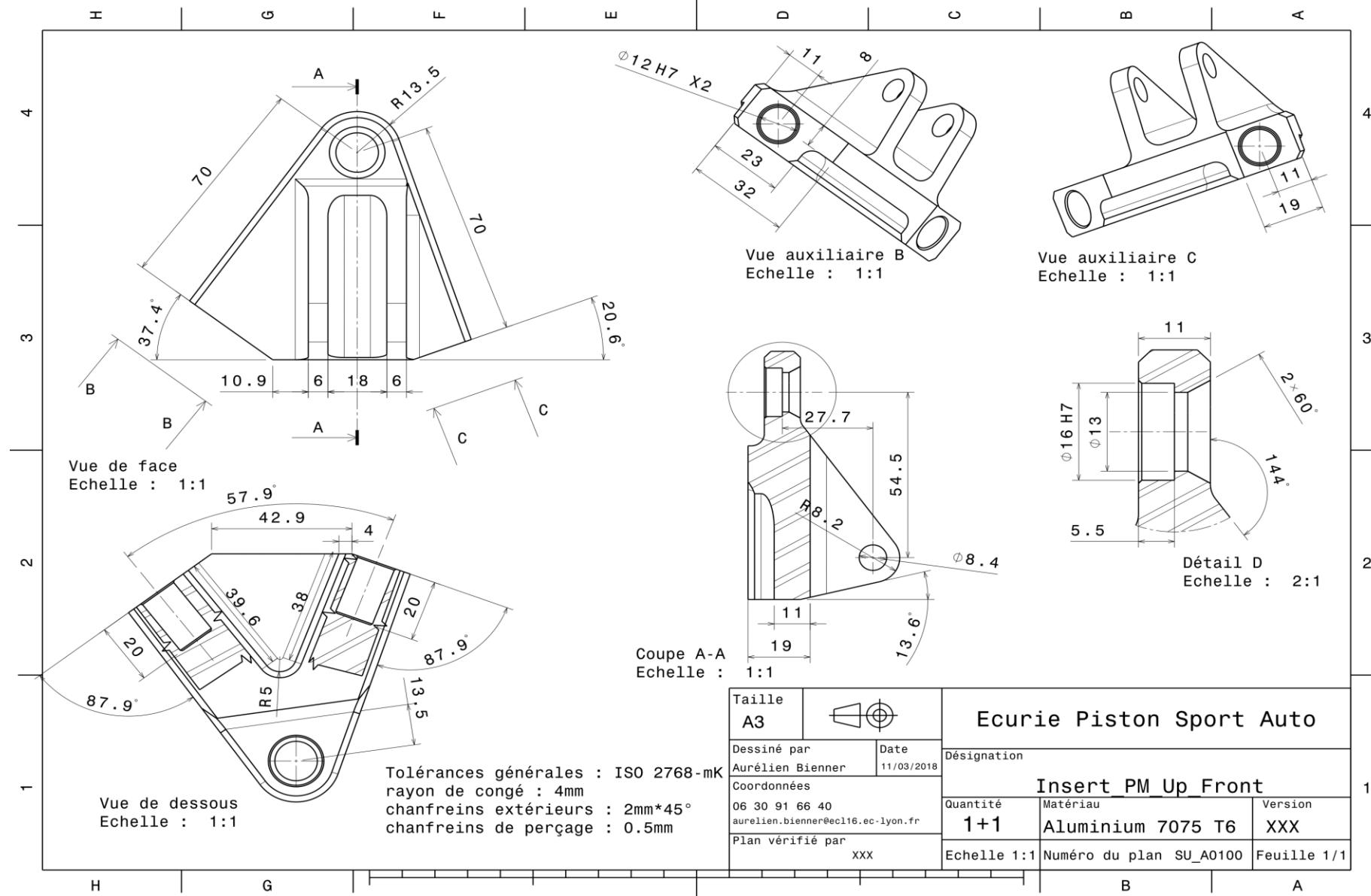
Sub Total \$ 0,45

ItemOrder	Tooling	Use	UnitCost	Unit	Quantity	PVF	FractionInC	Sub Total
10	Welds - Welding Fixture	Welding processes	\$ 500,00	point	8	3000	1	\$ 1,33

Sub Total \$ 1,33

University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 15,09								
System	Suspension & Shocks				Qty	1								
Assembly	Upper Front A-arm	FileLink1	Drawing	FileLink1										
Part	Upper Front Bearing Support	FileLink2		FileLink2										
P/N Base	SU_01001	FileLink3		FileLink3										
Suffix	AA				Extended C	\$ 15,09								
Details														
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total	
10	Aluminum, Premium	Stock material for part	\$ 4,20	0,642	kg			Upper face	5,04E-03	4,70E-02	2712	1	\$ 2,70	
													Sub Total	\$ 2,70
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total						
10	Machining Setup, Install and remove		\$ 1,30	Unit	1			\$ 1,30						
20	Machining	Main shape contouring and top of the main hole machining	\$ 0,04	cm^3	153			\$ 6,12						
30	Machining Setup, Change		\$ 0,65	Unit	1			\$ 0,65						
40	Machining	First tube hole machining	\$ 0,04	cm^3	2			\$ 0,09						
50	Machining Setup, Change		\$ 0,65	Unit	1			\$ 0,65						
60	Machining	Second tube hole machining	\$ 0,04	cm^3	2			\$ 0,09						
70	Machining Setup, Change		\$ 0,65	Unit	1			\$ 0,65						
80	Machining	Angle and bottom of the main hole machining	\$ 0,04	cm^3	4			\$ 0,16						
90	Machining Setup, Change		\$ 0,65	Unit	1			\$ 0,65						
100	Machining	Suspension rod support machining	\$ 0,04	cm^3	42			\$ 1,68						
110	Drilled holes < 25.4 mm	Suspension rod support drilling	\$ 0,35		1			\$ 0,35						
							Sub Total	\$ 12,39						



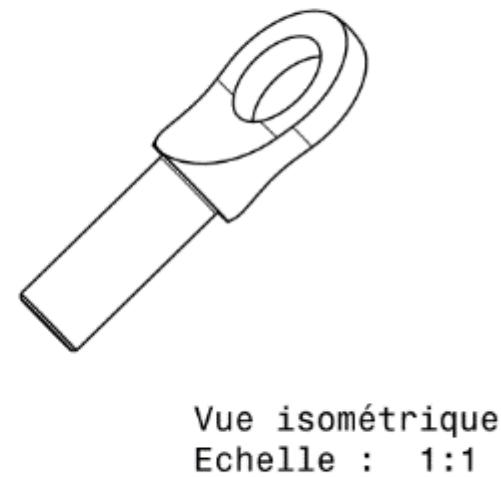
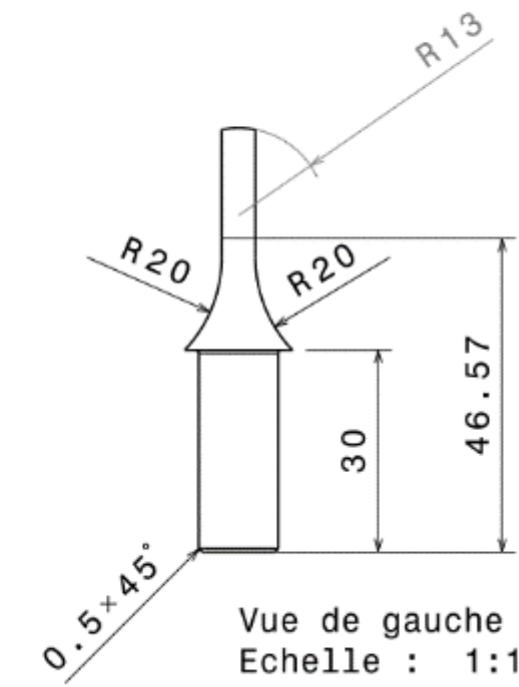
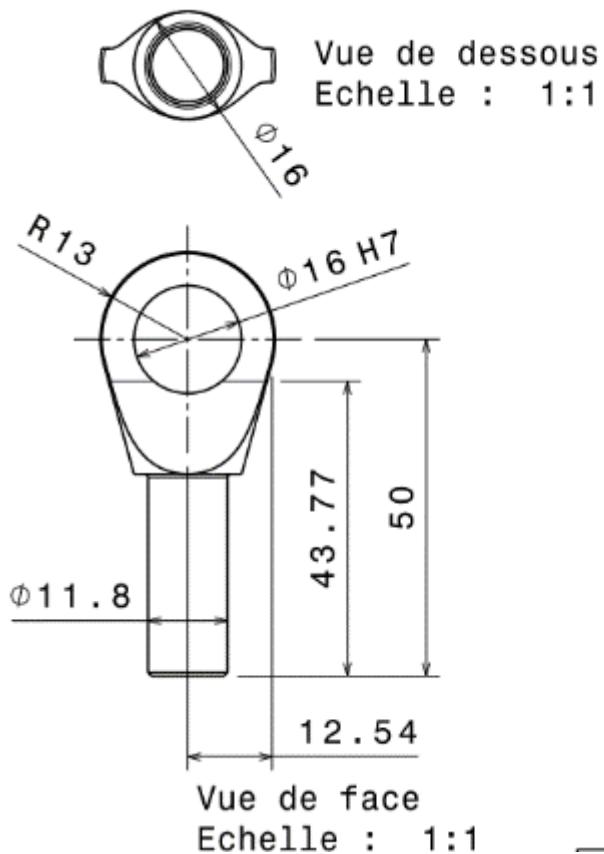


University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 1,87							
System	Suspension & Shocks		Qty	2									
Assembly	Upper Front A-arm		FileLink1										
Part	Inner Bearing Support	Drawing	FileLink2										
P/N Base	SU_01002		FileLink3										
Suffix	AA				Extended Cos	\$ 3,75							
Details			FileLink3										
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Aluminum, Premium	Stock material for part	\$ 4,20	0,204	Kg			Cylinder face area	1,26E-03	6E-02	2712	1	\$ 0,86
													Sub Total \$ 0,86
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove		\$ 1,30	Unit	1	16 parts from a single setup	0,0625	\$ 0,08					
20	Machining	Main shape machining	\$ 0,04	cm^3	17	Material - Aluminium	1	\$ 0,68					
30	Machining Setup, Change		\$ 0,65	Unit	1	16 parts from a single setup	0,0625	\$ 0,04					
40	Machining	Sides machining	\$ 0,04	cm^3	2	Material - Aluminium	1	\$ 0,08					
50	Machining Setup, Change		\$ 0,65	Unit	1	16 parts from a single setup	0,0625	\$ 0,04					
60	Machining	Hole machining	\$ 0,04	cm^3	2	Material - Aluminium	1	\$ 0,09					
							Sub Total	\$ 1,01					



Drawing part :

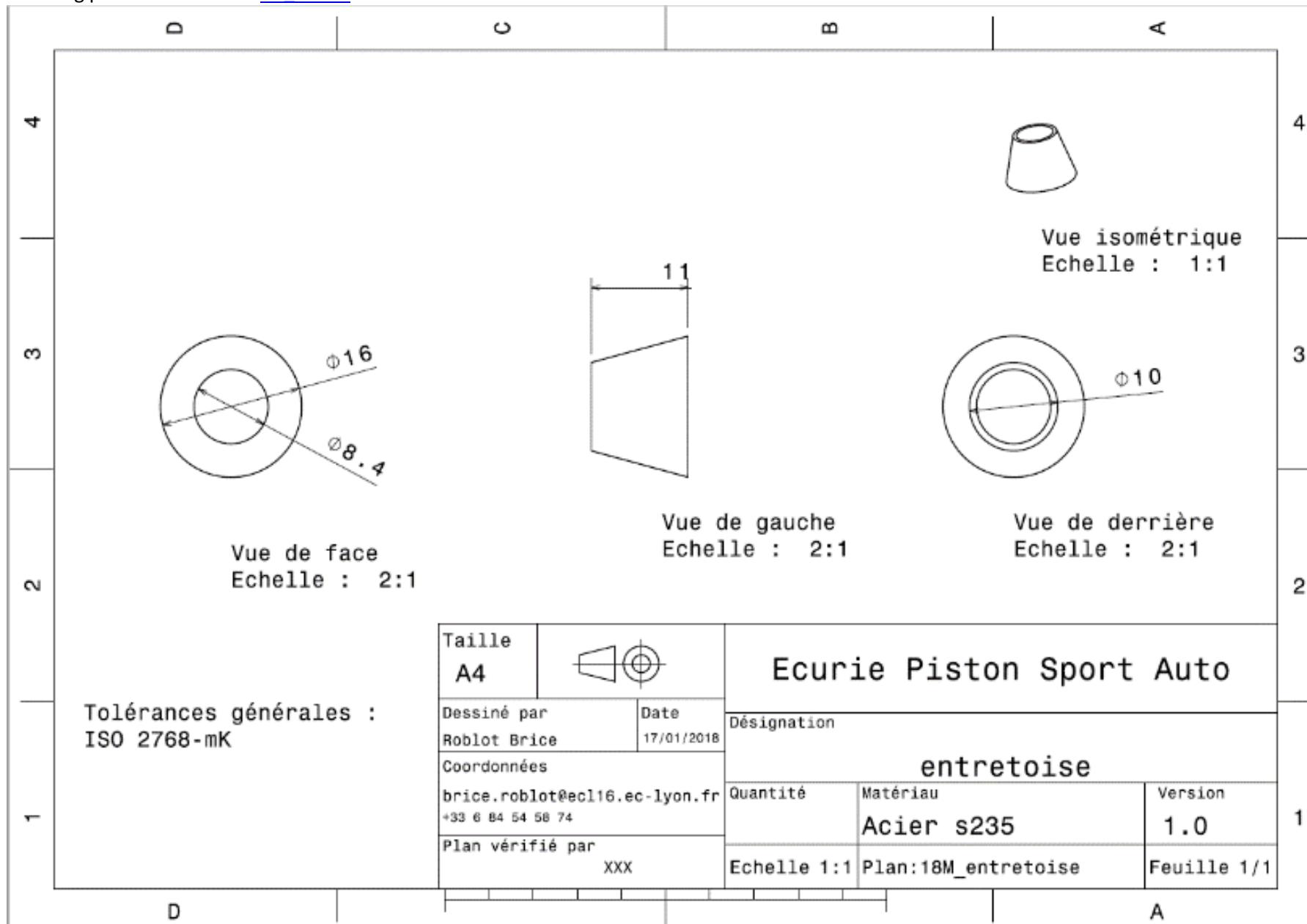
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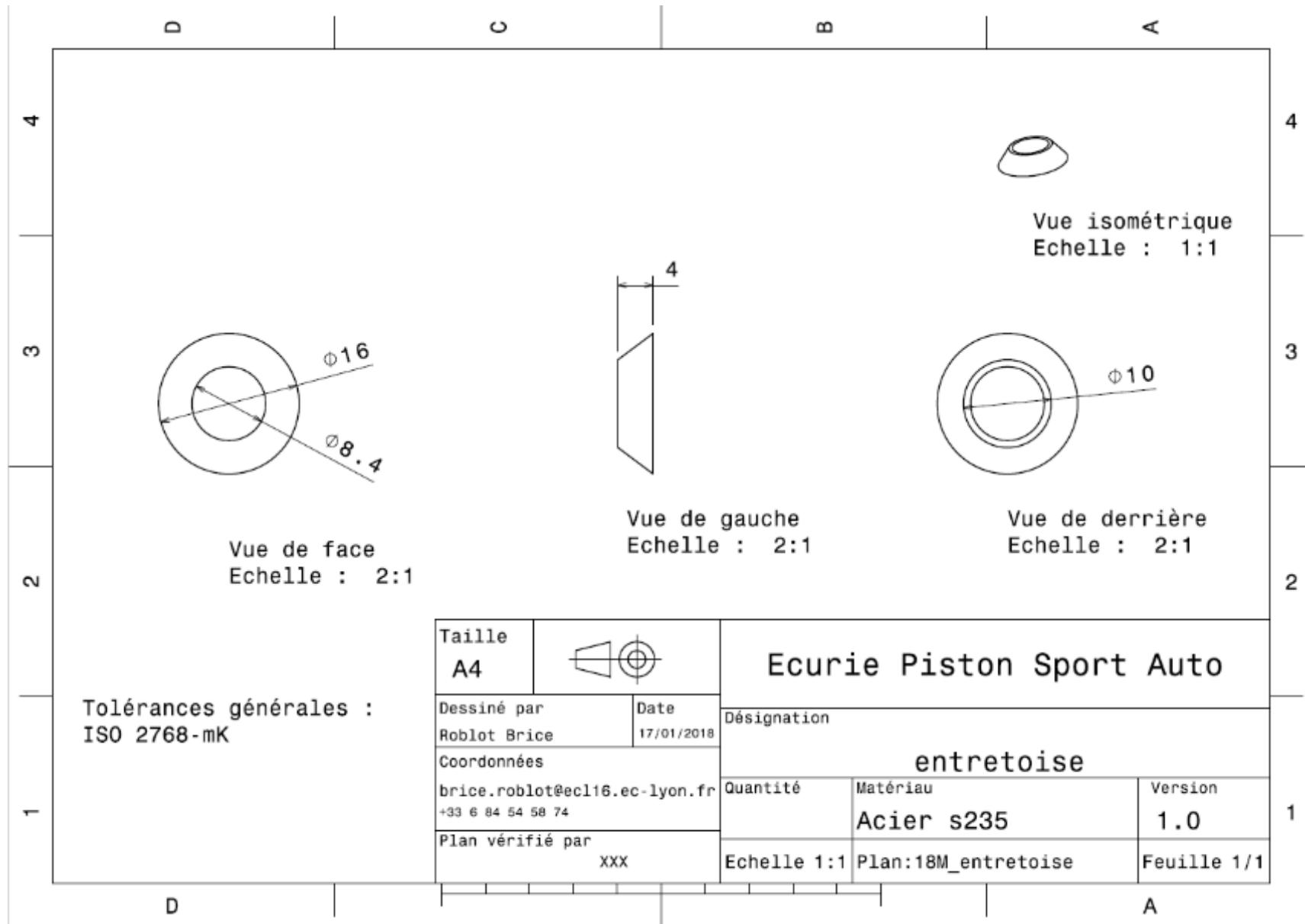
University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 8,88							
System	Suspension & Shocks		Qty	1									
Assembly	Upper Front A-arm												
Part	Upper Front A-arm tube (Front) Carbon Fiber Tube	FileLink1	Drawing										
P/N Base	SU_01003	FileLink2			Extended Cost	\$ 8,88							
Suffix	AA	FileLink3											
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Carbon Fiber, 1 Ply	Stock	\$ 200,00	0,039	kg			tube face	8,79E-05	0,284	1580	1	\$ 7,89
													Sub Total \$ 7,89
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Lamination, Filament Wirring	Tube Lamination	\$ 25,00	kg	0,039		\$ 0,99						
								Sub Total \$ 0,99					

University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 7,19							
System	Suspension & Shocks		Qty	1									
Assembly	Upper Front A-arm	FileLink1	FileLink1										
Part	Upper Front A-arm tube (Back) Carbon Fiber Tube	FileLink2	FileLink2										
P/N Base	SU_01004	FileLink3	FileLink3		Extended Cost	\$ 7,19							
Suffix	AA												
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Carbon Fiber, 1 Ply	Stock	\$ 200,00	3,20E-02	Kg			tube face	8,79E-05	0,23	1580	1	\$ 6,39
													Sub Total \$ 6,39
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Lamination, Filament Wirring	Tube Lamination	\$ 25,00	kg	3,20E-02			\$ 0,80					
								Sub Total \$ 0,80					

University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 0,99							
System	Suspension & Shocks	FileLink1	Qty	2	Part Cost	\$ 0,99							
Assembly	Upper Front A-arm	FileLink2	FileLink1		Drawing								
Part	Spacer 1	FileLink3	FileLink2		Extended Cost	\$ 1,98							
P/N Base	SU_01005		FileLink3										
Suffix	AA												
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Mild Steel	Stock material for part	\$ 2,25	1,74E-02	Kg			Cylinder face	2,01E-04	1,10E-02	7850	1	\$ 0,04
													Sub Total \$ 0,04
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	Setup for machining	\$ 1,30	Unit	1	2 parts from a single setup	0,5	\$ 0,65					
20	Machining	Material removal	\$ 0,04	cm^3	2,5	Material -Steel	3	\$ 0,30					
								Sub Total \$ 0,95					



University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 0,32								
System	Suspension & Shocks		Qty	4										
Assembly	Upper Front A-arm		FileLink1											
Part	Spacer 2		FileLink2											
P/N Base	SU_01006		FileLink3											
Suffix	AA				Extended Cos	\$ 1,30								
Details					FileLink3									
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total	
10	Steel, Mild (per kg)		\$ 2,25	6,31E-02	Kg			Cylinder face	2,01E-04	4E-02	7850	1	\$ 0,14	
													Sub Total	\$ 0,14
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total						
10	Machining Setup, Install and remove	Setup for machining	\$ 1,30	Unit	1	Same as SU_0*_006 (*=1,...,4) and SU_09_003	2,94E-02	\$ 0,04						
20	Machining	Material removal	\$ 0,04	cm^3	1,2	Material -Steel	3	\$ 0,14						
							Sub Total	\$ 0,18						

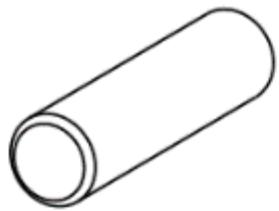


University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 0,56							
System	Suspension & Shocks		Qty	2									
Assembly	Upper Front A-arm		FileLink1										
Part	Outboard A-arm Insert		FileLink2										
P/N Base	SU_01007		FileLink3										
Suffix	AA				Extended Cos	\$ 1,11							
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Aluminium, Premium (per kg)	cylinder	\$ 4,20	0,018	kg			12mm	1,13E-04	0,060	2712	1	\$ 0,08
													Sub Total \$ 0,08
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Saw or tubing cut		\$ 0,40	cm	1,2			\$ 0,48					
							Sub Total	\$ 0,48					

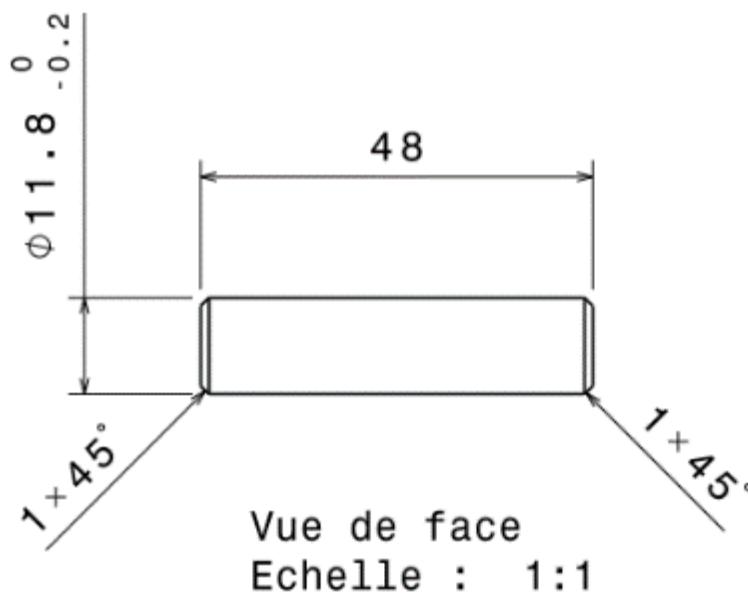


Drawing part :

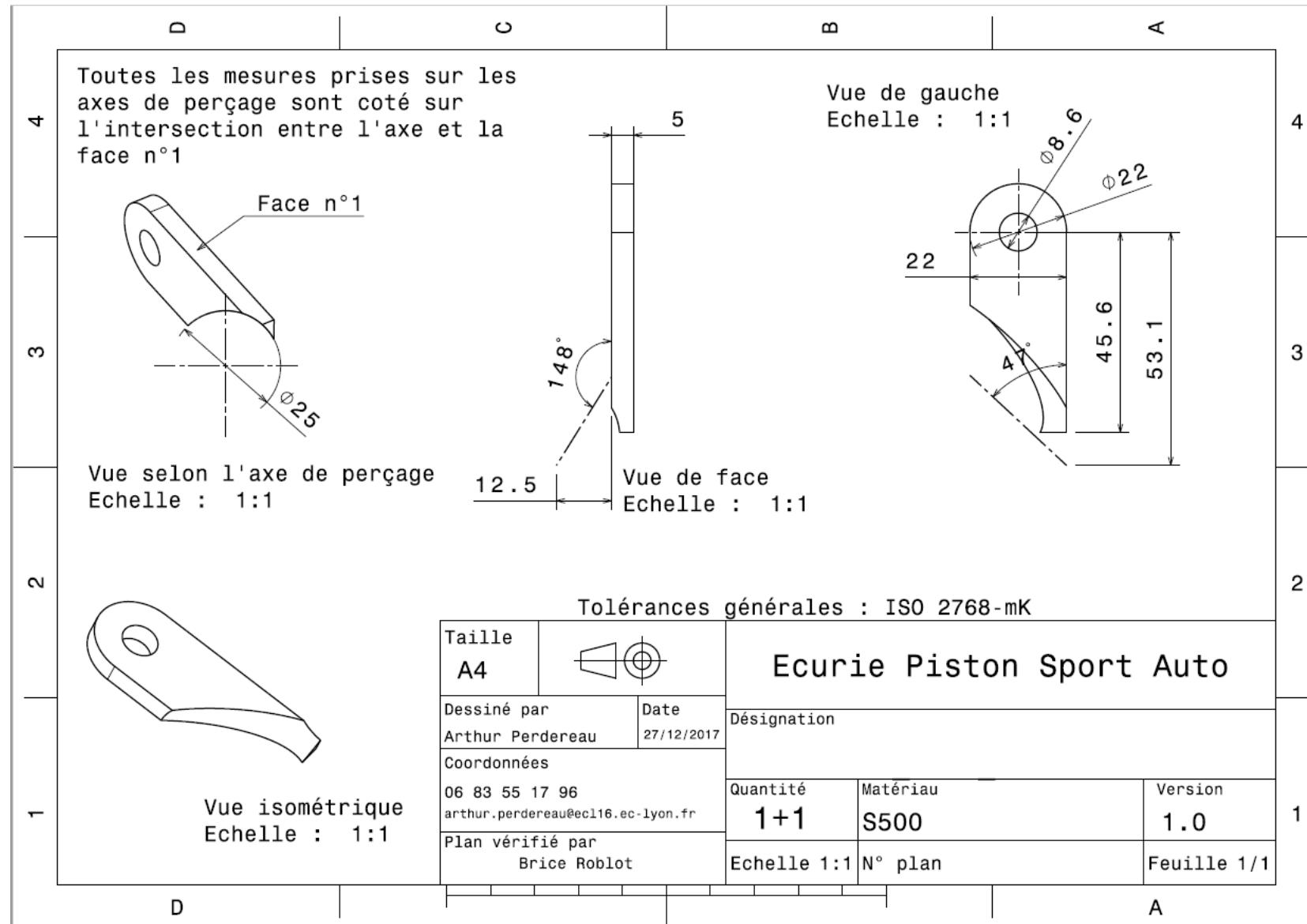
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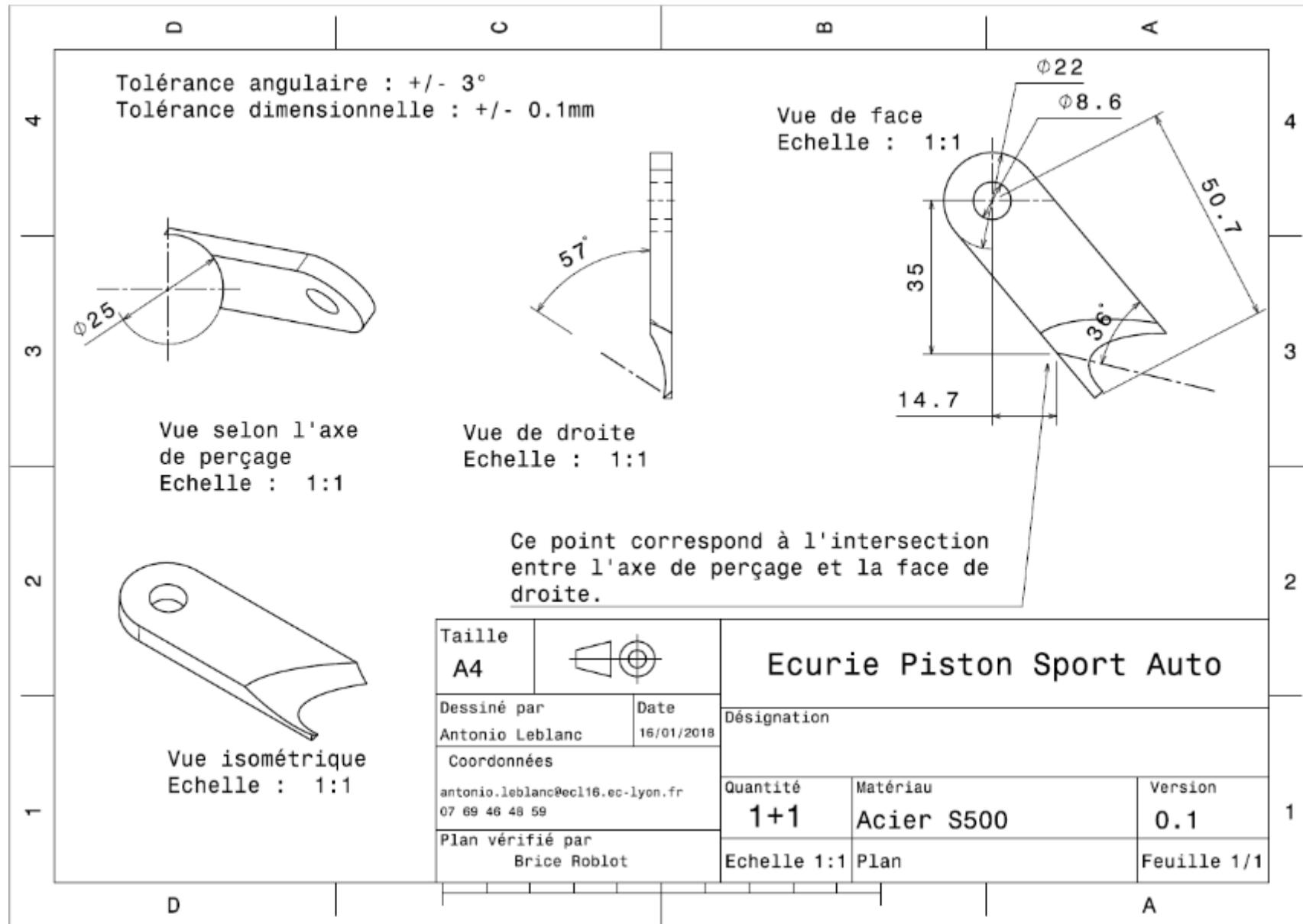
Vue isométrique
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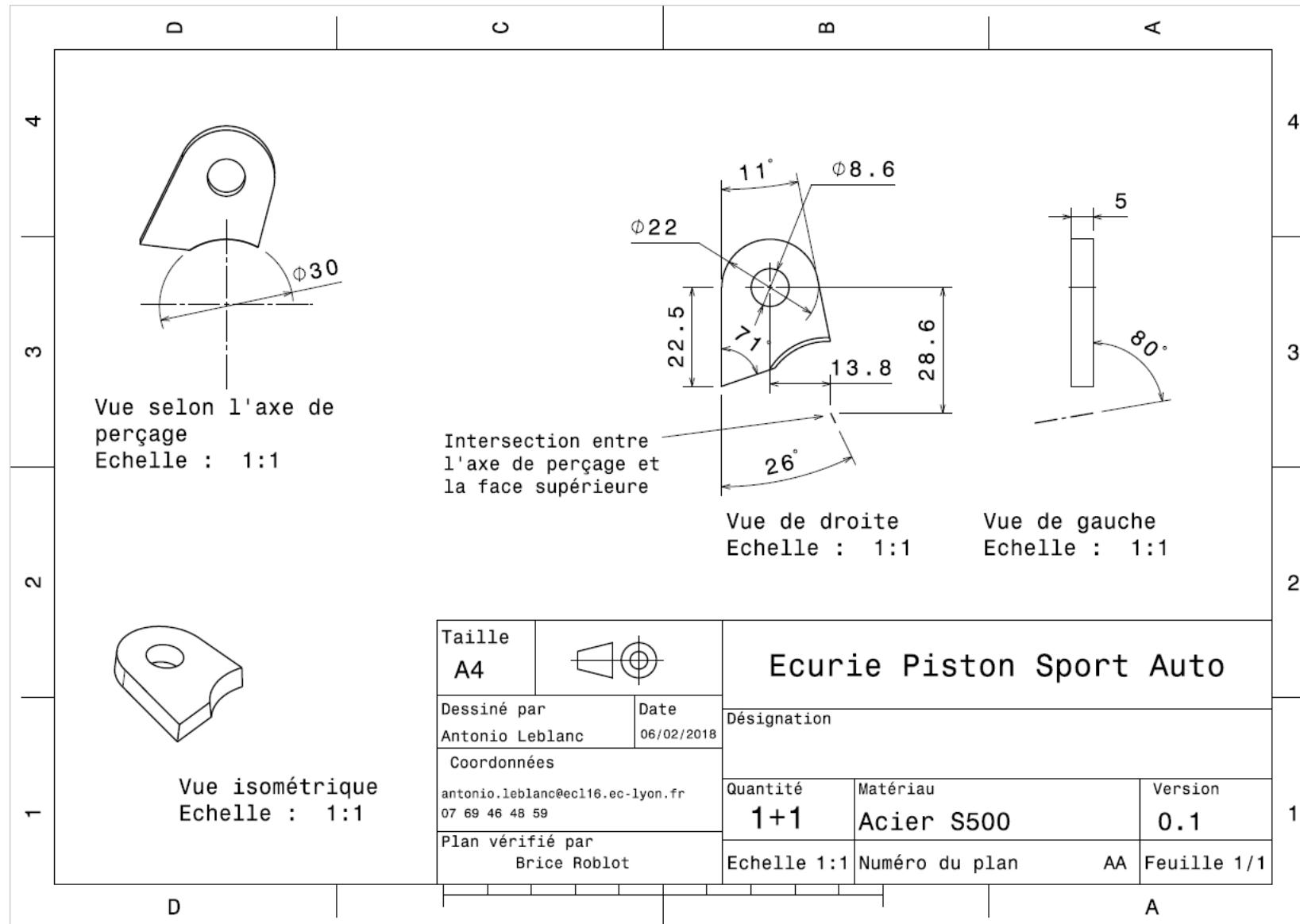
University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,35								
System	Suspension & Shocks	Qty	1	Qty	1								
Assembly	Upper Front A-arm	FileLink1		Extended Cost	\$ 1,35								
Part	Front up bracket	FileLink2											
P/N Base	SU_01008	FileLink3											
Suffix	AA												
Details	This part is Welded on the frame												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild (per kg)	Stock for the part	\$ 2,25	0,054	kg			Rectangular area	1,36E-03	5,00E-03	7850	1	\$ 0,12
												Sub Total	\$ 0,12
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	Installation of the item 10 for laser cut	\$ 1,30	Unit	1	2 parts made from a single setup	0,5	\$ 0,65					
20	Laser Cut		\$ 0,01	cm	13,6			\$ 0,14					
30	Machining Setup, Change		\$ 0,65	Unit	1	2 parts made from a single setup	0,5	\$ 0,33					
40	Machining	Tubing cavity	\$ 0,04	cm^3	1	Material -Steel	3	\$ 0,12					
							Sub Total	\$ 1,23					



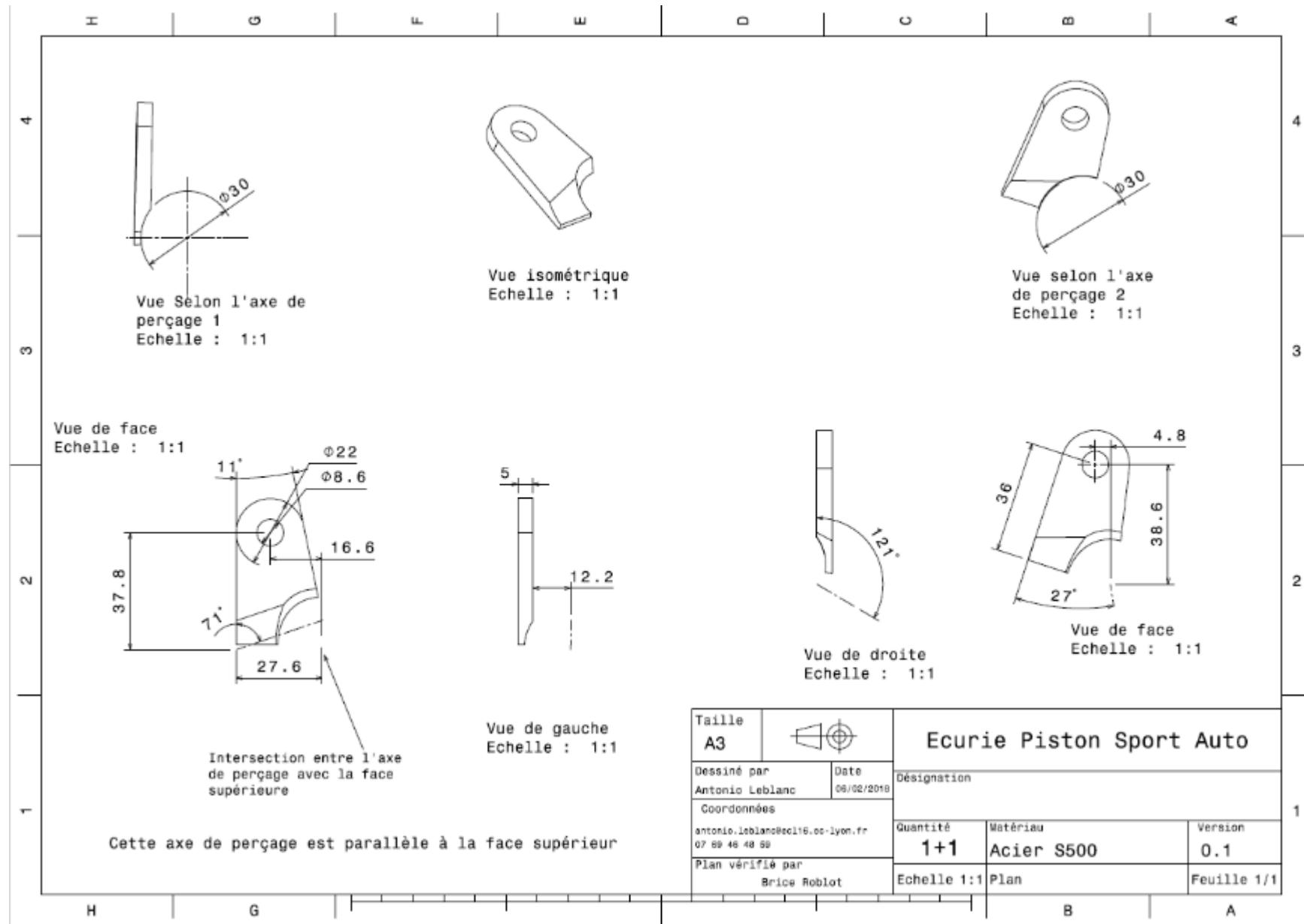
University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 1,32							
System	Suspension & Shocks	FileLink1	Qty	1	Qty	1							
Assembly	Upper Front A-arm	FileLink2	Extended Cos	\$ 1,32	FileLink1								
Part	Front down bracket	FileLink3	FileLink2		FileLink3								
P/N Base	SU_01009												
Suffix	AA												
Details	This part is Welded on the frame												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild (per kg)	Stock for the part	\$ 2,25	0,053	kg			Rectangular area	1,34E-03	5,00E-03	7850	1	\$ 0,12
													Sub Total \$ 0,12
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	Installation of the item 10 for laser cut	\$ 1,30	Unit	1	2 parts made from a single setup	0,5	\$ 0,65					
20	Laser Cut		\$ 0,01	cm	13,8			\$ 0,14					
30	Machining Setup, Change		\$ 0,65	Unit	1	2 parts made from a single setup	0,5	\$ 0,33					
40	Machining	Tubing cavity	\$ 0,03	cm^3	1	Material -Steel	3	\$ 0,09					
							Sub Total	\$ 1,20					



