TÜVRheinland®

Extract from Test report for unit certificate: **28108849 001**
"Determination of electrical properties"

Extract No: 1 _ **Annex F.3** (VDE-AR-N 4105)

Type of System:	PV - Photovoltaic grid tied inverter
System Manufacturer: **Manufacturer data:**	**Power-One Italy S.p.A.** Via S. Giorgio 642, 52028 Terranuova Bracciolini (AR) - Italy
Reference test report:	**28108849 001**
Measuring period:	**From** 20th April, 2015 **to** 24th April, 2015
Active Power [P_{Emax}]: *(nominal power at reference conditions)*	**Models** / **P_{Emax}** **REACT-UNO-4.6-TL** / **4.6KW** **REACT-UNO-3.6-TL** / **3.6KW**
Rated Voltage:	230 V (Phase/ Neutral)

Note : test performed on model **REACT-UNO-4.6-TL**. The test result found can be extended on all model of the same product family. All products are completely the same; identical software version and PCB control boards are installed; the difference is related only on output power set.

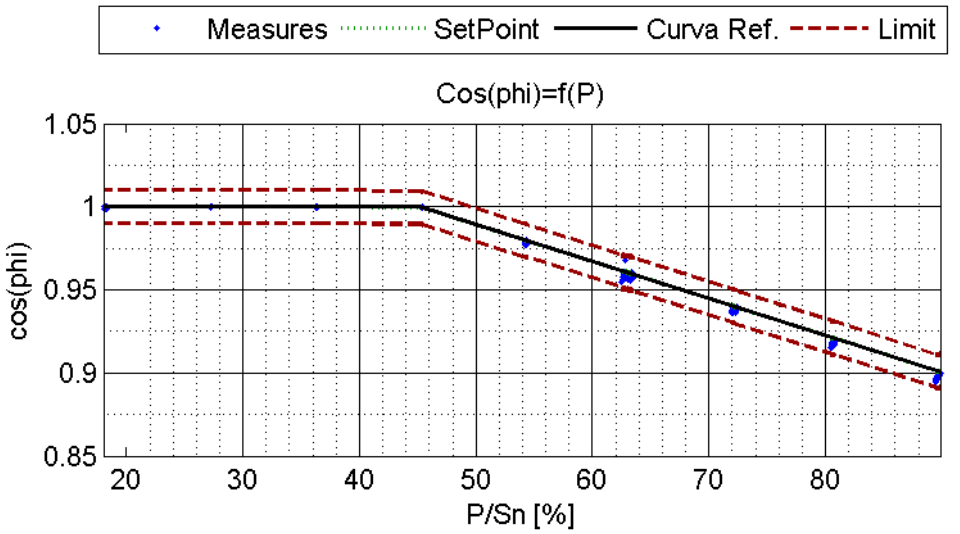
The family product model is made by the following products:

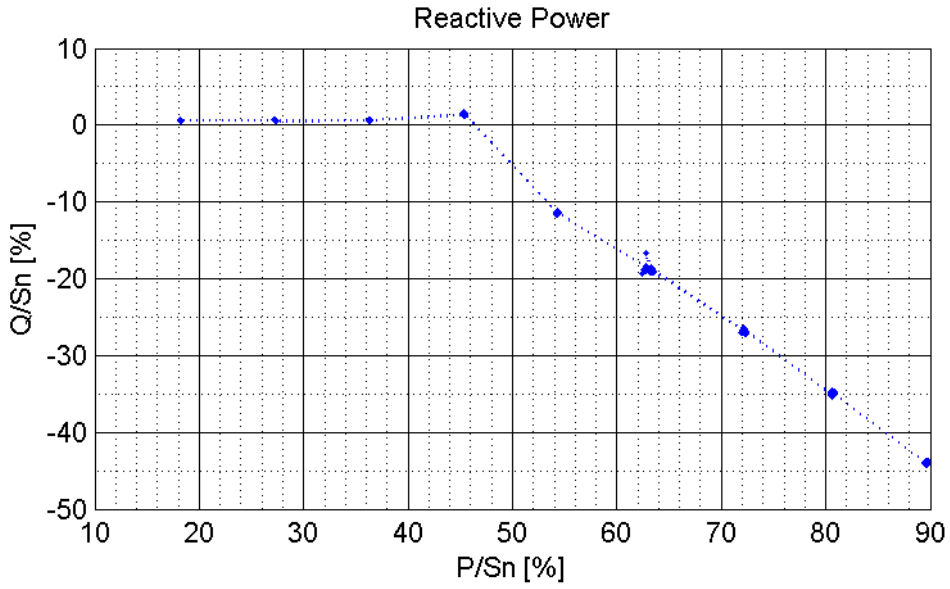
REACT-UNO-4.6-TL, REACT-UNO-3.6-TL

Reactive power reference										
Active Power P/P_n [%]	10	20	30	40	50	60	70	80	90	100
Max. cos $\varphi_{underexcited}$	0.903	0.902	0.900	0.899	0.899	0.899	0.899	0.899	0.898	-
Max. cos $\varphi_{overexcited}$	0.904	0.902	0.902	0.902	0.902	0.902	0.902	0.902	0.907	-

Compliance of required displacement factor cos φ											
Default in system control	$0{,}900_{OV}$	$0{,}920_{OV}$	$0{,}940_{OV}$	$0{,}960_{OV}$	$0{,}980_{OV}$	1	$0{,}980_{UN}$	$0{,}960_{UN}$	$0{,}940_{UN}$	$0{,}920_{UN}$	0,900
Measured value at PGU terminals	0,9020	0,9217	0,9407	0,9600	0,9792	1,0000	0,9800	0,9600	0,9400	0,9199	0,9002

Reactive power transfer function – Standard cos φ (P) – characteristic:										
Active Power P/Pn [%]	10	20	30	40	50	60	70	80	90	100
cos φ	-	1,000	1,000	1,000	1,000	0.96	0.94	0.92	0.90	-





Switching actions:		
Making operation without default	k_i:	-
Worst case at switch over of generator sections	k_i:	1,004
Making operation at reference conditions	k_i:	**1,013**
Breaking operation at nominal power	k_i:	0,999
Worst-case value of all switching operations	$k_{i\,max}$:	**1,013**

Flickers:				
Angle of network impedance Ψ_k *Worst case condition*	30°	50°	70°	85°
Coefficient of system flicker c_ψ	1,74	-	-	-

