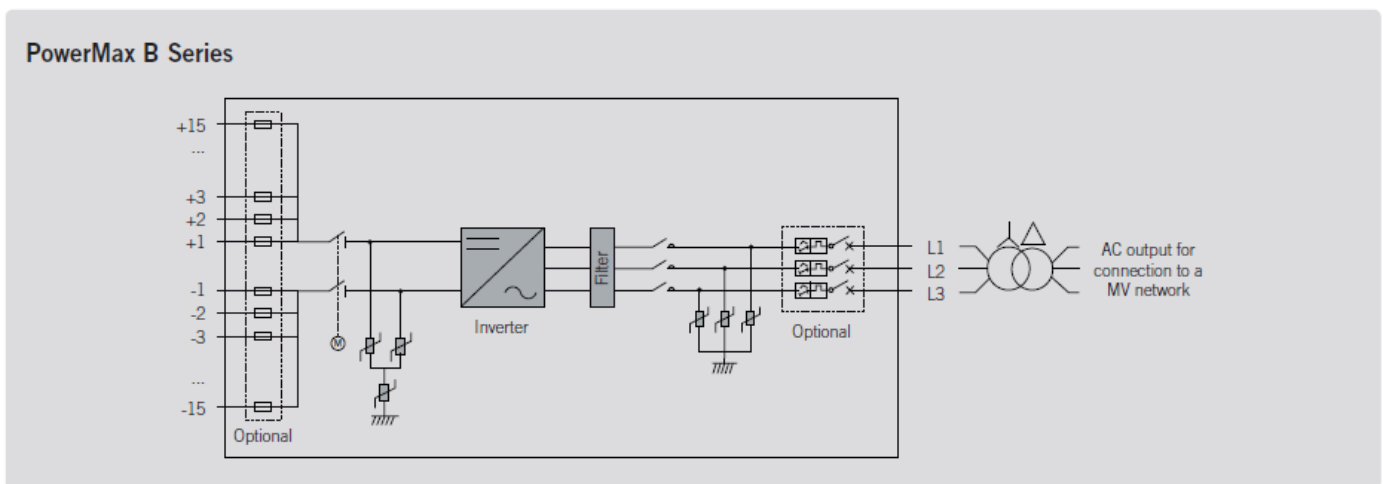


Product Certificate Number	11251-23-2-E2-CER
Applicant	Ingeteam Power Technology S.A. - Energy Avenida Ciudad De La Innovación, 13. 31621. Sarriguren. Navarra. SPAIN
Series/	INGECON SUN Power Max B Series 1500 Vdc
Model/	INGECON SUN 1170TL B450 INGECON SUN 1400TL B540 INGECON SUN 1500TL B578 INGECON SUN 1560TL B600 INGECON SUN 1580TL B630 INGECON SUN 1600TL B615 INGECON SUN 1640TL B630
Type of generating unit	Photovoltaic Inverter
Technical Data	See page 2
Standard	IEC 61683: 1999 Photovoltaic systems. Power conditioners. Procedure for measuring efficiency
<p>Having assessed the test report number: 11251-23-2-TR performed by Certification Entity for Renewable Energies, S.L. (CERE), (EA accredited laboratory nº 1209/LE2339) based on the requirements of the EN ISO/IEC 17025:2005</p> <p>The above-mentioned generating units complies with the requirements of the: IEC 61683: 1999 Photovoltaic systems. Power conditioners. Procedure for measuring efficiency.</p> <p>This certification is according the CERE internal process PET-CERE-09 Rev 10 based on the requirements of the EN ISO/IEC 17065:2012. For this certification process the conformity assesment activities was based on:</p> <ul style="list-style-type: none"> • Testing of production samples selected by CERE. • Audit of quality system according ISO 9001 with certificate number: 0.04.12231 issued by a certification body accredited according EN ISO/IEC 17021. • Inspection of the manufacturing process. <p>This certificate cancel and supersede to the certificate number: 11251-23-2-E1-CER.</p>	
<p>Madrid, January 17, 2018. This certificate is valid until August 22, 2019</p> <p style="text-align: right;">Miguel Martínez Lavin Certification Manager</p>	

