Certificate number: 23444/D0 BV
File number: AP 4153
Product code: 2592I

This certificate is not valid when presented without the full attached schedule composed of 7 sections

www.veristar.com

TYPE APPROVAL CERTIFICATE

This certificate is issued to

Danfoss LLC

Loves Park, IL - UNITED STATES OF AMERICA

for the type of product

FREQUENCY CONVERTERS (Power 50kW and over)

FC-302 VLT Automation Series, FC-202 VLT Aqua Series and FC-102 VLT HVAC Series

Requirements:
Bureau Veritas Rules for the Classification of Steel Ships.

EC code: 21

This certificate is issued to attest that Bureau Veritas Marine & Offshore did undertake the relevant approval procedures for the product identified above which was found to comply with the relevant requirements mentioned above.

This certificate will expire on: 07 Jan 2031

For Bureau Veritas Marine & Offshore,
At BV PORT EVERGLADES CENTRE, on 19 Jan 2026,
Flavio Rosas

This certificate was created electronically and is valid without signature

This certificate remains valid until the date stated above, unless cancelled or revoked, provided the conditions indicated in the subsequent page(s) are complied with and the product remains satisfactory in service. This certificate will not be valid if the applicant makes any changes or modifications to the approved product, which have not been notified to, and agreed in writing with Bureau Veritas Marine & Offshore. Should the specified regulations or standards be amended during the validity of this certificate, the product(s) is/are to be re-approved prior to it/they being placed on board vessels to which the amended regulations or standards apply. This certificate is issued within the scope of the General Conditions of Bureau Veritas Marine & Offshore available on the internet site www.veristar.com. Any Person not a party to the contract pursuant to which this document is delivered may not assert a claim against Bureau Veritas Marine & Offshore for any liability arising out of errors or omissions which may be contained in said document, or for errors of judgement, fault or negligence committed by personnel of the Society or of its Agents in establishment or issuance of this document, and in connection with any activities for which it may provide.

THE SCHEDULE OF APPROVAL

1. PRODUCT DESCRIPTION:

- Product model or type designation:
  FC-102, FC-202, FC-302.

- Product description:
  Frequency Converters

1.1 Frequency Converters

1.1.1 FC-102 VLT HVAC Drive Series:

FC-102 380-480V (T4)				
Power rating [kW]	Enclosure type			
	IP20 (*1)	IP00 (*1)	IP21 (*2)	IP54 (*3)
110 **132** **160**	D3h	NA	D1h/D5h/D6h	D1h/D5h/D6h
200 **250** **315**	D4h	NA	D2h/D7h/D8h	D2h/D7h/D8h
355 **400** **450**	E3h	E3h	E1h	E1h
500	E4h	E4h	F1/F3/E2h	F1/F3/E2h
560	E4h	E4h	F1/F3/E2h	F1/F3/E2h
630	NA	NA	F1/F3	F1/F3
710	NA	NA	F1/F3	F1/F3
800 **1M0**	NA	NA	F2/F4	F2/F4

FC-102 525-690V (T7)				
Power rating [kW]	Enclosure type			
	IP20 (*1)	IP00 (*1)	IP21 (*2)	IP54 (*3)
75 **90** **110** **132** **160**	D3h	NA	D1h/D5h/D6h	D1h/D5h/D6h
200 **250** **315** **400**	D4h	NA	D2h/D7h/D8h	D2h/D7h/D8h
450	E3h	E3h	E1h	E1h
500 **560** **630**	E3h	E3h	E1h	E1h
710 **800** **900**	E4h E4h NA	E4h E4h NA	F1/F3/E2h F1/F3/E2h F1/F3	F1/F3/E2h F1/F3/E2h F1/F3
1M0 **1M2** **1M4**	NA	NA	F2/F4	F2/F4