University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,28								
System	Suspension & Shocks	Qty	1	Qty	1								
Assembly	Upper Front A-arm	FileLink1		FileLink1									
Part	Rear up bracket	FileLink2		FileLink2									
P/N Base	SU_01010	FileLink3		FileLink3									
Suffix	AA												
Details	This part is Welded on the frame												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild (per kg)	Stock for the rear up bracket	\$ 2,25	0,045	kg			Rectangular area	1,14E-03	5,00E-03	7850	1	\$ 0,10
													Sub Total \$ 0,10
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	Installation of the item 10 for laser cut	\$ 1,30	Unit	1	2 parts made from a single setup	0,5	\$ 0,65					
20	Laser Cut		\$ 0,01	cm	11,7			\$ 0,12					
30	Machining Setup, Change		\$ 0,65	Unit	1	2 parts made from a single setup	0,5	\$ 0,33					
40	Machining	Tubing cavity	\$ 0,03	cm^3	1	Material -Steel	3	\$ 0,09					
							Sub Total	\$ 1,18					



University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 0,38								
System	Suspension & Shocks	Qty	1	Part Cost	\$ 0,38								
Assembly	Upper Front A-arm	FileLink1		Qty	1								
Part	Rear down bracket	FileLink2		Extended Cos	\$ 0,38								
P/N Base	SU_01011	FileLink3		FileLink1									
Suffix	AA	FileLink2		FileLink2									
Details	This part is Welded on the frame	FileLink3		FileLink3									
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild (per kg)	Stock for the part	\$ 2,25	0,050	kg			Rectangular area	1,27E-03	5,00E-03	7850	1	\$ 0,11
													Sub Total \$ 0,11
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	Installation of the item 10 for laser cut	\$ 1,30	Unit	1	2 parts made from a single	0,5	\$ 0,65					
20	Laser Cut		\$ 0,01	cm	11,5			\$ 0,12					
30	Machining Setup, Change		\$ 0,65	Unit	1	2 parts made from a single setup	0,5	\$ 0,33					
40	Machining	Tubing cavity	\$ 0,03	cm^3	1	Material -Steel	3	\$ 0,09					
													Sub Total \$ 1,18



University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Asm Cost	\$ 75,66	
System	Suspension & Shocks				Qty	2	
Assembly	Lower Front A-arm				FileLink1		
P/N Base	SU A0200				FileLink2		
Suffix					FileLink3		
Details						Extended	\$ 151,31

ItemOrder	Part	Part Cost	Quantity	Sub Total
10	Lower Front Bearing Support	\$ 9,11	1	\$ 9,11
20	Inner Bearing Support	\$ 1,87	2	\$ 3,75
30	Lower Front A-arm tube (Front) Carbon Fiber Tube	\$ 11,22	1	\$ 11,22
40	Lower Front A-arm tube (Back) Carbon Fiber Tube	\$ 10,00	1	\$ 10,00
50	Spacer 1	\$ 0,91	2	\$ 1,82
60	Spacer 2	\$ 0,32	4	\$ 1,30
70	Outboard A-arm Insert	\$ 0,56	2	\$ 1,11
80	Front up bracket	\$ 1,35	1	\$ 1,35
90	Front down bracket	\$ 1,39	1	\$ 1,39
100	Rear Up bracket	\$ 1,30	1	\$ 1,30
110	Rear down bracket	\$ 1,37	1	\$ 1,37
				Sub Total \$ 38,31

ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Spherical bearing		\$ 6,92	8	mm							3	\$ 20,76
20	Adhesive	Glue for Ball Joint – Cost Included in Processes	\$ -			95							\$ -
30	Adhesive	Epoxy resin for Tube/insert assembly – Cost Included in Processes	\$ -										\$ -
40	Paint	Steel mounts painting	\$ 10,00	0,01	m ²								\$ 0,10
													Sub Total \$ 20,86

ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total
10	Hand Finish - Surface Preparation	Solvent degreasing on Upper Front Bearing Support	\$ 0,02	cm ²	8,66	Repeat 2	2	\$ 0,35
20	Brush Apply	Glue applying on Upper Front Bearing Support	\$ 0,02	cm ²	8,66	Repeat 2	2	\$ 0,35
30	Hand Finish - Surface Preparation	Solvent degreasing on Outboard A-arm insert	\$ 0,02	cm ²	8,66	Repeat 2	2	\$ 0,35
40	Assemble, 1kg, loose	Outboard A-arm Insert in Upper front bearing support	\$ 0,06	Unit	1	Repeat 2	2	\$ 0,12
50	Hand Finish - Surface Preparation	Solvent degreasing on Inner Bearing support	\$ 0,02	cm ²	12,43	Repeat 2	2	\$ 0,50
60	Brush Apply	Glue applying on Inner Bearing support	\$ 0,02	cm ²	12,43	Repeat 2	2	\$ 0,50
70	Hand Finish - Surface Preparation	Solvent degreasing on carbon tube	\$ 0,02	cm ²	12,43	Repeat 2	2	\$ 0,50
80	Assemble, 1kg, loose	Inner Bearing support in Carbon Tube	\$ 0,14	Unit	1	Repeat 2	2	\$ 0,28
90	Hand Finish - Surface Preparation	Solvent degreasing on Outboard A-arm Insert	\$ 0,02	cm ²	12,43	Repeat 2	2	\$ 0,50
100	Brush Apply	Glue applying on Outboard A-arm Inserts	\$ 0,18	cm ²	12,43	Repeat 2	2	\$ 4,47
110	Hand Finish - Surface Preparation	Solvent degreasing on carbon tube	\$ 0,02	cm ²	12,43	Repeat 2	2	\$ 0,50
120	Assemble, 1kg, loose	Outboard A-arm Insert in Carbon Tube with Inner Bearing support	\$ 0,22	Unit	1	Repeat 2	2	\$ 0,44
130	Hand Finish - Surface Preparation	Solvent degreasing on bearing bores	\$ 0,02	cm ²	4,01	Repeat 3	3	\$ 0,24
140	Brush Apply	Glue applying on bearing bores	\$ 0,02	cm ²	4,01	Repeat 3	3	\$ 0,24
150	Assemble, 1kg, loose	Bearing in Insert Bores	\$ 0,30	Unit	1	Repeat 3	3	\$ 0,90
160	Aerosol Apply	Steel mounts painting	\$ 5,25	m ²	0,01			\$ 0,05
170	Weld	Steel mounts welding	\$ 0,15	cm ²	22			\$ 3,30
180	Assemble, 1kg, loose	A-Arm Positioning	\$ 0,14	Unit	1			\$ 0,14
190	Assemble, 1kg, Line on line	Spacers installation	\$ 0,13	Unit	4			\$ 0,52
200	Assemble, 1kg, Line on line	Washers installation	\$ 0,13	Unit	8			\$ 1,04
210	Ratchet <= 25,4mm	M8 bolts installation	\$ 0,13	Unit	2			\$ 0,26
220	Reaction tool <= 25,4mm	M8 nut blocking	\$ 0,25	Unit	2			\$ 0,50
								Sub Total \$ 16,03

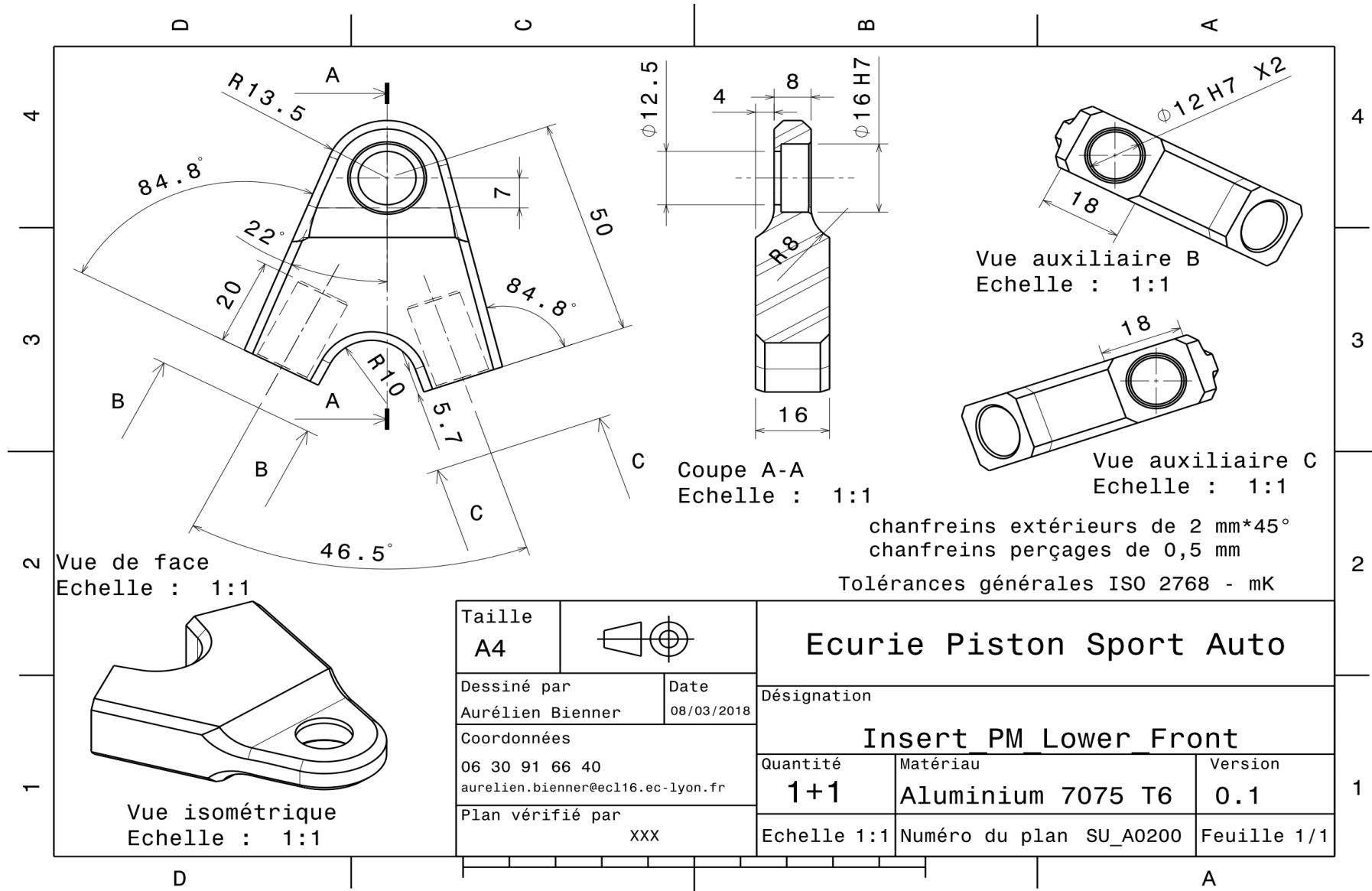
ItemOrder	Fastener	Use	UnitCost	Size1	Unit1	Size2	Unit2	Quantity	Sub Total
10	Bolt, Grade 8,8 (SAE 5)	A-Arm Fixing Bolts on Frame Side	\$ 0,16	8	mm	40	mm	2	\$ 0,32



20	Nut, Grade 8,8 (SAE 5)	A-Arm Fixing Nuts	\$ 0,04	8 mm			2	\$ 0,09
30	Washer, Grade 8,8 (SAE 5)	A-Arm Fixing Washers	\$ 0,01	8 mm			4	\$ 0,04
Sub Total								\$ 0,45

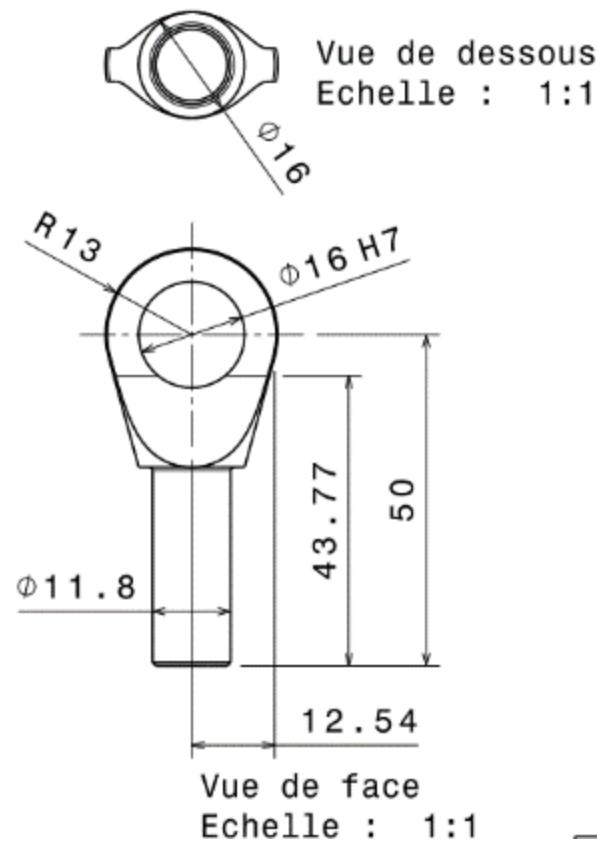
Item	Order	Tooling	Use	UnitCost	Unit	Quantity	PVF	FractionIn	Sub Total
10	Welds - Welding Fixture		Welding processes	\$ 500,00	point	8	3000	1	\$ 1,33
Sub Total									\$ 1,33

University	Ecole Centrale de Lyon	Back to BOM								Car #	81	Part Cost	\$ 9,11	
System	Suspension & Shocks									FileLink1	Drawing	Qty	1	
Assembly	Lower Front A-arm									FileLink1		FileLink2		
Part	Lower Front Bearing Support									FileLink3		Extended C	\$ 9,11	
P/N Base	SU 02001									FileLink3				
Suffix														
Details														
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total	
10	Aluminium, Premium (per kg)	Insert	\$ 4,20	0,156	kg			Rectangular area 64x36mm	3,58E-03	1,60E-02	2712	1	\$ 4,20	
												Sub Total	\$ 4,20	
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total						
10	Machining Setup, Install and remove		\$ 1,30	Unit	1			\$ 1,30						
20	Machining	Main shape contouring and top side machining	\$ 0,04	cm^3	30	Material - Aluminium	1	\$ 1,20						
30	Machining Setup, Change		\$ 0,65	Unit	1			\$ 0,65						
40	Machining	First tube hole machining	\$ 0,04	cm^3	2	Material - Aluminium	1	\$ 0,09						
50	Machining Setup, Change		\$ 0,65	Unit	1			\$ 0,65						
60	Machining	Second tube hole machining	\$ 0,04	cm^3	2	Material - Aluminium	1	\$ 0,09						
70	Machining Setup, Change		\$ 0,65	Unit	1			\$ 0,65						
80	Machining	Bottom side and hole machining	\$ 0,04	cm^3	7	Material - Aluminium	1	\$ 0,28						
							Sub Total	\$ 4,91						



University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,87								
System	Suspension & Shocks	Qty	2										
Assembly	Lower Front A-arm	FileLink1		FileLink1									
Part	Inner Bearing Support	FileLink2		FileLink2									
P/N Base	SU 02002	FileLink3		FileLink3									
Suffix													
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Aluminum, Premium	Stock material for part	\$ 4,20	0,204	Kg			Cylinder face area	1,26E-03	6E-02	2712	1	\$ 0,86
													Sub Total \$ 0,86
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove		\$ 1,30	Unit	1	16 parts from a single setup	0,0625	\$ 0,08					
20	Machining	Main shape machining	\$ 0,04	cm^3	17	Material - Aluminium	1	\$ 0,68					
30	Machining Setup, Change		\$ 0,65	Unit	1	16 parts from a single setup	0,0625	\$ 0,04					
40	Machining	Sides machining	\$ 0,04	cm^3	2	Material - Aluminium	1	\$ 0,08					
50	Machining Setup, Change		\$ 0,65	Unit	1	16 parts from a single setup	0,0625	\$ 0,04					
60	Machining	Hole machining	\$ 0,04	cm^3	2	Material - Aluminium	1	\$ 0,09					
							Sub Total	\$ 1,01					





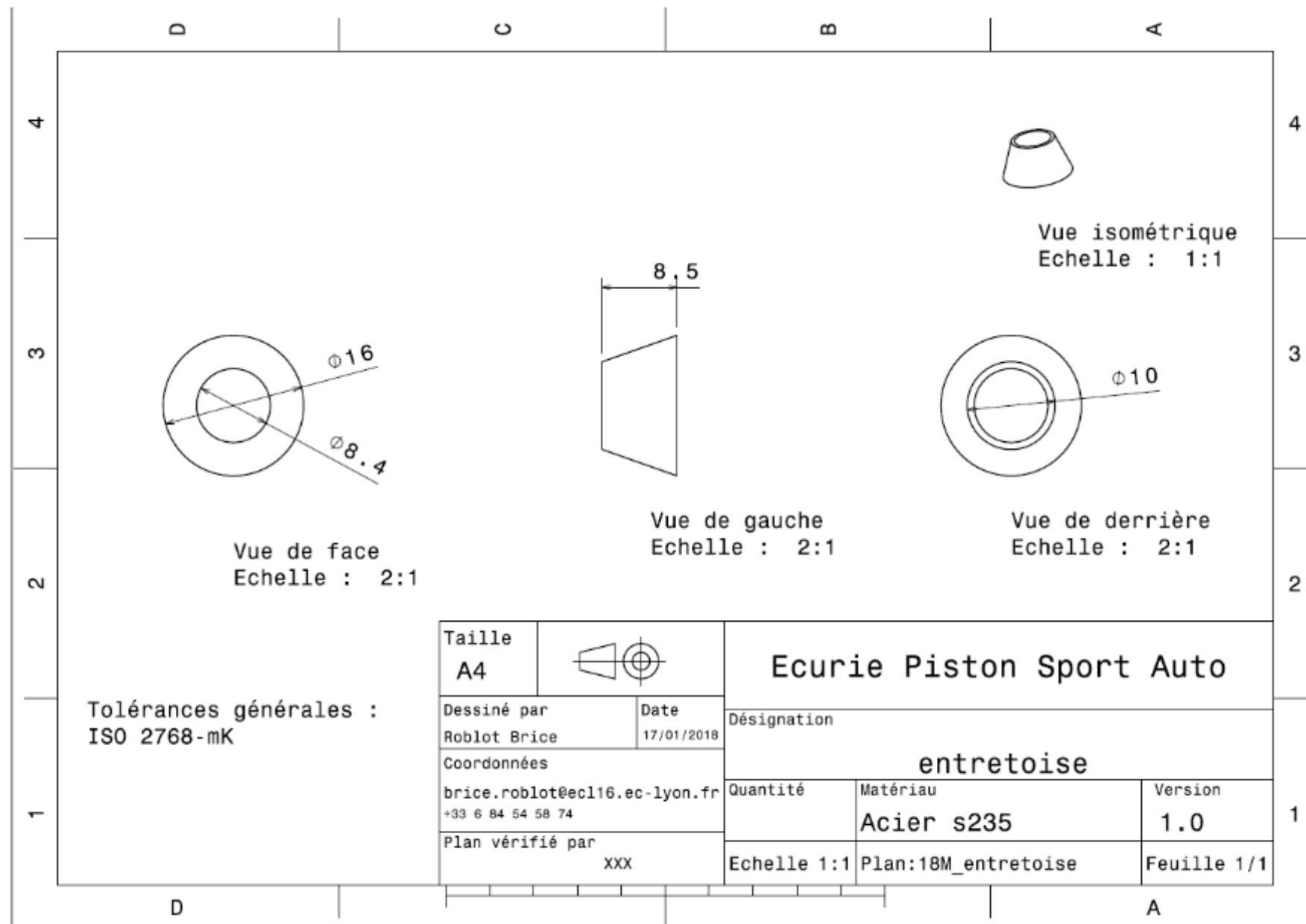
University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 11,22							
System	Suspension & Shocks				Qty	1							
Assembly	Lower Front A-arm		FileLink1										
Part	Lower Front A-arm tube (Front) Carbon Fiber Tube		FileLink2										
P/N Base	SU_02003		FileLink3										
Suffix					Extended Cos	\$ 11,22							
Details					FileLink3								
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Carbon Fiber, 1 Ply	Stock	\$ 200,00	0,050	kg			tube face	8,79E-05	3,59E-01	1580	1	\$ 9,97
													Sub Total \$ 9,97
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.						
10	Lamination, Filament Wirring	Tube Lamination	\$ 25,00	kg	0,05								\$ 1,25
													Sub Total \$ 1,25

University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 10,00							
System	Suspension & Shocks		Qty	1									
Assembly	Lower Front A-arm		FileLink1		Extended Cost	\$ 10,00							
Part	Lower Front A-arm tube (Back) Carbon Fiber Tube		FileLink2										
P/N Base	SU_02004		FileLink3										
Suffix													
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Carbon Fiber, 1 Ply	Stock	\$ 200,00	0,044	kg			tube face	8,79E-05	3,20E-01	1580	1	\$ 8,89
													Sub Total \$ 8,89
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Lamination, Filament Wirring	Tube Lamination	\$ 25,00	kg	0,044			\$ 1,11					
								Sub Total \$ 1,11					

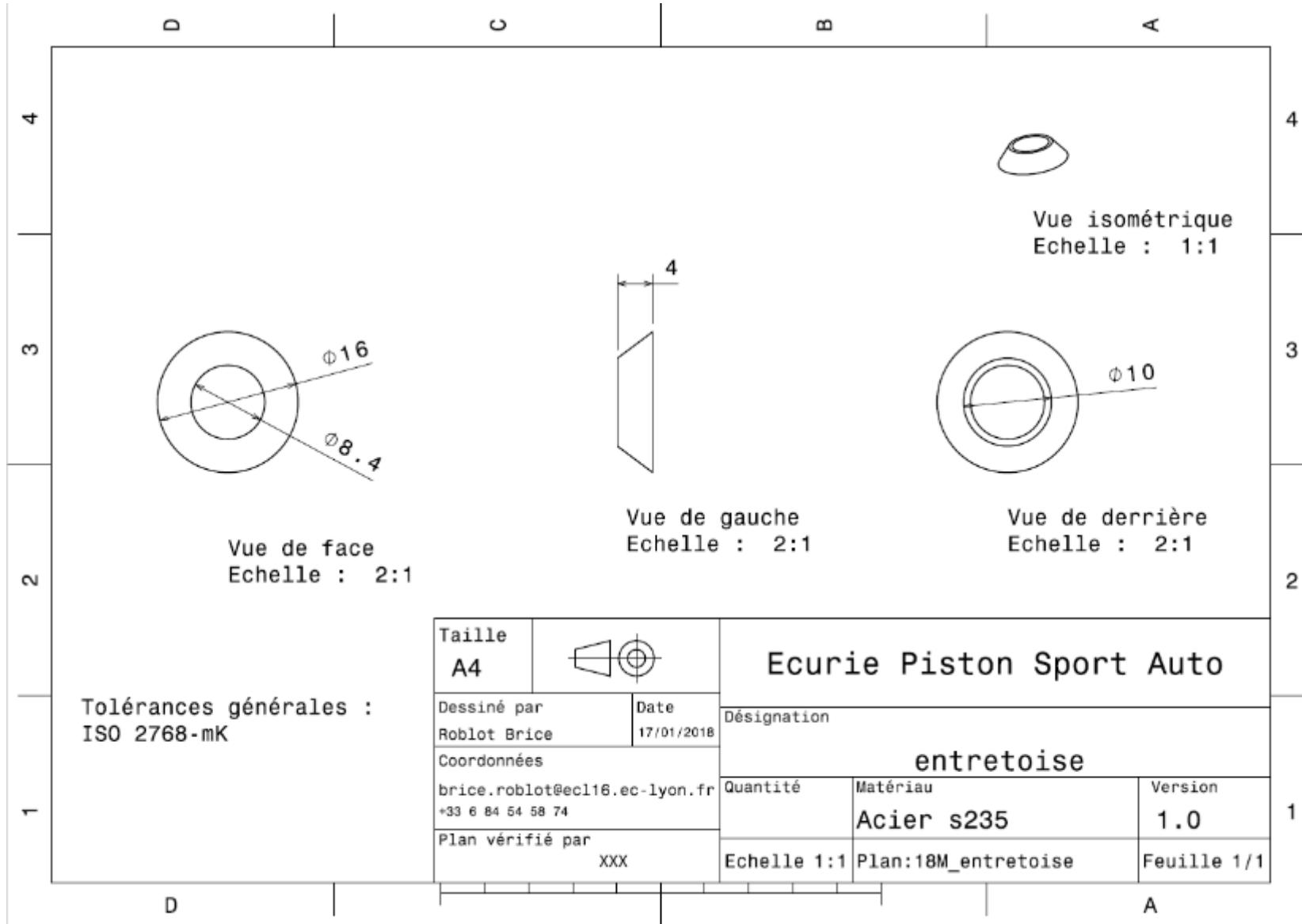
University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 0,91							
System	Suspension & Shocks		Qty	2									
Assembly	Lower Front A-arm		FileLink1										
Part	Spacer 1		FileLink2										
P/N Base	SU_02005		FileLink3										
Suffix					Extended Cos	\$ 1,82							
Details					FileLink3								
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Mild Steel	Stock material for part	\$ 2,25	0,013	Kg			Cylinder face	2,01E-04	8,50E-03	7850	1	\$ 0,03
													Sub Total \$ 0,03
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	Setup for machining	\$ 1,30	Unit		2 parts from 1 a single setup	0,5	\$ 0,65					
20	Machining	Material removal	\$ 0,04	cm^3	1,9	Material -Stee	3	\$ 0,23					
							Sub Total	\$ 0,88					

Drawing part :

SU_02005



University	Ecole Centrale de Lyon	Back to BOM							Car #	81	Part Cost	\$ 0,32	
System	Suspension & Shocks								Qty	4			
Assembly	Lower Front A-arm								FileLink1				
Part	Spacer 2								FileLink2				
P/N Base	SU_02006								FileLink3		Extended Cost	\$ 1,30	
Suffix									FileLink3				
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild (per kg)		\$ 2,25	6,31E-02	Kg			Cylinder face	2,01E-04	4E-02	7850	1	\$ 0,14
												Sub Total	\$ 0,14
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	Setup for machining	\$ 1,30	Unit		Same as SU_0*_006 (*=1,...,4) and SU_09_003	2,94E-02	\$ 0,04					
20	Machining	Material removal	\$ 0,04	cm^3	1,2	Material -Steel	3	\$ 0,14					
							Sub Total	\$ 0,18					

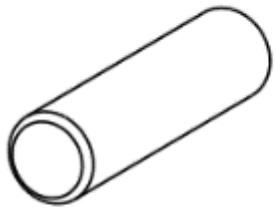


University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 0,56							
System	Suspension & Shocks		Qty	2									
Assembly	Lower Front A-arm		FileLink1										
Part	Outboard A-arm Insert		FileLink2										
P/N Base	SU_02007		FileLink3										
Suffix													
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Aluminium, Premium (per kg)	cylinder	\$ 4,20	0,018	kg			Round area diam. 12mm	1,13E-04	0,060	2712	1	\$ 0,08
													Sub Total \$ 0,08
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Saw or tubing cut		\$ 0,40	cm	1,2			\$ 0,48					
								Sub Total \$ 0,48					

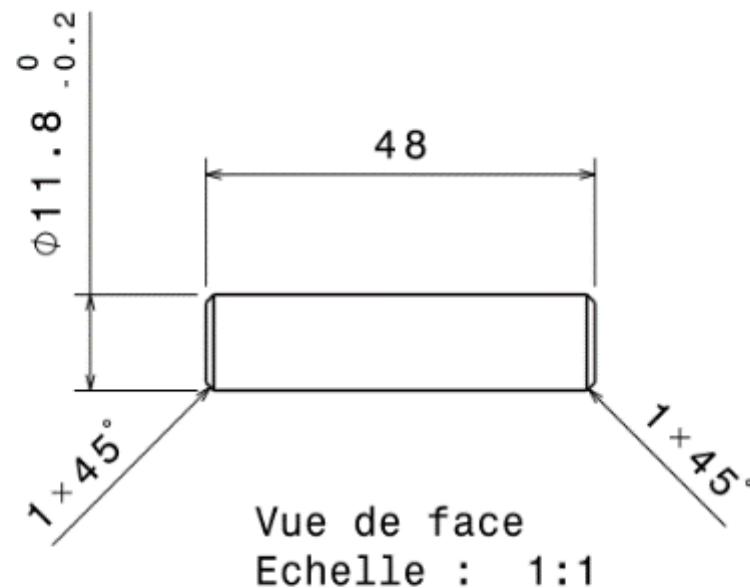


Drawing part :

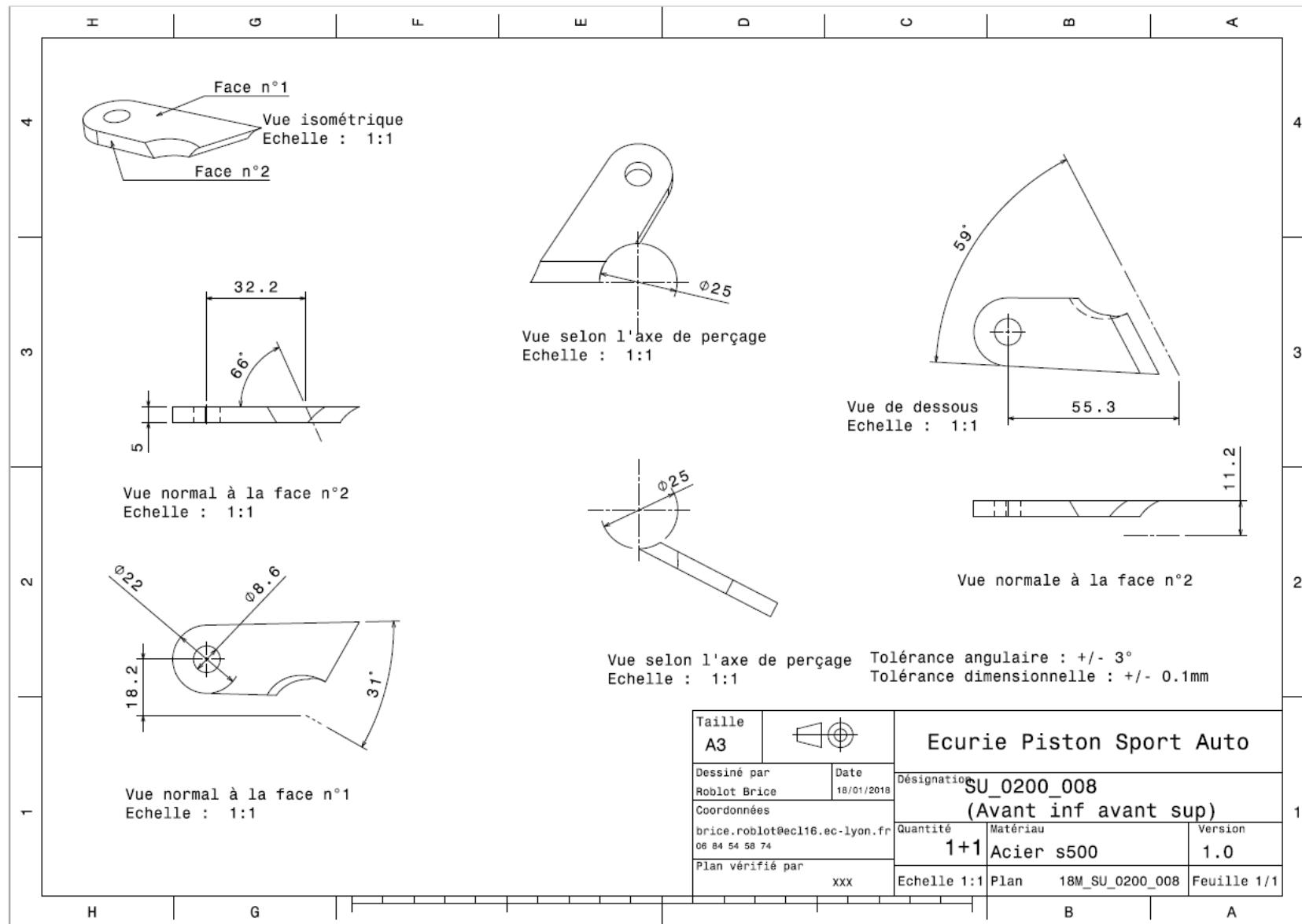
[SU_02007](#)



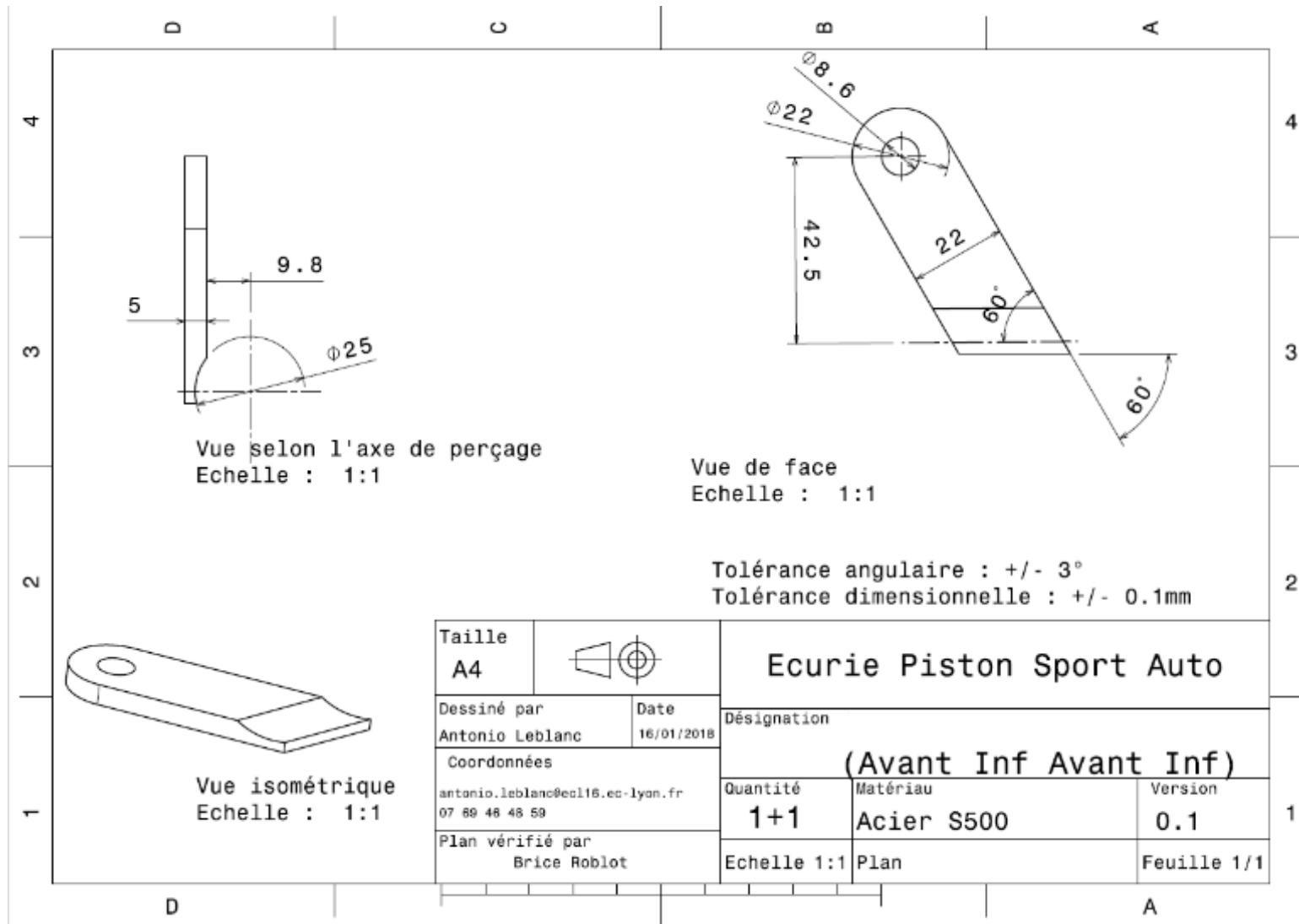
Vue isométrique
Echelle : 1:1



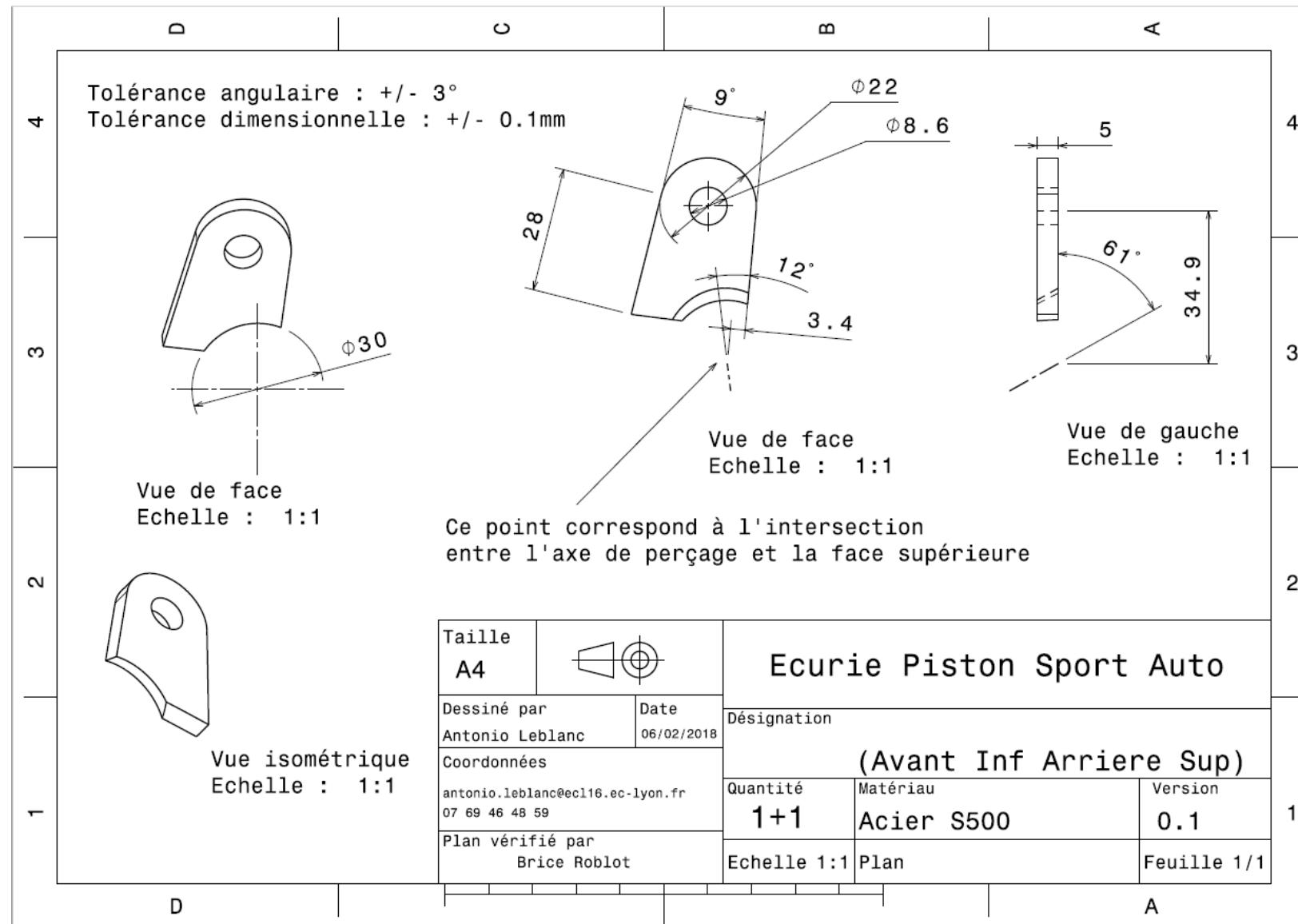
University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,35								
System	Suspension & Shocks	Qty	1	Qty	1								
Assembly	Lower Front A-arm	FileLink1		FileLink1									
Part	Front up bracket	FileLink2		FileLink2									
P/N Base	SU_02008	FileLink3		FileLink3									
Suffix	AA												
Details	This part is Welded on the frame												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild (per kg)	Stock for the part	\$ 2,25	0,045	kg			Rectangular area 48x24 mm	1,15E-03	5,00E-03	7850	1	\$ 0,10
													Sub Total \$ 0,10
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	Installation of the item 10 for laser cut	\$ 1,30	Unit	1	2 parts made from a single setup	0,5	\$ 0,65					
20	Laser Cut		\$ 0,01	cm	15,5			\$ 0,16					
30	Machining Setup, Change		\$ 0,65	Unit	1	2 parts made from a single setup	0,5	\$ 0,33					
40	Machining	Tubing cavity	\$ 0,04	cm^3	1	Material -Steel	3	\$ 0,12					
							Sub Total	\$ 1,25					