Model:	1170TL B450	1400TL B540	1500TL B578	1560TL B600	1580TL B630	1600TL B615	1640TL B630
Input (DC)							
Recommended PV array power range	1157-1520 kWp	1389-1824 kWp	1487-1952 kWp	1543-2027 kWp	1620-2128 kWp	1582-2077 kWp	1620-2128 kWp
Voltage Range MPP	655-1300 V	783-1300 V	837-1300 V	868-1300 V	910-1300 V	889-1300 V	910-1300 V
Maximum Voltage	1500 V						
Maximum Current	1850 A						
Output (AC)							
Power @30°C/@50°C	1169/1052 kVA	1403/1263 kVA	1502/1352 kVA	1559/1403 kVA	1582/1473 kVA	1598/1438 kVA	1637/1473 kVA
Current @30°C/@50°C	1500/1350 A						
Rated Voltage	450 V IT System	540 V IT System	578 V IT System	600 V IT System	630 V IT System	615 V IT System	630 V IT System
Frequency	50/60 Hz						
Software version	ABK1000_B						

Electrical Diagram of B series 1500 Vdc:



Manufacturer:

Ingeteam Power Technology S.A. - Paneles
Pol. Ind. El Juncarillo, Nave 1
31293 Sesma (Navarra) - SPAIN

The samples selected to test were representative of the production.
The samples were selected in manufacture facilities.

On 10th of August of 2016

Sample Report Number:

11251-23-2-TM

The inspection of manufacturing process was performed in
manufacture facilities:

On 28th of June of 2016

Inspection Report Number:

11251-IF

ANNEX TO CERTIFICATE

INGECON SUN 1170TL B450						
0,9 Vdcm_{ax} = 1170 V			Measure = 1113 V			
% P_n	P_{aDC} (kW)	P_{aAC} (kW)	η_p (%)	P_{fDC} (kW)	P_{fAC} (kW)	η_c (%)
5	63,17	59,23	93,77	63,16	59,24	93,79
10	124,94	120,34	96,32	124,94	120,34	96,32
20	246,76	240,24	97,36	246,76	240,30	97,38
25	299,61	292,32	97,57	299,61	292,33	97,57
30	363,94	355,77	97,76	363,95	355,79	97,76
50	594,88	582,67	97,95	594,88	582,70	97,95
75	845,02	826,76	97,84	845,02	826,76	97,84
100	1139,99	1113,33	97,66	1140,00	1113,37	97,66
Euroefficiency		97,57 %				
No-load losses		13,18 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,06	10,46			
U – THD / I – THD		1,01 – 2,99	0,32 – 1,24			
V_{dc nom} = 885,5 V			Measure = 884			
% P_n	P_{aDC} (kW)	P_{aAC} (kW)	η_p (%)	P_{fDC} (kW)	P_{fAC} (kW)	η_c (%)
5	63,37	60,45	95,39	63,38	60,45	95,38
10	125,62	122,03	97,14	125,62	122,03	97,14
20	242,74	237,52	97,85	242,77	237,46	97,81
25	298,80	292,89	98,02	298,80	292,88	98,02
30	363,27	356,49	98,14	363,29	356,54	98,14
50	599,19	588,74	98,26	599,19	588,79	98,26
75	842,83	827,27	98,15	842,83	827,30	98,16
100	1138,48	1114,57	97,90	1138,49	1114,66	97,91
Euroefficiency		97,97 %				
No-load losses		8,17 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,41	8,86			
U – THD / I – THD		0,87 – 2,88	0,30 – 1,10			
V_{dc min} = 660 V			V_{measure} = 658 V			
% P_n	P_{aDC} (kW)	P_{aAC} (kW)	η_p (%)	P_{fDC} (kW)	P_{fAC} (kW)	η_c (%)
5	66,19	64,06	96,78	66,29	64,27	96,94
10	128,00	125,40	97,97	128,00	125,49	98,04
20	242,25	238,28	98,36	242,25	238,35	98,39
25	301,82	297,31	98,51	301,82	297,33	98,51
30	366,41	361,16	98,57	366,42	361,15	98,56
50	598,27	589,98	98,61	598,28	590,01	98,62
75	839,83	827,19	98,50	839,85	827,38	98,52
100	1135,68	1115,95	98,26	1135,73	1116,13	98,27
Euroefficiency		98,41 %				
No-load losses		1,23 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		2,01	13,14			
U – THD / I – THD		0,85 – 4,73	0,32 – 2,08			

