Confirmation of Product Type Approval

Company Name: DANFOSS DRIVES OY

Address: RUNSORINTIE 7 VAASA FI 65380 Finland

Product: Frequency Converter

Model(s): VACON NX_Series

Endorsements:

Certificate Type	Certificate Number	Issue Date	Expiry Date
Product Design Assessment (PDA)	24-00T2545447-PDA	17-MAY-2024	16-MAY-2029
Manufacturing Assessment (MA)	19-TU3753184	08-NOV-2019	13-DEC-2024
Product Quality Assurance (PQA)	19-3753184-PQA	08-NOV-2019	13-DEC-2024

Tier
4 - Enrolled in PQA Program

Intended Service
Motor Controller for use in propulsion, thrusters, pumps, cranes etc. for use on ABS classed vessels and offshore installations in accordance with the listed ABS Rules and International Standards.

Description
NXS Standard Drives:

FR4 to FR14, 208V to 690V, Continuous load current rating from 2.2Aac to 730Aac, Enclosure IP21 and IP54.

NXP High Performance Drives, air- and liquid-cooled:

FR4 to FR14, 208V to 690V, Continuous load current rating from I low 3.7Aac / I high 2.4Aac to I low 2365Aac / I high 1940Aac, Up to max of 8987A is possible by paralleling 4 modules (4x2365x0,95). Enclosure IP00, IP21 and IP54.

CH3 to CH5, CH61, CH63, CH72, CH74, 2 x CH74, 4x CH74, 500V - 690V, Continous load current from I low 15Aac/ I high 11Aac to I low 3763Aac / I high 2760Aac, Up to max of 7866A is possible by paralleling 2 modules (2x4140x0,95). Enclosure IP00.

NX common DC bus drives, air- and liquid-cooled:

FR4, FR6 to FR8 and FI9 to FI14, 465Vdc - 1100Vdc, Continuous load current rating from I low 4.1Aac / I high 2.4Aac to I low

2700Aac / I high 2300Aac, Up to max of 10260A is possible by paralleling 4 modules (4x2700x0,95). Enclosure IP00, IP21 and IP54.

CH3 to CH5, CH61 to CH64, 2xCH64, 4xCH64, 465Vdc - 1100Vdc, Continuous load current rating from I low 15Aac / I high 11Aac to I low 3763 / I high 2760Aac, Up to max of 7150Aac is possible by paralleling 2 modules (2x3763x0,95). Enclosure IP00.

NXN non-regenerative front-end, FI9, Continuous load current rating I low 650Aac / I high 507Aac. Enclosure IP00.

DC Bus Tie Breaker Functionality

VACON DCGuard consist of a VACON® NXP inverter and application software ADFIF102.

NX Modules can be equipped with: SIN, DUT, LCL, RLC, RFI, etc. filters, input choke and brake resistor options. (External AC Choke to be used in all IP00 Frequency drives and rectifiers)

Following drive models and their configuration are also possible as per the attached sheets.

NXS Drives: FR4 to FR11

NXP Drives: FR4 to FR14

In addition NXP can be substituted by NXI, NXA, NXB, NXN or NXF. NXI, NXA, NXB and NXF -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 independent rectifier unit.

NXI, NXA, NXB, NXF Drives: FR4, FR6 to FR8 and FI9 to FI14, with NXA, NXB & NXF software applications.

NXN Drives: FI9.

Ratings
IP00, IP20, IP21 & IP54, 208V to 690V AC.

Enclosures IP00, IP20, IP21 and IP54, voltage and current ratings as per the manufacturer's manuals.

Enclosures IP00, IP20, IP21 and IP54, voltage ratings from 208 VAC to 690 VAC and 465 VDC to 1100 VDC, current ratings from 1.3 A to 2700 A and with paralleling up to max 10260 A (4x2700x0.95) as per the manufacturer's manuals.

Service Restrictions
- Unit Certification is required for semiconductor converters used to control motor drives having a rated power of 100 kW(135 hp) or over that are intended for essential services as 4-8-3/1.5 of Marine Vessel Rules (2024). Detailed requirements for unit certification are in 4-8-3/8.1 of the ABS Rules for Building and Classing Marine Vessels 2024.

