



Type Approval Certificate

This is to certify that the undernoted product(s) has/have been tested with satisfactory results in accordance with the relevant requirements of the Lloyd's Register Type Approval System.

Manufacturer	Vacon Ltd.
Address	Runsorintie 7, Vaasa, 65380, Finland
Place of Production	Vacon (China) Drives Co., Ltd. No. 339 Xinqiao North Road Wuyuan, Street Haiyan County, Jiaxing, 314300, China
Type	Circuit Breaker
Description	<p>The VACON® DCGuard is a fast-current cutter/DC bus-tie device based on standard VACON NXP inverter hardware and dedicated application software.</p> <p>VACON® DCGuard (peer-to-peer topology) basic configuration consists of:</p> <ul style="list-style-type: none">- VACON NXP inverter, (type approved with separate certificate);- aR supply fuses in each DC supply line (according to NXP inverter manual);- di/dt filter;- VACON® DCGuard application software, version ADFIF102; <p>For detailed product description, pls. refer to appendix.</p>
Trade Name	VACON® DCGuard
Application	Marine and Offshore applications for use in environmental category ENV2, as defined in Lloyd's Register Type Approval System, Test Specification Number 1 – December 2018. Suitable for general power distribution zones only.

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Matthias Karg

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Specified Standard	IACS UR E10 Rev. 8: 2021
Ratings	<p>Rated current: 3 to 4.140 A Rated voltage: 465 to 1.100 VDC Short-circuit current total clearance time: 200-300 μs</p> <p>SW version: ADFIF102V050</p> <p>For detailed ratings, pls. refer to appendix.</p>
Other Conditions	<p>For systems consisting of the listed components the final functional arrangement and application software are to comply with appropriate Lloyd's Register Rules and Regulations and shall be subject to project related Plan Approval Process, when installed on LR classed vessels. Documents and drawings for the actual application are to be provided according to relevant LR Rules and Regulations.</p> <p>The DCGuard is a directional fault current suppressor based on current interruption by switching IGBT transistors, applicable for directional and bi-directional peer-to-peer configuration. The device is used for fault current suppression and does not replace circuit breaker or switches for isolation. It is to be considered:</p> <ul style="list-style-type: none">- VACON NXP converter has hardware based short-circuit and overload protections as required by IEC 61800-5-1;- upstream mechanical disconnecter for isolation/switching is to be provided for VACON® DCGuard;- DC supply aR fuses are to be rated based on short-circuit current calculations and selectivity study on a case-by-case basis for DC distribution system;- earth fault monitoring device of DC distribution system is not part of this type approval certificate;- a system integrator is to ensure that a fault/trip in one peer VACON® DCGuard leads to the opening of the other peer VACON® DCGuard;

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Type Approval does not eliminate the need for normal inspection and survey procedures required by the Rules and Regulations.

If the specified standards are amended during the validity of this certificate, the product is to be re-approved prior to it being supplied to vessels to which the amended standards apply.

This certificate is not valid for equipment, the design, ratings or operating parameters of which have been varied from the specimen tested. The manufacturer should notify Lloyd's Register EMEA of any modification or changes to the equipment in order to obtain a valid Certificate.

Previous Version: 18/00076

The Design Appraisal Document HPC2362053-24/MK and its supplementary Type Approval Terms and Conditions form part of this Certificate.



