



Marine & Offshore
Division

Certificate number: 23444/B0 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

FC-302 VLT Automation Series, FC-202 VLT Aqua Series and FC-102 VLT HVAC Series, AAF Advanced Active Filters.

Requirements:

Bureau Veritas Rules for the Classification of Steel Ships.

This certificate is issued to attest that BUREAU VERITAS 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 2021

For BUREAU VERITAS,

At BV PORT EVERGLADES CENTRE, on 07 Jan 2016,

Flavio Rosas



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. 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 Division 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 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.

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BV Mod. Ad.E 530 October 2014

This certificate consists of 12 page(s)

THE SCHEDULE OF APPROVAL

1. PRODUCT DESCRIPTION:

1.1 Frequency Converters

1.1.1 FC-102 VLT HVAC Drive Series:

FC102 380-480V (T4)

Power rating [kW]	Enclosure type			
	IP20 (*1)	IP00 (*1)	IP21 (*2)	IP54 (*3)
110				
132	D3h	NA	D1h/D5h/D6h	D1h/D5h/D6h
160				
200				
250	D4h	NA	D2h/D7h/D8h	D2h/D7h/D8h
315				
110	NA	D3	D1	D1
132				
160				
200	NA	D4	D2	D2
250				
315				
355				
400	NA	E2	E1	E1
450				
500				
560				
630	NA	NA	F1/F3	F1/F3
710				
800	NA	NA	F2/F4	F2/F4
1M0				

FC102 525-690V (T7)

Power rating [kW]	Enclosure type			
	IP20 (*1)	IP00 (*1)	IP21 (*2)	IP54 (*3)
75				
90				
110	D3h	NA	D1h/D5h/D6h	D1h/D5h/D6h
132				
160				
200				
250	D4h	NA	D2h/D7h/D8h	D2h/D7h/D8h
315				
400				
75				
90				
110				
132	NA	D3	D1	D1
160				
200	NA	D4	D2	D2
250				
315	NA	D3	D1	D1
400				
450	NA	E2	E1	E1

1.1.1 FC-102 VLT HVAC Drive Series (to be continued):

FC102 525-690V (T7)

Power rating [kW]	Enclosure type			
	IP20 (*1)	IP00 (*1)	IP21 (*2)	IP54 (*3)
500	NA	E2	E1	E1
560				
630				
710	NA	NA	F1/F3	F1/F3
800				
900				
1M0	NA	NA	F2/F4	F2/F4
1M2				
1M4				

FC102 380-480V (T4) 12-Pulse Drives

Power rating [kW]	Enclosure type		
	IP00 (*1)	IP21 (*2)	IP54 (*3)
315	NA	F8/F9	F8/F9
355			
400			
450			
500	NA	F10/F11	F10/F11
560			
630			
710			
800	NA	F12/F13	F12/F13
1M0			

FC102 525-690V (T7)

Power rating [kW]	Enclosure type		
	IP00(*1)	IP21 (*2)	IP54 (*3)
450	NA	F8/F9	F8/F9
500			
560			
630			
710	NA	F10/F11	F10/F11
800			
900			
1M0	NA	F12/F13	F12/F13
1M2			
1M4			

FC102 380-480V (T4) Low Harmonic Drives

Power rating [kW]	Enclosure type		
	IP00 (*1)	IP21 (*2)	IP54 (*3)
160	NA	D11/D13	D11/D13
200		D11/D13	D11/D13
250			
315	NA	E7/E9	E7/E9
355			
400			
450			
500	NA	F17/F18	F17/F18
560			
630			
710			

1.1.2 FC-202 VLT AQUA Drive Series:

FC202 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				
110	NA	D3	D1	D1
132				
160				
200	NA	D4	D2	D2
250				
315				
355	NA	E2	E1	E1
400				
450				
500	NA	NA	F1/F3	F1/F3
560				
630				
710	NA	NA	F2/F4	F2/F4
800				
1M0				