- Environmental tests and approval are for hardware only.

- If the manufacturer or purchaser request an ABS Certificate for compliance with a specification or standard, the specification or standard, including inspection standards and tolerances, must be clearly defined.

- Evidence of of compliance with IEC 60146-1-1: 2009 must be submitted to ABS for review if requested by the customer

- Evidence for protection due to Increase in conductivity of cooling medium for all liquid cooled converters as per MVR 24: 4-8-3/8.5.12 (VI) needs to be submitted to ABS technical office on vessel specific basis.

Comments

1) Tests and approval are for the basic components. Each configuration and external connection is to be specifically approved for propulsion and DP applications.

2) When incorporated in a system of Category I, II or III in accordance with 4-9-3/7.1 and 4-9-3/Table 1 of the ABS Marine Vessels Rules the documentation detailed in 4-9-3/Table 2 is to be submitted to ABS or to be available for review by ABS as applicable.

3) We note that FI9, frame 10 and above drives are delivered as IP00 modules and they do not comply with EMC requirement as per 4-9-9/15.7 Table 1 of the ABS Marine Vessels Rules. Planned EMC measures are required to be submitted for review prior to installation of these models on board. This certificate does not cover the model FI9 and frame 10, these drives are delivered as IP00 modules, and they do not comply with EMC requirement as per 4-9-9/ 15.7 Table 1 of the ABS Marine Vessels Rules. Planned EMC measures are required to be submitted for review to ABS technical office prior to installation of these models on board.

4) The Manufacturer has provided a declaration about the control of, or the lack of Asbestos in this product.

Notes, Drawings and Documentation
Drawing No. DPD00887J, VACON NX Liquid-Cooled Drives User Manual, Revision: J, Pages: 273

Drawing No. NX Marine Test (version 1), NX Marine Test, Revision: -, Pages: 1

Drawing No. AQ468246143802, VACON NX IP00 Modules AQ468246143802en-000201, Revision: 002, Pages: 178

Drawing No. AQ275638903263, VACON NXS NXP Air-Cooled Operating guide, Revision: 006, Pages: 196

Drawings from past PDA Projects:

Drawing No. DCGuard - Application presentation - HW_Marine approval, DCGuard - Application presentation - HW_Marine approval, Revision: -, Pages: 9

Drawing No. ISO9001-2008-2017, ISO9001-2008-2017, Revision: -, Pages: 2

Drawing No. ISO9001-2008_CnEn_201606, ISO9001-2008_CnEn_201606, Revision: -, Pages: 4

Drawing No. TAE00002G2, DNVGL TA Cert, Revision: 1F, Pages: 2

Drawing No. VACON_abs_certificate_of_design_assessment_-china-, VACON_abs_certificate_of_design_assessment_-china-, Revision: -, Pages: 3

Drawing No. VACON_abs_certificate_of_design_assessment_-finland-, VACON_abs_certificate_of_design_assessment_-finland-, Revision: -, Pages: 3

Drawing No. VACON_abs_type_approval_in_finland_7_1_2015, VACON_abs_type_approval_in_finland_7_1_2015, Revision: -, Pages: 3

Drawing No. VACON_corfirmation_of_product_type_approva_china_18_8_20, VACON_corfirmation_of_product_type_approva_china_18_8_20, Revision: -, Pages: 3

Drawing No. VACON DCGuard-Application software and interface test plan-Rev0_0, VACON DCGuard-Application software and interface test plan-Rev0_0, Revision: 0, Pages: 15

Drawing No. VACON DCGuard-DNV-GL Type Approval Tests-00738584, VACON DCGuard-DNV-GL Type Approval Tests-00738584, Revision: A2, Pages: 96

Drawing No. VACON DCGuard-Functional description-00738711, VACON DCGuard-Functional

description-00738711, Revision: B2, Pages: 34

Drawing No. VACON DCGuard-Technical data-00738653, VACON DCGuard-Technical data-00738653, Revision: C2, Pages: 13

Drawing No. VACON DCGuard-Test plan, VACON DCGuard-Test plan, Revision: -, Pages: 12

Drawing No. Vacon-NXP-DCGuard-ADFIF102-Manual-DPD01971A-V004, Vacon-NXP-DCGuard-ADFIF102-Manual-DPD01971A-V004, Revision: 4, Pages: 49

Drawing No. VaconLtd_Finland_ISO9001_2008, VaconLtd_Finland_ISO9001_2008, Revision: -, Pages: 3

Term of Validity
This Product Design Assessment (PDA) Certificate remains valid until 16/May/2029 or until the Rules and/or Standards used in the assessment are revised or until there is a design modification warranting design reassessment (whichever occurs first).