Appendix

DESCRIPTION

VACON® DC Guard Air-cooled 800V units (NX5, 465 800 VDC)

Type Code	Unit Type	Frame	Current [A]	DC Power @800V [kW]	Overcurrent & Short circuit protection Instant trip ≤ [A]
NXP00035A2T0SSS	NXP0003	FR4	3	2	10
NXP00045A2T0SSS	NXP0004	FR4	4	3	15
NXP00055A2T0SSS	NXP0005	FR4	5	4	19
NXP00075A2T0SSS	NXP0007	FR4	7	6	25
NXP00095A2T0SSS	NXP0009	FR4	9	7	33
NXP00125A2T0SSS	NXP0012	FR4	12	10	40
NXP00165A2T0SSS	NXP0016	FR5	16	13	53
NXP00225A2T0SSS	NXP0022	FR5	22	18	70
NXP00315A2T0SSS	NXP0031	FR5	31	25	101
NXP00385A2T0SSS	NXP0038	FR6	38	30	136
NXP00455A2T0SSS	NXP0045	FR6	45	36	167
NXP00615A2T0SSS	NXP0061	FR6	61	49	202
NXP00725A2T0SSS	NXP0072	FR7	72	58	268
NXP00875A2T0SSS	NXP0087	FR7	87	70	317
NXP01055A2T0SSS	NXP0105	FR7	105	84	383
NXP01405A2T0SSS	NXP0140	FR8	140	112	462
NXI01685A0T0ISF	NXP0168	FI9	168	134	616
NXI02055A0T0ISF	NXP0205	FI9	205	164	748
NXI02615A0T0ISF	NXP0261	FI9	261	209	902
NXI03005A0T0ISF	NXP0300	FI9	300	240	1.078
NXI03855A0T0ISF	NXP0385	FI10	385	308	1.320
NXI04605A0T0ISF	NXP0460	FI10	460	368	1.694
NXI05205A0T0ISF	NXP0520	FI10	520	416	2.024
NXI05905A0T0ISF	NXP0590	FI12(2xFI10)	590	472	2.288
NXI06505A0T0ISF	NXP0650	FI12(2xFI10)	650	520	2.596
NXI07305A0T0ISF	NXP0730	FI12(2xFI10)	730	584	2.860
NXI08205A0T0ISF	NXP0820	FI12(2xFI10)	820	656	3.212
NXI09205A0T0ISF	NXP0920	FI12(2xFI10)	920	736	3.608
NXI103005A0T0ISF	NXP1030	FI12(2xFI10)	1030	824	4.048
NXI11505A0T0ISF	NXP1150	FI13	1150	920	4.532
NXI13005A0T0ISF	NXP1300	FI13	1300	1040	5.060
NXI145005A0T0ISF	NXP1450	FI13	1450	1160	5.720
NXI177005A0T0ISF	NXP1770	FI14	1770	1416	7.040
NXI21505A0T0ISF	NXP2150	FI14	2150	1720	8.536
NXI27005A0T0ISF	NXP2700	FI14	2700	2160	10.120



DESCRIPTION (continued) VACON® DCC Guard Air-cooled 890V units NXP6, 640 – 1.100VDC)

