

CHINT.OND FILE

# Inverter File Verification

Chint Power Systems North America

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Verify accuracy of PVsyst inverter model files (.OND) for Chint.

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## List of abbreviations

<b>Abbreviation</b>	<b>Meaning</b>
ac	Alternating Current
DNV GL	DNV KEMA Renewables, Inc.
CEC	California Energy Commission
dc	Direct Current
kW	Kilowatt
kVA	Kilowatt Apparent Power
MPPT	Maximum Power Point Tracking (for inverters)
NRTL	Nationally Recognized Testing Laboratory
.OND	Inverter model in PVsyst
PV	Photovoltaic
W	Watts

## 1 INTRODUCTION

Chint Power Systems North America ("Chint") retained DNV KEMA Renewables, Inc. ("DNV GL") to review and verify the accuracy of the PVsyst inverter model files (.OND) for the Chint Three Phase string inverter models CPS SCA50KTL-DO/US-480, CPS SCA60KTL-DO/US-480, CPS SCA100KTL-DO/US-600, and CPS SCA125KTL-DO/US-600. These inverters are specified as a transformer-less inverters. Key performance parameters are summarized in Table 1-1 below.

**Table 1-1 Summary of Key Electrical Performance Parameters**

	<b>Rated ac Output Real Power</b>	<b>Maximum ac Apparent Power (kVA)</b>	<b>MPPT Voltage Range (V)</b>	<b>Absolute Maximum Voltage (V)</b>	<b>CEC Efficiency (%)</b>
CPS SCA50KTL-DO/US-480	50	55	480-850	1,000	98.5
CPS SCA60KTL-DO/US-480	60	66	540-850	1,000	98.5
CPS SCA100KTL-DO/US-600	100	111	870-1,300	1,500	98.5
CPS SCA125KTL-DO/US-600	125	132	870-1,300	1,500	98.5

Maximum Power ratings dependent on temperature and/or PF.

## 2 INVERTER DESCRIPTION

The CPS SCA50KTL-DO/US-480, CPS SCA60KTL-DO/US-480, CPS SCA100KTL-DO/US-600, and CPS SCA125KTL-DO/US-600 are 3-phase, PV string inverters systems rated at 55 kW, 60 kW, 100kW, and 125kW respectively. The inverters work at a quasi-fixed voltage. The datasheets for the four inverters are shown in Figure 2-1 and Figure 2-2.

For the CPS SCA50/60KTL-DO/US-480 and CPS SCA100/125KTL-DO/US-600 inverters, the power derates above 45°C. For the 50 kW inverter the power derates linearly to 27.5 kW at 60°C. For the 60 kW inverter, power derates linearly to 33.0 kW at 60°C. For the 100 kW inverter, power derates linearly to 70.0 kW at 60°C. For the 125 kW inverter, power derates linearly to 87.5 kW at 60°C. These aspects have been incorporated into the OND files.