Acceptance of product is limited to the "Intended Service" details prescribed in the certificate and as per applicable Rules and Standards.

This Certificate is valid for installation of the listed product on ABS units which exist or are under contract for construction on or previous to the effective date of the ABS Rules and standards applied at the time of PDA issuance. Use of the Product for non-ABS units is subject to agreement between the manufacturer and intended client.

ABS Rules
- ABS RULES FOR BUILDING AND CLASSING MARINE VESSELS (2024) 1A-1-4/7.7, 1A-1-A3, 1A-1-A4, 4-8-3/8.1, 4-8-3/8.5.1, 4-8-3/8.5.2, 4-8-3/8.5.4, 4-8-3/8.5.5, 4-8-3/8.5.6, 4-8-3/8.5.8, 4-8-3/8.5.9, 4-8-3/8.5.10, 4-8-3/8.5.12

- ABS RULES FOR BUILDING AND CLASSING LIGHT AND HIGH-SPEED CRAFT (2024): 1C-1-4/11.9, 1C-1-A2, 1C-1-A3, 4-6-4/10.3, 4-6-4/10.5

- ABS RULES FOR BUILDING AND CLASSING MOBILE OFFSHORE UNITS (2024): 1B-1-4/9.7, 1B-1-A2, 1B-1-A3, 6-1-1/9, 6-1-1/13, 6-1-7/12.1, 6-1-7/12.3, 6-1-7/12.7

- ABS REQUIREMENTS FOR DIRECT CURRENT (DC) POWER DISTRIBUTION SYSTEMS FOR MARINE AND OFFSHORE APPLICATIONS (2018) 3/11

International Standards
IEC 61800-5-1:2007

EN 50178:1998

EN 60068-2-6 Ed.7:2007

BS EN 60204-1:2018

IEC 60092-504:2016

IEC 60533:2015

EN 50081-2: 1993

IACS E10 Rev. 8 (2021)

EU-MED Standards
NA

National Standards
NA

Government Standards
NA

Other Standards
NA

Corporate ABS Programs
American Bureau of Shipping
Print Date and Time: 31-Jul-2024 2:12

ABS has used due diligence in the preparation of this certificate, and it represents the information on the product in the ABS Records as of the date and time the certificate is printed.

If the Rules and/or standards used in the PDA evaluation are revised or if there is a design modification (whichever occurs first), a PDA revalidation may be necessary.

The continued validity of the MA is dependent on completion of satisfactory audits as required by the ABS Rules. The validity of both PDA and MA entitles the product to receive a **Confirmation of Product Type Approval**.

Acceptance of product is limited to the “Intended Service” details prescribed in the certificate and as per applicable Rules and Standards.

This Certificate is valid for installation of the listed product on ABS units which exist or are under contract for construction on or prior to the effective date of the ABS Rules and standards applied at the time of PDA issuance. ABS makes no representations regarding Type Approval of the Product for use on vessels, MODUs or facilities built after the date of the ABS Rules used for this evaluation.

Type Approval requires Drawing Assessment, Prototype Testing and assessment of the manufacturer's quality assurance and quality control arrangements. The manufacturer is responsible to maintain compliance with all specifications applicable to the product design assessment. Unless specifically indicated in the description of the product, certification under type approval does not waive requirements for witnessed inspection or additional survey for product use on a vessel, MODU or facility intended to be ABS classed or that is presently in class with ABS.

Due to wide variety of specifications used in the products ABS has evaluated for Type Approval, it is part of our contract that; whether the standard is an ABS Rule or a non-ABS Rule, the Client has full responsibility for continued compliance with the standard.

Questions regarding the validity of ABS Rules or the need for supplemental testing or inspection of such products should, in all cases, be addressed to ABS.