University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,39								
System	Suspension & Shocks	Qty	1	Drawing	Back to BOM								
Assembly	Lower Front A-arm	FileLink1		FileLink1									
Part	Front down bracket	FileLink2		FileLink2									
P/N Base	SU_02009	FileLink3		FileLink3									
Suffix	AA												
Details	This part is Welded on the frame												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild (per kg)	Stock for the part	\$ 2,25	0,059	kg			Rectangular area 68x22mm	1,50E-03	5,00E-03	7850	1	\$ 0,13
													Sub Total \$ 0,13
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	Installation of the item 10 for laser cut	\$ 1,30	Unit	1	2 parts made from a single setup	0,5	\$ 0,65					
20	Laser Cut		\$ 0,01	cm	16,3			\$ 0,16					
30	Machining Setup, Change		\$ 0,65	Unit	1	2 parts made from a single setup	0,5	\$ 0,33					
40	Machining	Tubing cavity	\$ 0,04	cm^3	1	Material -Stee	3	\$ 0,12					
							Sub Total	\$ 1,26					

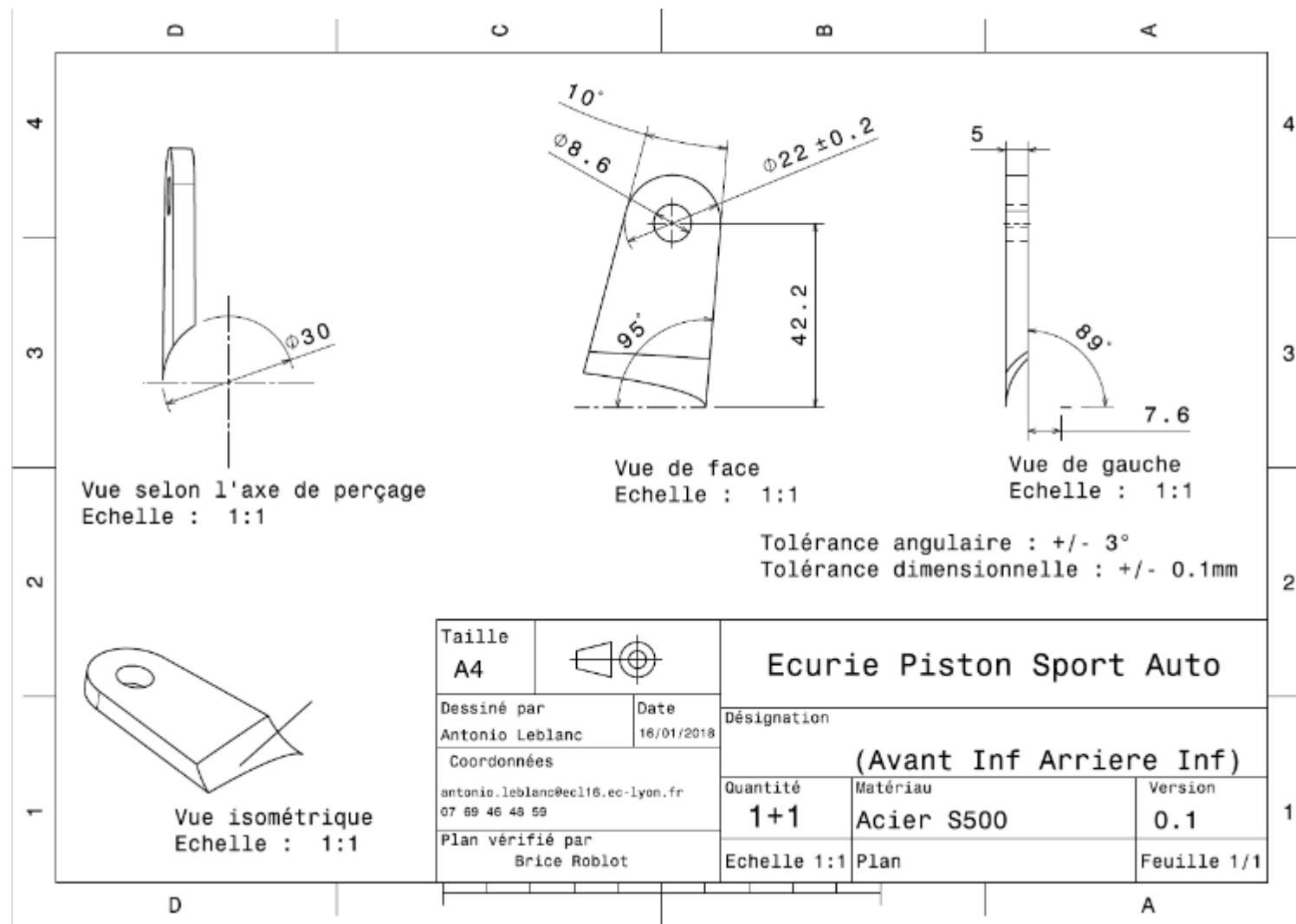


University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,30								
System	Suspension & Shocks	Qty	1	Part Cost	\$ 1,30								
Assembly	Lower Front A-arm	FileLink1	Drawing	FileLink1	FileLink1								
Part	Rear Up bracket	FileLink2		FileLink2	FileLink2								
P/N Base	SU_02010	FileLink3		FileLink3	FileLink3								
Suffix	AA												
Details	This part is Welded on the frame												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild (per kg)	Stock for the part	\$ 2,25	0,035	kg			Rectangular area 40x22mm	8,80E-04	5,00E-03	7850	1	\$ 0,08
													Sub Total \$ 0,08
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	Installation item 10 for laser cut	\$ 1,30	Unit	1	2 parts made from a single setup	0,5	\$ 0,65					
20	Laser Cut		\$ 0,01	cm	13,2			\$ 0,13					
30	Machining Setup, Change		\$ 0,65	Unit	1	2 parts made from a single setup	0,5	\$ 0,33					
40	Machining	Tubing cavity	\$ 0,04	cm^3	1	Material -Steel	3	\$ 0,12					
							Sub Total	\$ 1,23					



University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,37								
System	Suspension & Shocks	Qty	1	Qty	1								
Assembly	Lower Front A-arm	FileLink1		FileLink1									
Part	Rear down bracket	FileLink2		FileLink2									
P/N Base	SU_02011	FileLink3		FileLink3									
Suffix	AA			Extended Cos	\$ 1,37								
Details	This part is Welded on the frame												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild (per kg)	Stock for the part	\$ 2,25	0,054	kg			Rectangular area	1,36E-03	5,00E-03	7850	1	\$ 0,12
													Sub Total \$ 0,12
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	Installation of the item 10 for laser cut	\$ 1,30	Unit	1	2 parts made from a single setup	0,5	\$ 0,65					
20	Laser Cut		\$ 0,01	cm	15,8			\$ 0,16					
30	Machining Setup, Change		\$ 0,65	Unit	1	2 parts made from a single setup	0,5	\$ 0,33					
40	Machining	Tubing cavity	\$ 0,04	cm^3	1	Material -Steel	3	\$ 0,12					
							Sub Total	\$ 1,25					

Drawing :



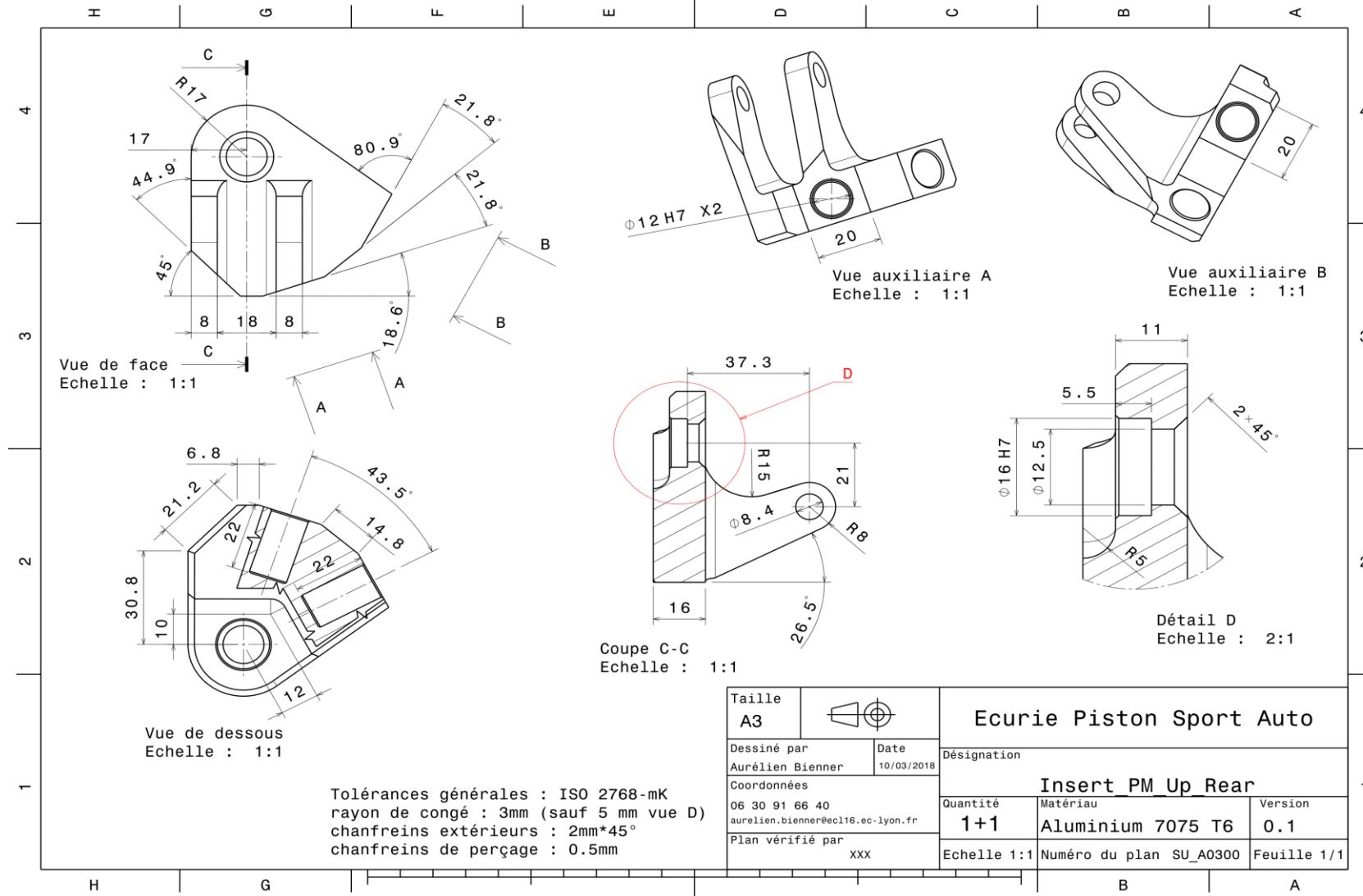
University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Asm Cost	\$ 76,65								
System	Suspension & Shocks		Qty	2										
Assembly	Upper Back A-arm		FileLink1											
P/N Base	SU A0300		FileLink2											
Suffix			FileLink3											
Details														
ItemOrder	Part	Part Cost	Quantity	Sub Total										
10	Upper Back Bearing Support	\$ 16,49	1	\$ 16,49										
20	Inner Bearing Support	\$ 1,87	2	\$ 3,75										
30	Upper Back A-arm tube (Front) Carbon Fiber Tube	\$ 10,88	1	\$ 10,88										
40	Upper Back A-arm tube (Back) Carbon Fiber Tube	\$ 4,34	1	\$ 4,34										
50	Spacer_1	\$ 0,72	2	\$ 1,44										
60	Spacer_2	\$ 0,32	4	\$ 1,30										
70	Outboard A-arm Insert	\$ 0,56	2	\$ 1,11										
80	Front up bracket	\$ 1,44	1	\$ 1,44										
90	Front down bracket	\$ 1,44	1	\$ 1,44										
100	Rear up bracket	\$ 1,25	1	\$ 1,25										
110	Rear down bracket	\$ 1,34	1	\$ 1,34										
				Sub Total	\$ 39,30									
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Nam	Area	Length	Density	Quantity	Sub Total	
10	Sperical bearing	\$ 6,92	8 mm									3	\$ 20,76	
20	Adhesive	Glue for Ball Joint – Cost Included in Processes	\$ -										\$ -	
30	Adhesive	Epoxy resin for Tube/insert assembly – Cost Included in Processes	\$ -										\$ -	
40	Paint	Steel mounts painting	\$ 10,00	0,01 m ²									\$ 0,10	
													Sub Total	\$ 20,86
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total						
10	Hand Finish - Surface Preperation	Solvent degreasing on Upper Front Bearing Support	\$ 0,02 cm ²	8,66	Repeat 2	2	\$ 0,35							
20	Brush Apply	Glue applying on Upper Front Bearing Support	\$ 0,02 cm ²	8,66	Repeat 2	2	\$ 0,35							
30	Hand Finish - Surface Preperation	Solvent degreasing on Outboard A-arm insert	\$ 0,02 cm ²	8,66	Repeat 2	2	\$ 0,35							
40	Assemble, 1kg, loose	Outboard A-arm Insert in Upper front bearing support	\$ 0,06 Unit	1	Repeat 2	2	\$ 0,12							
50	Hand Finish - Surface Preperation	Solvent degreasing on Inner Bearing support	\$ 0,02 cm ²	12,43	Repeat 2	2	\$ 0,50							
60	Brush Apply	Glue applying on Inner Bearing support	\$ 0,02 cm ²	12,43	Repeat 2	2	\$ 0,50							
70	Hand Finish - Surface Preperation	Solvent degreasing on carbon tube	\$ 0,02 cm ²	12,43	Repeat 2	2	\$ 0,50							
80	Assemble, 1kg, loose	Inner Bearing support in Carbon Tube	\$ 0,14 Unit	1	Repeat 2	2	\$ 0,28							
90	Hand Finish - Surface Preperation	Solvent degreasing on Outboard A-arm Insert	\$ 0,02 cm ²	12,43	Repeat 2	2	\$ 0,50							
100	Brush Apply	Glue applying on Outboard A-arm Inserts	\$ 0,18 cm ²	12,43	Repeat 2	2	\$ 4,47							
110	Hand Finish - Surface Preperation	Solvent degreasing on carbon tube	\$ 0,02 cm ²	12,43	Repeat 2	2	\$ 0,50							
120	Assemble, 1kg, loose	Outboard A-arm Insert in Carbon Tube with Inner Bearing support	\$ 0,22 Unit	1	Repeat 2	2	\$ 0,44							
130	Hand Finish - Surface Preperation	Solvent degreasing on bearing bores	\$ 0,02 cm ²	4,01	Repeat 3	3	\$ 0,24							
140	Brush Apply	Glue applying on bearing bores	\$ 0,02 cm ²	4,01	Repeat 3	3	\$ 0,24							
150	Assemble, 1kg, loose	Bearing in Insert Bores	\$ 0,30 Unit	1	Repeat 3	3	\$ 0,90							
160	Aerosol Apply	Steel mounts painting	\$ 5,25 m ²	0,01				\$ 0,05						
170	Weld	Steel mounts welding	\$ 0,15 cm ²	22				\$ 3,30						
180	Assemble, 1kg, loose	A-Arm Positionning	\$ 0,14 Unit	1				\$ 0,14						
190	Assemble, 1kg, Line on line	Spacers installation	\$ 0,13 Unit	4				\$ 0,52						
200	Assemble, 1kg, Line on line	Washers installation	\$ 0,13 Unit	8				\$ 1,04						
210	Ratchet <= 25,4mm	M8 bolts installation	\$ 0,13 Unit	2				\$ 0,26						
220	Reaction tool <=25,4mm	M8 nut blocking	\$ 0,25 Unit	2				\$ 0,50						
								Sub Total	\$ 16,03					
ItemOrder	Fastener	Use	UnitCost	Size1	Unit1	Size2	Unit2	Quantity	Sub Total					
10	Bolt, Grade 8,8 (SAE 5)	A-Arm Fixing Bolts on Frame Side	\$ 0,16	8 mm		40 mm		2	\$ 0,32					
20	Nut, Grade 8,8 (SAE 5)	A-Arm Fixing Nuts	\$ 0,04	8 mm				2	\$ 0,09					
30	Washer, Grade 8,8 (SAE 5)	A-Arm Fixing Washers	\$ 0,01	8 mm				4	\$ 0,04					
								Sub Total	\$ 0,45					



ItemOrder	Tooling	Use	UnitCost	Unit	Quantity	PVF	FractionIn	Sub Total
10	Welds - Welding Fixture	Welding processes	\$ 500,00	point	8	3000	1	\$ 1,33
							Sub Total	\$ 1,33

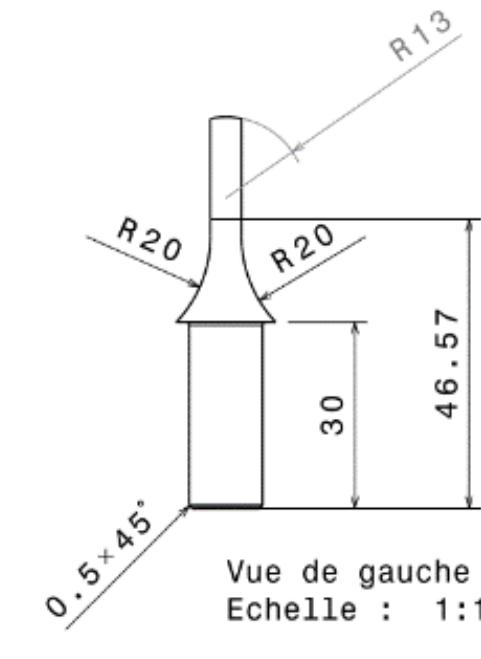
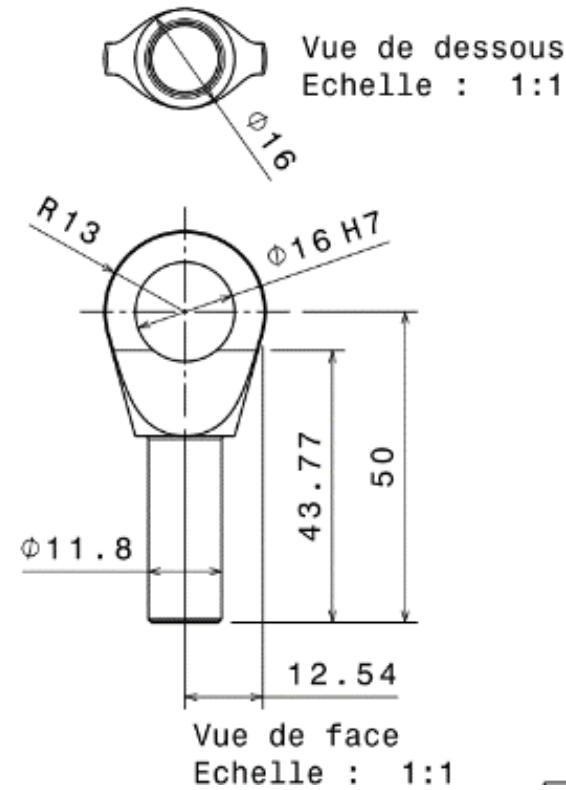
University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 16,49							
System	Suspension & Shocks		Qty	1									
Assembly	Upper Back A-arm		FileLink1										
Part	Upper Back Bearing Support		FileLink2										
P/N Base	SU 03001		FileLink3										
Suffix					Extended Cost	\$ 16,49							
Details					FileLink1								
					FileLink2								
					FileLink3								
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Aluminum, Premium	Stock material for part	\$ 4,20	0,593	kg			Upper face	3,91E-03	5,60,E-02	2712	1	\$ 2,49
													Sub Total \$ 2,49
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove		\$ 1,30	Unit	1			\$ 1,30					
20	Machining	Main shape contouring and top of the main hole machining	\$ 0,04	cm^3	174			\$ 6,96					
30	Machining Setup, Change		\$ 0,65	Unit	1			\$ 0,65					
40	Machining	First tube hole machining	\$ 0,04	cm^3	2			\$ 0,09					
50	Machining Setup, Change		\$ 0,65	Unit	1			\$ 0,65					
60	Machining	Second tube hole machining	\$ 0,04	cm^3	2			\$ 0,09					
70	Machining Setup, Change		\$ 0,65	Unit	1			\$ 0,65					
80	Machining	Angle and bottom of the main hole machining	\$ 0,04	cm^3	8			\$ 0,32					
90	Machining Setup, Change		\$ 0,65	Unit	1			\$ 0,65					
100	Machining	Suspension rod support machining	\$ 0,04	cm^3	57			\$ 2,28					
110	Drilled holes < 25.4 mm	Suspension rod support drilling	\$ 0,35		1			\$ 0,35					
							Sub Total	\$ 13,99					





University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 1,87								
System	Suspension & Shocks	FileLink1	Qty	2	FileLink1									
Assembly	Upper Back A-arm	FileLink2	FileLink2		FileLink3									
Part	Inner Bearing Support	FileLink3	FileLink3		Extended Cos	\$ 3,75								
P/N Base	SU 03002													
Suffix														
Details														
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total	
10	Aluminum, Premium	Stock materia	\$ 4,20	0,204	Kg			Cylinder face area	1,26E-03	6E-02	2712	1,00	\$ 0,86	
													Sub Total	\$ 0,86
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total						
10	Machining Setup, Install and remove		\$ 1,30	Unit		16 parts from a single setup	0,0625	\$ 0,08						
20	Machining	Main shape machining	\$ 0,04	cm^3		17	Material - Aluminium	1 \$ 0,68						
30	Machining Setup, Change		\$ 0,65	Unit		16 parts from a single setup	0,0625	\$ 0,04						
40	Machining	machining	\$ 0,04	cm^3		2	Material - Aluminium	1 \$ 0,08						
50	Machining Setup, Change		\$ 0,65	Unit		16 parts from a single setup	0,0625	\$ 0,04						
60	Machining	Hole	\$ 0,04	cm^3		2	Material - Aluminium	1 \$ 0,09						
							Sub Total	\$ 1,01						

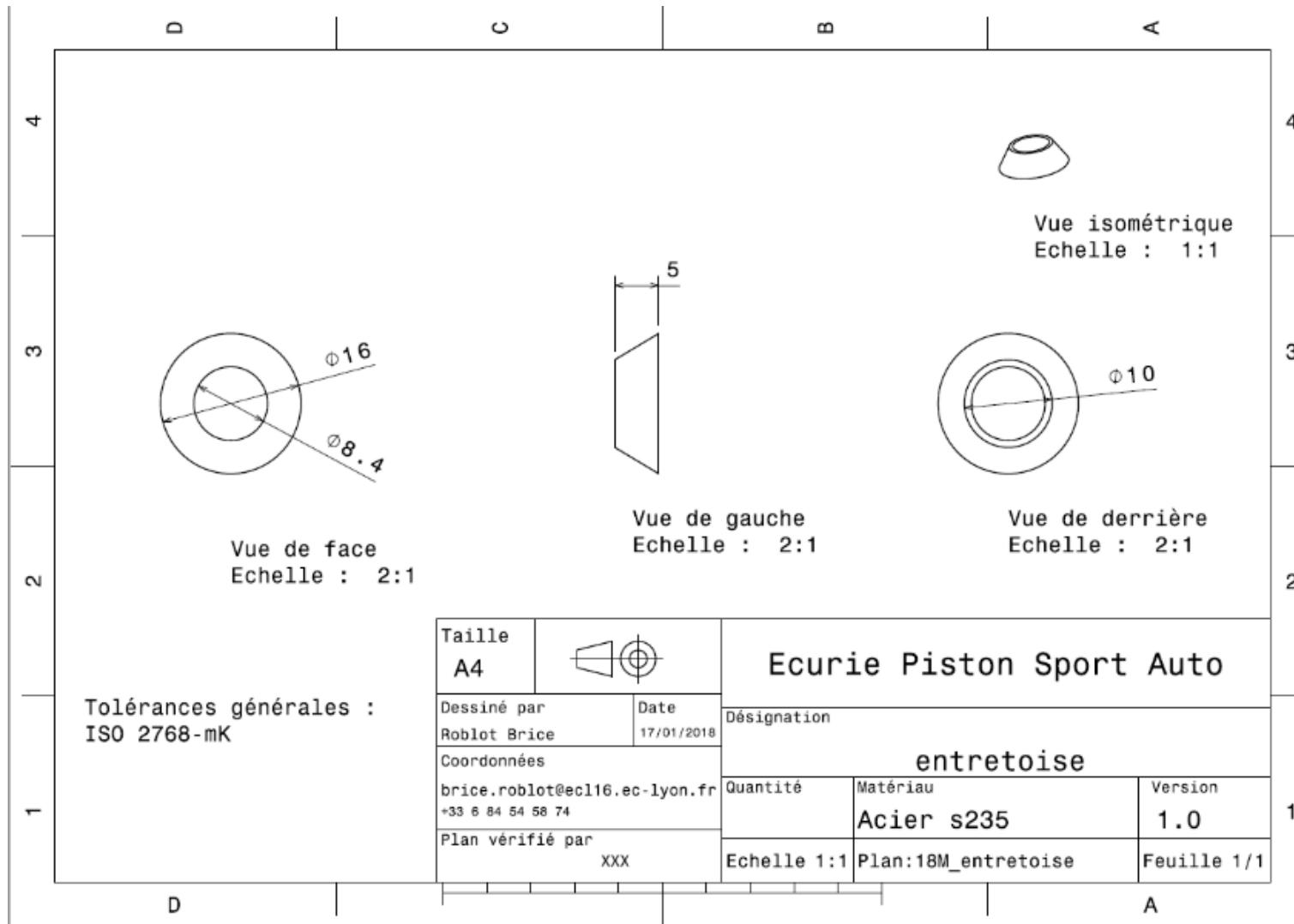




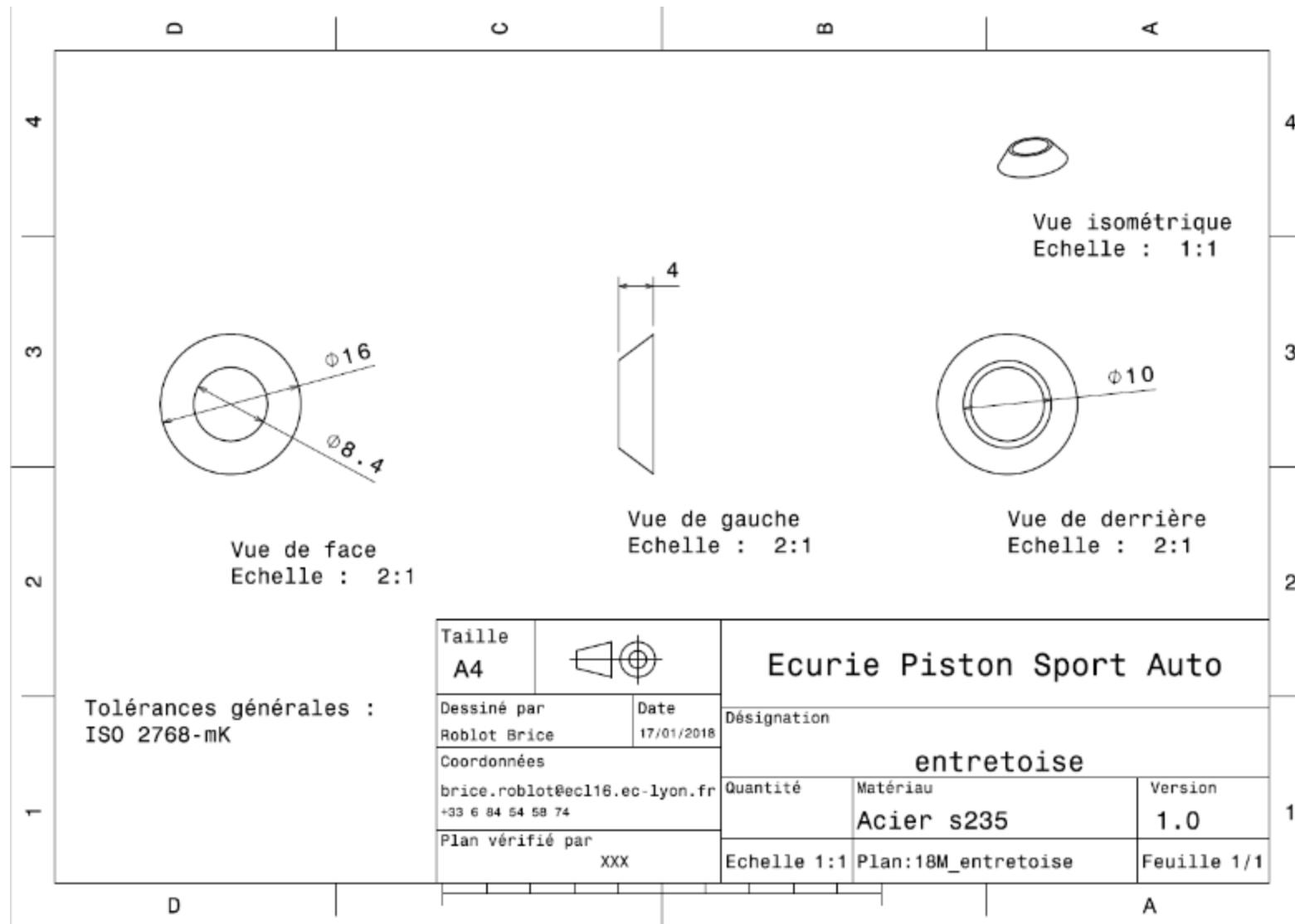
University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 10,88								
System	Suspension & Shocks	Qty	1										
Assembly	Upper Back A-arm	FileLink1											
Part	Upper Back A-arm tube (Front) Carbon Fiber Tube	FileLink2											
P/N Base	SU 03003	FileLink3											
Suffix													
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Carbon Fiber, 1 Ply	Stock	\$ 9,67	3,06E-05	m^3			tube face	8,79E-05	0,348	1580	1	\$ 9,67
													Sub Total \$ 9,67
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Lamination, Filament Wirring	Tube Lamination	\$ 25,00	kg	0,048			\$ 1,21					
								Sub Total \$ 1,21					

University	Ecole Centrale de Lyon	Car #	81										
System	Suspension & Shocks	Part Cost	\$ 4,34										
Assembly	Upper Back A-arm	Qty	1										
Part	Upper Back A-arm tube (Back) Carbon Fiber Tube	FileLink1	Drawing										
P/N Base	SU 03004	FileLink2											
Suffix		FileLink3											
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Carbon Fiber, 1 Ply	Stock	\$ 200,00	0,019	kg			tube face	8,79E-05	0,139	1580	1	\$ 3,86
													Sub Total \$ 3,86
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Lamination, Filament Wirring	Tube Lamination	\$ 25,00	kg	0,019								\$ 0,48
								Sub Total	\$ 0,48				

University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 0,72								
System	Suspension & Shocks	Qty	2										
Assembly	<u>Upper Back A-arm</u>	FileLink1	Drawing	FileLink1									
Part	Spacer 1	FileLink2		FileLink2									
P/N Base	SU 03005	FileLink3		FileLink3	Extended Cos \$ 1,44								
Suffix													
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Mild Steel	Stock material for part	\$ 2,25	0,008	Kg			Cylinder face	0,00	5,0	7850	1	\$ 0,02
													Sub Total \$ 0,02
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	Setup for machining	\$ 1,30	unit	1	Same setup for 2 parts	0,5	\$ 0,65					
20	Machining	Material removal	\$ 0,04	cm^3	1,3			\$ 0,05					
							Sub Total	\$ 0,70					



University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 0,32									
System	Suspension & Shocks	Qty	4											
Assembly	Upper Back A-arm	FileLink1												
Part	Spacer 2	FileLink2												
P/N Base	SU 03006	FileLink3		Extended Cost	\$ 1,30									
Suffix														
Details														
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total	
10	Steel, Mild (per kg)		\$ 2,25	6,31E-02	Kg			Cylinder face	2,01E-04	4E-02	7850	1	\$ 0,14	
													Sub Total \$ 0,14	
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total						
10	Machining Setup, Install and remove	Setup for machining	\$ 1,30	Unit	1	SU_0*_006 (*=1,...,4) and SU_09_003	2,94E-02	\$ 0,04						
20	Machining	Material removal	\$ 0,04	cm^3	1,2	Material -Stee	3	\$ 0,14						
								Sub Total \$ 0,18						



University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 0,56								
System	Suspension & Shocks	Qty	2										
Assembly	Upper Back A-arm	FileLink1											
Part	Outboard A-arm Insert	FileLink2											
P/N Base	SU 03007	FileLink3											
Suffix				Extended Cos	\$ 1,11								
Details				FileLink3									
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Aluminium, Premium (per kg)	cylinder	\$ 4,20	0,018	kg			Round area diam. 12mm	1,13E-04	0,060	2712	1	\$ 0,08
													Sub Total \$ 0,08
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Saw or tubing cut		\$ 0,40	cm	1,2			\$ 0,48					
								Sub Total \$ 0,48					

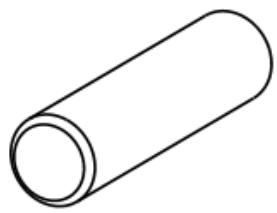
[Back to BOM](#)

[FileLink1](#) [Drawing](#)
[FileLink2](#)
[FileLink3](#)

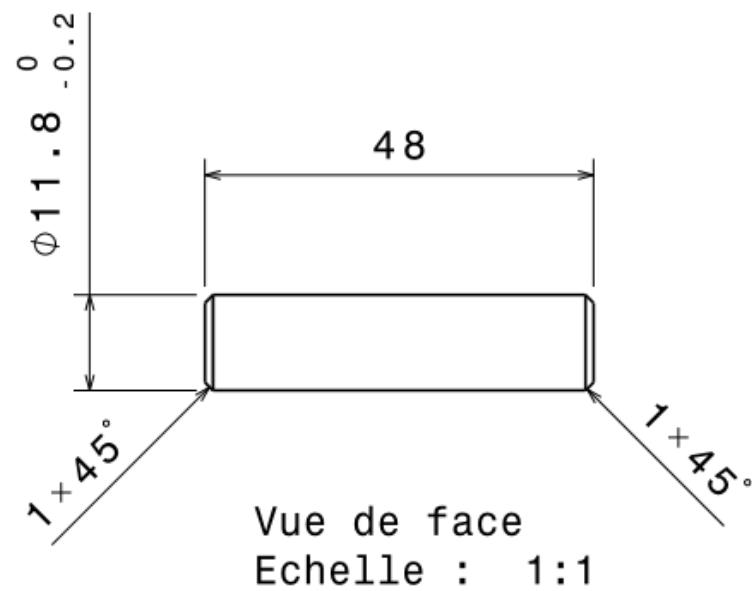
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[FileLink2](#)
[FileLink3](#)

Drawing part :