ANNEX TO CERTIFICATE

INGECON SUN 1400TL B540						
0,9 Vdcm _{ax} = 1170 V			Measure = 1113 V			
% P _n	P _{aDC} (kW)	P _{aAC} (kW)	η _p (%)	P _{fDC} (kW)	P _{fAC} (kW)	η _c (%)
5	74,46	70,36	94,49	74,46	70,37	94,51
10	147,93	143,20	96,80	147,93	143,18	96,79
20	295,78	288,86	97,66	295,78	288,96	97,70
25	359,45	351,87	97,89	359,45	351,91	97,90
30	436,30	427,93	98,08	436,33	427,86	98,06
50	712,37	699,67	98,22	712,37	699,67	98,22
75	1002,85	984,62	98,18	1002,85	984,76	98,20
100	1357,96	1331,37	98,04	1357,96	1331,49	98,05
Euroefficiency		97,90 %				
No-load losses		15,71 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,08	9,67			
U – THD / I – THD		0,93 – 2,99	0,40 - 1,73			
V _{dc nom} = 948,5 V			Measure = 947 V			
% P _n	P _{aDC} (kW)	P _{aAC} (kW)	η _p (%)	P _{fDC} (kW)	P _{fAC} (kW)	η _c (%)
5	79,13	75,82	95,81	79,13	75,83	95,83
10	148,99	145,10	97,40	149,00	145,01	97,32
20	295,26	289,38	98,01	295,30	289,40	98,00
25	360,28	353,85	98,22	360,32	353,72	98,17
30	435,93	428,67	98,34	435,97	428,54	98,30
50	711,34	700,18	98,43	711,34	700,18	98,43
75	997,75	981,78	98,40	997,75	981,80	98,40
100	1363,43	1338,99	98,21	1363,44	1339,09	98,21
Euroefficiency		98,18 %				
No-load losses		9,20 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,36	10,09			
U – THD / I – THD		0,93 – 2,56	0,42 – 1,38			
V _{dc min} = 786 V			V _{measure} = 783 V			
% P _n	P _{aDC} (kW)	P _{aAC} (kW)	η _p (%)	P _{fDC} (kW)	P _{fAC} (kW)	η _c (%)
5	79,85	77,30	96,81	79,85	76,67	96,01
10	152,35	149,19	97,93	152,35	149,22	97,94
20	291,46	286,68	98,36	291,46	286,66	98,35
25	363,23	357,81	98,51	363,24	357,85	98,52
30	438,99	433,02	98,64	439,00	433,00	98,63
50	712,04	702,85	98,71	712,05	702,83	98,71
75	996,89	983,88	98,70	996,90	983,91	98,70
100	1355,98	1335,23	98,47	1356,01	1335,33	98,47
Euroefficiency		98,51 %				
No-load losses		0,20 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,63	13,03			
U – THD / I – THD		0,95 – 3,98	0,47 – 2,18			

ANNEX TO CERTIFICATE

INGECON SUN 1500TL B578						
0,9 Vdcm_{max} = 1170 V			Measure = 1113 V			
% P_n	P_{aDC} (kW)	P_{aAC} (kW)	η_p (%)	P_{fDC} (kW)	P_{fAC} (kW)	η_c (%)
5	78,98	74,79	94,70	78,98	74,73	94,61
10	159,99	155,09	96,94	159,99	155,12	96,96
20	315,05	308,56	97,94	315,07	308,51	97,92
25	385,89	378,62	98,12	385,89	378,66	98,13
30	468,21	459,92	98,23	468,22	459,82	98,21
50	764,14	751,08	98,29	764,14	751,30	98,32
75	1076,63	1057,73	98,24	1076,63	1057,97	98,27
100	1453,16	1426,31	98,15	1453,16	1426,34	98,15
Euroefficiency		98,02 %				
No-load losses		15,80 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,18	9,50			
U – THD / I – THD		0,85 – 2,28	0,40 – 1,20			
V_{dc} nom = 975,5 V			Measure = 970 V			
% P_n	P_{aDC} (kW)	P_{aAC} (kW)	η_p (%)	P_{fDC} (kW)	P_{fAC} (kW)	η_c (%)
5	82,92	79,47	95,84	82,93	78,27	94,38
10	155,99	151,88	97,37	156,00	151,89	97,37
20	314,37	308,78	98,22	314,36	308,86	98,25
25	385,31	379,01	98,36	385,31	379,03	98,37
30	467,41	460,18	98,45	467,44	460,09	98,43
50	765,54	753,92	98,48	765,54	753,97	98,49
75	1074,35	1057,50	98,43	1074,36	1057,67	98,45
100	1458,33	1432,84	98,25	1458,33	1432,97	98,26
Euroefficiency		98,25 %				
No-load losses		9,06 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,18	8,32			
U – THD / I – THD		0,81 – 3,08	0,37 – 1,43			
V_{dc}min = 840 V			V_{measure} = 839 V			
% P_n	P_{aDC} (kW)	P_{aAC} (kW)	η_p (%)	P_{fDC} (kW)	P_{fAC} (kW)	η_c (%)
5	80,55	77,75	96,53	80,55	77,79	96,57
10	158,61	155,20	97,85	158,61	154,47	97,39
20	313,32	308,67	98,52	313,32	308,66	98,51
25	385,69	380,32	98,61	385,84	380,48	98,61
30	468,19	462,06	98,69	468,20	462,07	98,69
50	763,35	753,73	98,74	763,36	753,91	98,76
75	1074,55	1059,94	98,64	1074,58	1060,13	98,66
100	1454,83	1432,08	98,44	1454,87	1432,34	98,45
Euroefficiency		98,52 %				
No-load losses		0,88 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,47	13,01			
U – THD / I – THD		1,01 – 8,20	0,57 – 2,46			

