

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Frequency Converter

with type designation(s)

NXA, NXB, NXI, NXN & NXP

Issued to

Vacon Ltd

VAASA, Finland

is found to comply with

DNV GL rules for classification – Ships and offshore units

Application :

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.

This Certificate is valid until **2018-12-31**.

Issued at **Høvik** on **2016-06-17**

DNV GL local station: **Turku**

Approval Engineer: **Nicolay Horn**

for **DNV GL**

.....
Marit Laumann
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.

Certificate No: **TAE000013B**
 File No: **822.21**
 Job Id: **262.1-010767-4**

Name and place of manufacturer

Vacon Oyj
 VAASA, Finland

Vacon China Drives Co. Ltd
 No.71 Xinqing Road, 215123 Suzhou, China

Product description

Variable speed controller for asynchronous motor. Constant / variable torque applications.
 Air and liquid cooled. CHxx = liquid cooled, FRxx = air cooled, FIxx = Inverter module, Air cooled.

| Type designation | Frame size | Mains supply (V) | Number of phases | Motor shaft power (kW) ^{1) 2)} |
|------------------|-----------------|------------------|------------------|---|
| NXP0004 | FR4 | 208 - 240 | 3 | 0,55 /- |
| NXP0007 | FR4 | 208 - 240 | 3 | 0,75 /- |
| NXP0008 | FR4 | 208 - 240 | 3 | 1,1 /- |
| NXP0011 | FR4 | 208 - 240 | 3 | 1,5 /- |
| NXP0012 | FR4 | 208 - 240 | 3 | 2,2 /- |
| NXP0017 | FR5 | 208 - 240 | 3 | 3 /- |
| NXP0025 | FR5 | 208 - 240 | 3 | 4 /- |
| NXP0031 | FR5 | 208 - 240 | 3 | 5,5 /- |
| NXP0048 | FR6 | 208 - 240 | 3 | 7,5 /- |
| NXP0061 | FR6 | 208 - 240 | 3 | 11 /- |
| NXP0075 | FR7 | 208 - 240 | 3 | 15 /- |
| NXP0088 | FR7 | 208 - 240 | 3 | 18,5 /- |
| NXP0114 | FR7 | 208 - 240 | 3 | 22 /- |
| NXP0140 | FR8 | 208 - 240 | 3 | 30 /- |
| NXP0170 | FR8 | 208 - 240 | 3 | 37 /- |
| NXP0205 | FR8 | 208 - 240 | 3 | 45 /- |
| NXP0261 | FR9 | 208 - 240 | 3 | 55 /- |
| NXP0300 | FR9 | 208 - 240 | 3 | 75 /- |
| | | | | |
| NXP0003 | FR4 | 380 - 500 | 3 | 1,1 /- |
| NXP0004 | FR4 | 380 - 500 | 3 | 1,5 /- |
| NXP0005 | FR4 | 380 - 500 | 3 | 2,2 /- |
| NXP0007 | FR4 | 380 - 500 | 3 | 3 /- |
| NXP0009 | FR4 | 380 - 500 | 3 | 4 /- |
| NXP0012 | FR4 | 380 - 500 | 3 | 5,5 /- |
| NXP0016 | FR5 / CH3 | 380 - 500 | 3 | 7,5 / 11 |
| NXP0022 | FR5 / CH3 | 380 - 500 | 3 | 11 / 15 |
| NXP0031 | FR5 / CH3 | 380 - 500 | 3 | 15 / 18,5 |
| NXP0038 | FR6 / CH3 | 380 - 500 | 3 | 18,5 / 22 |
| NXP0045 | FR6 / CH3 | 380 - 500 | 3 | 22 / 30 |
| NXP0061 | FR6 / CH3 | 380 - 500 | 3 | 30 / 37 |
| NXP0072 | FR7 / CH4 | 380 - 500 | 3 | 37 / 45 |
| NXP0087 | FR7 / CH4 | 380 - 500 | 3 | 45 / 55 |
| NXP0105 | FR7 / CH4 | 380 - 500 | 3 | 55 / 75 |
| NXP0140 | FR8 / CH4 | 380 - 500 | 3 | 75 / 90 |
| NXP0168 | FR8 / FI9 / CH5 | 380 - 500 | 3 | 90 / 110 |
| NXP0205 | FR8 / FI9 / CH5 | 380 - 500 | 3 | 110 / 132 |
| NXP0261 | FR9 / FI9 / CH5 | 380 - 500 | 3 | 132 / 160 |