1.1.2 FC-202 VLT AQUA Drive Series:

FC-202 380-480V (T4)				
Power rating [kW]	**Enclosure type**			
	IP20 (*1)	IP00 (*1)	IP21 (*2)	IP54 (*3)
110	D3h	NA	D1h/D5h/D6h	D1h/D5h/D6h
132				
160				
200	D4h	NA	D2h/D7h/D8h	D2h/D7h/D8h
250				
315				
355	E3h	E3h	E1h	E1h
400				
450				
500	E4h	E4h	F1/F3/E2h	F1/F3/E2h
560	E4h	E4h	F1/F3/E2h	F1/F3/E2h
630	NA	NA	F1/F3	F1/F3
710	NA	NA	F1/F3	F1/F3
800	NA	NA	F2/F4	F2/F4
1M0				

FC-202 525-690V (T7)				
Power rating [kW]	Enclosure type			
	IP20 (*1)	IP00 (*1)	IP21 (*2)	IP54 (*3)
75	D3h	NA	D1h/D5h/D6h	D1h/D5h/D6h
90				
110				
132				
160				
200	D4h	NA	D2h/D7h/D8h	D2h/D7h/D8h
250				
315				
400				
450	E3h	E3h	E1h	E1h
500				
560				
630				
710	E4h	E4h	F1/F3/E2h	F1/F3/E2h
800	E4h	E4h	F1/F3/E2h	F1/F3/E2h
900	NA	NA	F1/F3	F1/F3
1M0	NA	NA	F2/F4	F2/F4
1M2				
1M4				

1.1.3 FC-302 VLT Automation Drive Series:

FC-302: 380-500V (T5)				
Power rating [kW]	Enclosure type			
	IP20 (*1)	IP00 (*1)	IP21 (*2)	IP54 (*3)
90	D3h	NA	D1h/D5h/D6h	D1h/D5h/D6h
110				
132				
160	D4h	NA	D2h/D7h/D8h	D2h/D7h/D8h
200				
250				
315	E3h	E3h	E1h	E1h
355				
400				
450	E4h	E4h	F1/F3/E2h	F1/F3/E2h
500	E4h	E4h	F1/F3/E2h	F1/F3/E2h
560	NA	NA	F1/F3	F1/F3
630	NA	NA	F1/F3	F1/F3
710	NA	NA	F2/F4	F2/F4
800				

FC-302 525-690V (T7)				
Power rating [kW]	Enclosure type			
	IP20 (*1)	IP00 (*1)	IP21 (*2)	IP54 (*3)
55	D3h	NA	D1h/D5h/D6h	D1h/D5h/D6h
75				
90				
110				
132				
160	D4h	NA	D2h/D7h/D8h	D2h/D7h/D8h
200				
250				
315				
355	E3h	E3h	E1h	E1h
400				
500				
560				
630	E4h	E4h	F1/F3/E2h	F1/F3/E2h
710	E4h	E4h	F1/F3/E2h	F1/F3/E2h
800	NA	NA	F1/F3	F1/F3
900	NA	NA	F2/F4	F2/F4
1M0	NA	NA	F2/F4	F2/F4
1M2	NA	NA	F2/F4	F2/F4

(*1) IP 00/IP20: Panel mount.
(*2) IP 21: NEMA Type 1
(*3) IP 54: NEMA Type 12
Ruggedized boards selection "R" in character 20 must be selected where applicable.

Selection types for Type Codes for FC-102 / FC-202 / FC-302

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ (character 24 – 39 software + options)
1 4 7 10 11 23

<u>Basic string definitions:</u>

- *Product Group (character 1-3)*

FC-: Adjustable Frequency Converters

- *VLT series (character 4-6)*

102: VLT HVAC Drive – Advanced version
202: VLT AQUA Drive – Advanced version
302: VLT Automation Drive – Advanced version
322: Equal to FC-202
312: Equal to FC-302
103: Equal to FC-102

- *Power size (character 7-10)*

P: Power (standard design)
N55K: 55kW/75 HP
P1M4: 1400kW/1900 HP

- *Voltage: (character 11-12)*

T4: Three phase 380-480 VAC
T5: Three phase 380-500 VAC
T7: Three Phase 525-690 VAC