Model Name	CPS SCA50KTL-DO/US-480	CPS SCA60KTL-DO/US-480
<b>DC Input</b>		
Max. PV Power	75kW (25kW per MPPT)	90kW (30kW per MPPT)
Max. DC Input Voltage		1000Vdc
Operating DC Input Voltage Range		200-950Vdc
Start-up DC Input Voltage / Power		330V / 80W
Number of MPP Trackers		3
MPPT Voltage Range @ PF>0.99 <sup>1</sup>	480-850Vdc	540-850Vdc
Max. PV Short-Circuit Current (Isc x 1.25)		180A (60A per MPPT)
Number of DC Inputs		15 inputs, 5 per MPPT
DC Disconnection Type		Load rated DC switch
DC Surge Protection		Type II MOV, 2800V <sub>C</sub> , 20kA I <sub>TM</sub> (8/20 <sub>μ</sub> S)
<b>AC Output</b>		
Rated AC Output Power @ PF>0.99 to ±0.91 <sup>2</sup>	50kW	60kW
Max. AC Apparent Power	55kVA	66kVA
Rated Output Voltage		480Vac
Output Voltage Range <sup>3</sup>		422 - 528Vac
Grid Connection Type		3Φ / PE / N (Neutral optional)
Max. AC Output Current @480Vac	66.2A	79.4A
Rated Output Frequency		60Hz
Output Frequency Range <sup>3</sup>		57 - 63Hz
Power Factor		>0.99 (±0.8 adjustable)
Current THD @ Rated Load		<3%
Max. Fault Current Contribution (1 Cycle RMS)		64.1A
Max. OCPD Rating	110A	125A
AC Disconnection Type		Load rated AC switch
AC Surge Protection		Type II MOV, 1240V <sub>C</sub> , 15kA I <sub>TM</sub> (8/20 <sub>μ</sub> S)
<b>System and Performance</b>		
Topology		Transformerless
Max. Efficiency		98.8%
CEC Efficiency		98.5%
Stand-by / Night Consumption		<1W
<b>Environment</b>		
Enclosure Protection Degree		NEMA Type 4X
Cooling Method		Variable speed cooling fans
Operating Temperature Range <sup>4</sup>		-22°F to +140°F / -30°C to +60°C <sup>4</sup>
Non-Operating Temperature Range <sup>5</sup>		No low temp minimum to +158°F / +70°C maximum <sup>5</sup>
Operating Humidity		0 to 95%, non-condensing
Operating Altitude		13123.4ft / 4000m (derating from 9842.5ft / 3000m)
Audible Noise		<60dBA @ 1m and 25°C
<b>Display and Communication</b>		
User Interface and Display		LCD+LED
Inverter Monitoring		Modbus RS485
Site Level Monitoring		CPS Flex Gateway (1 per 32 inverters)
Modbus Data Mapping		CPS
Remote Diagnostics / FW Upgrade Functions		Standard / (with Flex Gateway)
<b>Mechanical</b>		
Dimensions (HxWxD)		39.4 x 23.6 x 10.24in. (1000 x 600 x 260mm)
Weight		Inverter: 123.5lbs/56kg; Wire-box: 33lbs/15kg
Mounting / Installation Angle <sup>6</sup>		0 to 90 degrees from horizontal (vertical, angled, or lay flat) <sup>6</sup>
AC Termination <sup>7</sup>		M8 Stud Type Terminal Block (Wire range: #6 - 2/0AWG CU/AL <sup>7</sup> , Lugs not supplied)
DC Termination		Screw Clamp Fuse Holder (Wire range: #14 - #6AWG CU), Optional H4 (Amphenol)
Fused String Inputs (5 per MPPT)		15A fuses provided (Fuse values up to 30A acceptable)
<b>Safety</b>		
Certifications and Standards		UL1741SA-2016, UL1699B, CSA-C22.2 NO.107.1-01, IEEE1547a-2014; FCC PART15
Selectable Grid Standard and SRD		IEEE1547a-2014, CA Rule 21
Smart-Grid Features		Voltage-RideThru, Frequency-RideThru, Soft-Start, Volt-Var, Frequency-Watt, Volt-Watt
<b>Warranty</b>		
Standard		10 years
Extended Terms		15 and 20 years

1) See user manual for further information regarding MPPT Voltage Range when operating at non-unity PF.  
2) Active Power Derating begins; at PF=±0.91 to ±0.8  
3) The "Output Voltage Range" and "Output Frequency Range" may differ according to the specific grid standard.  
4) Active Power Derating begins; at 40°C when PF=±0.9 and MPPT ≥V<sub>min</sub>, at 45°C when PF=1 and MPPT ≥V<sub>min</sub>, and at 50°C when PF=1 and MPPT V ≥ 700Vdc  
5) See user manual for further requirements regarding non-operating conditions.  
6) Shade Cover accessory required for installation angles of 75 degrees or less.  
7) AL requires bi-metallic compression lug or bi-metallic adapter.

