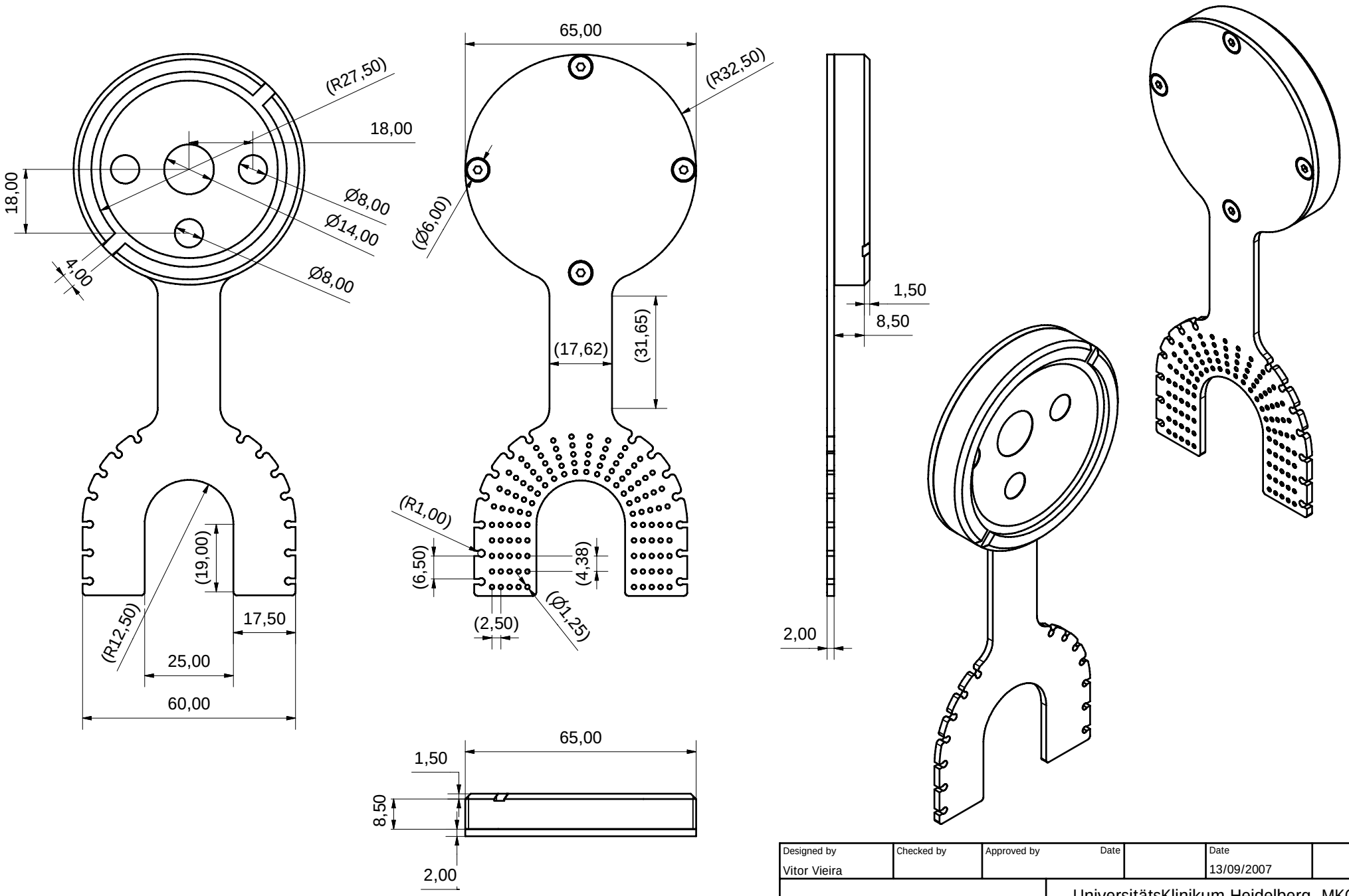
CHAPTER 7

APPENDIXES

APPENDIX A
TECHNICAL DRAWINGS OF THE PROTOTYPE

The following pages display the complete technical drawings of the developed prototype. The first page is presents the surgical tool, or mouth-piece, the second shows the in-between piece and the third the camera housing. The fourth and fifth pages display the three pieces of the prototype before and after assembly.



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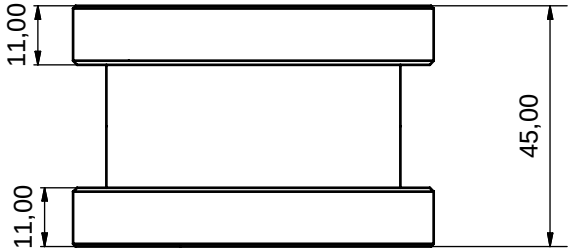
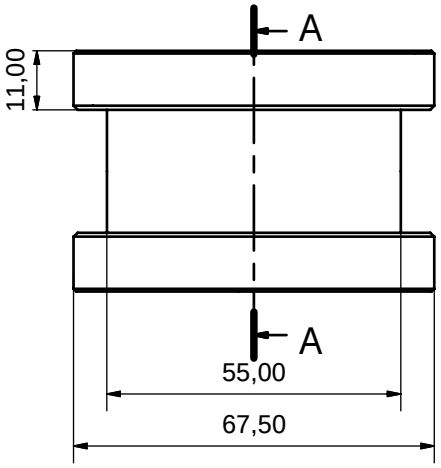
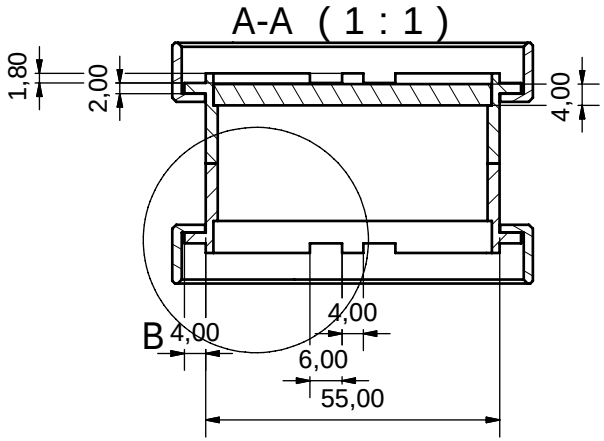
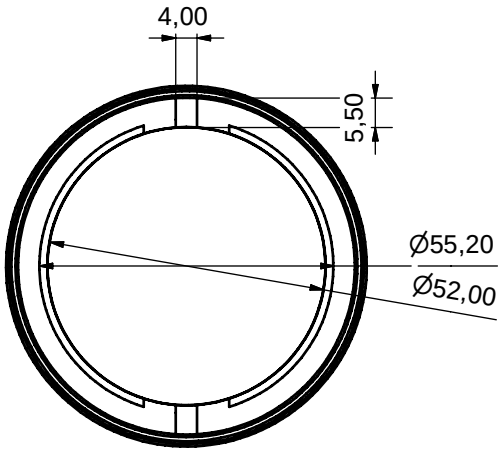
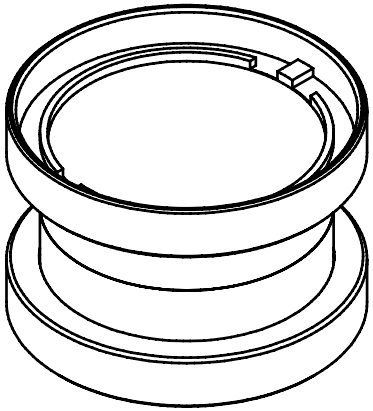
Mouth-piece with tracking markers and threaded crest	UniversitätsKlinikum Heidelberg, MKG		
	Surgical tool	Edition	Sheet 1 / 1

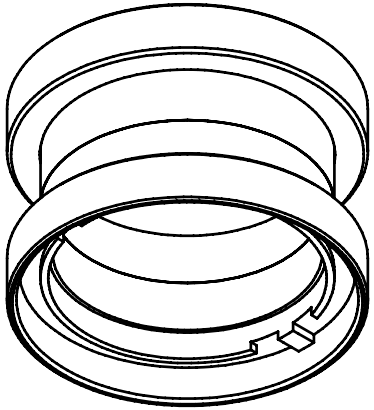


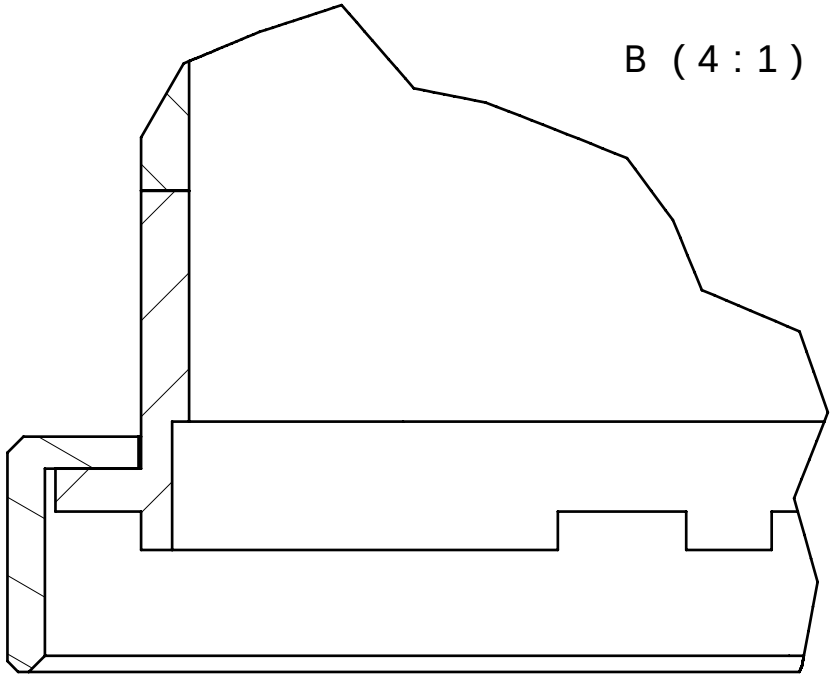












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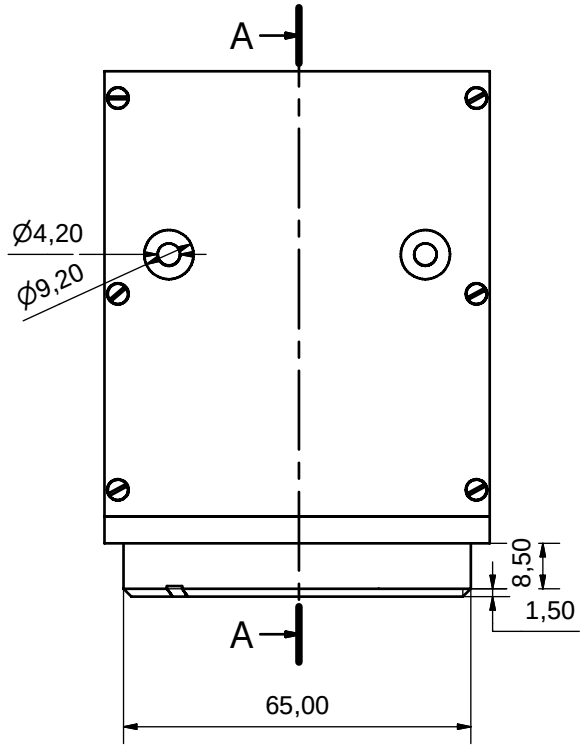
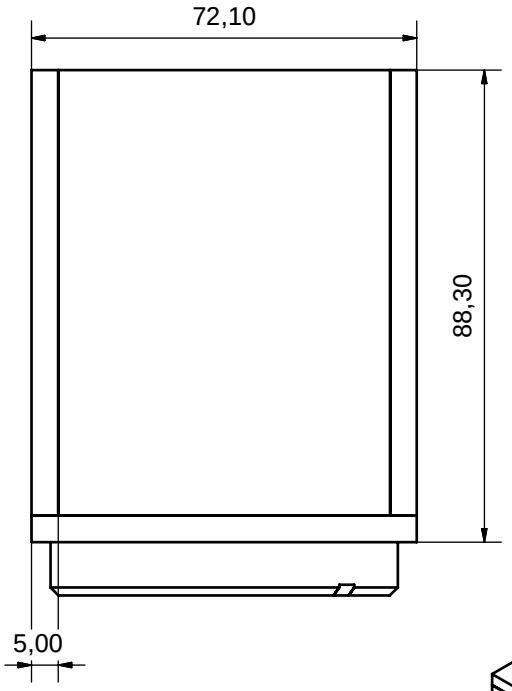
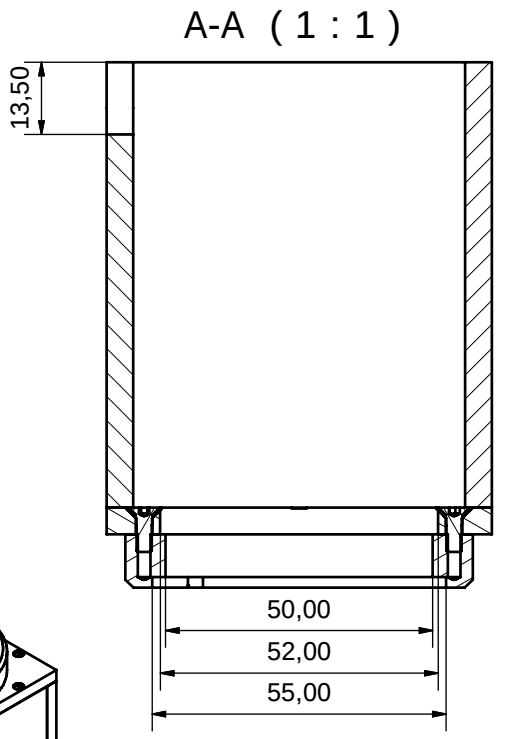
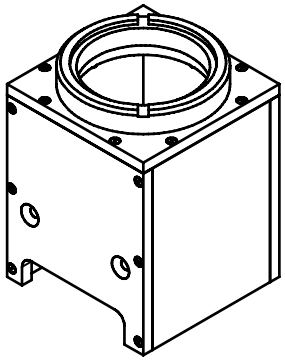
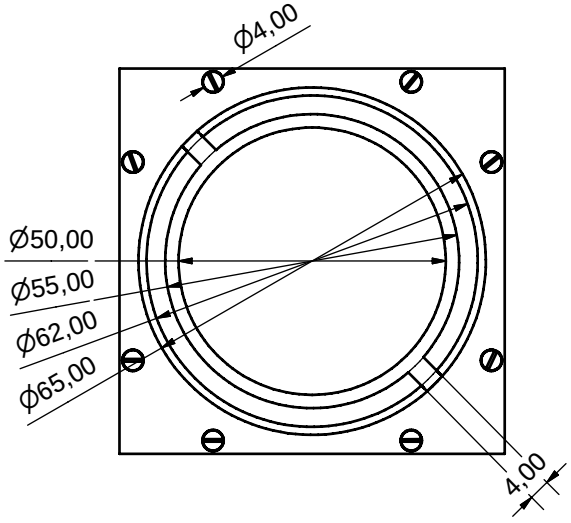
Connection between the surgical tool and camera housing with fixating nuts	UniversitätsKlinikum Heidelberg, MKG		
	In-between piece	Edition	Sheet 1 / 1

