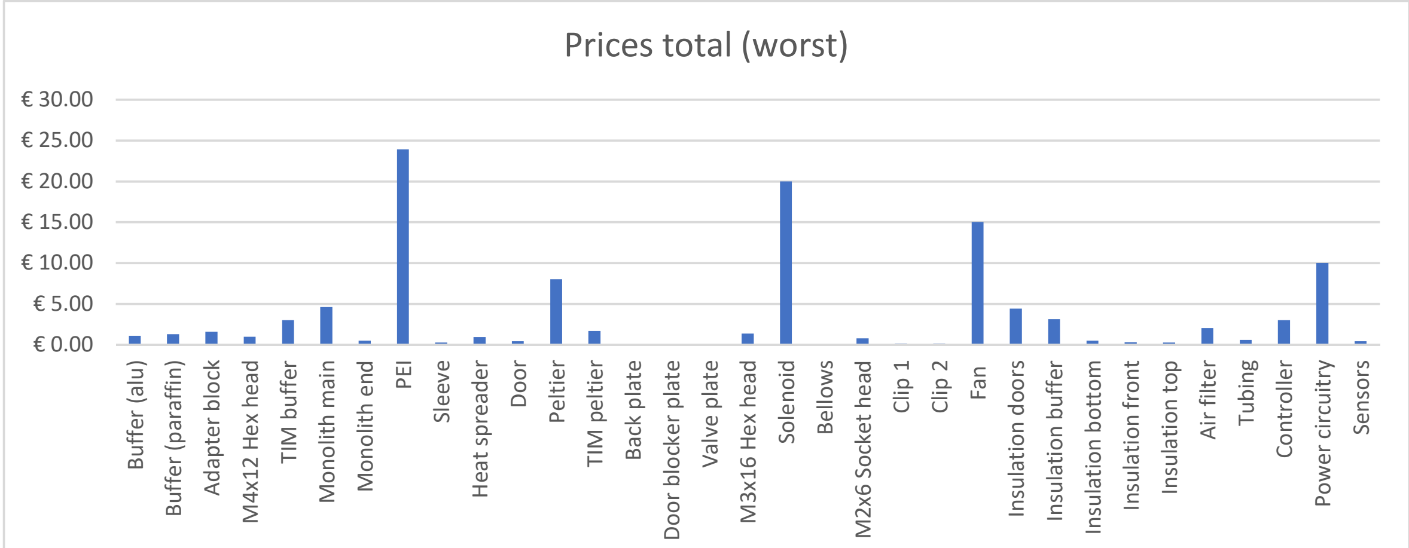
Component	**Material**	**Density**	**unit**	**Volume/unit**	**unit**	**Mass/unit**	**unit**	**Quantity**	**Total Mass**	**unit**	**Total volume**	**unit**	**EUR/kg (low)**	**EUR/kg (high)**	**Price/volume (Low)**	**Price/volume (high)**	**unit**	**EUR/piece (Low)**	**EUR/piece (high)**	**Cost (best)**	**Cost (worst)**	**Own production (1) Assembly (0)**	**Percentage of total (best)**	**Percentage of total (worst)**	**Percentage of total self (best)**	**Percentage of total self (worst)**	**Percentage of total bought (best)**	**Percentage of total bought (worst)**	**Manufacturing technique**	**Manufacturing cost/piece or factor**	**Manufacturing cost(best)**	**Manufacturing cost(worst)**	**Comment**		
Buffer (alu)	Aluminum	2700	kg/m3	1.77E+05	mm3	4.78E-01	kg	1	0.478	kg			1.98	2.27						€ 0.95	€ 1.08	1	2.3%	0.9%	6.7%	4.1%			Extrusion + hole dril	1.5	€ 1.42	€ 1.63			
Buffer (paraffin)	Paraffin	900	kg/m3	1.43E+06	mm3	1.28E+00	kg	1	1.283	kg			0.83	1.00						€ 1.06	€ 1.28	1	2.6%	1.1%	7.5%	4.9%			Extrusion	1	€ 1.06	€ 1.28	Material + manufacturing factor = 2		
Adapter block	Aluminum	2700	kg/m3	6.40E+04	mm3	1.73E-01	kg	4	0.691	kg			1.98	2.27						€ 1.37	€ 1.57	1	3.3%	1.4%	9.7%	5.9%			Aluminum injection	1	€ 1.37	€ 1.57			
M4x12 Hex head	Steel/Stainless steel							12										0.0554	0.079	€ 0.66	€ 0.95	0	1.6%	0.8%			2.5%	1.1%	x						
TIM buffer	Tflex SF800			1.49E+03	Area:	2985.047	mm2	4							100	1000	m2			€ 0.30	€ 2.99	0	0.7%	2.6%			1.1%	3.4%	Punching/cutting	0.5	€ 0.15	€ 1.49	67% efficient cutting		
Monolith main	Activated Carbon	400.00	kg/m3	2.00E+05	mm3	8.00E-02	kg	18	1.440	kg	3600000	mm3			546.58	1274.28	m3			€ 1.97	€ 4.59	1	4.8%	4.0%	13.9%	17.4%			x						
Monolith end	Activated Carbon	400.00	kg/m3	9.62E+04	mm3	3.85E-02	kg	4	0.154	kg	384840	mm3			546.58	1274.28	m3			€ 0.21	€ 0.49	1	0.5%	0.4%	1.5%	1.9%			x						
PEI	30% loading							1	0.683	kg			7	35						€ 4.78	€ 23.91	0	11.7%	20.9%			17.9%	27.2%	x						
Sleeve	EPDM	870	kg/m3	7.33E+04	mm3	6.38E-02	kg	2	0.128	kg			1.65	1.86						€ 0.21	€ 0.24	1	0.5%	0.2%	1.5%	0.9%			Injection molding	1	€ 0.21	€ 0.24			
Heat spreader	Aluminum	2700	kg/m3	7.56E+04	mm3	2.04E-01	kg	2	0.408	kg			1.98	2.27						€ 0.81	€ 0.93	1	2.0%	0.8%	5.7%	3.5%			Extrusion	1	€ 0.81	€ 0.93			
Door	PET 45% glass	1700	kg/m3	4.22E+04	mm3	7.17E-02	kg	4	0.287	kg			1.31	1.49						€ 0.38	€ 0.43	1	0.9%	0.4%	2.7%	1.6%			Injection molding	1	€ 0.38	€ 0.43			
Peltier	Assembly							4	*0.200*									1.25	2	€ 5.00	€ 8.00	0	12.2%	7.0%			18.7%	9.1%	x						
TIM peltier	Tflex SF800			8.40E+02	Area:	1680.142	mm2	8	*0.01*						100	1000	m2			€ 0.17	€ 1.68	0	0.4%	1.5%			0.6%	1.9%	Punching/cutting	0.5	€ 0.08	€ 0.84			
Back plate	PET 45% glass	1700	kg/m3	2.07E+04	mm3	3.52E-02	kg	2	0.070	kg			1.31	1.49						€ 0.09	€ 0.10	1	0.2%	0.1%	0.7%	0.4%			Injection molding	1	€ 0.09	€ 0.10			
Door blocker plate	PET 45% glass	1700	kg/m3	2.46E+03	mm3	4.18E-03	kg	4	0.017	kg			1.31	1.49						€ 0.02	€ 0.02	1	0.1%	0.0%	0.2%	0.1%			Injection molding	1	€ 0.03	€ 0.02			