Type Code	Unit Type	Frame	Current [A]	DC Power @800V [kW]	Overcurrent protection Instant Trip ≤ [A]
NXP00046A2T0SSS	NXP0004	FR6	4,5	4	14
NXP00056A2T0SSS	NXP0005	FR6	5,5	4	20
NXP00076A2T0SSS	NXP0007	FR6	8	6	24
NXP00106A2T0SSS	NXP0010	FR6	10	8	33
NXP00136A2T0SSS	NXP0013	FR6	13,5	11	44
NXP00186A2T0SSS	NXP0018	FR6	18	14	59
NXP00226A2T0SSS	NXP0022	FR6	22	18	79
NXP00276A2T0SSS	NXP0027	FR6	27	22	97
NXP00346A2T0SSS	NXP0034	FR6	34	27	119
NXP00416A2T0SSS	NXP0041	FR7	41	33	150
NXP00526A2T0SSS	NXP0052	FR7	52	42	180
NXP00526A2T0SSS	NXP0062	FR8	62	50	229
NXP00526A2T0SSS	NXP0080	FR8	80	64	273
NXP00526A2T0SSS	NXP0100	FR8	100	80	352
NXP01256A2T0ISF	NXP0125	FI9	125	100	440
NXP01446A2T0ISF	NXP0144	FI9	144	115	550
NXP01706A2T0ISF	NXP0170	FI9	170	136	634
NXP02056A2T0ISF	NXP0208	FI9	208	166	748
NXP02616A2T0ISF	NXP0261	FI10	261	209	915
NXP03256A2T0ISF	NXP0325	FI10	325	260	1.148
NXP03856A2T0ISF	NXP0385	FI10	385	308	1.430
NXP04166A2T0ISF	NXP0416	FI10	416	333	1.430
NXP04606A2T0ISF	NXP0460	FI12(2xFI10)	460	368	1.694
NXP05026A2T0ISF	NXP0502	FI12(2xFI10)	502	402	2.024
NXP05906A2T0ISF	NXP0590	FI12(2xFI10)	590	472	2.209
NXP06506A2T0ISF	NXP0650	FI12(2xFI10)	650	520	2.596
NXP07506A2T0ISF	NXP0750	FI12(2xFI10)	750	600	2.860
NXP08206A2T0ISF	NXP0820	FI12(2xFI10)	820	656	2.860
NXP09206A2T0ISF	NXP0920	FI13	920	736	3.608
NXP10306A2T0ISF	NXP1030	FI13	1030	824	4.048
NXP11806A2T0ISF	NXP1180	FI13	1180	944	4.532
NXP15006A2T0ISF	NXP1500	FI14(2xFI13)	1500	1200	5.720
NXP19006A2T0ISF	NXP1900	FI14(2xFI13)	1900	1520	6.600
NXP22506A2T0ISF	NXP2250	FI14(2xFI13)	2250	1800	8.360



DESCRIPTION (continued) VACON® DCGuard liquid-cooled 800V units (NX4,465 – 800VDC)

Type Code	Unit Type	Frame	Current [A]	DC Power @800V [kW]	Overcurrent protection Instant Trip ≤ [A]
NXP00165A0T0IWF	NXP0016	CH3	16	13	61
NXP00225A0T0IWF	NXP0022	CH3	22	18	83
NXP00315A0T0IWF	NXP0031	CH3	31	25	116
NXP00385A0T0IWF	NXP0038	CH3	38	30	138
NXP00455A0T0IWF	NXP0045	CH3	45	36	165
NXP00615A0T0IWF	NXP0061	CH3	61	49	226
NXP00725A0T0IWF	NXP0072	CH4	72	58	264
NXP00875A0T0IWF	NXP0087	CH4	87	70	319
NXP01055A0T0IWF	NXP0105	CH4	105	84	385
NXP01405A0T0IWF	NXP0140	CH4	140	112	512
NXP01685A0T0IWF	NXP0168	CH5	168	134	616
NXP02055A0T0IWF	NXP0205	CH5	205	164	754
NXP02615A0T0IWF	NXP0261	CH5	261	209	957
NXP03005A0T0IWF	NXP0300	CH61	300	240	616
NXP03855A0T0IWF	NXP0385	CH61	385	308	792
NXP04605A0T0IWF	NXP0460	CH62	460	368	946
NXP05205A0T0IWF	NXP0520	CH62	520	416	1.069
NXP05905A0T0IWF	NXP0590	CH62	590	472	1.210
NXP06505A0T0IWF	NXP0650	CH62	650	520	1.334
NXP07305A0T0IWF	NXP0730	CH62	730	584	1.500
NXP08205A0T0IWF	NXP0820	CH63	820	656	1.685
NXP09205A0T0IWF	NXP0920	CH63	920	736	1.888
NXP10305A0T0IWF	NXP1030	CH63	1030	824	2.116
NXP11505A0T0IWF	NXP1150	CH63	1150	920	2.359
NXP13705A0T0IWF	NXP1370	CH64	1370	1096	2.812
NXP16405A0T0IWF	NXP1640	CH64	1640	1312	3.366
NXP20605A0T0IWF	NXP2060	CH64	2060	1648	4.229
NXP230005A0T0IWF	NXP2300	CH64	2300	1840	4.722
NXP24705A0T0IWF	NXP2470	2xCH64	2470	1976	5.073
NXP29505A0T0IWF	NXP2950	2xCH64	2950	2360	6.058
NXP37105A0T0IWF	NXP3710	2xCH64	3710	2968	7.617
NXP41405A0T0IWF	NXP4140	2xCH64	4140	3312	8.501



