

# Certificate of Conformity

Registered No.:

**COCPVP11052/20E-01\_R1**

File reference

PVP11052/20E-04

Test report No.

TRPVP11052/20E/04

Date of issue

2021-04-29

On the basis of the tests undertaken, the samples of the below product(s) have been found to comply with the essential requirements of the referenced specifications at the time the tests were carried out:

**Applicant:** **Alpha ESS Co., Ltd.**  
JiuHua Road 888, High-Tech Industrial Development Zone 226300  
Nantong City, Jiangsu Province, China.

**Manufacturer:** **Alpha ESS Co., Ltd.**  
JiuHua Road 888, High-Tech Industrial Development Zone 226300  
Nantong City, Jiangsu Province, China.

**Factory:** **Heyuan Sinovo Electric Technology Co., Ltd.**  
Dongyuan County, Xian Tang Town, Dongyuan Reservoir Immigrant  
"Double Transfer" Demonstration Base, P.R. China

**Product:** Hybrid Inverter

**Type designation:** SMILE5-INV

**Certification fundamental(s):** BOS-P-01 Rev. 00

**Standard(s):** DIN VDE V 0124-100:2020-06  
VDE-AR-N 4105:2018  
See test report for detailed information.

This document is based on the evaluation of the samples of the above mentioned product(s). It does not imply an assessment of the mass-production of the product(s), and it does not permit the use of a TÜV NORD mark. The holder of this document may use it in connection with the related test report(s).

This certificate replaces certificate no. COCPVP11052/20E-01 due to modification of information. With issuance of this certificate, certificate no. COCPVP11052/20E-01 is therefore void.



Renewable Energy

ESS-T-008 COC

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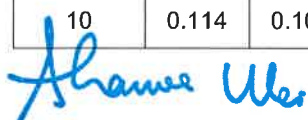
Version 1.0

E.4 Unit certificate		
<b>Manufacturer:</b>	<b>Alpha ESS Co., Ltd.</b> JiuHua Road 888, High-Tech Industrial Development Zone 226300 Nantong City, Jiangsu Province, China.	
<b>Power generation unit type:</b>	<input checked="" type="checkbox"/> Inverter <input type="checkbox"/> Asynchronous generator <input type="checkbox"/> Synchronous generator <input type="checkbox"/> Stirling generator <input type="checkbox"/> Fuel cell <input type="checkbox"/> Other: _____	
<b>Assessment values:</b>	Max. active power $P_{E_{max}}$ :	4600W
	Max. apparent power $S_{E_{max}}$ :	4600VA
	Rated voltage:	230V
<b>Rated values:</b>	Rated current (AC) $I_r$ :	20A
	Initial short-circuit AC current:	40A
<b>Network connection rule:</b>	VDE-AR-N 4105:2018 "Generators connected to the low-voltage distribution network"  Technical minimum requirements for connection and parallel operation of power generation systems connected to the low-voltage network	
<b>Test requirement:</b>	DIN VDE V 0124-100 (VDE V 0124-100):2020-06 "Network integration of power generation systems - Low voltage"  Test requirements for power generation units intended for connection to and parallel operation on the low-voltage network	
<b>Test report:</b>	TRPVP11052/20E/04 issued on 2021-03-31	
The above designated power generation unit meets the requirements of VDE-AR-N 4105. This unit certificate shall not be used in extracts.		