ANNEX TO CERTIFICATE

INGECON SUN 1560TL B600						
0,9 Vdcm _{max} = 1170 V			Measure = 1113 V			
% P _n	P _{aDC} (kW)	P _{aAC} (kW)	η _p (%)	P _{fDC} (kW)	P _{fAC} (kW)	η _c (%)
5	86,32	82,09	95,09	86,32	82,10	95,11
10	166,02	161,04	97,00	166,03	160,96	96,95
20	316,38	309,85	97,94	316,39	309,80	97,92
25	402,54	395,08	98,15	402,55	394,97	98,12
30	480,91	472,43	98,24	480,93	472,39	98,22
50	796,87	783,83	98,36	796,87	783,84	98,37
75	1112,02	1093,36	98,32	1112,02	1093,52	98,34
100	1509,75	1482,50	98,20	1509,76	1482,63	98,20
Euroefficiency		98,08 %				
No-load losses		15,39 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,04	8,73			
U – THD / I – THD		0,82 – 3,22	0,38 – 1,61			
V _{dc} nom = 990,5 V			Measure = 989 V			
% P _n	P _{aDC} (kW)	P _{aAC} (kW)	η _p (%)	P _{fDC} (kW)	P _{fAC} (kW)	η _c (%)
5	83,80	80,29	95,81	83,80	80,27	95,78
10	163,14	158,85	97,37	163,14	158,89	97,40
20	322,82	317,02	98,20	322,84	316,95	98,17
25	408,84	402,17	98,37	408,84	402,15	98,36
30	484,02	476,42	98,43	484,05	476,41	98,42
50	802,92	791,00	98,52	802,92	791,00	98,52
75	1112,91	1095,99	98,48	1112,91	1096,07	98,49
100	1511,16	1485,58	98,31	1511,16	1485,68	98,31
Euroefficiency		98,28 %				
No-load losses		8,79 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,26	9,83			
U – THD / I – THD		0,79 – 2,55	0,39 – 1,34			
V _{dc} min = 870 V			V _{measure} = 868 V			
% P _n	P _{aDC} (kW)	P _{aAC} (kW)	η _p (%)	P _{fDC} (kW)	P _{fAC} (kW)	η _c (%)
5	84,93	81,94	96,48	84,93	81,96	96,50
10	162,93	159,23	97,73	162,99	159,45	97,82
20	330,11	324,99	98,45	330,12	325,20	98,51
25	401,54	395,77	98,56	401,54	395,82	98,58
30	486,58	480,05	98,66	486,59	480,06	98,66
50	800,16	789,81	98,71	800,17	789,80	98,70
75	1111,10	1096,55	98,69	1111,13	1096,64	98,70
100	1516,28	1493,50	98,50	1516,32	1493,78	98,51
Euroefficiency		98,50 %				
No-load losses		0,79 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,42	12,70			
U – THD / I – THD		0,91 – 3,25	0,50 – 2,33			