Table: Harmonics according to IEC61000-4-30

	10%P/Pn	20%P/Pn	30%P/Pn	40%P/Pn	50%P/Pn	60%P/Pn	70%P/Pn	80%P/Pn	90%P/Pn	Full Power
	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
1	1.626979	3.599078	5.581917	7.530379	9.50339	11.45981	13.41748	15.33824	18.26725	20.09463
2	0.027212	0.028396	0.028661	0.028831	0.060709	0.0313	0.033255	0.032475	0.03412	0.035058
3	0.020967	0.02956	0.035213	0.038969	0.049774	0.045518	0.047849	0.050832	0.049447	0.049804
4	0.011154	0.011017	0.011352	0.012403	0.013967	0.012358	0.013556	0.013295	0.012917	0.012961
5	0.012534	0.014828	0.017201	0.015908	0.016897	0.011607	0.010633	0.008235	0.010289	0.009964
6	0.005959	0.005727	0.005718	0.005258	0.00806	0.005786	0.005786	0.005233	0.005754	0.005712
7	0.010243	0.00616	0.009953	0.012299	0.013095	0.010487	0.008735	0.007392	0.006623	0.006429
8	0.004549	0.004514	0.00458	0.004622	0.006688	0.004891	0.004905	0.004744	0.004518	0.004608
9	0.011429	0.013084	0.013404	0.016545	0.017593	0.01708	0.015393	0.013474	0.009281	0.009383
10	0.00652	0.006529	0.006667	0.006616	0.007331	0.006484	0.006368	0.006267	0.005706	0.005577
11	0.004256	0.00575	0.004676	0.007009	0.00926	0.008942	0.00775	0.006611	0.006541	0.006362
12	0.004061	0.004037	0.003951	0.004081	0.004963	0.004081	0.004183	0.004205	0.004261	0.004266
13	0.012674	0.012975	0.012881	0.0131	0.01406	0.013876	0.013232	0.012219	0.010532	0.010483
14	0.004348	0.00443	0.004495	0.004467	0.005129	0.004495	0.004674	0.004597	0.004778	0.004742
15	0.005374	0.002848	0.002999	0.003722	0.005648	0.005416	0.005202	0.00525	0.00956	0.009564
16	0.00297	0.003081	0.003036	0.003068	0.003897	0.003214	0.003513	0.003499	0.003959	0.003879
17	0.009239	0.004393	0.004944	0.003207	0.004373	0.004902	0.004227	0.003284	0.005747	0.005686
18	0.002837	0.002927	0.002901	0.003001	0.003612	0.002963	0.003082	0.003316	0.00408	0.003943
19	0.007896	0.003435	0.003079	0.003697	0.004575	0.004131	0.004279	0.004838	0.009609	0.009551
20	0.002663	0.003049	0.002845	0.002984	0.003434	0.002927	0.003304	0.003508	0.004347	0.004115
21	0.008368	0.00334	0.003506	0.003837	0.004773	0.0044	0.00501	0.005164	0.008253	0.008086
22	0.003266	0.003549	0.00321	0.003362	0.003666	0.003703	0.004168	0.004559	0.005796	0.005597
23	0.008864	0.00626	0.004814	0.005167	0.00782	0.008344	0.010419	0.011242	0.016433	0.016192
24	0.005014	0.004718	0.004608	0.00429	0.004765	0.004587	0.005373	0.005292	0.007902	0.007877
25	0.023677	0.021235	0.017916	0.014895	0.014399	0.014476	0.012853	0.012299	0.01286	0.012765
26	0.007822	0.006529	0.007025	0.00842	0.00795	0.008706	0.010011	0.011329	0.016809	0.015734
27	0.031975	0.030537	0.032199	0.039325	0.044301	0.0445	0.054535	0.058745	0.091076	0.091536
28	0.010653	0.010561	0.009749	0.010292	0.014735	0.0115	0.015987	0.014143	0.026492	0.025364
29	0.032274	0.031946	0.029271	0.036091	0.04374	0.041549	0.052225	0.054442	0.088391	0.088792
30	0.008738	0.006696	0.008288	0.00986	0.010201	0.011239	0.013493	0.015549	0.024822	0.024697
31	0.023353	0.021559	0.020061	0.018443	0.016746	0.017575	0.015812	0.016959	0.016559	0.016657
32	0.006235	0.005929	0.005359	0.005578	0.005843	0.007093	0.006422	0.007129	0.008759	0.008299
33	0.005446	0.004936	0.004732	0.005689	0.007963	0.008182	0.009983	0.009933	0.014077	0.014456
34	0.003116	0.002892	0.003779	0.005906	0.004359	0.006012	0.00512	0.006297	0.006563	0.006078
35	0.006926	0.007451	0.006576	0.005378	0.007016	0.0059	0.007381	0.006807	0.008283	0.008289
36	0.002584	0.002433	0.003641	0.006213	0.003954	0.00553	0.004248	0.005326	0.004821	0.004526
37	0.006562	0.006545	0.005902	0.004351	0.006033	0.00353	0.004032	0.003922	0.004991	0.004857
38	0.00219	0.002193	0.00316	0.005947	0.00286	0.002886	0.002957	0.003391	0.004019	0.003789
39	0.006544	0.006581	0.005588	0.003495	0.003437	0.003169	0.00378	0.004088	0.005172	0.00503
40	0.002682	0.002786	0.003146	0.003378	0.003235	0.003168	0.003285	0.003656	0.004071	0.00402
41	0.003482	0.003441	0.003365	0.003396	0.003491	0.002909	0.003364	0.003441	0.00458	0.004585
42	0.002896	0.002607	0.002685	0.003023	0.003127	0.002964	0.003183	0.003293	0.003618	0.003472
43	0.003859	0.003552	0.003235	0.003336	0.003681	0.003388	0.004095	0.004058	0.00523	0.005284
44	0.004792	0.004965	0.005096	0.004983	0.005265	0.005068	0.005294	0.005612	0.005622	0.005568
45	0.003591	0.003584	0.003059	0.003082	0.003377	0.003008	0.003415	0.003406	0.004197	0.004257
46	0.003698	0.003749	0.003839	0.003568	0.003938	0.003788	0.004053	0.004279	0.004251	0.004192
47	0.002856	0.002905	0.00311	0.003698	0.003872	0.00338	0.00398	0.003727	0.004308	0.004233