Valve plate	PET 45% glass	1700	kg/m3	1.06E+04	mm3	1.81E-02	kg	2	0.036	kg			1.31	1.49						€ 0.05	€ 0.05	1	0.1%	0.0%	0.3%	0.2%			Injection molding	1	€ 0.05	€ 0.05			
M3x16 Hex head	Stainless steel/steel							16	*0.02*									0.0763	0.0838	€ 1.22	€ 1.34	0	3.0%	1.2%			4.6%	1.5%	x						
Solenoid								4	*0.12*						1	5				€ 4.00	€ 20.00	0	9.8%	17.5%			14.9%	22.7%	x						
Bellows	PE - HD	958.5	kg/m3	1.03E+03	mm3	9.88E-04	kg	4	0.004	kg			1.44	1.48						€ 0.01	€ 0.01	1	0.0%	0.0%	0.0%	0.0%			Blow molding	15	€ 0.09	€ 0.09			
M2x6 Socket head	Stainless steel/steel							8	*0.01*									0.0546	0.0949	€ 0.44	€ 0.76	0	1.1%	0.7%			1.6%	0.9%	x						
Clip 1	Stainless steel AISI 301, full hard	7920	kg/m3	4126.602	mm3	3.27E-02	kg	2	0.065	kg			1.85	2.24						€ 0.12	€ 0.15	1	0.3%	0.1%	0.9%	0.6%			CNC wire bending		€ 0.18	€ 0.25	18 bends in 5 sec @110	720	0.18
Clip 2	Stainless steel AISI 301, full hard	7920	kg/m3	4140.099	mm3	3.28E-02	kg	2	0.066	kg			1.85	2.24						€ 0.12	€ 0.15	1	0.3%	0.1%	0.9%	0.6%			CNC wire bending		€ 0.21	€ 0.30	22 bends in 6 sec	600	0.22
Fan	Assembly							1	*0.300*									5	15	€ 5.00	€ 15.00	0	12%	13%			18.7%	17.0%	x						
Insulation doors	Aerogel			1099500	mm3			2	*0.5*						2000	4000	m3			€ 2.20	€ 4.40	1	5%	4%	15.5%	16.6%			Punching/cutting	0.5	€ 1.10	€ 2.20			
Insulation buffer	Aerogel			7.81E+05	mm3			1	*0.250*						2000	4000	m3			€ 1.56	€ 3.13	1	4%	3%	11.0%	11.8%			Punching/cutting	0.5	€ 0.78	€ 1.56			
Insulation bottom	PP foam (expanded)	21	kg/m3	1.26E+07	mm3	2.64E-01		1	0.264	kg			1.63	1.79						€ 0.43	€ 0.47	1	1%	0%	3.0%	1.8%			Injection molding	2	€ 0.86	€ 0.94			
Insulation front	PP foam (expanded)	21	kg/m3	8.18E+06	mm3	1.72E-01		1	0.172	kg			1.63	1.79						€ 0.28	€ 0.31	1	1%	0%	2.0%	1.2%			Injection molding	2	€ 0.56	€ 0.62			
Insulation top	PP foam (expanded)	21	kg/m3	7.18E+06	mm3	1.51E-01		1	0.151	kg			1.63	1.79						€ 0.25	€ 0.27	1	1%	0%	1.7%	1.0%			Injection molding	2	€ 0.49	€ 0.54			
Air filter	Mesh	2.31E+04	mm2	9.23E+04	mm3			2	*0.05*									0.2	1	€ 0.40	€ 2.00	1	1%	2%	2.8%	7.6%			x						
Tubing	Stainless steel			1.00E+00	m			1	*0.06*						0.28	0.56	m			€ 0.28	€ 0.56	1	1%	0%	2.0%	2.1%			CNC wire bending		€ 0.04	€ 0.10	3 bends in 1 sec	3600	0.036
Controller	Arduino							1	*0.05*									1	2	€ 2.00	€ 3.00	0	5%	3%			7.5%	3.4%	x						
Power circuitry	H-bridges, capcitors							2	*0.100*									3	10	€ 3.00	€ 10.00	0	7%	9%			11.2%	11.4%	x				separate components+pcb, check aed		
Sensors	NTC							8	*0.005*									0.025	0.05	€ 0.20	€ 0.40	0	0%	0%			0.7%	0.5%	x						
Bag	Jute			1.4	m			1	*0.1*						1	3	m			€ 1.40	€ 4.20	1	3%	4%	9.9%	15.9%			Sewing		€ 1.60	€ 1.70	about 3m ol stichrate = 10EUR/h		1.67
Total									**5.72**	**kg**								**Totals**		**€ 40.93**	**€ 114.44**		**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**			**€ 11.56**	**€ 16.88**			
																		Total self		€ 14.16	€ 26.42	35%													
																		Total bougth		€ 26.77	€ 88.02	65%													
																				Best	Worst														