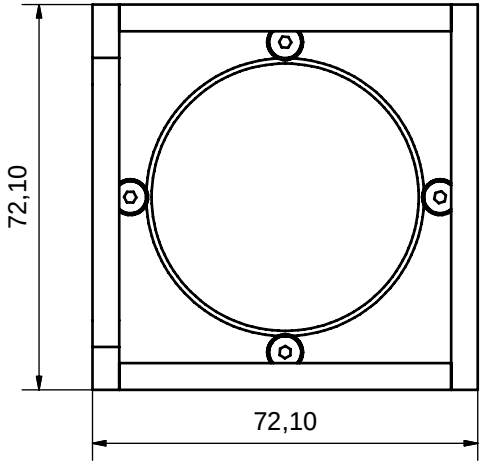


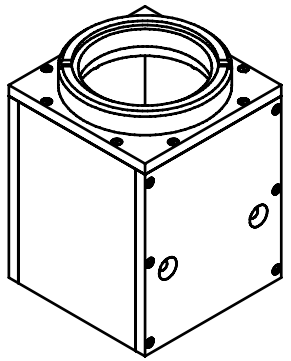


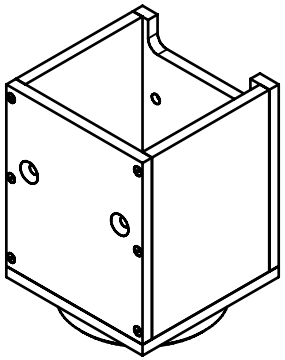












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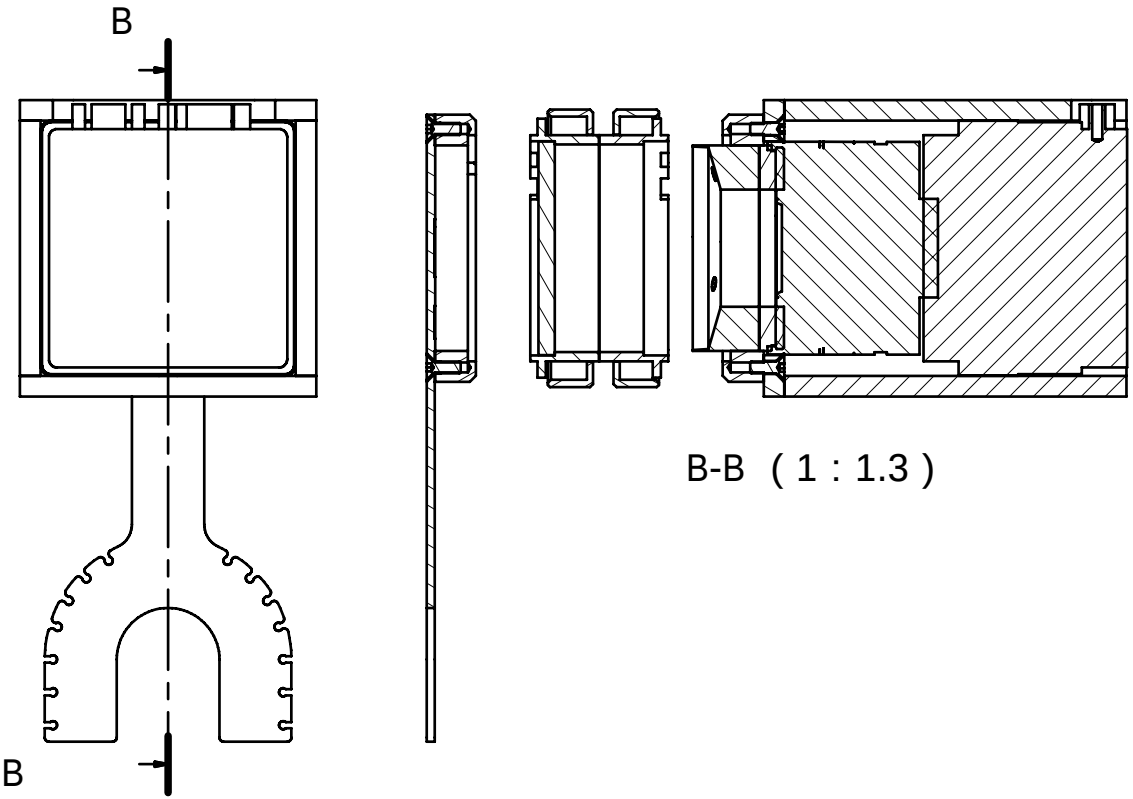
Camera housing with threaded crest	UniversitätsKlinikum Heidelberg, MKG		
	Camera housing	Edition	Sheet 1 / 1



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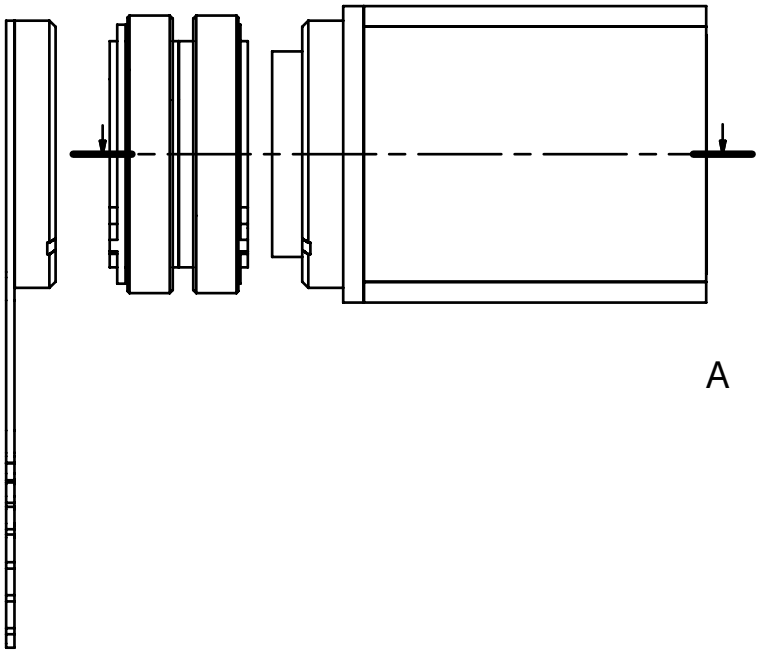

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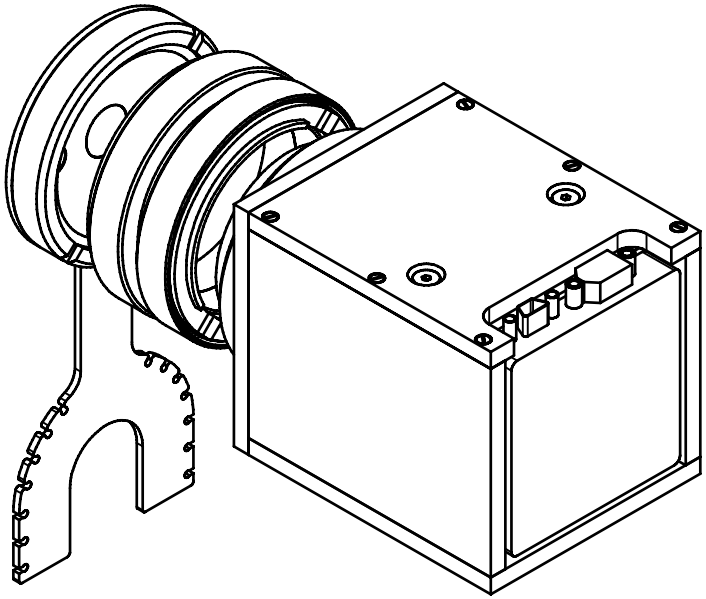

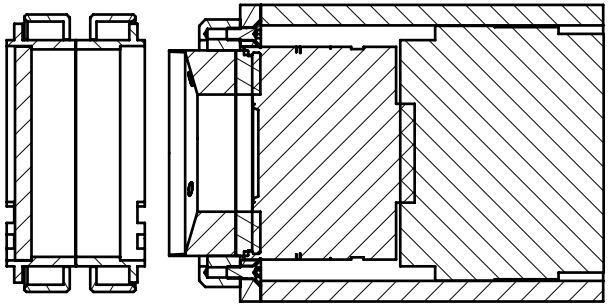

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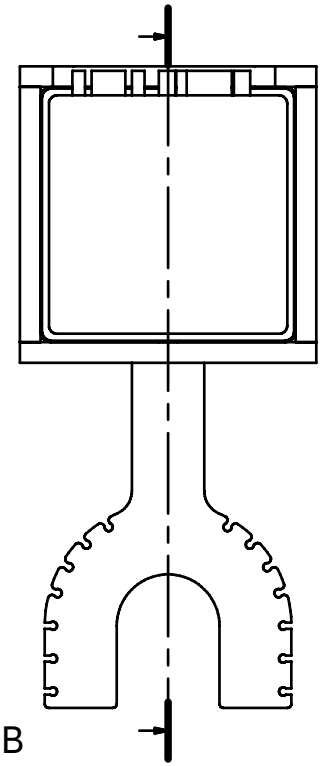
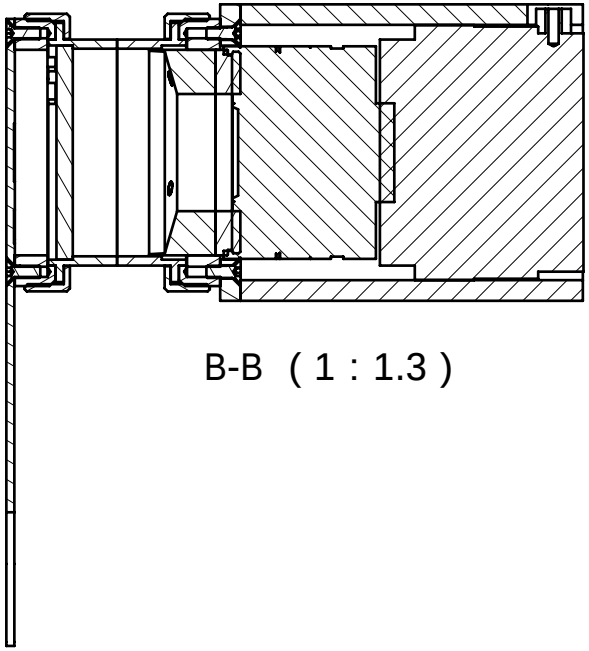
Vitor Vieira					10/02/2008	

Full Device Unmounted	UniversitätsKlinikum Heidelberg, MKG		
	Section views	Edition	Sheet 1 / 1





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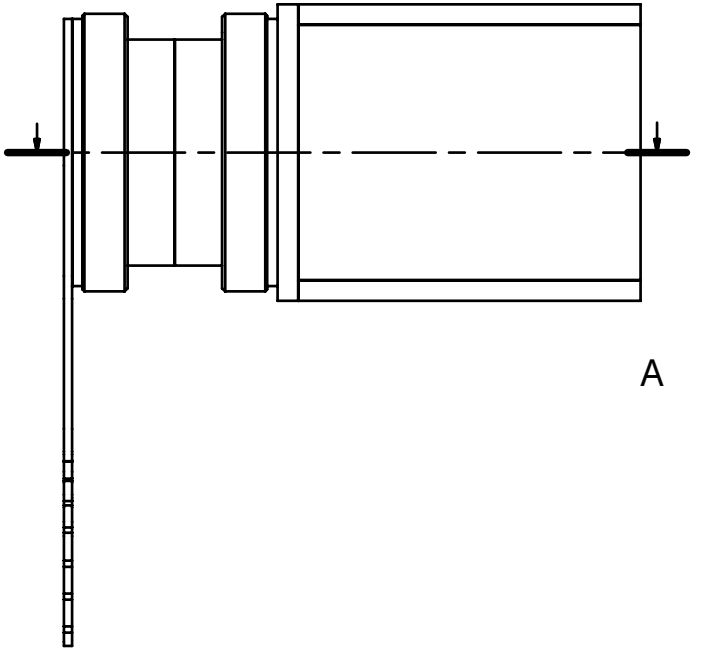

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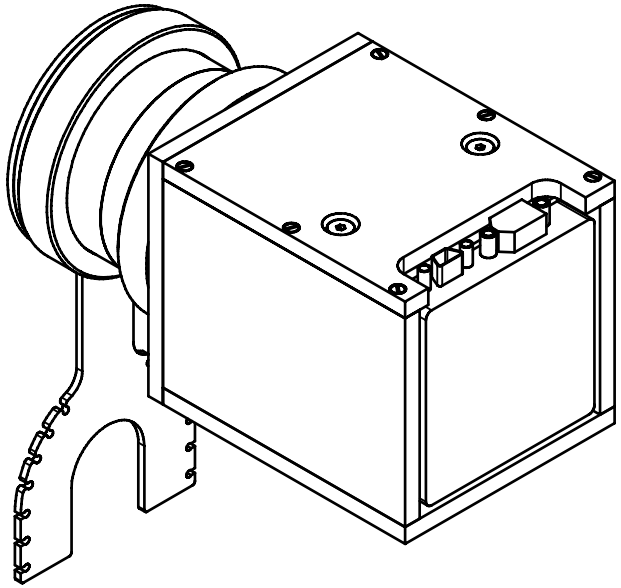

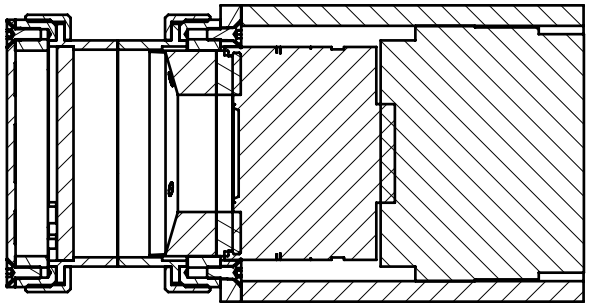

Designed by	Checked by	Approved by	Date		Date	
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Full Device Mounted	UniversitätsKlinikum Heidelberg, MKG		
	Section views	Edition	Sheet 1 / 1

APPENDIX B
DEPTH ERROR MEASUREMENTS

Table 5 - Depth error of the measured 221 points. X Y and Z for the point in space, with the normal vector of the camera pointing towards the centre of the target. Position zero indicates the coupling position.

