



### Brief introduction of Products

The models under test are dual input three -phase PV inverter which shall be installed and connected to the grid network after installation. The input connectors for each model are identical to each other.

All models are identical to each other, except the model name, parameter setting of software used to the limit the output power and some components used, see table 1 for details.

Size: 530mmx650mmx230mm(WxHxD)

The maximum ambient temperature permitted by the manufacturer's specification is 60°C. When the ambient temperature exceeds 45°C, the max. output power rating will be reduced by 3.6% from rated load per degree temperature rise from 45°C to 60°C

**Table 1: Model differences list**

Reference Position	GW10K-DT	GW12K-DT	GW15K-DT	GW17K-DT	Comments
L <sub>R</sub> , L <sub>S</sub> , L <sub>T</sub>	141-10012-00	141-10012-00	141-10011-00	141-10011-00	Inverter Choke
C328, C316	NC	800V/50uF	800V/50uF	800V/50uF	Inverter Bus Capacitor
C327, C315	NC	NC	800V/50uF	800V/50uF	
C326, C314	NC	NC	NC	800V/50uF	
R545	NC	NC	5.6kΩ	5.6kΩ	Model Identify Resistor
R546	10 kΩ	10 kΩ	NC	NC	
R547	NC	5.6 kΩ	NC	5.6 kΩ	
R548	10 kΩ	NC	10 kΩ	NC	
Q105, Q106	1200V/25A	1200V/25A	1200V/40A	1200V/40A	Boost Main MOSFET
D112	NC	NC	1200V/75A	1200V/75A	Clamping Diode
R446, R508, R536	620Ω	620Ω	200Ω	200Ω	Inverter current sampling resistor
PV input connector in parallel	4	4	6	6	Number of input connectors
Remark: NC= not connected					

### Summary of testing:

All test performed on modes GW17K-DT and GW10K-DT, which gave rise the worst result. The evaluation for other models can be covered by these tests.

**A.1 Requirements to the Test Report on Generation Units (DIN V VDE V 0124-100)**  
**F.3 Requirements for the test report for power generation units (VDE-AR-N 4105)**

Extract from the test report on the certificate of units		No. 2011-nnnn (serial number) : Engineering sample								
Type of installation:	<b>PV Inverter</b>	Manufacturer instructions								
Installation manufacturer:	<b>N/A</b>	Type of installation: <b>PV-WR</b> (BHWK, PV-WR,...)								
		Effective realpower of normal output in nominal conditions):							<b>10kW to 17kW</b>	
		Rating voltage: <b>See marking plate</b> <span style="float: right;">V</span>								
Period of measurement: <b>From 2012-03-20 to 2012-04-30</b>										
Effective real power $P_{E_{max}}$ <b>10kW for model GW10K-DT</b>										
Reference to idle power										
Effective real power $P/P_n$ [%]	10	20	30	40	50	60	70	80	90	100
Maximum possible $\cos\phi$ under-excited	-	0.897	0.901	0.893	0.9	0.898	0.903	0.906	0.905	-
Maximum possible $\cos\phi$ over-excited	-	0.898	0.896	0.899	0.893	0.901	0.898	0.896	0.904	-
Effective efficiency $P_{E_{max}}$ <b>17kW model GW17K-DT</b>										
Reference to idle power										
Effective real power $y P/P_n$ [%]	10	20	30	40	50	60	70	80	90	100
Maximum possible $\cos\phi$ under-excited	-	0.8998	0.9029	0.8979	0.9028	0.8999	0.9022	0.9042	0.9057	-
Maximum possible $\cos\phi$ over-excited	-	0.9045	0.9024	0.9023	0.8981	0.9050	0.9025	0.9010	0.9027	-

<b>10kW for model GW10K-DT</b>										
Observation of a fixedly specified shift factor $\cos\phi$										
Specification in the installation control	0.900over		1.000				0.900 under			
Measured value on the terminals of EZE	0.901		1.00				0.904			
$S_{E_{max}}$ (VA)	10000		10000				10000			
$P_{E_{max}}$ (W)	9242.6		9931.0				9370.8			
<b>17kW model GW17K-DT</b>										
Observation of a fixedly specified shift factor $\cos\phi$										
Specification in the installation control	0.900over		1.000				0.900 under			
Measured value on the terminals of EZE	0.9078		0.9953				0.9083			
$S_{E_{max}}$ (VA)	17000		17000				17000			
$P_{E_{max}}$ (W)	15400		16977.5				15525.1			
Transient response of idle power – standard $\cos\phi$ characteristic curve (P)										
Effective efficiency $P/P_n$ [%]	10	20	30	40	50	60	70	80	90	100
$\cos\phi$	0.935	0.981	0.990	0.992	0.996	0.969	0.950	0.925	0.909	0.909
The standard characteristic curve of $\cos\phi(P)$ is being observed.										