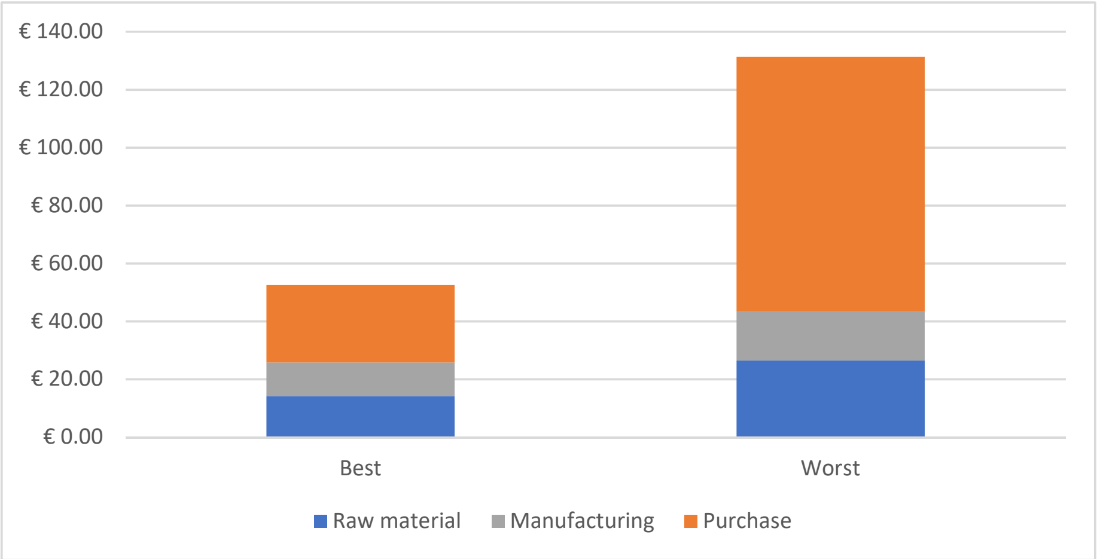
	Best	Worst	
Material	€ 14.16	€ 26.42	
% total	26.97%	20.12%	
Production	€ 11.56	€ 16.88	
%total	22.02%	12.86%	
Manufactured	€ 25.72	€ 43.30	
% total	48.99%	32.97%	
Bougth	€ 26.77	€ 88.02	
% total	51.01%	67.03%	
Total	**€ 52.49**	**€ 131.32**	2.502069