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|------------------|-----------------------|------------------|------------------|---|
| NXP0300 | FR9 / FI9 / CH61 | 380 - 500 | 3 | 160 / 200 |
| NXP0385 | FR10 / FI10 / CH61 | 380 - 500 | 3 | 200 / 250 |
| NXP0460 | FR10 / FI10 / CH62/72 | 380 - 500 | 3 | 250 / 315 |
| NXP0520 | FR10 / FI10 / CH62/72 | 380 - 500 | 3 | 250 / 355 |
| NXP0385 | FR10 / FI12 / CH62/72 | 380 - 500 | 3 | 200 / 250 |
| NXP0460 | FR10 / FI12 / CH62/72 | 380 - 500 | 3 | 250 / 315 |
| NXP0520 | FR10 / FI12 / CH62/72 | 380 - 500 | 3 | 250 / 355 |
| NXP0590 | FR11 / FI12 / CH62/72 | 380 - 500 | 3 | 315 / 400 |
| NXP0650 | FR11 / FI12 / CH62/72 | 380 - 500 | 3 | 355 / 450 |
| NXP0730 | FR11 / FI12 / CH62/72 | 380 - 500 | 3 | 400 / 500 |
| NXP0820 | FR12 / FI12 / CH63 | 380 - 500 | 3 | 450 / 560 |
| NXP0920 | FR12 / FI12 / CH63 | 380 - 500 | 3 | 500 / 600 |
| NXP1030 | FR12 / FI12 / CH63 | 380 - 500 | 3 | 560 / 700 |
| NXP1150 | FR13 / FI13 / CH63 | 380 - 500 | 3 | 630 / 750 |
| NXP1300 | FR13 / FI13 | 380 - 500 | 3 | 710 / - |
| NXP1370 | CH64/74 | 380 - 500 | 3 | - / 900 |
| NXP1450 | FR13 | 380 - 500 | 3 | 800 / - |
| NXP1640 | CH64/74 | 380 - 500 | 3 | - / 1100 |
| NXP1770 | FR14 / FI14 | 380 - 500 | 3 | 900 / - |
| NXP2060 | CH64/74 | 380 - 500 | 3 | - / 1400 |
| NXP2150 | FR14 / FI14 | 380 - 500 | 3 | 1100 / - |
| NXP2300 | CH64/74 | 380 - 500 | 3 | - / 1500 |
| NXP2470 | 2xCH64/74 | 380 - 500 | 3 | - / 1600 |
| NXP2700 | FR14 / FI14 | 380 - 500 | 3 | 1400 / - |
| NXP2950 | 2xCH64/74 | 380 - 500 | 3 | - / 1950 |
| NXP3710 | 2xCH64/74 | 380 - 500 | 3 | - / 2450 |
| NXP4140 | 2xCH64/74 | 380 - 500 | 3 | - / 2700 |
| NXP0004 | FR6 | 525 - 690 | 3 | 3 / - |
| NXP0005 | FR6 | 525 - 690 | 3 | 4 / - |
| NXP0007 | FR6 | 525 - 690 | 3 | 5,5 / - |
| NXP0010 | FR6 | 525 - 690 | 3 | 7,5 / - |
| NXP0013 | FR6 | 525 - 690 | 3 | 10 / - |
| NXP0018 | FR6 | 525 - 690 | 3 | 15 / - |
| NXP0022 | FR6 | 525 - 690 | 3 | 18,5 / - |
| NXP0027 | FR6 | 525 - 690 | 3 | 22 / - |
| NXP0034 | FR6 | 525 - 690 | 3 | 30 / - |
| NXP0041 | FR7 | 525 - 690 | 3 | 37,5 / - |
| NXP0052 | FR7 | 525 - 690 | 3 | 45 / - |
| NXP0062 | FR8 | 525 - 690 | 3 | 55 / - |
| NXP0080 | FR8 | 525 - 690 | 3 | 75 / - |
| NXP0100 | FR8 | 525 - 690 | 3 | 90 / - |
| NXP0125 | FR9 / FI9 | 525 - 690 | 3 | 110 / - |
| NXP0144 | FR9 / FI9 | 525 - 690 | 3 | 132 / - |
| NXP0170 | FR9 / FI9 / CH61 | 525 - 690 | 3 | 160 |
| NXP0208 | FR9 / FI9 / CH61 | 525 - 690 | 3 | 200 |