<b>17kW model GW17K-DT</b>										
Switching actions										
Switching on without specification (to the primary energy carrier)	$k_1$	0.20								
Most unfavorable case when switching between generator levels	$k_1$	-								
Switching on during nominal conditions (of the primary energy carrier)	$k_1$	1.05								
Switching off during normal output	$k_1$	1.04								
Worst value of all switching operations	$k_{imax}$	1.04								
Flicker Angle of network impedance $\Psi_k$ :	32° <sup>1)</sup>	50°	70°	85°						
Flicker coefficient of installations $c\Psi$ :	2.31	-	-	-						
Remark: 1) RA = 0,24 _; XA = j 0,15 _ at 50 Hz network impedance used for most unfavorable condition which is approximately 32° flicker angle.										

**Table 5.1.4 Harmonics and Inter-harmonics**

Harmonic vibrations for GW17K-DT											
Real power $P/P_n$ [%]	0	10	20	30	40	50	60	70	80	90	100
Ordinal number	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2	0.262	0.396	0.481	0.550	0.622	0.673	0.752	0.799	0.851	0.855	0.901
3	0.123	0.183	0.243	0.262	0.282	0.298	0.349	0.359	0.371	0.305	0.305
4	0.025	0.051	0.057	0.061	0.072	0.082	0.092	0.095	0.109	0.114	0.139
5	0.096	0.112	0.142	0.149	0.155	0.161	0.164	0.167	0.175	0.174	0.177
6	0.149	0.183	0.167	0.173	0.190	0.206	0.224	0.245	0.258	0.271	0.286
7	0.032	0.022	0.029	0.034	0.037	0.042	0.047	0.052	0.056	0.058	0.064
8	0.114	0.161	0.138	0.158	0.177	0.192	0.208	0.223	0.233	0.246	0.258
9	0.031	0.038	0.047	0.051	0.052	0.055	0.057	0.061	0.064	0.070	0.067
10	0.019	0.020	0.030	0.033	0.033	0.038	0.042	0.044	0.046	0.048	0.049
11	0.021	0.026	0.030	0.029	0.029	0.033	0.040	0.044	0.045	0.050	0.050
12	0.056	0.036	0.092	0.135	0.163	0.180	0.201	0.214	0.226	0.235	0.241
13	0.016	0.015	0.021	0.024	0.026	0.029	0.034	0.034	0.037	0.038	0.037
14	0.043	0.061	0.083	0.128	0.160	0.180	0.200	0.215	0.224	0.233	0.236
15	0.022	0.017	0.029	0.033	0.037	0.039	0.043	0.044	0.047	0.042	0.037
16	0.013	0.019	0.021	0.021	0.025	0.026	0.028	0.028	0.032	0.033	0.034
17	0.014	0.022	0.022	0.025	0.031	0.035	0.037	0.039	0.042	0.038	0.036
18	0.033	0.071	0.074	0.102	0.131	0.151	0.172	0.189	0.200	0.209	0.214
19	0.008	0.011	0.014	0.016	0.020	0.023	0.028	0.030	0.031	0.031	0.032
20	0.032	0.051	0.080	0.104	0.133	0.153	0.174	0.192	0.205	0.214	0.217
21	0.009	0.011	0.014	0.017	0.023	0.028	0.032	0.035	0.036	0.035	0.032
22	0.009	0.012	0.014	0.016	0.019	0.021	0.024	0.027	0.030	0.030	0.032
23	0.015	0.024	0.032	0.036	0.039	0.041	0.048	0.052	0.052	0.051	0.047
24	0.030	0.040	0.086	0.102	0.121	0.136	0.156	0.172	0.184	0.194	0.198
25	0.007	0.011	0.016	0.018	0.020	0.022	0.027	0.029	0.029	0.029	0.032
26	0.030	0.058	0.090	0.109	0.128	0.142	0.161	0.177	0.190	0.199	0.201
27	0.017	0.019	0.027	0.030	0.035	0.039	0.044	0.047	0.048	0.042	0.041
28	0.007	0.015	0.019	0.018	0.020	0.022	0.024	0.026	0.030	0.033	0.033
29	0.013	0.014	0.016	0.020	0.024	0.029	0.035	0.040	0.040	0.039	0.037
30	0.032	0.067	0.079	0.098	0.113	0.123	0.136	0.148	0.157	0.166	0.177
31	0.007	0.011	0.014	0.016	0.019	0.023	0.027	0.028	0.029	0.027	0.030
32	0.031	0.060	0.085	0.106	0.121	0.131	0.143	0.155	0.165	0.175	0.177
33	0.007	0.018	0.019	0.019	0.025	0.030	0.036	0.040	0.043	0.040	0.038
34	0.008	0.018	0.022	0.022	0.025	0.027	0.030	0.031	0.036	0.037	0.037
35	0.011	0.026	0.024	0.027	0.030	0.034	0.042	0.048	0.052	0.055	0.055
36	0.024	0.064	0.084	0.095	0.105	0.110	0.118	0.125	0.131	0.137	0.150
37	0.008	0.010	0.015	0.016	0.019	0.021	0.023	0.023	0.025	0.028	0.030
38	0.028	0.082	0.090	0.098	0.108	0.117	0.123	0.130	0.137	0.145	0.147
39	0.011	0.016	0.017	0.020	0.025	0.030	0.038	0.045	0.050	0.052	0.057
40	0.007	0.023	0.034	0.036	0.039	0.039	0.040	0.041	0.044	0.045	0.043
Remark: $P_n$ refer to the current related to 100% nominal output power.											
Output voltage of the artificial mains network	230V										