ANNEX TO CERTIFICATE

INGECON SUN 1580TL B630						
0,9 Vdcm _{ax} = 1170 V			Measure = 1110 V			
% P _n	P _{aDC} (kW)	P _{aAC} (kW)	η _p (%)	P _{fDC} (kW)	P _{fAC} (kW)	η _c (%)
5	83,00	78,96	95,13	83,00	79,03	95,22
10	168,00	163,25	97,17	168,00	163,30	97,20
20	326,53	319,81	97,94	326,53	320,02	98,01
25	404,06	396,64	98,16	404,07	396,49	98,12
30	492,01	483,51	98,27	492,03	483,63	98,29
50	805,26	792,67	98,44	805,26	792,73	98,44
75	1127,67	1109,69	98,41	1127,68	1109,96	98,43
100	1528,96	1503,04	98,30	1528,97	1503,17	98,31
Euroefficiency		98,15 %				
No-load losses		14,48 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,01	8,72			
U – THD / I – THD		0,77 – 2,58	0,40 – 1,47			
V _{dc nom} = 1013 V			Measure = 1010 V			
% P _n	P _{aDC} (kW)	P _{aAC} (kW)	η _p (%)	P _{fDC} (kW)	P _{fAC} (kW)	η _c (%)
5	86,38	82,88	95,95	86,38	82,87	95,94
10	167,11	162,97	97,52	167,11	162,76	97,40
20	326,08	320,00	98,14	326,08	320,01	98,14
25	405,11	398,47	98,36	405,12	398,36	98,33
30	487,71	480,04	98,43	487,70	480,05	98,43
50	803,81	792,23	98,56	803,81	792,37	98,58
75	1126,83	1110,27	98,53	1126,84	1110,34	98,54
100	1529,75	1505,07	98,39	1529,76	1505,22	98,40
Euroefficiency		98,32 %				
No-load losses		8,48 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,09	8,79			
U – THD / I – THD		0,73 – 5,88	0,42 – 1,54			
V _{dc min} = 910 V			V _{measure} = 913 V			
% P _n	P _{aDC} (kW)	P _{aAC} (kW)	η _p (%)	P _{fDC} (kW)	P _{fAC} (kW)	η _c (%)
5	85,10	81,96	96,31	85,13	82,36	96,76
10	167,53	163,90	97,83	167,53	163,95	97,86
20	326,29	320,88	98,34	326,29	320,89	98,34
25	405,64	399,64	98,52	405,66	399,75	98,54
30	484,53	477,87	98,63	484,53	477,84	98,62
50	801,79	791,74	98,75	801,81	791,77	98,75
75	1124,44	1110,19	98,73	1124,46	1110,30	98,74
100	1527,88	1506,41	98,59	1527,92	1506,56	98,60
Euroefficiency		98,52 %				
No-load losses		1,38 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,37	14,34			
U – THD / I – THD		0,87 – 3,08	0,50 – 2,54			

ANNEX TO CERTIFICATE

INGECON SUN 1600TL B615						
0,9 Vdcm _{max} = 1170 V			Measure = 1113 V			
% P _n	P _{aDC} (kW)	P _{aAC} (kW)	η _p (%)	P _{fDC} (kW)	P _{fAC} (kW)	η _c (%)
5	84,90	80,56	94,89	84,89	80,23	94,51
10	163,54	158,56	96,95	163,54	158,53	96,94
20	325,55	319,00	97,99	325,57	318,96	97,97
25	413,85	406,45	98,21	413,86	406,39	98,19
30	494,28	485,89	98,30	494,30	485,82	98,29
50	816,24	803,68	98,46	816,24	803,84	98,48
75	1140,76	1122,76	98,42	1140,77	1122,84	98,43
100	1547,03	1520,29	98,27	1547,04	1520,30	98,27
Euroefficiency		98,15 %				
No-load losses		14,88 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,04	8,31			
U – THD / I – THD		0,82 – 2,81	0,40 – 1,35			
V _{dc nom} = 1001,5 V			Measure = 1000 V			
% P _n	P _{aDC} (kW)	P _{aAC} (kW)	η _p (%)	P _{fDC} (kW)	P _{fAC} (kW)	η _c (%)
5	89,74	86,06	95,90	89,75	85,86	95,66
10	171,41	167,02	97,44	171,41	166,63	97,21
20	331,82	326,04	98,26	331,83	326,00	98,24
25	420,18	413,50	98,41	420,19	413,48	98,40
30	492,35	484,87	98,48	492,37	484,78	98,46
50	817,58	806,10	98,60	817,58	806,15	98,60
75	1136,82	1120,30	98,55	1136,83	1120,36	98,55
100	1553,02	1527,50	98,36	1553,02	1527,62	98,36
Euroefficiency		98,34 %				
No-load losses		8,51 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,16	9,14			
U – THD / I – THD		0,86 – 2,70	0,39 – 1,60			
V _{dc min} = 889 V			V _{measure} = 889 V			
% P _n	P _{aDC} (kW)	P _{aAC} (kW)	η _p (%)	P _{fDC} (kW)	P _{fAC} (kW)	η _c (%)
5	89,02	85,89	96,48	89,02	85,88	96,46
10	171,43	167,67	97,81	171,43	167,58	97,75
20	338,84	333,84	98,52	338,85	333,83	98,52
25	414,98	409,31	98,63	414,98	409,37	98,65
30	491,15	484,82	98,71	491,15	484,78	98,70
50	817,10	807,46	98,82	817,11	807,49	98,82
75	1138,79	1125,00	98,79	1138,79	1125,02	98,79
100	1551,22	1529,74	98,62	1551,25	1529,95	98,63
Euroefficiency		98,60 %				
No-load losses		1,07 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,40	13,49			
U – THD / I – THD		0,99 – 5,79	0,63 – 2,47			