Renewable Energy

E.5 Test report "Network interactions" for power generation units with an input current > 75 A											
<b>System manufacturer:</b>		<b>Alpha ESS Co., Ltd.</b> JiuHua Road 888, High-Tech Industrial Development Zone 226300 Nantong City, Jiangsu Province, China.									
<b>Manufacturer indications:</b>		System type (BHKW, PV-WR, ...):						Hybrid Inverter			
		Max. active power $P_{E_{max}}$ :						4600W			
		Rated voltage						230V			
<b>Measurement period:</b>		From 2020-11-01 to 2021-03-20									
<b>Rapid voltage changes</b>											
<b>Connection without provisions (regarding the primary energy carrier):</b>							$k_i = 0.240$				
<b>Most adverse case when switching between generator levels:</b>							N/A				
<b>Connection at nominal conditions (of the primary energy carrier):</b>							$k_i = 1.017$				
<b>Disconnection at rated power:</b>							$k_i = 1.016$				
<b>Worst value of all switching operations:</b>							$k_{i_{max}} = 1.017$				
<b>Flicker:</b>		Network impedance angle $\Psi_k$		30°	50°	70°	90°				
		Initial flicker factor $c_\psi$		0.022	N/A	N/A	N/A				
<b>Harmonics</b>											
P/Pn [%]	0	10	20	30	40	50	60	70	80	90	100
Order	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
1	4.601	11.128	21.788	33.035	43.325	54.726	59.853	68.503	78.429	89.120	99.406
2	1.183	1.090	1.114	1.198	1.293	1.192	1.129	1.172	1.158	1.197	1.206
3	0.604	0.476	0.547	0.632	0.640	0.889	0.798	0.984	1.092	1.173	1.234
4	0.506	0.509	0.517	0.529	0.555	0.529	0.594	0.571	0.576	0.575	0.577
5	0.213	0.238	0.230	0.269	0.285	0.259	0.267	0.261	0.234	0.241	0.214
6	0.298	0.314	0.308	0.314	0.327	0.313	0.339	0.311	0.325	0.325	0.326
7	0.249	0.381	0.186	0.295	0.327	0.345	0.340	0.324	0.297	0.289	0.277
8	0.271	0.250	0.270	0.278	0.310	0.281	0.284	0.291	0.285	0.297	0.318
9	0.269	0.571	0.225	0.280	0.340	0.377	0.403	0.408	0.404	0.390	0.355
10	0.114	0.104	0.101	0.117	0.123	0.124	0.151	0.158	0.155	0.158	0.161



Renewable Energy

11	0.202	0.370	0.248	0.173	0.289	0.331	0.361	0.396	0.408	0.409	0.371
12	0.251	0.238	0.261	0.265	0.297	0.286	0.300	0.289	0.295	0.293	0.289
13	0.190	0.170	0.413	0.180	0.212	0.277	0.316	0.366	0.412	0.429	0.416
14	0.169	0.160	0.182	0.186	0.198	0.209	0.248	0.255	0.252	0.261	0.235
15	0.364	0.455	0.526	0.468	0.478	0.530	0.595	0.617	0.651	0.695	0.641
16	0.124	0.121	0.119	0.128	0.146	0.149	0.159	0.175	0.191	0.205	0.190
17	0.133	0.256	0.275	0.185	0.151	0.172	0.206	0.246	0.293	0.332	0.322
18	0.126	0.116	0.127	0.128	0.142	0.142	0.164	0.181	0.201	0.226	0.232
19	0.105	0.142	0.191	0.154	0.130	0.123	0.135	0.154	0.183	0.218	0.237
20	0.077	0.072	0.072	0.076	0.087	0.097	0.115	0.130	0.145	0.177	0.181
21	0.103	0.102	0.135	0.147	0.128	0.134	0.156	0.172	0.195	0.225	0.238
22	0.091	0.085	0.092	0.095	0.105	0.101	0.103	0.104	0.117	0.138	0.148
23	0.071	0.077	0.082	0.105	0.089	0.085	0.093	0.103	0.116	0.139	0.148
24	0.050	0.046	0.051	0.050	0.053	0.057	0.072	0.078	0.084	0.100	0.112
25	0.049	0.074	0.052	0.079	0.075	0.061	0.066	0.070	0.077	0.092	0.101
26	0.061	0.058	0.062	0.061	0.071	0.066	0.062	0.068	0.074	0.084	0.085
27	0.040	0.053	0.041	0.061	0.058	0.053	0.058	0.062	0.069	0.080	0.090
28	0.044	0.040	0.045	0.046	0.047	0.047	0.060	0.058	0.061	0.063	0.072
29	0.072	0.065	0.069	0.076	0.079	0.076	0.084	0.089	0.094	0.102	0.097
30	0.024	0.024	0.025	0.025	0.030	0.029	0.030	0.033	0.036	0.042	0.045
31	0.026	0.029	0.033	0.036	0.039	0.035	0.038	0.038	0.041	0.047	0.048
32	0.042	0.040	0.042	0.043	0.048	0.044	0.046	0.046	0.048	0.050	0.049
33	0.022	0.027	0.029	0.027	0.033	0.031	0.030	0.029	0.031	0.036	0.037
34	0.018	0.018	0.018	0.019	0.020	0.020	0.027	0.028	0.029	0.030	0.033
35	0.025	0.027	0.030	0.027	0.034	0.032	0.033	0.033	0.033	0.034	0.034
36	0.030	0.030	0.030	0.030	0.036	0.032	0.027	0.030	0.033	0.035	0.035
37	0.019	0.020	0.022	0.019	0.025	0.024	0.023	0.023	0.024	0.025	0.025
38	0.017	0.016	0.016	0.017	0.017	0.018	0.024	0.022	0.022	0.023	0.026
39	0.018	0.018	0.020	0.019	0.023	0.023	0.023	0.023	0.024	0.026	0.026