Nº	ERROR (MM)	X	Y	Z	NORMAL X	NORMAL Y	NORMAL Z
0	0	0	0	0	1	1	1
1	0.63317663	-0.29192112	-0.0721941	1.65516322	0.17297889	0.05767481	-0.98323544
2	1.37212303	-0.98768762	0.523673	5.47313082	0.17352924	0.04291497	-0.98389324
3	2.0620379	-2.00917162	0.6210587	10.7835938	0.17492085	0.03750229	-0.98386802
4	1.08340443	-3.26981812	0.6614369	17.3169283	0.17637145	0.0332073	-0.98376338
5	0.12087855	-4.61682562	0.9602514	25.3609593	0.17519094	0.02567671	-0.9841996
6	-0.76355141	-5.77505392	0.6700399	32.3833889	0.17410918	0.02697452	-0.98435683
7	2.05689695	-7.92506892	0.4550005	43.8913099	0.17529026	0.02590712	-0.98417587
8	15.5814142	-10.6684681	0.4523908	57.2487175	0.17857137	0.02266358	-0.98366591
9	2.35681728	-10.5652282	-3.0624799	51.4834559	0.18721675	0.05817788	-0.98059432
10	0.03532112	-6.81215912	-6.0867376	3.38230252	0.28595074	0.050468	-0.95691439
11	0.82099317	-7.00461152	-6.3631813	6.73475482	0.27292235	0.05240251	-0.96060781
12	0.7772447	-7.17063252	-6.3085301	10.1884775	0.26051163	0.04859258	-0.96424709
13	-0.04062093	-7.98254842	-7.5827483	16.2880104	0.24861641	0.06318109	-0.9665392
14	-1.28304889	-9.96223222	-9.1319411	23.4613075	0.25005983	0.0776208	-0.96511403
15	-2.29729824	-12.6091834	-10.9480534	31.6108039	0.25580641	0.09138455	-0.96239906
16	0.73727158	-18.0703151	-10.550233	42.2581885	0.282006	0.07593276	-0.95640307
17	2.04986596	-20.9031961	-11.0784435	47.7516974	0.29304874	0.07657822	-0.95302582
18	2.32264804	-22.21822	-11.7244865	48.6199094	0.3022932	0.08195775	-0.94968508
19	2.4210714	-21.4365622	-11.2475576	49.8495524	0.2920564	0.07660781	-0.95332801
20	1.15654182	-17.0722265	-1.1819314	6.07706522	0.42165917	0.06699609	-0.90427599
21	1.00929393	-17.3634762	-1.2335432	7.73295552	0.41536179	0.0660808	-0.90725295
22	0.14518778	-19.2535167	-1.2306531	15.0896819	0.3980249	0.05898849	-0.91547612
23	5.5141113	-27.037477	-1.9342713	24.865067	0.43387621	0.05882723	-0.89904994
24	-1.65369781	-27.037477	-1.9342713	24.865067	0.43387621	0.05882723	-0.89904994
25	-1.91861048	-32.2086691	-2.2431456	29.1381535	0.46221688	0.05822966	-0.88485302
26	-1.31848869	-35.5127452	-2.7910236	32.3998539	0.47562401	0.06133713	-0.87750758
27	-2.20624529	-37.9129969	-1.0799734	31.8192297	0.49840559	0.04263559	-0.86589496
28	-0.45113427	-26.2504346	-1.5305871	5.26165052	0.53917936	0.06851364	-0.83939949
29	-0.81149393	-27.2243071	-0.8923676	7.17706432	0.53685486	0.05680775	-0.84175991
30	-1.3549263	-29.344824	-0.9165924	10.1786706	0.5390117	0.05419461	-0.84055299
31	-2.56961505	-32.7516901	0.0065971	13.6058156	0.55075968	0.03852812	-0.83377417
32	-4.07601403	-37.3367082	0.5367043	16.6116827	0.57330112	0.02949212	-0.8188138
33	-9.02502472	-38.9363678	2.7158134	2.91430022	0.67528189	0.00263114	-0.73755505
34	-9.07699397	-42.736455	2.3160351	4.20164902	0.69430944	0.00790929	-0.71963313
35	-8.45976563	-47.8564871	2.988486	5.35999672	0.72029688	-0.00111399	-0.69366502
36	0.91203401	5.04687118	-3.486086	13.5772153	0.05677299	0.10132379	-0.99323226
37	-1.0469668	7.69816828	-0.7188419	13.6005618	0.01478252	0.05769269	-0.99822494
38	-1.80656158	6.18102258	-0.8135131	18.8358315	0.03594323	0.05461491	-0.99786036
39	-1.76687927	5.65016628	-1.5308205	23.6892795	0.04080626	0.06077929	-0.99731676
40	-2.61846442	6.00050898	-2.3416951	28.7728562	0.03364463	0.06719219	-0.99717263
41	-3.24163734	6.69585748	-3.3963865	37.2684495	0.02229669	0.07275886	-0.9971003

42	-1.60111385	11.3051241	-5.2742876	52.9040379	-0.02619166	0.07991589	-0.99645745
43	-0.19195037	17.2340698	-2.3159341	18.4627761	-0.12614262	0.07644829	-0.98906203
44	-0.77197482	16.7612013	-1.9000292	23.1976957	-0.11167969	0.06590778	-0.99155626
45	-2.17506807	18.3624848	-1.9279744	31.7560665	-0.11944368	0.05923997	-0.99107206
46	-2.65470425	20.9015869	-1.8898836	38.2932628	-0.13899982	0.05424869	-0.98880541
47	-2.62716381	24.1116972	-1.8668543	46.1857464	-0.16032965	0.04936396	-0.98582838
48	-3.4863778	28.1022181	-0.0008438	45.1687068	-0.20237719	0.03015395	-0.9788433
49	-2.35220128	28.1808371	-0.232609	20.8508645	-0.26921809	0.04314264	-0.96211243
50	-2.72879391	28.5291833	-0.4767429	24.5099193	-0.26098017	0.04429169	-0.96432754
51	-4.99814037	33.4390127	0.8310419	28.8271406	-0.3035435	0.02532361	-0.952481
52	-6.1127013	38.2205922	1.926733	34.6728471	-0.33331419	0.01097423	-0.94275194
53	2.63383433	-2.61511752	-7.9130483	9.59524432	0.18528257	0.17825015	-0.96638359
54	2.70834143	-3.05622422	-7.9179314	11.7321182	0.18596658	0.17223041	-0.96734333
55	2.57615831	-3.65112342	-7.8514873	14.3904996	0.18746012	0.16418627	-0.96845319
56	1.90207356	-5.06022792	-9.3870823	20.6872339	0.18980193	0.17041776	-0.96691934
57	1.13279656	-6.20936372	-11.8896058	27.1925244	0.18766089	0.18710006	-0.96424943
58	0.48241574	-7.92687242	-15.2482658	35.7568465	0.18750702	0.20559569	-0.96050587
59	1.05116846	-9.48825852	-21.8389747	44.8639316	0.18338162	0.25046312	-0.9505995
60	0.82442862	-10.7800165	-24.8955646	46.6711882	0.19112965	0.27377347	-0.94261209
61	-1.21287009	-3.16029332	-24.2812971	11.6023655	0.17464011	0.40277798	-0.89848246
62	-2.01404673	-4.03265492	-26.3618732	15.9581325	0.17486003	0.40423311	-0.89778592
63	-3.0540666	-4.45817432	-30.1380613	19.806912	0.16888649	0.42646919	-0.88859517
64	-2.98736409	-5.75538652	-33.9481944	25.6318214	0.17019761	0.43610495	-0.88365448
65	-2.2974547	-6.71144152	-37.0305062	30.3858287	0.17002228	0.44266816	-0.88041884
66	0.64265878	-4.49895722	17.1653931	14.5245063	0.19751663	-0.21466669	-0.95650687
67	0.00466356	-5.29340732	17.8771652	18.5658996	0.19708761	-0.212053	-0.95717815
68	-0.57244293	-6.17492542	19.3049087	22.3878809	0.19797267	-0.21941622	-0.95533415
69	-1.55763565	-7.31291922	22.7019466	27.7103617	0.19715237	-0.24492555	-0.94928522
70	-1.84797994	-8.11000792	24.9490469	31.8946435	0.19566757	-0.25777574	-0.9461849
71	-1.39897743	-10.2487642	30.0820908	40.3212968	0.19808264	-0.28525702	-0.93775887
72	-1.20877696	-12.1984851	36.8622817	45.7142391	0.2026048	-0.33041815	-0.92183249
73	-14.3004662	-6.13725022	44.2875796	16.1401053	0.18781679	-0.52652517	-0.82915385
74	-8.61928983	-6.31465332	47.6836018	22.0650048	0.17505888	-0.52472415	-0.833078
75	0.69575877	-3.85227042	-9.9134635	2.35094292	0.23711994	0.13182326	-0.96249507
76	1.20810065	-3.92041372	-9.4653379	4.48844852	0.22957484	0.11870822	-0.96602472
77	1.50861056	-4.39411992	-9.4418657	7.11334812	0.22724607	0.11280536	-0.96728185
78	1.0775808	-5.15138012	-9.1678714	11.9060956	0.22191914	0.0996634	-0.9699583
79	0.51690101	-6.24368022	-9.4832194	16.9435664	0.22113089	0.09669715	-0.97043845
80	-0.18302294	-7.69827622	-9.8386314	22.8760751	0.22253406	0.09347567	-0.97043335
81	-0.41499819	-9.09096372	-10.7044496	28.35972	0.22407166	0.09768089	-0.96966506
82	-0.14139758	-10.4125011	-11.9021828	32.2438888	0.22869322	0.10717784	-0.96758066
83	0.06676619	-11.528598	-12.8831178	36.0670146	0.23084203	0.11343922	-0.96635578
84	0.82124639	-13.0239353	-13.9618644	40.5368226	0.23508126	0.11926345	-0.96463104
85	0.80400542	-14.1790021	-14.4418363	45.3728778	0.2348863	0.11807064	-0.96482524
86	2.3037614	-16.2786401	-17.1581174	49.6072983	0.24413747	0.13902737	-0.95972303
87	1.35073574	-3.84734682	-0.6544749	4.46303032	0.22982001	-0.04330974	-0.97226901
88	1.3064361	-4.05684232	-0.2301691	5.92590902	0.22742827	-0.04978077	-0.9725216
89	1.34633073	-4.26204452	-1.1260193	8.86636282	0.2197633	-0.03201316	-0.97502782
90	1.1528178	-4.91085822	-1.6443549	11.4914801	0.22071109	-0.02213049	-0.97508813
91	0.59129278	-5.83028012	-1.9103015	15.5474115	0.22075439	-0.01665128	-0.97518728
92	-0.29883683	-7.63794282	-1.9095726	21.5313433	0.22677908	-0.01521016	-0.97382745
93	-0.70415871	-9.09230402	-1.6188741	27.0691006	0.2287912	-0.0178447	-0.97331195