**Figure 2-1 Chint CPS SCA50/60KTL-DO/US-480 datasheet**



Model Name	CPS SCA100KTL-DO/US-600	CPS SCA125KTL-DO/US-600
<b>DC Input</b>		
Max. PV Power	150kW	187.5kW
Max. DC Input Voltage		1500V
Operating DC Input Voltage Range		860-1450Vdc
Start-up DC Input Voltage / Power		900V / 250W
Number of MPP Trackers		1
MPPT Voltage Range		870-1300Vdc
Max. PV Input Current (Isc x1.25)	220A	275A
Number of DC Inputs	16 inputs / per MPPT	20 inputs / per MPPT
DC Disconnection Type		Load rated DC switch
DC Surge Protection		Type II MOV, Up=2.5kV , In=20kA(8/20us)
<b>AC Output</b>		
Rated AC Output Power	100kW	125kW
Max. AC Output Power <sup>1</sup>	100kVA (111KVA @ PF>0.9)	125kVA (132KVA @ PF>0.95)
Rated Output Voltage		600Vac
Output Voltage Range <sup>2</sup>		528-660Vac
Grid Connection Type <sup>3</sup>		3Φ / PE / (N optional) Wye or Delta
Nominal AC Output Current @600Vac	106.9A	127.2A
Rated Output Frequency		60Hz
Output Frequency Range <sup>2</sup>		57-63Hz
Power Factor	>0.99 (±0.8 adjustable)	>0.99 (±0.8 adjustable)
Current THD		<3%
AC Disconnection Type		Load rated AC switch
AC Surge Protection		Type II MOV, Up=2.5kV , In=20kA(8/20us)
<b>System</b>		
Topology		Transformerless
Max. Efficiency		98.8%
CEC Efficiency		98.5%
Stand-by / Night Consumption		<2W
<b>Environment</b>		
Enclosure Protection Degree		NEMA Type 4X
Cooling Method		Variable speed cooling fans
Operating Temperature Range	-22°F to +140°F / -30°C to +60°C (derating from +113°F / +45°C)	
Non-Operating Temperature Range <sup>4</sup>		-40°F to +158°F / -40°C to +70°C maximum <sup>4</sup>
Operating Humidity		0-95%, non-condensing
Operating Altitude		8202ft / 2500mm (no derating)
Audible Noise		<65dBA@1m and 25°C
<b>Display and Communication</b>		
User Interface and Display		LED, WiFi + APP
Inverter Monitoring		Modbus RS485, PLC Option
Site Level Monitoring		CPS Flex Gateway (1 per 32 inverters)
Modbus Data Mapping		SunSpec/CPS
Remote Diagnostics/FW Upgrade Functions		Standard
<b>Mechanical</b>		
Dimensions (WxHxD)		45.28x24.25x9.84in (1150x616x250mm) with Standard Wire-box 39.37x24.25x9.84in (1000x616x250mm) with Centralized Wire-box
Weight		Inverter: 121lbs / 55kg; Wire-box: 55lbs / 25kg (standard); 33lbs / 15kg (centralized)
Mounting/Installation Angle		15 - 90 degrees from horizontal (vertical, angled)
AC Termination <sup>5</sup>		M8 Stud Type Terminal Block (Wire range: #6 - 3/0AWG CU/AL <sup>6</sup> , Lugs not supplied) Screw Clamp Fuse Holder (Wire range: 14AWG - 10AWG CU) - Standard Wire-box Screw Clamp Fuse Holder (Wire range: 1AWG - 250kcmil CU/AL, Lugs not supplied) - Centralized Wire-box
DC Termination		
Fused String Inputs (5 per MPPT)		15A fuses provided (Fuse values up to 30A acceptable)
<b>Safety</b>		
Safety and EMC Standard		UL1741SA-2016 <sup>6</sup> , UL1699B, CSA-C22.2 NO.107.1-01, IEEE1547a-2014; FCC PART15
Grid Standard <sup>6</sup>		IEEE 1547a-2014, CA Rule 21 <sup>6</sup>
Smart-Grid Features		Voltage-RideThru, Frequency-RideThru, Soft-Start, Volt-Var, Frequency-Watt
<b>Warranty</b>		
Standard		10 years
Extended Terms		15 and 20 years
<sup>1</sup> "Max. AC Apparent Power" rating valid within MPPT voltage range and temperature range of -30°C to +40°C (-22°F to +104°F) for 100KW PF ≥0.9 and 125KW PF ≥0.95 <sup>2</sup> The "Output Voltage Range" and "Output Frequency Range" may differ according to the specific grid standard. <sup>3</sup> Wye neutral-grounded, Delta may not be corner-grounded. <sup>4</sup> See user manual for further requirements regarding non-operating conditions. <sup>5</sup> AL requires bi-metallic compression lug or bi-metallic adapter. <sup>6</sup> Certifications Pending.		

Figure 2-2 Chint CPS SCA100/125KTL-DO/US-600 datasheet



### 3 EFFICIENCY CURVES

For the PVsyst inverter models (.OND file), DNV GL reviewed efficiency data provided by the California Energy Commission (CEC) test data witnessed by CSA, an internationally-accredited standards development and testing & certification organization. The data for the 50/60 kW inverters were available on the Go Solar California website<sup>1</sup>, the data for the 100/125 kW inverters were provided by Chint and expect to be on the Go Solar California website in the near future. The performance test results for inverters presented on this website are performed by a Nationally Recognized Testing Laboratory according to protocols adopted by the CEC. The test results are provided from three input voltages. For each input voltage, results are reported for a range of power levels ranging from 10% to 100%. The CEC weighted efficiency is calculated by weighting the measured efficiency at various rated power levels by assigned weighting factors which correspond to the percentage of time that an inverter is expected to reside in a particular range of operation.