DESCRIPTION (continued) VACON® DC Guard liquid-cooled 90V units NX6, 640 1.100 VDC)

Type Code	Unit Type	Frame	Current [A]	DC Power @800V [kW]	Overcurrent protection Instant Trip ≤ [A]
NXP01706A0T0IWF	NXP0170	CH61	170	187	524
NXP02086A0T0IWF	NXP0208	CH61	208	229	641
NXP02616A0T0IWF	NXP0261	CH61	261	287	804
NXP03256A0T0IWF	NXP0325	CH62	325	358	1.001
NXP03856A0T0IWF	NXP0385	CH62	385	424	1.186
NXP04166A0T0IWF	NXP0416	CH62	416	458	1.281
NXP04606A0T0IWF	NXP0460	CH62	460	506	1.417
NXP05026A0T0IWF	NXP0502	CH62	502	552	1.546
NXP05906A0T0IWF	NXP0590	CH63	590	649	1.817
NXP06506A0T0IWF	NXP0650	CH63	650	715	2.002
NXP07506A0T0IWF	NXP0750	CH63	750	825	2.310
NXP08156A0T0IWF	NXP0815	CH63	815	897	2.510
NXP08206A0T0IWF	NXP0820	CH64	820	902	2.526
NXP09206A0T0IWF	NXP0920	CH64	920	1012	2.834
NXP10306A0T0IWF	NXP1030	CH64	1030	1133	3.172
NXP11806A0T0IWF	NXP1180	CH64	1180	1298	3.634
NXP13006A0T0IWF	NXP1300	CH64	1300	1430	4.004
NXP15006A0T0IWF	NXP1500	CH64	1500	1650	4.620
NXP17006A0T0IWF	NXP1700	CH64	1700	1870	5.236
NXP18506A0T0IWF	NXP1850	2xCH64	1850	2035	5.698
NXP212006A0T0IWF	NXP2120	2xCH64	2120	2332	6.530
NXP234006A0T0IWF	NXP2340	2xCH64	2340	2574	7.207
NXP27006A0T0IWF	NXP2700	2xCH64	2700	2970	8.316
NXP31006A0T0IWF	NXP3100	2xCH64	3100	3410	9.548

RATINGS

Input voltage U _{IN}	Voltage class 5: 380 - 500 V (±10%) / DC Link voltage = 465 - 800 VDC (±0%) Voltage class 6: 525 - 690 V (±10%) / DC Link voltage = 640 - 1.100 VDC ((±0%)
Rated current	Rated AC current = Rated DC current
Distribution network	IT system, with appropriate insulation monitoring to PE
Output voltage	Normal operation: U _{in} ≈ U _{out} Charging: 0 ~ U _{in}
Output frequency	Normal operation: DC voltage (directly connected to DC terminals). Charging: DC voltage (Pulse Width Modulation)
Output filter	di/dt filter, recommended 2% inductance
Switching frequency	Normal operation: No switching / 0 kHz Charging: 1...10 kHz; factory default 5 kHz
Control method	Individual IGBT control
DC Short circuit current	Limited by the aR fuses in each DC supply line (aR fuses shall be used according to NXP inverter user manual)
Over voltage protection	500 V / Voltage class 5: 911 VDC 690 V / Voltage class 6: 1.258 VDC



RATINGS (continued)

IGBT hardware over current protection current	$\leq I_h^{*3...5}$ Unit dependent
IGBT hardware over current protection delay	Hardware circuit, instant without time delay

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