



Marine &amp; Offshore

Certificate number: 23444/B3 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 (Power 50kW and over)**

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 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 2021**

**For Bureau Veritas Marine & Offshore,**

At BV PORT EVERGLADES CENTRE, on 21 Sep 2018,

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 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.

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BV Mod. Ad.E 530 June 2017

This certificate consists of 14 page(s)

## THE SCHEDULE OF APPROVAL

### 1. PRODUCT DESCRIPTION:

- Product model or type designation:

**FC-102, FC-202, FC-302, AAF006 series**

- 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	D3h	NA	D1h/D5h/D6h	D1h/D5h/D6h
132				
160				
200	D4h	NA	D2h/D7h/D8h	D2h/D7h/D8h
250				
315				
355	E3h	E2	E1/E1h	E1/E1h
400				
450				
500	E4h	NA	F1/F3/E2h	F1/F3/E2h
560	E4h	NA	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-102 525-690V (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	E2	E1/E1h	E1/E1h

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

#### FC-102 525-690V (T7)

Power rating [kW]	Enclosure type			
	IP20 (*1)	IP00 (*1)	IP21 (*2)	IP54 (*3)
500	E3h	E2	E1/E1h	E1/E1h
560				
630				
710	E4h	NA	F1/F3/E2h	F1/F3/E2h
800	E4h		F1/F3/E2h	F1/F3/E2h
900	NA		F1/F3	F1/F3
1M0	NA	NA	F2/F4	F2/F4
1M2				
1M4				

**FC-102 380-480V (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			

**FC-102 525-690V (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			

**FC-102 380-480V (T4) Low Harmonic Drives**

Power rating [kW]	Enclosure type		
	IP00 (*1)	IP21 (*2)	IP54 (*3)
160	NA	D1n	D1n
200		D2n	D2n
250			
315	NA	E9	E9
355			
400			
450			
500	NA	F18	F18
560			
630			
710			

## 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				
250	D4h	NA	D2h/D7h/D8h	D2h/D7h/D8h
315				
355				
400	E3h	E2	E1/E1h	E1/E1h
450				
500				
560	E4h	NA	F1/F3/E2h	F1/F3/E2h
630	E4h		F1/F3/E2h	F1/F3/E2h
710	NA		F1/F3	F1/F3
800	NA		F1/F3	F1/F3
1M0	NA	NA	F2/F4	F2/F4

**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				
250	D4h	NA	D2h/D7h/D8h	D2h/D7h/D8h
315				
400				
450				
500	E3h	E2	E1/E1h	E1/E1h
560				
630				

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

**FC-202 525-690V (T7)**

Power rating [kW]	Enclosure type			
	IP20 (*1)	IP00 (*1)	IP21 (*2)	IP54 (*3)
710	E4h	NA	F1/F3/E2h	F1/F3/E2h
800	E4h		F1/F3/E2h	F1/F3/E2h
900	NA		F1/F3	F1/F3
1M0	NA	NA	F2/F4	F2/F4
1M2				
1M4				

**FC-202 380-480V (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			
560	NA	F10/F11	F10/F11
630			
710			
800	NA	F12/F13	F12/F13
1M0			

**FC-202 525-690V (T7)**

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

**FC-202 380-480V (T4) Low Harmonic Drives**

Power rating [kW]	Enclosure type		
	IP00 (*1)	IP21 (*2)	IP54 (*3)
160	NA	D1n	D1n
200	NA	D2n	D2n
250	NA	E9	E9
315			
355			
400			
450			
500	NA	F18	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				
200	D4h	NA	D2h/D7h/D8h	D2h/D7h/D8h
250				
315				
355	E3h	E2	E1/E1h	E1/E1h
400				
450				
500	E4h	NA	F1/F3/E2h	F1/F3/E2h
560	E4h		F1/F3/E2h	F1/F3/E2h
630	NA		F1/F3	F1/F3
710	NA		F1/F3	F1/F3
800	NA	NA	F2/F4	F2/F4