**b, Inter-harmonics:**

Inter-harmonic vibrations for GW17K-DT											
Real power $P/P_n$ [%]	0	10	20	30	40	50	60	70	80	90	100
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
75	0.014	0.029	0.049	0.065	0.083	0.103	0.124	0.132	0.160	0.165	0.200
125	0.009	0.020	0.034	0.045	0.060	0.074	0.086	0.092	0.113	0.108	0.137
175	0.035	0.025	0.039	0.050	0.059	0.072	0.084	0.091	0.106	0.098	0.123
225	0.043	0.023	0.032	0.041	0.046	0.053	0.060	0.066	0.072	0.079	0.064
275	0.026	0.015	0.027	0.035	0.041	0.050	0.057	0.060	0.069	0.063	0.081
325	0.021	0.014	0.030	0.036	0.044	0.051	0.057	0.063	0.067	0.074	0.050
375	0.008	0.012	0.023	0.026	0.031	0.037	0.042	0.046	0.052	0.058	0.053
425	0.007	0.011	0.021	0.024	0.030	0.037	0.044	0.049	0.053	0.060	0.060
475	0.014	0.012	0.025	0.031	0.040	0.045	0.053	0.059	0.063	0.070	0.073
525	0.014	0.011	0.020	0.028	0.034	0.040	0.045	0.047	0.053	0.056	0.050
575	0.008	0.012	0.021	0.027	0.032	0.038	0.042	0.049	0.052	0.056	0.057
625	0.010	0.012	0.018	0.028	0.035	0.041	0.049	0.052	0.058	0.059	0.055
675	0.007	0.011	0.016	0.021	0.026	0.032	0.037	0.040	0.048	0.049	0.047
725	0.006	0.011	0.015	0.021	0.024	0.030	0.035	0.039	0.044	0.045	0.045
775	0.010	0.014	0.018	0.026	0.031	0.037	0.043	0.049	0.053	0.058	0.057
825	0.009	0.013	0.018	0.023	0.029	0.035	0.040	0.044	0.048	0.048	0.048
875	0.009	0.013	0.018	0.023	0.029	0.033	0.039	0.045	0.049	0.051	0.049
925	0.008	0.013	0.019	0.023	0.031	0.037	0.044	0.048	0.051	0.052	0.052
975	0.006	0.011	0.016	0.018	0.022	0.028	0.033	0.037	0.041	0.043	0.043
1025	0.006	0.010	0.015	0.017	0.021	0.026	0.033	0.038	0.041	0.043	0.043
1075	0.007	0.010	0.018	0.022	0.027	0.033	0.040	0.046	0.051	0.054	0.054
1125	0.008	0.010	0.017	0.021	0.026	0.031	0.038	0.043	0.045	0.048	0.049
1175	0.007	0.010	0.017	0.022	0.027	0.030	0.036	0.044	0.048	0.051	0.050
1225	0.006	0.010	0.018	0.022	0.028	0.032	0.040	0.043	0.048	0.051	0.053
1275	0.005	0.009	0.014	0.017	0.020	0.025	0.031	0.035	0.038	0.043	0.043
1325	0.005	0.009	0.013	0.016	0.020	0.024	0.028	0.032	0.034	0.038	0.039
1375	0.006	0.010	0.016	0.020	0.024	0.029	0.033	0.040	0.044	0.049	0.051
1425	0.006	0.010	0.016	0.020	0.024	0.029	0.035	0.039	0.041	0.045	0.046
1475	0.007	0.010	0.016	0.021	0.025	0.028	0.032	0.040	0.044	0.046	0.046
1525	0.007	0.011	0.016	0.021	0.025	0.030	0.036	0.039	0.042	0.047	0.049
1575	0.006	0.009	0.012	0.014	0.017	0.021	0.025	0.029	0.033	0.037	0.038
1625	0.005	0.008	0.011	0.014	0.017	0.020	0.024	0.028	0.030	0.033	0.036
1675	0.006	0.008	0.014	0.018	0.022	0.026	0.029	0.034	0.039	0.044	0.046
1725	0.006	0.008	0.015	0.019	0.024	0.028	0.031	0.034	0.036	0.040	0.040
1775	0.007	0.008	0.015	0.019	0.024	0.026	0.030	0.037	0.041	0.043	0.040
1825	0.006	0.008	0.014	0.019	0.023	0.029	0.033	0.036	0.039	0.044	0.050
1875	0.006	0.007	0.011	0.015	0.018	0.019	0.024	0.028	0.033	0.037	0.039
1925	0.006	0.006	0.010	0.013	0.018	0.021	0.025	0.030	0.034	0.040	0.041
1975	0.006	0.007	0.012	0.015	0.018	0.021	0.026	0.034	0.041	0.049	0.056