- *Enclosure (character 13-15)*

"C" units with corrosion resistant back channel:
C20: IP20 / Chassis
C21: IP21 / (NEMA) Type 1
C2H: IP21 / (NEMA) Type 1 + heater
C54: IP54 / (NEMA) Type 12
C5H: IP54 / (NEMA) Type 12 + heater
C2M: IP21 / (NEMA) Type 1 + Mains Shield
C5M: IP54 / (NEMA) Type 12 + Mains Shield
"E" & "H" units denote standard sized variants:
E00: IP00 / Chassis
E20: IP20 / Chassis
E21: IP21 / (NEMA) Type 1
E54: IP54 / (NEMA) Type 12
E5S: IP54 / (NEMA) Type 12 Stainless Steel screws + heater
E2M: IP21 / (NEMA) Type 1 + mains shield
E5M: IP54 / (NEMA) Type 12 + mains shield
H21: IP21 / (NEMA) Type 1 + heater
H54:IP54 / (NEMA) Type 12 + heater

- *Hardware (character 16-23)*

Hardware, RFI filter (character 16-17)
- H2: 6 Pulse Drive RFI for Maritime (complies with IACS E10 requirements except radiated and conducted emissions)
- H4: 6 Pulse Drive RFI for Maritime (complies with IACS E10 requirements except radiated and conducted emissions)

Hardware, Brake & Stop, (character 18)
Hardware, Display (character 19)
Hardware, Coating (character 20)
Hardware, Mains options (character 21)
Hardware, adaptation A (character 22)
Hardware, adaptation B (character 23)

- *Software (character 24-28)*

Options – A (character 29-30)
Options – B (character 31-32)
Options – C (character 33-37)
Options – D (character 38-39)
Software FC-102: 07.81
Software FC-202: 05.81
Software FC-302: 09.72

1.2 Enclosure Power Ratings and Dimensions for standard configurations

Enclosure size	E1h	E2h	E3h	E4h
Rated Power at 380-480 V [(kW (hp)]	355-450 (500-600)	500-560 (650-750)	355-450 (500-600)	500-560 (650-750)

Rated Power at 525-690 V [(kW (hp)]	450-630 (450-650)	710-800 (750-950)	450-630 (450-650)	710-800 (750-950)
Enclosure protection rating	IP21/Type 1 IP54/Type 12	IP21/Type 1 IP54/Type 12	IP20/ Chassis	IP20/ Chassis
Unit dimensions				
Height [mm (in)]	2043 (80.4)	2043 (80.4)	1578 (62.1)	1578 (62.1)
Width [mm (in)]	602 (23.7)	698 (27.5)	506 (19.6)	604 (23.89)
Depth [mm (in)]	513 (20.2)	513 (20.2)	482 (19.0)	482 (19.0)
Weight [kg (lb)]	295 (650)	318 (700)	272 (600)	295 (650)
Shipping dimensions				
Height [mm (in)]	768 (30.2)	768 (30.2)	746 (29.4)	746 (29.4)
Width [mm (in)]	2191 (86.3)	2191 (86.3)	1759 (69.3)	1759 (69.3)
Depth [mm (in)]	870 (34.3)	870 (34.3)	794 (31.3)	794 (31.3)
Weight [kg (lb)]	-	-	-	-

2. DOCUMENTS AND DRAWINGS:

Documentation, drawings and schematics stored in AP 4153.