Table: Harmonics according to IEC61000-4-30

	10%P/Pn	20%P/Pn	30%P/Pn	40%P/Pn	50%P/Pn	60%P/Pn	70%P/Pn	80%P/Pn	90%P/Pn	Full Power
	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
48	0.003777	0.004165	0.003951	0.00425	0.004293	0.004201	0.00452	0.004584	0.00464	0.004665
49	0.004897	0.004834	0.004929	0.004591	0.00482	0.004795	0.004725	0.004645	0.005639	0.005651
50	0.003723	0.003894	0.003916	0.004291	0.004234	0.004297	0.004627	0.004694	0.004641	0.004527

Table: Inter-Harmonics according to IEC61000-4-30

	10%P/Pn	20%P/Pn	30%P/Pn	40%P/Pn	50%P/Pn	60%P/Pn	70%P/Pn	80%P/Pn	90%P/Pn	Full Power
	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
1,5	0.0047696	0.005597	0.006361	0.008864	0.087516	0.013934	0.022456	0.011908	0.310078	0.277578
2,5	0.002798035	0.002862	0.002769	0.003138	0.016738	0.00408	0.00609	0.004009	0.087696	0.084515
3,5	0.01885762	0.019038	0.019488	0.019311	0.023549	0.018394	0.018103	0.018225	0.057991	0.05588
4,5	0.0023203	0.002377	0.00227	0.002427	0.005559	0.002941	0.003029	0.003139	0.041005	0.039791
5,5	0.002032525	0.001973	0.002069	0.002304	0.003549	0.002819	0.003387	0.003424	0.033084	0.032007
6,5	0.001896899	0.001846	0.001872	0.002005	0.002491	0.00208	0.002332	0.002348	0.027437	0.02663
7,5	0.001868056	0.001778	0.001868	0.002044	0.002631	0.002303	0.002635	0.002787	0.02375	0.023022
8,5	0.001786912	0.001724	0.001749	0.00186	0.002413	0.001974	0.002302	0.00227	0.02079	0.020151
9,5	0.01164531	0.011691	0.011741	0.011576	0.011471	0.011122	0.010785	0.010551	0.020635	0.02012
10,5	0.001731362	0.001638	0.001664	0.001796	0.002085	0.001906	0.002192	0.002255	0.016864	0.01636
11,5	0.00179991	0.001733	0.001832	0.002087	0.002455	0.002454	0.002775	0.002854	0.015641	0.015123
12,5	0.0018772	0.001802	0.001845	0.001932	0.002077	0.001988	0.002162	0.002195	0.014274	0.013837
13,5	0.01240791	0.01235	0.01233	0.012232	0.012129	0.01183	0.01174	0.011475	0.016022	0.01546
14,5	0.001772105	0.001578	0.001673	0.001698	0.001875	0.001818	0.002023	0.002086	0.012365	0.011916
15,5	0.001710002	0.001557	0.001671	0.001839	0.002047	0.002188	0.002481	0.00255	0.011788	0.011391
16,5	0.001675568	0.001451	0.001522	0.00164	0.001778	0.001745	0.001968	0.001968	0.010959	0.010612
17,5	0.001900202	0.001628	0.001728	0.001772	0.001904	0.001877	0.002047	0.002085	0.010431	0.010074
18,5	0.001684994	0.001469	0.001545	0.001636	0.001757	0.001712	0.001899	0.001983	0.009902	0.009525
19,5	0.001552074	0.001813	0.001995	0.002044	0.00204	0.001835	0.002047	0.002076	0.009486	0.009149
20,5	0.001477976	0.001788	0.001537	0.001638	0.001814	0.001718	0.001984	0.002079	0.009124	0.008793
21,5	0.001544733	0.002211	0.002757	0.003434	0.003804	0.003737	0.00393	0.004189	0.009402	0.009068
22,5	0.00151421	0.001923	0.001582	0.001671	0.001908	0.001793	0.002101	0.002319	0.008623	0.008271
23,5	0.003529882	0.002625	0.001917	0.003608	0.005402	0.006416	0.007649	0.008449	0.013337	0.012856
24,5	0.002324876	0.002493	0.002242	0.002108	0.002148	0.002304	0.002553	0.002594	0.008275	0.007988
25,5	0.02256204	0.020385	0.017833	0.01507	0.013632	0.013042	0.010925	0.011634	0.010409	0.009971
26,5	0.003117697	0.003292	0.002987	0.0035	0.004362	0.003755	0.004761	0.005524	0.011833	0.011668
27,5	0.03139297	0.03139	0.032025	0.037631	0.045314	0.043234	0.051251	0.054183	0.076225	0.073249
28,5	0.003511187	0.003506	0.003906	0.004349	0.004259	0.004987	0.006387	0.005758	0.012901	0.01273
29,5	0.03108657	0.029691	0.029279	0.035091	0.043273	0.041017	0.049312	0.053255	0.075505	0.07264
30,5	0.002650756	0.002653	0.002884	0.002735	0.003473	0.002597	0.003283	0.003752	0.008882	0.008494
31,5	0.02249658	0.021191	0.019384	0.016993	0.015488	0.015584	0.01346	0.013434	0.01028	0.009372
32,5	0.001808117	0.001843	0.002364	0.002538	0.003992	0.002201	0.00242	0.002456	0.006863	0.006531
33,5	0.003548396	0.002521	0.002211	0.004022	0.005181	0.007619	0.009134	0.009926	0.012212	0.011664
34,5	0.001662107	0.00172	0.004893	0.003921	0.004179	0.001869	0.002007	0.002194	0.00636	0.006015
35,5	0.001563867	0.001951	0.002593	0.004058	0.003853	0.005583	0.006232	0.006115	0.007007	0.006563
36,5	0.001660786	0.001781	0.005147	0.004171	0.004026	0.001785	0.001915	0.002048	0.006025	0.005698
37,5	0.001697029	0.001903	0.002076	0.003253	0.002526	0.002307	0.002604	0.002741	0.006013	0.005669

