



**BUREAU
VERITAS**

Certificate of compliance

Applicant: **ABB Oy Power Conversion**
Hiomotie 13
FI-00380 Helsinki
Finland

Product: **Grid-tied photovoltaic (PV) inverter**

Model: **PRO-33.0-TL-OUTD-400**
PRO-33.0-TL-OUTD-S-400
PRO-33.0-TL-OUTD-SX-400

Use in accordance with regulations:

The inverters are tested according the IEC 61683:1999, EN 61683:2000, DIN EN 61683:2000, EN 50530:2010, DIN EN 50530 (VDE 0126-12):2011 procedure for measuring efficiency.

Applied rules and standards:

IEC 61683:1999, EN 61683:2000, DIN EN 61683:2000

Photovoltaic systems – Power conditioners – Procedure for measuring efficiency

EN 50530:2010, DIN EN 50530 (VDE 0126-12):2011

Overall efficiency of grid connected photovoltaic inverters

At the time of issue of this certificate the safety concept of an aforementioned representative product corresponds to the valid safety specifications for the specified use in accordance with regulations.

Report number: **13TH0463-IEC61683**
13TH0463-EN50530

Certificate number: **U15-0132**

Date of issue: **2015-04-24**

Certification body

Dieter Zitzmann



Deutsche
Akkreditierungsstelle
D-ZE-12024-01-01

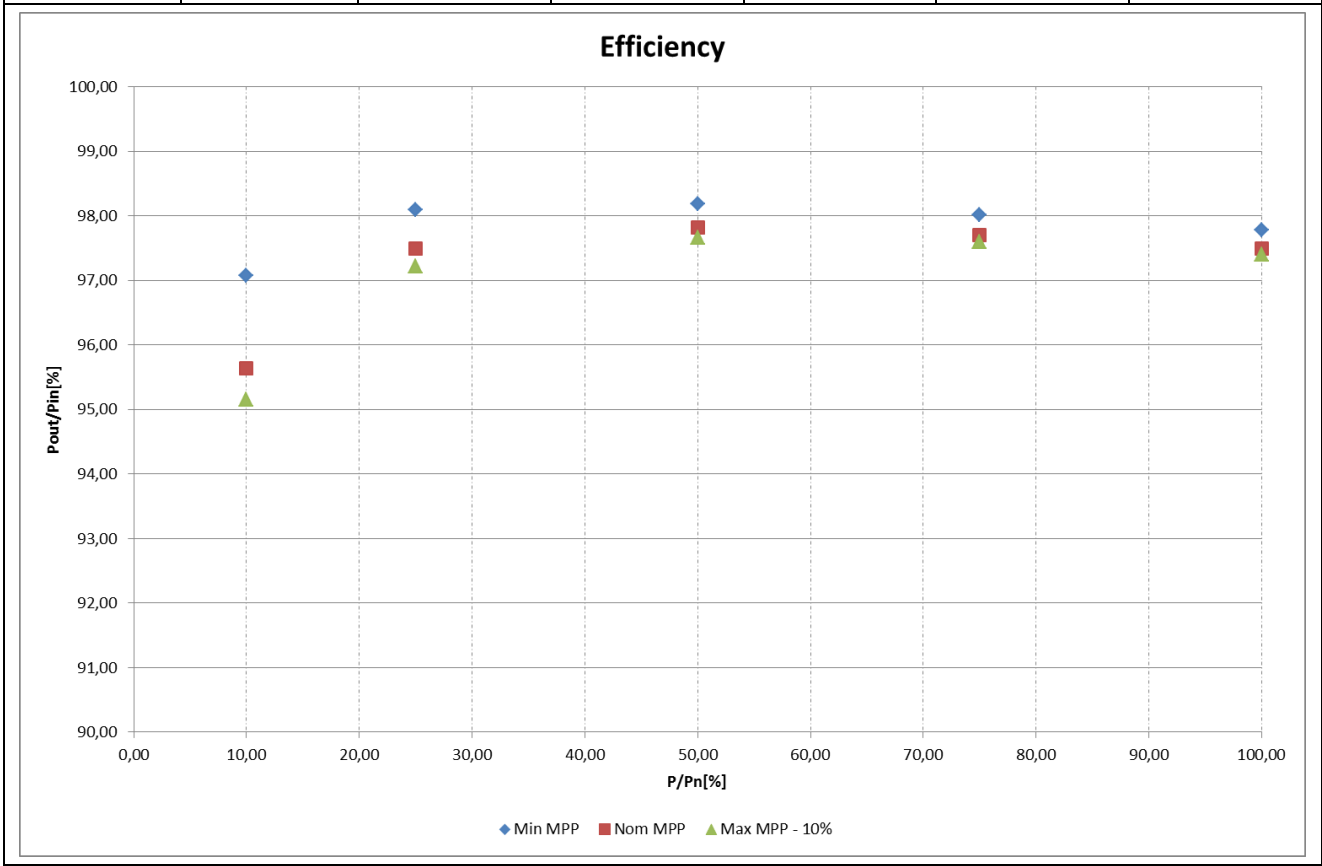
Certification body of Bureau Veritas Consumer Products Services Germany GmbH
Accredited according to EN 45011 - ISO / IEC Guide 65