Renewable Energy

40	0.014	0.014	0.015	0.015	0.017	0.016	0.017	0.018	0.018	0.020	0.021
<b>Inter-harmonics</b>											
P/Pn [%]	0	10	20	30	40	50	60	70	80	90	100
Freq. [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
75	0.156	0.127	0.166	0.219	0.277	0.329	0.361	0.399	0.470	0.571	0.596
125	0.097	0.072	0.076	0.080	0.092	0.093	0.090	0.097	0.122	0.132	0.140
175	0.107	0.066	0.069	0.070	0.081	0.076	0.079	0.083	0.091	0.098	0.101
225	0.116	0.065	0.066	0.068	0.078	0.073	0.075	0.079	0.086	0.090	0.092
275	0.134	0.065	0.066	0.067	0.077	0.072	0.075	0.078	0.085	0.087	0.090
325	0.133	0.066	0.065	0.067	0.076	0.072	0.078	0.081	0.086	0.089	0.089
375	0.151	0.066	0.065	0.068	0.077	0.072	0.080	0.084	0.086	0.089	0.089
425	0.143	0.070	0.067	0.070	0.078	0.076	0.087	0.089	0.093	0.095	0.094
475	0.168	0.078	0.079	0.083	0.089	0.090	0.101	0.103	0.106	0.108	0.105
525	0.156	0.073	0.077	0.077	0.086	0.086	0.100	0.103	0.107	0.108	0.105
575	0.176	0.076	0.080	0.082	0.089	0.092	0.108	0.114	0.117	0.120	0.118
625	0.155	0.080	0.088	0.086	0.098	0.099	0.122	0.126	0.130	0.136	0.127
675	0.167	0.080	0.089	0.086	0.096	0.098	0.118	0.128	0.131	0.134	0.128
725	0.133	0.080	0.082	0.080	0.087	0.092	0.114	0.121	0.130	0.136	0.131
775	0.136	0.078	0.084	0.083	0.094	0.100	0.117	0.128	0.139	0.146	0.136
825	0.105	0.068	0.073	0.068	0.076	0.080	0.099	0.113	0.128	0.141	0.133
875	0.102	0.060	0.065	0.063	0.068	0.070	0.088	0.099	0.115	0.128	0.127
925	0.080	0.057	0.059	0.057	0.065	0.067	0.081	0.096	0.111	0.129	0.130
975	0.076	0.054	0.052	0.052	0.056	0.057	0.069	0.079	0.092	0.111	0.117
1025	0.061	0.051	0.049	0.050	0.055	0.055	0.065	0.073	0.084	0.103	0.113
1075	0.060	0.050	0.049	0.051	0.056	0.056	0.067	0.073	0.083	0.097	0.106
1125	0.050	0.039	0.042	0.044	0.047	0.045	0.052	0.056	0.065	0.078	0.088
1175	0.049	0.036	0.044	0.041	0.045	0.042	0.051	0.055	0.061	0.071	0.078
1225	0.043	0.035	0.041	0.038	0.043	0.041	0.046	0.049	0.055	0.064	0.069