mm3 m3
1 1.00E-09

Complete monolith 400.00 kg/m3 2000000 mm3 0.8 kg


Prices total (best)


Prices total (worst)



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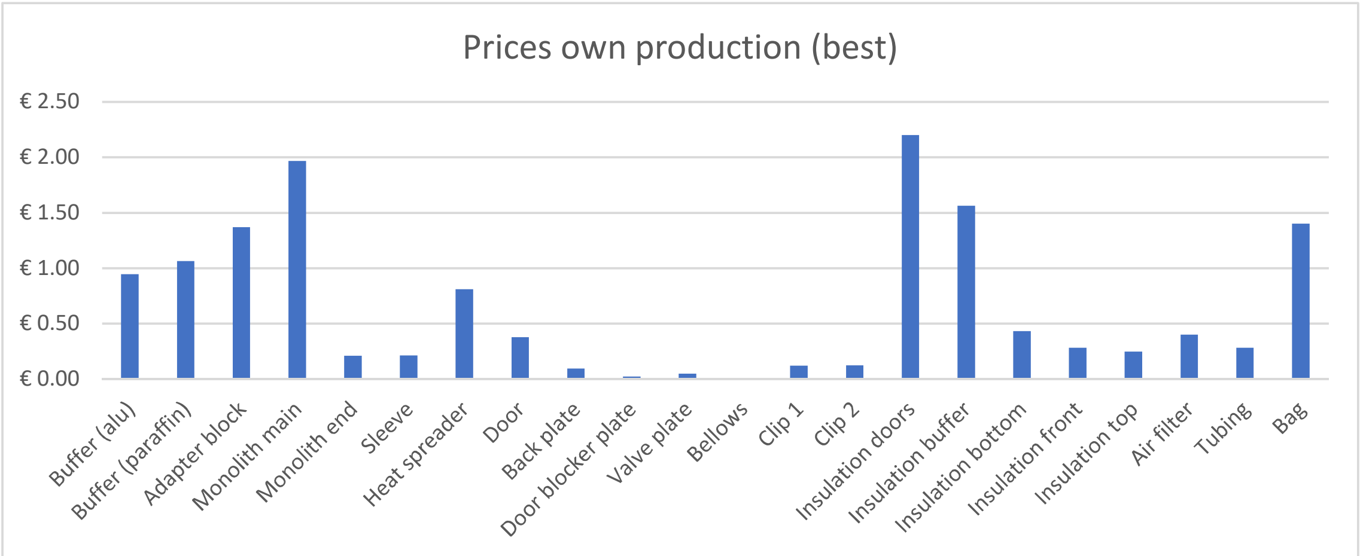
