

Extract from Test report for unit certificate: 28111587 029
 “Determination of electrical properties”

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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:	28111587 029	
Measuring period:	From 25th june, 2018 to 10th October, 2018	
Active Power [$P_{E_{max}}$]: <i>(nominal power at reference conditions)</i>	Models	$P_{E_{max}}$
	REACT2-UNO-5.0-TL	4.6KW
	REACT2-UNO-3.6-TL	3.6KW
Rated Voltage:	230 V (Phase/ Neutral)	
<p>Note : test performed on model REACT2-UNO-5.0-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.</p> <p>The family product model is made by the following products: REACT2-UNO-5.0-TL, REACT2-UNO-3.6-TL</p>		

Reactive power reference										
Active Power P/P_n [%]	10	20	30	40	50	60	70	80	90	100
Max. $\cos \varphi_{\text{underexcited}}$	0.895	0.897	0.898	0.898	0.898	0.898	0.899	0.899	0.900	0.899
Max. $\cos \varphi_{\text{overexcited}}$	0.895	0.897	0.898	0.898	0.898	0.898	0.898	0.898	0.897	0.897

Compliance of required displacement factor $\cos \varphi$											
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

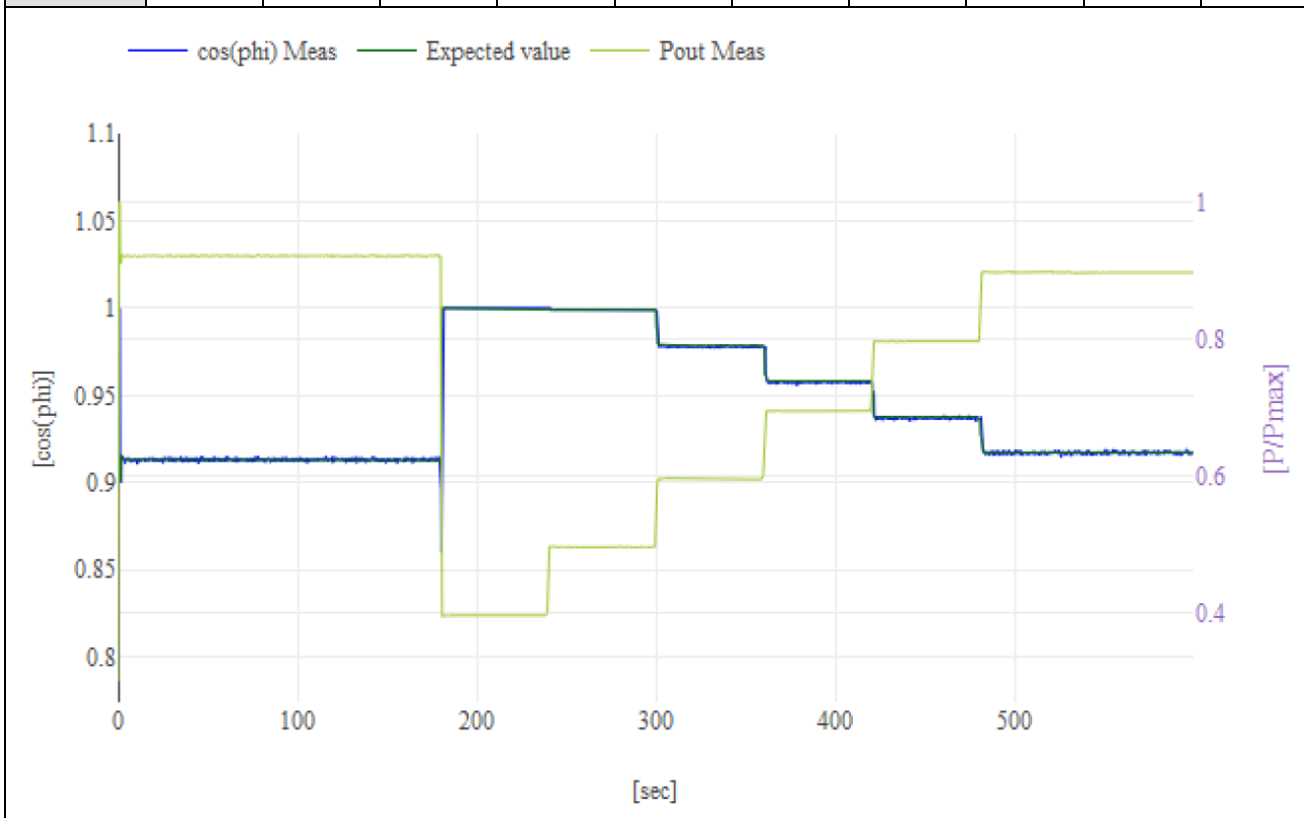
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Reactive power transfer function – Standard $\cos \phi$ (P) – characteristic:

Active Power P/P _n [%]	10	20	30	40	50	60	70	80	90	100
$\cos \phi$	-	1.000	1.000	1.000	0.998	0.977	0.957	0.936	0.916	-



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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 <i>Worst case condition</i>	30°	50°	70°	85°
Coefficient of system flicker c_Ψ	1,74	-	-	-