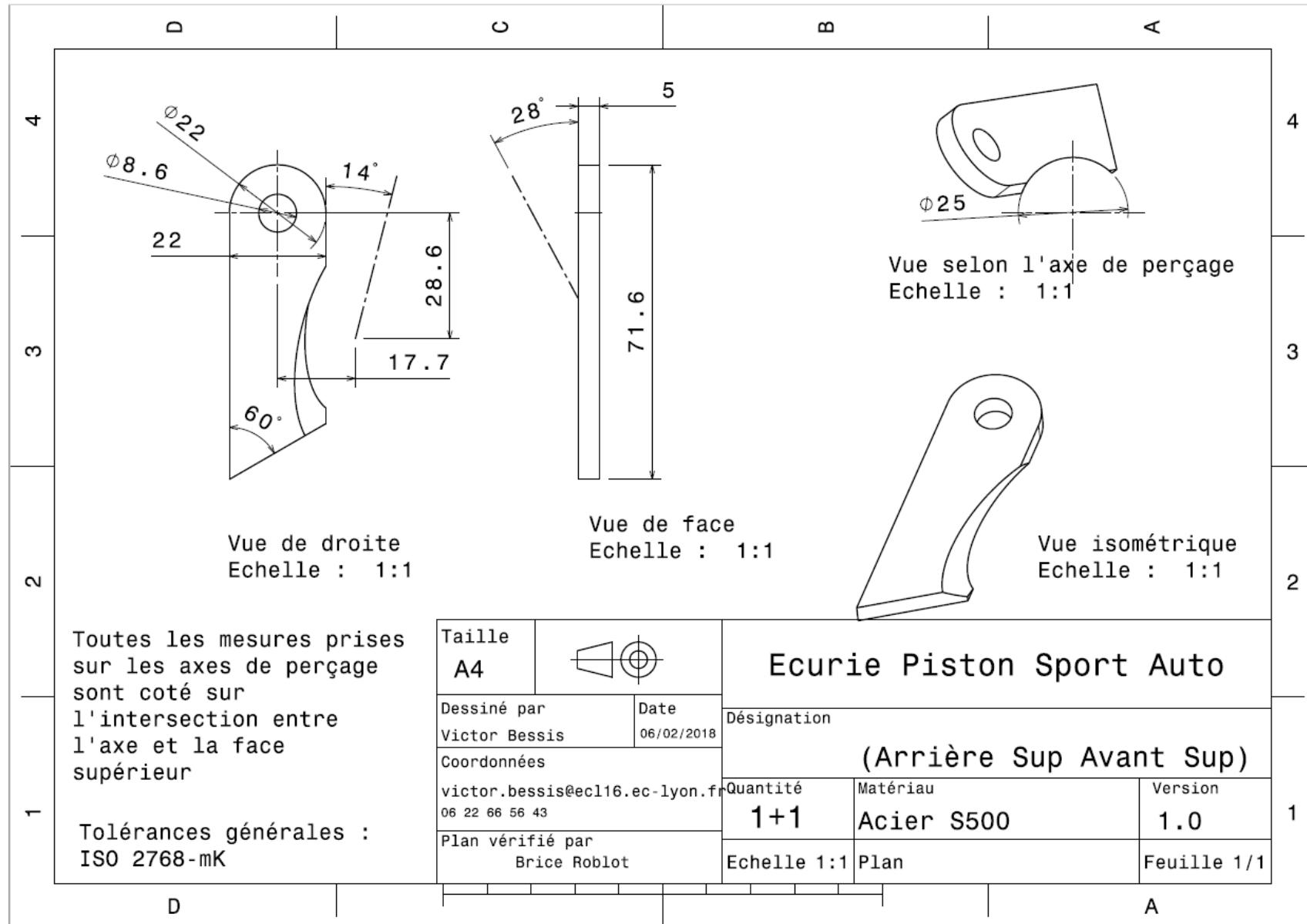
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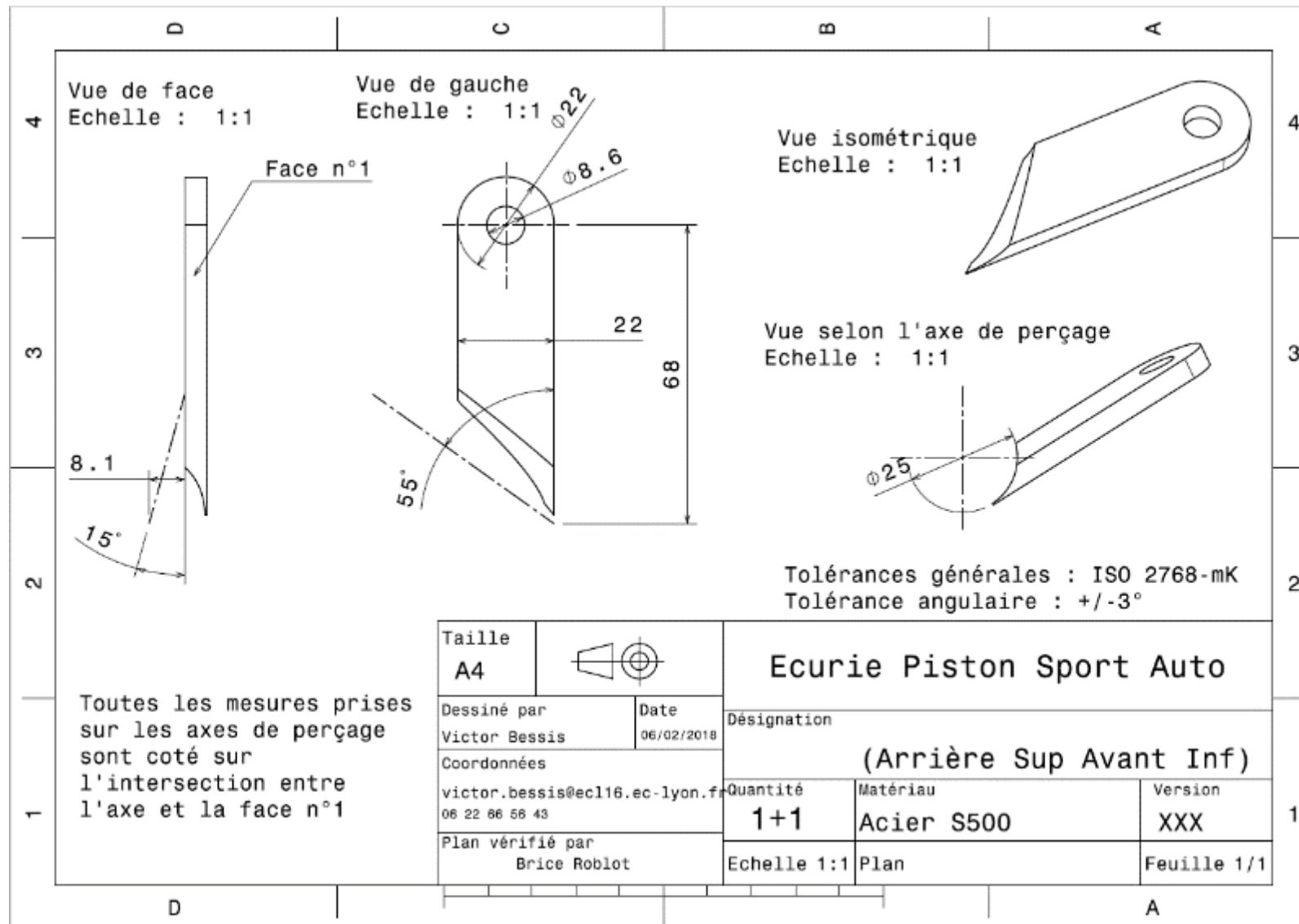
Vue isométrique
Echelle : 1:1



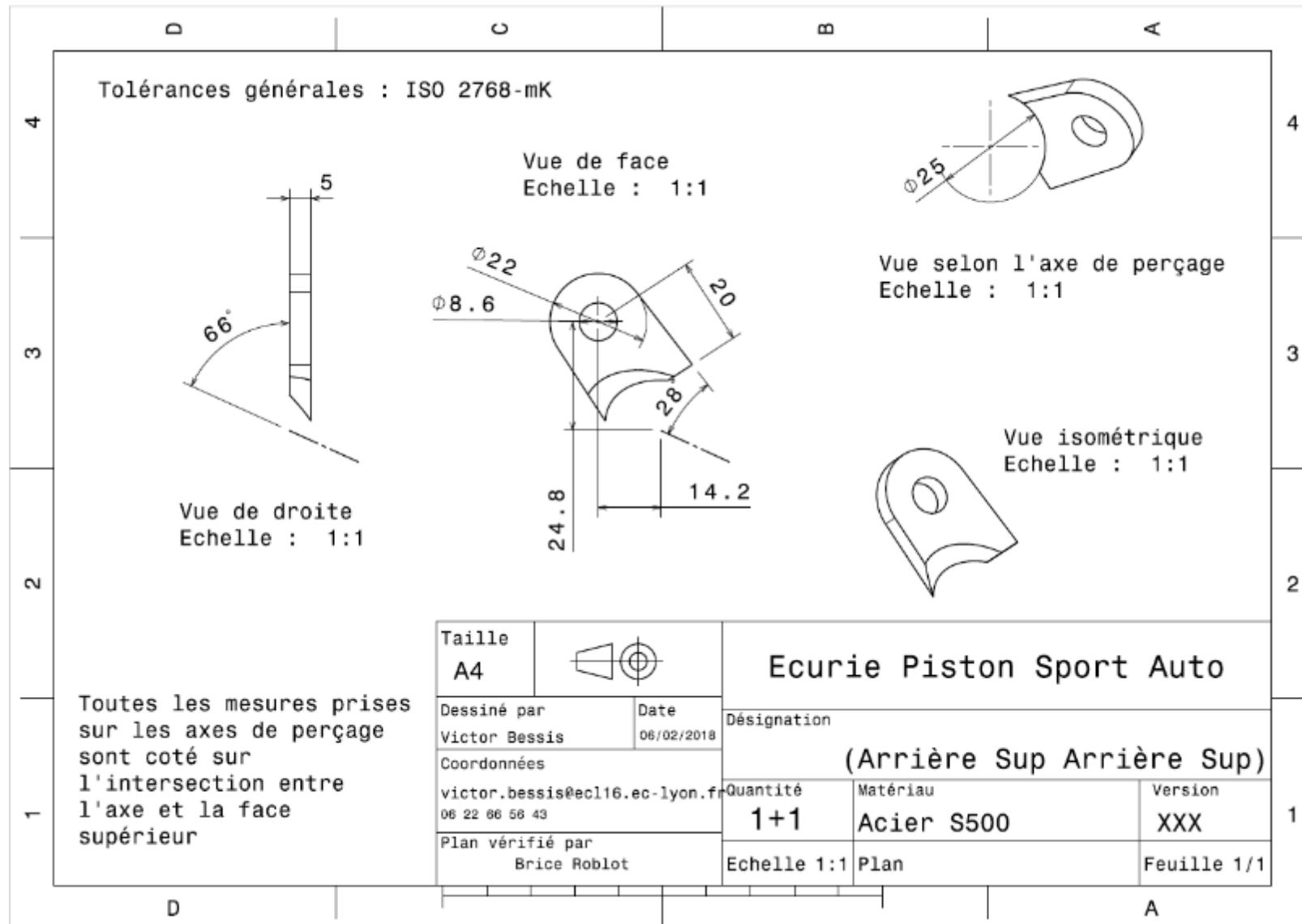
University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,44									
System	Suspension & Shocks	Qty	1											
Assembly	Upper Back A-arm	FileLink1												
Part	Front up bracket	FileLink2												
P/N Base	SU 03008	FileLink3												
Suffix	AA													
Details	This part is Welded on the frame													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total	
10	Steel, Mild (per kg)	Stock for the part	\$ 2,25	0,072	kg			Rectangular area 83x22 mm	1,83E-03	5,00E-03	7850	1	\$ 0,16	
													Sub Total	\$ 0,16
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total						
10	Machining Setup, Install and remove	Installation of the item 10 for laser cut	\$ 1,30	Unit	1	from a single setup	0,5	\$ 0,65						
20	Laser Cut		\$ 0,01	cm	18,5			\$ 0,19						
30	Machining Setup, Change		\$ 0,65	Unit	1	from a single setup	0,5	\$ 0,33						
40	Machining	Tubing cavity	\$ 0,04	cm^3	1	Material -Stee	3	\$ 0,12						
							Sub Total	\$ 1,28						



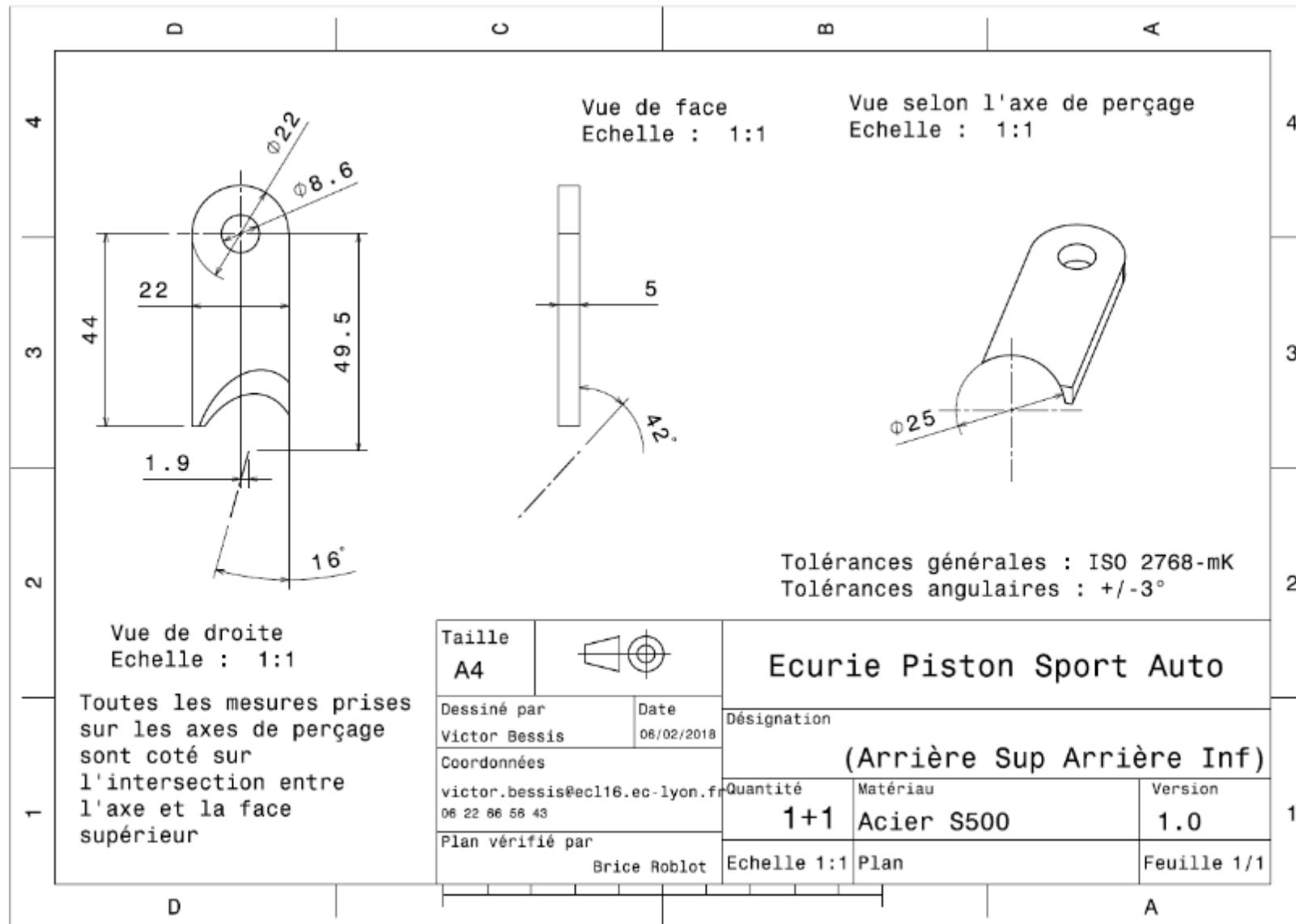
University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,44								
System	Suspension & Shocks	Qty	1										
Assembly	Upper Back A-arm	FileLink1											
Part	Front down bracket	FileLink2											
P/N Base	SU 03009	FileLink3											
Suffix	AA												
Details	This part is Welded on the frame	FileLink1											
FileLink2	Drawing	FileLink2											
FileLink3		FileLink3											
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild (per kg)	Stock for the part	\$ 2,25	0,069	kg			Rectangular area 80x22 mm		1,76E-03	5,00E-03	7850	1 \$ 0,16
													Sub Total \$ 0,16
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	Installation of the item 10 for laser cut	\$ 1,30	Unit		from a single setup	0,5	\$ 0,65					
20	Laser Cut		\$ 0,01	cm	18,8			\$ 0,19					
30	Machining Setup, Change		\$ 0,65	Unit		2 parts made from a single setup	0,5	\$ 0,33					
40	Machining	Tubing cavity	\$ 0,04	cm^3		1 Material -Stee	3	\$ 0,12					
							Sub Total	\$ 1,28					



University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,25								
System	Suspension & Shocks	Qty	1	Part Cost	\$ 1,25								
Assembly	Upper Back A-arm	FileLink1		Qty	1								
Part	Rear up bracket	FileLink2		Extended Cost	\$ 1,25								
P/N Base	SU 03010	FileLink3		FileLink1									
Suffix	AA			FileLink2									
Details	This part is Welded on the frame			FileLink3									
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild (per kg)	Stock for the part	\$ 2,25	0,027	kg			Rectangular area 31x22mm	6,82E-04	5,00E-03	7850	1	\$ 0,06
													Sub Total \$ 0,06
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	Installation item 10 for laser cut	\$ 1,30	Unit	1	from a single setup	0,5	\$ 0,65					
20	Laser Cut		\$ 0,01	cm	9,2			\$ 0,09					
30	Machining Setup, Change		\$ 0,65	Unit	1	2 parts made from a single setup	0,5	\$ 0,33					
40	Machining	Tubing cavity	\$ 0,04	cm^3	1	Material -Stee	3	\$ 0,12					
							Sub Total	\$ 1,19					



University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,34								
System	Suspension & Shocks	Qty	1	Part Cost	\$ 1,34								
Assembly	Upper Back A-arm	FileLink1		FileLink1									
Part	Rear down bracket	FileLink2		FileLink2									
P/N Base	SU 03011	FileLink3		FileLink3									
Suffix	AA			Extended Cos	\$ 1,34								
Details	This part is Welded on the frame												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild (per kg)	Stock for the part	\$ 2,25	0,047	kg			Rectangular area 55x22 mm		1,21E-03	5,00E-03	7850	1 \$ 0,11
													Sub Total \$ 0,11
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	Installation of the item 10 for laser cut	\$ 1,30	Unit	1	2 parts made from a single setup	0,5	\$ 0,65					
20	Laser Cut		\$ 0,01	cm	14,0			\$ 0,14					
30	Machining Setup, Change		\$ 0,65	Unit	1	2 parts made from a single setup	0,5	\$ 0,33					
40	Machining	Tubing cavity	\$ 0,04	cm^3	1	Material -Steel	3	\$ 0,12					
							Sub Total	\$ 1,24					

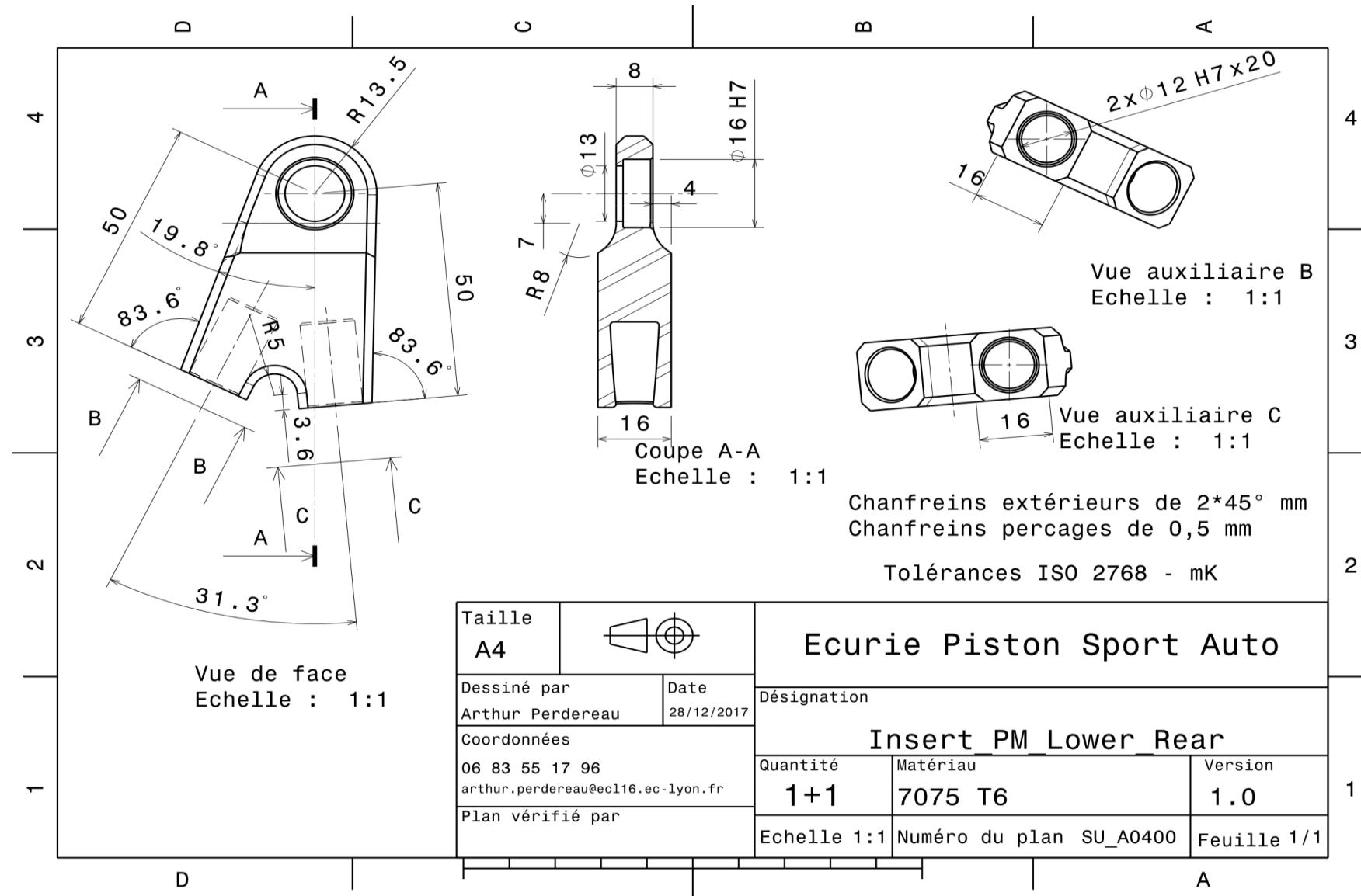


University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Asm Cost	\$ 79,60								
System	Suspension & Shocks		Qty	2										
Assembly	Lower Back A-arm		FileLink1											
P/N Base	SU A0400		FileLink2											
Suffix			FileLink3											
Details														
ItemOrder	Part	Part Cost	Quantity	Sub Total										
10	Lower Back Bearing Support	\$ 5,25	1	\$ 5,25										
20	Inner Bearing Support	\$ 1,87	2	\$ 3,75										
30	Lower Back A-arm tube (Front) Carbon Fiber Tube	\$ 12,03	1	\$ 12,03										
40	Lower Back A-arm tube (Back) Carbon Fiber Tube	\$ 7,41	1	\$ 7,41										
50	Spacer_1	\$ 1,63	2	\$ 3,26										
60	Spacer_2	\$ 0,81	4	\$ 3,22										
70	Outboard A-arm Insert	\$ 0,56	2	\$ 1,11										
80	Front up bracket	\$ 1,35	1	\$ 1,35										
90	Front down bracket	\$ 1,34	1	\$ 1,34										
100	Rear up bracket	\$ 1,73	1	\$ 1,73										
110	Rear down bracket	\$ 1,80	1	\$ 1,80										
				Sub Total	\$ 42,26									
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total	
10	Sperical bearing		\$ 6,92	8 mm								3	\$ 20,76	
20	Adhesive	Glue for Ball Joint – Cost Included in Processes											\$ -	
30	Adhesive	Epoxy resin for Tube/insert assembly – Cost Included in Processes											\$ -	
40	Paint	Steel mounts painting	\$ 10,00	0,01 m ²									\$ 0,10	
													Sub Total	\$ 20,86
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total						
10	Hand Finish - Surface Preperation	Solvent degreasing on Upper Front Bearing Support	\$ 0,02	cm ²	8,66	Repeat 2	2	\$ 0,35						
20	Brush Apply	Glue applying on on Upper Front Bearing Support	\$ 0,02	cm ²	8,66	Repeat 2	2	\$ 0,35						
30	Hand Finish - Surface Preperation	Solvent degreasing on Outboard A-arm insert	\$ 0,02	cm ²	8,66	Repeat 2	2	\$ 0,35						
40	Assemble, 1kg, loose	Outboard A-arm Insert in Upper front bearing support	\$ 0,06	Unit	1	Repeat 2	2	\$ 0,12						
50	Hand Finish - Surface Preperation	Solvent degreasing on Inner Bearing support	\$ 0,02	cm ²	12,43	Repeat 2	2	\$ 0,50						
60	Brush Apply	Glue applying on Inner Bearing support	\$ 0,02	cm ²	12,43	Repeat 2	2	\$ 0,50						
70	Hand Finish - Surface Preperation	Solvent degreasing on carbon tube	\$ 0,02	cm ²	12,43	Repeat 2	2	\$ 0,50						
80	Assemble, 1kg, loose	Inner Bearing support in Carbon Tube	\$ 0,14	Unit	1	Repeat 2	2	\$ 0,28						
90	Hand Finish - Surface Preperation	Solvent degreasing on Outboard A-arm Insert	\$ 0,02	cm ²	12,43	Repeat 2	2	\$ 0,50						
100	Brush Apply	Glue applying on Outboard A-arm Inserts	\$ 0,18	cm ²	12,43	Repeat 2	2	\$ 4,47						
110	Hand Finish - Surface Preperation	Solvent degreasing on carbon tube	\$ 0,02	cm ²	12,43	Repeat 2	2	\$ 0,50						
120	Assemble, 1kg, loose	Outboard A-arm Insert in Carbon Tube with Inner Bearing support	\$ 0,22	Unit	1	Repeat 2	2	\$ 0,44						
130	Hand Finish - Surface Preperation	Solvent degreasing on bearing bores	\$ 0,02	cm ²	4,01	Repeat 3	3	\$ 0,24						
140	Brush Apply	Glue applying on bearing bores	\$ 0,02	cm ²	4,01	Repeat 3	3	\$ 0,24						
150	Assemble, 1kg, loose	Bearing in Insert Bores	\$ 0,30	Unit	1	Repeat 3	3	\$ 0,90						
160	Aerosol Apply	Steel mounts painting	\$ 5,25	m ²	0,01			\$ 0,05						
170	Weld	Steel mounts welding	\$ 0,15	cm ²	22			\$ 3,30						
180	Assemble, 1kg, loose	A-Arm Positionning	\$ 0,14	Unit	1			\$ 0,14						
190	Assemble, 1kg, Line on line	Spacers installation	\$ 0,13	Unit	4			\$ 0,52						
200	Assemble, 1kg, Line on line	Washers installation	\$ 0,13	Unit	8			\$ 1,04						
210	Ratchet <= 25,4mm	M8 bolts installation	\$ 0,13	Unit	2			\$ 0,26						
220	Reaction tool <=25,4mm	M8 nut blocking	\$ 0,25	Unit	2			\$ 0,50						
								Sub Total	\$ 16,03					
ItemOrder	Fastener	Use	UnitCost	Size1	Unit1	Size2	Unit2	Quantity	Sub Total					
10	Bolt, Grade 8,8 (SAE 5)	A-Arm Fixing Bolts on Frame Side	0,16	8 mm		40 mm		2	\$ 0,32					
20	Nut, Grade 8,8 (SAE 5)	A-Arm Fixing Nuts	0,04	8 mm				2	\$ 0,09					
30	Washer, Grade 8,8 (SAE 5)	A-Arm Fixing Washers	0,01	8 mm				4	\$ 0,04					
									Sub Total	\$ 0,45				



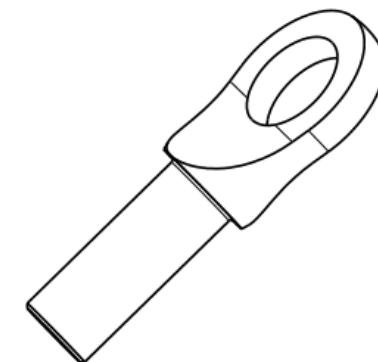
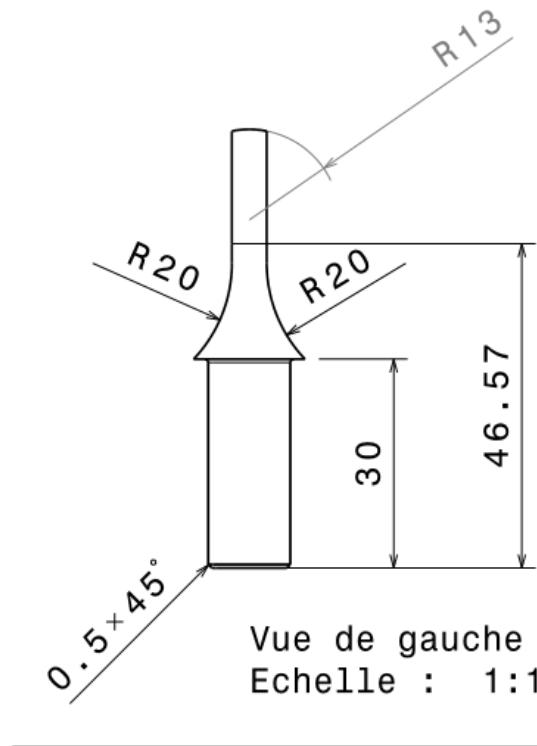
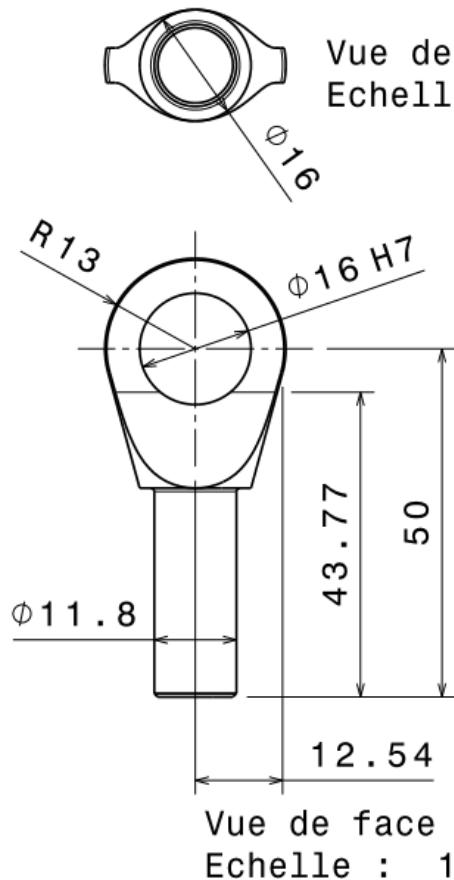
ItemOrder	Tooling	Use	UnitCost	Unit	Quantity	PWF	FractionIn	Sub Total
10	Welds - Welding Fixture	Welding processes	\$ 500,00	point	8	3000	1	\$ 1,33
								Sub Total \$ 1,33

University	Ecole Centrale de Lyon	Back to BOM								Car #	81	Part Cost	\$ 5,25	
System	Suspension & Shocks									Qty	1			
Assembly	Lower Back A-arm									FileLink1				
Part	Lower Back Bearing Support									FileLink2				
P/N Base	SU 04001									FileLink3				
Suffix										Extended				
Details										FileLink3				
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total	
10	Aluminium, Premium	Insert	\$ 4,20	0,118	kg			ar area		2,73E-03	1,60E-02	2712	1 \$ 0,50	
													Sub Total \$ 0,50	
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total						
10	Machining Setup, Install and remove		\$ 1,30	Unit	1			\$ 1,30						
20	Machining	Main shape contouring and top side machining	\$ 0,04	cm^3	27	Material - Aluminium	1	\$ 1,08						
30	Change		\$ 0,65	Unit	1			\$ 0,65						
40	Machining	First tube hole machining	\$ 0,04	cm^3	2	Material - Aluminium	1	\$ 0,09						
50	Change		\$ 0,65	Unit	1			\$ 0,65						
60	Machining	Second tube hole machining	\$ 0,04	cm^3	2	Material - Aluminium	1	\$ 0,09						
70	Machining Setup, Change		\$ 0,65	Unit	1			\$ 0,65						
80	Machining	Bottom side and hole machining	\$ 0,04	cm^3	6	Material - Aluminium	1	\$ 0,24	Sub Total	\$ 4,75				



University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,87								
System	Suspension & Shocks	Qty	2	Drawing	Drawing								
Assembly	Lower Back A-arm	FileLink1		FileLink1									
Part	Inner Bearing Support	FileLink2		FileLink2									
P/N Base	SU_04002	FileLink3		FileLink3									
Suffix													
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Aluminum, Premium	Stock material	\$ 4,20	0,204	Kg			Cylinder face area	1,26E-03	6E-02	2712	1	\$ 0,86
													Sub Total \$ 0,86
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove		\$ 1,30	Unit	1	16 parts from a single setup	0,0625	\$ 0,08					
20	Machining	Main shape machining	\$ 0,04	cm^3	17	Aluminium	1	\$ 0,68					
30	Machining Setup, Change		\$ 0,65	Unit	1	16 parts from a single setup	0,0625	\$ 0,04					
40	Machining	machining	\$ 0,04	cm^3	2	Aluminium	1	\$ 0,08					
50	Machining Setup, Change		\$ 0,65	Unit	1	16 parts from a single setup	0,0625	\$ 0,04					
60	Machining	Hole	\$ 0,04	cm^3	2	Aluminium	1	\$ 0,09					
							Sub Total	\$ 1,01					

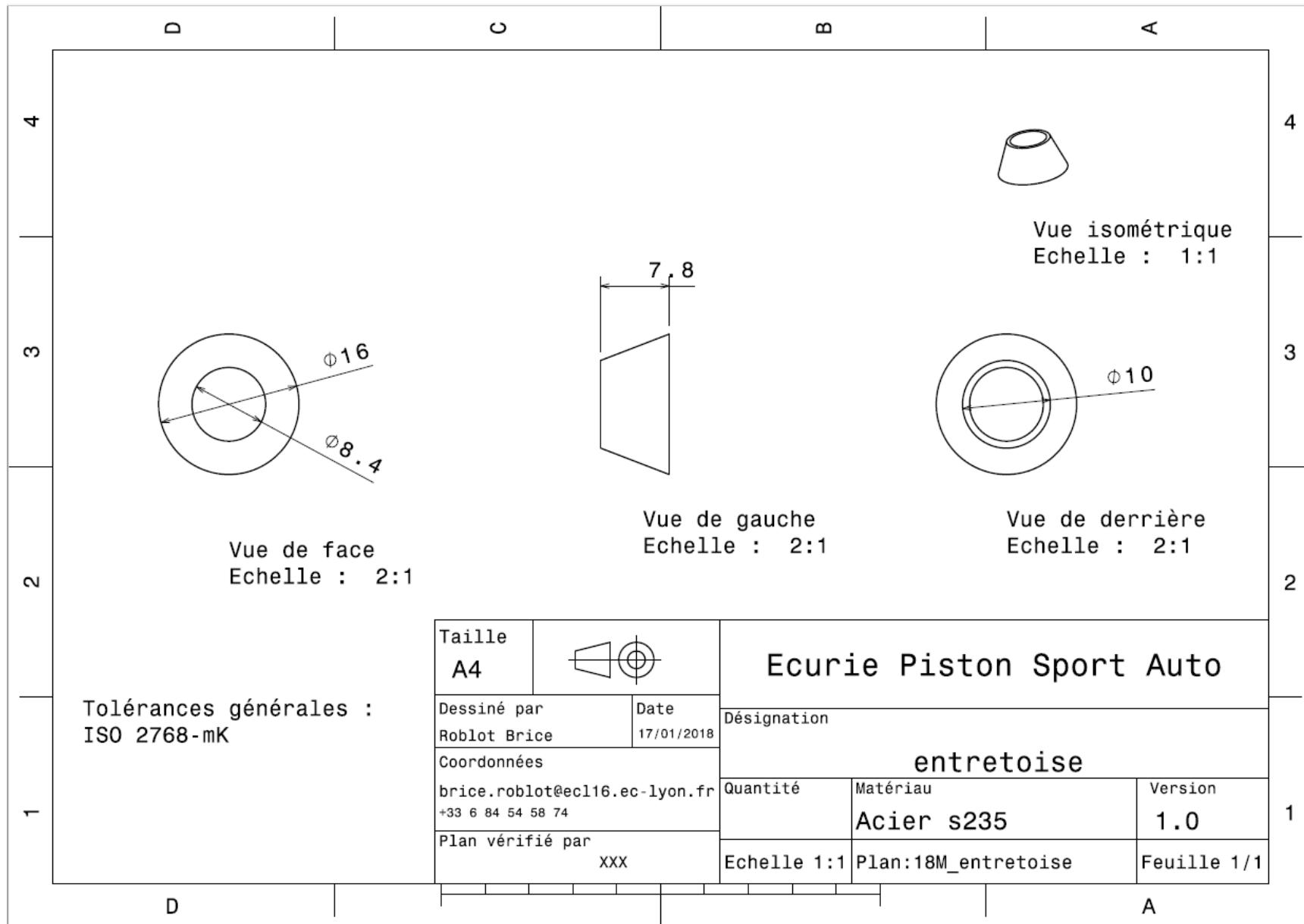




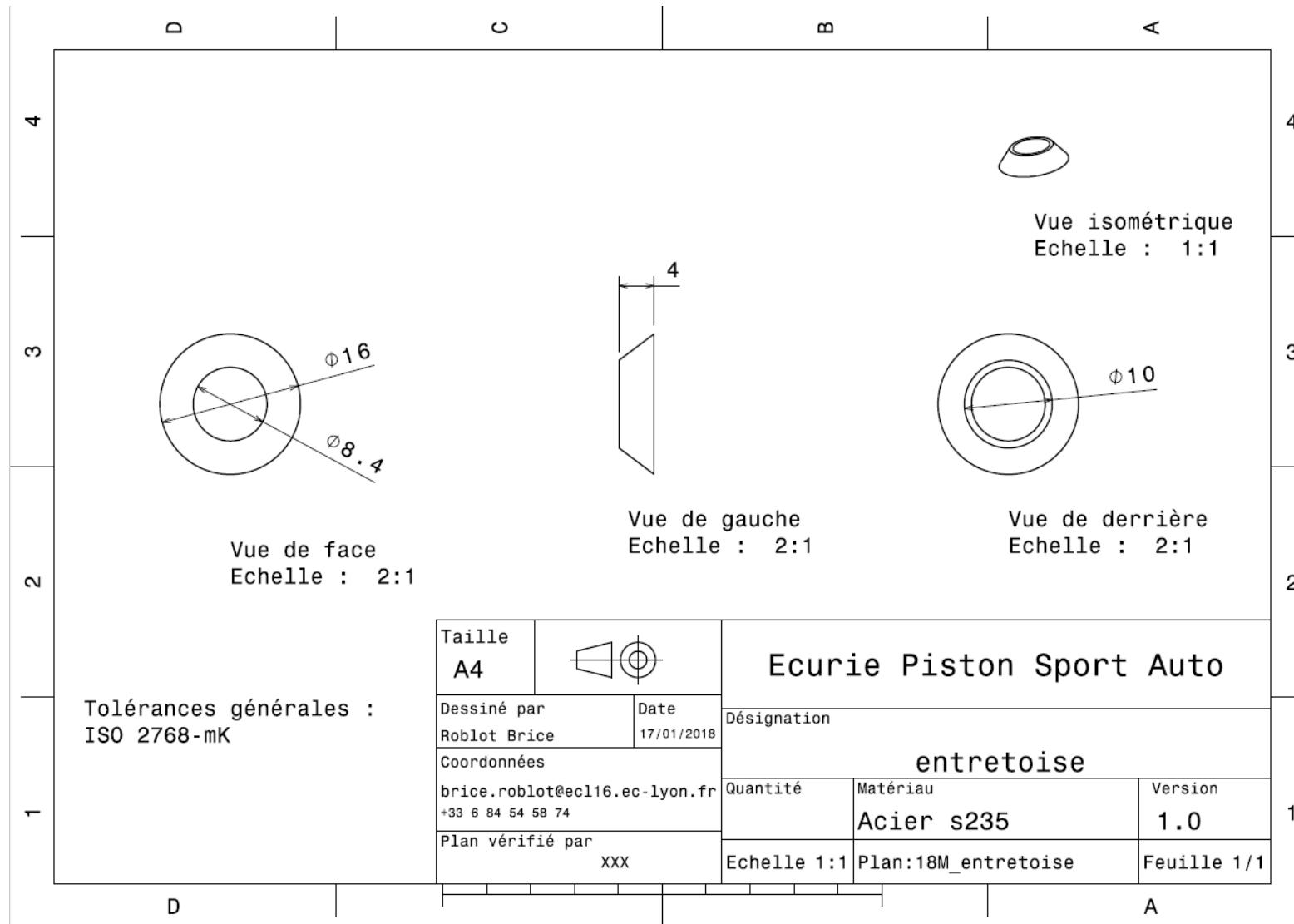
University	Ecole Centrale de Lyon	FileLink1	Drawing	Back to BOM	Car #	81	Part Cost	\$ 12,03					
System	Suspension & Shocks	FileLink2			Qty	1							
Assembly	Lower Back A-arm	FileLink3			FileLink1								
Part	Lower Back A-arm tube (Front) Carbon Fiber Tube				FileLink2		Extended Cos	\$ 12,03					
P/N Base	SU_04003				FileLink3								
Suffix													
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Carbon Fiber, 1 Ply	Stock	\$ 200,00	5,35E-02	kg			tube face	8,79E-05	0,385	1580	1	\$ 10,70
													Sub Total \$ 10,70
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Lamination, Filament Wirring	Tube Lamination	\$ 25,00	kg	0,053			\$ 1,34					
								Sub Total \$ 1,34					