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|------------------|-----------------------|------------------|------------------|---|
| NXP0261 | FR10 / FI10 / CH61 | 525 - 690 | 3 | 250 |
| NXP0325 | FR10 / FI10 / CH62/72 | 525 - 690 | 3 | 315 |
| NXP0385 | FR10 / FI10 / CH62/72 | 525 - 690 | 3 | 355 |
| NXP0416 | FR10 / FI10 / CH62/72 | 525 - 690 | 3 | 450 |
| NXP0460 | FR10 / FI12 / CH62/72 | 525 - 690 | 3 | 450 |
| NXP0502 | FR10 / FI12 / CH62/72 | 525 - 690 | 3 | 500 |
| NXP0590 | FR11 / FI12 / CH63 | 525 - 690 | 3 | 560 |
| NXP0650 | FR11 / FI12 / CH63 | 525 - 690 | 3 | 630 |
| NXP0750 | FR11 / FI12 / CH63 | 525 - 690 | 3 | 710 |
| NXP0815 | CH63 | 525 - 690 | 3 | 750 |
| NXP0820 | FR12 / FI12 / CH74/74 | 525 - 690 | 3 | 800 |
| NXP0920 | FR13 / FI13 / CH64/74 | 525 - 690 | 3 | 900 |
| NXP1030 | FR13 / FI13 / CH64/74 | 525 - 690 | 3 | 1000 |
| NXP1180 | FR13 / FI13 / CH64/74 | 525 - 690 | 3 | 1150 |
| NXP1300 | CH64/74 | 525 - 690 | 3 | 1150 |
| NXP1500 | FR14 / FI14 / CH64/74 | 525 - 690 | 3 | 1500 |
| NXP1700 | CH64/74 | 525 - 690 | 3 | - /1550 |
| NXP1850 | 2x CH64/74 | 525 - 690 | 3 | - /1650 |
| NXP1900 | FR14 / FI14 | 525 - 690 | 3 | 1800/ - |
| NXP2120 | 2x CH64/74 | 525 - 690 | 3 | - /1900 |
| NXP2250 | FR14 / FI14 | 525 - 690 | 3 | 2000/ - |
| NXP2340 | 2x CH64/74 | 525 - 690 | 3 | - /2100 |
| NXP2700 | 2x CH64/74 | 525 - 690 | 3 | - /2450 |
| NXP3100 | 2x CH64/74 | 525 - 690 | 3 | - /3100 |
| 2 x NXP2470 | 4 x CH64/74 | 400 - 500 | 3 | 3050 |
| 2 x NXP2950 | 4 x CH64/74 | 400 - 500 | 3 | 3600 |
| 2 x NXP3710 | 4 x CH64/74 | 400 - 500 | 3 | 4500 |
| 2 x NXP4140 | 4 x CH64/74 | 400 - 500 | 3 | 5150 |
| 2 x NXP1850 | 4 x CH74 | 525 - 690 | 3 | 3150 |
| 2 x NXP2120 | 4 x CH74 | 525 - 690 | 3 | 3600 |
| 2 x NXP2340 | 4 x CH74 | 525 - 690 | 3 | 3950 |
| 2 x NXP2700 | 4 x CH74 | 525 - 690 | 3 | 4600 |
| 2 x NXP3100 | 4 x CH74 | 525 - 690 | 3 | 5300 |
| NXN2000 | CH60 | 400 - 690 | 3 | 2200 |

- 1) Values applicable for 40 °C, 10 % overload and highest voltage in each voltage class. To be modified for ships application at 45 °C. See under "Application / limitation".
- 2) Values applicable for 50 °C, 0 % overload and highest voltage in each voltage class.
- 3) Module is rectifier unit and does not run motor but feed DC power to the inverters.

