MARINE DIVISION

Certificate number: 23444/A3 BV
File number: AP 4153
Product code: 2592I

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

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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

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: 28 Dec 2015

For BUREAU VERITAS,

At BV PORT EVERGLADES CENTRE, on 19 Jun 2014,

Flavio Rosas

BUREAU VERITAS SURVEYORS AT PARIS 1828 MIAMI CENTRE INTERNATIONAL REGISTER

THE SCHEDULE OF APPROVAL

1. PRODUCT DESCRIPTION:

1.1 Frequency Converters

1.1.1 FC-102 VLT HVAC Series:

Voltage / Type	Power Rating	Enclosure Type	RFI Filter
380 - 480V (T4)	110 to 1000 kW	IP00 (*1) or IP20 (*1) or IP21 (*2) or IP54 (*3)	H2 Type (*4)
380 - 480V (T4)	315 to 800 kW		B2 Type (*5)
380 - 480V (T4)	132 to 630 kW		L2 Type (*6)
380 - 480V (T4)	132 to 710 kW		N2 Type (*7)
525 - 690V (T7)	75 to 1400 kW		H2 Type (*4)
525 - 690V (T7)	450 to 1400 kW		B2 Type (*5)

1.1.2 FC-202 VLT Aqua Series:

Voltage / Type	Power Rating	Enclosure Type	RFI Filter Type (*4)
380 - 480V (T4)	110 to 1000 kW	IP00 (*1) or IP20 (*0) or IP21 (*2) or IP54 (*3)	H2 Type (*4)
380 - 480V (T4)	315 to 800 kW		B2 Type (*5)
380 - 480V (T4)	132 to 630 kW		L2 Type (*6)
380 - 480V (T4)	160 to 710 kW		N2 Type (*7)
525 - 690V (T7)	75 to 1400 kW		H2 Type (*4)
525 - 690V (T7)	450 to 1400 kW		B2 Type (*5)

1.1.3 FC-302 VLT Automation Series:

Voltage / Type	Power Rating	Enclosure Type	RFI Filter Type (*4)
380 - 500V (T5)	90 to 800 kW	IP00 (*1) or IP20 (*1) or IP21 (*2) or IP54 (*3)	H2 Type (*4)
380 - 500V (T5)	250 to 800 kW		B2 Type (*5)
380 - 500V (T5)	132 to 630 kW		N2 Type (*7)
380 - 480V (T4)	132 to 630 kW		L2 Type (*6)
525 - 690V (T7)	55 to 1200 kW		H2 Type (*4)
525 - 690V (T7)	355 to 1200 kW		B2 Type (*5)

(*1) IP 00/IP20: Panel mount.
(*2) IP 21: NEMA Type 1
(*3) IP 54: NEMA Type 12
(*4) H2: 6 pulses drive RFI complies with all IACS E10 requirements except radiated and conducted emissions.
(*4) H6: 6 pulses drive RFI complies with all IACS E10 requirements.
(*5) B2: 12 pulses drive RFI complies with all IACS E10 requirements except radiated and conducted emissions.
(*6) L2: Low Harmonic drive RFI complies with all IACS E10 requirements except radiated and conducted emissions.
(*7) N2: Low Harmonic drive RFI complies with all IACS E10 requirements except radiated and conducted emissions.

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
103: VLT Refrigeration Drive
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) Type H2, B2, L2, N2
Hardware, Brake & Stop, (character 18)
B: brake chopper

Hardware, Display (character 19)
Hardware, Coating (character 20)
Hardware, Mains options (character 21)
Options are
x: No mains option
7:Fuses
A:Fuses and loadsharing terminals (IP20 only)
D:Loadsharing terminals (IP20 only)
3: Mains disconnect and fuse
4: Mains contactor and fuse
E: Mains disconnect, contactor and fuse
J: Circuit breaker and fuse

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 complies with IACS E10 requirements except radiated and conducted emissions.

***Limitations:* Converters with conducted and radiated emission above the CCS required limits can be installed in "special distribution zone" and "general power distribution zone", in accordance with IEC60553 provided measures are taken to attenuate these effects on the distribution system, so safe operation in assured. Planned EMC measures shall be submitted for approval prior installation on-board.

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
- Mounting def. HP10119 N°175R5955 Rev.4, dated 12/16/2010
- Terminal def. HP09079N°175R5961 Rev.A, dated 05/29/2009
- 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°1757R0037 Rev.3, dated 12/27/2011
- Block diagram, Harmonic filter N°177R0007 , sheets 1/3, 2/3, 3/3
- Mounting LHD P424-D N°177R0426 Rev.P1, dated 01/06/2011, sheet 1/3, 2/3, 3/3.
- Mounting LHD210 Series 5 N°177R0429 Rev.P1, dated 10/31/2011, sheet 1/3, 2/3, 3/3.

List of updated drawings 23444/A2:

- Installation drawing, D1H, IP21/54 N°177R0374 Rev.003, dated 05/25/12
- Installation drawing, D2H, IP21/54 N°177R0375 Rev.002, dated 03/14/12
- Installation drawing, D3H, IP20/CHASSIS N°177R0339 Rev.002, dated 05/25/12
- Installation drawing, D4H, IP20/CHASSIS N°177R0340 Rev.001, dated 01/25/12
- Installation drawing, D5H, IP21/54 N°177R0490 Rev.001, dated 06/18/12
- DWG, REF, SHIELDS, EMC, OPT, DI, P454 N°177R0491 Rev.001, dated 06/15/12
- Installation drawing, D7H, IP21/54 N°177R0492 Rev.001, dated 06/18/12
- Installation drawing, D8H, IP21/54 N°177R0493 Rev.001, dated 06/18/12
- INST, MTG, SERIES 6, AAF190, D FRAME N°177R0349 Rev.001, dated 09/18/12
- INST, MTG, SERIES 6, LHD120, D FRAME N°177R0350 Rev.001, dated 09/07/12
- INST, MTG, SERIES 6, AAF310 E FRAME N°177R0351 Rev.001, dated 09/18/12
- INST, MTG, SERIES 6, LHD210 E FRAME N°177R0352 Rev.001, dated 09/12/12
- INST, MTG, SERIES 6, LHD330 F FRAME N°177R0354 Rev.001, dated 09/17/12

List of updated drawings 23444/A3:

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

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

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 N°23444/A2 BV issued on January 21, 2013 by the Society.

*** END OF CERTIFICATE ***