CEC efficiency curves are reported with output power, input voltage and corresponding efficiency. PVsyst efficiency curves, however, are defined by input power. In order to convert the CEC efficiency data into an equivalent format for PVsyst, DNV GL converts the output power into input power using the inverter's corresponding efficiency.

The efficiency curves at multiple input voltages are shown in Figure 3-1.

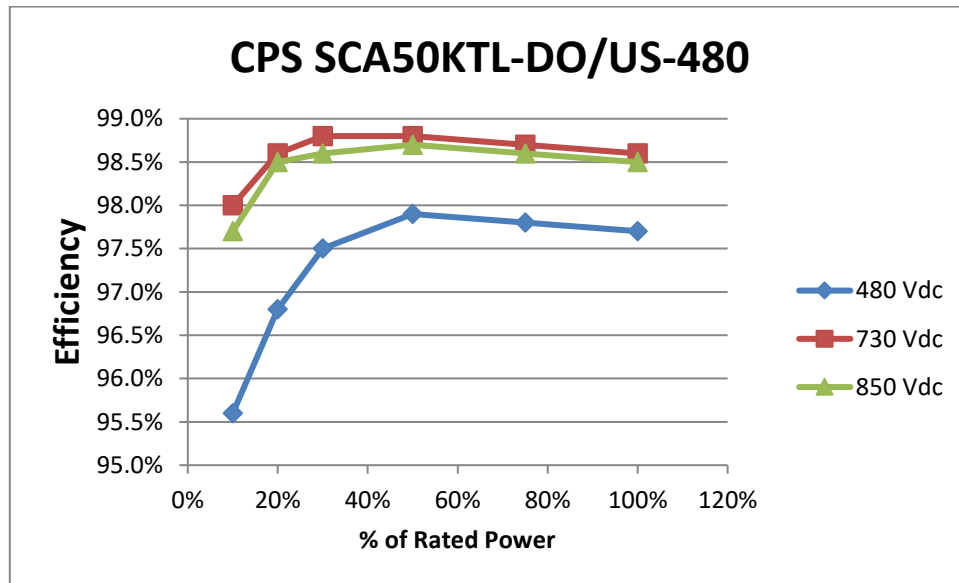


Figure 3-1 CEC Efficiency Curves for CPS SCA50KTL-DO/US-480 Inverter

<sup>1</sup> [http://www.gosolarcalifornia.ca.gov/equipment/inverter\\_tests/summaries/](http://www.gosolarcalifornia.ca.gov/equipment/inverter_tests/summaries/)

