TYPE APPROVAL CERTIFICATE

Certificate No:
TAE00002G2
Revision No:
2

This is to certify:

That the Circuit Breaker

with type designation(s)
NXP0003…4140 voltage class 5, NXP0004…3100 voltage class 6, NXI0004…2700 voltage class 5, NXI0004…2250 voltage class 6

Issued to
Vacon Ltd
VAASA, Finland

is found to comply with
DNV rules for classification – Ships, offshore units, and high speed and light craft

Application :

Products approved by this certificate are accepted for installation on all vessels classed by DNV.

Type	Rated voltage (V)	Rated current (A)
NXP0003…4140 voltage class 5	465 - 1100 DC	3 - 4140
NXP0004…3100 voltage class 6		
NXI0004…2700 voltage class 5		
NXI0004…2250 voltage class 6		

Issued at **Høvik** on **2023-02-28**
This Certificate is valid until **2027-12-20.**
DNV local unit: **Finland CMC**

Approval Engineer: **Nicolay Horn**

for **DNV**

Frederik Tore Elter
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

Name and place of manufacturer

Vacon Ltd Runsorintie 7 VAASA, Finland	Vacon (China) Drives Co.,Ltd. Block 6-7, No. 339 North Xingiao Road, Wuyuan Street, Haiyan Country, JiaXing City, Zhejiang Province, China

Product description

VACON DC Guard: Fast-current cutter/DC-bus tie device

VACON® DCGuard basic configuration consist of:
- aR supply fuses in each DC supply line, according to NXP inverter manual.
- Vacon NXP inverter. (Type approved with separate certificate)
- di/dt filter, with ca 2% inductance.
- VACON® DCGuard application software, named: ADFIF102.

Air-cooled 500 V units

Air cooled NX5* 465-800VDC			DC Guard Current	DC power @800V	Over current & Short circuit protection
Type code	Unit type	Frame	I_2 (A)	P_{DC} (kW)	Instant trip ≤(A)
NXP00035A2T0SSS	NXP0003	FR4	3	2	10
NXP00045A2T0SSS	NXP0004	FR4	4	3	15
NXP00055A2T0SSS	NXP0005	FR4	5	4	19
To					
NXP01405A2T0SSS	NXP0140	FR8	140	112	462
NXI01685A0T0ISF	NXP0168	FI9	168	134	616
NXI02055A0T0ISF	NXP0205	FI9	205	164	748
NXI02615A0T0ISF	NXP0261	FI9	261	209	902
To					
NXI27005A0T0ISF	NXP2700	FI14	2700	2160	10120

Air-cooled 690 V units

Air cooled NX6* 640-1100VDC			DC Guard Current	DC power @800V	Over current & Short circuit protection
Type code	Unit type	Frame	I_2 (A)	P_{DC} (kW)	Instant trip ≤(A)
NXP00046A2T0SSS	NXP0004	FR6	4.5	4	14
NXP00056A2T0SSS	NXP0005	FR6	5.5	4	20
NXP00076A2T0SSS	NXP0007	FR8	8	6	24
To					
NXP00526A2T0SSS	NXP0100	FI9	100	80	352
NXP01256A0T0ISF	NXP0125	FI9	125	100	440
NXP014460AT0ISF	NXP0144	FI9	144	115	550
NXI01706A0T0ISF	NXP0170	FI9	170	136	634
To					
NXP22506A0T0ISF	NXP2250	FI14	2250	1800	8360

*The listed models must regarded as examples. Other models with slightly different configuration is also included. For more detailed technical information see *VACON® DCGuard manuals.*

Liquid-cooled 500 V units

liquid cooled NX6* 465-800VDC			DC Guard Current	DC power @800V	Over current & Short circuit protection
Type code	Unit type	Frame	I_2 (A)	P_{DC} (kW)	Instant trip ≤(A)
NXP00165A0T0IWF	NXP0016	CH3	16	13	61
NXP00225A0T0IWF	NXP0022	CH3	22	18	83
NXP00315A0T0IWF	NXP0031	CH3	31	25	116
To					
NXP41405A0T0IWF	NXP4140	2XCH64	4140	3312	8501