FC202 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				
45				
55	NA	D3	D1	D1
75				
90				
110				
132				
160	NA	D4	D2	D2
200				
250				
315				
400				
450	NA	E2	E1	E1
500				
560				
630				

1.1.2 FC-202 VLT AQUA Drive Series (to be continued):

FC202 525-690V (T7)

Power rating [kW]	Enclosure type			
	IP20 (*1)	IP00 (*1)	IP21 (*2)	IP54 (*3)
710	NA	NA	F1/F3	F1/F3
800				
900				
1M0	NA	NA	F2/F4	F2/F4
1M2				
1M4				

FC202 380-480V (T4) 12-Pulse Drives

Power rating [kW]	Enclosure type		
	IP00(*1)	IP21 (*2)	IP54 (*3)
315	NA	F8/F9	F8/F9
355			
400			
450			
500	NA	F10/F11	F10/F11
560			
630			
710			
800	NA	F12/F13	F12/F13
1M0			

FC202 525-690V (T7)

Power rating [kW]	Enclosure type		
	IP00 (*1)	IP21 (*2)	IP54 (*3)
450	NA	F8/F9	F8/F9
500			
560			
630			
710	NA	F10/F11	F10/F11
800			
900			
1M0			
1M2	NA	F12/F13	F12/F13
1M4			

FC202 380-480V (T4) Low Harmonic Drives

Power rating [kW]	Enclosure type		
	IP00 (*1)	IP21 (*2)	IP54 (*3)
160	NA	D11/D13	D11/D13
200			
250			
315	NA	E7/E9	E7/E9
355			
400			
450			
500	NA	F17/F18	F17/F18
560			
630			
710			

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				
90	NA	D3	D1	D1
110	NA	D4	D2	D2
132				
160				
200	NA	E2	E1	E1
250				
315				
355	NA	NA	F1/F3	F1/F3
400				
450				
500	NA	NA	F2/F4	F2/F4
560				
630				
710	NA	NA	F2/F4	F2/F4
800				

FC302 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	D4h	NA	D2h/D7h/D8h	D2h/D7h/D8h
132				
160				
200	NA	D3	D1	D1
250				
315				
37	NA	D4	D2	D2
45				
55				
75	NA	E2	E1	E1
90				
110				
132	NA	E2	E1	E1
160				
200				
250	NA	E2	E1	E1
315				
355				
400	NA	E2	E1	E1
500				
560				

1.1.3 FC-302 VLT Automation Drive Series (to be continued):

FC302 525-690V (T7)

Power rating [kW]	Enclosure type		
	IP20 (*1)	IP00 (*1)	IP21 (*2)
630	NA	NA	F1/F3
710			
800			
900	NA	NA	F2/F4
1M0			
1M2			

FC302 380-500V (T5) 12-Pulse Drives

Power rating [kW]	Enclosure type		
	IP00(*1)	IP21 (*2)	IP54 (*3)
250	NA	F8/F9	F8/F9
315			
355			
400			
450	NA	F10/F11	F10/F11
500			
560			
630			
710	NA	F12/F13	F12/F13
800			

FC302 525-690V (T7)

Power rating [kW]	Enclosure type		
	IP00(*1)	IP21 (*2)	IP54 (*3)
355	NA	F8/F9	F8/F9
400			
500			
560			
630	NA	F10/F11	F10/F11
710			
800			
900			
1M0	NA	F12/F13	F12/F13
1M2			

FC302 380-500V (T5) Low Harmonic Drives

Power rating [kW]	Enclosure type		
	IP00 (*1)	IP21 (*2)	IP54 (*3)
132	NA	D11/D13	D11/D13
160			
200			
250	NA	E7/E9	E7/E9
315			
355			
400			
450	NA	F17/F18	F17/F18
500			
560			
630			

- (*1) IP 00/IP20: Panel mount.
- (*2) IP 21: NEMA Type 1
- (*3) IP 54: NEMA Type 12

Limitations: Converters which exceed the limits for radiated and conducted emissions of IACS E10 can be installed in "special power distribution zone" according to IEC 60533. For installations in "general distribution zone" measures must be taken to attenuate the effects on the distribution system. Planned EMC measures according to IEC 60533 shall be assessed prior to installation on board.