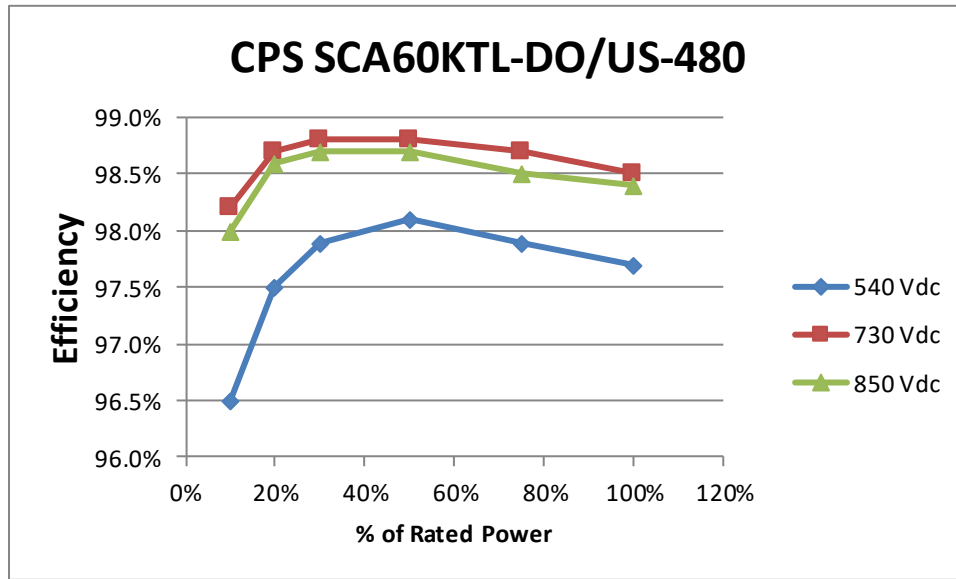


Figure 3-2 CEC Efficiency Curves for CPS SCA60KTL-DO/US-480 Inverter

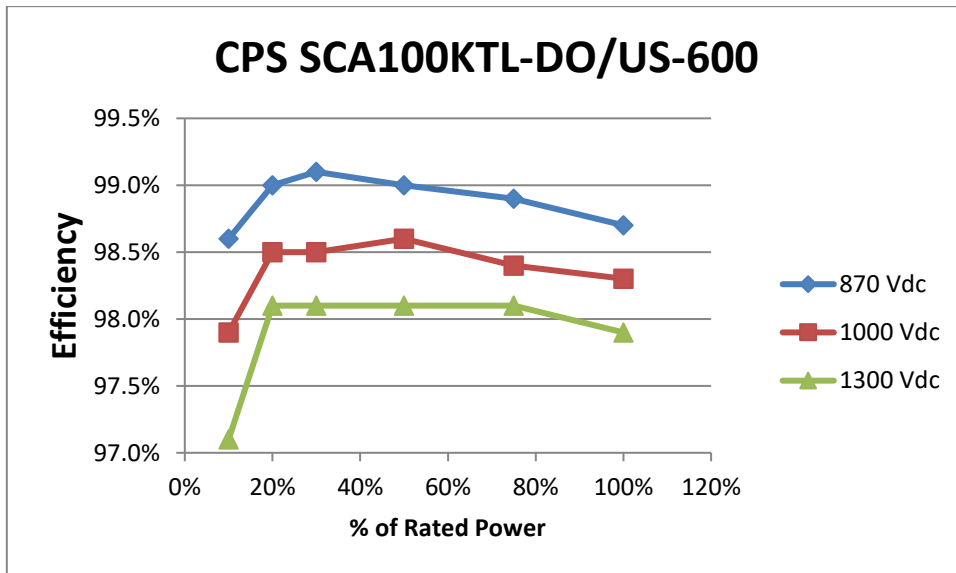
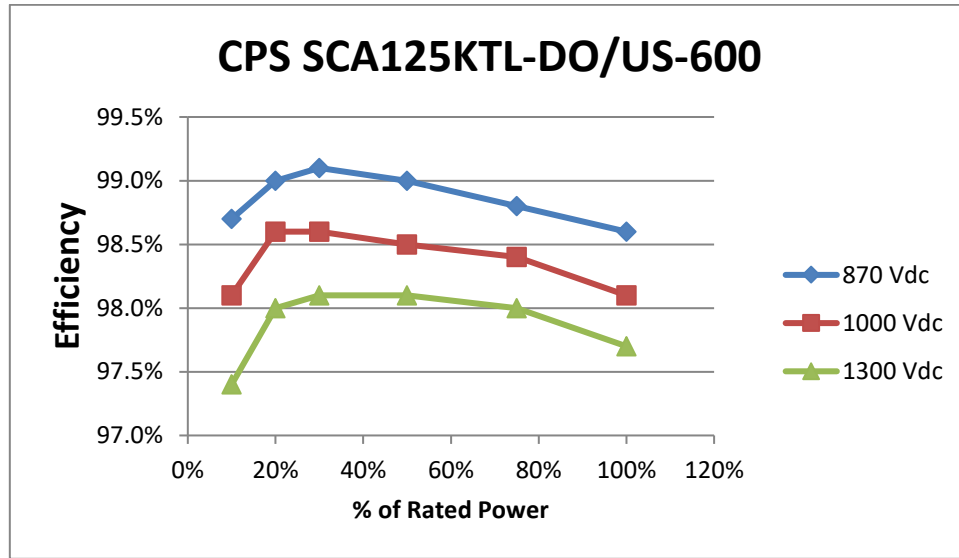


Figure 3-3 CEC Efficiency Curves for CPS SCA100KTL-DO/US-600 Inverter



**Figure 3-4 CEC Efficiency Curves for CPS SCA125KTL-DO/US-600 Inverter**

## 4 SUMMARY

DNV GL has reviewed and confirms that the model file for the CPS SCA50KTL-DO/US-480, CPS SCA60KTL-DO/US-480, CPS SCA100KTL-DO/US-600, and CPS SCA125KTL-DO/US-600 inverters accurately reflects the electrical parameters taken from the datasheets and the independent test results described above. Printouts of the parameters in the PVsyst model files are shown in Section 5.