Renewable Energy

1275	0.039	0.032	0.034	0.035	0.039	0.036	0.042	0.044	0.049	0.056	0.061
1325	0.035	0.030	0.031	0.033	0.037	0.034	0.039	0.039	0.045	0.049	0.052
1375	0.033	0.028	0.029	0.031	0.035	0.032	0.036	0.037	0.040	0.045	0.048
1425	0.031	0.026	0.028	0.031	0.033	0.030	0.034	0.034	0.038	0.040	0.042
1475	0.029	0.025	0.027	0.028	0.031	0.028	0.032	0.032	0.036	0.039	0.041
1525	0.027	0.025	0.026	0.026	0.030	0.027	0.030	0.030	0.033	0.036	0.036
1575	0.025	0.023	0.024	0.024	0.028	0.026	0.028	0.029	0.031	0.033	0.034
1625	0.024	0.022	0.023	0.023	0.027	0.025	0.027	0.027	0.029	0.030	0.030
1675	0.022	0.020	0.021	0.022	0.026	0.024	0.025	0.025	0.027	0.029	0.029
1725	0.022	0.020	0.021	0.021	0.025	0.023	0.024	0.024	0.026	0.026	0.027
1775	0.021	0.019	0.020	0.020	0.024	0.022	0.023	0.023	0.024	0.025	0.025
1825	0.020	0.018	0.019	0.019	0.023	0.022	0.022	0.022	0.024	0.025	0.024
1875	0.018	0.017	0.018	0.018	0.021	0.020	0.021	0.020	0.021	0.022	0.022
1925	0.017	0.016	0.017	0.017	0.021	0.019	0.020	0.019	0.021	0.021	0.021
1975	0.017	0.016	0.017	0.017	0.020	0.018	0.019	0.019	0.020	0.021	0.020

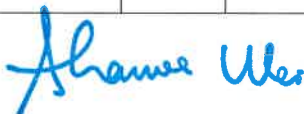
**Higher frequencies**

P/Pn [%]	0	10	20	30	40	50	60	70	80	90	100
Freq. [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2.1	0.046	0.045	0.047	0.046	0.054	0.051	0.055	0.054	0.056	0.057	0.057
2.3	0.037	0.035	0.038	0.038	0.044	0.041	0.045	0.045	0.046	0.046	0.046
2.5	0.031	0.030	0.032	0.033	0.037	0.035	0.038	0.037	0.039	0.039	0.040
2.7	0.028	0.027	0.029	0.029	0.033	0.031	0.032	0.031	0.034	0.034	0.035
2.9	0.025	0.023	0.025	0.025	0.029	0.027	0.029	0.028	0.030	0.030	0.030
3.1	0.023	0.022	0.024	0.023	0.027	0.025	0.026	0.026	0.028	0.029	0.029
3.3	0.022	0.022	0.023	0.023	0.026	0.025	0.026	0.026	0.028	0.029	0.030
3.5	0.026	0.025	0.027	0.027	0.030	0.030	0.033	0.035	0.038	0.041	0.042
3.7	0.018	0.017	0.018	0.018	0.020	0.019	0.020	0.020	0.021	0.022	0.023
3.9	0.020	0.019	0.020	0.021	0.022	0.022	0.024	0.025	0.026	0.028	0.030