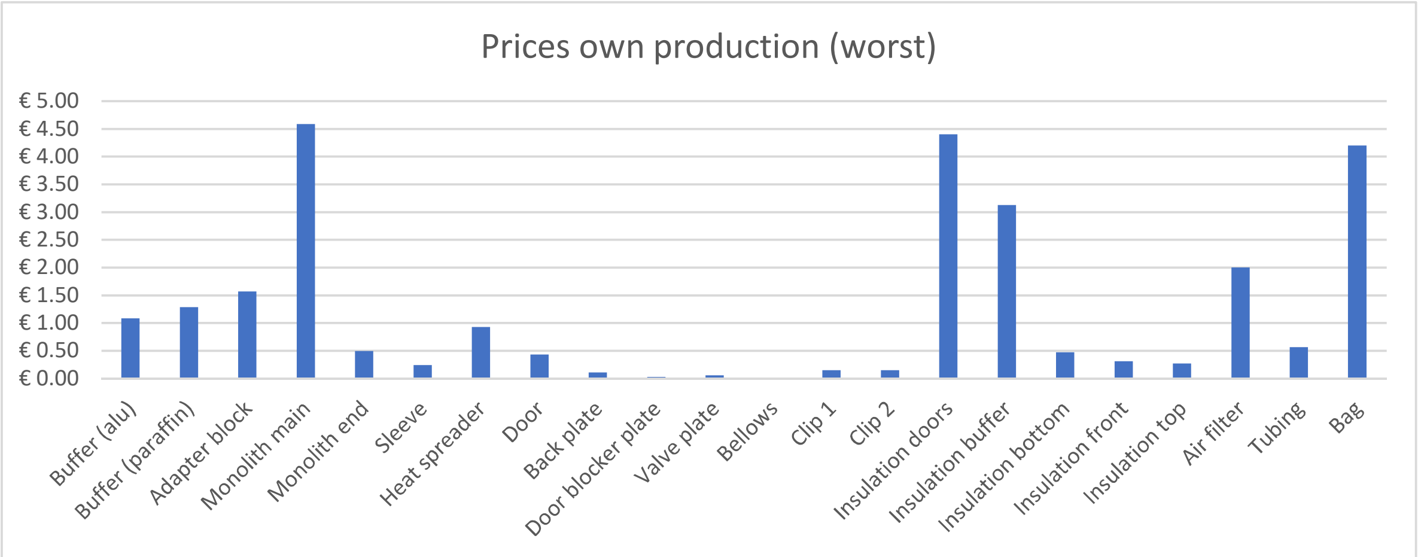
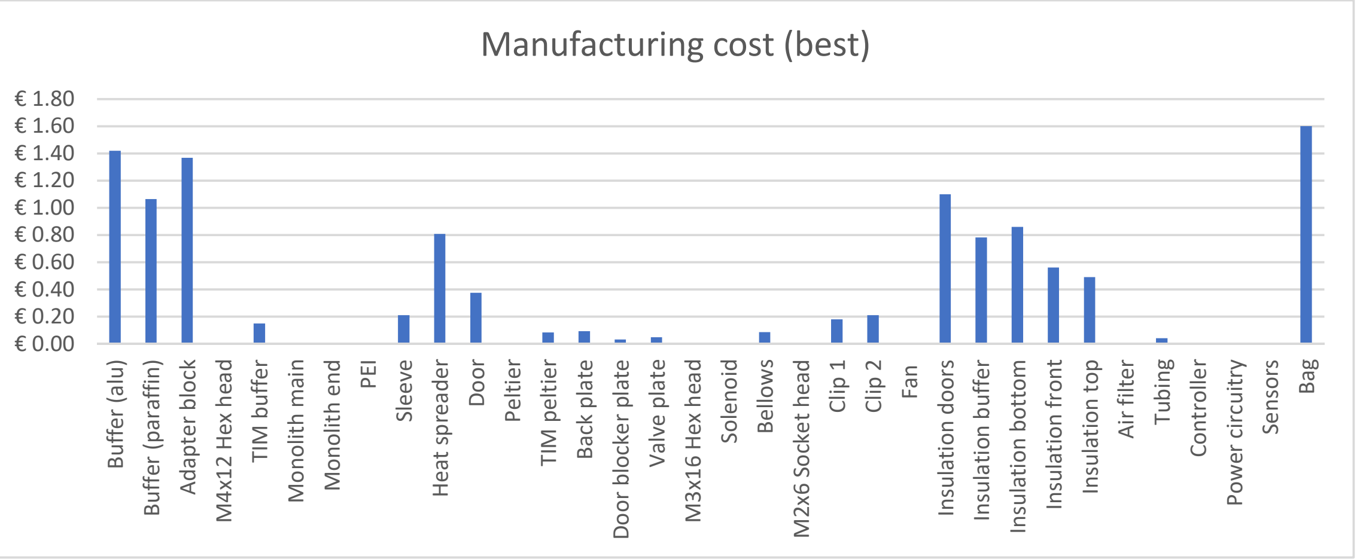
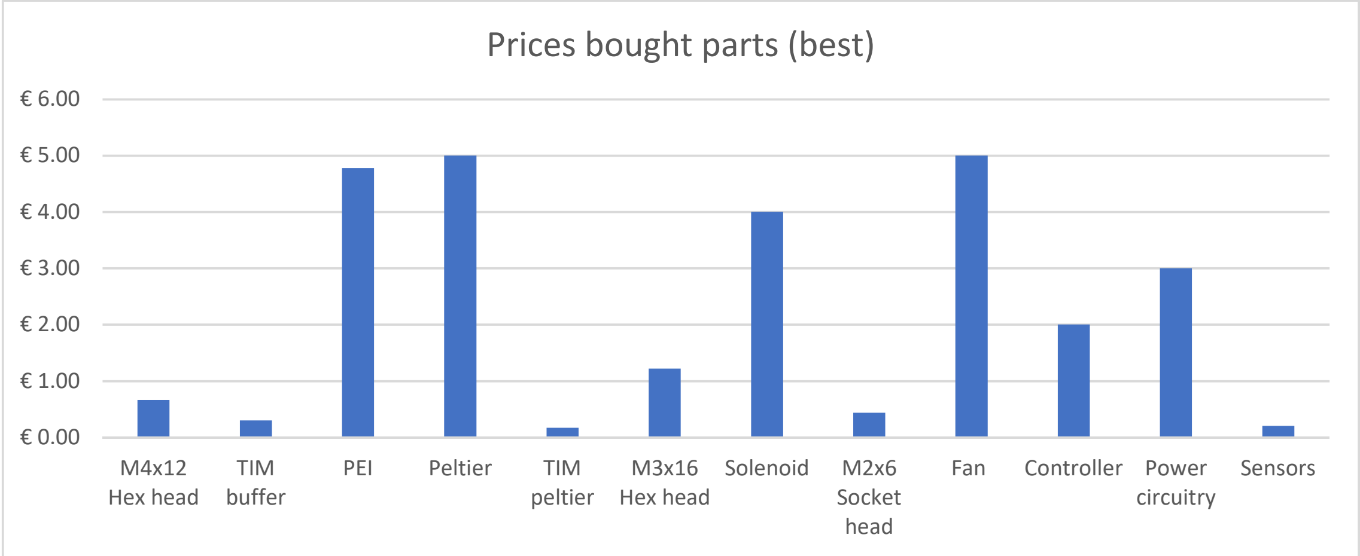
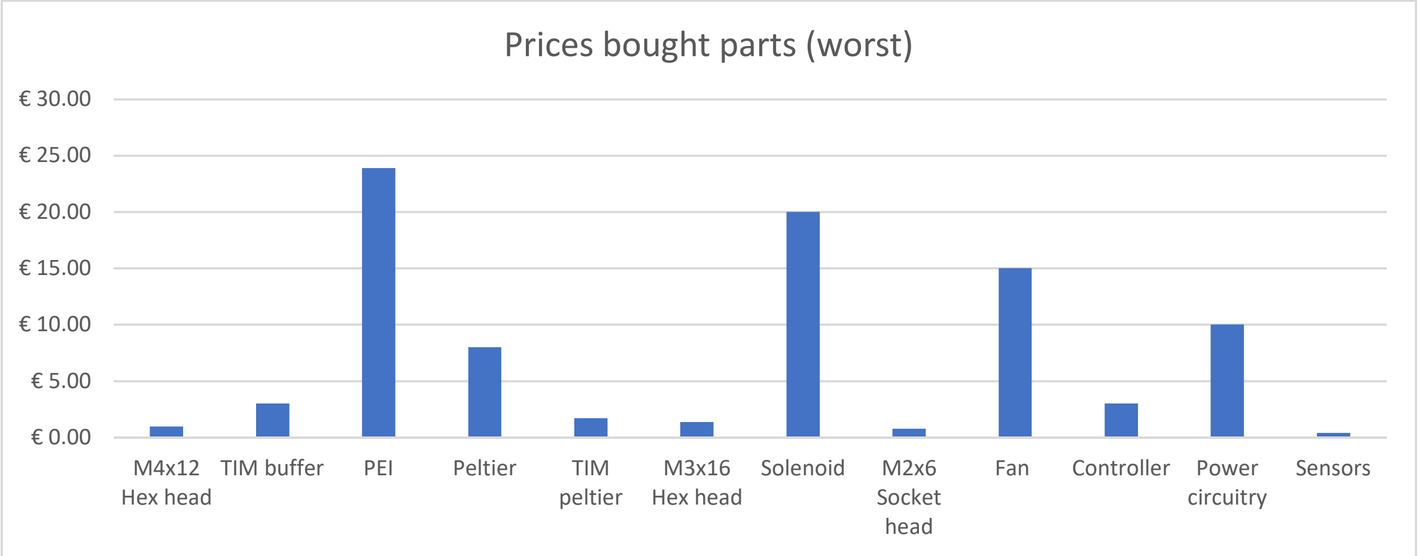