Measuring of efficiency

Extract from test report according the IEC 61683 Nr. 13TH0463

Efficiency measurement conditions test results

PRO-33.0-TL-OUTD-400						
Input voltage [Vdc]		Power in [W] (nom. 33000 W)				
		10%	25%	50%	75%	100%
		3300	8250	16500	24750	33000
		η in [%]				
V _(nominal)	580	97,07	98,10	98,18	98,02	97,78
V _(average)	715	95,64	97,49	97,81	97,71	97,49
V _{max (90% MPPT)}	765	95,16	97,22	97,66	97,60	97,40



Measuring of efficiency
 Extract from test report according the EN 50530 Nr. 13TH0463

Static MPPT Efficiency

Technology	cSi	cSi	cSi	TF	TF	TF
DC-Voltage	U_{MPPmax}	$U_{DC,r}$	U_{MPPmin}	U_{MPPmax}	$U_{DC,r}$	U_{MPPmin}
DC-Value	850	--	580	770	--	580
P/PN						
5%	99,10	--	99,18	98,72	--	98,82
10%	99,56	--	99,38	99,54	--	99,09
20%	99,85	--	99,21	99,78	--	98,85
25%	99,97	--	99,33	99,93	--	99,02
30%	99,93	--	99,24	99,94	--	98,95
50%	99,91	--	99,26	99,91	--	98,9
75%	99,94	--	99,00	99,94	--	98,72
100%	99,95	--	98,60	99,15	--	98,34

Note:
 Static MPPT Efficiency

$$\eta_{MPPT} = \frac{\int_0^{T_m} P_{DC}(t) dt}{\int_0^{T_m} P_{MPP}(t) dt}$$

Static MPPT Efficiency

Vdc [V]	Inverter [%]		Transformer [%]		Overall [%]	
	EU	CEC	EU	CEC	EU	CEC
580 ¹⁾	98,80	98,79	--	--	98,80	98,79
770 ¹⁾	99,69	99,87			99,69	99,87
580 ²⁾	99,12	99,09			99,12	99,09
850 ²⁾	99,87	99,91			99,87	99,91

Note:
¹⁾ TF
²⁾ cSi

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Nr. 13TH0463

Dynamic MPPT Efficiency		
Dynamic MPPT-Test 10%-50%		
Slope (W/m ²)	Ramp (s)	Efficiency (%)
0,5	800	99,14
1	400	99,17
2	200	99,18
3	133	99,18
5	80	99,05
7	57	98,96
10	40	99,09
14	29	99,16
20	20	99,16
30	13	99,14
50	8	99,22
Overall efficiency:		99,13
Dynamic MPPT-Test 30%-100%		
Slope (W/m ²)	Ramp (s)	Efficiency (%)
10	70	98,99
14	50	98,95
20	35	98,93
30	23	98,91
50	14	98,90
100	7	99,04
Overall efficiency:		98,95

Measuring of efficiency
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Static Power Conversion Efficiency						
Technology	cSi	cSi	cSi	TF	TF	TF
DC-Voltage	U_{MPPmax}	$U_{DC,r}$	U_{MPPmin}	U_{MPPmax}	$U_{DC,r}$	U_{MPPmin}
DC-Value	850	--	580	770	--	580
P/PN						
5%	88,30	--	95,35	88,24	--	95,35
10%	88,29	--	95,35	88,44	--	95,35
20%	96,42	--	98,03	96,41	--	98,03
25%	96,42	--	98,03	96,41	--	98,03
30%	96,85	--	98,15	96,85	--	98,14
50%	97,42	--	98,16	97,42	--	98,14
75%	97,37	--	97,94	97,36	--	97,91
100%	97,16	--	97,65	97,14	--	97,62

Note:
 Static Power Conversion Efficiency

$$\eta_{CONV} = \frac{\int_0^{Tm} P_{AC(t)} dt}{\int_0^{Tm} P_{DC(t)} dt}$$

Static Power Conversion Efficiency						
Vdc [V]	Inverter [%]		Transformer [%]		Overall [%]	
	EU	CEC	EU	CEC	EU	CEC
580 ¹⁾	97,77	97,87	--	--	97,77	97,87
770 ¹⁾	96,36	96,89			96,36	96,89
580 ²⁾	97,79	97,90			97,79	97,90
850 ²⁾	96,36	96,89			96,36	96,89

Note:
¹⁾ TF
²⁾ cSi

Measuring of efficiency

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Overall efficiency						
Technology	cSi	cSi	cSi	TF	TF	TF
DC-Voltage	U_{MPPmax}	$U_{DC,r}$	U_{MPPmin}	U_{MPPmax}	$U_{DC,r}$	U_{MPPmin}
DC-Value	850	--	580	770	--	580
P/PN						
5%	87,51	--	94,57	87,11	--	94,22
10%	87,90	--	94,76	88,03	--	94,48
20%	96,28	--	97,26	96,20	--	96,90
25%	96,39	--	97,37	96,34	--	97,07
30%	96,78	--	97,40	96,79	--	97,11
50%	97,33	--	97,43	97,33	--	97,06
75%	97,31	--	96,96	97,30	--	96,66
100%	97,11	--	96,28	96,31	--	96,00
Note:						
Overall efficiency						
$\eta_t = \eta_{CONV} \cdot \eta_{MPPTstat}$						