Remark: Pn refer to the current related to 100% nominal output power.

Output voltage of the artificial mains network	230V
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c, Highest frequency harmonics:

Highest frequency harmonic vibrations for GW17K-DT											
Real power $P/P_n$ [%]	0	10	20	30	40	50	60	70	80	90	100
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2.1	0.035	0.084	0.104	0.108	0.116	0.123	0.132	0.146	0.161	1.732	2.256
2.3	0.025	0.028	0.050	0.055	0.059	0.063	0.068	0.072	0.076	1.663	2.173
2.5	0.033	0.025	0.043	0.051	0.056	0.059	0.063	0.066	0.068	1.561	2.091
2.7	0.037	0.046	0.047	0.050	0.055	0.058	0.059	0.062	0.065	1.826	2.075
2.9	0.023	0.024	0.034	0.035	0.037	0.041	0.044	0.048	0.051	1.826	2.062
3.1	0.040	0.035	0.040	0.041	0.041	0.044	0.048	0.049	0.049	1.745	2.007
3.3	0.043	0.040	0.044	0.047	0.049	0.050	0.057	0.058	0.058	1.958	1.944
3.5	0.033	0.031	0.037	0.041	0.043	0.046	0.050	0.052	0.054	1.813	1.932
3.7	0.029	0.028	0.036	0.041	0.044	0.047	0.050	0.052	0.051	1.637	2.030
3.9	0.036	0.037	0.045	0.049	0.052	0.053	0.059	0.061	0.060	1.757	2.171
4.1	0.035	0.037	0.041	0.045	0.049	0.053	0.053	0.057	0.062	1.777	2.316
4.3	0.023	0.027	0.031	0.033	0.036	0.038	0.045	0.046	0.044	1.832	2.428
4.5	0.019	0.020	0.026	0.027	0.030	0.033	0.036	0.038	0.038	1.951	2.494
4.7	0.016	0.017	0.020	0.022	0.023	0.025	0.027	0.029	0.030	2.000	2.527
4.9	0.016	0.017	0.019	0.021	0.022	0.024	0.026	0.027	0.028	2.021	2.515
5.1	0.015	0.016	0.018	0.019	0.021	0.023	0.024	0.026	0.027	1.979	2.442
5.3	0.014	0.014	0.017	0.017	0.018	0.019	0.020	0.021	0.022	1.875	2.290
5.5	0.016	0.015	0.017	0.017	0.018	0.018	0.020	0.020	0.020	1.802	2.105
5.7	0.013	0.014	0.015	0.016	0.016	0.017	0.018	0.019	0.019	1.745	1.944
5.9	0.013	0.013	0.014	0.015	0.015	0.016	0.017	0.017	0.017	1.635	1.847
6.1	0.014	0.013	0.014	0.015	0.015	0.016	0.017	0.017	0.017	1.597	1.799
6.3	0.014	0.013	0.014	0.014	0.014	0.015	0.016	0.016	0.016	1.627	1.764
6.5	0.013	0.013	0.014	0.014	0.014	0.014	0.015	0.015	0.015	1.592	1.689
6.7	0.013	0.012	0.013	0.014	0.014	0.014	0.015	0.015	0.015	1.497	1.606
6.9	0.012	0.012	0.013	0.013	0.013	0.013	0.014	0.014	0.014	1.526	1.516
7.1	0.012	0.012	0.012	0.013	0.013	0.013	0.014	0.013	0.014	1.528	1.422
7.3	0.012	0.012	0.012	0.013	0.013	0.013	0.013	0.013	0.013	1.390	1.350
7.5	0.011	0.011	0.012	0.012	0.012	0.012	0.013	0.013	0.013	1.382	1.295
7.7	0.011	0.011	0.012	0.012	0.012	0.012	0.012	0.013	0.013	1.382	1.276
7.9	0.011	0.011	0.012	0.012	0.012	0.012	0.012	0.012	0.013	1.262	1.272
8.1	0.011	0.011	0.011	0.012	0.012	0.012	0.012	0.012	0.012	1.168	1.282
8.3	0.011	0.011	0.011	0.012	0.012	0.012	0.012	0.012	0.012	1.128	1.275
8.5	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.013	1.064	1.257
8.7	0.011	0.011	0.011	0.012	0.012	0.012	0.012	0.012	0.012	1.028	1.233
8.9	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.013	0.013	1.028	1.219