Prices own production (best)


Prices own production (worst)


Manufacturing cost (best)


Prices bought parts (best)


Prices bought parts (worst)

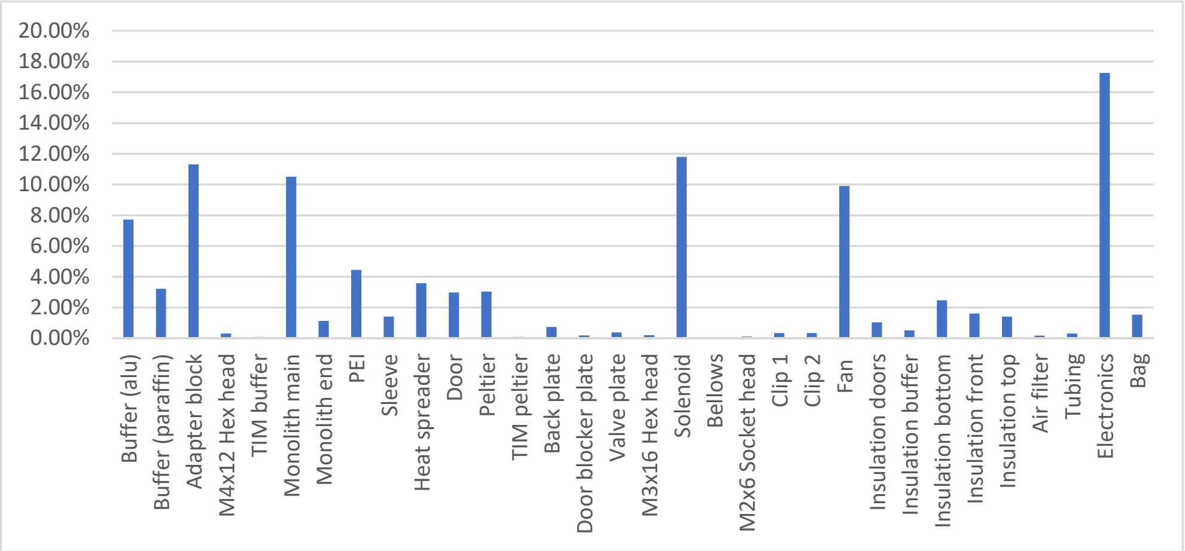
Based on Idemat 2018 Production

Component	Material	Density	unit	Volume/unit	unit	Mass/unit	unit	Quantity	Total Mass	unit	idemat code	idemat name	Carbon footprint kg CO2 equiv. (material)	Footprint material	Production process	idemat code	idemat name	Carbon footprint kg CO2 equiv. (production)	Foot print production	Total CO2 footprint	Footprint percentage	Days to 0
Buffer (alu)	Aluminum	2700	kg/m3	1.77E+05	mm3	4.78E-01	kg	1	0.478	kg	A.100.14.103	Idemat2018 Al	5.66	2.703	Extrusion	D.050.01.262	Section bar extru	0.92	0.439	3.143	7.72%	15.1
Buffer (paraffin)	Paraffin	900	kg/m3	1.43E+06	mm3	1.28E+00	kg	1	1.283	kg	A.030.06.375	Paraffin {GLO}	0.66	0.846	Extrusion	D.120.01.303	Idemat2018 Extr	0.36	0.462	1.308	3.21%	6.3
Adapter block	Aluminum	2700	kg/m3	6.40E+04	mm3	1.73E-01	kg	4	0.691	kg	A.100.14.103	Idemat2018 Al	5.66	3.911	Aluminum injec	N/A	see ref	1	0.691	4.602	11.30%	22.1
M4x12 Hex head	Steel/Stainless steel							12	0.03	kg	A.100.03.210	Steel, chromiu	4.12	0.124	x				0.000	0.124	0.30%	0.6
TIM buffer	Tflex SF800			1.49E+03	Area:	2985.047	mm2	4	0.01	kg	A.130.03.111	Idemat2018 Si	2.85	0.029	Punching/cutti	D.120.01.202	Calendering, rigi	0.42	0.004	0.033	0.08%	0.2
Monolith main	Activated Carbon	400.00	kg/m3	2.00E+05	mm3	8.00E-02	kg	18	1.440	kg	A.030.06.232	Activated carb	2.97	4.277	x				0.000	4.277	10.51%	20.6
Monolith end	Activated Carbon	400.00	kg/m3	9.62E+04	mm3	3.85E-02	kg	4	0.154	kg	A.030.06.232	Activated carb	2.97	0.457	x				0.000	0.457	1.12%	2.2
PEI	30% loading							1	0.683	kg	A.030.06.304	Ethylamine {Gl	2.65	1.810	x				0.000	1.810	4.45%	8.7
Sleeve	EPDM	870	kg/m3	7.33E+04	mm3	6.38E-02	kg	2	0.128	kg	A.130.03.102	Idemat2018 E	2.47	0.315	Injection moldi	D.120.01.305	Idemat2018 Inje	2.03	0.259	0.574	1.41%	2.8
Heat spreader	Aluminum	2700	kg/m3	7.56E+04	mm3	2.04E-01	kg	2	0.408	kg	A.100.14.103	Idemat2018 Al	2.65	1.081	Extrusion	D.050.01.262	Section bar extru	0.92	0.375	1.457	3.58%	7.0
Door	PET 45% glass	1700	kg/m3	4.22E+04	mm3	7.17E-02	kg	4	0.287	kg	A.130.04.116	Idemat2018 PE	2.2	0.631	Injection moldi	D.120.01.305	Idemat2018 Inje	2.03	0.582	1.213	2.98%	5.8
Peltier	Assembly							4	*0.200*	kg	A.050.04.323	Idemat2018 so	6.16	1.232	x				0.000	1.232	3.03%	5.9
TIM peltier	Tflex SF800			8.40E+02	Area:	1680.142	mm2	8	*0.01*	kg	A.130.03.111	Idemat2018 Si	2.85	0.029	Punching/cutti	D.120.01.202	Calendering, rigi	0.42	0.004	0.033	0.08%	0.2
Back plate	PET 45% glass	1700	kg/m3	2.07E+04	mm3	3.52E-02	kg	2	0.070	kg	A.130.04.116	Idemat2018 PE	2.2	0.155	Injection moldi	D.120.01.305	Idemat2018 Inje	2.03	0.143	0.298	0.73%	1.4
Door blocker plate	PET 45% glass	1700	kg/m3	2.46E+03	mm3	4.18E-03	kg	4	0.017	kg	A.130.04.116	Idemat2018 PE	2.2	0.037	Injection moldi	D.120.01.305	Idemat2018 Inje	2.03	0.034	0.071	0.17%	0.3