Ruggedized boards selection "R" in character 20, or H5 in character 16-17 must be selected.

Selection types for Type Codes for FC 100 / FC 200 / FC 300

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

Basic string definitions:

- *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

- *Power size (character 7-10)*

P: Power (standard design)

P110: 110 kW / 150 HP

N110: 110 kW / 150 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)*

E20: IP 20 / Chassis

E2S: IP 20 / Chassis (medium power D-Frame)

E21: IP 21 / Type 1

E2D: IP 21 / Type 1 (medium power D-Frame)

H21: IP 21 / Type 1 heater

E54: IP 54 / Type 12

H54: IP 54 / Type 1 heater

E5H: Hybrid IP 54

E2M : IP21/ Type 1 with mains shield

E5M : IP54/ Type 12 with mains shield

E5D : IP54/ Type 12 (medium power D-Frame)

- *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)
- B2: 12 Pulse Drive RFI for Maritime (complies with IACS E10 requirements except radiated and conducted emissions)
- B2: 12 Pulse Drive RFI for Maritime (complies with IACS E10 requirements except radiated and conducted emissions)
- N2: Low Harmonic Drive RFI for Maritime (complies with IACS E10 requirements except radiated and conducted emissions)
- N4: Low Harmonic 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)

- *Brand labelling and customer specific definitions:*

Brand labelling and customer specific drives are following the type codes except the characters 1-6 for product group and VLT series. Character 1-6 are used for customer specific definitions.

Basic string definitions for brand labelling and customer specific drives:

Product Group and VLT series (character 1-6)

- AF-600: Equals to FC-102
- AKD102: Equals to FC-102
- ADS102: Equals to FC-102
- IVS102: Equals to FC-102
- TR-200: Equals to FC-102
- ITT102: Equals to FC-102
- CUE202: Equals to FC-202
- FC-322: Equals to FC-202
- LD-302: Equals to FC-302
- IR-302: Equals to FC-302
- IRV302: Equals to FC-302
- CD-302: Equals to FC-302
- MWU302: Equals to FC-302
- CDS302: Equals to FC-302
- DV-302: Equals to FC-302
- 3G3DV: Equals to FC-302
- LB-302: Equals to FC-302
- AFE302: Equals to FC-302
- AF-650: Equals to FC-302
- FCK302: Equals to FC-302
- FC-312: Equals to FC-302

1.2 Active Filter : Model VLT Active Filter AAF006**AAA006: 380-480 (T4)**

Current rating (Amps)	Enclosure type				RFI filter Type (*4)
	IP20 (*1)	IP00 (*1)	IP21 (*2)	IP54 (*3)	
190	NA	NA	D14	D14	HX**
250	NA	NA	E1	E1	
310					
400					

(*1) IP 00/IP20: Panel mount.

(*2) IP 21: NEMA Type 1

(*3) IP 54: NEMA Type 12

(*4) HX: Active Filter RFI for Maritime complies with IACS E10 requirements except radiated and conducted emissions.

****Limitations:** Filters which exceed the limits for radiated and conducted emissions of IACS E10 can be installed in "special power distribution zone" according to IEC 60533. For installations in "general distribution zone" measures must be taken to attenuate the effects on the distribution system. Planned EMC measures according to IEC 60533 shall be assessed prior to installation on board.

Ruggedized boards selection "R" in character 20, or H5 in character 16-17 must be selected.

Selection types for Type Codes for AAF006 Active Filters

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

Basic string definitions:

- *Product Group (character 1-3)*

AAF: Active Filters

- *VLT series (character 4-6)*

006: VLT Active Filter - Series 6

- *Current rating (character 7-10)*

A190: 190 Amp

- *Voltage: (character 11-12)*

T4: Three phase 380-480 VAC

- *Enclosure (character 13-15)*

E21: IP 21 / Type 1

E54: IP 54 / Type 12

E2M: IP21/Type 1 with mains shield

E5M : IP54/ Type 12 with mains shield

- *Hardware (character 16-23)*

Hardware, RFI filter (character 16-17)

- *Software (character 24-28)*

Options – A (character 29-30)

Options – B (character 31-32)

Options – C (character 33-37)

Options – D (character 38-39)

2. DOCUMENTS AND DRAWINGS:

Documentation, drawings and schematics stored in AP 4153.