Remark: Pn refer to the current related to 100% nominal output power.

<b>Output voltage of the artificial mains network</b>	230
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A.2 Requirements to the Test Report on the NA Protection (DIN V VDE V 0124-100)			
F.4 Requirement for the test report for the NS protection (VDE-AR-N 4105)			
Extract from the test report for the NA protection		No. YYYY-nnnn (serial number) : Engineering sample	
"Determination of electric properties"			
<input type="checkbox"/> <b>NA Protection as Central NA Protection</b> <i>N/A, PV inverter regarded as power unit, conformity should be evaluated in final system</i>			
Type of NA protection: _____		Other manufacturer instructions	
Software version: _____			
Manufacturer: _____			
Period of measurement: From YYYY-MM-DD to YYYY-MM-DD			
Protective function	Control value	Release value	Delay-time action of NA protection <sup>a</sup>
Protection of voltage reduction $U <$	$0.8 * U_n$	$* U_n$	ms
Protection of voltage increase $U >$	$1.1 * U_n$	$* U_n$	ms
Protection of voltage increase $U >>$	$1.15 * U_n$	$* U_n$	ms
Protection of frequency reduction $f <$	47.5Hz	Hz	ms
Protection of frequency multiplication $f >$	51.5Hz	Hz	ms
<sup>a</sup> The release time includes the period of time from the violation of the limiting value $U/f$ to the release signal on the coupling switch. When planning the generation plant, the time element of the coupling switch must be added to the highest upper ascertained standing value. The switch-off time (total of release time of NA protection plus time element of the coupling switch) must not exceed 200 ms.			
<input checked="" type="checkbox"/> <b>NA Protection as Central NA Protection</b>			
Type of NA protection: Integrated NS protection		Other manufacturer instructions	
Software version: Master cpu: V 1.00, Slave cpu: V1.00		Assigned to generator unit, type Type of switching arrangement 2	
Manufacturer: Jiangsu Goodwe Power Supply Technology Co., Ltd.			
Period of measurement: From 2012-03-20 to 2012-04-30			
Protective function	Target value	Release value	Switch-off Time
Protection of voltage reduction $U <$	$0.8 * U_n$	$0.85 * U_n$	89.8ms
Protection of voltage increase $U >$	$1.1 * U_n$	$1.1 * U_n$	101.2 ms
Protection of voltage increase $U >>$	$1.15 * U_n$	$1.1 * U_n$	78.1ms
Protection of frequency reduction $f <$	47.5Hz	47.53Hz	86 ms
Protection of frequency multiplication $f >$	51.5Hz	51.47Hz	86.8 ms
Of it: time element of coupling switch			20ms
The switch-off time (total of delay-time action of NA protection, plus time element of coupling switch) must not exceed 200 ms. The review of the entire effectiveness chain "NA protection coupling switch" led to a successful switch-off. For voltage monitoring test, test has been performed between each line phase an neutral phase individually, also the 100% rated load, 50% rated load, 25% rated load has been considered, each test has been repeated three times, only the worst result recorded as above. For frequency monitoring test, each test has been repeated three times, only the worst result recorded as above.			