Valve plate	PET 45% glass	1700	kg/m3	1.06E+04	mm3	1.81E-02	kg	2	0.036	kg	A.130.04.116	Idemat2018 PE	2.2	0.080	Injection moldi	D.120.01.305	Idemat2018 Inje	2.03	0.073	0.153	0.38%	0.7
M3x16 Hex head	Stainless steel/steel							16	*0.02*	kg	A.100.03.210	Steel, chromiu	4.12	0.082	x				0.000	0.082	0.20%	0.4
Solenoid	Assembly							4	*0.12*	kg	A.050.01.247	Permanent ma	40.01	4.801	x				0.000	4.801	11.79%	23.1
Bellows	PE - HD	958.5	kg/m3	1.03E+03	mm3	9.88E-04	kg	4	0.004	kg	A.130.04.111	Idemat2018 PE	1.8	0.007	Blow molding	D.120.01.201	Blow moulding {	1.24	0.005	0.012	0.03%	0.1
M2x6 Socket head	Stainless steel/steel							8	*0.01*	kg	A.100.03.210	Steel, chromiu	4.12	0.041	x				0.000	0.041	0.10%	0.2
Clip 1	Stainless steel AISI 301, full hard	7920	kg/m3	4126.602	mm3	3.27E-02	kg	2	0.065	kg	A.100.05.101	Idemat2018 St	1.51	0.099	CNC wire bend	D.050.01.268	Wire drawing, c	0.55	0.036	0.135	0.33%	0.6
Clip 2	Stainless steel AISI 301, full hard	7920	kg/m3	4140.099	mm3	3.28E-02	kg	2	0.066	kg	A.100.05.101	Idemat2018 St	1.51	0.099	CNC wire bend	D.050.01.268	Wire drawing, c	0.55	0.036	0.135	0.33%	0.6
Fan	Assembly							1	*0.300*	kg	A.050.03.208	Fan, for power	13.43	4.029	x				0.000	4.029	9.90%	19.4
Insulation doors	Aerogel based insulation			1099500	mm3			2	*0.5*	kg	A.060.01.103	Idemat2018 Gl	0.42	0.210	Punching/cutti	D.120.01.202	Calendering, rigi	0.42	0.210	0.420	1.03%	2.0
Insulation buffer	Aerogel based insulation			7.81E+05	mm3			1	*0.250*	kg	A.060.01.103	Idemat2018 Gl	0.42	0.105	Punching/cutti	D.120.01.202	Calendering, rigi	0.42	0.105	0.210	0.52%	1.0
Insulation bottom	PP foam (expanded)	21	kg/m3	1.26E+07	mm3	2.64E-01		1	0.264	kg	A.130.04.123	Idemat2018 PS	3.05	0.804	Injection moldi	D.120.01.212	Polymer foamin	0.75	0.198	1.002	2.46%	4.8
Insulation front	PP foam (expanded)	21	kg/m3	8.18E+06	mm3	1.72E-01		1	0.172	kg	A.130.04.123	Idemat2018 PS	3.05	0.524	Injection moldi	D.120.01.212	Polymer foamin	0.75	0.129	0.653	1.60%	3.1
Insulation top	PP foam (expanded)	21	kg/m3	7.18E+06	mm3	1.51E-01		1	0.151	kg	A.130.04.123	Idemat2018 PS	3.05	0.460	Injection moldi	D.120.01.212	Polymer foamin	0.75	0.113	0.573	1.41%	2.8
Air filter	Mesh	2.31E+04	mm2	9.23E+04	mm3			2	*0.05*	kg	A.040.12.203	Air filter, dece	1.36	0.068	x				0.000	0.068	0.17%	0.3
Tubing	Stainless steel			1.00E+00	m			1	*0.06*	kg	A.100.05.101	Idemat2018 St	1.51	0.091	CNC wire bend	D.050.01.268	Wire drawing, c	0.55	0.033	0.124	0.30%	0.6
Electronics	Arduino, H-bridge, sensors							1	*0.1*	kg	A.050.06.213	Printed wiring	70.21	7.021	x				0.000	7.021	17.25%	33.8
Bag	Jute			1.4	m			1	*0.1*	kg	A.140.01.201	Textile, jute {G	5.41	0.541	Sewing	D.130.01.102	Weaving, bast fi	0.8	0.080	0.621	1.53%	3.0
Total									**5.66**	**kg**			**Total**	**36.699**	**kg CO2**			**Total**	**4.012**	**40.710**	**kg CO2**	