Please note that inverter model file (.OND) is applicable to PVsyst version 6.



## 5 PVSYST OUTPUT

### Characteristics of a grid inverter

Manufacturer, model : **Chint Power Systems, CPS SCA50KTL-DO/US-480**  
 Data source : Manufacturer 2018

**Input characteristics (PV array side)**

Operating mode	<b>MPPT</b>		
<b>Minimum MPP Voltage</b>	<b>Vmin 200 V</b>	Nominal PV Power	Pnom DC 50 kW
<b>Maximum MPP Voltage</b>	<b>Vmax 850 V</b>	Maximum PV Power	Pmax DC 75 kW
Absolute max. PV Voltage	Vmax array 1000 V	Maximum PV Current	Imax DC N/A A
Min. Voltage for PNom	Vmin PNom 480 V	Power Threshold	Pthresh. 80 W
<b>"String" inverter with input protections</b>		Number of string inputs	15
<b>Multi MPPT capability</b>		Number of MPPT inputs	3
Behaviour at Vmin/Vmax	Limitation	Behaviour at Pnom	Limitation

**Output characteristics (AC grid side)**

Grid Voltage	Unom 480 V	<b>Nominal AC Power</b>	<b>Pnom AC 50 kWac</b>
Grid frequency	Freq 60 Hz Triphased	Maximum AC Power	Pmax AC 55 kWac
		Nominal AC current	Inom AC 60 A
		Maximum AC current	Imax AC 66 A
<b>Efficiency defined for 3 voltages</b>		480 V	730 V 850 V
Maximum efficiency	97.9 %	98.8 %	98.7 %
European average efficiency	97.6 %	98.7 %	98.6 %

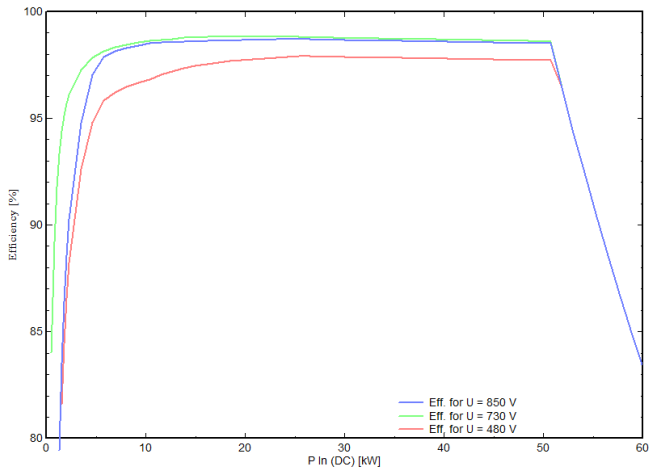
**Remarks and Technical features**

Array nominal power should be lower than then Max. PV Power,  
 This is a contractual requirement of the manufacturer.  
 Array isolation monitoring, Internal DC switch,  
 Internal AC switch,

Sizes: Width 600 mm  
 Height 1000 mm  
 Depth 260 mm  
 Weight 60.00 kg

Technology: Without transformer, IGBT, 20KHz, FE  
 Protection : -30 +60°C, NEMA4X: indoor/outdoor  
 Control: LCD  
 Approved by DNVGL February 2018. Using CEC effeiciency data and parameters from the Chint Data Sheet101217-P .

**Efficiency profile vs Input power**



### Characteristics of a grid inverter

Manufacturer, model : **Chint Power Systems, CPS SCA60KTL-DO/US-480**

Data source : Manufacturer 2018

#### Input characteristics (PV array side)

Operating mode	<b>MPPT</b>				
<b>Minimum MPP Voltage</b>	<b>Vmin</b>	<b>200 V</b>	Nominal PV Power	Pnom DC	60 kW
<b>Maximum MPP Voltage</b>	<b>Vmax</b>	<b>850 V</b>	Maximum PV Power	Pmax DC	90 kW
Absolute max. PV Voltage	Vmax array	1000 V	Maximum PV Current	Imax DC	N/A A
Min. Voltage for PNom	Vmin PNom	540 V	Power Threshold	Pthresh.	80 W
<b>"String" inverter with input protections</b>			Number of string inputs	15	
<b>Multi MPPT capability</b>			Number of MPPT inputs	3	
Behaviour at Vmin/Vmax	Limitation		Behaviour at Pnom	Limitation	