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

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	1.768	3.912	6.067	8.185	10.330	12.456	14.584	16.672	19.856	21.842
2	0.030	0.031	0.031	0.031	0.066	0.034	0.036	0.035	0.037	0.038
3	0.023	0.032	0.038	0.042	0.054	0.049	0.052	0.055	0.054	0.054
4	0.012	0.012	0.012	0.013	0.015	0.013	0.015	0.014	0.014	0.014
5	0.014	0.016	0.019	0.017	0.018	0.013	0.012	0.009	0.011	0.011
6	0.006	0.006	0.006	0.006	0.009	0.006	0.006	0.006	0.006	0.006
7	0.011	0.007	0.011	0.013	0.014	0.011	0.009	0.008	0.007	0.007
8	0.005	0.005	0.005	0.005	0.007	0.005	0.005	0.005	0.005	0.005
9	0.012	0.014	0.015	0.018	0.019	0.019	0.017	0.015	0.010	0.010
10	0.007	0.007	0.007	0.007	0.008	0.007	0.007	0.007	0.006	0.006
11	0.005	0.006	0.005	0.008	0.010	0.010	0.008	0.007	0.007	0.007
12	0.004	0.004	0.004	0.004	0.005	0.004	0.005	0.005	0.005	0.005
13	0.014	0.014	0.014	0.014	0.015	0.015	0.014	0.013	0.011	0.011
14	0.005	0.005	0.005	0.005	0.006	0.005	0.005	0.005	0.005	0.005
15	0.006	0.003	0.003	0.004	0.006	0.006	0.006	0.006	0.010	0.010
16	0.003	0.003	0.003	0.003	0.004	0.003	0.004	0.004	0.004	0.004
17	0.010	0.005	0.005	0.003	0.005	0.005	0.005	0.004	0.006	0.006
18	0.003	0.003	0.003	0.003	0.004	0.003	0.003	0.004	0.004	0.004
19	0.009	0.004	0.003	0.004	0.005	0.004	0.005	0.005	0.010	0.010
20	0.003	0.003	0.003	0.003	0.004	0.003	0.004	0.004	0.005	0.004
21	0.009	0.004	0.004	0.004	0.005	0.005	0.005	0.006	0.009	0.009
22	0.004	0.004	0.003	0.004	0.004	0.004	0.005	0.005	0.006	0.006
23	0.010	0.007	0.005	0.006	0.009	0.009	0.011	0.012	0.018	0.018
24	0.005	0.005	0.005	0.005	0.005	0.005	0.006	0.006	0.009	0.009
25	0.026	0.023	0.019	0.016	0.016	0.016	0.014	0.013	0.014	0.014
26	0.009	0.007	0.008	0.009	0.009	0.009	0.011	0.012	0.018	0.017
27	0.035	0.033	0.035	0.043	0.048	0.048	0.059	0.064	0.099	0.099
28	0.012	0.011	0.011	0.011	0.016	0.013	0.017	0.015	0.029	0.028
29	0.035	0.035	0.032	0.039	0.048	0.045	0.057	0.059	0.096	0.097
30	0.009	0.007	0.009	0.011	0.011	0.012	0.015	0.017	0.027	0.027
31	0.025	0.023	0.022	0.020	0.018	0.019	0.017	0.018	0.018	0.018
32	0.007	0.006	0.006	0.006	0.006	0.008	0.007	0.008	0.010	0.009
33	0.006	0.005	0.005	0.006	0.009	0.009	0.011	0.011	0.015	0.016
34	0.003	0.003	0.004	0.006	0.005	0.007	0.006	0.007	0.007	0.007
35	0.008	0.008	0.007	0.006	0.008	0.006	0.008	0.007	0.009	0.009
36	0.003	0.003	0.004	0.007	0.004	0.006	0.005	0.006	0.005	0.005
37	0.007	0.007	0.006	0.005	0.007	0.004	0.004	0.004	0.005	0.005
38	0.002	0.002	0.003	0.006	0.003	0.003	0.003	0.004	0.004	0.004
39	0.007	0.007	0.006	0.004	0.004	0.003	0.004	0.004	0.006	0.005
40	0.003	0.003	0.003	0.004	0.004	0.003	0.004	0.004	0.004	0.004
41	0.004	0.004	0.004	0.004	0.004	0.003	0.004	0.004	0.005	0.005
42	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004
43	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.006	0.006
44	0.005	0.005	0.006	0.005	0.006	0.006	0.006	0.006	0.006	0.006
45	0.004	0.004	0.003	0.003	0.004	0.003	0.004	0.004	0.005	0.005
46	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.005	0.005	0.005
47	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.005	0.005
48	0.004	0.005	0.004	0.005	0.005	0.005	0.005	0.005	0.005	0.005

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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]
49	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.006	0.006
50	0.004	0.004	0.004	0.005	0.005	0.005	0.005	0.005	0.005	0.005
THD	0.392%	0.391%	0.398%	0.438%	0.568%	0.481%	0.540%	0.560%	0.769%	0.771%

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

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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

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

This extract from the test report is only valid in conjunction with the test report no.: **28111587 029**

Reviewed by:

12/10/2018	Marco Piva / BFM	
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>