Capture **208** **g/day**

Regeneration **195.7** **days**

mm3	m3					
1		1.00E-09				
Complete monolith		400.00 kg/m3	2E+06	mm3	0.8	kg



Based on Philips DfA guide		Table 1					Table 2			
Component	**Rotation**	**Handling**	**Time (s) /unit**	**Units**	**Total time (s) aligning**	**Ease**	**Assembly**	**Time (s) /unit**	**Units**	**Total time (s) fastening**
Buffer (alu)	9	1	3	1	3	0	0	1.5	1	1.5
Buffer (paraffin)	9	0	2	1	2	0	1	2.5	1	2.5
Adapter block	1	0	1.5	4	6	0	6	5.5	4	22
M4x12 Hex head	1	1	1.8	12	21.6	9	2	5	12	60
TIM buffer	0	3	1.7	4	6.8	3	0	2	4	8
Monolith main	0	0	1.1	18	19.8	3	2	4	18	72
Monolith end	1	0	1.5	4	6	3	2	4	4	16
Sleeve	1	0	1.5	2	3	0	0	1.5	2	3
Heat spreader	9	1	3	2	6	3	4	6	2	12
Door	9	0	2	4	8	3	4	6	4	24
Peltier	1	0	1.5	4	6	1	0	4	4	16
TIM peltier	0	3	1.7	8	13.6	3	0	2	8	16
Back plate	9	1	3	2	6	0	0	1.5	2	3
Door blocker plate	1	0	1.5	4	6	3	2	4	4	16
Valve plate	2	0	1.8	2	3.6	0	1	2.5	2	5
M3x16 Hex head	1	0	1.5	16	24	9	2	5	16	80
Solenoid	1	0	1.5	4	6	0	0	1.5	4	6
Bellows	1	0	1.5	4	6	0	1	2.5	4	10
M2x6 Socket head	1	1	1.8	8	14.4	9	2	5	8	40
Clip 1	9	1	3	2	6	5	4	10	2	20
Clip 2	9	1	3	2	6	5	4	10	2	20
Fan	0	0	1.1	1	1.1	0	0	1.5	1	1.5
Insulation doors	8	0	4.1	2	8.2	3	2	4	2	8
Insulation buffer	8	0	4.1	1	4.1	3	2	4	1	4
Insulation bottom	9	1	3	1	3	0	0	1.5	1	1.5
Insulation front	9	1	3	1	3	0	1	2.5	1	2.5
Insulation top	9	1	3	1	3	0	0	1.5	1	1.5
Air filter	0	0	1.1	2	2.2	0	1	2.5	2	5
Tubing	9	1	3	4	12	3	0	2	4	8
Wiring	8	8	6.3	1	6.3	3	4	6	1	6
Bag	8	3	5.6	1	5.6	0	3	3.5	1	3.5
				Aligning	228.3 s				Fastening	494.5 s
					12					
									Total	722.8 s
										12 min