#### Output characteristics (AC grid side)

Grid Voltage	Unom	480 V	<b>Nominal AC Power</b>	<b>Pnom AC</b>	<b>60 kWac</b>
Grid frequency	Freq	60 Hz	Maximum AC Power	Pmax AC	66 kWac
	Triphased		Nominal AC current	Inom AC	72 A
			Maximum AC current	Imax AC	79 A
<b>Efficiency defined for 3 voltages</b>	540 V	730 V	850 V		
Maximum efficiency	98.1 %	98.8 %	98.7 %		
European average efficiency	97.9 %	98.7 %	98.5 %		

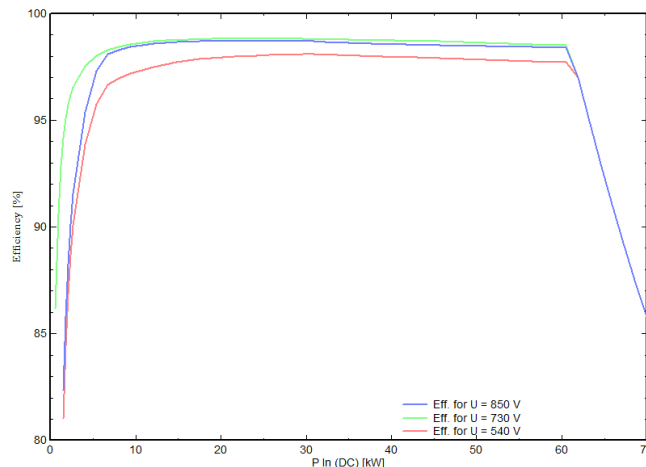
#### Remarks and Technical features

Array nominal power should be lower than then Max. PV Power,  
 This is a contractual requirement of the manufacturer.  
 Array isolation monitoring, Internal DC switch,  
 Internal AC switch,

Sizes: Width 600 mm  
 Height 1000 mm  
 Depth 260 mm  
 Weight 60.00 kg

Technology: Without transformer, IGBT, 20KHz, FE  
 Protection : -30 +60°C, NEMA4X: indoor/outdoor  
 Control: LCD  
 Approved by DNVGL February 2018. Using CEC efficeincy data and parameters from the Chint Data Sheet101217-P .

**Efficiency profile vs Input power**



### Characteristics of a grid inverter

Manufacturer, model : **Chint Power Systems, CPS SCA100KTL-DO/US-600**

Data source : Manufacturer 2018

#### Input characteristics (PV array side)

Operating mode	<b>MPPT</b>					
<b>Minimum MPP Voltage</b>	<b>Vmin</b>	<b>870 V</b>	Nominal PV Power	Pnom DC	150 kW	
<b>Maximum MPP Voltage</b>	<b>Vmax</b>	<b>1300 V</b>	Maximum PV Power	Pmax DC	150 kW	
Absolute max. PV Voltage	Vmax array	1500 V	Maximum PV Current	Imax DC	N/A A	
Min. Voltage for PNom	Vmin PNom	860 V	Power Threshold	Pthresh.	250 W	
<b>"String" inverter with input protections</b>			Number of string inputs	16		
Behaviour at Vmin/Vmax			Limitation	Behaviour at Pnom		Limitation

#### Output characteristics (AC grid side)

Grid Voltage	Unom	600 V	<b>Nominal AC Power</b>	<b>Pnom AC</b>	<b>100 kWac</b>
Grid frequency	Freq	60 Hz	Maximum AC Power	Pmax AC	111 kWac
	Triphased		Nominal AC current	Inom AC	107 A
			Maximum AC current	Imax AC	107 A
<b>Efficiency defined for 3 voltages</b>	870 V	1000 V	1300 V		
Maximum efficiency	99.1 %	98.6 %	98.1 %		
European average efficiency	98.9 %	98.4 %	98.0 %		

#### Remarks and Technical features

Array nominal power should be lower than then Max. PV Power,  
 This is a contractual requirement of the manufacturer.  
 Array isolation monitoring, Internal DC switch,  
 Internal AC switch,