Table: Inter-Harmonics according to IEC61000-4-30

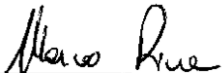
	10%P/Pn	20%P/Pn	30%P/Pn	40%P/Pn	50%P/Pn	60%P/Pn	70%P/Pn	80%P/Pn	90%P/Pn	Full Power
	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
38,5	0.001576973	0.001713	0.004781	0.003952	0.002002	0.001611	0.001849	0.00192	0.005816	0.005524
39,5	0.00170439	0.001829	0.001789	0.002027	0.001982	0.002024	0.002292	0.002404	0.005802	0.005472
40,5	0.001508436	0.00152	0.002168	0.002052	0.001972	0.001677	0.00193	0.002025	0.00569	0.005363
41,5	0.001635351	0.001615	0.001706	0.001925	0.002081	0.002087	0.002441	0.002431	0.005704	0.005371
42,5	0.001667171	0.001654	0.001879	0.002012	0.002288	0.001812	0.002139	0.002215	0.005598	0.00526
43,5	0.002244037	0.002139	0.002161	0.002406	0.002606	0.002278	0.002663	0.002557	0.005791	0.005461
44,5	0.002278323	0.002449	0.002586	0.002573	0.002683	0.00246	0.002695	0.002686	0.00571	0.005382
45,5	0.001870026	0.002119	0.002066	0.00214	0.002513	0.002296	0.002575	0.002498	0.005658	0.005331
46,5	0.002128238	0.002196	0.002297	0.002342	0.002549	0.002274	0.002602	0.002681	0.00566	0.005331
47,5	0.002018156	0.002083	0.00204	0.00237	0.00243	0.002206	0.002582	0.0026	0.005651	0.005289
48,5	0.002513842	0.002547	0.002653	0.002763	0.002753	0.002598	0.002825	0.002648	0.005696	0.005387
49,5	0.002312277	0.002412	0.002377	0.002593	0.002741	0.002654	0.002787	0.002764	0.005715	0.005346