List of updated drawings :

- Block diagram HP12027 N°177R0040 Rev.4, dated 02/10/2012
- Block diagram HP12027 N°177R0043 Rev.5, dated 02/10/2012
- Block diagram HP12027 N°177R0044 Rev.5, dated 02/10/2012
- Block diagram HP12027 N°177R0041 Rev.4, dated 02/10/2012
- Block diagram HP12027 N°177R0045 Rev.5, dated 02/10/2012
- Mounting Def. HP10064 N°175R5959 Rev.4, dated 07/29/2012
- Terminal def. HP09039 N°175R5960 Rev.A, dated 04/09/2009, sheets 1/2, 2/2
- Block diagram HP10081 N°177R0042 Rev.B, dated 12/02/2010
- Block diagram HP10081 N°177R0046 Rev.C, dated 12/02/2010
- Block diagram HP12229 N°177R0048 Rev.11, dated 12/7/2012
- Block diagram HP12007 N°177R0162 Rev.3, dated 01/16/2012
- Block diagram HP12229 N°177R0197 Rev.4, dated 12/17/2012
- Rect. Terminal Def. HP11258 N°177R0034 Rev.3, dated 12/21/2011
- Rect. Terminal Def. HP11258 N°177R0035 Rev.3, dated 01/04/2012
- Opt. Terminal Def. HP11258 N°177R0036 Rev.3, dated 12/22/2011
- Terminal def. HP11258 N°177R0037 Rev.3, dated 12/27/2011

List of updated drawings 23444/A2:

- 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

List of updated drawings 23444/A3:

- Mounting def. HP11054 N°177R0029 Rev.7, dated 06/27/2013

List of updated drawings 23444/B0:

- Mounting def. HP10119 No.175R5955 Rev.5, dated 03/10/2014
- Terminal def. HP09079No.175R5961 Rev.3, dated 10/18/2013
- Installation drawing, D1H, IP21/54 No.177R0374 Rev.004, dated 11/27/2012
- Installation drawing, D2H, IP21/54 No.177R0375 Rev.003, dated 10/07/2013
- Installation drawing, D3H, IP20/CHASSIS No.177R0339 Rev.003, dated 01/21/2014
- Installation drawing, D4H, IP20/CHASSIS No.177R0340 Rev.002, dated 11/21/2012
- Installation drawing, D5H, IP21/54 No.177R0490 Rev.004, dated 02/05/2015
- Installation drawing, D7H, IP21/54 No.177R0492 Rev.005, dated 01/06/2015
- INST, MTG, SERIES 6, AAF190, D FRAME No.177R0349 Rev.002, dated 03/14/2014
- INST, MTG, SERIES 6, LHD120, D FRAME No.177R0350 Rev.003, dated 09/05/2014
- INST, MTG, SERIES 6, AAF310 E FRAME No.177R0351 Rev.002, dated 03/13/2014
- INST, MTG, SERIES 6, LHD210 E FRAME No.177R0352 Rev.005, dated 01/29/2015
- INST, MTG, SERIES 6, LHD330 F FRAME No.177R0354 Rev.004, dated 09/05/2014
- Block diagram D-FRAME No. 177R0433 Rev.5, dated Aug 25, 2014
- Block diagram D-FRAME INVERTER ONLY No. 177R0489 Rev.1, dated Oct 21, 2013