- DWG, REF, SHIELDS, EMC, OPT, DI, P454 N°177R0491 Rev.001, dated 06/15/12
- Installation drawing, D8H, IP21/54 N°177R0493 Rev.001, dated 06/18/12
- Installation drawing, D7H, IP21/54 No.177R0492 Rev.005, dated 01/06/2015
- Mounting def. HP11054 N°177R0029 Rev.7, dated 06/27/2013
- Block diagram D-FRAME No. 177R0433 Rev.6, dated 08/21/2023
- Block diagram D-FRAME INVERTER ONLY No. 177R0489 Rev.1, dated 10/21/2013
- INSTALLATION DRAWING, D6H, IP21/54 - N°177R0491 - Rev.002, dated 8/24/2016
- INSTALLATION DRAWING, D7H, IP21/54 - No.177R0492 - Rev.006, dated 8/24/2016
- INSTALLATION DRAWING, D8H, IP21/54 - N°177R0493 - Rev.002, dated 8/24/2016
- DWG, BLOCK DIAGRAMS, E-FRAME, P4001 - No: 177R0659 - Rev.004, dated 08/14/2023
- DWG, BLOCK DIAGRAMS, F1-F4 FRAME - N°177R0048 - Rev.13, dated 05/17/2018
- DWG, BLOCK DIAGRAMS, F8 F9 - N°177R0162 - Rev.4, dated 05/17/2018
- DWG, REF, TERMINAL, RECTIFIER CAB, F1/F2 - N°177R0034 - Rev.4, dated 05/04/2018
- DRW, REF, TERMINAL, INVERTER CAB, F1/F3 - N°177R0035 - Rev.5, dated 05/07/2018
- DRW, REF, OPTIONS CAB, F3/F4 - N°177R0036 - Rev.4, dated 05/07/2018
- DWG, REF, TERMINAL, INVERTER CAB, F2/F4 - N°177R0037 - Rev.5, dated 05/08/2018
- Installation drawing, D3H, IP20/CHASSIS No.177R0339 Rev.004, dated 06/06/2019
- Installation drawing, D4H, IP20/CHASSIS No.177R0340 Rev.003, dated 06/06/2019
- Installation drawing, D1H, IP21/54 No.177R0374 Rev.005, dated 06/06/2019
- Installation drawing, D2H, IP21/54 No.177R0375 Rev.004, dated 06/06/2019
- Installation drawing, D5H, IP21/54 - No.177R0490 Rev.006, dated 01/08/2021
- Drawing No: 177R0704 Rev.001, dated 07/21/2020
- Drawing No: 177R0705 Rev.001, dated 07/21/2020
- Drawing No: 177R0706 Rev.001, dated 07/21/2020
- Drawing No: 177R0707 Rev.001, dated 07/21/2020
- Danfoss Product overview complete Marine approval No.00714813, Revision A, 34 dated 08/18/2025
- Process - DD Software Development Model,dated 09/01/2026
- Process - DD Software Development Model_compliance tab, dated 09/01/2026
- Process - DD Software Development Model_performance monitoring, dated 09/01/2026

3. TEST REPORTS:

- Danfoss LLC Damp Heat Test Report No.00705181 Rev.A3, dated 12/11/2011.
- Danfoss LLC EMC F302-N132T5 Test Report No.00705683 Rev.A14, dated 09/27/2012.
- Danfoss LLC EMC F302-N132T7 Test Report No.00708506 Rev.A7, dated 09/27/2012.
- Danfoss LLC EMC F302-N250T5 Test Report No.00705781 Rev.A9, dated 09/27/2012.
- Danfoss LLC EMC F302-N315T7 Test Report No.00708507 Rev.A6, dated 09/27/2012.
- Danfoss LLC EMC F302-N132T5 Test Report "Power Quality Tests-D1 v1_0.docx" Rev.A14, dated 07/12/2011.
- Danfoss LLC EMC F302-N132T7 Test Report "Power Quality Tests-D1T7 v1_0.docx" Rev.A14, dated 06/06/2012.
- Danfoss LLC EMC F302-N250T5 Test Report "Power Quality Tests-D2 v1_0.docx" Rev.A14, dated 07/12/2011.
- Danfoss LLC EMC F302-N315T7 Test Report "Power Quality Tests-D2T7 v1_0.docx" Rev.A14, dated 06/06/2012.
- DATASYST Vibration Test Report D15-14976, dated 02/20/2012.
- Danfoss LLC Vibration Test Report No.00707038 Rev.A3, dated 10/24/2012.
- LAB DATA PACKAGE - Performance Test No.4786469180, dated 09/04/2014
- LAB DATA PACKAGE - Performance Test No.11NK14834, dated 11/10/2011
- Danfoss - N132T5 Four Quadrant Operation Test No. tr454 PTP 4 Quadrant Operation N132T5, dated 02/11/2011