94	-0.81864106	-10.1992421	-0.6417214	30.6762438	0.23175796	-0.02906548	-0.97233916
95	-0.70101644	-11.4441268	0.8925575	34.6837654	0.23482682	-0.04560626	-0.97096675
96	-0.58943035	-12.517361	2.6842799	38.5480538	0.23606116	-0.06355538	-0.96965759
97	0.76896312	-14.5677341	4.2406368	44.37922	0.24208197	-0.07567642	-0.96730006
98	2.40438502	-16.9119368	6.7019695	51.1427028	0.24764863	-0.09420391	-0.96425919
99	0.93842102	-5.83359212	-12.9068747	3.78305062	0.26318178	0.18083939	-0.94764575
100	1.02005167	-6.33271972	-13.3393103	6.69329062	0.25829845	0.17903286	-0.94933089
101	0.84505768	-7.02888482	-13.4347766	11.0146977	0.25159975	0.16815373	-0.95311169
102	0.2773611	-7.58831692	-13.9209751	14.9527308	0.24491685	0.16538776	-0.95533378
103	-0.36395787	-8.73643132	-15.1553295	19.6623339	0.24388917	0.17115646	-0.95458029
104	-0.92788256	-10.0163045	-16.9185953	24.3473561	0.24438949	0.18287174	-0.95227712
105	-0.99226403	-12.549134	-19.1055074	30.7320449	0.2539487	0.19352875	-0.94765853
106	-0.48558955	-14.8956158	-21.8255644	37.431817	0.25886939	0.20755117	-0.94334996
107	0.56547038	-17.0739529	-23.134352	42.8392376	0.2655005	0.20833897	-0.94133116
108	0.95744845	-18.9479639	-25.0160671	44.2770581	0.27836986	0.22259437	-0.93432434
109	1.13597775	-5.79249312	2.9371386	5.87520782	0.25580794	-0.10557847	-0.9609451
110	0.72418807	-6.61171932	3.7949383	8.54887842	0.25723838	-0.11496427	-0.95948509
111	0.65767294	-7.03235362	2.3958075	11.4749096	0.25247845	-0.08718271	-0.96366686
112	0.30921292	-7.64545962	1.91471	13.9094127	0.25234365	-0.0763663	-0.96461955
113	-0.25684241	-9.05340842	2.3062972	17.7700699	0.25776046	-0.07750151	-0.96309556
114	-0.94692586	-10.3864401	3.1457188	22.3147332	0.25911354	-0.08389824	-0.96219606
115	-1.17519169	-11.7766802	4.2525962	26.4480649	0.26222061	-0.09336077	-0.96048119
116	-1.3909969	-13.0435625	6.3123557	29.6652223	0.26608346	-0.11452478	-0.9571226
117	-1.40021648	-14.3808991	8.666803	33.38185	0.26864136	-0.13643141	-0.95352939
118	-0.49659093	-16.3555487	10.027608	38.754064	0.2730794	-0.14260436	-0.95136304
119	-0.38172224	-18.5414199	13.5422085	42.1231487	0.28349269	-0.17284106	-0.94326977
120	0.84740682	-20.6991774	15.3553429	46.4069661	0.29091964	-0.18231193	-0.93921676
121	0.23826822	-8.78069922	-18.1442046	4.90493942	0.30029256	0.26187939	-0.91719331
122	0.17350394	-9.07875742	-18.7382105	6.75209052	0.2955329	0.26331724	-0.91832692
123	-0.23464814	-9.68757222	-19.3695394	10.0639353	0.28931251	0.259182	-0.92147868
124	-0.74907172	-10.5361292	-20.5965305	13.5967589	0.28548232	0.26271935	-0.92167152
125	-1.28718483	-11.8877925	-21.4194503	16.8786934	0.28995722	0.26087594	-0.92079778
126	-1.77900525	-13.0348935	-23.8966026	21.2174681	0.28601422	0.27644382	-0.9174828
127	-2.09033824	-14.9836671	-25.9079263	25.8973627	0.29096879	0.2828097	-0.91397803
128	-1.75249803	-19.2449068	-31.0320979	32.4211743	0.31018469	0.31243562	-0.89786939
129	-1.44676109	-21.1527743	-33.7306996	35.1973389	0.31748982	0.32808741	-0.88969594
130	-0.15136381	-9.03680482	8.2127852	7.23879402	0.29775739	-0.18940073	-0.93566442
131	-0.66636372	-9.56008882	8.8167003	9.20953032	0.29602268	-0.19271882	-0.93553729
132	-1.19166249	-11.2613807	8.8119309	14.02233	0.29930056	-0.17807955	-0.93739365
133	-1.62787407	-12.5703251	9.8174584	17.3858313	0.30207112	-0.18296496	-0.93556232
134	-2.44453871	-13.8978114	11.3338673	20.9322665	0.30367748	-0.19355866	-0.93290677
135	-3.01305339	-15.2857714	13.5974551	23.5423331	0.30861	-0.21452802	-0.92668096
136	-3.13302632	-16.7528989	15.4917357	26.6634042	0.31239135	-0.22793629	-0.92220209
137	-2.86507254	-18.887257	17.7364908	31.0186621	0.31828424	-0.24019956	-0.91706015
138	-2.24687082	-23.2000587	23.6876479	37.2349809	0.33484686	-0.28110272	-0.8993658
139	-2.52866041	-24.2849693	25.129209	37.5519532	0.34243261	-0.29300011	-0.89268743
140	-1.49697557	-11.5034015	-24.2205205	5.71342022	0.32788218	0.34635481	-0.87893778
141	-1.99388137	-12.4922873	-25.2936238	8.23706232	0.32840265	0.34734867	-0.87835107
142	-2.63336405	-13.7711527	-27.487134	11.7446186	0.32661426	0.35774048	-0.87483991
143	-3.45900118	-15.3561008	-30.4083028	14.9827935	0.32859513	0.3761752	-0.86632411
144	-4.31097609	-18.2511817	-35.0304099	20.2774105	0.3347573	0.3995421	-0.85340709
145	-4.88129837	-19.3176792	-38.9529654	20.9488529	0.33728088	0.43457977	-0.83509403

146	-4.76316231	-20.9177149	-40.37851	23.5080566	0.34294959	0.43449051	-0.83282866
147	-4.39419194	-22.1540103	-41.7473744	25.6662547	0.34599119	0.43612197	-0.83071519
148	-2.59300579	-11.8065571	13.7436526	6.71381582	0.33502742	-0.27502501	-0.90117583
149	-2.51695818	-13.7394896	15.0085894	11.3177429	0.33819687	-0.27275215	-0.9006826
150	-4.84859418	-15.0832607	16.7091786	14.2044485	0.34038704	-0.28338891	-0.89656422
151	-6.0102558	-17.5116963	19.6158942	18.4045286	0.3481081	-0.30162013	-0.88760692
152	-4.46241753	-20.7721164	23.7320492	23.555747	0.35822463	-0.32613933	-0.87481898
153	-9.52975083	-24.4855708	28.6611572	26.3540642	0.3782319	-0.36206092	-0.85196979
154	-4.09650454	-14.4788842	-32.0210423	4.77769062	0.35698445	0.44917677	-0.81902523
155	-4.74863739	-15.2894042	-33.2077951	6.04785842	0.35916564	0.45443205	-0.81516351
156	-5.98370322	-16.9496505	-36.4351605	8.51040592	0.36187993	0.47383319	-0.80282316
157	-5.73773975	-16.9574561	-40.2266459	12.4694081	0.33798273	0.49257274	-0.80195996
158	-5.55840277	-15.5481411	20.8668637	7.22061212	0.37166022	-0.36748912	-0.85253764
159	-6.01565351	-16.8423582	22.1531676	9.51171292	0.37480644	-0.37069747	-0.84976674
160	-6.7536903	-18.6890399	23.8231742	11.9278492	0.38300398	-0.37660863	-0.84348912
161	-7.41685254	-20.1632266	25.8306809	13.6775826	0.38839906	-0.38945091	-0.83514918
162	-8.054673	-21.3647254	27.5115687	14.7303069	0.39393623	-0.40126529	-0.82692226
163	-7.56478798	-26.1995974	34.1601644	19.662669	0.41029761	-0.43826222	-0.79973877
164	1.12682097	1.02283188	-9.6493692	3.76277882	0.14306745	0.12579971	-0.98168536
165	1.44785131	0.65666808	-9.6949358	4.82320472	0.14693684	0.12408103	-0.98133249
166	1.57404428	-0.01037482	-9.3869916	7.43527672	0.15190114	0.1128807	-0.98192871
167	1.44901952	-0.37645912	-9.0812217	9.19998212	0.15360304	0.1042441	-0.98261858
168	0.91847313	-1.21590592	-9.2429984	14.6921069	0.15341362	0.09773192	-0.98331721
169	0.16122183	-2.56122832	-10.7453049	21.917687	0.15622212	0.10856304	-0.9817376
170	-0.5377476	-3.43977932	-11.4914747	29.1019241	0.1529481	0.10801276	-0.98231366
171	-0.34497426	-4.87160102	-14.9410351	37.3265716	0.15409333	0.13673898	-0.97854877
172	2.4000145	-6.54175852	-18.1105644	51.4765664	0.14848686	0.14832577	-0.97772753
173	1.25264762	2.58600368	-13.1697201	5.76959952	0.10873862	0.18430345	-0.97683579
174	1.34118522	2.11540248	-12.9835171	7.57987912	0.11358512	0.17525136	-0.97794958
175	0.94078102	1.02905218	-13.0213613	12.4566002	0.12213289	0.16196714	-0.97920897
176	0.49482273	0.51944538	-13.2947	15.8047431	0.12360521	0.15775349	-0.97971199
177	-0.32260188	-0.24822932	-14.7668687	23.3428507	0.12106098	0.16125308	-0.97945989
178	-0.901181	-0.68372212	-17.8919839	30.5071573	0.11505048	0.18482988	-0.97601296
179	-0.65817236	-1.05940662	-23.2442243	38.9631715	0.10724993	0.22509261	-0.96841663
180	1.34637935	-1.34825612	-29.1770319	46.1971104	0.10096399	0.2660274	-0.9586635
181	0.2468579	2.58600368	-13.1697201	5.76959952	0.10873862	0.18430345	-0.97683579
182	-0.688063	2.11540248	-12.9835171	7.57987912	0.11358512	0.17525136	-0.97794958
183	1.87375777	1.02905218	-13.0213613	12.4566002	0.12213289	0.16196714	-0.97920897
184	0.48584368	0.51944538	-13.2947	15.8047431	0.12360521	0.15775349	-0.97971199
185	0.33586981	-0.24822932	-14.7668687	23.3428507	0.12106098	0.16125308	-0.97945989
186	-1.555914	-1.34660022	4.5693982	29.2721886	0.12668347	-0.0965009	-0.987238
187	4.44450667	-1.05940662	-23.2442243	38.9631715	0.10724993	0.22509261	-0.96841663
188	-0.79203075	-1.66517072	11.7843691	42.6975989	0.11071324	-0.15962653	-0.98094951
189	0.09410112	4.94719138	-18.0661514	8.06714042	0.06243018	0.25842409	-0.96401217
190	0.12935645	4.47578248	-18.2073617	10.4453784	0.0677704	0.25069348	-0.96569144
191	-0.12672136	4.02017968	-18.8789442	12.9459554	0.07216969	0.25094802	-0.96530649
192	-0.91762082	3.66949438	-20.7192917	19.2483109	0.07040093	0.25368667	-0.96472109
193	-1.56466023	3.68876388	-24.2075061	25.4739155	0.06381112	0.27628356	-0.95895544
194	-1.82661027	3.82561988	-26.3730406	30.9211153	0.0576595	0.28304588	-0.95737162
195	-1.42151359	6.92282738	-32.670603	38.7539483	0.01812504	0.32309713	-0.94619223
196	-0.23223962	4.07704868	7.9913748	9.64631712	0.07644987	-0.18626507	-0.97952067
197	-0.74747224	3.53771518	7.8339649	13.2068093	0.08079113	-0.17330003	-0.98154974

198	-1.63940951	3.07682108	8.2878158	18.3443934	0.08144138	-0.16679122	-0.98262302
199	-2.19802844	2.83225468	10.0482837	23.7802649	0.07849025	-0.17792606	-0.98090856
200	-3.15929027	3.30181748	15.5782047	31.1536544	0.06476265	-0.22760609	-0.97159728
201	-2.731698	3.43099478	17.8100301	36.1886395	0.05925976	-0.23913294	-0.96917683
202	-2.74001125	4.94693118	22.6909273	41.1363716	0.03915627	-0.27630328	-0.96027251
203	-1.01328473	7.34737188	-23.9878372	8.91690592	0.02039167	0.34516928	-0.93831889
204	-1.54672854	7.25932898	-25.1463568	12.3117282	0.02062296	0.3439323	-0.93876795
205	-2.38451075	7.40466638	-27.5670553	16.8291681	0.01702456	0.35365405	-0.93522135
206	2.44852822	7.85311938	-29.7623418	21.1710313	0.00988199	0.36019545	-0.93282452
207	-4.54863763	12.9754178	-43.2092261	23.9163532	-0.05310026	0.48660683	-0.87200583
208	-2.21655922	6.47367438	13.2365897	10.8774111	0.03451048	-0.26505594	-0.96361526
209	-2.84152867	6.39626378	14.485467	15.1427413	0.03335433	-0.26613659	-0.96335809
210	-3.4558067	6.35852758	15.895285	20.1914928	0.0314222	-0.26635043	-0.96336395
211	-4.65060682	7.14306768	19.7768564	24.6997763	0.01892135	-0.29835637	-0.95426698
212	-4.93782866	8.03112518	23.2112499	29.0078315	0.00682695	-0.32165068	-0.94683379
213	-2.65490695	11.2280447	31.7094006	39.5149166	-0.02799783	-0.36798921	-0.92940845
214	-3.73809199	10.5989465	-30.3591872	8.59968162	-0.03191544	0.4341202	-0.90028943
215	-4.4150716	10.8596547	-32.4236916	12.4176636	-0.03372818	0.43678372	-0.89893403
216	-4.69233035	12.828407	-37.319109	21.7465728	-0.05438748	0.44014347	-0.89627883
217	-3.50068159	15.192314	-41.8928571	29.5908296	-0.07576847	0.44618606	-0.89172706
218	-5.89561018	10.1532907	22.2296545	14.8954894	-0.02305583	-0.37144503	-0.92816864
219	-6.02365848	10.1199783	22.6962994	16.4081051	-0.02205338	-0.36973257	-0.92887646
220	-7.37997003	11.3936214	26.3981674	20.4279488	-0.03758706	-0.3937362	-0.91845469
221	-6.962939	13.2213762	30.9211388	27.2908291	-0.05593974	-0.40945823	-0.91061227

APPENDIX C
COPLANAR ERROR MEASUREMENTS

Table 6 - Coplanar of the measured 221 points. X Y and Z for the point in space, with the normal vector of the camera pointing towards the centre of the target. Position zero indicates the coupling position.