University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 7,41							
System	Suspension & Shocks		Qty	1									
Assembly	Lower Back A-arm		FileLink1		FileLink2								
Part	Lower Back A-arm tube (Back) Carbon Fiber Tube		FileLink3		Extended Cos	\$ 7,41							
P/N Base	SU_04004				FileLink3								
Suffix													
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Carbon Fiber, 1 Ply	Stock	\$ 200,00	0,033	kg			tube face	8,79E-05	0,237	1580	1	\$ 6,58
													Sub Total \$ 6,58
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Lamination, Filament Wirring	Tube Lamination	\$ 25,00	kg	0,033			\$ 0,82					
								Sub Total \$ 0,82					

University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 1,63							
System	Suspension & Shocks		Qty	2									
Assembly	Lower Back A-arm		FileLink1										
Part	Spacer 1		FileLink2										
P/N Base	SU_04005		FileLink3										
Suffix													
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Mild Steel	Stock material for part	\$ 2,25	0,012	Kg			Cylinder face	0,00	7,800	7850	1	\$ 0,03
													Sub Total \$ 0,03
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	Setup for machining	\$ 1,30	unit	1			\$ 1,30					
20	Machining	Material removal	\$ 0,04	cm^3	2,5	Steel	3	\$ 0,30					
								Sub Total \$ 1,60					



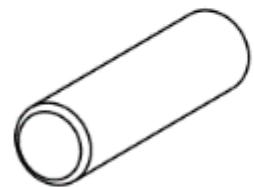
University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 0,81							
System	Suspension & Shocks	Drawing	Qty	4	Extended Cost	\$ 3,22							
Assembly	Lower Back A-arm		FileLink1		FileLink2								
Part	Spacer 2		FileLink3		FileLink1								
P/N Base	SU_04006				FileLink2								
Suffix					FileLink3								
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild (per kg)		\$ 2,25	6,31E-02	Kg			Cylinder face	2,01E-04	4E-02	7850	1	\$ 0,14
													Sub Total \$ 0,14
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	Setup for machining	\$ 1,30	Unit		2 parts from a single setup	0,5	\$ 0,65					
20	Machining	Material removal	\$ 0,04	cm^3	0,11	Material -Steel	3	\$ 0,01					
							Sub Total	\$ 0,66					



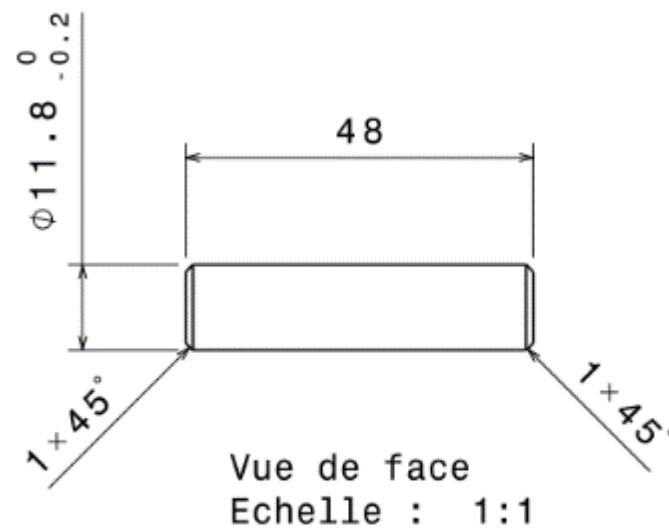
University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 0,56							
System	Suspension & Shocks	FileLink1	Drawing	FileLink1	Qty	2							
Assembly	Lower Back A-arm	FileLink2		FileLink2	Extended Cos	\$ 1,11							
Part	Outboard A-arm Insert	FileLink3		FileLink3									
P/N Base	SU_04007												
Suffix													
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Aluminium, Premium (per kg)	cylinder	\$ 4,20	0,018	kg			Round area diam. 12mm	1,13E-04	0,060	2712	1	\$ 0,08
													Sub Total \$ 0,08
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Saw or tubing cut		\$ 0,40	cm	1,2			\$ 0,48					Sub Total \$ 0,48

Drawing part :

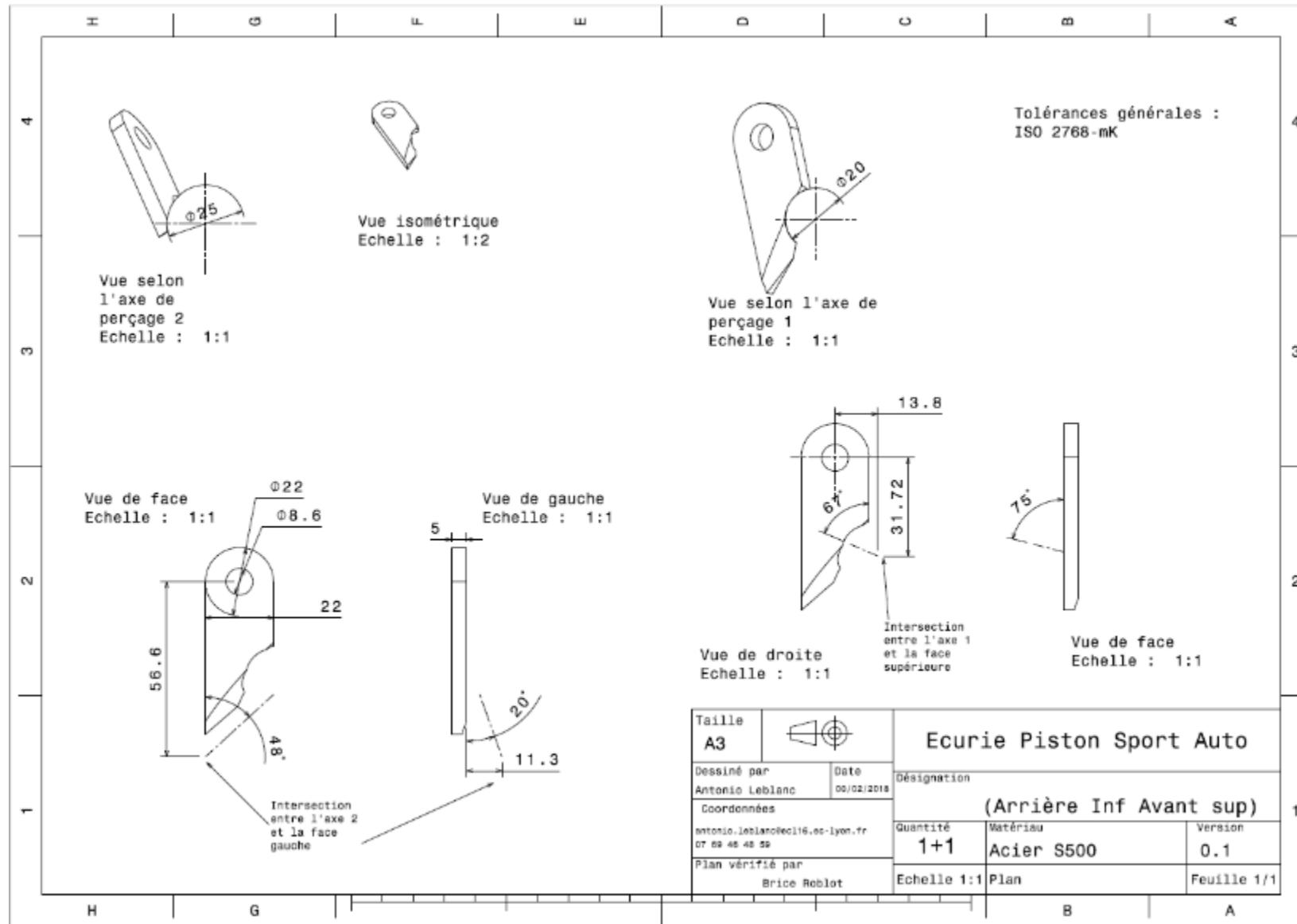
SU_04007



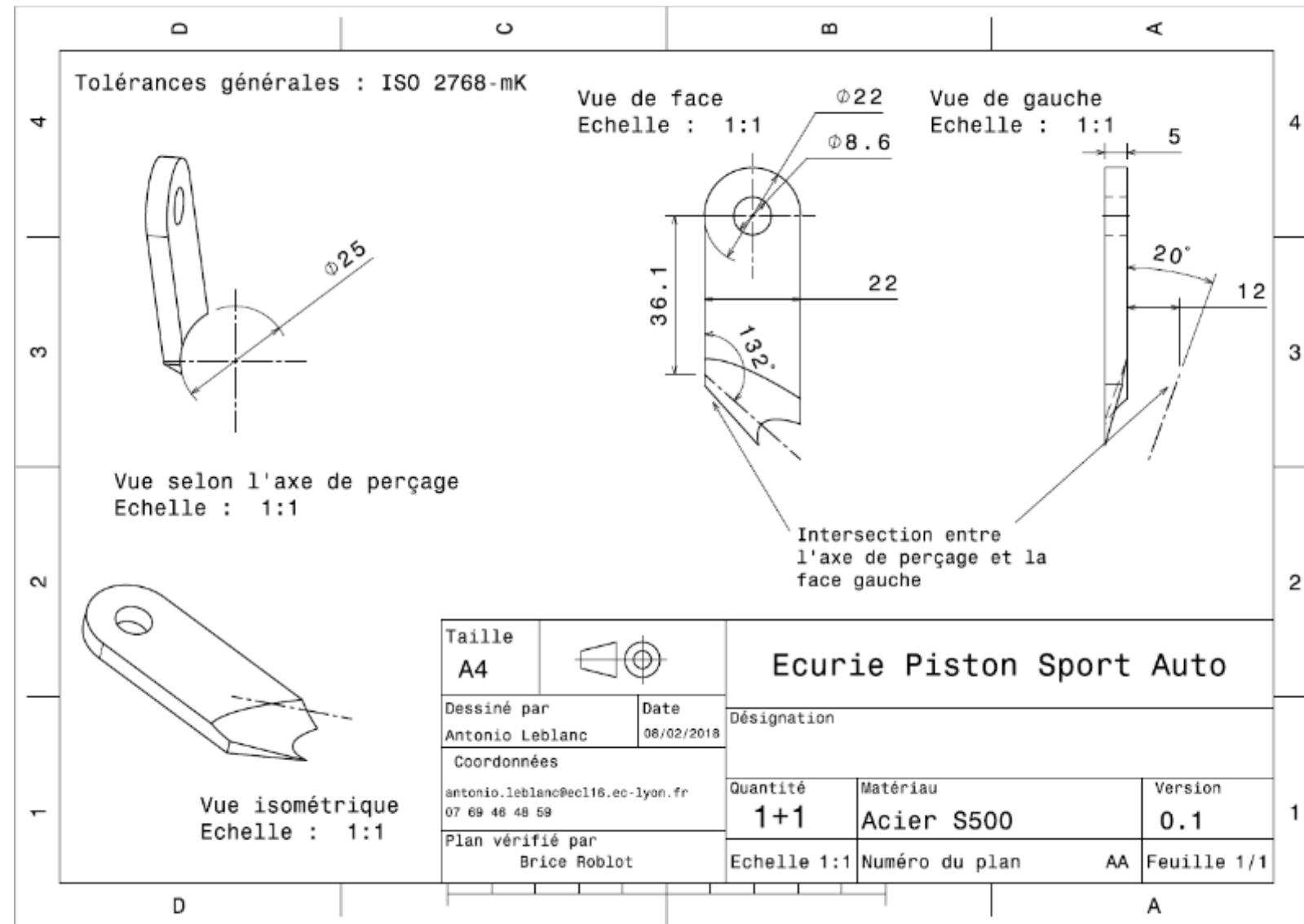
Vue isométrique
Echelle : 1:1



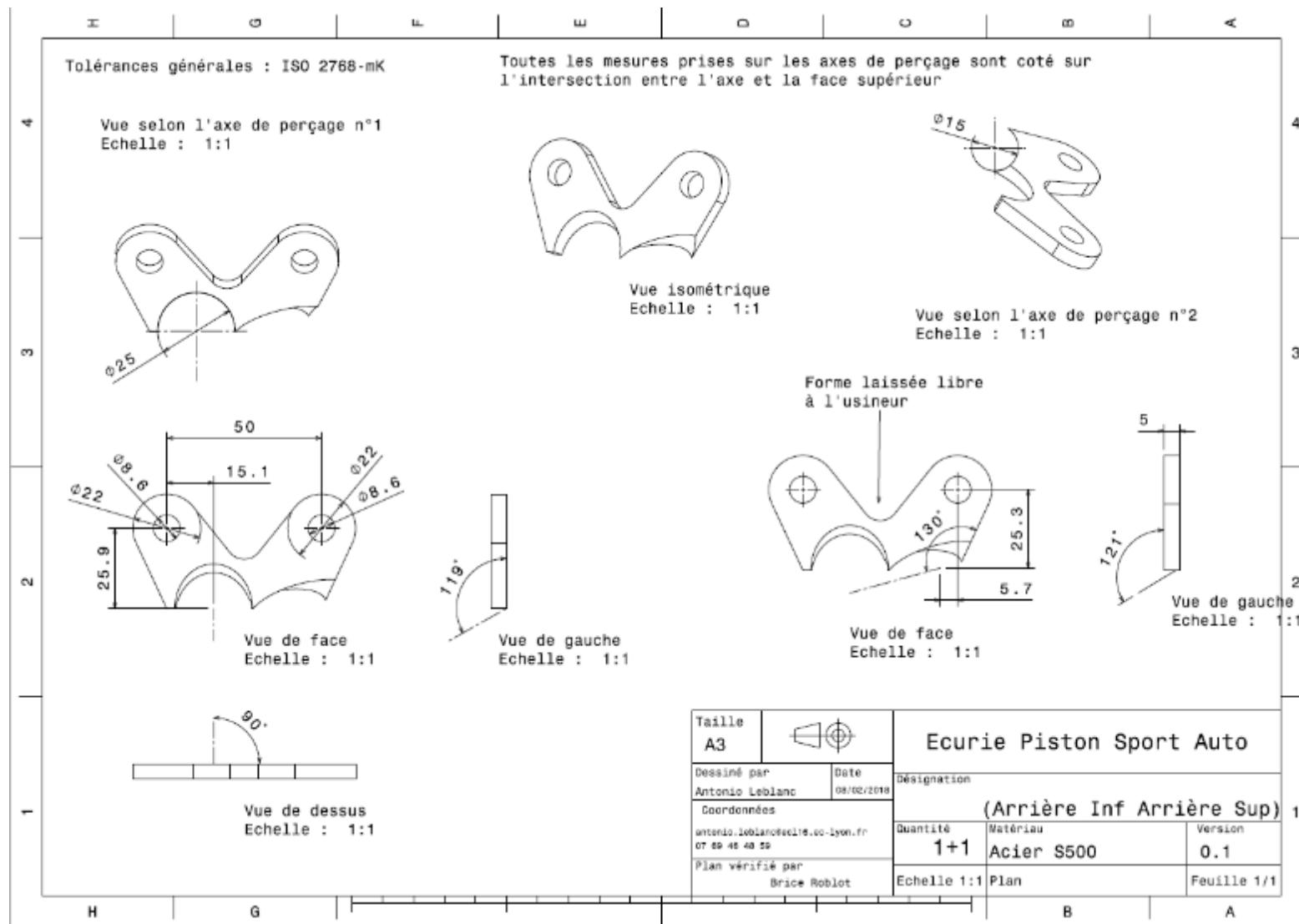
University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,35								
System	Suspension & Shocks	Qty	1										
Assembly	Lower Back A-arm	FileLink1		FileLink1									
Part	Front up bracket	FileLink2		FileLink2									
P/N Base	SU 04008	FileLink3		FileLink3	Extended Cos \$ 1,35								
Suffix	AA												
Details	This part is Welded on the frame												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild (per kg)	Stock for the part	\$ 2,25	0,047	kg			Rectangular area 50x22mm		1,20E-03	5,00E-03	7850	1 \$ 0,11
													Sub Total \$ 0,11
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	item 10 for laser cut	\$ 1,30	Unit	1	2 parts made from a single setup	0,5	\$ 0,65					
20	Laser Cut		\$ 0,01	cm	15,3			\$ 0,15					
30	Machining Setup, Install and remove		\$ 0,65	Unit	1	2 parts made from a single setup	0,5	\$ 0,33					
40	Machining	Tubing cavity	\$ 0,04	cm^3	1	Material -Steel	3	\$ 0,12					
							Sub Total	\$ 1,25					



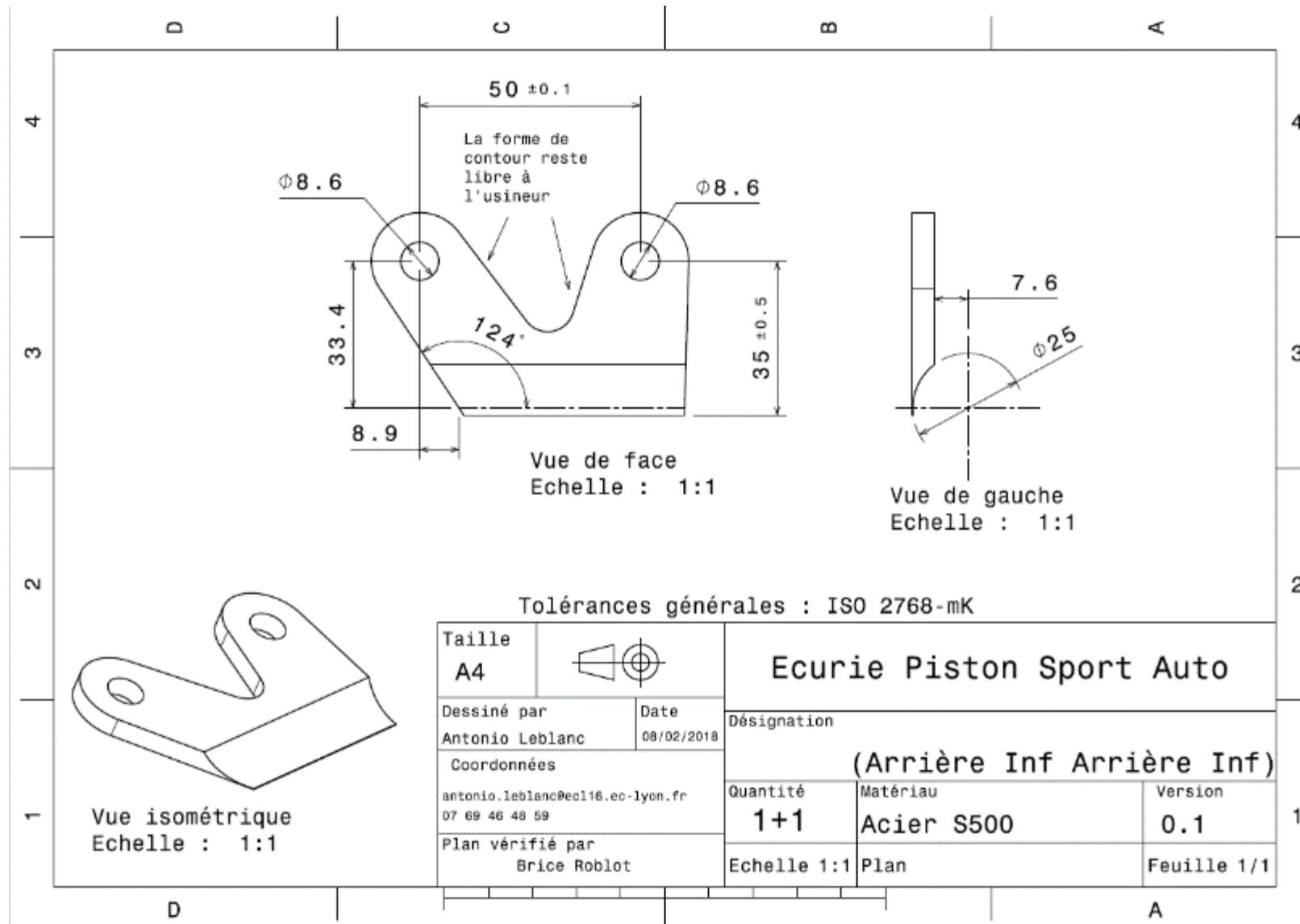
University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,34								
System	Suspension & Shocks	Qty	1	Part Cost	\$ 1,34								
Assembly	Lower Back A-arm	FileLink1		FileLink1									
Part	Front down bracket	FileLink2		FileLink2									
P/N Base	SU 04009	FileLink3		FileLink3									
Suffix	AA			Extended Cos	\$ 1,34								
Details	This part is Welded on the frame												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild (per kg)	Stock for the part	\$ 2,25	0,048	kg			Rectangular area 51x22mm	1,22E-03	5,00E-03	7850	1	\$ 0,11
													Sub Total \$ 0,11
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	Installation of the item 10 for laser cut	\$ 1,30	Unit		2 parts made from a single setup	0,5	\$ 0,65					
20	Laser Cut		\$ 0,01	cm	14,1								\$ 0,14
30	Machining Setup, Install and remove		\$ 0,65	Unit		2 parts made from a single setup	0,5	\$ 0,33					
40	Machining	Tubing cavity	\$ 0,04	cm^3	1	Material -Steel	3	\$ 0,12					
							Sub Total	\$ 1,24					



University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 1,73							
System	Suspension & Shocks	Drawing	Qty	1	Part Cost	\$ 1,73							
Assembly	Lower Back A-arm	FileLink1	FileLink1		Extended Cos	\$ 1,73							
Part	Rear up bracket	FileLink2	FileLink2		FileLink3	FileLink3							
P/N Base	SU 04010												
Suffix	AA												
Details	This part is Welded on the frame												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild (per kg)	Stock for the part	\$ 2,25	0,107	kg			Rectangular area 72x38mm	2,74E-03	5,00E-03	7850	1	\$ 0,24
													Sub Total \$ 0,24
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove	Installation of the item 10 for laser cut	\$ 1,30	Unit	1	2 parts made from a single setup	0,5	\$ 0,65					
20	Laser Cut		\$ 0,01	cm	27,3			\$ 0,27					
30	Machining Setup, Install and remove		\$ 0,65	Unit	1	2 parts made from a single setup	0,5	\$ 0,33					
40	Machining	Tubing cavity	\$ 0,04	cm^3	2	Material -Steel	3	\$ 0,24					
								Sub Total \$ 1,49					

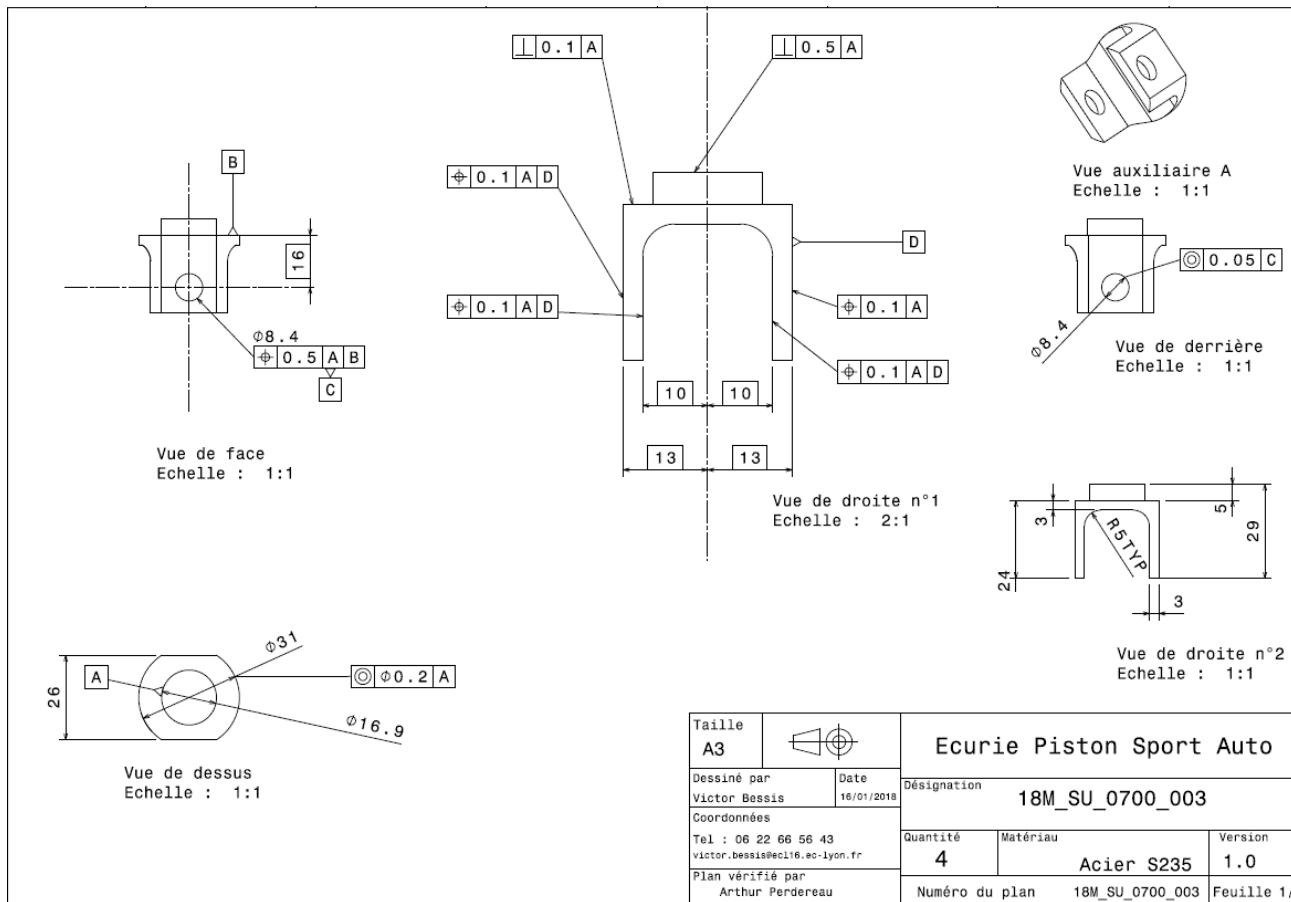


University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 1,80							
System	Suspension & Shocks	Drawing	Qty	1	Part Cost	\$ 1,80							
Assembly	Lower Back A-arm	FileLink1	FileLink1		Extended Cos	\$ 1,80							
Part	Rear down bracket	FileLink2	FileLink2		FileLink3	FileLink3							
P/N Base	SU 04011												
Suffix	AA												
Details	This part is Welded on the frame												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild (per kg)	Stock for the part	\$ 2,25	0,130	kg			Rectangular area 72x46mm	3,31E-03	5,00E-03	7850	1	\$ 0,29
													Sub Total \$ 0,29
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install a 10 for laser cut	Installation of the item	\$ 1,30	Unit	1	2 parts made from a single setup	0,5	\$ 0,65					
20	Laser Cut		\$ 0,01	cm	29,3			\$ 0,29					
30	Machining Setup, Install and remove		\$ 0,65	Unit	1	2 parts made from a single setup	0,5	\$ 0,33					
40	Machining	Tubing cavity	\$ 0,04	cm^3	2	Material -Steel	3	\$ 0,24					
							Sub Total	\$ 1,51					



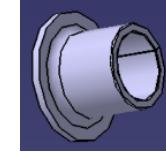
University	Ecole Centrale de Lyon	Back to BOM								Car #	81	Asm Cost	\$ 338,62	
System	Suspension & Shocks									Qty	2			
Assembly	Front suspension									FileLink1				
P/N Base	SU A0500									FileLink2				
Suffix	AA									FileLink3				
Details	Front suspension, right and left are symetric									Extended			\$ 677,24	
ItemOrder	Part	Part Cost	Quantity	Sub Total										
10	Shock Front Bracket	\$ 5,92	1	\$ 5,92										
				Sub Total	\$ 5,92									
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total	
10	Damper Öhlins TTX25 MkII	\$ 305,00			unit							1	\$ 305,00	
20	Spring	\$ 25,00			unit							1	\$ 25,00	
30	Bushing, Student Built	\$ -			unit							2	\$ -	
40	Paint	Shock Front Bracket red paint	\$ 10,00	0,004	m^2							1	\$ 0,04	
													Sub Total	\$ 330,04
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total						
10	Weld - Round Tubing	Weldind shock front bracket with the frame	\$ 0,38	cm	3,4			\$ 1,29						
20	Aerosol apply	Painting the suspension mount	\$ 5,25	m^2	0,004			\$ 0,02						
30	Assemble, 1 kg, Loose	Insert the spring in the damper	\$ 0,06	unit	1			\$ 0,06						
40	Wrench > 25.4 mm	Wrench the spring in the damper	\$ 2,00	unit	1			\$ 2,00						
50	Assemble, 1kg, Loose	Insert the bushings in the damper extremity	\$ 0,06	unit	1			\$ 0,06						
60	Assemble, 1kg, Loose	Put the damper in place	\$ 0,06	unit	1			\$ 0,06						
70	Hand - Start Only	Bolt damper to shock front bracket	\$ 0,12	unit	1			\$ 0,12						
80	Hand - Start Only	Put the nuts into the bolts	\$ 0,12	unit	1			\$ 0,12						
90	Ratchet <= 25.4 mm	Thighten the M8 nuts	\$ 0,75	unit	1			\$ 0,75						
100	Reaction tool <= 25.4 mm	Thighten the M8 nuts	\$ 0,25	unit	1			\$ 0,25						
								Sub Total	\$ 2,12					
ItemOrder	Fastener	Use	UnitCost	Size1	Unit1	Size2	Unit2	Quantity	Sub Total					
10	Bolt,Grade 8.8 (SAE)	Bolt Damper Öhlins TTX25 MkII on Shock Front Bracket	\$ 0,14	8	mm	35	mm	1	\$ 0,14					
20	Washer, Grade 8.8 (SAE 5)	Bolt Damper Öhlins TTX25 MkII on Shock Front Bracket	\$ 0,01	8	mm			2	\$ 0,02					
30	Nut, Grade 8.8 (SAE 5)	Bolt Damper Öhlins TTX25 MkII on Shock Front Bracket	\$ 0,04	8	mm			1	\$ 0,04					
								Sub Total	\$ 0,20					
ItemOrder	Tooling	Use	UnitCost	Unit	Quantity	PVF	FractionIn	Sub Total						
10	Welds - Welding Fixture	Welding of the mount	\$ 500,00	point	2	3000	1	\$ 0,33						
								Sub Total	\$ 0,33					

University	Ecole Centrale de Lyon	Back to BOM								Car #	81	Part Cost	\$ 5,92	
System	Suspension & Shocks									Qty	1			
Assembly	Front suspension									FileLink1				
Part	Shock Front Bracket									FileLink2				
P/N Base	SU 05001									FileLink3				
Suffix	AA											Extended	\$ 5,92	
Details	Suspension bracket													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total	
10	Steel, Mild	Raw material	\$ 2,25	0,172	kg			circle area pi*0,0155 ²	7,55E-04	0,029	7850	1	\$ 0,39	
													Sub Total	\$ 0,39
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total						
10	Machining Setup, Install and remove	Setup for machining	\$ 1,30	unit	1			\$ 1,30						
20	Machining	Material Removal	\$ 0,04	cm ³	2,6	Material-Steel	3	\$ 0,32						
30	Machining Setup, change		\$ 0,65		1			\$ 0,65						
40	Machining	Material Removal	\$ 0,04	cm ³	9,2	Material-Steel	3	\$ 1,10						
50	Machining Setup, change		\$ 0,65		1			\$ 0,65						
60	Machining	Material Removal	\$ 0,04	cm ³	6,8	Material-Steel	3	\$ 0,82						
70	Drilled holes < 25.4 mm dia.	Material Removal	\$ 0,35	hole	2			\$ 0,70						
							Sub Total	\$ 5,54						

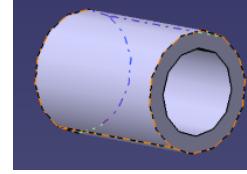


University	Ecole Centrale de Lyon							Back to BOM	Car #	81	Asm Cost	\$ 13,37	
System	Suspension & Shocks								Qty	2			
Assembly	Front Bell Crank								FileLink1				
P/N Base	SU A0600								FileLink2				
Suffix	AA								FileLink3				
Details	Front rocker, right and left are symetric								Extended C	\$ 26,75			
ItemOrder	Part	Part Cost	Quantity	Sub Total									
10	Rocker bushing	\$ 1,34	2	\$ 2,67									
20	Rocker spacer	\$ 1,54	1	\$ 1,54									
30	Sheets of metal for rocker	\$ 2,31	2	\$ 4,62									
40	Front rocker mount	\$ 1,13	2	\$ 2,27									
			Sub Total	\$ 11,11									
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Paint	Rocker mount red paint	\$ 10,00	0,003	m^2							1	\$ 0,03
20	Paint	Rocker black paint	\$ 10,00	0,006	m^2							1	\$ 0,06
												Sub Total	\$ 0,09
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Weld	Welding the rocker mount on the chassis	\$ 0,15	cm	10			\$ 1,50					
20	Aerosol apply	Painting the rocker mount in red	\$ 5,25	m^2	0,006			\$ 0,03					
30	Aerosol apply	Painting the rocker in black	\$ 5,25	m^2	0,012			\$ 0,06					
40	Assemble, 1kg, loose	Insert 2 busher into the rocker and the rocker spacer	\$ 0,06	unit	1			\$ 0,06					
50	Assemble, 1kg, loose	Put the previous assembly in place	\$ 0,06	unit	1			\$ 0,06					
60	Assemble, 1kg, loose	Put the washers of the rocker in place	\$ 0,06	unit	1			\$ 0,06					
70	Hand - Start Only	Bolt rocker into rocker mount	\$ 0,12	unit	1			\$ 0,12					
80	Hand - Start Only	Put the nuts into the bolt	\$ 0,12	unit	1			\$ 0,12					
90	Ratchet <= 25.4 mm	Thighten the M8 nuts	\$ 0,75	unit	1			\$ 0,75					
100	Reaction tool <= 25.4 mm	Thighten the M8 nuts	\$ 0,25	unit	1			\$ 0,25					Sub Total \$ 1,59
ItemOrder	Fastener	Use	UnitCost	Size1	Unit1	Size2	Unit2	Quantity	Sub Total				
10	Bolt,Grade 8.8 (SAE)	Bolt rocker on its mount	\$ 0,19	8	mm	45	mm	1	\$ 0,19				
20	Washer, Grade 8.8 (SAE 5)	Bolt rocker on its mount	\$ 0,01		unit			2	\$ 0,02				
30	Nut, Grade 8.8 (SAE 5)	Bolt rocker on its mount	\$ 0,04	8	mm			1	\$ 0,04				
								Sub Total	\$ 0,25				
ItemOrder	Tooling	Use	UnitCost	Unit	Quantity	PVF	FractionIn	Sub Total					
10	Welds - Welding Fixture	Welding process for rocker mount	\$ 500,00	point	2	3000	1	\$ 0,33					Sub Total \$ 0,33

University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,34								
System	Suspension & Shocks	Qty	2										
Assembly	Front Bell Crank	FileLink1											
Part	Rocker bushing	FileLink2											
P/N Base	SU 06001	FileLink3											
Suffix	AA												
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Plastic, Fluoropolymers	Stock material for bushings	\$ 3,30	0,004	kg			Round area, diameter 15 mm	1,77E-04	0,009	2170	1	\$ 0,01
													Sub Total \$ 0,01
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove		\$ 1,30	unit	1			\$ 1,30					
20	Machining (turning)	Machining removal	\$ 0,04	cm^3	1,25	Material - Plastic	0,5	\$ 0,03					
							Sub Total	\$ 1,33					

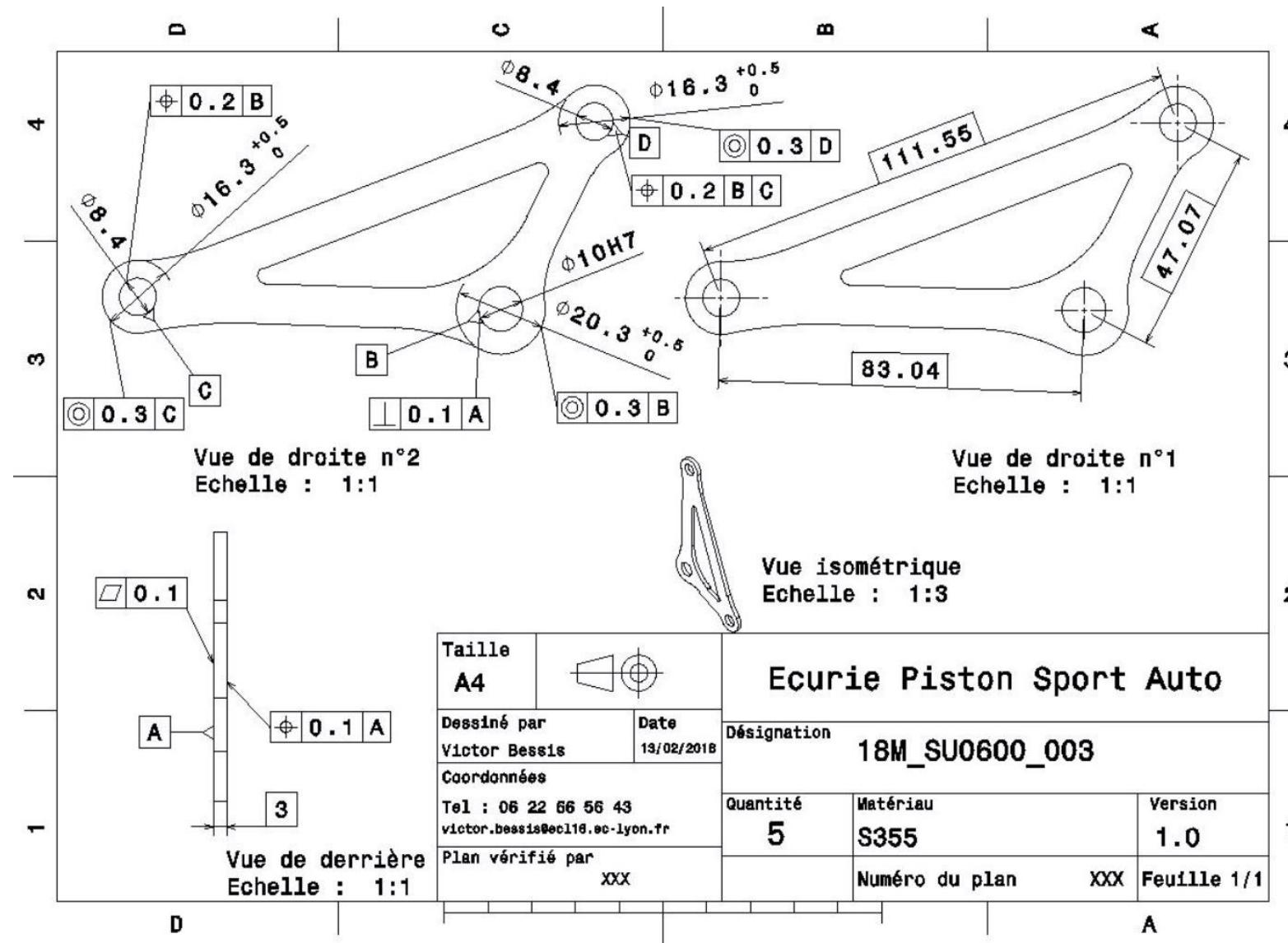


University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,54								
System	Suspension & Shocks	Qty	1	Qty	1								
Assembly	Front Bell Crank	FileLink1		FileLink1									
Part	Rocker spacer	FileLink2		FileLink2									
P/N Base	SU 06002	FileLink3		FileLink3									
Prefix	AA			Extended Cost	\$ 1,54								
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild	Raw material	\$ 2,25	0,024	kg			Round area, diameter 14 mm	1,54E-04	0,020	7850	1	\$ 0,05
													Sub Total \$ 0,05
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove		\$ 1,30	unit	1			\$ 1,30					
20	Machining (turning)	Machining removal	\$ 0,04	cm^3	1,57	Material - Steel	3	\$ 0,19					
							Sub Total	\$ 1,49					