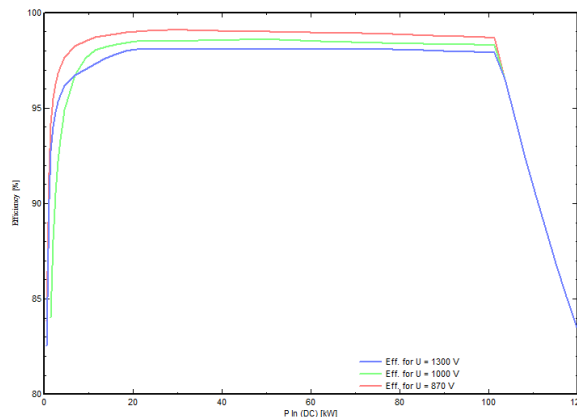
Sizes: Width 1150 mm  
 Height 616 mm  
 Depth 250 mm  
 Weight 55.00 kg

Technology: Without transformer, IGBT, 20KHz, FE  
 Protection : -30 +60°C, NEMA4X: indoor/outdoor  
 Control: LCD

Approved by DNVGL March 2018. Using CEC efficeincy data and parameters from the Chint Data Sheet 2018/01-MKT NA and user manual revision 1.0 Feb 2018.

Additional derating above 1,300Vdc and below nominal grid voltage per the installation manual.

**Efficiency profile vs Input power**



### Characteristics of a grid inverter

Manufacturer, model : **Chint Power Systems, CPS SCA125KTL-DO/US-600**

Data source : Manufacturer 2018

#### Input characteristics (PV array side)

Operating mode	<b>MPPT</b>					
<b>Minimum MPP Voltage</b>	<b>Vmin</b>	<b>870 V</b>	Nominal PV Power	Pnom DC	188 kW	
<b>Maximum MPP Voltage</b>	<b>Vmax</b>	<b>1300 V</b>	Maximum PV Power	Pmax DC	188 kW	
Absolute max. PV Voltage	Vmax array	1500 V	Maximum PV Current	Imax DC	N/A A	
Min. Voltage for PNom	Vmin PNom	860 V	Power Threshold	Pthresh.	250 W	
<b>"String" inverter with input protections</b>			Number of string inputs	20		
Behaviour at Vmin/Vmax			Limitation	Behaviour at Pnom		Limitation

#### Output characteristics (AC grid side)

Grid Voltage	Unom	600 V	<b>Nominal AC Power</b>	<b>Pnom AC</b>	<b>125 kWac</b>
Grid frequency	Freq	60 Hz	Maximum AC Power	Pmax AC	132 kWac
	Triphased		Nominal AC current	Inom AC	127 A
			Maximum AC current	Imax AC	127 A
<b>Efficiency defined for 3 voltages</b>	870 V	1000 V	1300 V		
Maximum efficiency	99.1 %	98.6 %	98.1 %		
European average efficiency	98.9 %	98.4 %	98.0 %		

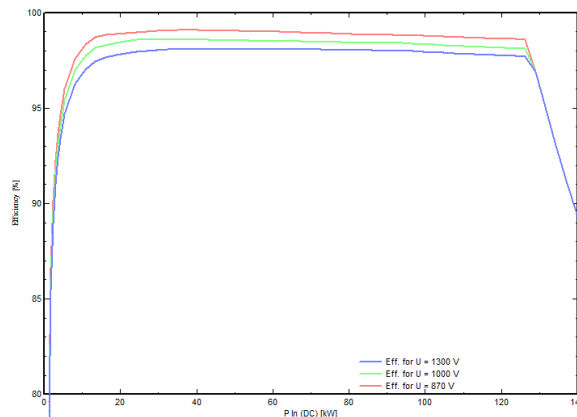
#### Remarks and Technical features

Array nominal power should be lower than then Max. PV Power,  
 This is a contractual requirement of the manufacturer.  
 Array isolation monitoring, Internal DC switch,  
 Internal AC switch,

Sizes: Width 1150 mm  
 Height 616 mm  
 Depth 250 mm  
 Weight 55.00 kg

Technology: Without transformer, IGBT, 20KHz, FE  
 Protection : -30 +60°C, NEMA4X: indoor/outdoor  
 Control: LCD  
 Approved by DNVGL March 2018. Using CEC efficeincy data and parameters from the Chint Data Sheet 2018/01-MKT NA and user manual revision 1.0 Feb 2018.  
 Additional derating above 1,300Vdc and below nominal grid voltage per the installation manual.

**Efficiency profile vs Input power**







## **ABOUT DNV GL**

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