Nº	ERROR (MM)	X	Y	Z	NORMAL X	NORMAL Y	NORMAL Z
0	0	0	0	0	1	1	1
1	0.19369852	-0.29192112	-0.0721941	1.65516322	0.17297889	0.05767481	-0.98323544
2	0.19569317	-0.98768762	0.523673	5.47313082	0.17352924	0.04291497	-0.98389324
3	0.09352968	-2.00917162	0.6210587	10.7835938	0.17492085	0.03750229	-0.98386802
4	0.13194137	-3.26981812	0.6614369	17.3169283	0.17637145	0.0332073	-0.98376338
5	0.12029864	-4.61682562	0.9602514	25.3609593	0.17519094	0.02567671	-0.9841996
6	0.16722812	-5.77505392	0.6700399	32.3833889	0.17410918	0.02697452	-0.98435683
7	0.13022884	-7.92506892	0.4550005	43.8913099	0.17529026	0.02590712	-0.98417587
8	0.10345145	-10.6684681	0.4523908	57.2487175	0.17857137	0.02266358	-0.98366591
9	0.12283357	-10.5652282	-3.0624799	51.4834559	0.18721675	0.05817788	-0.98059432
10	-0.07249966	-6.81215912	-6.0867376	3.38230252	0.28595074	0.050468	-0.95691439
11	-0.13603385	-7.00461152	-6.3631813	6.73475482	0.27292235	0.05240251	-0.96060781
12	-0.13027802	-7.17063252	-6.3085301	10.1884775	0.26051163	0.04859258	-0.96424709
13	-0.16660072	-7.98254842	-7.5827483	16.2880104	0.24861641	0.06318109	-0.9665392
14	-0.2112457	-9.96223222	-9.1319411	23.4613075	0.25005983	0.0776208	-0.96511403
15	-0.25689021	-12.6091834	-10.9480534	31.6108039	0.25580641	0.09138455	-0.96239906
16	-0.22140484	-18.0703151	-10.550233	42.2581885	0.282006	0.07593276	-0.95640307
17	-0.23091116	-20.9031961	-11.0784435	47.7516974	0.29304874	0.07657822	-0.95302582
18	-0.291566	-22.21822	-11.7244865	48.6199094	0.3022932	0.08195775	-0.94968508
19	-0.20424828	-21.4365622	-11.2475576	49.8495524	0.2920564	0.07660781	-0.95332801
20	0.11505828	-17.0722265	-1.1819314	6.07706522	0.42165917	0.06699609	-0.90427599
21	0.16662612	-17.3634762	-1.2335432	7.73295552	0.41536179	0.0660808	-0.90725295
22	0.20715094	-19.2535167	-1.2306531	15.0896819	0.3980249	0.05898849	-0.91547612
23	0.15410175	-27.037477	-1.9342713	24.865067	0.43387621	0.05882723	-0.89904994
24	0.16295184	-27.037477	-1.9342713	24.865067	0.43387621	0.05882723	-0.89904994
25	0.17924006	-32.2086691	-2.2431456	29.1381535	0.46221688	0.05822966	-0.88485302
26	0.07936458	-35.5127452	-2.7910236	32.3998539	0.47562401	0.06133713	-0.87750758
27	0.35445823	-37.9129969	-1.0799734	31.8192297	0.49840559	0.04263559	-0.86589496
28	0.07576164	-26.2504346	-1.5305871	5.26165052	0.53917936	0.06851364	-0.83939949
29	0.2716556	-27.2243071	-0.8923676	7.17706432	0.53685486	0.05680775	-0.84175991
30	0.26765109	-29.344824	-0.9165924	10.1786706	0.5390117	0.05419461	-0.84055299
31	0.50613355	-32.7516901	0.0065971	13.6058156	0.55075968	0.03852812	-0.83377417
32	0.63107717	-37.3367082	0.5367043	16.6116827	0.57330112	0.02949212	-0.8188138
33	1.20890344	-38.9363678	2.7158134	2.91430022	0.67528189	0.00263114	-0.73755505
34	0.49122056	-42.736455	2.3160351	4.20164902	0.69430944	0.00790929	-0.71963313
35	0.83629489	-47.8564871	2.988486	5.35999672	0.72029688	-0.00111399	-0.69366502
36	0.19173279	5.04687118	-3.486086	13.5772153	0.05677299	0.10132379	-0.99323226
37	-0.3754246	7.69816828	-0.7188419	13.6005618	0.01478252	0.05769269	-0.99822494
38	-0.36059701	6.18102258	-0.8135131	18.8358315	0.03594323	0.05461491	-0.99786036
39	-0.34326112	5.65016628	-1.5308205	23.6892795	0.04080626	0.06077929	-0.99731676
40	-0.26280154	6.00050898	-2.3416951	28.7728562	0.03364463	0.06719219	-0.99717263
41	-0.25058633	6.69585748	-3.3963865	37.2684495	0.02229669	0.07275886	-0.9971003

42	-0.23985663	11.3051241	-5.2742876	52.9040379	-0.02619166	0.07991589	-0.99645745
43	-0.24065493	17.2340698	-2.3159341	18.4627761	-0.12614262	0.07644829	-0.98906203
44	-0.29422901	16.7612013	-1.9000292	23.1976957	-0.11167969	0.06590778	-0.99155626
45	-0.39438554	18.3624848	-1.9279744	31.7560665	-0.11944368	0.05923997	-0.99107206
46	-0.4328375	20.9015869	-1.8898836	38.2932628	-0.13899982	0.05424869	-0.98880541
47	-0.46134325	24.1116972	-1.8668543	46.1857464	-0.16032965	0.04936396	-0.98582838
48	-0.75724491	28.1022181	-0.0008438	45.1687068	-0.20237719	0.03015395	-0.9788433
49	-0.57739138	28.1808371	-0.232609	20.8508645	-0.26921809	0.04314264	-0.96211243
50	-0.63853591	28.5291833	-0.4767429	24.5099193	-0.26098017	0.04429169	-0.96432754
51	-0.94238306	33.4390127	0.8310419	28.8271406	-0.3035435	0.02532361	-0.952481
52	-1.04718869	38.2205922	1.926733	34.6728471	-0.33331419	0.01097423	-0.94275194
53	0.02967176	-2.61511752	-7.9130483	9.59524432	0.18528257	0.17825015	-0.96638359
54	0.05197281	-3.05622422	-7.9179314	11.7321182	0.18596658	0.17223041	-0.96734333
55	0.02368194	-3.65112342	-7.8514873	14.3904996	0.18746012	0.16418627	-0.96845319
56	-0.04136322	-5.06022792	-9.3870823	20.6872339	0.18980193	0.17041776	-0.96691934
57	-0.01518991	-6.20936372	-11.8896058	27.1925244	0.18766089	0.18710006	-0.96424943
58	-0.05975105	-7.92687242	-15.2482658	35.7568465	0.18750702	0.20559569	-0.96050587
59	0.00583862	-9.48825852	-21.8389747	44.8639316	0.18338162	0.25046312	-0.9505995
60	-0.11819567	-10.7800165	-24.8955646	46.6711882	0.19112965	0.27377347	-0.94261209
61	-0.18074844	-3.16029332	-24.2812971	11.6023655	0.17464011	0.40277798	-0.89848246
62	-0.15804721	-4.03265492	-26.3618732	15.9581325	0.17486003	0.40423311	-0.89778592
63	-0.12834802	-4.45817432	-30.1380613	19.806912	0.16888649	0.42646919	-0.88859517
64	-0.15228997	-5.75538652	-33.9481944	25.6318214	0.17019761	0.43610495	-0.88365448
65	-0.04553806	-6.71144152	-37.0305062	30.3858287	0.17002228	0.44266816	-0.88041884
66	0.56125824	-4.49895722	17.1653931	14.5245063	0.19751663	-0.21466669	-0.95650687
67	0.56773723	-5.29340732	17.8771652	18.5658996	0.19708761	-0.212053	-0.95717815
68	0.53487667	-6.17492542	19.3049087	22.3878809	0.19797267	-0.21941622	-0.95533415
69	0.6081628	-7.31291922	22.7019466	27.7103617	0.19715237	-0.24492555	-0.94928522
70	0.68528517	-8.11000792	24.9490469	31.8946435	0.19566757	-0.25777574	-0.9461849
71	0.78823563	-10.2487642	30.0820908	40.3212968	0.19808264	-0.28525702	-0.93775887
72	0.90769542	-12.1984851	36.8622817	45.7142391	0.2026048	-0.33041815	-0.92183249
73	0.76510046	-6.13725022	44.2875796	16.1401053	0.18781679	-0.52652517	-0.82915385
74	1.48029589	-6.31465332	47.6836018	22.0650048	0.17505888	-0.52472415	-0.833078
75	0.06637955	-3.85227042	-9.9134635	2.35094292	0.23711994	0.13182326	-0.96249507
76	0.28200938	-3.92041372	-9.4653379	4.48844852	0.22957484	0.11870822	-0.96602472
77	0.24835987	-4.39411992	-9.4418657	7.11334812	0.22724607	0.11280536	-0.96728185
78	0.24275862	-5.15138012	-9.1678714	11.9060956	0.22191914	0.0996634	-0.9699583
79	0.28374587	-6.24368022	-9.4832194	16.9435664	0.22113089	0.09669715	-0.97043845
80	0.25502863	-7.69827622	-9.8386314	22.8760751	0.22253406	0.09347567	-0.97043335
81	0.30239883	-9.09096372	-10.7044496	28.35972	0.22407166	0.09768089	-0.96966506
82	0.25544635	-10.4125011	-11.9021828	32.2438888	0.22869322	0.10717784	-0.96758066
83	0.20293456	-11.528598	-12.8831178	36.0670146	0.23084203	0.11343922	-0.96635578
84	0.24124718	-13.0239353	-13.9618644	40.5368226	0.23508126	0.11926345	-0.96463104
85	0.20824073	-14.1790021	-14.4418363	45.3728778	0.2348863	0.11807064	-0.96482524
86	0.14866153	-16.2786401	-17.1581174	49.6072983	0.24413747	0.13902737	-0.95972303
87	0.44286182	-3.84734682	-0.6544749	4.46303032	0.22982001	-0.04330974	-0.97226901
88	0.47136583	-4.05684232	-0.2301691	5.92590902	0.22742827	-0.04978077	-0.9725216
89	0.39359414	-4.26204452	-1.1260193	8.86636282	0.2197633	-0.03201316	-0.97502782
90	0.40629522	-4.91085822	-1.6443549	11.4914801	0.22071109	-0.02213049	-0.97508813
91	0.4366011	-5.83028012	-1.9103015	15.5474115	0.22075439	-0.01665128	-0.97518728
92	0.38768759	-7.63794282	-1.9095726	21.5313433	0.22677908	-0.01521016	-0.97382745
93	0.39125704	-9.09230402	-1.6188741	27.0691006	0.2287912	-0.0178447	-0.97331195

94	0.43839885	-10.1992421	-0.6417214	30.6762438	0.23175796	-0.02906548	-0.97233916
95	0.42969822	-11.4441268	0.8925575	34.6837654	0.23482682	-0.04560626	-0.97096675
96	0.48859922	-12.517361	2.6842799	38.5480538	0.23606116	-0.06355538	-0.96965759
97	0.50578784	-14.5677341	4.2406368	44.37922	0.24208197	-0.07567642	-0.96730006
98	0.59835501	-16.9119368	6.7019695	51.1427028	0.24764863	-0.09420391	-0.96425919
99	0.11949178	-5.83359212	-12.9068747	3.78305062	0.26318178	0.18083939	-0.94764575
100	0.10089974	-6.33271972	-13.3393103	6.69329062	0.25829845	0.17903286	-0.94933089
101	0.09327528	-7.02888482	-13.4347766	11.0146977	0.25159975	0.16815373	-0.95311169
102	0.19912694	-7.58831692	-13.9209751	14.9527308	0.24491685	0.16538776	-0.95533378
103	0.11298962	-8.73643132	-15.1553295	19.6623339	0.24388917	0.17115646	-0.95458029
104	0.13956438	-10.0163045	-16.9185953	24.3473561	0.24438949	0.18287174	-0.95227712
105	0.08975045	-12.549134	-19.1055074	30.7320449	0.2539487	0.19352875	-0.94765853
106	-0.04751421	-14.8956158	-21.8255644	37.431817	0.25886939	0.20755117	-0.94334996
107	0.01393992	-17.0739529	-23.134352	42.8392376	0.2655005	0.20833897	-0.94133116
108	-0.12521598	-18.9479639	-25.0160671	44.2770581	0.27836986	0.22259437	-0.93432434
109	0.19526791	-5.79249312	2.9371386	5.87520782	0.25580794	-0.10557847	-0.9609451
110	0.23279523	-6.61171932	3.7949383	8.54887842	0.25723838	-0.11496427	-0.95948509
111	0.12834249	-7.03235362	2.3958075	11.4749096	0.25247845	-0.08718271	-0.96366686
112	0.10789494	-7.64545962	1.91471	13.9094127	0.25234365	-0.0763663	-0.96461955
113	0.10770244	-9.05340842	2.3062972	17.7700699	0.25776046	-0.07750151	-0.96309556
114	0.1495232	-10.3864401	3.1457188	22.3147332	0.25911354	-0.08389824	-0.96219606
115	0.16423214	-11.7766802	4.2525962	26.4480649	0.26222061	-0.09336077	-0.96048119
116	0.22227315	-13.0435625	6.3123557	29.6652223	0.26608346	-0.11452478	-0.9571226
117	0.33773299	-14.3808991	8.666803	33.38185	0.26864136	-0.13643141	-0.95352939
118	0.37715653	-16.3555487	10.027608	38.754064	0.2730794	-0.14260436	-0.95136304
119	0.58802881	-18.5414199	13.5422085	42.1231487	0.28349269	-0.17284106	-0.94326977
120	0.64784586	-20.6991774	15.3553429	46.4069661	0.29091964	-0.18231193	-0.93921676
121	-0.33821765	-8.78069922	-18.1442046	4.90493942	0.30029256	0.26187939	-0.91719331
122	-0.3333796	-9.07875742	-18.7382105	6.75209052	0.2955329	0.26331724	-0.91832692
123	-0.26804511	-9.68757222	-19.3695394	10.0639353	0.28931251	0.259182	-0.92147868
124	-0.24755905	-10.5361292	-20.5965305	13.5967589	0.28548232	0.26271935	-0.92167152
125	-0.28888345	-11.8877925	-21.4194503	16.8786934	0.28995722	0.26087594	-0.92079778
126	-0.28749734	-13.0348935	-23.8966026	21.2174681	0.28601422	0.27644382	-0.9174828
127	-0.40349096	-14.9836671	-25.9079263	25.8973627	0.29096879	0.2828097	-0.91397803
128	-0.72217523	-19.2449068	-31.0320979	32.4211743	0.31018469	0.31243562	-0.89786939
129	-0.79736196	-21.1527743	-33.7306996	35.1973389	0.31748982	0.32808741	-0.88969594
130	0.27315872	-9.03680482	8.2127852	7.23879402	0.29775739	-0.18940073	-0.93566442
131	0.26341641	-9.56008882	8.8167003	9.20953032	0.29602268	-0.19271882	-0.93553729
132	0.18631381	-11.2613807	8.8119309	14.02233	0.29930056	-0.17807955	-0.93739365
133	0.24746459	-12.5703251	9.8174584	17.3858313	0.30207112	-0.18296496	-0.93556232
134	0.30868739	-13.8978114	11.3338673	20.9322665	0.30367748	-0.19355866	-0.93290677
135	0.43335402	-15.2857714	13.5974551	23.5423331	0.30861	-0.21452802	-0.92668096
136	0.5681057	-16.7528989	15.4917357	26.6634042	0.31239135	-0.22793629	-0.92220209
137	0.6305185	-18.887257	17.7364908	31.0186621	0.31828424	-0.24019956	-0.91706015
138	1.09766393	-23.2000587	23.6876479	37.2349809	0.33484686	-0.28110272	-0.8993658
139	1.35906457	-24.2849693	25.129209	37.5519532	0.34243261	-0.29300011	-0.89268743
140	-0.84204881	-11.5034015	-24.2205205	5.71342022	0.32788218	0.34635481	-0.87893778
141	-0.71621743	-12.4922873	-25.2936238	8.23706232	0.32840265	0.34734867	-0.87835107
142	-0.60143625	-13.7711527	-27.487134	11.7446186	0.32661426	0.35774048	-0.87483991
143	-0.50236319	-15.3561008	-30.4083028	14.9827935	0.32859513	0.3761752	-0.86632411
144	-0.30929671	-18.2511817	-35.0304099	20.2774105	0.3347573	0.3995421	-0.85340709
145	0.26310974	-19.3176792	-38.9529654	20.9488529	0.33728088	0.43457977	-0.83509403