University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 2,31								
System	Suspension & Shocks	Qty	2										
Assembly	Front Bell Crank	FileLink1	Drawing	FileLink2									
Part	Sheet of metal for the rocker	FileLink3		FileLink2									
P/N Base	SU 06003			FileLink3									
Prefix	AA												
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild	Material for rocker	\$ 2,25	0,177	kg			Rectangular sheet 125*65 mm^2	7,50E-03	0,003	7850	1	\$ 0,40
													Sub Total \$ 0,40
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining setup, install and remove	Insert and remove parts from laser	\$ 1,30	unit	1	4 parts made from a single machine setup	0,25	\$ 0,33					
20	Laser cut	Cutting the sheets	\$ 0,01	cm	53	Material - Steel	3	\$ 1,59					
							Sub Total	\$ 1,92					



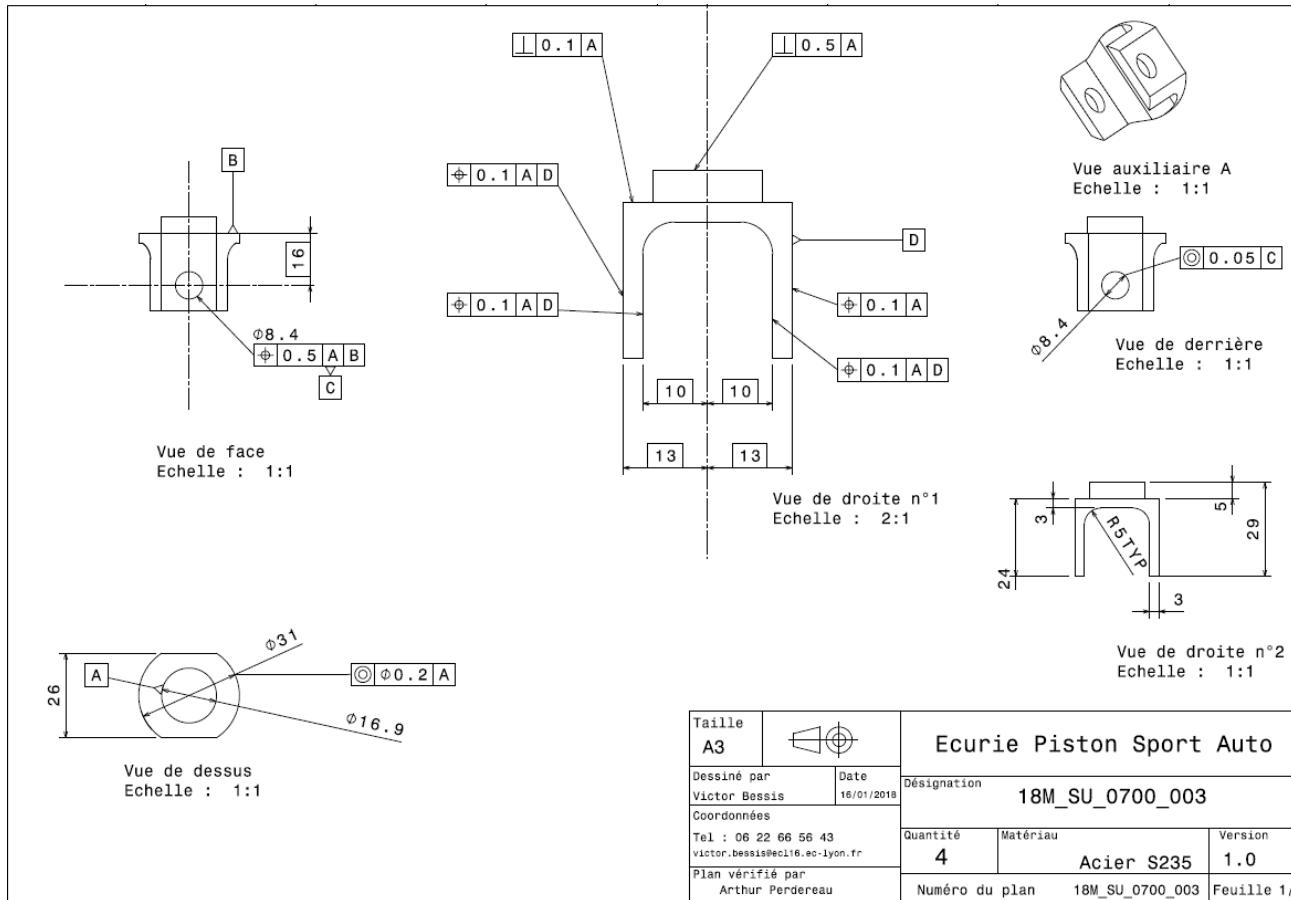


University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,13									
System	Suspension & Shocks	Qty	2											
Assembly	Front Bell Crank	FileLink1												
Part	Front rocker mount	FileLink2												
P/N Base	SU 06004	FileLink3												
Suffix	AA													
Details		Extended Cos	\$ 2,27											
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total	
10	Steel, Mild	Raw material	\$ 2,25	0,051	kg			Rectangular sheet 50*26 mm^2	1,30E-03	0,005	7850	1	\$ 0,11	
													Sub Total	\$ 0,11
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total						
10	Machining setup, install and remove	Insert and remove parts from laser	\$ 1,30	unit	1	4 parts made from a single machine setup	0,25	\$ 0,33						
20	Laser cut	Cutting the sheets	\$ 0,01	cm	16	Material - Steel	3	\$ 0,48						
30	Machining Setup,Change		\$ 0,65	unit	1	4 parts made from a single machine setup	0,25	\$ 0,16						
40	Machining	Machining removal	\$ 0,04	cm^3	0,42	Material - Steel	3	\$ 0,05						
							Sub Total	\$ 1,02						



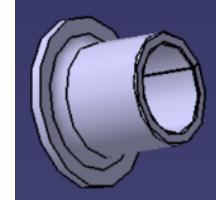
University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Asm Cost	\$ 340,94							
System	Suspension & Shocks		Qty	2									
Assembly	Rear suspension		FileLink1										
P/N Base	SU A0700		FileLink2										
Suffix	AA		FileLink3										
Details	Rear suspension, right and left are symetric		Extended C	\$ 681,89									
ItemOrder	Part	Part Cost	Quantity	Sub Total									
10	Shock Rear Bracket	\$ 5,92	1	\$ 5,92									
			Sub Total	\$ 5,92									
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Damper Öhlins TTX25 MkII		\$ 305,00		unit							1	\$ 305,00
20	Spring		\$ 25,00		unit							1	\$ 25,00
30	Bushing, Student Built		\$ -		unit							2	\$ -
40	Paint	Shock rear Bracket red paint	\$ 10,00	0,004	m^2							1	\$ 0,04
												Sub Total	\$ 330,04
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multipli	Mult. Val.		Sub Total				
10	Weld - Round Tubing	Weldind shock rear bracket with the frame	0,38	cm	3,4				\$ 1,29				
20	Aerosol apply	Painting the suspension bracket	\$ 5,25	m^2	0,004				\$ 0,02				
30	Assemble, 1 kg, Loose	Insert the spring in the damper	\$ 0,06	unit	2				\$ 0,12				
40	Wrench > 25.4 mm	Wrench the spring in the damper	\$ 2,00	unit	2				\$ 4,00				
50	Assemble, 1kg, Loose	Insert the bushings in the damper extremity	\$ 0,06	unit	2				\$ 0,12				
60	Assemble, 1kg, Loose	Put the damper in place	\$ 0,06	unit	2				\$ 0,12				
70	Hand - Start Only	Bolt damper to shock rear bracket	\$ 0,12	unit	2				\$ 0,24				
80	Hand - Start Only	Put the nuts into the bolts	\$ 0,12	unit	2				\$ 0,24				
90	Ratchet <= 25.4 mm	Thighten the M8 nuts	\$ 0,75	unit	2				\$ 1,50				
100	Reaction tool <= 25.4 mm	Thighten the M8 nuts	\$ 0,25	unit	2				\$ 0,50				
									Sub Total	\$ 4,24			
ItemOrder	Fastener	Use	UnitCost	Size1	Unit1	Size2	Unit2	Quantity	Sub Total				
10	Bolt,Grade 8.8 (SAE)	Bolt Damper Öhlins TTX25 MkII on Shock rear Bracket	\$ 0,14	8	mm	35	mm	2	\$ 0,28				
20	Washer, Grade 8.8 (SAE 5)	Bolt Damper Öhlins TTX25 MkII on Shock rear Bracket	\$ 0,01	8	mm			4	\$ 0,04				
30	Nut, Grade 8.8 (SAE 5)	Bolt Damper Öhlins TTX25 MkII on Shock rear Bracket	\$ 0,04	8	mm			2	\$ 0,09				
									Sub Total	\$ 0,41			
ItemOrder	Tooling	Use	UnitCost	Unit	Quantity	PVF	FractionInclu	Sub Total					
10	Welds - Welding Fixture	Welding of the mounts	\$ 500,00	point	2	3000		1	\$ 0,33				
									Sub Total	\$ 0,33			

University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 5,92							
System	Suspension & Shocks	Drawing	Qty	1									
Assembly	Rear suspension	FileLink1	FileLink1										
Part	Shock rear Bracket	FileLink2	FileLink2										
P/N Base	SU 07001	FileLink3	FileLink3										
Suffix	AA												
Details	Suspension bracket												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild	Raw material	\$ 2,25	0,172	kg			Circular area	7,55E-04	0,029	7850	1	\$ 0,39
													Sub Total \$ 0,39
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Inst	Setup for machining	\$ 1,30	unit	1			\$ 1,30					
20	Machining	Material Removal	\$ 0,04	cm^3	2,6	Material-Steel	3	\$ 0,32					
30	Machining Setup, change		\$ 0,65		1			\$ 0,65					
40	Machining	Material Removal	\$ 0,04	cm^3	9,2	Material-Steel	3	\$ 1,10					
50	Machining Setup, change		\$ 0,65		1			\$ 0,65					
60	Machining	Material Removal	\$ 0,04	cm^3	6,8	Material-Steel	3	\$ 0,82					
70	Drilled holes < 25.4 m	Material Removal	\$ 0,35	hole	2,0			\$ 0,70					
							Sub Total	\$ 5,54					



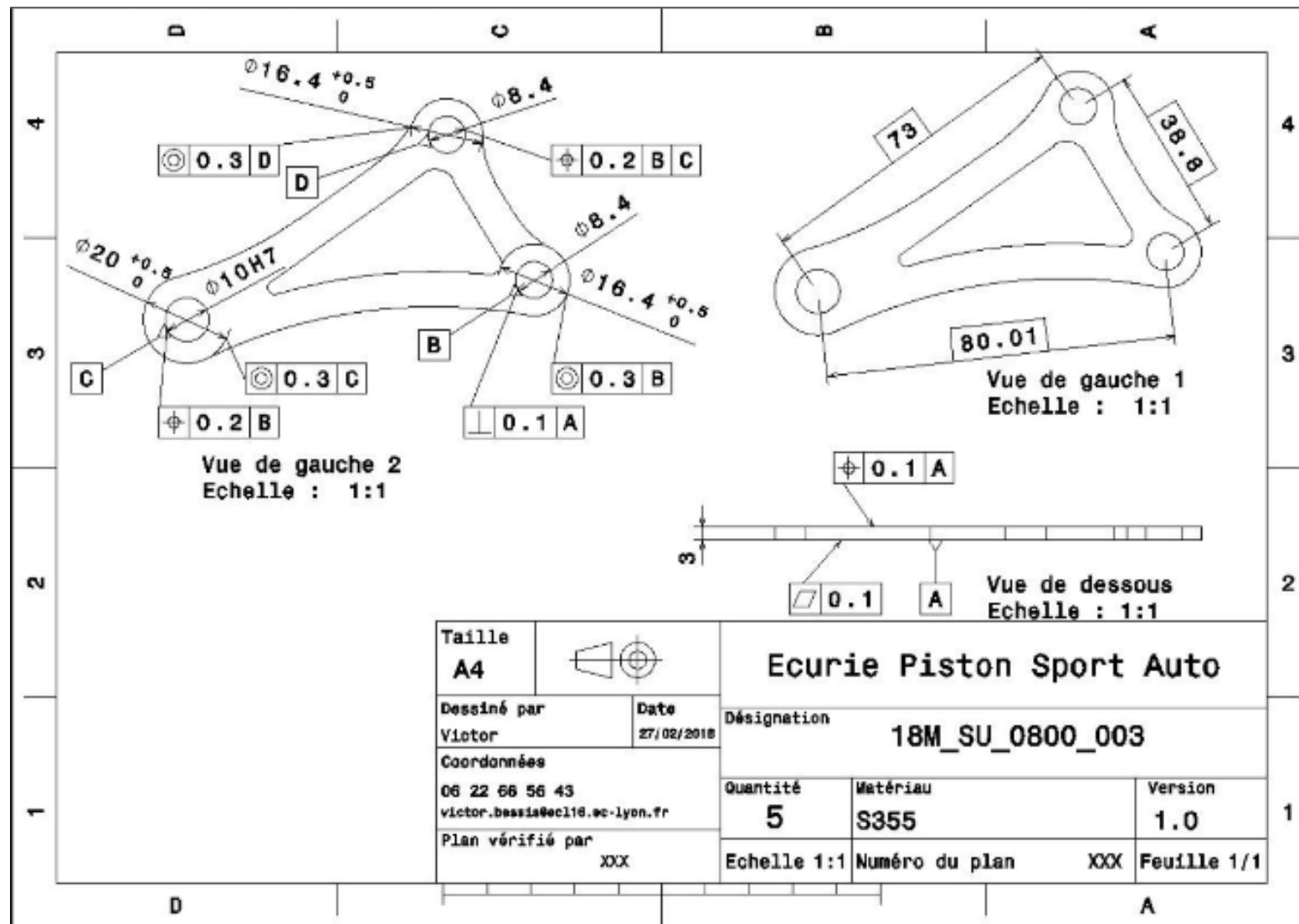
University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Asm Cost	\$ 14,02							
System	Suspension & Shocks		Qty	2									
Assembly	Rear Bell Crank		FileLink1										
P/N Base	SU A0800		FileLink2										
Suffix	AA		FileLink3										
Details	Rear rocker, right and left are symetric		Extended	\$ 28,05									
ItemOrder	Part	Part Cost	Quantity	Sub Total									
10	Rocker bushing	\$ 1,34	2	\$ 2,67									
20	Sheets of metal for rocker	\$ 2,06	2	\$ 4,13									
30	Rear rocker mount	\$ 2,40	1	\$ 2,40									
			Sub Total	\$ 9,21									
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Paint	Rocker mount red paint	\$ 10,00	0,005	m^2							2	\$ 0,10
20	Paint	Rocker black paint	\$ 10,00	0,005	m^2							2	\$ 0,10
												Sub Total	\$ 0,20
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Weld	Welding the rocker mount on the chassis	\$ 0,15	cm	23			\$ 3,45					
20	Aerosol apply	Painting the rocker mount in red	\$ 5,25	m^2	0,005			\$ 0,03					
30	Aerosol apply	Painting the rocker in black	\$ 5,25	m^2	0,005			\$ 0,03					
40	Assemble, 1kg, loose	Insert the busher into the rocker mount	\$ 0,06	unit	2			\$ 0,12					
50	Assemble, 1kg, loose	Put each part of the rocker in place	\$ 0,06	unit	2			\$ 0,12					
60	Assemble, 1kg, loose	Put the washers of the rocker in place	\$ 0,06	unit	2			\$ 0,12					
70	Hand - Start Only	Bolt rocker into rocker mount	\$ 0,12	unit	1			\$ 0,12					
80	Hand - Start Only	Put the nuts into the bolt	\$ 0,12	unit	1			\$ 0,12					
90	Ratchet <= 25.4 mm	Thighten the M8 nuts	\$ 0,75	unit	1			\$ 0,75					
100	Reaction tool <= 25.4 mm	Thighten the M8 nuts	\$ 0,25	unit	1			\$ 0,25					
					Sub Total	\$ 3,50							
ItemOrder	Fastener	Use	UnitCost	Size1	Unit1	Size2	Unit2	Quantity	Sub Total				
10	Bolt,Grade 8.8 (SAE)	Bolt rocker on its mount	\$ 0,07	6	mm	30	mm	1	\$ 0,07				
20	Washer, Grade 8.8 (SAE 5)	Bolt rocker on its mount	\$ 0,01		unit			2	\$ 0,02				
30	Nut, Grade 8.8 (SAE 5)	Bolt rocker on its mount	\$ 0,03	6	mm			1	\$ 0,03				
					Sub Total	\$ 0,12							
ItemOrder	Tooling	Use	UnitCost	Unit	Quantity	PVF	FractionInd	Sub Total					
10	Welds - Welding Fixture	Welding process for rocker mount	\$ 500,00	point	6	3000	1	\$ 1,00					
					Sub Total	\$ 1,00							

University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,34								
System	Suspension & Shocks	Qty	2										
Assembly	Rear Bell Crank	FileLink1											
Part	Rocker bushing	FileLink2											
P/N Base	SU 08001	FileLink3											
Suffix	AA												
Details		FileLink1											
		FileLink2											
		FileLink3											
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Plastic, Fluoropolymers	Stock material for bushings	\$ 3,30	0,004	kg			Round area, diameter 15 mm	1,77E-04	0,009	2170	1	\$ 0,01
													Sub Total \$ 0,01
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove		\$ 1,30	unit	1			\$ 1,30					
20	Machining (turning)	Machining removal	\$ 0,04	cm^3	1,25	Material - Plastic	0,5	\$ 0,03					
								Sub Total \$ 1,33					

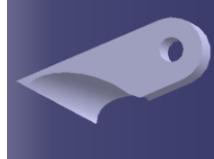


University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 2,06								
System	Suspension & Shocks	Qty	2										
Assembly	Rear Bell Crank	FileLink1	Drawing	FileLink1									
Part	Sheet of metal for the rocker	FileLink2		FileLink2									
P/N Base	SU 08002	FileLink3		FileLink3	Extended Cos \$ 4,13								
Suffix	AA												
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild	Material for rocker	\$ 2,25	1,53E-01	kg			Rectangular sheet 100*65 mm^2	6,50E-03	0,003	7850	1	\$ 0,34
													Sub Total \$ 0,34
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining setup, install and remove	Insert and remove parts from laser	\$ 1,30	unit		1 4 parts made from a single machine setup	0,25	\$ 0,33					
20	Laser cut	Cutting the sheets	\$ 0,01	cm	46,5	Material - Steel	3	\$ 1,40					
							Sub Total	\$ 1,72					





University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 2,40										
System	Suspension & Shocks	Qty	1												
Assembly	Rear Bell Crank	FileLink1													
Part	Rear rocker mount	FileLink2													
P/N Base	SU 08003	FileLink3													
Suffix	AA														
Details															
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total		
10	Steel, Mild	Raw material	\$ 2,25	0,364	kg			Rectangular sheet 58*50 mm^2	2,90E-03	0,016	7850	1	\$ 0,82		
														Sub Total \$ 0,82	
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total							
10	Machining setup, install and remove	Insert and remove parts from laser	\$ 1,30	unit	1	2 parts made from a single machine setup	0,5	\$ 0,65							
20	Laser cut	Cutting the sheets	\$ 0,01	cm	20	Material - Steel	3	\$ 0,60							
30	Machining Setup, Change		\$ 0,65	unit	1	2 parts made from a single machine setup	0,5	\$ 0,33							
40	Machining	Machining removal	\$ 0,04	cm^3	0,07	Material - Steel	3	\$ 0,01							
							Sub Total	\$ 1,58							

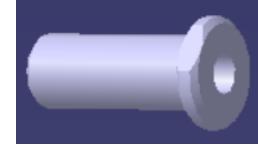


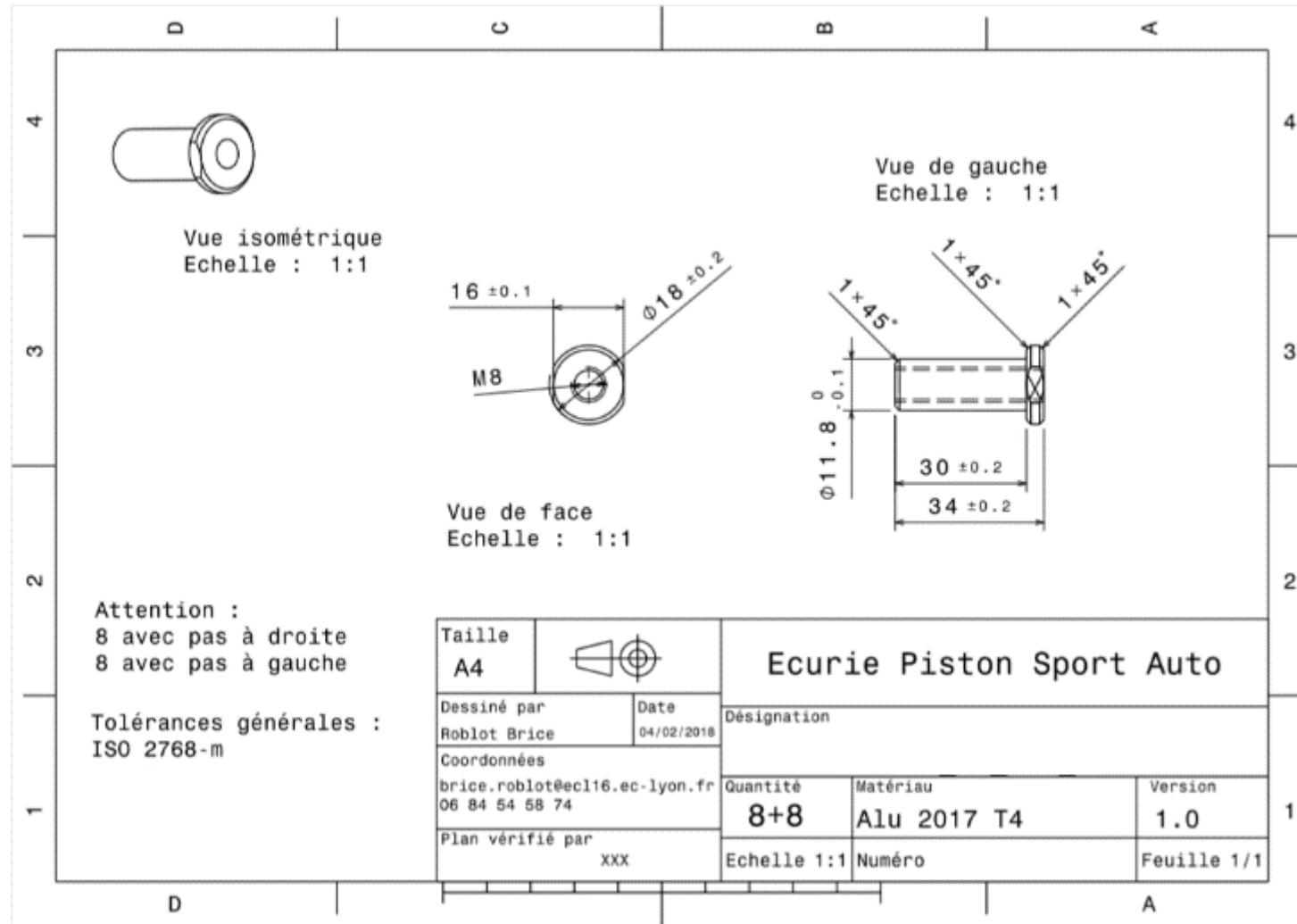
University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Asm Cost	\$ 29,13							
System	Suspension & Shocks		Qty	2									
Assembly	Rear Tie rod		FileLink1										
P/N Base	SU A0900		FileLink2										
Suffix	AA		FileLink3										
Details	Rear tie rod, right and left are symetric												
ItemOrder	Part	Part Cost	Quantity	Sub Total									
10	Pullrod tube	\$ 9,07	1	\$ 9,07									
20	Pullrod insert	\$ 1,88	2	\$ 3,77									
30	Spacer 1	\$ 1,06	2	\$ 2,13									
40	Spacer 2	\$ 0,24	2	\$ 0,48									
			Sub Total	\$ 15,44									
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Rod End, Industrial	Right-hand rod end for pushrod extremities	\$ 2,50	8 mm				Balls Diameter				1	\$ 2,50
20	Rod End, Industrial	Left-hand rod end for pushrod extremities	\$ 2,50	8 mm				Balls Diameter				1	\$ 2,50
30	Adhesive	Glue insert to tierod tube - Cost included in process	\$ -										\$ -
												Sub Total	\$ 5,00
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Hand Finish - Surface Preparation	Solvent degreasing on carbon tube	\$ 0,02	cm ²	6,6			1 \$ 0,13					
20	Hand Finish - Surface Preparation	Solvent degreasing on insert	\$ 0,02	cm ²	6,6			1 \$ 0,13					
30	Brush apply	Glue insert to tierod tube	\$ 0,02	cm ²	6,6			1 \$ 0,13					
40	Hand - Start Only	Put a nut on the rod end	\$ 0,12	unit	2			1 \$ 0,24					
50	Hand, Loose <= 25.4 mm	Screwing by hand the rod end in the pullrod insert	\$ 0,50	unit	2			1 \$ 1,00					
60	Wrench <= 25.4 mm	Tighten the M8 nuts	\$ 1,50	unit	2			1 \$ 3,00					
70	Reaction tool <= 25.4 mm	Tighten the M8 nuts	\$ 0,25	unit	2			1 \$ 0,50					
80	Assemble, 1kg, Loose	Put the spacers of the rocker in place	\$ 0,06	unit	2			1 \$ 0,12					
90	Assemble, 1kg, Loose	Put the washers of the rocker in place	\$ 0,06	unit	2			1 \$ 0,12					
100	Hand - Start Only	Bolt pullrod into the rocker	\$ 0,12	unit	1			1 \$ 0,12					
110	Assemble, 1kg, Loose	Put the spacers of the A-arm in place	\$ 0,06	unit	2			1 \$ 0,12					
120	Assemble, 1kg, Loose	Put the washers of the A-arm in place	\$ 0,06	unit	2			1 \$ 0,12					
130	Hand - Start Only	Bolt pullrod into the A-Arm	\$ 0,12	unit	1			1 \$ 0,12					
140	Hand - Start Only	Put the nuts into the bolts	\$ 0,12	unit	2			1 \$ 0,24					
150	Ratchet <= 25.4 mm	Tighten the M8 nuts	\$ 0,75	unit	2			1 \$ 1,50					
160	Reaction tool <= 25.4 mm	Tighten the M8 nuts	\$ 0,25	unit	2			1 \$ 0,50					
							Sub Total	\$ 8,10					
ItemOrder	Fastener	Use	UnitCost	Size1	Unit1	Size2	Unit2	Quantity	Sub Total				
10	Bolt,Grade 8.8 (SAE)	Pullrod to rocker fixing bolt	\$ 0,19	8 mm		45 mm		1	\$ 0,19				
20	Bolt,Grade 8.8 (SAE)	Pullrod to A-arm fixing bolt	\$ 0,19	8 mm		45 mm		1	\$ 0,19				
30	Washer, Grade 8.8 (SAE 5)		\$ 0,01	8 unit				4	\$ 0,04				
40	Nut, Grade 8.8 (SAE 5)	To tighten the rod ends	\$ 0,04	8 mm				2	\$ 0,09				
50	Nut, Grade 8.8 (SAE 5)	To tighten the bolts	\$ 0,04	8 mm				2	\$ 0,09				
							Sub Total	\$ 0,59					

University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 9,07							
System	Suspension & Shocks	FileLink1	Qty	1	FileLink1								
Assembly	Rear Tie rod	FileLink2	FileLink2		FileLink3	Extended Cos \$ 9,07							
Part	Tie rod tube	FileLink3											
P/N Base	SU 09001												
Suffix	AA												
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Carbon fiber, 1 Ply	Stock material	\$ 200,00	0,040	kg			Round area, diameter 16x2 mm	8,80E-05	0,290	1580	1	\$ 8,06
													Sub Total \$ 8,06
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Lamination, Filament Wirring	Tube lamination	\$ 25,00	kg	0,040			\$ 1,01					
								Sub Total \$ 1,01					



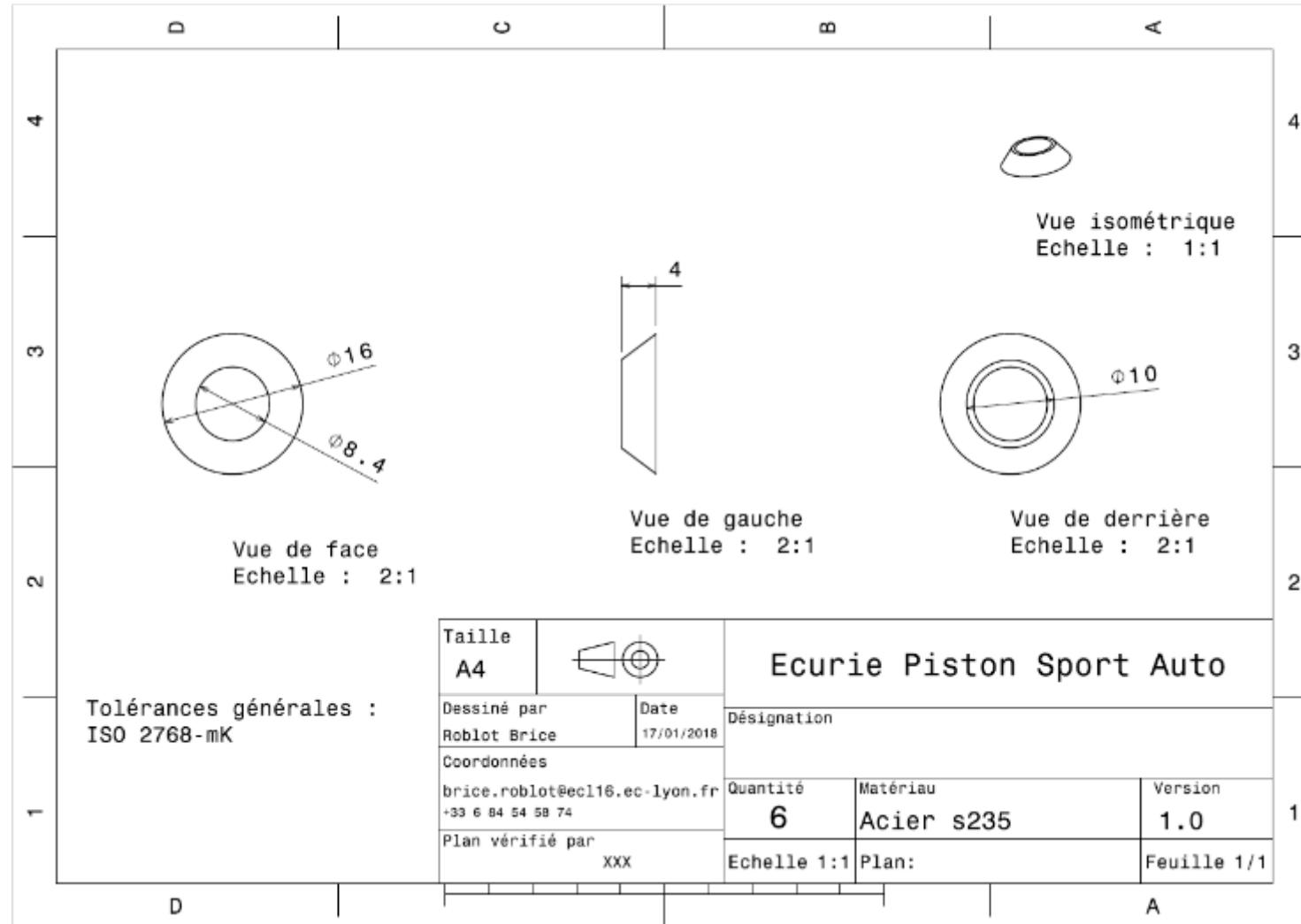
University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,88									
System	Suspension & Shocks	Qty	2											
Assembly	Rear Tie rod	FileLink1	Drawing	FileLink2	Extended Cost									
Part	Tie rod insert	FileLink3		FileLink1	\$ 3,77									
P/N Base	SU 09002			FileLink2										
Suffix	AA			FileLink3										
Details														
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total	
10	Aluminium, Premium (per kg)	cylinder	\$ 4,20	0,07	kg			Round area diam. 18mm	2,54E-04	3,50E-02	7850	1	\$ 0,29	
													Sub Total \$ 0,29	
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total						
10	Machining Setup, Install and remove	Setup for machining and removal	\$ 1,30	Unit	1	8 parts from a single machine setup (pushrod insert)	0,125	\$ 0,16						
20	Machining	Material removal - side view profile	\$ 0,04	cm^3	5,5	Material - Steel	3	\$ 0,66						
30	Machining setup, change	Setup for machining process	\$ 0,65	Unit	1	8 parts from a single machine setup (pushrod insert)	0,125	\$ 0,08						
40	Machining	Material removal	\$ 0,04	cm^3	0,3	Material - Steel	3	\$ 0,04						
50	Threading, Internal (machining)	Rod End emplacement	\$ 0,10	cm	3		1	\$ 0,30						
60	Tapping Holes		\$ 0,35	hole	1		1	\$ 0,35						
							Sub Total	\$ 1,59						



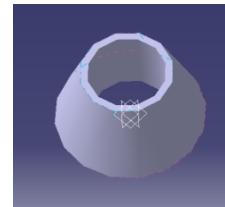


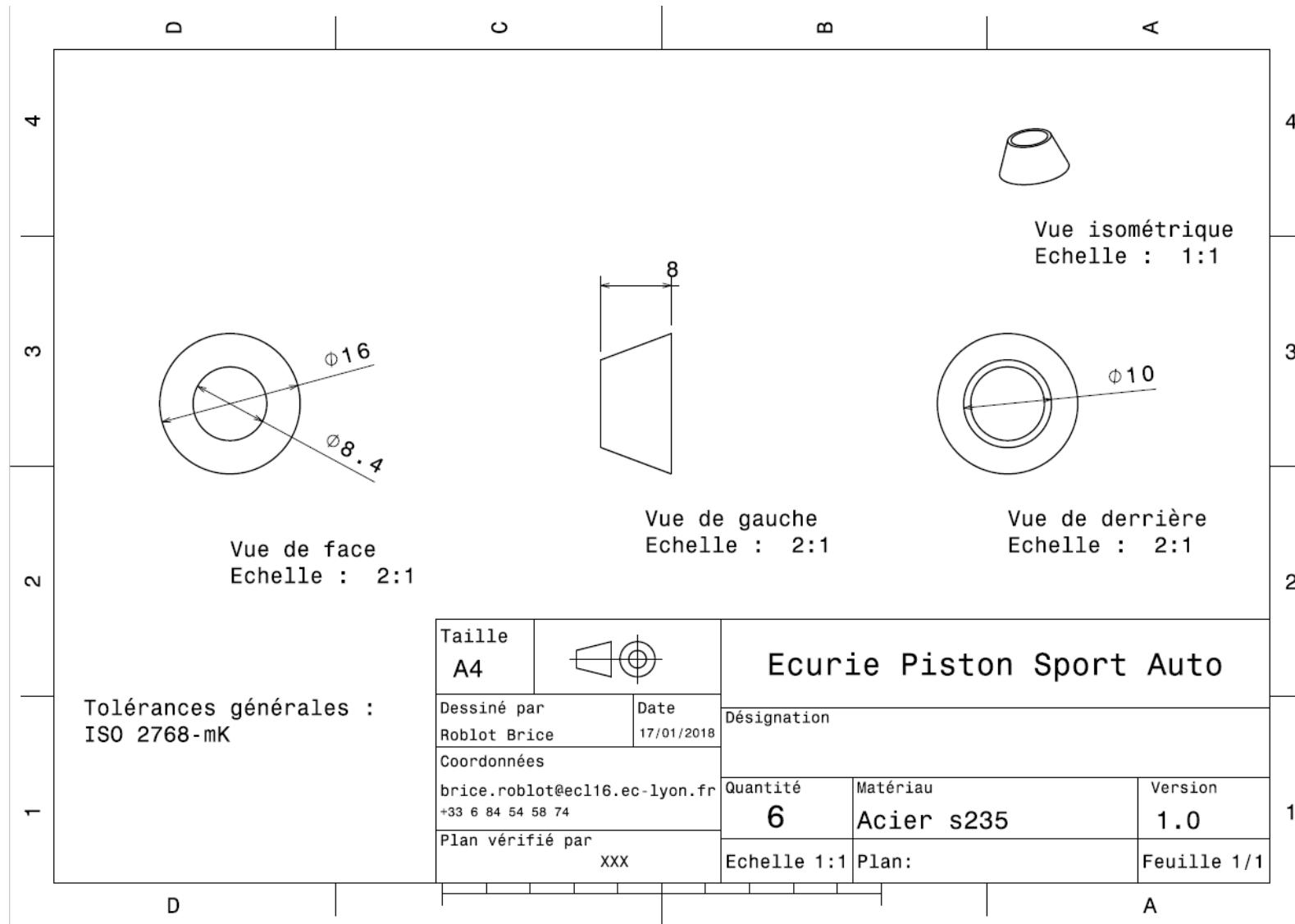
University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 0,24							
System	Suspension & Shocks				Qty	2							
Assembly	Rear Tie rod	FileLink1	Drawing		FileLink1								
Part	Spacer 1	FileLink2			FileLink2								
P/N Base	SU 09003	FileLink3			FileLink3								
Suffix	AA												
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild	Material for Part	\$ 2,25	0,025	kg			Cylindrical 16 mm diameter	8,04E-04	4,00E-03	7850	1	\$ 0,06
													Sub Total \$ 0,06
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining setup, install and remove		\$ 1,30	unit	1	Same as SU_0*_006 (*=1,...,4)	2,94E-02	\$ 0,04					
20	Machining		\$ 0,04	cm^3	1,2	Material - Steel	3	\$ 0,14					
							Sub Total	\$ 0,18					





University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 1,06							
System	Suspension & Shocks	FileLink1	Drawing		Qty	2							
Assembly	Rear Tie rod	FileLink2			FileLink1								
Part	Spacer 2	FileLink3			FileLink2								
P/N Base	SU 09004				FileLink3								
Suffix	AA												
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild	Material for Part	\$ 2,25	0,051	kg			Cylindrical 16 mm diameter	8,04E-04	8,00E-03	7850	1	\$ 0,11
													Sub Total \$ 0,11
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining setup, install and remove		\$ 1,30	unit		2 parts made from a single machine setup	0,5	\$ 0,65					
20	Machining		\$ 0,04	cm^3	2,5	Material - Steel	3	\$ 0,30					
							Sub Total	\$ 0,95					





University Ecole Centrale de Lyon
System Wheels & Tires
Assembly Front Uprights
P/N Base SU A1000
Suffix AA
Details Assembly of a part of the wheel with the uprights

[Back to BOM](#)
Car # 81

Asm Cost \$ 151,09
Qty 2

[FileLink1](#)
[FileLink2](#)
[FileLink3](#)
[Extended](#) \$ 302,18

ItemOrder	Part	Part Cost	Quantity	Sub Total
10	Front Upright	\$ 106,19	1	\$ 106,19
20	Upper Arm Wedge	\$ 2,51	1	\$ 2,51
30	Upper Arm Bracket	\$ 18,68	1	\$ 18,68
40	Speed Sensor Brakct	\$ 0,84	1	\$ 0,84
50	Camber adjustment shim	\$ 0,43	15	\$ 6,40
Sub Total				\$ 134,61