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2.1	0.046	0.045	0.047	0.046	0.054	0.051	0.055	0.054	0.056	0.057	0.057
2.3	0.037	0.035	0.038	0.038	0.044	0.041	0.045	0.045	0.046	0.046	0.046
2.5	0.031	0.030	0.032	0.033	0.037	0.035	0.038	0.037	0.039	0.039	0.040
2.7	0.028	0.027	0.029	0.029	0.033	0.031	0.032	0.031	0.034	0.034	0.035
2.9	0.025	0.023	0.025	0.025	0.029	0.027	0.029	0.028	0.030	0.030	0.030
3.1	0.023	0.022	0.024	0.023	0.027	0.025	0.026	0.026	0.028	0.029	0.029
3.3	0.022	0.022	0.023	0.023	0.026	0.025	0.026	0.026	0.028	0.029	0.030
3.5	0.026	0.025	0.027	0.027	0.030	0.030	0.033	0.035	0.038	0.041	0.042
3.7	0.018	0.017	0.018	0.018	0.020	0.019	0.020	0.020	0.021	0.022	0.023
3.9	0.020	0.019	0.020	0.021	0.022	0.022	0.024	0.025	0.026	0.028	0.030
4.1	0.018	0.018	0.019	0.019	0.020	0.020	0.020	0.020	0.021	0.021	0.022
4.3	0.016	0.015	0.016	0.016	0.017	0.016	0.017	0.017	0.017	0.018	0.017
4.5	0.017	0.016	0.017	0.016	0.018	0.017	0.018	0.017	0.018	0.018	0.017
4.7	0.015	0.015	0.016	0.015	0.017	0.016	0.016	0.016	0.017	0.017	0.016
4.9	0.023	0.021	0.023	0.022	0.024	0.023	0.024	0.024	0.024	0.024	0.020
5.1	0.012	0.012	0.013	0.013	0.014	0.013	0.013	0.013	0.014	0.014	0.013
5.3	0.012	0.012	0.012	0.012	0.013	0.012	0.012	0.012	0.013	0.013	0.013
5.5	0.012	0.011	0.012	0.012	0.012	0.012	0.012	0.012	0.013	0.013	0.012
5.7	0.010	0.010	0.010	0.011	0.011	0.011	0.011	0.011	0.011	0.012	0.012
5.9	0.010	0.010	0.010	0.010	0.011	0.011	0.011	0.011	0.011	0.011	0.011
6.1	0.010	0.010	0.010	0.010	0.011	0.011	0.011	0.011	0.011	0.011	0.011
6.3	0.010	0.010	0.010	0.010	0.011	0.010	0.011	0.011	0.011	0.011	0.011
6.5	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.012
6.7	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.011	0.011	0.011
6.9	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
7.1	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
7.3	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.013	0.013	0.012
7.5	0.017	0.017	0.017	0.017	0.018	0.018	0.017	0.017	0.017	0.017	0.017
7.7	0.013	0.013	0.013	0.013	0.014	0.013	0.013	0.013	0.013	0.013	0.013



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7.9	0.042	0.043	0.042	0.042	0.041	0.041	0.040	0.040	0.040	0.039	0.038
8.1	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.026
8.3	0.015	0.015	0.015	0.015	0.016	0.015	0.015	0.015	0.015	0.015	0.015
8.5	0.015	0.015	0.015	0.015	0.015	0.016	0.015	0.015	0.015	0.015	0.015
8.7	0.013	0.012	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012
8.9	0.012	0.012	0.012	0.012	0.013	0.012	0.012	0.012	0.012	0.013	0.012

Note: The normalization current is 20A.





# Certificate of Conformity

Registered No.:

**COCPVP11052/20E-02\_R1**

File reference

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On the basis of the tests undertaken, the samples of the below product(s) have been found to comply with the essential requirements of the referenced specifications at the time the tests were carried out:

**Applicant:** **Alpha ESS Co., Ltd.**  
JiuHua Road 888, High-Tech Industrial Development Zone 226300  
Nantong City, Jiangsu Province, China.

**Manufacturer:** **Alpha ESS Co., Ltd.**  
JiuHua Road 888, High-Tech Industrial Development Zone 226300  
Nantong City, Jiangsu Province, China.

**Factory:** **Heyuan Sinovo Electric Technology Co., Ltd.**  
Dongyuan County, Xian Tang Town, Dongyuan Reservoir Immigrant  
"Double Transfer" Demonstration Base, P.R. China

**Product:** Hybrid Inverter

**Type designation:** SMILE5-INV

**Certification fundamental(s):** BOS-P-01 Rev. 00

**Standard(s):** DIN VDE V 0124-100:2020-06  
VDE-AR-N 4105:2018  
See test report for detailed information.

This document is based on the evaluation of the samples of the above mentioned product(s). It does not imply an assessment of the mass-production of the product(s), and it does not permit the use of a TÜV NORD mark. The holder of this document may use it in connection with the related test report(s).