- Danfoss - N250T5 Four Quadrant Operation Test No. tr454 PTP 4 Quadrant Operation N250T5, dated 10/31/2011
- Danfoss - N132T5 Torque Speed Curves and Starting Torque Test No. tr454 PTP Torque Speed Curve N132T5, dated 08/25/2011
- Danfoss - P250T5 Torque Speed Curves and Starting Torque Test No. tr454 PTP Torque Speed Curve N250t5, dated 08/23/2011
- Danfoss - EMC Engineering Test Report for Product “P454-2, D1 frame.” No. Power Quality Tests -D1 v1_0, dated Jan 2012
- Danfoss - EMC Engineering Test Report for Product “P454-2, D2 frame.” No. Power Quality Tests -D2 v1_0, dated Jan 2012
- Danfoss - Marine 45 Temperature Rise data Report No: 00735840, dated 03/27/2017
- Danfoss - VLT Laboratory Report N710T7 , dated 12/18/2016
- P4001 Operating Guide Next Gen E-Frame- Visual inspection for power drive systems, dated 01/18/2017
- Danfoss Laboratory report N710T7 Four Quadrant Operation, dated 12/18/2016
- Danfoss Laboratory report N400T5 Four Quadrant Operation, dated 09/06/2016
- Danfoss Laboratory report N500T5_N710T7 Insulation Resistance Test, dated 12/09/2016
- DATASYST Engineering & Testing Services, Inc. Vibration Testing of E2 and E4 drives No: D15-17445, dated 08/17/2016
- Letter from Danfoss dated 11/21/2017
- Letter from Danfoss dated 05/21/2018
- Laird Technologies Inc.'s scope of accreditation ISO/IEC 17025 No. 1255.01 dated 12/22/2017
- LSR engineering test report No.316365 dated 02/17/2017
- Test Report No.346675 issued by Delta, Aarhus DK
- Test Report No.346678 issued by Delta, Aarhus DK
- UL LLC Electromagnetic Compatibility Test Report No. 11494250A, dated 12/16/2016.
- NTS ROCKFORD- EMC Tests Report No. CTR-ll-0205 Rev. B, dated 12/29/2011

4. APPLICATION / LIMITATION:

4.1 - According to BV Rules for the Classification of Steel Ships

4.2 Approval valid for ships intended to be granted with the following additional class notations: **AUT-UMS, AUT-CCS, AUT-PORT and AUT-IMS.**

4.3 - The equipment, once installed on board ship, is to be tested in accordance with the above referred Rules under the supervision of a Society's Surveyor.

4.4 - Equipments covered by this Type Approval certificate comply with the electromagnetic field test requirements of IACS UR E10 rev9.

4.5 - Converters with EMC emission test 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

4.6 - In accordance with IACS UR E22 and as applicable to programmable devices for computer based systems of Category II or III, for each ship application:

- Ship specific documentation is to be submitted including software documentation and categorization of the computer based system.
- Inspection and testing before installation onboard is to be performed under the surveillance of the Society.

5. PRODUCTION SURVEY REQUIREMENTS:

5.1 - The above products are to be supplied by **DANFOSS LLC** in compliance with the type and the requirements described in this certificate.
5.2 - This type of product is within the category IBV of Bureau Veritas Rule Note NR320.
5.3 - BV product certificate is required.
5.4 - For information, **Danfoss LLC** has declared to Bureau Veritas the following production site(s):

Danfoss LLC
4401 N. Bell School Rd.
Loves Park, IL
UNITED STATES OF AMERICA

Danfoss Drives Oy
P.O. Box 25
Runsorintie 7
65381 VAASA
FINLAND

ZHEJIANG HOLIP ELECTRONIC TECHNOLOGY CO.,LTD
339 North Xinqiao Road, Wuyuan street,
Haiyan County, Jiaxing City
314300 Haiyan, Zhejiang
CHINA

6. MARKING OF PRODUCT:

6.1 - Maker's name or trade mark.
6.2 - Serial number of the units.
6.3 - Equipment type number or model identification under which it was type-tested.
6.4 - Bureau Veritas' marking

7. OTHERS:

7.1 - It is **Danfoss LLC**'s responsibility to inform shipbuilders or their sub-contractors of the proper methods of fitting, use and general maintenance of the approved equipment and the conditions of this approval.
7.2 - This Certificate supersedes the Type Approval Certificate No.23444/C1 BV issued by the Society.

***** END OF CERTIFICATE *****