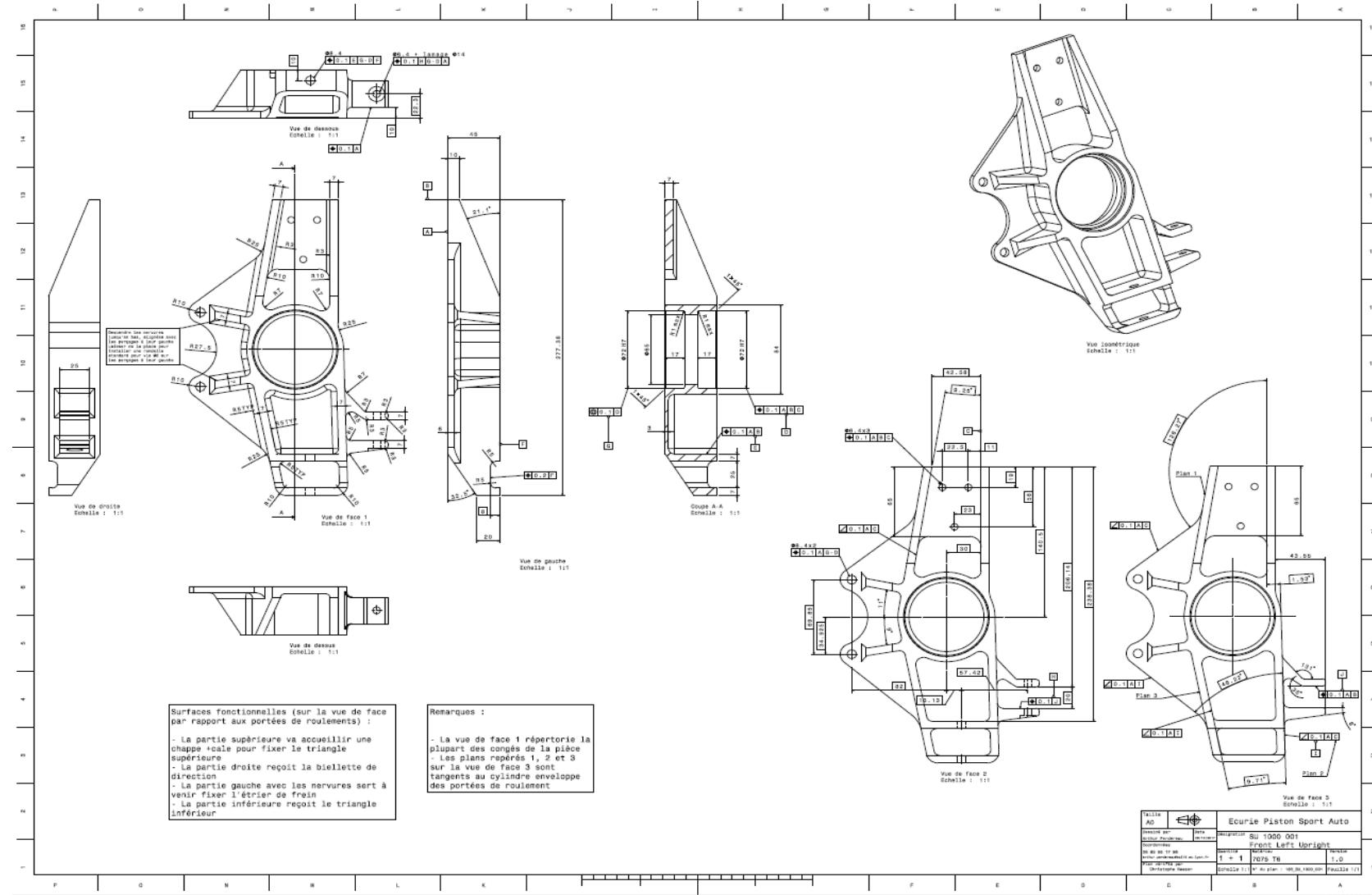
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total
10	Assemble, 3kg, Interference	Assemble upright with hub	\$ 0,56	unit	1		1	\$ 0,56
20	Assemble, 1 kg, Line-on-Line	Assemble Upper arm wedge with upright	\$ 0,13	unit	1		1	\$ 0,13
30	Assemble, 1 kg, Line-on-Line	Assemble camber adjustment shim with upright	\$ 0,13	unit	1		1	\$ 0,13
40	Assemble, 1 kg, Line-on-Line	Assemble Upper arm bracket with upright	\$ 0,13	unit	1		1	\$ 0,13
50	Ratchet <= 25.4 mm	Bolt upper arm bracket, shim and Wedge with upright	\$ 0,75	unit	3		1	\$ 2,25
60	Reaction Tool <= 25.4 mm	Bolt upper arm bracket, shim and Wedge with upright	\$ 0,25	Unit	3		1	\$ 0,75
70	Assemble, 1 kg, Line-on-Line	Assemble speed sensor bracket with upright	\$ 0,13	Unit	1		1	\$ 0,13
80	Assemble, 5kg, Line-on-Line	Assemble upright assembly with frame	\$ 0,63	unit	1		1	\$ 0,63
90	Ratchet <= 25.4 mm	Bolt upright assembly with front A-arms	\$ 0,75	Unit	2		1	\$ 1,50
100	Reaction Tool <= 25.4 mm	Bolt upright assembly with front A-arms	\$ 0,25	Unit	2		1	\$ 0,50
110	Suspension Setup-Independent Susp. (per corner)	Camber and toe adjustment	\$ 8,75	Unit	1		1	\$ 8,75
Sub Total				\$ 15,46				

ItemOrder	Fastener	Use	UnitCost	Size1	Unit1	Size2	Unit2	Quantity	Sub Total
10	Bolt, Grade 8.8 (SAE 5)	Bolt Upper arm bracket, wedge, camber adjustment shim and upright	\$0,09	6 mm		40 mm		3	\$ 0,27
20	Nut, Grade 8.8 (SAE 5)	Bolt Upper arm bracket, wedge, camber adjustment shim and upright	\$0,03	6 mm				3	\$ 0,09
30	Washer, Grade 8.8 (SAE 5)	Bolt Upper arm bracket, wedge, camber adjustment shim and upright	\$0,01		mm			6	\$ 0,06
70	Bolt, Grade 8.8 (SAE 5)	Bolt Upper arm bracket, wedge, camber adjustment shim and upright	\$0,24	8 mm		55 mm		2	\$ 0,47
80	Nut, Grade 8.8 (SAE 5)	Bolt Upper arm bracket, wedge, camber adjustment shim and upright	\$0,04	8 mm				2	\$ 0,09
90	Washer, Grade 8.8 (SAE 5)	Bolt Upper arm bracket, wedge, camber adjustment shim and upright	\$0,01		mm			4	\$ 0,04
Sub Total				\$ 1,02					

University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 106,19								
System	Wheels & Tires	FileLink1	Drawing	FileLink1	Qty	1								
Assembly	Front Uprights	FileLink2		FileLink2	Extended	\$ 106,19								
Part	Front Upright	FileLink3		FileLink3										
P/N Base	SU 10001													
Suffix	AA													
Details	Main part of the assembly													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total	
10	Aluminium, Premium		\$ 4,20	6,83	kg			rectangular area, 180 x 280	5,04E-02	5,00E-02	2712	1	\$ 28,70	
													Sub Total \$ 28,70	
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total						
10	Machining Setup, Install and Remove	Setup for milling	\$ 1,30	Unit	1			1	\$ 1,30					
20	Machining	Milling the main part	\$ 0,04	cm^3	1362	Material - Aluminium		1	\$ 54,48					
30	Machining Setup, Change	Change the milling setup	\$ 0,65	Unit	1			1	\$ 0,65					
40	Machining	Milling, remove the major part of the sole	\$ 0,04	cm^3	352,2	Material - Aluminium		1	\$ 14,09					
50	Machining Setup, Change		\$ 0,65	Unit	1			1	\$ 0,65					
60	Machining	Milling, ending the sole, finishing the second bearing seat	\$ 0,04	cm^3	72,2	Material - Aluminium		1	\$ 2,89					
70	Machining Setup, Change		\$ 0,65	Unit	1			1	\$ 0,65					
80	Machining	Last holes	\$ 0,04	cm^3	1,1	Material - Aluminium		1	\$ 0,04					
90	Machining Setup, Change		\$ 0,65	Unit	1			1	\$ 0,65					
100	Machining	Milling upper slopes	\$ 0,04	cm^3	18,2	Material - Aluminium		1	\$ 0,73					
110	Machining Setup, Change		\$ 0,65	Unit	1			1	\$ 0,65					
120	Machining	Milling lower slopes	\$ 0,04	cm^3	17,6	Material - Aluminium		1	\$ 0,70					
130	Machining Setup, Change		\$ 0,65	Unit	1			1	\$ 0,65					
140	Machining	Milling brake side slopes	\$ 0,04	cm^3	5,8	Material - Aluminium		1	\$ 0,23					
							Sub Total	\$ 77,48						

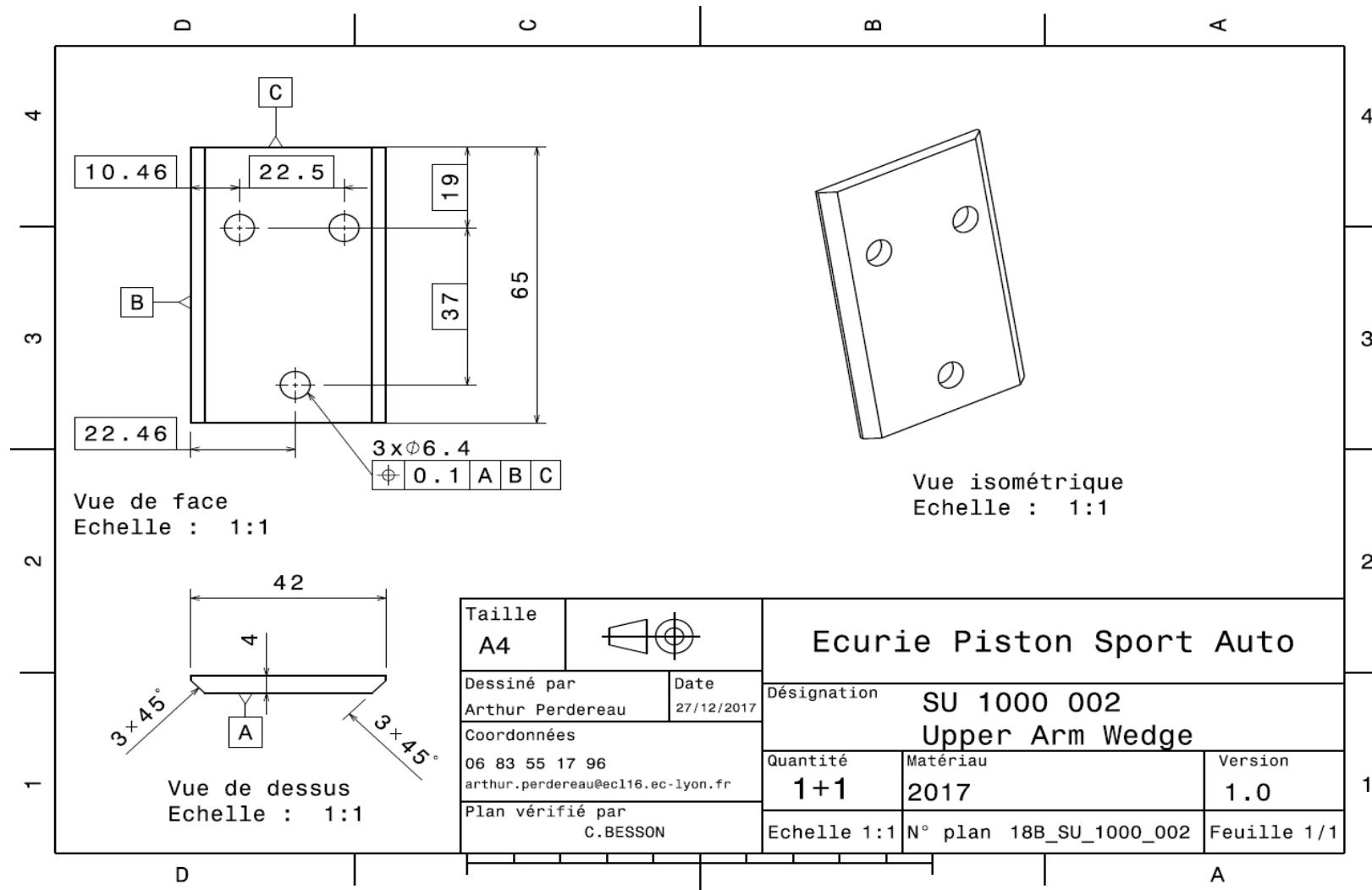


Drawing part : SU_10001



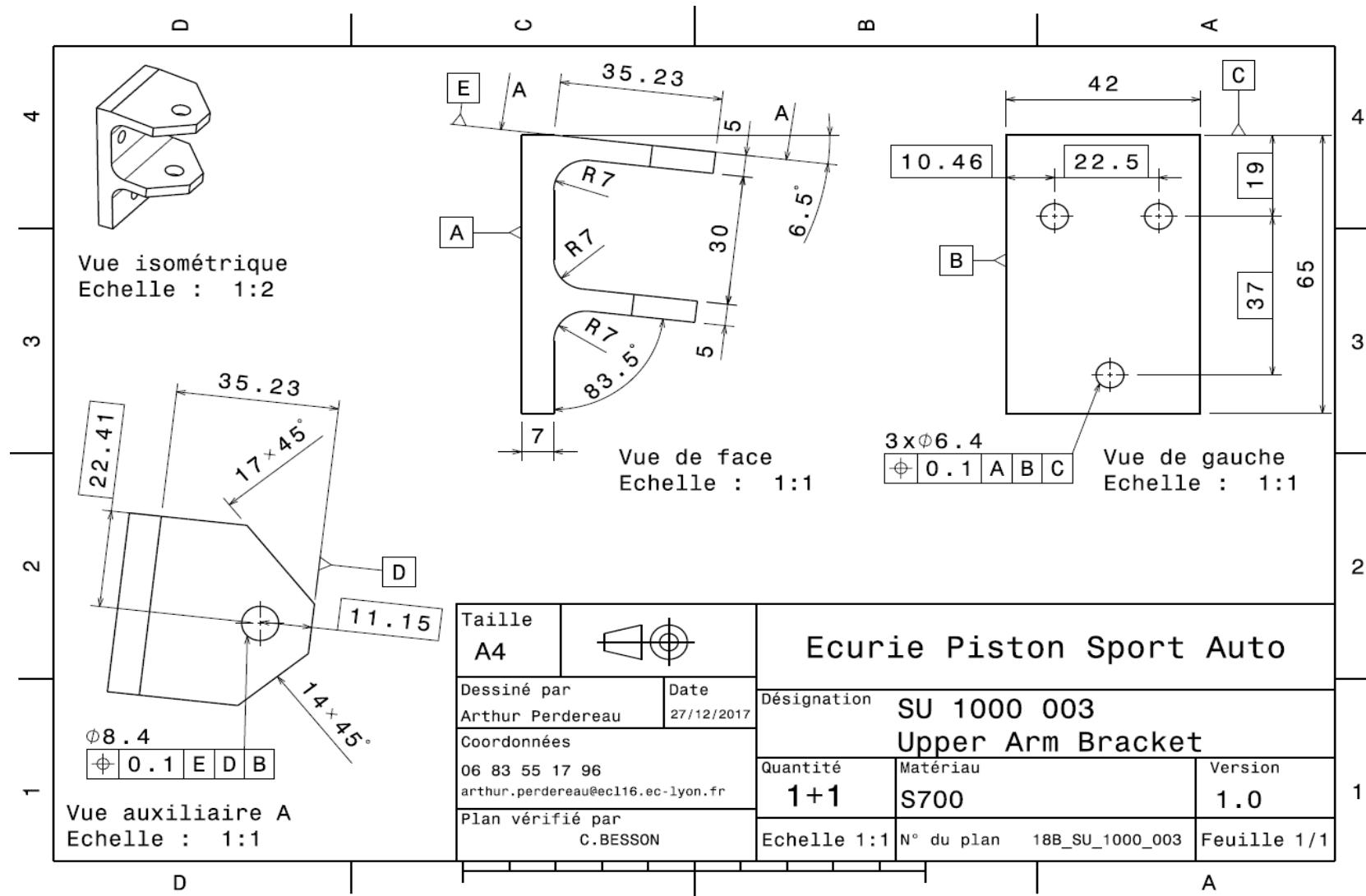
University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 2,51							
System	Wheels & Tires				Qty	1							
Assembly	Front Uprights	FileLink1	Drawing	FileLink1									
Part	Upper Arm Wedge	FileLink2		FileLink2									
P/N Base	SU 10002	FileLink3		FileLink3									
Suffix	AA												
Details	Part between the Upper arm bracket and the upright												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Aluminium, Normal		\$ 4,20	0,051	kg			Rectangular area, 70x45mm	0,003	0,006	2712	1	\$ 0,22
													Sub Total \$ 0,22
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and Remove	Setup for turning	\$ 1,30	Unit	1		1	\$ 1,30					
20	Machining	Milling	\$ 0,04	cm^3	5,3	Material - Aluminium	1	\$ 0,21					
30	Machining Setup, Change	Change the turning setup	\$ 0,65	Unit	1		1	\$ 0,65					
40	Machining	Milling	\$ 0,04	cm^3	3,2	Material - Aluminium	1	\$ 0,13					
							Sub Total	\$ 2,29					



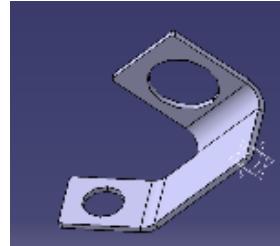


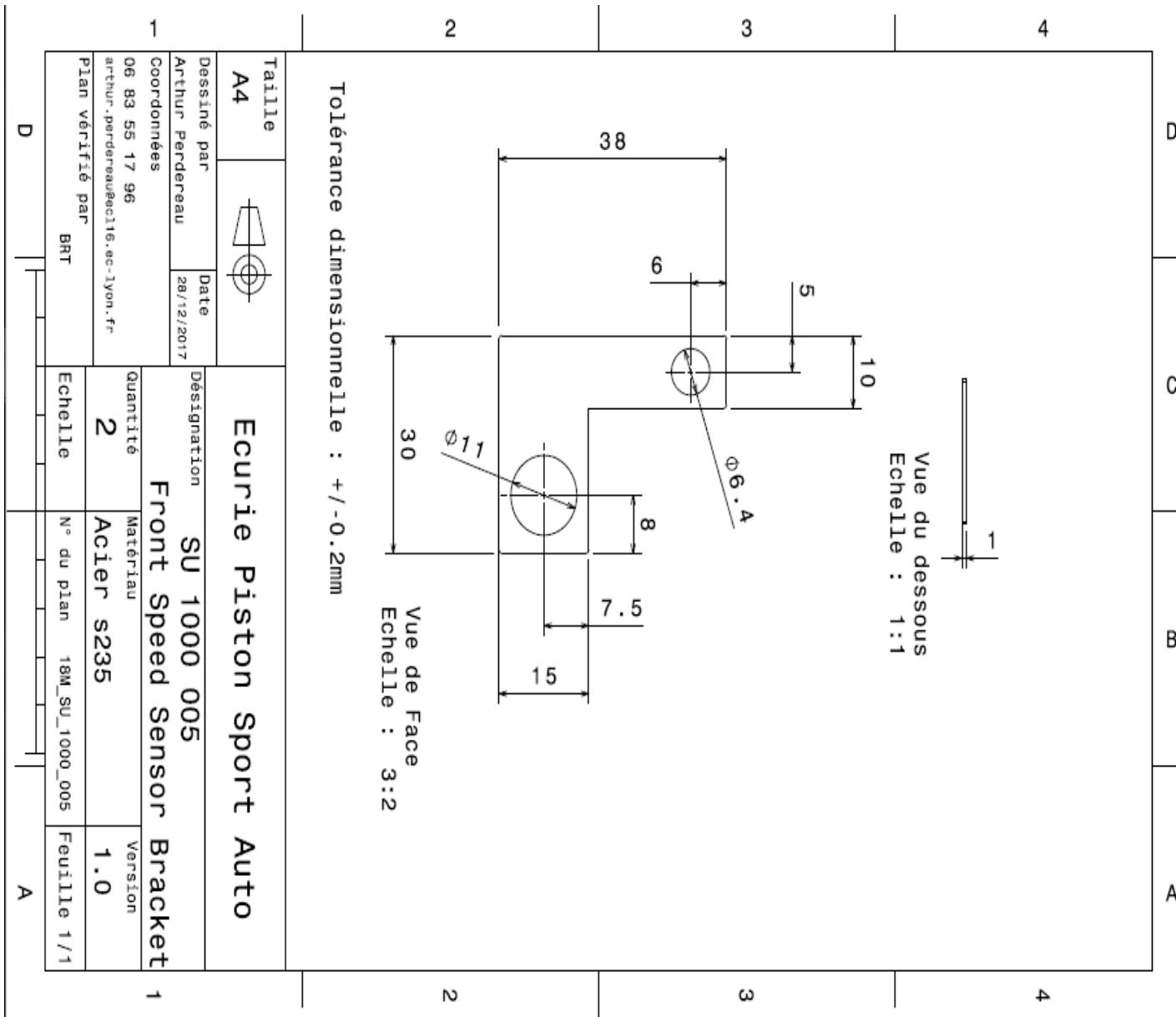
University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 18,68								
System	Wheels & Tires		Qty	1										
Assembly	Front Uprights		FileLink1											
Part	Upper Arm Bracket		FileLink2											
P/N Base	SU 10003		FileLink3											
Suffix	AA				Extended C	\$ 18,68								
Details	Bracket to link the upper arm to the upright													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total	
10	Steel, Alloy		\$ 2,25	1,236	kg			Rectangle A	0,004	0,045	7850	1	\$ 2,78	
													Sub Total	\$ 2,78
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total						
10	Machining Setup, Inst	Setup for milling	\$ 1,30	Unit	1		1	\$ 1,30						
20	Machining	Milling the main part	\$ 0,04	cm^3	85,4	Material - Steel	3	\$ 10,25						
30	Machining Setup, Cha	Change the milling setup	\$ 0,65	Unit	1		1	\$ 0,65						
40	Machining	Milling to remove the sole	\$ 0,04	cm^3	25,2	Material - Steel	3	\$ 3,02						
50	Machining Setup, Cha	Change the milling setup	\$ 0,65	Unit	1		1	\$ 0,65						
60	Machining	Milling 3 holes	\$ 0,04	cm^3	0,2	Material - Steel	3	\$ 0,02						
70	Machining Setup, Cha	Change the milling setup	\$ 0,65	Unit	1		1	\$ 0,65						
80	Machining	Milling, chamfer and last hole	\$ 0,04	cm^3	3,56	Material - Steel	3	\$ 0,43						
						Sub Total	\$ 15,90							





University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 0,84							
System	Wheels & Tires	Drawing	Qty	1	Part Cost	\$ 0,84							
Assembly	Front Uprights	FileLink1	FileLink1		Qty	1							
Part	Speed Sensor Bracket	FileLink2	FileLink2		Extended C	\$ 0,84							
P/N Base	SU 10004	FileLink3	FileLink3		Extended C	\$ 0,84							
Suffix	AA												
Details	Bracket to maintain the speed sensor at the good position relative to the speed sensor disc												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild		\$ 2,25	0,011	kg			Square area 35x40mm	0,001	0,001	7850	1	\$ 0,02
													Sub Total \$ 0,02
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and Remove	Setup for turning	\$ 1,30	Unit	1	one setup for 2 pieces	0,5	\$ 0,65					
20	Laser cut		\$ 0,01	cm	16,1		1	\$ 0,16					
30	Sheet metal bends		\$ 0,25	bend	2		1	\$ 0,50					
							Sub Total	\$ 0,81					





University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 0,43							
System	Wheels & Tires	FileLink1	Drawing		Qty	15							
Assembly	Front Uprights	FileLink2			FileLink1								
Part	Camber adjustment shim	FileLink3			FileLink2								
P/N Base	SU 10005				Extended C	\$ 6,40							
Suffix	AA				FileLink3								
Details	Part to modify the static camber of a wheel												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild		\$ 2,25	0,028	kg			rectangular area, 80*45mm	0,004	0,001	7850	1	\$ 0,06
													Sub Total \$ 0,06
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and Remove	Setup for turning	\$ 1,30	Unit	1	one setup for 2 pieces	0,033333333	\$ 0,04					
20	Laser cut		\$ 0,01	cm	32		1	\$ 0,32					
							Sub Total	\$ 0,36					



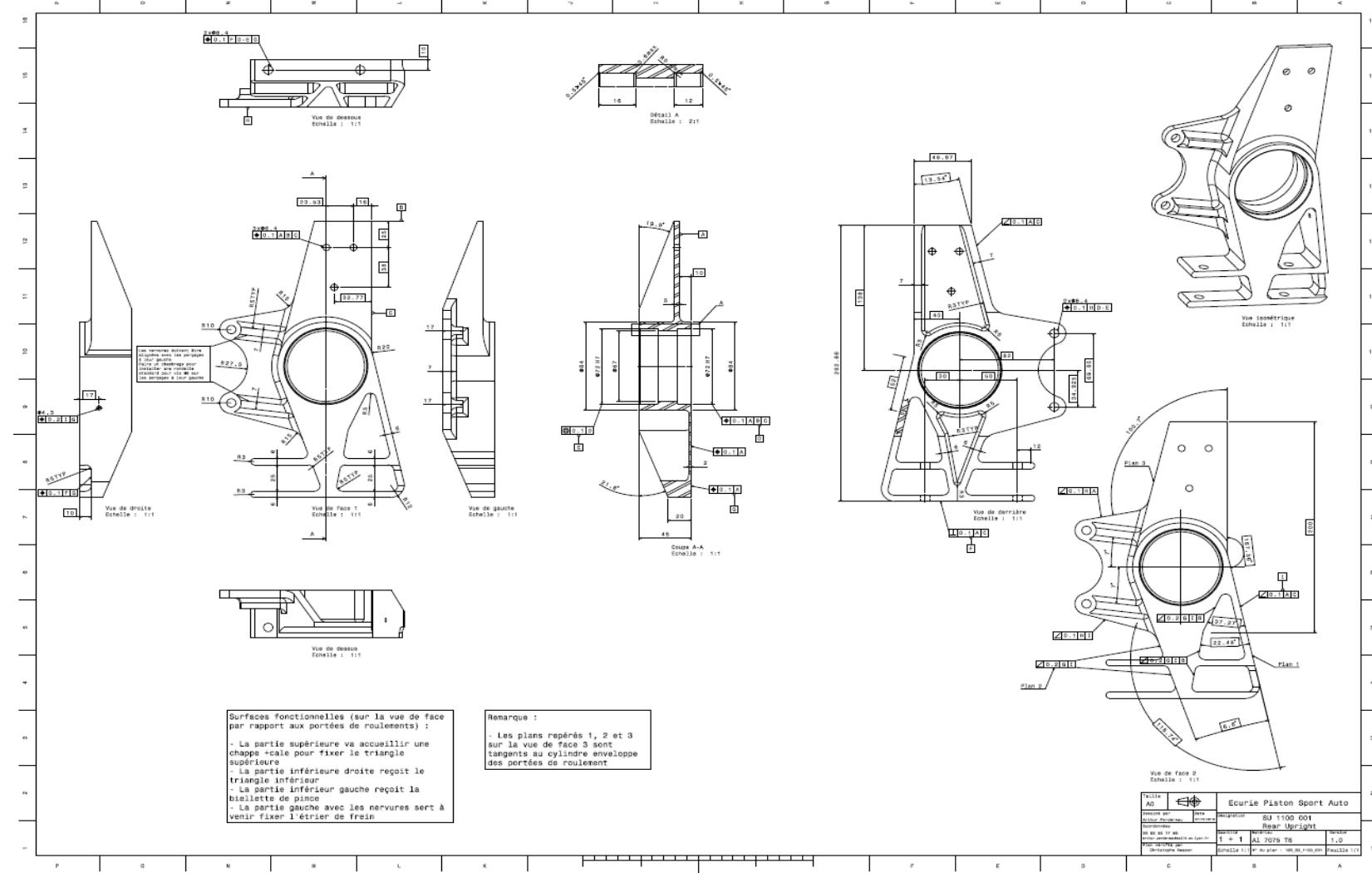
1		2		3		4	
<p>Taille A4</p> <p>Dessiné par Matthieu</p> <p>Date 07/02/2018</p> <p>Coordonnées 06 83 55 17 96 arthur_perdereau@gmail.com</p> <p>Plan vérifié par A. PERDEREAU</p>		<p>Vue isométrique</p> <p>Echelle : 1:1</p>		<p>Vue de face</p> <p>Echelle : 1:1</p> <p>Vue de dessus</p> <p>Echelle : 1:1</p>		<p>65</p> <p>37</p> <p>9</p> <p>5.7</p> <p>20°</p> <p>10°</p> <p>7.2</p> <p>Ø6.6</p> <p>Ø20</p>	
D		2	2	3	3	4	A

University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Asm Cost	\$ 152,32				
System	Wheels & Tires		Qty	2						
Assembly	Rear Uprights									
P/N Base	SU A1100									
Suffix	AA									
Details	Assembly of a part of the wheel with the uprights									
ItemOrder	Part	Part Cost	Quantity	Sub Total						
10	Rear Upright	\$ 106,52	1	\$ 106,52						
20	Upper Arm Bracket	\$ 21,19	1	\$ 21,19						
30	Speed Sensor Brakct	\$ 0,83	1	\$ 0,83						
40	Camber adjustment shim	\$ 0,42	15	\$ 6,37						
				Sub Total	\$ 134,91					
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total		
10	Assemble, 3kg, Interference	Assemble upright with hub	\$ 0,56	unit	1			\$ 0,56		
20	Assemble, 1 kg, Line-on-Line	Assemble camber adjustment shim with upright	\$ 0,13	unit	1			\$ 0,13		
30	Assemble, 1 kg, Line-on-Line	Assemble Upper arm bracket with upright	\$ 0,13	unit	1			\$ 0,13		
40	Ratchet <= 25.4 mm	Bolt upper arm bracket and shim with upright	\$ 0,75	unit	3			\$ 2,25		
50	Reaction Tool <= 25.4 mm	Bolt upper arm bracket and shim with upright	\$ 0,25	Unit	3			\$ 0,75		
60	Assemble, 1 kg, Line-on-Line	Assemble speed sensor bracket with upright	\$ 0,13	Unit	1			\$ 0,13		
70	Ratchet <= 25.4 mm	Bolt speed sensor bracket with upright	\$ 0,75	unit	1			\$ 0,75		
80	Reaction Tool <= 25.4 mm	Bolt speed sensor bracket with upright	\$ 0,25	Unit	1			\$ 0,25		
90	Assemble, 5kg, Line-on-Line	Assemble upright assembly with frame	\$ 0,63	unit	1			\$ 0,63		
100	Ratchet <= 25.4 mm	Bolt upright assembly with rear A-arms	\$ 0,75	Unit	2			\$ 1,50		
110	Reaction Tool <= 25.4 mm	Bolt upright assembly with rear A-arms	\$ 0,25	Unit	2			\$ 0,50		
120	Suspension Setup-Independent Susp. (per corner)	Camber and toe adjustment	\$ 8,75	Unit	1			\$ 8,75		
								Sub Total	\$ 16,33	
ItemOrder	Fastener	Use	UnitCost	Size1	Unit1	Size2	Unit2	Quantity	Sub Total	
10	Bolt, Grade 8.8 (SAE 5)	Bolt Upper arm bracket, wedge, camber adjustment shim and upright	\$0,09	6 mm		40 mm		3	\$ 0,27	
20	Nut, Grade 8.8 (SAE 5)	Bolt Upper arm bracket, wedge, camber adjustment shim and upright	\$0,03	6 mm				3	\$ 0,09	
30	Washer, Grade 8.8 (SAE 5)	Bolt Upper arm bracket, wedge, camber adjustment shim and upright	\$0,01		mm			6	\$ 0,06	
40	Bolt, Grade 8.8 (SAE 5)	Bolt Speed sensor bracket on upright	\$0,02	4 mm		16 mm		1	\$ 0,02	
50	Nut, Grade 8.8 (SAE 5)	Bolt Speed sensor bracket on upright	\$0,02	4 mm				1	\$ 0,02	
60	Washer, Grade 8.8 (SAE 5)	Bolt Speed sensor bracket on upright	\$0,01		mm			2	\$ 0,02	
70	Bolt, Grade 8.8 (SAE 5)	Bolt Upper arm bracket, wedge, camber adjustment shim and upright	\$0,24	8 mm		55 mm		2	\$ 0,47	
80	Nut, Grade 8.8 (SAE 5)	Bolt Upper arm bracket, wedge, camber adjustment shim and upright	\$0,04	8 mm				2	\$ 0,09	
90	Washer, Grade 8.8 (SAE 5)	Bolt Upper arm bracket, wedge, camber adjustment shim and upright	\$0,01		mm			4	\$ 0,04	
									Sub Total	\$ 1,08

University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 106,52							
System	Wheels & Tires				Qty	1							
Assembly	Rear Uprights	FileLink1	Drawing		FileLink1								
Part	Rear Upright	FileLink2			FileLink2								
P/N Base	SU 11001	FileLink3			FileLink3								
Suffix	AA												
Details	Main part of the assembly												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Aluminium, Premium		\$ 4,20	6,153	kg			rectangula	0,045	0,050	2712	1	\$ 25,84
													Sub Total \$ 25,84
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and Remove	Setup for milling	\$ 1,30	Unit	1		1	\$ 1,30					
20	Machining	Milling the back and the first bearing seat	\$ 0,04	cm^3	350	Material - Aluminium	1	\$ 14,00					
30	Machining Setup, Change	Change the milling setup	\$ 0,65	Unit	1		1	\$ 0,65					
40	Machining	Milling, the main phase	\$ 0,04	cm^3	1285	Material - Aluminium	1	\$ 51,40					
50	Machining Setup, Change		\$ 0,65	Unit	1		1	\$ 0,65					
60	Machining	Milling, removing the sole	\$ 0,04	cm^3	227	Material - Aluminium	1	\$ 9,08					
70	Machining Setup, Change		\$ 0,65	Unit	1		1	\$ 0,65					
80	Machining	Milling, 2 holes for A- Arm and toe link	\$ 0,04	cm^3	1,2	Material - Aluminium	1	\$ 0,05					
90	Machining Setup, Change		\$ 0,65	Unit	1		1	\$ 0,65					
100	Machining	Milling upper slopes	\$ 0,04	cm^3	24	Material - Aluminium	1	\$ 0,96					
110	Machining Setup, Change		\$ 0,65	Unit	1		1	\$ 0,65					
120	Machining	Milling lower slopes	\$ 0,04	cm^3	16	Material - Aluminium	1	\$ 0,64					
130	Drilled holes < 25,4 mm dia.	Drill the hole for the speed sensor bracket	\$ 0,35	Hole	1	Material - Aluminium	1	\$ 0,35					
							Sub Total	\$ 80,68					