ANNEX TO CERTIFICATE

INGECON SUN 1640TL B630						
0,9 Vdcm _{max} = 1170 V			Measure = 1113 V			
% P _n	P _{aDC} (kW)	P _{aAC} (kW)	η _p (%)	P _{fDC} (kW)	P _{fAC} (kW)	η _c (%)
5	79,28	75,17	94,81	79,29	74,97	94,56
10	161,74	156,90	97,01	161,74	156,90	97,00
20	334,69	327,97	97,99	334,69	327,96	97,99
25	424,73	417,24	98,23	424,77	416,97	98,16
30	499,23	490,90	98,33	499,22	490,89	98,33
50	833,31	820,37	98,45	833,31	820,47	98,46
75	1168,97	1150,70	98,44	1168,97	1150,78	98,44
100	1584,70	1558,54	98,35	1584,70	1558,65	98,36
Euroefficiency		98,16 %				
No-load losses		14,48 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,129	8,56			
U – THD / I – THD		0,81 – 2,37	0,42 – 1,38			
V _{dc nom} = 1013 V			Measure = 1011 V			
% P _n	P _{aDC} (kW)	P _{aAC} (kW)	η _p (%)	P _{fDC} (kW)	P _{fAC} (kW)	η _c (%)
5	85,75	82,13	95,79	85,75	80,94	94,39
10	167,91	163,62	97,44	167,92	162,47	96,75
20	340,46	334,43	98,23	340,46	334,44	98,23
25	423,02	416,17	98,38	423,03	416,12	98,37
30	505,22	497,56	98,48	505,24	497,55	98,48
50	834,94	823,06	98,58	834,94	823,19	98,59
75	1174,32	1157,32	98,55	1174,32	1157,41	98,56
100	1585,88	1560,61	98,41	1585,89	1560,65	98,41
Euroefficiency		98,34 %				
No-load losses		8,48 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,10	8,66			
U – THD / I – THD		0,89 – 3,16	0,45 – 1,59			
V _{dc min} = 910 V			V _{measure} = 912 V			
% P _n	P _{aDC} (kW)	P _{aAC} (kW)	η _p (%)	P _{fDC} (kW)	P _{fAC} (kW)	η _c (%)
5	92,69	89,43	96,47	92,69	89,50	96,56
10	171,31	167,49	97,77	171,33	167,29	97,64
20	340,01	334,69	98,43	340,05	334,77	98,45
25	426,57	420,53	98,58	426,57	420,52	98,58
30	508,20	501,60	98,70	508,20	501,63	98,71
50	820,43	810,70	98,81	820,44	810,87	98,83
75	1170,52	1155,94	98,75	1170,53	1156,53	98,80
100	1588,37	1566,03	98,59	1588,43	1566,47	98,62
Euroefficiency		98,58 %				
No-load losses		1,38 kW				
Standby loss		0,15 kW				
U – Ripple / I – Ripple		1,36	13,48			
U – THD / I – THD		1,02 -3,91	0,67 – 2,95			