146	1.22703472	-20.9177149	-40.37851	23.5080566	0.34294959	0.43449051	-0.83282866
147	3.88646718	-22.1540103	-41.7473744	25.6662547	0.34599119	0.43612197	-0.83071519
148	0.13803562	-11.8065571	13.7436526	6.71381582	0.33502742	-0.27502501	-0.90117583
149	0.07171552	-13.7394896	15.0085894	11.3177429	0.33819687	-0.27275215	-0.9006826
150	0.20788242	-15.0832607	16.7091786	14.2044485	0.34038704	-0.28338891	-0.89656422
151	0.33469515	-17.5116963	19.6158942	18.4045286	0.3481081	-0.30162013	-0.88760692
152	0.36201891	-20.7721164	23.7320492	23.555747	0.35822463	-0.32613933	-0.87481898
153	-0.57943595	-24.4855708	28.6611572	26.3540642	0.3782319	-0.36206092	-0.85196979
154	0.83076864	-14.4788842	-32.0210423	4.77769062	0.35698445	0.44917677	-0.81902523
155	1.20715166	-15.2894042	-33.2077951	6.04785842	0.35916564	0.45443205	-0.81516351
156	1.49409996	-16.9496505	-36.4351605	8.51040592	0.36187993	0.47383319	-0.80282316
157	0.73203449	-16.9574561	-40.2266459	12.4694081	0.33798273	0.49257274	-0.80195996
158	0.77323646	-15.5481411	20.8668637	7.22061212	0.37166022	-0.36748912	-0.85253764
159	1.63335921	-16.8423582	22.1531676	9.51171292	0.37480644	-0.37069747	-0.84976674
160	-4.37911014	-18.6890399	23.8231742	11.9278492	0.38300398	-0.37660863	-0.84348912
161	-4.75419968	-20.1632266	25.8306809	13.6775826	0.38839906	-0.38945091	-0.83514918
162	-4.91616193	-21.3647254	27.5115687	14.7303069	0.39393623	-0.40126529	-0.82692226
163	-3.41567918	-26.1995974	34.1601644	19.662669	0.41029761	-0.43826222	-0.79973877
164	0.3070069	1.02283188	-9.6493692	3.76277882	0.14306745	0.12579971	-0.98168536
165	0.31406757	0.65666808	-9.6949358	4.82320472	0.14693684	0.12408103	-0.98133249
166	0.3722531	-0.01037482	-9.3869916	7.43527672	0.15190114	0.1128807	-0.98192871
167	0.29045585	-0.37645912	-9.0812217	9.19998212	0.15360304	0.1042441	-0.98261858
168	0.32883603	-1.21590592	-9.2429984	14.6921069	0.15341362	0.09773192	-0.98331721
169	0.33303174	-2.56122832	-10.7453049	21.917687	0.15622212	0.10856304	-0.9817376
170	0.35930982	-3.43977932	-11.4914747	29.1019241	0.1529481	0.10801276	-0.98231366
171	0.39314045	-4.87160102	-14.9410351	37.3265716	0.15409333	0.13673898	-0.97854877
172	0.35208105	-6.54175852	-18.1105644	51.4765664	0.14848686	0.14832577	-0.97772753
173	0.46233451	2.58600368	-13.1697201	5.76959952	0.10873862	0.18430345	-0.97683579
174	0.42425652	2.11540248	-12.9835171	7.57987912	0.11358512	0.17525136	-0.97794958
175	0.4519518	1.02905218	-13.0213613	12.4566002	0.12213289	0.16196714	-0.97920897
176	0.43196681	0.51944538	-13.2947	15.8047431	0.12360521	0.15775349	-0.97971199
177	0.4192122	-0.24822932	-14.7668687	23.3428507	0.12106098	0.16125308	-0.97945989
178	0.55675036	-0.68372212	-17.8919839	30.5071573	0.11505048	0.18482988	-0.97601296
179	0.691971	-1.05940662	-23.2442243	38.9631715	0.10724993	0.22509261	-0.96841663
180	0.69467379	-1.34825612	-29.1770319	46.1971104	0.10096399	0.2660274	-0.9586635
181	0.47065696	2.58600368	-13.1697201	5.76959952	0.10873862	0.18430345	-0.97683579
182	0.41042645	2.11540248	-12.9835171	7.57987912	0.11358512	0.17525136	-0.97794958
183	0.43768319	1.02905218	-13.0213613	12.4566002	0.12213289	0.16196714	-0.97920897
184	0.43001383	0.51944538	-13.2947	15.8047431	0.12360521	0.15775349	-0.97971199
185	0.3282461	-0.24822932	-14.7668687	23.3428507	0.12106098	0.16125308	-0.97945989
186	-0.11828129	-1.34660022	4.5693982	29.2721886	0.12668347	-0.0965009	-0.987238
187	0.73121982	-1.05940662	-23.2442243	38.9631715	0.10724993	0.22509261	-0.96841663
188	-0.31243401	-1.66517072	11.7843691	42.6975989	0.11071324	-0.15962653	-0.98094951
189	0.09410112	4.94719138	-18.0661514	8.06714042	0.06243018	0.25842409	-0.96401217
190	0.12935645	4.47578248	-18.2073617	10.4453784	0.0677704	0.25069348	-0.96569144
191	-0.12672136	4.02017968	-18.8789442	12.9459554	0.07216969	0.25094802	-0.96530649
192	-0.91762082	3.66949438	-20.7192917	19.2483109	0.07040093	0.25368667	-0.96472109
193	-1.56466023	3.68876388	-24.2075061	25.4739155	0.06381112	0.27628356	-0.95895544
194	-1.82661027	3.82561988	-26.3730406	30.9211153	0.0576595	0.28304588	-0.95737162
195	-1.42151359	6.92282738	-32.670603	38.7539483	0.01812504	0.32309713	-0.94619223
196	-0.27269278	4.07704868	7.9913748	9.64631712	0.07644987	-0.18626507	-0.97952067
197	-0.17411191	3.53771518	7.8339649	13.2068093	0.08079113	-0.17330003	-0.98154974

198	-0.16123451	3.07682108	8.2878158	18.3443934	0.08144138	-0.16679122	-0.98262302
199	-0.23800488	2.83225468	10.0482837	23.7802649	0.07849025	-0.17792606	-0.98090856
200	-0.46221439	3.30181748	15.5782047	31.1536544	0.06476265	-0.22760609	-0.97159728
201	-0.36301557	3.43099478	17.8100301	36.1886395	0.05925976	-0.23913294	-0.96917683
202	0.01076997	4.94693118	22.6909273	41.1363716	0.03915627	-0.27630328	-0.96027251
203	0.72892588	7.34737188	-23.9878372	8.91690592	0.02039167	0.34516928	-0.93831889
204	0.77370842	7.25932898	-25.1463568	12.3117282	0.02062296	0.3439323	-0.93876795
205	0.88135625	7.40466638	-27.5670553	16.8291681	0.01702456	0.35365405	-0.93522135
206	1.00857652	7.85311938	-29.7623418	21.1710313	0.00988199	0.36019545	-0.93282452
207	2.39148874	12.9754178	-43.2092261	23.9163532	-0.05310026	0.48660683	-0.87200583
208	-0.30150667	6.47367438	13.2365897	10.8774111	0.03451048	-0.26505594	-0.96361526
209	-0.33465682	6.39626378	14.485467	15.1427413	0.03335433	-0.26613659	-0.96335809
210	-0.3613168	6.35852758	15.895285	20.1914928	0.0314222	-0.26635043	-0.96336395
211	-0.08361305	7.14306768	19.7768564	24.6997763	0.01892135	-0.29835637	-0.95426698
212	0.07389342	8.03112518	23.2112499	29.0078315	0.00682695	-0.32165068	-0.94683379
213	6.20345246	11.2280447	31.7094006	39.5149166	-0.02799783	-0.36798921	-0.92940845
214	-0.55336248	10.5989465	-30.3591872	8.59968162	-0.03191544	0.4341202	-0.90028943
215	-0.56822682	10.8596547	-32.4236916	12.4176636	-0.03372818	0.43678372	-0.89893403
216	-1.04659567	12.828407	-37.319109	21.7465728	-0.05438748	0.44014347	-0.89627883
217	4.20758474	15.192314	-41.8928571	29.5908296	-0.07576847	0.44618606	-0.89172706
218	1.68186189	10.1532907	22.2296545	14.8954894	-0.02305583	-0.37144503	-0.92816864
219	7.13642862	10.1199783	22.6962994	16.4081051	-0.02205338	-0.36973257	-0.92887646
220	1.98280669	11.3936214	26.3981674	20.4279488	-0.03758706	-0.3937362	-0.91845469
221	2.6398384	13.2213762	30.9211388	27.2908291	-0.05593974	-0.40945823	-0.91061227

APPENDIX D
XY POSITION ERROR MEASUREMENTS

Table 7 - XY position error of the measured 221 points. X Y and Z for the point in space, with the normal vector of the camera pointing towards the centre of the target. Position zero indicates the coupling position.

Nº	ERROR (MM)	X	Y	Z	NORMAL X	NORMAL Y	NORMAL Z
0	0	0	0	0	1	1	1
1	0.0029412	-0.29192112	-0.0721941	1.65516322	0.17297889	0.05767481	-0.98323544
2	0.00295632	-0.98768762	0.523673	5.47313082	0.17352924	0.04291497	-0.98389324
3	0.00296673	-2.00917162	0.6210587	10.7835938	0.17492085	0.03750229	-0.98386802
4	0.00300644	-3.26981812	0.6614369	17.3169283	0.17637145	0.0332073	-0.98376338
5	0.00303296	-4.61682562	0.9602514	25.3609593	0.17519094	0.02567671	-0.9841996
6	0.00306126	-5.77505392	0.6700399	32.3833889	0.17410918	0.02697452	-0.98435683
7	0.00308518	-7.92506892	0.4550005	43.8913099	0.17529026	0.02590712	-0.98417587
8	0.00308583	-10.6684681	0.4523908	57.2487175	0.17857137	0.02266358	-0.98366591
9	0.0031246	-10.5652282	-3.0624799	51.4834559	0.18721675	0.05817788	-0.98059432
10	0.00296629	-6.81215912	-6.0867376	3.38230252	0.28595074	0.050468	-0.95691439
11	0.0029583	-7.00461152	-6.3631813	6.73475482	0.27292235	0.05240251	-0.96060781
12	0.00297659	-7.17063252	-6.3085301	10.1884775	0.26051163	0.04859258	-0.96424709
13	0.00301078	-7.98254842	-7.5827483	16.2880104	0.24861641	0.06318109	-0.9665392
14	0.00304923	-9.96223222	-9.1319411	23.4613075	0.25005983	0.0776208	-0.96511403
15	0.00308234	-12.6091834	-10.9480534	31.6108039	0.25580641	0.09138455	-0.96239906
16	0.00308822	-18.0703151	-10.550233	42.2581885	0.282006	0.07593276	-0.95640307
17	0.00311922	-20.9031961	-11.0784435	47.7516974	0.29304874	0.07657822	-0.95302582
18	0.00314625	-22.21822	-11.7244865	48.6199094	0.3022932	0.08195775	-0.94968508
19	0.00310973	-21.4365622	-11.2475576	49.8495524	0.2920564	0.07660781	-0.95332801
20	0.00300451	-17.0722265	-1.1819314	6.07706522	0.42165917	0.06699609	-0.90427599
21	0.0029879	-17.3634762	-1.2335432	7.73295552	0.41536179	0.0660808	-0.90725295
22	0.0030132	-19.2535167	-1.2306531	15.0896819	0.3980249	0.05898849	-0.91547612
23	0.00305309	-27.037477	-1.9342713	24.865067	0.43387621	0.05882723	-0.89904994
24	0.00306763	-27.037477	-1.9342713	24.865067	0.43387621	0.05882723	-0.89904994
25	0.00309633	-32.2086691	-2.2431456	29.1381535	0.46221688	0.05822966	-0.88485302
26	0.00311487	-35.5127452	-2.7910236	32.3998539	0.47562401	0.06133713	-0.87750758
27	0.00310283	-37.9129969	-1.0799734	31.8192297	0.49840559	0.04263559	-0.86589496
28	0.00299656	-26.2504346	-1.5305871	5.26165052	0.53917936	0.06851364	-0.83939949
29	0.00303566	-27.2243071	-0.8923676	7.17706432	0.53685486	0.05680775	-0.84175991
30	0.00302485	-29.344824	-0.9165924	10.1786706	0.5390117	0.05419461	-0.84055299
31	0.00305498	-32.7516901	0.0065971	13.6058156	0.55075968	0.03852812	-0.83377417
32	0.00305528	-37.3367082	0.5367043	16.6116827	0.57330112	0.02949212	-0.8188138
33	0.00307055	-38.9363678	2.7158134	2.91430022	0.67528189	0.00263114	-0.73755505
34	0.00317543	-42.736455	2.3160351	4.20164902	0.69430944	0.00790929	-0.71963313
35	0.00351029	-47.8564871	2.988486	5.35999672	0.72029688	-0.00111399	-0.69366502
36	0.00295779	5.04687118	-3.486086	13.5772153	0.05677299	0.10132379	-0.99323226
37	0.00296074	7.69816828	-0.7188419	13.6005618	0.01478252	0.05769269	-0.99822494
38	0.0029966	6.18102258	-0.8135131	18.8358315	0.03594323	0.05461491	-0.99786036
39	0.0030165	5.65016628	-1.5308205	23.6892795	0.04080626	0.06077929	-0.99731676
40	0.00304063	6.00050898	-2.3416951	28.7728562	0.03364463	0.06719219	-0.99717263
41	0.00305788	6.69585748	-3.3963865	37.2684495	0.02229669	0.07275886	-0.9971003

