

TYPE APPROVAL CERTIFICATE

Certificate no.:
TAE000013B
Revision No:
4

This is to certify:

that the **Frequency Converter**

with type designation(s)

NXA, NXB, NXI, NXN, NXP & NXS

issued to

Danfoss Drives Oy
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.

Issued at **Høvik** on **2024-01-22**

This Certificate is valid until **2028-12-31**.

DNV local unit: **Finland CMC**

Approval Engineer: **Nicolay Horn**



for **DNV**

Digitally Signed By: Elter, Frederik Tore
Location: DNV Høvik, Norway

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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.



Name and place of manufacturer

Danfoss Drives Oy Ltd.
 VAASA, Finland

Danfoss (China) Drives Co., Ltd.
 Haiyan Country, JiaXing City
 Zhejiang Province, P.R China

Product description

NXP:

Frequency converter for use in various marine applications. Constant / variable torque applications.
 Air and liquid cooled. CHxx = liquid cooled, FRxx = air cooled, Flxx = Inverter module, Air cooled.

Applicable with different applications as:

- ARFIF02 and ARFIF05, AFE (Active Front End)
- ANFIF01, NFE (Non-regenerative Front End)
- ARFIF03, grid converter
- ARFIF106, grid converter
- ADFIF101, DCDC converter
- ABFIF01, BCU (Brake Chopper Unit)

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

Type designation	Frame size	Mains supply (V)	Number of phases	Motor shaft power (kW) ^{1) 2)}
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
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

Type designation	Frame size	Mains supply (V)	Number of phases	Motor shaft power (kW) ^{1) 2)}
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 ³⁾	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.

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

NXS:

Variable speed controller for asynchronous motor. Constant / variable torque applications.
 Air cooled. FRxx = air cooled.

Type designation	Frame size	Mains supply (V)	Number of phases	Motor shaft power (kW) ¹⁾
NXS0004	FR4	208 - 240	3	0,55
NXS0007	FR4	208 - 240	3	0,75
NXS0008	FR4	208 - 240	3	1,1
NXS0011	FR4	208 - 240	3	1,5
NXS0012	FR4	208 - 240	3	2,2
NXS0017	FR5	208 - 240	3	3
NXS0025	FR5	208 - 240	3	4
NXS0031	FR5	208 - 240	3	5,5
NXS0048	FR6	208 - 240	3	7,5
NXS0061	FR6	208 - 240	3	11
NXS0075	FR7	208 - 240	3	15
NXS0088	FR7	208 - 240	3	18,5
NXS0114	FR7	208 - 240	3	22
NXS0140	FR8	208 - 240	3	30
NXS0170	FR8	208 - 240	3	37
NXS0205	FR8	208 - 240	3	45
NXS0261	FR9	208 - 240	3	55
NXS0300	FR9	208 - 240	3	75
NXS0003	FR4	380 - 500	3	1,1
NXS0004	FR4	380 - 500	3	1,5
NXS0005	FR4	380 - 500	3	2,2
NXS0007	FR4	380 - 500	3	3
NXS0009	FR4	380 - 500	3	4
NXS0012	FR4	380 - 500	3	5,5
NXS0016	FR5	380 - 500	3	7,5
NXS0022	FR5	380 - 500	3	11
NXS0031	FR5	380 - 500	3	15
NXS0038	FR6	380 - 500	3	18,5
NXS0045	FR6	380 - 500	3	22

Type designation	Frame size	Mains supply (V)	Number of phases	Motor shaft power (kW) ¹⁾
NXS0061	FR6	380 - 500	3	30
NXS0072	FR7	380 - 500	3	37
NXS0087	FR7	380 - 500	3	45
NXS0105	FR7	380 - 500	3	55
NXS0140	FR8	380 - 500	3	75
NXS0168	FR8	380 - 500	3	90
NXS0205	FR8	380 - 500	3	110
NXS0261	FR9	380 - 500	3	132
NXS0300	FR9	380 - 500	3	160
NXS0385	FR10	380 - 500	3	200
NXS0460	FR10	380 - 500	3	250
NXS0520	FR10	380 - 500	3	250
NXS0590	FR11	380 - 500	3	315
NXS0650	FR11	380 - 500	3	355
NXS0730	FR11	380 - 500	3	400
NXS0004	FR6	525 - 690	3	3
NXS0005	FR6	525 - 690	3	4
NXS0007	FR6	525 - 690	3	5,5
NXS0010	FR6	525 - 690	3	7,5
NXS0013	FR6	525 - 690	3	11
NXS0018	FR6	525 - 690	3	15
NXS0022	FR6	525 - 690	3	18,5
NXS0027	FR6	525 - 690	3	22
NXS0034	FR6	525 - 690	3	30
NXS0041	FR7	525 - 690	3	37,5
NXS0052	FR7	525 - 690	3	45
NXS0062	FR8	525 - 690	3	55
NXS0080	FR8	525 - 690	3	75
NXS0100	FR8	525 - 690	3	90
NXS0125	FR9	525 - 690	3	110
NXS0144	FR9	525 - 690	3	132
NXS0170	FR9	525 - 690	3	160
NXS0208	FR9	525 - 690	3	200
NXS0261	FR10	525 - 690	3	250
NXS0325	FR10	525 - 690	3	315
NXS0385	FR10	525 - 690	3	355
NXS0416	FR10	525 - 690	3	400
NXS0460	FR11	525 - 690	3	450
NXS0502	FR11	525 - 690	3	500
NXS0590	FR11	525 - 690	3	560

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".

NXS FR10-FR12 will include external chokes.

Choke types
CHK0261
CHK0400
CHK0520
CHK0650
CHK0750
CHK0820
CHK1030
CHK1150

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".

NXP and NXS units can be equipped with following options: SIN Filters, DUT Filters, RFI Filters and Brake Resistor. (For details see Vacon documentation.)

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

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

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.

Product certification:

Frequency converters rated equal or larger than 100 kW serving essential or important functions as defined in DNV rules Pt.4 Ch.8 shall have a product certificate according to DNV Pt.4 Ch.8 Sec.1 Table 3 for each delivery to DNV classed vessels.

For product certification / plan approval, the following documents of the semiconductor assembly should be submitted for approval, Ref. to DNV Pt.4 Ch.8 Sec.1 Table 2 by the end user / final product integrator:

- Reference to this Type Approval Certificate
- (E180) A drawing showing external location of instruments and devices for operation (panel layout)
- (E240) Functional description for the intended use, configuration and interface (e.g. alarms, monitoring and auxiliary power supplies)
- (Z252) Test program at manufacturer for routine tests and functional tests as per DNV Pt.4 Ch.8 Sec.7, 2.1.1
- Single line diagram (only applicable for multi drive configuration)
- If additional components to the type approved frequency converter are delivered, documentation according to DNV rules Pt.4 Ch.8 Sec.1 table 2 shall be submitted for review.

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.

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 –ARFIF106 Grid Converter with general grid code – Application Manual
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:

VACON @ NXP Grid Converter Short Circuit Tests, dated 2019-02-07.
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

Danfoss drives NXP/NXN/NXS – 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 2 and 3.5 years and at renewal.

END OF CERTIFICATE