In addition NXP can be substituted by NXI, NXA, NXB, or NXN. NXI, NXA and NXB -units are exactly based on DC-fed Vacon NXP control and power electronics component platforms, excluding for rectifier units and charging circuitry, which are not used in these products. Variation is made by application selection. NXN is a building block of FR13-14 or independent rectifier unit.

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NXP FR10-FR14 and all CH units will include external chokes.

NXA units can also be accompanied with following L/LCL filters and NXF units with following L filters

| Choke types |
|-------------|
| CHK0261 |
| CHK0400 |
| CHK0520 |
| CHK0650 |
| CHK0750 |
| CHK0820 |
| CHK1030 |
| CHK1150 |

| L/LCL Filters |
|---------------|
| LCL 0261 5 |
| LCL 0460 5 |
| LCL 1300 5 |
| LCL 0170 6 |
| LCL 0325 6 |
| LCL 1030 6 |
| L 0300 5 |
| L 0520 5 |
| L 1450 5 |
| L 0208 6 |
| L 0416 6 |
| L 1180 6 |

NX_ Liquid cooled (CHxx) units can be accompanied with hoses attached to the modules.
 NX Liquid cooled (CHxx) units can be accompanied with following options: Heat Exchangers, Air-cooled Regenerative LCL filters IP00 (Naturally convected) and Liquid-cooled Regenerative LCL filters IP00. For details see Vacon documentation.

"The power range can be extended up to 5 MW by using the Vacon DriveSynch control concept for running 2..4 pcs of CH64/74 or NXI modules frequency converter modules/ cabinet solutions in parallel", see document "Vacon DriveSynch"

Application/Limitation

| | |
|---------------------------------|--|
| Supply voltage range: | 208 - 690 V, 50/60 Hz |
| Voltage variation: | - 10 % , + 10 % |
| Frequency variation: | ± 10 % |
| Output frequency: | 0 - 320 Hz |
| Temperature range in operation: | Air cooled: 0 - 40 °C (40 - 50 °C when derated 1,5% /°C, 50 - 55 when derated 2,5% /°C) Liquid cooled: 0 - 50 °C (CH6x series 50 - 55 °C when derated 2,5% / °C) |
| Temperature class: | A |
| Vibration class: | A |
| Humidity class: | A |
| Protection class: | IP00, IP21 & IP54 |
| EMC class*: | DNV CN 2,4 / IEC 61800-3 To be used on EMC class A locations |

The NX_ must be regarded as a component. The actual installation shall be designed according to Vacon Installation & Operating Instructions and according to the applicable DNV Rules for the actual application. Documents for the actual application are to be submitted for approval in each case in accordance with DNV Rules Pt.4, Ch.8, Sec.1 Table B2. A Product Certificate is required for converters ≥ 100 kW

To be installed in an enclosure with an IP degree in accordance with DNV Rules w.r.t. location.

* Converters EMC classed C3 according to IEC 61800-3 can be installed in "special distribution zone" and "general power distribution zone" in accordance with IEC 60533 provided precautions are taken to attenuate these effects on the distribution system, so the safe operation is assured.

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For marine applications size of drive to be derated with respect to an ambient temperature of 40°C (1,5% per deg. C for ambient above 40 - 50 °C) or chosen acc. to 50 °C rating. See manual.

Type Approval documentation

Technical info:

VACON® NX AC DRIVES – Liquid –Cooled DRIVES NON-REGENERATIVE END UNIT – USER MANUAL
"Vacon request for update" Part of email from Vacon to DNV dated 2010-09-23.
"Vacon User's manual NXP Frequency Converters dated 2005 (parts).

Test reports:

SGS Fimko Test report No. 282088-1.
VACON Doc. "CH60 Liquid Cooled NFE 400-690V Summary of IEC 61800-5-1 Type tests" rev V001 dated 2016-01-19.
UL Approval Test Report No. E171278, Vol.1, New Section, dated 2016-01-14.
Vacon Test Report "CH60 Liquid Cooled NFE 400-690V Summary of IEC61800-5-1 Type Tests Doc. No.????, dated 2014-12-14.
"Classification documentation of frequency converters – Air cooled Fr4-14, Liq. Cooled Ch3-7, dated 2006.

Tests carried out

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 NXP/NXN – Type designation – Power – Voltage

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 least every second year.

END OF CERTIFICATE