42	0.00308258	11.3051241	-5.2742876	52.9040379	-0.02619166	0.07991589	-0.99645745
43	0.00299713	17.2340698	-2.3159341	18.4627761	-0.12614262	0.07644829	-0.98906203
44	0.00299756	16.7612013	-1.9000292	23.1976957	-0.11167969	0.06590778	-0.99155626
45	0.00302541	18.3624848	-1.9279744	31.7560665	-0.11944368	0.05923997	-0.99107206
46	0.00304751	20.9015869	-1.8898836	38.2932628	-0.13899982	0.05424869	-0.98880541
47	0.00306532	24.1116972	-1.8668543	46.1857464	-0.16032965	0.04936396	-0.98582838
48	0.00307985	28.1022181	-0.0008438	45.1687068	-0.20237719	0.03015395	-0.9788433
49	0.0030162	28.1808371	-0.232609	20.8508645	-0.26921809	0.04314264	-0.96211243
50	0.00301098	28.5291833	-0.4767429	24.5099193	-0.26098017	0.04429169	-0.96432754
51	0.00303871	33.4390127	0.8310419	28.8271406	-0.3035435	0.02532361	-0.952481
52	0.00303881	38.2205922	1.926733	34.6728471	-0.33331419	0.01097423	-0.94275194
53	0.0029773	-2.61511752	-7.9130483	9.59524432	0.18528257	0.17825015	-0.96638359
54	0.0029576	-3.05622422	-7.9179314	11.7321182	0.18596658	0.17223041	-0.96734333
55	0.00297898	-3.65112342	-7.8514873	14.3904996	0.18746012	0.16418627	-0.96845319
56	0.00302394	-5.06022792	-9.3870823	20.6872339	0.18980193	0.17041776	-0.96691934
57	0.00304618	-6.20936372	-11.8896058	27.1925244	0.18766089	0.18710006	-0.96424943
58	0.00307822	-7.92687242	-15.2482658	35.7568465	0.18750702	0.20559569	-0.96050587
59	0.00311475	-9.48825852	-21.8389747	44.8639316	0.18338162	0.25046312	-0.9505995
60	0.00310295	-10.7800165	-24.8955646	46.6711882	0.19112965	0.27377347	-0.94261209
61	0.00301338	-3.16029332	-24.2812971	11.6023655	0.17464011	0.40277798	-0.89848246
62	0.00304175	-4.03265492	-26.3618732	15.9581325	0.17486003	0.40423311	-0.89778592
63	0.00307367	-4.45817432	-30.1380613	19.806912	0.16888649	0.42646919	-0.88859517
64	0.0031893	-5.75538652	-33.9481944	25.6318214	0.17019761	0.43610495	-0.88365448
65	0.00322486	-6.71144152	-37.0305062	30.3858287	0.17002228	0.44266816	-0.88041884
66	0.00300303	-4.49895722	17.1653931	14.5245063	0.19751663	-0.21466669	-0.95650687
67	0.00300242	-5.29340732	17.8771652	18.5658996	0.19708761	-0.212053	-0.95717815
68	0.00301205	-6.17492542	19.3049087	22.3878809	0.19797267	-0.21941622	-0.95533415
69	0.0030332	-7.31291922	22.7019466	27.7103617	0.19715237	-0.24492555	-0.94928522
70	0.00304911	-8.11000792	24.9490469	31.8946435	0.19566757	-0.25777574	-0.9461849
71	0.00307684	-10.2487642	30.0820908	40.3212968	0.19808264	-0.28525702	-0.93775887
72	0.0031029	-12.1984851	36.8622817	45.7142391	0.2026048	-0.33041815	-0.92183249
73	0.00297526	-6.13725022	44.2875796	16.1401053	0.18781679	-0.52652517	-0.82915385
74	0.00303226	-6.31465332	47.6836018	22.0650048	0.17505888	-0.52472415	-0.833078
75	0.00296596	-3.85227042	-9.9134635	2.35094292	0.23711994	0.13182326	-0.96249507
76	0.00295554	-3.92041372	-9.4653379	4.48844852	0.22957484	0.11870822	-0.96602472
77	0.00296283	-4.39411992	-9.4418657	7.11334812	0.22724607	0.11280536	-0.96728185
78	0.00298695	-5.15138012	-9.1678714	11.9060956	0.22191914	0.0996634	-0.9699583
79	0.00300464	-6.24368022	-9.4832194	16.9435664	0.22113089	0.09669715	-0.97043845
80	0.00303828	-7.69827622	-9.8386314	22.8760751	0.22253406	0.09347567	-0.97043335
81	0.00307269	-9.09096372	-10.7044496	28.35972	0.22407166	0.09768089	-0.96966506
82	0.00307801	-10.4125011	-11.9021828	32.2438888	0.22869322	0.10717784	-0.96758066
83	0.00309277	-11.528598	-12.8831178	36.0670146	0.23084203	0.11343922	-0.96635578
84	0.00310364	-13.0239353	-13.9618644	40.5368226	0.23508126	0.11926345	-0.96463104
85	0.00295047	-14.1790021	-14.4418363	45.3728778	0.2348863	0.11807064	-0.96482524
86	0.00311372	-16.2786401	-17.1581174	49.6072983	0.24413747	0.13902737	-0.95972303
87	0.0029631	-3.84734682	-0.6544749	4.46303032	0.22982001	-0.04330974	-0.97226901
88	0.00296008	-4.05684232	-0.2301691	5.92590902	0.22742827	-0.04978077	-0.9725216
89	0.00298558	-4.26204452	-1.1260193	8.86636282	0.2197633	-0.03201316	-0.97502782
90	0.00299175	-4.91085822	-1.6443549	11.4914801	0.22071109	-0.02213049	-0.97508813
91	0.00301737	-5.83028012	-1.9103015	15.5474115	0.22075439	-0.01665128	-0.97518728
92	0.00303416	-7.63794282	-1.9095726	21.5313433	0.22677908	-0.01521016	-0.97382745
93	0.00303921	-9.09230402	-1.6188741	27.0691006	0.2287912	-0.0178447	-0.97331195

94	0.00305125	-10.1992421	-0.6417214	30.6762438	0.23175796	-0.02906548	-0.97233916
95	0.00307382	-11.4441268	0.8925575	34.6837654	0.23482682	-0.04560626	-0.97096675
96	0.00308094	-12.517361	2.6842799	38.5480538	0.23606116	-0.06355538	-0.96965759
97	0.00309893	-14.5677341	4.2406368	44.37922	0.24208197	-0.07567642	-0.96730006
98	0.00311363	-16.9119368	6.7019695	51.1427028	0.24764863	-0.09420391	-0.96425919
99	0.00298338	-5.83359212	-12.9068747	3.78305062	0.26318178	0.18083939	-0.94764575
100	0.00296791	-6.33271972	-13.3393103	6.69329062	0.25829845	0.17903286	-0.94933089
101	0.00298614	-7.02888482	-13.4347766	11.0146977	0.25159975	0.16815373	-0.95311169
102	0.00301319	-7.58831692	-13.9209751	14.9527308	0.24491685	0.16538776	-0.95533378
103	0.00305089	-8.73643132	-15.1553295	19.6623339	0.24388917	0.17115646	-0.95458029
104	0.00305961	-10.0163045	-16.9185953	24.3473561	0.24438949	0.18287174	-0.95227712
105	0.00308147	-12.549134	-19.1055074	30.7320449	0.2539487	0.19352875	-0.94765853
106	0.00308938	-14.8956158	-21.8255644	37.431817	0.25886939	0.20755117	-0.94334996
107	0.00312162	-17.0739529	-23.134352	42.8392376	0.2655005	0.20833897	-0.94133116
108	0.00312932	-18.9479639	-25.0160671	44.2770581	0.27836986	0.22259437	-0.93432434
109	0.00296536	-5.79249312	2.9371386	5.87520782	0.25580794	-0.10557847	-0.9609451
110	0.00299712	-6.61171932	3.7949383	8.54887842	0.25723838	-0.11496427	-0.95948509
111	0.00300899	-7.03235362	2.3958075	11.4749096	0.25247845	-0.08718271	-0.96366686
112	0.00301397	-7.64545962	1.91471	13.9094127	0.25234365	-0.0763663	-0.96461955
113	0.00301556	-9.05340842	2.3062972	17.7700699	0.25776046	-0.07750151	-0.96309556
114	0.00302978	-10.3864401	3.1457188	22.3147332	0.25911354	-0.08389824	-0.96219606
115	0.00304833	-11.7766802	4.2525962	26.4480649	0.26222061	-0.09336077	-0.96048119
116	0.00306027	-13.0435625	6.3123557	29.6652223	0.26608346	-0.11452478	-0.9571226
117	0.00307771	-14.3808991	8.666803	33.38185	0.26864136	-0.13643141	-0.95352939
118	0.00309014	-16.3555487	10.027608	38.754064	0.2730794	-0.14260436	-0.95136304
119	0.00309725	-18.5414199	13.5422085	42.1231487	0.28349269	-0.17284106	-0.94326977
120	0.00311894	-20.6991774	15.3553429	46.4069661	0.29091964	-0.18231193	-0.93921676
121	0.00299323	-8.78069922	-18.1442046	4.90493942	0.30029256	0.26187939	-0.91719331
122	0.0029813	-9.07875742	-18.7382105	6.75209052	0.2955329	0.26331724	-0.91832692
123	0.00300331	-9.68757222	-19.3695394	10.0639353	0.28931251	0.259182	-0.92147868
124	0.0030358	-10.5361292	-20.5965305	13.5967589	0.28548232	0.26271935	-0.92167152
125	0.00304303	-11.8877925	-21.4194503	16.8786934	0.28995722	0.26087594	-0.92079778
126	0.00306504	-13.0348935	-23.8966026	21.2174681	0.28601422	0.27644382	-0.9174828
127	0.00308077	-14.9836671	-25.9079263	25.8973627	0.29096879	0.2828097	-0.91397803
128	0.00310075	-19.2449068	-31.0320979	32.4211743	0.31018469	0.31243562	-0.89786939
129	0.00311718	-21.1527743	-33.7306996	35.1973389	0.31748982	0.32808741	-0.88969594
130	0.00298462	-9.03680482	8.2127852	7.23879402	0.29775739	-0.18940073	-0.93566442
131	0.00300729	-9.56008882	8.8167003	9.20953032	0.29602268	-0.19271882	-0.93553729
132	0.00302198	-11.2613807	8.8119309	14.02233	0.29930056	-0.17807955	-0.93739365
133	0.00302147	-12.5703251	9.8174584	17.3858313	0.30207112	-0.18296496	-0.93556232
134	0.00304242	-13.8978114	11.3338673	20.9322665	0.30367748	-0.19355866	-0.93290677
135	0.00305711	-15.2857714	13.5974551	23.5423331	0.30861	-0.21452802	-0.92668096
136	0.00306981	-16.7528989	15.4917357	26.6634042	0.31239135	-0.22793629	-0.92220209
137	0.00308804	-18.887257	17.7364908	31.0186621	0.31828424	-0.24019956	-0.91706015
138	0.00311687	-23.2000587	23.6876479	37.2349809	0.33484686	-0.28110272	-0.8993658
139	0.00306575	-24.2849693	25.129209	37.5519532	0.34243261	-0.29300011	-0.89268743
140	0.00298881	-11.5034015	-24.2205205	5.71342022	0.32788218	0.34635481	-0.87893778
141	0.00300716	-12.4922873	-25.2936238	8.23706232	0.32840265	0.34734867	-0.87835107
142	0.00303954	-13.7711527	-27.487134	11.7446186	0.32661426	0.35774048	-0.87483991
143	0.00305866	-15.3561008	-30.4083028	14.9827935	0.32859513	0.3761752	-0.86632411
144	0.00307968	-18.2511817	-35.0304099	20.2774105	0.3347573	0.3995421	-0.85340709
145	0.00308087	-19.3176792	-38.9529654	20.9488529	0.33728088	0.43457977	-0.83509403