Liquid-cooled 690 V units

liquid cooled NX6* 640-1100VDC			DC Guard Current	DC power @800V	Over current & Short circuit protection
Type code (exsample)	Unit type	Frame	I_2 (A)	P_{DC} (kW)	Instant trip ≤(A)
NXP01706A0T0IWF	NXP0170	CH61	170	187	524
NXP02086A0T0IWF	NXP0208	CH61	208	229	641
NXP02616A0T0IWF	NXP0261	CH61	261	287	804
To					
NXP08206A0T0IWF	NXP0820	CH64	820	902	2526
NXP09206A0T0IWF	NXP0920	CH64	920	1012	2834
NXP10306A0T0IWF	NXP1030	CH64	1030	1133	3172
NXP11806A0T0IWF	NXP1180	CH64	1180	1298	3634
NXP13006A0T0IWF	NXP1300	CH64	1300	1430	4004
NXP15006A0T0IWF	NXP1500	CH64	1500	1650	4620
NXP17006A0T0IWF	NXP1700	CH64	1700	1870	5236
To					
NXP31006A0T0IWF	NXP3100	2XCH64	3100	3410	9548

* The listed models must be regarded as examples. Other models with slightly different configuration is also included. For more detailed technical information see *VACON® DCGuard manuals.*

Technical data for VACON® DCGuard	
Input voltage UIN:	Voltage class 5:380-500V(±10%)/DC Link voltage=465–800VDC(±0%) Voltage class 6:525-690V(±10%)/DC Link voltage=640–1100VDC(±0%)
Rated current:	Rated AC current = Rated DC current.
Networks:	IT Grid, with appropriate insulation monitoring to PE.
Output voltage:	Normal operation: $U_{IN} \approx U_{OUT}$ Controlled voltage ramp up : 0-≈U_{IN}
Output frequency:	Normal operation: DC voltage. Controlled voltage ramp up: DC voltage (Pulse Width Modulation)
Output filter:	dI/dt filter, recommended ca 2% inductance.
Switching frequency:	Normal operation: No switching / 0kHz Controlled voltage ramp up: 1…10kHz; Factory default 5kHz.
Control method:	Individual IGBT control.
AC Short circuit current	Maximum AC short circuit current to be <100kA
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	500V / Voltage class5: 911VDC 690V / Voltage class 6: 1258VDC
IGBT hardware over current protection current.	≤IH*3…5 Unit dependent. See table in separate chapter.
IGBT hardware over current protection delay.	Hardware circuit, instant without time delay.

Application/Limitation

The DC Guard is a directional, fault current suppressor based on current interruption by switching of IGBT transistors. This type approval is applicable for a directional and bi-directional peer-to-peer configuration.

The device is tested in accordance with relevant class rules, and is found to be suitable for marine use.

The device is used for fault current suppression and does not replace circuit breakers or switches for isolation. The system design needs to be approved on a case by case basis, and must include, as part of the overall system arrangement:

- means for manual, local, operation independent of higher level automation system, enabling necessary means for local operation, local/remote change over, and interface for setting of parameters.
- means for monitoring and indication of operating status and alarms.
- means for isolation/switching, allowing operation, enabling access for repair and electrical maintenance, in accordance with relevant rule requirements.
- back-up protection (e.g. fuses) in accordance with relevant rule requirements (as applicable).
- documentation of required system discrimination.

Testing requirements:

Light load and non-destructive function testing, as well as verification of control system interface must be performed at system level during FAT. (These tests are not required during semiconductor module testing.)

Type Approval documentation

Tests carried out

DC Guard: Thermal test, Short circuit in two and three DC cables, Stop at full current and Bus tie cable overload detection.
Converter: Visual inspection, Performance/heat run, Power supply failure, Power supply variations, Voltage/frequency variation, Vibration, Dry heat, Damp heat, Insulation resistance, High voltage.

EMC: The following tests are in accordance with the DNV CN2.4/ IEC 61800-3: Electrical fast transient (Burst), electrical slow transient (Surge), RF-common mode Voltage, radiated RF-electromagnetic fields, electric discharge (ESD), radiated and conducted emission. (See under application limitation).

Marking of product

Vacon – Type designation – DC Current – Short circuit current

Periodical assessment

The scope of the periodical assessment is to verify that the conditions stipulated for the Type approval are complied with and that no alterations are made to the product design or choice of materials.

The main elements of the assessment are:

- Inspection on factory samples, selected at random from the production line (where practicable)
- Results from Routine tests (RT) checked (if not available tests according to RT to be carried out)
- Review of type approval documentation
- Review of possible change in design, materials and performance
- Ensuring traceability between manufacturer's product type marking and Type Approval Certificate.

Assessment to be performed at 2 and 3.5 and at renewal.

END OF CERTIFICATE