**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	E2	E1/E1h	E1/E1h
400				
500				
560				

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

<b>FC-302 525-690V (T7)</b>				
Power rating [kW]	Enclosure type			
	IP20 (*1)	IP00 (*1)	IP21 (*2)	IP54 (*3)
<b>630</b>	E4h	NA	F1/F3/E2h	F1/F3/E2h
<b>710</b>	E4h	NA	F1/F3/E2h	F1/F3/E2h
<b>800</b>	NA	NA	F1/F3	F1/F3
<b>900</b>	NA	NA	F2/F4	F2/F4
<b>1M0</b>	NA	NA	F2/F4	F2/F4
<b>1M2</b>	NA	NA	F2/F4	F2/F4
<b>FC-302 380-500V (T5)</b>				
12-Pulse Drives				
Power rating [kW]	Enclosure type			
	IP00(*1)	IP21 (*2)	IP54 (*3)	
<b>250</b>	NA	F8/F9	F8/F9	
<b>315</b>	NA	F8/F9	F8/F9	
<b>355</b>	NA	F8/F9	F8/F9	
<b>400</b>	NA	F8/F9	F8/F9	
<b>450</b>	NA	F10/F11	F10/F11	
<b>500</b>	NA	F10/F11	F10/F11	
<b>560</b>	NA	F10/F11	F10/F11	
<b>630</b>	NA	F10/F11	F10/F11	
<b>710</b>	NA	F12/F13	F12/F13	
<b>800</b>	NA	F12/F13	F12/F13	
<b>FC-302 525-690V (T7)</b>				
Power rating [kW]	Enclosure type			
	IP00(*1)	IP21 (*2)	IP54 (*3)	
<b>355</b>	NA	F8/F9	F8/F9	
<b>400</b>	NA	F8/F9	F8/F9	
<b>500</b>	NA	F8/F9	F8/F9	
<b>560</b>	NA	F8/F9	F8/F9	
<b>630</b>	NA	F10/F11	F10/F11	
<b>710</b>	NA	F10/F11	F10/F11	
<b>800</b>	NA	F10/F11	F10/F11	
<b>900</b>	NA	F12/F13	F12/F13	
<b>1M0</b>	NA	F12/F13	F12/F13	
<b>1M2</b>	NA	F12/F13	F12/F13	
<b>FC-302 380-500V (T5)</b>				
Low Harmonic Drives				
Power rating [kW]	Enclosure type			
	IP00 (*1)	IP21 (*2)	IP54 (*3)	
<b>132</b>	NA	D1n	D1n	
<b>160</b>	NA	D2n	D2n	
<b>200</b>	NA	D2n	D2n	
<b>250</b>	NA	E9	E9	
<b>315</b>	NA	E9	E9	
<b>355</b>	NA	E9	E9	
<b>400</b>	NA	E9	E9	
<b>450</b>	NA	F18	F18	
<b>500</b>	NA	F18	F18	
<b>560</b>	NA	F18	F18	
<b>630</b>	NA	F18	F18	

(\*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





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:	Equal to FC-102
- AKD102:	Equal to FC-102
- ADS102:	Equal to FC-102
- IVS102:	Equal to FC-102
- TR-200:	Equal to FC-102
- ITT102:	Equal to FC-102
- CUE202:	Equal to FC-202
- FC-322:	Equal to FC-202
- LD-302:	Equal to FC-302
- IR-302:	Equal to FC-302
- IRV302:	Equal to FC-302
- CD-302:	Equal to FC-302
- MWU302:	Equal to FC-302
- CDS302:	Equal to FC-302
- DV-302:	Equal to FC-302
- 3G3DV:	Equal to FC-302
- LB-302:	Equal to FC-302
- AFE302:	Equal to FC-302
- AF-650:	Equal to FC-302
- FCK302:	Equal to FC-302
- FC-312:	Equal to FC-302
- FC-103:	Equal to FC-102
- WI-EFC:	Equal to FC-202

**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.

**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)

**For B2 Version**

VLT® HVAC Drive FC-102 (FC-102N355T4 – FC-102N560T4; FC-102N450T7 – FC-102N800T7)

VLT® AQUA Drive FC-202 (FC-202N355T4 – FC-202N560T4; FC-202N450T7 – FC-202N800T7)

VLT® Automation Drive FC-302 (FC-302N315T5 – FC-302N500T5; FC-302N355T7 – FC-302N710T7)

**1.3 Enclosure Power Ratings and Dimensions for standard configurations**

Enclosure size	E1h	E2h	E3h	E4h
<b>Rated Power at 380-480 V [(kW (hp))]</b>	355-450 (500-600)	500-560 (650-750)	355-450 (500-600)	500-560 (650-750)
<b>Rated Power at 525-690 V [(kW (hp))]</b>	450-630 (450-650)	710-800 (750-950)	450-630 (450-650)	710-800 (750-950)
<b>Enclosure protection rating</b>	IP21/Type 1 IP54/Type 12	IP21/Type 1 IP54/Type 12	IP20/ Chassis	IP20/ Chassis
<b>Unit dimensions</b>				
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)
<b>Shipping dimensions</b>				
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)]	-	-	-	-

Enclosure size	E1h	E2h	E3h	E4h
<b>Rated Power at 380-500 V [(kW (hp))]</b>	315-400 (450-550)	450-500 (600-650)	315-400 (450-550)	450-500 (600-650)
<b>Rated Power at 525-690 V [(kW (hp))]</b>	355-560 (400-600)	630-710 (650-950)	355-560 (400-600)	630-710 (650-950)
<b>Enclosure protection rating</b>	IP21/Type 1 IP54/Type 12	IP21/Type 1 IP54/Type 12	IP20/ Chassis	IP20/ Chassis
<b>Unit dimensions</b>				
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)
<b>Shipping dimensions</b>				
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.