Table: High Frequency Harmonics

	10%P/Pn	20%P/Pn	30%P/Pn	40%P/Pn	50%P/Pn	60%P/Pn	70%P/Pn	80%P/Pn	90%P/Pn	Full Power
	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]
42	0.002896	0.002607	0.002685	0.003023	0.003127	0.002964	0.003183	0.003293	0.003618	0.003472
46	0.003698	0.003749	0.003839	0.003568	0.003938	0.003788	0.004053	0.004279	0.004251	0.004192
50	0.003723	0.003894	0.003916	0.004291	0.004234	0.004297	0.004627	0.004694	0.004641	0.004527
54	0.004112	0.004427	0.004253	0.004699	0.00448	0.004679	0.004734	0.004576	0.005425	0.005149
58	0.003589	0.003561	0.003469	0.00416	0.00368	0.003739	0.004278	0.003753	0.006045	0.006938
62	0.002969	0.002951	0.002981	0.003143	0.002925	0.002994	0.003239	0.003129	0.003058	0.003006
66	0.002179	0.002336	0.002258	0.002345	0.002382	0.002776	0.003799	0.002778	0.002459	0.002412
70	0.001835	0.001907	0.001901	0.002416	0.004726	0.002457	0.002275	0.002119	0.002242	0.002215
74	0.006928	0.006935	0.003934	0.002591	0.001782	0.001948	0.002318	0.001978	0.002112	0.002047
78	0.002363	0.002533	0.0024	0.002654	0.00271	0.002842	0.002896	0.002942	0.002675	0.002624
82	0.003719	0.003978	0.003767	0.004245	0.004058	0.004273	0.00446	0.00411	0.004092	0.004087
86	0.004982	0.004856	0.003905	0.004595	0.003509	0.006289	0.00469	0.003198	0.003803	0.004185
90	0.021258	0.019149	0.015445	0.007095	0.004108	0.015456	0.006254	0.002437	0.00245	0.002529
94	0.006032	0.005872	0.005215	0.005732	0.004115	0.006323	0.003145	0.001433	0.001775	0.001877
98	0.002868	0.002792	0.002295	0.003448	0.003351	0.002641	0.002206	0.001566	0.001882	0.002014
102	0.00222	0.002149	0.001941	0.002249	0.002386	0.002588	0.002217	0.001992	0.002051	0.002146
106	0.002026	0.00193	0.001697	0.001795	0.001893	0.001605	0.001563	0.00145	0.002225	0.002243
110	0.002243	0.002137	0.002982	0.00197	0.001826	0.001784	0.00161	0.001651	0.002324	0.002273
114	0.001844	0.001805	0.001744	0.001794	0.001768	0.001679	0.001632	0.001675	0.002642	0.002561
118	0.001427	0.001468	0.001416	0.001472	0.001423	0.001291	0.001253	0.001295	0.00217	0.001974
122	0.001193	0.001219	0.001207	0.001282	0.001241	0.001219	0.001264	0.001401	0.001632	0.001612
126	0.001098	0.001162	0.001183	0.001219	0.00114	0.001159	0.001246	0.001287	0.001602	0.001558
130	0.000989	0.001	0.001017	0.001124	0.001088	0.001116	0.001228	0.001273	0.001578	0.001539
134	0.00093	0.000947	0.000951	0.001088	0.001048	0.001412	0.001394	0.001608	0.001493	0.001473
138	0.000907	0.000916	0.000897	0.001091	0.001319	0.001058	0.001153	0.001199	0.001727	0.001692
142	0.000925	0.000945	0.00093	0.001176	0.001131	0.001118	0.00131	0.0014	0.001979	0.001981
146	0.00098	0.000963	0.001169	0.001234	0.001123	0.001152	0.001278	0.001369	0.001725	0.001715
150	0.001359	0.001791	0.001621	0.002154	0.001671	0.00131	0.001477	0.001356	0.00177	0.001789
154	0.001773	0.002093	0.002035	0.00228	0.002194	0.002042	0.002232	0.001985	0.002073	0.002112
158	0.001225	0.001286	0.00124	0.001323	0.001265	0.001341	0.001605	0.001489	0.001692	0.001775
162	0.000921	0.00102	0.000992	0.001066	0.001116	0.001238	0.001643	0.001284	0.001529	0.001577
166	0.00098	0.001091	0.00106	0.001077	0.00109	0.001211	0.001697	0.001676	0.001787	0.001805
170	0.000985	0.001117	0.00112	0.001128	0.001142	0.001276	0.001698	0.001933	0.002205	0.002209
174	0.002123	0.001679	0.001596	0.001659	0.001472	0.001742	0.001828	0.002114	0.002529	0.002515
178	0.003792	0.003165	0.002547	0.003387	0.002846	0.004072	0.003714	0.002952	0.007724	0.008574

This extract from the test report is only valid in conjunction with the test report no.: **28108849 001**

Reviewed by:

2016-01-29	Marco Piva / BFM	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*