3. TEST REPORTS:

- Laboratory Data Package Performance Test Report ULS-005008C-NMMS-2002 dated 24/01/2001
- NTS Vibration Test Report A9182 dated 9/12/2009
- Delta EMC test report DANAK 19K0441 dated 02/03/2007
- Danfoss LLC EMC Test Report P407-151_R0126T01v100b dated 09/03/2007
- Danfoss LLC EMC Test Report P407-151_R0126T02v100a dated 09/03/2007
- Danfoss LLC EMC Test Report P407-154_R0126T05v100a dated 09/03/2007
- Danfoss LLC EMC Test Report P408-83_R0134T04v200a dated 15/11/2007
- Danfoss LLC EMC Test Report P408-90_R0134T02v200a dated 03/05/2007
- Danfoss LLC EMC Test Report P408-89_R0134T01v200a dated 07/05/2007
- Danfoss LLC EMC Test Report P408-88_R0131T01v100b dated 10/04/2007
- Danfoss LLC EMC Test Report P408-85_R0134T09v100 dated 01/05/2007
- Danfoss LLC EMC Test Report P408-84_R0134T05v210a dated 02/05/2007
- Danfoss LLC EMC Test Report P408-82_R0134T05v100b dated 17/04/2007
- Danfoss LLC EMC Test Report P408-81_R0132T03v100c dated 29/05/2007
- Danfoss LLC EMC Test Report P408-80_R0132T02v100a dated 16/04/2007
- Danfoss LLC EMC Test Report P408-79_R0132T01v100b dated 16/04/2007
- Danfoss LLC EMC Test Report P408-90_R0134T02v200a dated 03/05/2007
- Danfoss LLC EMC Test Report P408-78_R0131T02v100a dated 29/05/2007

3. TEST REPORTS (to be continued):**List of updated Test Reports 23444/A2:**

- Danfoss LLC Damp Heat Test Report No.00705181 Rev.A3, dated 2011-11-12.
- Danfoss LLC EMC F302-N132T5 Test Report No.00705683 Rev.A14, dated 2012-09-27.
- Danfoss LLC EMC F302-N132T7 Test Report No.00708506 Rev.A7, dated 2012-09-27.
- Danfoss LLC EMC F302-N250T5 Test Report No.00705781 Rev.A9, dated 2012-09-27.
- Danfoss LLC EMC F302-N315T7 Test Report No.00708507 Rev.A6, dated 2012-09-27.
- Danfoss LLC EMC F302-N132T5 Test Report "Power Quality Tests-D1 v1_0.docx" Rev.A14, dated 2011-12-07.
- Danfoss LLC EMC F302-N132T7 Test Report "Power Quality Tests-D1T7 v1_0.docx" Rev.A14, dated 2012-06-06.
- Danfoss LLC EMC F302-N250T5 Test Report "Power Quality Tests-D2 v1_0.docx" Rev.A14, dated 2011-12-07.
- Danfoss LLC EMC F302-N315T7 Test Report "Power Quality Tests-D2T7 v1_0.docx" Rev.A14, dated 2012-06-06.
- DATASYST Vibration Test Report D15-14976, dated 2012-02-20.
- Danfoss LLC Vibration Test Report No.00707038 Rev.A3, dated 2012-10-24.

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 Regulations under the supervision of a Society's Surveyor.

4.4 - Converters with conducted and radiated emission above the BV required limits can be installed in "special distribution zone" and "general power distribution zone", in accordance with IEC 60533 provided measures are taken to attenuate these effects on the distribution system, so safe operation is assured. Planned EMC measures shall be submitted for approval prior installation onboard.

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.

6. MARKING OF PRODUCT:

Trade name, Date of manufacture and serial number, Equipment type or model identification under which it was type-tested

\ or @conformity marking, as relevant.

7. OTHERS:

7.1 - This approval is given on the understanding that the Society reserves the right to require check tests to be carried out on the units at any time and that **DANFOSS LLC, Loves Park, IL USA.** will accept full responsibility for informing shipbuilders, shipowners or their sub-contractors of the proper methods of use and general maintenance of the units and the conditions of this approval.

7.2 - This Certificate supersedes the Type Approval Certificate No.23444/A3 BV issued on 19 Jun 2014 by the Society.

*** END OF CERTIFICATE ***