This certificate replaces certificate no. COCPVP11052/20E-02 due to modification of information. With issuance of this certificate, certificate no. COCPVP11052/20E-02 is therefore void.



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ESS-T-009 COC

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<b>E.6 Certificate of the network and system protection</b>	
<b>Manufacturer:</b>	<b>Alpha ESS Co., Ltd.</b> JiuHua Road 888, High-Tech Industrial Development Zone 226300 Nantong City, Jiangsu Province, China.
<b>Type of NS protection:</b>	<input type="checkbox"/> Central NS protection <input checked="" type="checkbox"/> Integrated NS protection: Assigned to power generation unit of type: SMILE5-INV
<b>Network connection rule:</b>	VDE-AR-N 4105:2018 "Generators connected to the low-voltage distribution network" Technical minimum requirements for connection and parallel operation of power generation systems connected to the low-voltage network
<b>Test requirement:</b>	DIN VDE V 0124-100 (VDE V 0124-100):2020-06 "Network integration of power generation systems - Low voltage" Test requirements for power generation units intended for connection to and parallel operation on the low-voltage network
<b>Test report:</b>	TRPVP11052/20E/04 issued on 2021-03-31
The network and system protection designated above meets the requirements of VDE-AR-N 4105. This NS protection certificate shall not be used in extracts.	



E.7 Requirements for the test report for the NS protection						
Type of NS protection:	<input type="checkbox"/> Central NS protection <input checked="" type="checkbox"/> Integrated NS protection: Assigned to power generation unit of type: SMILE5-INV					
Software version:	DSP / MCU: V1.47; EMS: V1.02.27					
Manufacturer:	<b>Alpha ESS Co., Ltd.</b> JiuHua Road 888, High-Tech Industrial Development Zone 226300 Nantong City, Jiangsu Province, China.					
Measurement period:	From 2020-11-01 to 2021-03-20					
-	Stirling generators, fuel cells			Inverter(s)		
	Synchronous and asynchronous generators with $P_n \leq 50$ kW coupled directly or via inverters			Directly coupled synchronous and asynchronous generators with $P_n > 50$ kW		
Protective function	Set value	Tripping value	*Tripping time NS protection	Set value	Tripping value	*Tripping time NS protection
Rise-in-voltage protection $U >>$	$1.15 * U_n$	N/A	N/A	$1.25 * U_n$	287.1V	121.8ms
Rise-in-voltage protection $U > *$	$1.10 * U_n$	N/A	N/A	$1.10 * U_n$	-	507s
Voltage drop protection $U <$	$0.8 * U_n$	N/A	N/A	$0.8 * U_n$	184.5V	3098ms
Voltage drop protection $U <<$	N/A			$0.45 * U_n$	104.1V	382.7ms
Frequency decrease protection $f <$	47.5Hz	N/A	N/A	47.5Hz	47.5Hz	197.5ms
Frequency increase protection $f >$	51.5Hz	N/A	N/A	51.5Hz	51.5Hz	131.4ms
<p>* The tripping time includes the period from the limit value violation U/f until the tripping signal to the interface switch.</p> <p>When planning the power generation system, the response time of the interface switch shall be added to the maximum time value obtained as indicated above.</p> <p>The disconnection time (sum of tripping time of the NS protection plus response time of the interface switch) shall not exceed 200ms.</p>						



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<input checked="" type="checkbox"/> For integrated NS protection	
Assigned to power generation unit of type:	SMILE5-INV
Type integrated interface switch:	Relay
Response time of interface switch for integrated NS protection:	≤ 10ms
<input checked="" type="checkbox"/> Verification of the entire functional chain "integrated NS protection – interface switch" has resulted in successful disconnection.	



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