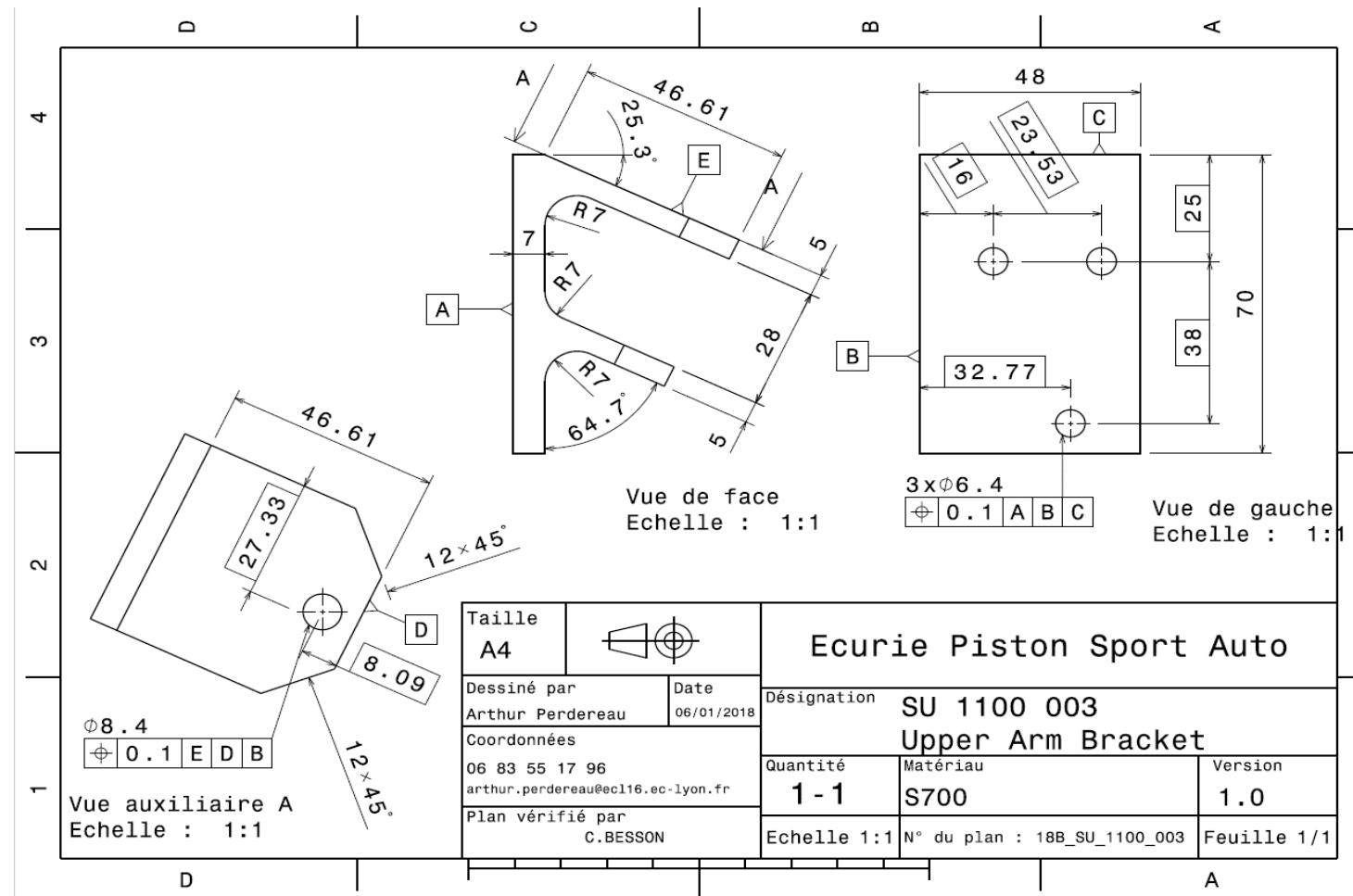


Drawing part : SU 11001

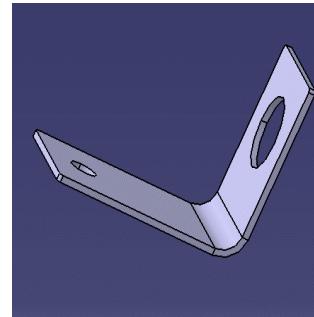


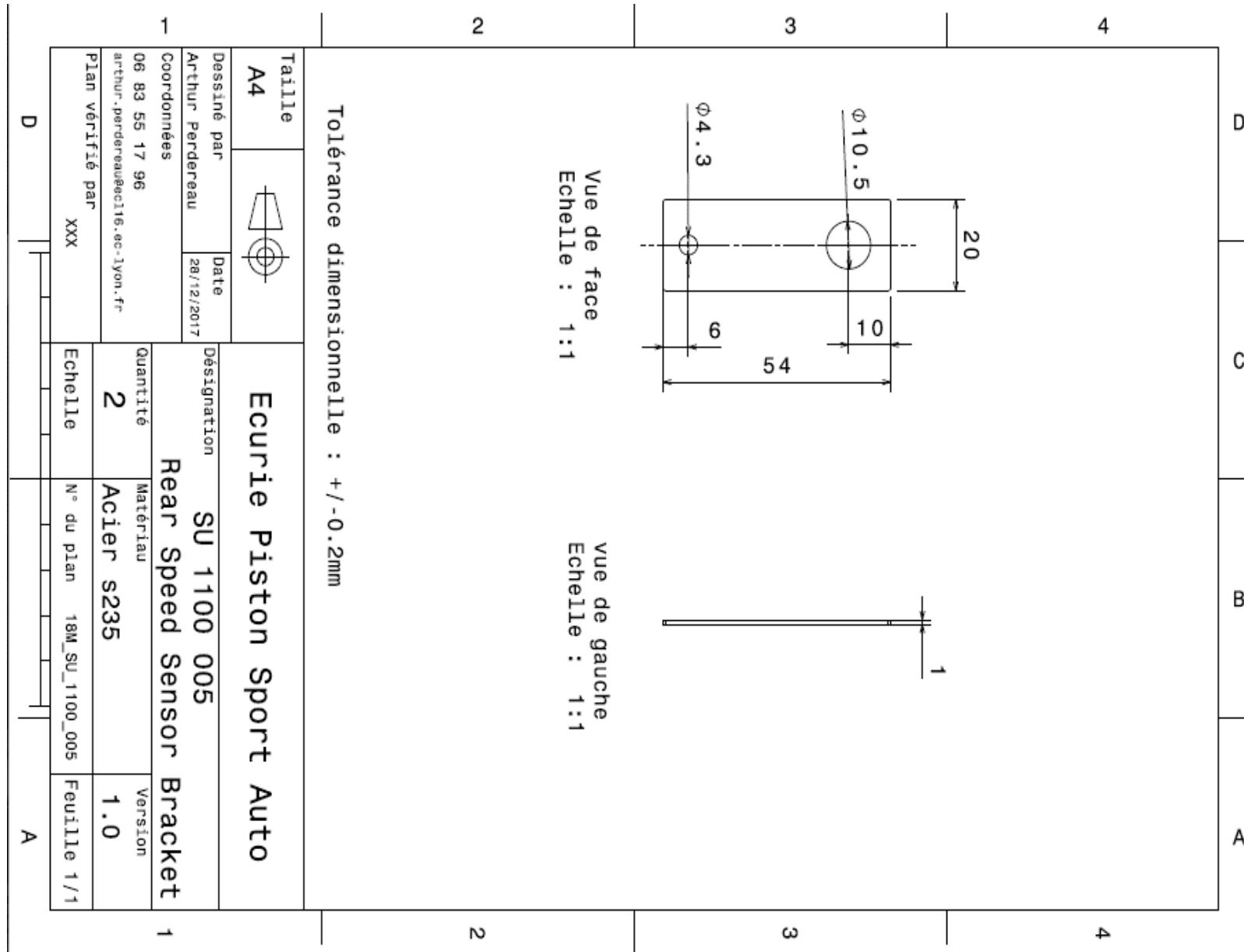
University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 21,19							
System	Wheels & Tires		Qty	1									
Assembly	Rear Uprights		FileLink1										
Part	Upper Arm Bracket		FileLink2										
P/N Base	SU 11002		FileLink3										
Suffix	AA				Extended C	\$ 21,19							
Details	Bracket to link the upper arm to the upright												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Alloy		\$ 2,25	1,470	kg			Rectangle Area, 50x70 (mm)	0,004	0,052	7850	1	\$ 3,31
													Sub Total \$ 3,31
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and Remove	Setup for milling	\$ 1,30	Unit	1		1	\$ 1,30					
20	Machining	Milling the main part	\$ 0,04	cm^3	102	Material - Steel	3	\$ 12,24					
30	Machining Setup, Change	Change the milling setup	\$ 0,65	Unit	1		1	\$ 0,65					
40	Machining	Milling to remove the sole	\$ 0,04	cm^3	25,2	Material - Steel	3	\$ 3,02					
50	Machining Setup, Change	Change the milling setup	\$ 0,65	Unit	1		1	\$ 0,65					
60	Machining	Milling 3 holes	\$ 0,04	cm^3	0,2	Material - Steel	3	\$ 0,02					
70	Machining Setup, Change	Change the milling setup	\$ 0,65	Unit	1		1	\$ 0,65					
80	Machining	Milling, chamfer and last hole	\$ 0,04	cm^3	3,56	Material - Steel	3	\$ 0,43					
							Sub Total	\$ 17,89					



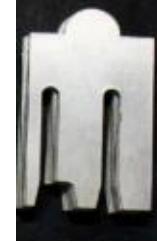


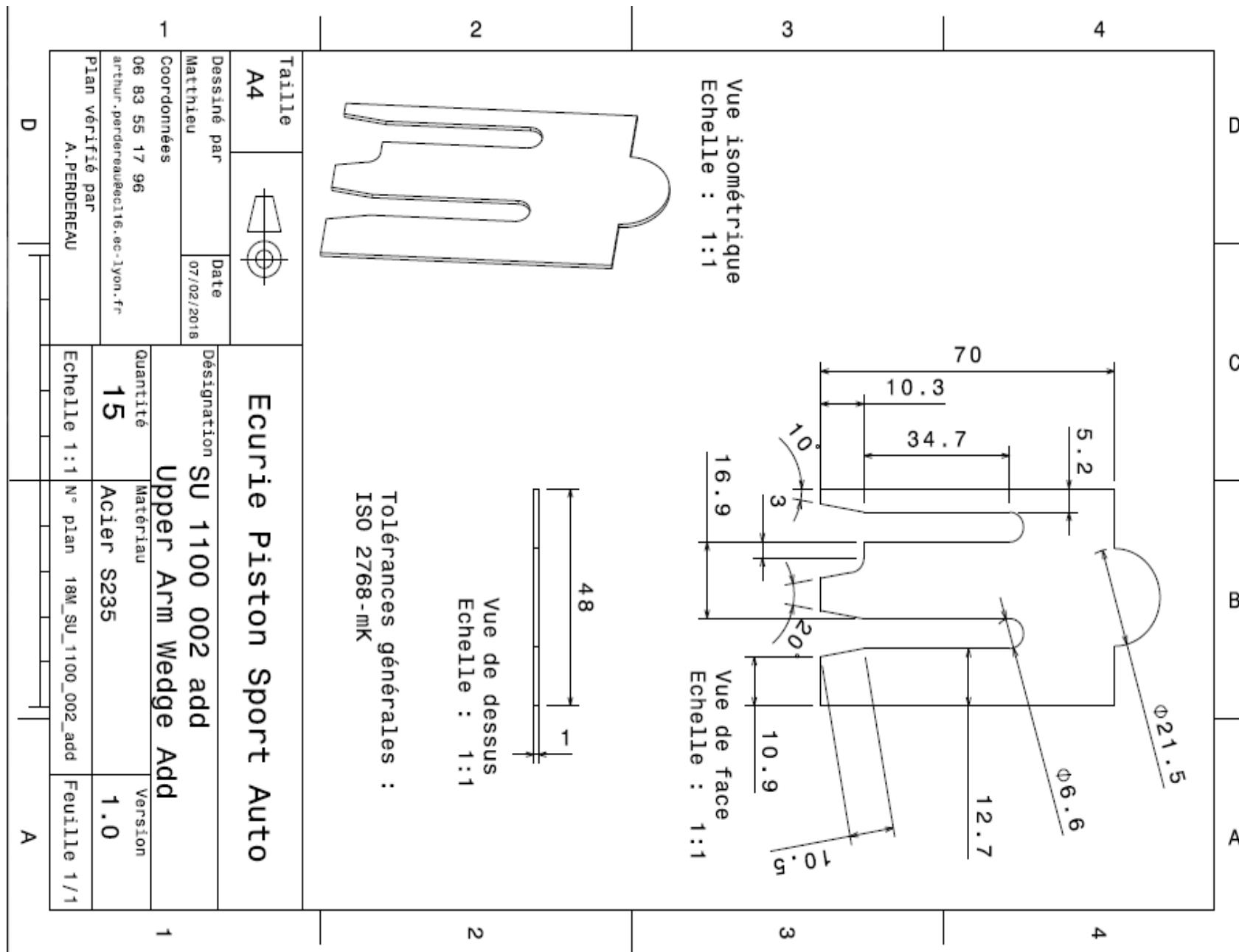
University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 0,83							
System	Wheels & Tires	Drawing	Qty	1	FileLink1								
Assembly	Rear Uprights	FileLink2	FileLink1		FileLink2								
Part	Speed Sensor Bracket	FileLink3	FileLink3		Extended	\$ 0,83							
P/N Base	SU 11003												
Suffix	AA												
Details	Bracket to maintain the speed sensor at the good position relative to the speed sensor disc												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild		\$ 2,25	0,010	kg			Square are	0,001	0,001	7850	1	\$ 0,02
													Sub Total \$ 0,02
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and Remove	Setup for turning	\$ 1,30	Unit	1	one setup for 2 pieces	0,5	\$ 0,65					
20	Laser cut		\$ 0,01	cm	15,4		1	\$ 0,15					
30	Sheet metal bends		\$ 0,25	bend	1		1	\$ 0,25					
						Sub Total	\$ 0,80						





University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 0,42							
System	Wheels & Tires	Drawing	Qty	15	FileLink1								
Assembly	Rear Uprights	FileLink1	FileLink2	FileLink3	FileLink1								
Part	Camber adjustment shim	FileLink2	FileLink3		FileLink2								
P/N Base	SU 11004				FileLink3	Extended C							
Suffix	AA					\$ 6,37							
Details	Part to modify the static camber of a wheel												
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild		\$ 2,25	0,032	kg			rectangular area, 84mm*48mm	0,004	0,001	7850	1	\$ 0,07
													Sub Total \$ 0,07
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and Remove	Setup for turning	\$ 1,30	Unit	1	one setup for 30 pieces	0,033333333	\$ 0,04					
20	Laser cut		\$ 0,01	cm	31		1	\$ 0,31					
							Sub Total	\$ 0,35					

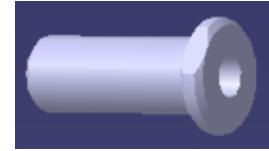


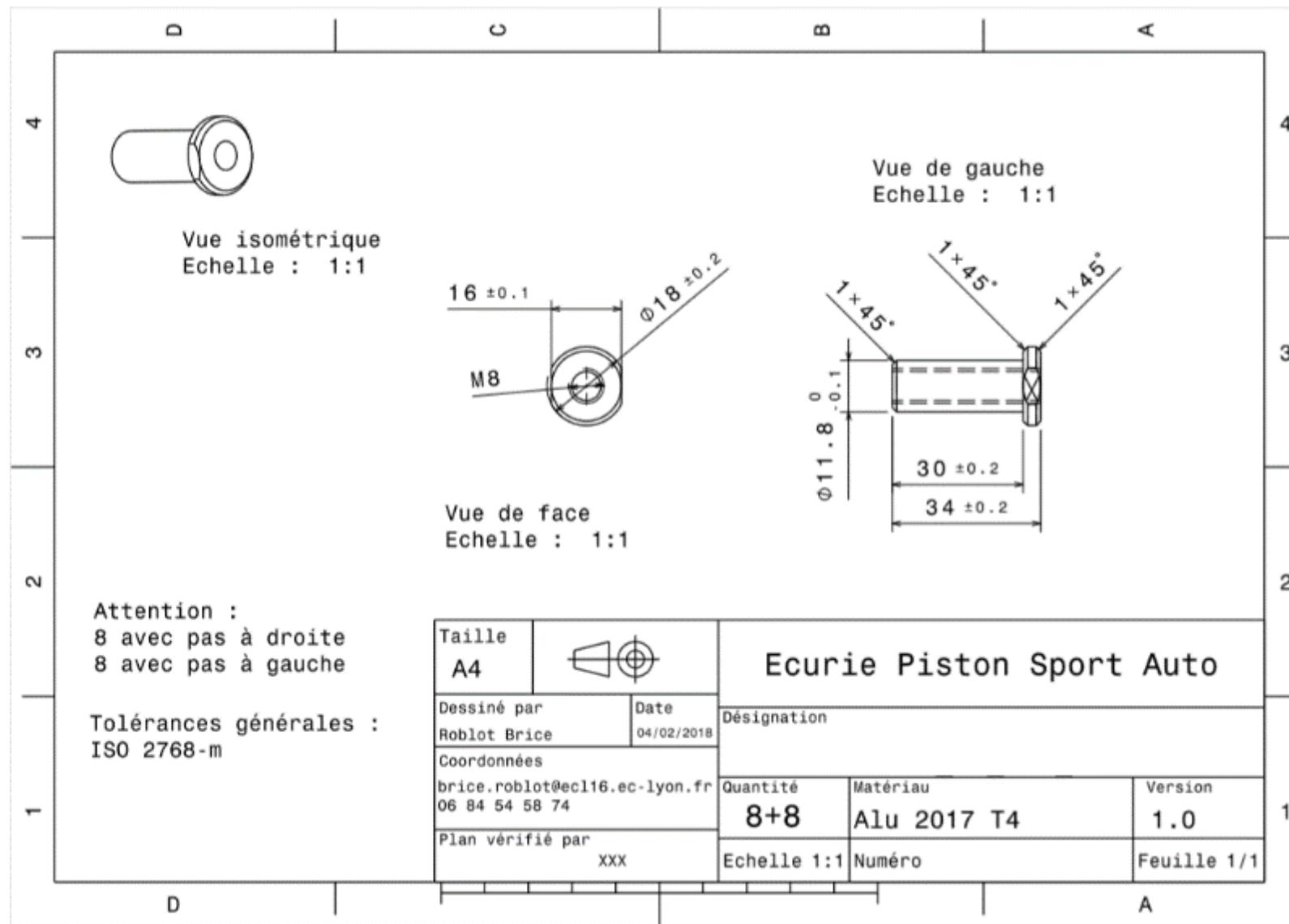


University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Asm Cost	\$ 27,91							
System	Suspension & Shocks		Qty	2									
Assembly	Front Pullrod		FileLink1										
P/N Base	SU A1200		FileLink2										
Suffix	AA		FileLink3										
Details	Front Pullrod, right and left are symetric		Extended C	55,83									
ItemOrder	Part	Part Cost	Quantity	Sub Total									
10	Pullrod tube	\$ 9,07	1	\$ 9,07									
20	Pullrod insert	\$ 1,88	2	\$ 3,77									
30	Spacer 1	\$ 0,35	2	\$ 0,70									
30	Spacer 2	\$ 0,35	2	\$ 0,70									
			Sub Total	\$ 14,23									
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Rod End, Industrial	Right-hand rod end for pushrod extremities	\$ 2,50	8 mm				Balls Diameter				1	\$ 2,50
20	Rod End, Industrial	Left-hand rod end for pushrod extremities	\$ 2,50	8 mm				Balls Diameter				1	\$ 2,50
30	Adhesive	Glue insert to pushrod tube - Cost included in process	\$ -										\$ -
												Sub Total	\$ 5,00
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multip	Mult. Val.	Sub Total					
10	Hand Finish - Surface Preparation	Solvent degreasing on carbon tube	\$ 0,02	cm ²	6,6		1	\$ 0,13					
20	Hand Finish - Surface Preparation	Solvent degreasing on insert	\$ 0,02	cm ²	6,6		1	\$ 0,13					
30	Brush apply	Glue insert to pushrod tube	\$ 0,02	cm ²	6,6		1	\$ 0,13					
40	Hand - Start Only	Put a nut on the rod end	\$ 0,12	unit	2		1	\$ 0,24					
50	Hand, Loose <= 25.4 mm	Screwing by hand the rod end in the pullrod insert	\$ 0,50	unit	2		1	\$ 1,00					
60	Wrench <= 25.4 mm	Thighten the M8 nuts	\$ 1,50	unit	2		1	\$ 3,00					
70	Reaction tool <= 25.4 mm	Thighten the M8 nuts	\$ 0,25	unit	2		1	\$ 0,50					
80	Assemble, 1kg, Loose	Put the spacers of the rocker in place	\$ 0,06	unit	2		1	\$ 0,12					
90	Assemble, 1kg, Loose	Put the washers of the rocker in place	\$ 0,06	unit	2		1	\$ 0,12					
100	Hand - Start Only	Bolt pullrod into the rocker	\$ 0,12	unit	1		1	\$ 0,12					
110	Assemble, 1kg, Loose	Put the spacers of the A-arm in place	\$ 0,06	unit	2		1	\$ 0,12					
120	Assemble, 1kg, Loose	Put the washers of the A-arm in place	\$ 0,06	unit	2		1	\$ 0,12					
130	Hand - Start Only	Bolt pullrod into the A-Arm	\$ 0,12	unit	1		1	\$ 0,12					
140	Hand - Start Only	Put the nuts into the bolts	\$ 0,12	unit	2		1	\$ 0,24					
150	Ratchet <= 25.4 mm	Thighten the M8 nuts	\$ 0,75	unit	2		1	\$ 1,50					
160	Reaction tool <= 25.4 mm	Thighten the M8 nuts	\$ 0,25	unit	2		1	\$ 0,50					
					Sub Total	\$ 8,10							
ItemOrder	Fastener	Use	UnitCost	Size1	Unit1	Size2	Unit2	Quantity	Sub Total				
10	Bolt,Grade 8.8 (SAE)	Pullrod to rocker fixing bolt	\$ 0,19	8 mm	45 mm			1	\$ 0,19				
20	Bolt,Grade 8.8 (SAE)	Pullrod to A-arm fixing bolt	\$ 0,19	8 mm	45 mm			1	\$ 0,19				
30	Washer, Grade 8.8 (SAE 5)		\$ 0,01	8 unit				4	\$ 0,04				
40	Nut, Grade 8.8 (SAE 5)	To tighten the rod ends	\$ 0,04	8 mm				2	\$ 0,09				
50	Nut, Grade 8.8 (SAE 5)	To tighten the bolts	\$ 0,04	8 mm				2	\$ 0,09				
					Sub Total	\$ 0,59							

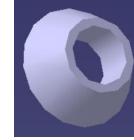
University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 9,07							
System	Suspension & Shocks	FileLink1	Qty	1	Extended Cos	\$ 9,07							
Assembly	Front Pullrod	FileLink2	FileLink3										
Part	Pullrod tube												
P/N Base	SU 12001												
Suffix	AA												
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Carbon fiber, 1 Ply	Stock material	\$ 200,00	0,040	kg			Round area, diameter 16x2 mm	8,80E-05	0,290	1580	1	\$ 8,06
													Sub Total \$ 8,06
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Lamination, Filament Wirring	Tube lamination	\$ 25,00	kg	0,040			\$ 1,01					
							Sub Total	\$ 1,01					
													

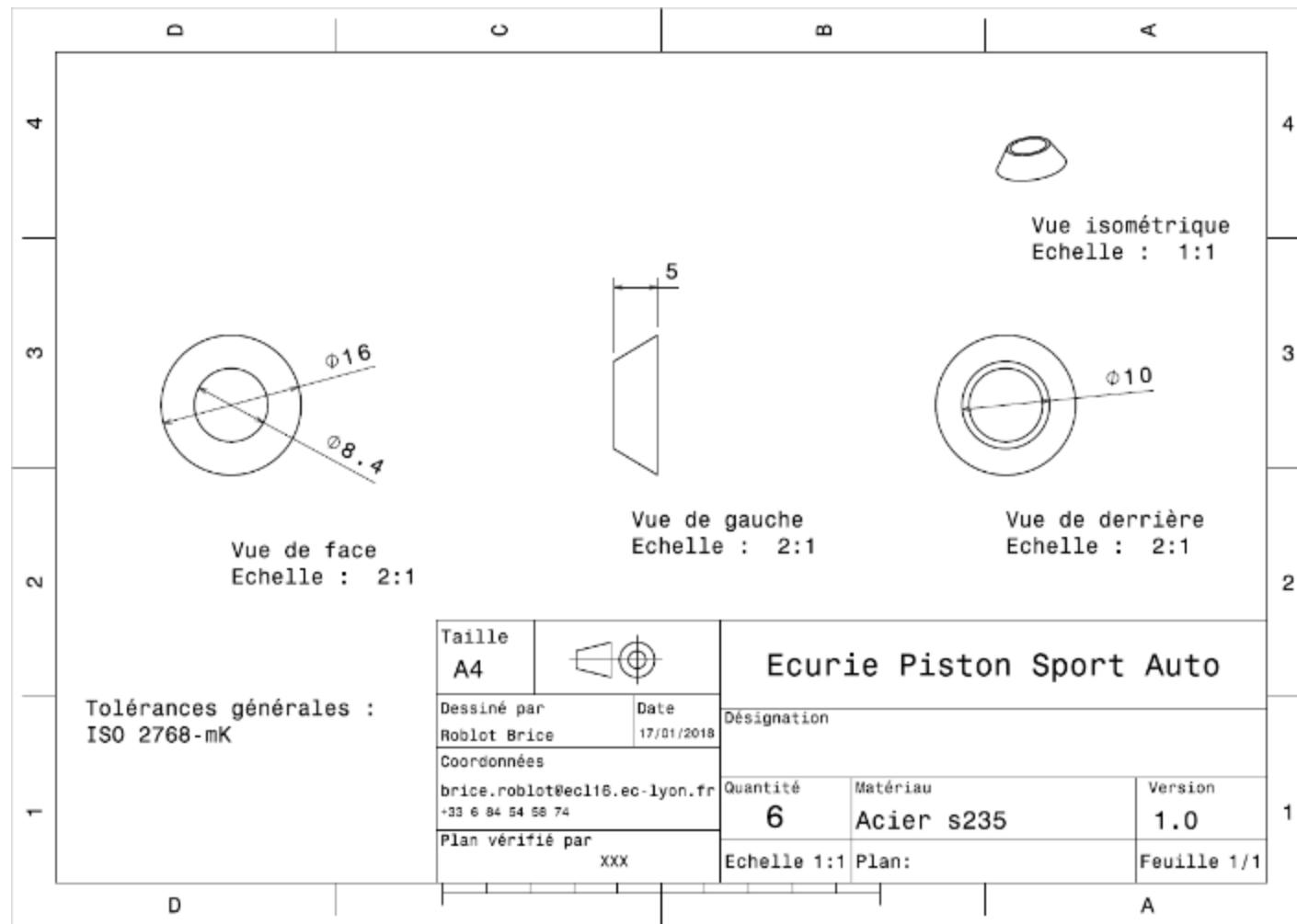
University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 1,88										
System	Suspension & Shocks	Qty	2												
Assembly	Front Pullrod	FileLink1													
Part	Pullrod insert	FileLink2													
P/N Base	SU 12002	FileLink3													
Suffix	AA														
Details															
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total		
10	Aluminium, Premium (per kg)	cylinder	\$ 4,20	0,070	kg			Round area diam. 18mm	2,54E-04	3,50E-02	7 850,00	1	\$ 0,29	Sub Total	\$ 0,29
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier		Mult. Val.	Sub Total						
10	Machining Setup, Install and remove	Setup for machining and removal	\$ 1,30	Unit	1	8 parts from a single machine setup (tierod insert)		0,125	\$ 0,16						
20	Machining	Material removal - side view profile	\$ 0,04	cm^3	5,5	Material - Steel		3	\$ 0,66						
30	Machining setup, change	Setup for machining process	\$ 0,65	Unit	1	8 parts from a single machine setup (tierod insert)		0,125	\$ 0,08						
40	Machining	Material removal	\$ 0,04	cm^3	0,3	Material - Steel		3	\$ 0,04						
50	Threading, Internal (machining)		\$ 0,10	cm	3			1	\$ 0,30						
60	Tapping Holes	Rod End emplacement	\$ 0,35	hole	1			1	\$ 0,35						
								Sub Total	\$ 1,59						





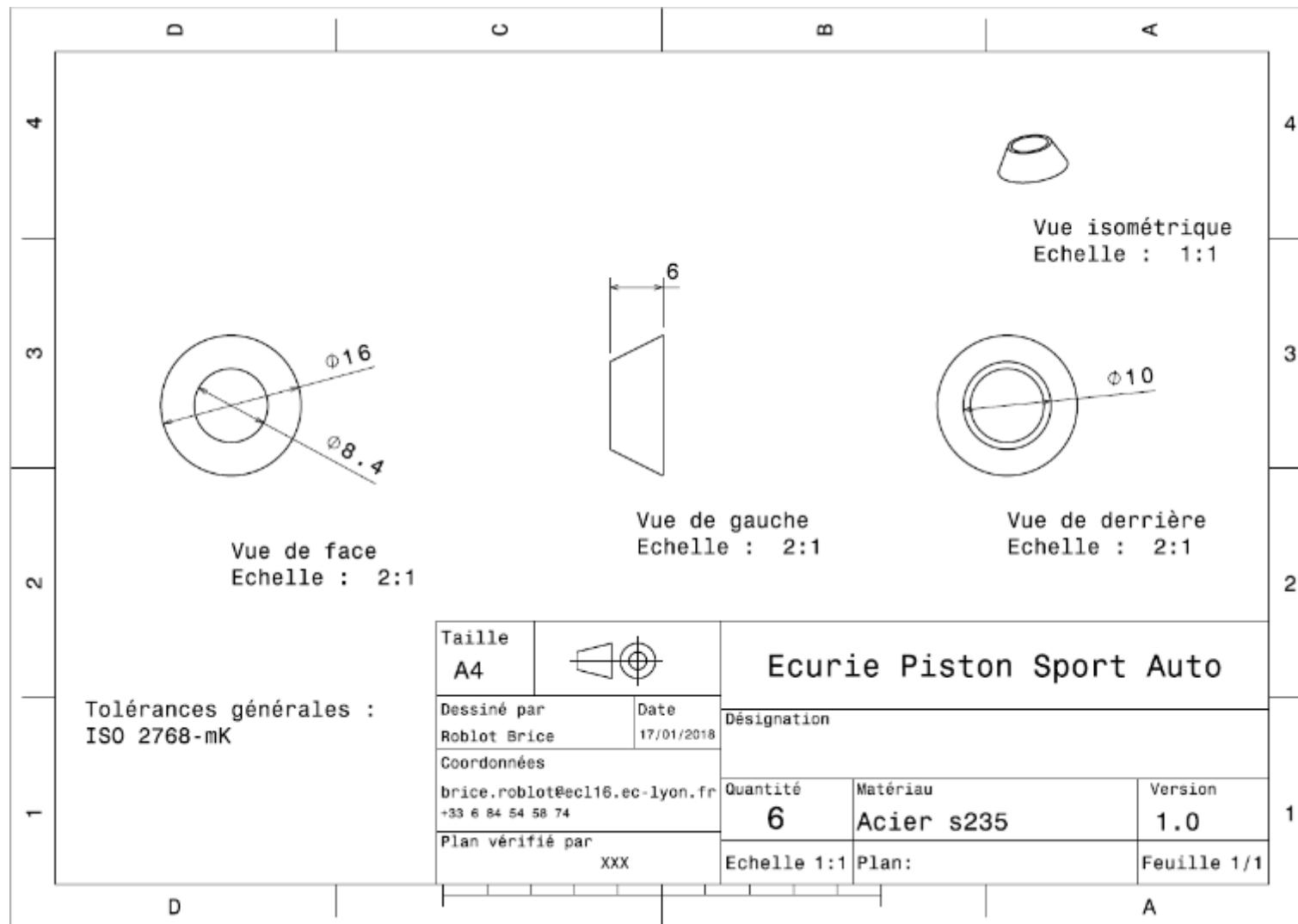
University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 0,35							
System	Suspension & Shocks	FileLink1	Qty	2	Part Cost	\$ 0,35							
Assembly	Front Pullrod	FileLink2	FileLink1		FileLink2								
Part	Spacer 1	FileLink3	FileLink2		FileLink3	Extended Cos \$ 0,70							
P/N Base	SU 12003												
Prefix	AA												
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild	Material for Part	\$ 2,25	0,008	kg			Cylindrical 16 mm diameter	2,01E-04	5,00E-03	7850	1	\$ 0,02
													Sub Total \$ 0,02
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining setup, install and remove		\$ 1,30	unit	1	8 parts made from a single machine setup	0,125	\$ 0,16					
20	Machining		\$ 0,04	cm^3	1,4	Material - Steel	3	\$ 0,17					
							Sub Total	\$ 0,33					





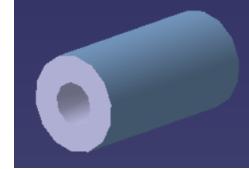
University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Part Cost	\$ 0,35							
System	Suspension & Shocks	FileLink1	Qty	2	Part Cost	\$ 0,35							
Assembly	Front Pullrod	FileLink2	Extended Cos	\$ 0,70	Part Cost	\$ 0,35							
Part	Spacer 2	FileLink3	FileLink1		Part Cost	\$ 0,35							
P/N Base	SU 12004		FileLink2		Part Cost	\$ 0,35							
Suffix	AA		FileLink3		Part Cost	\$ 0,35							
Details					Part Cost	\$ 0,35							
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, Mild	Material for Part	\$ 2,25	0,009	kg			Cylindrical 16 mm diameter	2,01E-04	6,00E-03	7850	1	\$ 0,02
													Sub Total \$ 0,02
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining setup, install and remove		\$ 1,30	unit		8 parts made from a single machine setup	0,125	\$ 0,16					
20	Machining		\$ 0,04	cm^3	1,5	Material - Steel	3	\$ 0,18					
							Sub Total	\$ 0,34					

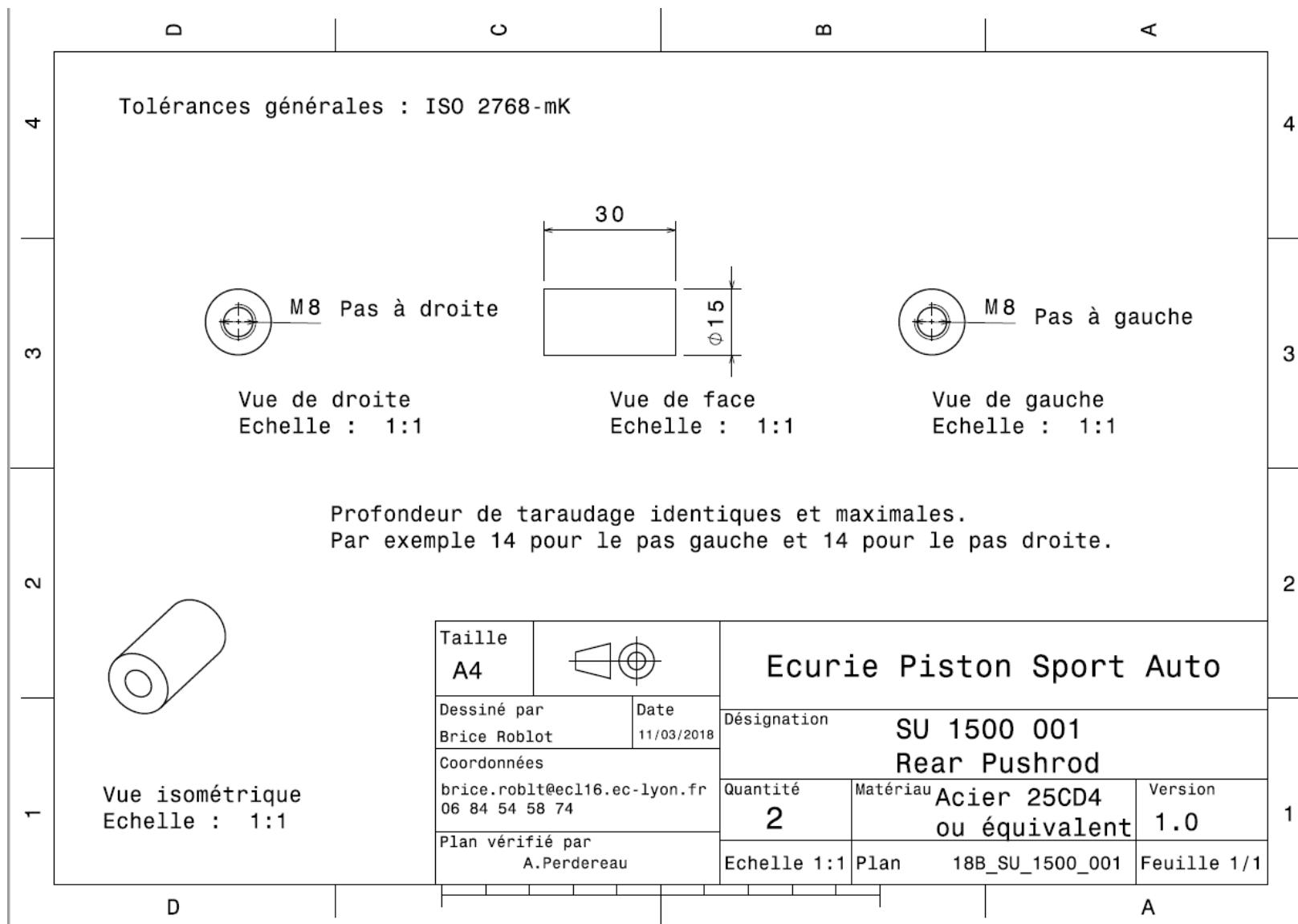




University	Ecole Centrale de Lyon	Back to BOM	Car #	81	Asm Cost	\$ 13,81							
System	Suspension & Shocks		Qty	2									
Assembly	Rear Pushrod		FileLink1										
P/N Base	SU A1300		FileLink2										
Suffix	AA		FileLink3										
Details	Rear Pushrod, right and left are symetric												
ItemOrder	Part	Part Cost	Quantity	Sub Total									
10	Steel cylinder for pushrod	\$ 2,90	1	\$ 2,90									
20	Spacer	\$ 0,36	4	\$ 1,46									
			Sub Total	\$ 4,36									
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Rod End, Industrial	Right-hand rod end for pushrod extremities	\$ 2,50		8 mm			Balls Diameter				1	\$ 2,50
20	Rod End, Industrial	Left-hand rod end for pushrod extremities	\$ 2,50		8 mm			Balls Diameter				1	\$ 2,50
												Sub Total	\$ 5,00
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Hand - Start Only	Put a nut on the rod end	\$ 0,12	unit	1		1	\$ 0,12					
20	Hand, Loose <= 25.4 mm	Screwing by hand the rod end in the steel cylinder	\$ 0,50	unit	1		1	\$ 0,50					
30	Wrench <= 25.4 mm	Tighten the M8 nuts	\$ 1,50	unit	1		1	\$ 1,50					
40	Reaction tool <= 25.4 mm	Tighten the M8 nuts	\$ 0,25	unit	1		1	\$ 0,25					
50	Assemble, 1kg, Loose	Put the spacers of the rocker in place	\$ 0,06	unit	1		1	\$ 0,06					
60	Assemble, 1kg, Loose	Put the washers of the rocker in place	\$ 0,06	unit	1		1	\$ 0,06					
70	Hand - Start Only	Bolt pushrod into the rocker	\$ 0,12	unit	1		1	\$ 0,12					
80	Assemble, 1kg, Loose	Put the spacers of the A-arm in place	\$ 0,06	unit	1		1	\$ 0,06					
90	Assemble, 1kg, Loose	Put the washers of the A-arm in place	\$ 0,06	unit	1		1	\$ 0,06					
100	Hand - Start Only	Bolt pushrod into the A-Arm	\$ 0,12	unit	1		1	\$ 0,12					
110	Hand - Start Only	Put the nuts into the bolts	\$ 0,12	unit	1		1	\$ 0,12					
120	Ratchet <= 25.4 mm	Tighten the M8 nuts	\$ 0,75	unit	1		1	\$ 0,75					
130	Reaction tool <= 25.4 mm	Tighten the M8 nuts	\$ 0,25	unit	1		1	\$ 0,25					
							Sub Total	\$ 3,97					
ItemOrder	Fastener	Use	UnitCost	Size1	Unit1	Size2	Unit2	Quantity	Sub Total				
10	Bolt,Grade 8.8 (SAE)	Pushrod to rocker fixing bolt	\$ 0,19	8 mm		45 mm		1	\$ 0,19				
20	Bolt,Grade 8.8 (SAE)	Pushrod to A-arm fixing bolt	\$ 0,19	8 mm		45 mm		1	\$ 0,19				
30	Washer, Grade 8.8 (SAE 5)		\$ 0,01	8 unit				4	\$ 0,04				
40	Nut, Grade 8.8 (SAE 5)	To tighten the rod ends	\$ 0,03	6 mm				1	\$ 0,03				
50	Nut, Grade 8.8 (SAE 5)	To tighten the bolts	\$ 0,04	8 mm				1	\$ 0,04				
							Sub Total	\$ 0,49					

University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 2,90								
System	Suspension & Shocks	Qty	1										
Assembly	Rear Pushrod	FileLink1	Drawing	FileLink2	Back to BOM								
Part	Steel cylinder for pushrod	FileLink3		Extended Cos	\$ 2,90								
P/N Base	SU 13001	FileLink1		FileLink2									
Suffix	AA	FileLink3											
Details													
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total
10	Steel, alloy	Material for part	\$ 2,25	0,045	kg			Round area, outside diameter 15 mm	1,77E-04	0,030	8500	1	\$ 0,10
20	Paint	To protect part from rust	\$ 10,00	0,001	m^2								\$ 0,01
													Sub Total \$ 0,12
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total					
10	Machining Setup, Install and remove		\$ 1,30	unit	1	2 parts made from a single machine setup	0,5	\$ 0,65					
20	Machining (turning)	Machining removal	\$ 0,04	cm^3	1,04	Material - Steel	3	\$ 0,12					
30	Tapping holes	Material removal	\$ 0,35	hole	2	Drill & Tap	1	\$ 0,70					
40	Machining setup, change	Setup for machining process	\$ 0,65	Unit	1	2 parts made from a single machine setup	0,5	\$ 0,33					
50	Tapping holes	Material removal	\$ 0,35	hole	2	Drill & Tap	1	\$ 0,70					
60	Aerosol apply	To protect part from rust	\$ 5,25	m^2	0,001			\$ 0,01					
70	Threading, Internal (machining)		\$ 0,10	cm	2,8			\$ 0,28					
							Sub Total	\$ 2,79					





University	Ecole Centrale de Lyon	Car #	81	Part Cost	\$ 0,36									
System	Suspension & Shocks	Qty	4											
Assembly	Rear Pushrod	FileLink1		FileLink1										
Part	Spacer	FileLink2		FileLink2										
P/N Base	SU 13002	FileLink3		Extended Cos	\$ 1,46									
Suffix	AA			FileLink3										
Details														
ItemOrder	Material	Use	UnitCost	Size1	Unit1	Size2	Unit2	Area Name	Area	Length	Density	Quantity	Sub Total	
10	Steel, Mild	Material for Part	\$ 2,25	0,009	kg			Cylindrical 16 mm diameter	2,01E-04	6,00E-03	7850	1	\$ 0,02	
													Sub Total	\$ 0,02
ItemOrder	Process	Use	UnitCost	Unit	Quantity	Multiplier	Mult. Val.	Sub Total						
10	Machining setup, install and remove		\$ 1,30	unit	1	8 parts made from a single machine setup	0,125	\$ 0,16						
20	Machining		\$ 0,04	cm^3	1,5	Material - Steel	3	\$ 0,18						
							Sub Total	\$ 0,34						



[Back to BOM](#)

[FileLink1](#) Drawing
[FileLink2](#)
[FileLink3](#)