146	0.00307155	-20.9177149	-40.37851	23.5080566	0.34294959	0.43449051	-0.83282866
147	0.00307541	-22.1540103	-41.7473744	25.6662547	0.34599119	0.43612197	-0.83071519
148	0.00298341	-11.8065571	13.7436526	6.71381582	0.33502742	-0.27502501	-0.90117583
149	0.00298953	-13.7394896	15.0085894	11.3177429	0.33819687	-0.27275215	-0.9006826
150	0.00298922	-15.0832607	16.7091786	14.2044485	0.34038704	-0.28338891	-0.89656422
151	0.00302288	-17.5116963	19.6158942	18.4045286	0.3481081	-0.30162013	-0.88760692
152	0.00303304	-20.7721164	23.7320492	23.555747	0.35822463	-0.32613933	-0.87481898
153	0.00291636	-24.4855708	28.6611572	26.3540642	0.3782319	-0.36206092	-0.85196979
154	0.00305	-14.4788842	-32.0210423	4.77769062	0.35698445	0.44917677	-0.81902523
155	0.0030141	-15.2894042	-33.2077951	6.04785842	0.35916564	0.45443205	-0.81516351
156	0.00301987	-16.9496505	-36.4351605	8.51040592	0.36187993	0.47383319	-0.80282316
157	0.00313866	-16.9574561	-40.2266459	12.4694081	0.33798273	0.49257274	-0.80195996
158	0.00298593	-15.5481411	20.8668637	7.22061212	0.37166022	-0.36748912	-0.85253764
159	0.00299612	-16.8423582	22.1531676	9.51171292	0.37480644	-0.37069747	-0.84976674
160	0.00303711	-18.6890399	23.8231742	11.9278492	0.38300398	-0.37660863	-0.84348912
161	0.00305473	-20.1632266	25.8306809	13.6775826	0.38839906	-0.38945091	-0.83514918
162	0.00305883	-21.3647254	27.5115687	14.7303069	0.39393623	-0.40126529	-0.82692226
163	0.00307031	-26.1995974	34.1601644	19.662669	0.41029761	-0.43826222	-0.79973877
164	0.00295745	1.02283188	-9.6493692	3.76277882	0.14306745	0.12579971	-0.98168536
165	0.00295758	0.65666808	-9.6949358	4.82320472	0.14693684	0.12408103	-0.98133249
166	0.00297024	-0.01037482	-9.3869916	7.43527672	0.15190114	0.1128807	-0.98192871
167	0.00298129	-0.37645912	-9.0812217	9.19998212	0.15360304	0.1042441	-0.98261858
168	0.00299539	-1.21590592	-9.2429984	14.6921069	0.15341362	0.09773192	-0.98331721
169	0.00303873	-2.56122832	-10.7453049	21.917687	0.15622212	0.10856304	-0.9817376
170	0.00307127	-3.43977932	-11.4914747	29.1019241	0.1529481	0.10801276	-0.98231366
171	0.00309285	-4.87160102	-14.9410351	37.3265716	0.15409333	0.13673898	-0.97854877
172	0.0031042	-6.54175852	-18.1105644	51.4765664	0.14848686	0.14832577	-0.97772753
173	0.00297065	2.58600368	-13.1697201	5.76959952	0.10873862	0.18430345	-0.97683579
174	0.00296218	2.11540248	-12.9835171	7.57987912	0.11358512	0.17525136	-0.97794958
175	0.00298986	1.02905218	-13.0213613	12.4566002	0.12213289	0.16196714	-0.97920897
176	0.00301174	0.51944538	-13.2947	15.8047431	0.12360521	0.15775349	-0.97971199
177	0.00304085	-0.24822932	-14.7668687	23.3428507	0.12106098	0.16125308	-0.97945989
178	0.00307061	-0.68372212	-17.8919839	30.5071573	0.11505048	0.18482988	-0.97601296
179	0.0031048	-1.05940662	-23.2442243	38.9631715	0.10724993	0.22509261	-0.96841663
180	0.00312103	-1.34825612	-29.1770319	46.1971104	0.10096399	0.2660274	-0.9586635
181	0.00295092	2.58600368	-13.1697201	5.76959952	0.10873862	0.18430345	-0.97683579
182	0.0029743	2.11540248	-12.9835171	7.57987912	0.11358512	0.17525136	-0.97794958
183	0.00299124	1.02905218	-13.0213613	12.4566002	0.12213289	0.16196714	-0.97920897
184	0.0030079	0.51944538	-13.2947	15.8047431	0.12360521	0.15775349	-0.97971199
185	0.00300761	-0.24822932	-14.7668687	23.3428507	0.12106098	0.16125308	-0.97945989
186	0.00303218	-1.34660022	4.5693982	29.2721886	0.12668347	-0.0965009	-0.987238
187	0.00305206	-1.05940662	-23.2442243	38.9631715	0.10724993	0.22509261	-0.96841663
188	0.00308052	-1.66517072	11.7843691	42.6975989	0.11071324	-0.15962653	-0.98094951
189	0.00299119	4.94719138	-18.0661514	8.06714042	0.06243018	0.25842409	-0.96401217
190	0.00299845	4.47578248	-18.2073617	10.4453784	0.0677704	0.25069348	-0.96569144
191	0.00301313	4.02017968	-18.8789442	12.9459554	0.07216969	0.25094802	-0.96530649
192	0.00304538	3.66949438	-20.7192917	19.2483109	0.07040093	0.25368667	-0.96472109
193	0.00306343	3.68876388	-24.2075061	25.4739155	0.06381112	0.27628356	-0.95895544
194	0.00309182	3.82561988	-26.3730406	30.9211153	0.0576595	0.28304588	-0.95737162
195	0.00318412	6.92282738	-32.670603	38.7539483	0.01812504	0.32309713	-0.94619223
196	0.00295036	4.07704868	7.9913748	9.64631712	0.07644987	-0.18626507	-0.97952067
197	0.00299435	3.53771518	7.8339649	13.2068093	0.08079113	-0.17330003	-0.98154974

198	0.00301853	3.07682108	8.2878158	18.3443934	0.08144138	-0.16679122	-0.98262302
199	0.00301366	2.83225468	10.0482837	23.7802649	0.07849025	-0.17792606	-0.98090856
200	0.00304421	3.30181748	15.5782047	31.1536544	0.06476265	-0.22760609	-0.97159728
201	0.00305074	3.43099478	17.8100301	36.1886395	0.05925976	-0.23913294	-0.96917683
202	0.00307478	4.94693118	22.6909273	41.1363716	0.03915627	-0.27630328	-0.96027251
203	0.00299701	7.34737188	-23.9878372	8.91690592	0.02039167	0.34516928	-0.93831889
204	0.00303955	7.25932898	-25.1463568	12.3117282	0.02062296	0.3439323	-0.93876795
205	0.00306028	7.40466638	-27.5670553	16.8291681	0.01702456	0.35365405	-0.93522135
206	0.00306028	7.85311938	-29.7623418	21.1710313	0.00988199	0.36019545	-0.93282452
207	0.0034674	12.9754178	-43.2092261	23.9163532	-0.05310026	0.48660683	-0.87200583
208	0.00298341	6.47367438	13.2365897	10.8774111	0.03451048	-0.26505594	-0.96361526
209	0.00298953	6.39626378	14.485467	15.1427413	0.03335433	-0.26613659	-0.96335809
210	0.00298922	6.35852758	15.895285	20.1914928	0.0314222	-0.26635043	-0.96336395
211	0.00302288	7.14306768	19.7768564	24.6997763	0.01892135	-0.29835637	-0.95426698
212	0.00303304	8.03112518	23.2112499	29.0078315	0.00682695	-0.32165068	-0.94683379
213	0.00291636	11.2280447	31.7094006	39.5149166	-0.02799783	-0.36798921	-0.92940845
214	0.00298986	10.5989465	-30.3591872	8.59968162	-0.03191544	0.4341202	-0.90028943
215	0.00302147	10.8596547	-32.4236916	12.4176636	-0.03372818	0.43678372	-0.89893403
216	0.0031605	12.828407	-37.319109	21.7465728	-0.05438748	0.44014347	-0.89627883
217	0.00323521	15.192314	-41.8928571	29.5908296	-0.07576847	0.44618606	-0.89172706
218	0.00296845	10.1532907	22.2296545	14.8954894	-0.02305583	-0.37144503	-0.92816864
219	0.00295313	10.1199783	22.6962994	16.4081051	-0.02205338	-0.36973257	-0.92887646
220	0.00299693	11.3936214	26.3981674	20.4279488	-0.03758706	-0.3937362	-0.91845469
221	0.00290379	13.2213762	30.9211388	27.2908291	-0.05593974	-0.40945823	-0.91061227

APPENDIX E
DEPTH ERROR CUMULATIVE FREQUENCY

Table 8 - Cumulative frequency table for the depth error referring to the errors presented on Appendix B, Table 5.

ERROR INTERVAL	NUMBER OF POINTS IN THE INTERVAL	CUMULATIVE NUMBER OF POINTS	CUMULATIVE FREQUENCY PERCENTAGE
0 < |E| < 0.01	1	1	0,45%
0.01 < |E| < 0.1	4	5	2,26%
0.1 < |E| < 0.2	10	15	6,79%
0.2 < |E| < 0.3	7	22	9,95%
0.3 < |E| < 0.4	6	28	12,67%
0.4 < |E| < 0.5	7	35	15,84%
0.5 < |E| < 0.6	6	41	18,55%
0.6 < |E| < 0.7	7	48	21,72%
0.7< |E| < 0.8	11	59	26,70%
0.8 < |E| < 0.9	8	67	30,32%
0.9 < |E| < 1	10	77	34,84%
1 < |E| < 1.1	7	84	38,01%
1.1 < |E| < 1.2	7	91	41,18%
1.2 < |E| < 1.3	6	97	43,89%
1.3 < |E| < 1.4	10	107	48,42%
1.4 < |E| < 1.5	6	113	51,13%
1.5 < |E| < 1.6	6	119	53,85%
1.6 < |E| < 1.7	4	123	55,66%
1.7 < |E| < 1.8	3	126	57,01%
1.8 < |E| < 1.9	4	130	58,82%
1.9 < |E| < 2	3	133	60,18%
2 < |E| < 2.1	5	138	62,44%
2.1< |E| < 2.2	2	140	63,35%
2.2 < |E| < 2.3	5	145	65,61%
2.3 < |E| < 2.4	5	150	67,87%
2.4 < |E| < 2.5	5	155	70,14%
2.5 < |E| < 2.6	5	160	72,40%
2.6 < |E| < 2.7	6	166	75,11%
2.7 < |E| < 2.8	4	170	76,92%
2.8 < |E| < 2.9	2	172	77,83%
2.9 < |E| < 3	1	173	78,28%
3 < |E| < 3.1	2	175	79,19%
3.1 < |E| < 3.2	2	177	80,09%
3.2 < |E| < 3.3	1	178	80,54%
3.3 < |E| < 3.4	0	178	80,54%
3.4 < |E| < 3.5	3	181	81,90%
3.5 < |E| < 3.6	1	182	82,35%
E > 3.6	39	221	100,00%

APPENDIX F
COPLANAR ANGLE ERROR CUMULATIVE FREQUENCY

Table 9 - Cumulative frequency table for the coplanar angle error referring to the errors presented on Appendix C, Table 6.

ERROR INTERVAL	NUMBER OF POINTS IN THE INTERVAL	CUMULATIVE NUMBER OF POINTS	CUMULATIVE FREQUENCY PERCENTAGE
0 < |E| < 0.01	1	1	0,45%
0.01 < |E| < 0.05	8	9	4,07%
0.05 < |E| < 0.1	13	22	9,95%
0.1 < |E| < 0.15	24	46	20,81%
0.15 < |E| < 0.2	18	64	28,96%
0.2 < |E| < 0.25	18	82	37,10%
0.25 < |E| < 0.3	19	101	45,70%
0.3 < |E| < 0.35	16	117	52,94%
0.35 < |E| < 0.4	15	132	59,73%
0.4 < |E| < 0.45	14	146	66,06%
0.45 < |E| < 0.5	8	154	69,68%
0.5 < |E| < 0.55	4	158	71,49%
0.55 < |E| < 0.6	10	168	76,02%
0.6 < |E| < 0.65	6	174	78,73%
0.65 < |E| < 0.7	3	177	80,09%
0.7 < |E| < 0.75	5	182	82,35%
0.75 < |E| < 0.8	6	188	85,07%
0.8 < |E| < 0.85	3	191	86,43%
0.85 < |E| < 0.9	1	192	86,88%
0.9 < |E| < 0.95	3	195	88,24%
0.95 < |E| < 1	0	195	88,24%
1 < |E| < 1.05	3	198	89,59%
1.05 < |E| < 1.1	1	199	90,05%
E >1.1	22	221	100,00%

APPENDIX G
XY POSITION ERROR CUMULATIVE FREQUENCY

Table 10 - Cumulative frequency table for the XY position error referring to the errors presented on Appendix D, Table 7.

ERROR INTERVAL	NUMBER OF POINTS IN THE INTERVAL	CUMULATIVE NUMBER OF POINTS	CUMULATIVE FREQUENCY PERCENTAGE
0 < |E| < 0.0029	0	0	0,00%
0.0029 < |E| < 0.00291	1	1	0,45%
0.00291 < |E| < 0.00292	2	3	1,36%
0.00292 < |E| < 0.00293	0	3	1,36%
0.00293< |E| < 0.00294	0	3	1,36%
0.00294 < |E| < 0.00295	1	4	1,81%
0.00295 < |E| < 0.00296	11	15	6,79%
0.00296 < |E| < 0.00297	11	26	11,76%
0.00297 < |E| < 0.00298	7	33	14,93%
0.00298 < |E| < 0.00299	18	51	23,08%
0.00299 < |E| < 0.003	15	66	29,86%
0.003 < |E| < 0.00301	11	77	34,84%
0.00301 < |E| < 0.00302	17	94	42,53%
0.00302 < |E| < 0.00303	9	103	46,61%
0.00303 < |E| < 0.00304	17	120	54,30%
0.00304 < |E| < 0.00305	13	133	60,18%
0.00305 < |E| < 0.00306	13	146	66,06%
0.00306 < |E| < 0.00307	10	156	70,59%
0.00307 < |E| < 0.00308	16	172	77,83%
0.00308 < |E| < 0.00309	12	184	83,26%
0.00309 < |E| < 0.0031	7	191	86,43%
0.0031 < |E| < 0.00311	8	199	90,05%
0.00311 < |E| < 0.00312	8	207	93,67%
0.00312 < |E| < 0.00313	4	211	95,48%
0.00313 < |E| < 0.00314	1	212	95,93%
0.00314 < |E| < 0.00315	1	213	96,38%
0.00315 < |E| < 0.00316	0	213	96,38%
0.00316 < |E| < 0.00317	1	214	96,83%
0.00317 < |E| < 0.00318	1	215	97,29%
0.00318 < |E| < 0.00319	2	217	98,19%
0.00319 < |E| < 0.0032	0	217	98,19%
E > 0.0032	4	221	100,00%