### **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.12, dated 11/12/2015
- Block diagram HP12007 N°177R0162 Rev.3, dated 01/16/2012
- Block diagram HP12229 N°177R0197 Rev.5, dated 11/12/2015
- Rect. Terminal Def. HP11258 N°177R0034 Rev.3, dated 12/21/2011
- Rect. Terminal Def. HP11258 N°177R0035 Rev.4, dated 07/16/2015
- Opt. Terminal Def. HP11258 N°177R0036 Rev.3, dated 12/22/2011
- Terminal def. HP11258 N°177R0037 Rev.4, dated 07/14/2015

### **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.005, dated 07/16/2015
- Block diagram D-FRAME No. 177R0433 Rev.5, dated 8/25/2014
- Block diagram D-FRAME INVERTER ONLY No. 177R0489 Rev.1, dated 10/21/2013

**For modification B2 version:**

- Drawing No: 177R0659, dated 09/15/2016
- Drawing No: 177R0676, dated 01/25/2017
- Drawing No: 177R0673, dated 01/25/2017
- Drawing No: 177R0674, dated 01/25/2017
- Drawing No: 177R0675, dated 01/25/2017
- Operating Guide VLT HVAC Drive FC 102, 355-800kW, dated Jan 2017
- Operating Guide VLT AQUA Drive FC 202, 355-800kW, dated Jan 2017
- Operating Guide VLT AutomationDrive FC 302, 315-710kW, dated Jan 2017
- Danfoss Product overview complete Marine approval, dated 23/3/ 2017

**For modification B2 version:**

- Bill of material Ref. 130B7790 dated 4/11/2018

**For modification B3 version:**

- INSTALLATION DRAWING, D5H, IP21/54 - No.177R0490 - Rev.005, dated 8/23/2016
- 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.C, dated 04/09/2018
- 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, BLOCK DIAGRAM, F10-F13 - N°177R0197 - Rev.6, dated 5/17/2018
- 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

**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 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.

**For modification B1 version:**

- P7020 LHD-D Frame, Visual inspection for Power Drive Systems No.00724479 Rev.2.20, dated 18/01/2010
- LAB DATA PACKAGE - Performance Test No.4786469180, dated 09/04/2014
- LAB DATA PACKAGE - Performance Test No.11NK14834, dated 11/10/2011
- Danfoss - Performance Test No.tr7020\_PTP\_Input\_THD\_LHD\_N200, dated 07/30/2014
- Danfoss - AC Line loss Test No. tr7020 PTP ACLoss N200T5, dated 09/09/2014
- Danfoss - Measure Inrush Current Test No. tr7020 PTP Inrush Switch ON Mains N200T5, dated 10/06/2014
- Danfoss - P200T5 Unit Initialization Time Test No. tr7020\_PTP\_Unit\_Initialization\_Time\_P200T5, dated 02/06/2014
- 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 - P250T5 P7020 LHD120N200 test No. tr7020\_PTP\_Input\_THD\_LHD\_N200, dated 07/30/2014
- Danfoss - Marine Dry Heat Test Report for 132-200kW LHD-120 No. 00720712, dated 07/08/2015
- UL India Lab - Damp Heat Test Report for LHD-120 No. 4786962025-S1-2, dated 07/09/2015
- Danfoss - Marine Damp Heat Test Report for 132-200kW LHD-120 No. 00726257, dated 07/10/2015
- Elite - Environmental Tests on P7020 LHD120 Drive No. 1401064-01, Rev. A, dated 06/17/2014
- Danfoss - Vibration Test Report for P7020 LHD120 No. 00720571, dated 07/08/2015
- UL India Lab - Cold Test Report for LHD-120 No. 4786962025-S1-1, dated 07/09/2015
- Danfoss - Cold Test Report for P7020 LHD120 No. 00726256, dated 07/10/2015
- Elite - EMC Tests on LHD120 Drive System No. 1401200-01 Rev. C, dated 01/12/2015
- Elite - EMC Tests on LHD120 Drive System No. 1402112-01 Rev. B, dated 11/12/2014
- 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
- NTS ROCKFORD- EMC Tests on LHDP200 No. CTR-II-0125 Rev. B, dated 08/24/2011

#### **For modification B2 version:**

- 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

#### **For modification B3 version:**

- 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

#### **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:**

- 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 - @ or \ conformity marking, as relevant

**7. OTHERS:**

7.1 - It is **DANFOSS LLC, Loves Park, IL USA**'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/B2 BV issued on 13 Sep 2017 by the Society.

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