



Marine & Offshore  
Division

Certificate number: 21623/B0 BV

File number: AP 3763

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 POWER ELECTRONICS A/S**

Graasten - DENMARK

*for the type of product*

**FREQUENCY CONVERTERS**

Drives frequency converters FC-30x, FC-202, FC-102.

**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: 05 Feb 2020**

**For BUREAU VERITAS,**

At BV FREDERICIA, on 05 Feb 2015,

Jesper Jensen



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.

The electronic version is available at: <http://www.veristarp.com/veristarnb/jsp/viewPublicPdfTypepec.jsp?id=hequuyfm6>

BV Mod. Ad.E 530 October 2014

This certificate consists of 9 page(s)

## THE SCHEDULE OF APPROVAL

### 1. PRODUCT DESCRIPTION:

1.1 VLT HVAC Drive Series FC102 in the range 1.1 kW - 90 kW:

1.1.1 FC-102 power rating vs. enclosure type and IP rating.

• **FC-102: 200-240V (T2)**

Power rating [kW]	Enclosure type			
	IP 20 (*1)	IP 21 (*2)	IP 55 (*3)	IP 66 (*4)
1,1	A2	A2 (*5)	A4/A5	A4/A5
1,5				
2,2				
3,0	A3	A3 (*5)	A5	A5
3,7			A5	A5
4,0	N/A			
5,5	B3	B1	B1	B1
7,5				
11				
15	B4	B2	B2	B2
18,5		C3	C1	C1
22				
30				
37	C4	C2	C2	C2
45				
55				
75	N/A			
90	N/A			

• **FC-102: 380-480V (T4) & 380-500V (T5)**

Power rating [kW]	Enclosure type				
	IP 20(*1)	IP 21(*2)	IP 55(*3)	IP 66(*4)	
1,1	A2	A2 (*5)	A4+A5	A4+A5	
1,5					
2,2					
3,0	N/A				
3,7	N/A				
4,0	A2	A2 (*5)	A4/A5	A4/A5	
5,5	A3	A3 (*5)	A5	A5	
7,5					
11	B3	B1	B1	B1	
15					
18,5					
22	B4	B2	B2	B2	
30		C3	C1	C1	C1
37					
45	C4	C2	C2	C2	
55					
75					
90	N/A				

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

Power rating [kW]	Enclosure type			
	IP 20(*1)	IP 21(*2)	IP 55(*3)	IP 66(*4)
1,1	A3	N/A		
1,5				
2,2		B2		
3,0		N/A		
3,7	A3	B2		
4,0				
5,5				
7,5				
11				
15	B4			
18,5				
22				
30				
37	C3			
45				
55				
75				
90	D3h	C2		

(\*1) IP 20/Panel mount. All IP 20 versions can be upgraded to IP 21 with optional kit

(\*2) IP 21 / NEMA Type 1

(\*3) IP 55 / NEMA Type 12

(\*4) IP 66 / NEMA Type 4X

(\*5) IP 20 / Panel with IP 21 upgrade kit

H1; H2; H3; H4 RFI comply with IACS E10 requirements except radiated and conducted emissions

H5 RFI complies with IACS E10 requirements except radiated and conducted emissions.

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

\* For future product line expansion

\*\**Limitations*: Converters which exceed the limits for radiated and conducted emissions of IACS E10 can be installed in "special power distribution zone" according to IEC60533. For installations in "general power distribution zone" measures must be taken to attenuate the effects on the distribution system Planned EMC measures according to IEC60533 shall be assessed prior to installation on board.

**1.2 VLT AQUA Drive FC202 in the range 0.25 kW - 90 kW:****1.2.1 FC-202 power rating vs. enclosure type and IP rating**• **FC-202: 200-240V (T2)**

Power rating [kW]	Enclosure type			
	IP 20 (*1)	IP 21 (*2)	IP 55 (*3)	IP 66 (*4)
0,25	A2	A2(*5)	A4/A5	A4/A5
0,37				
0,55				
0,75				
1,1				
1,5				
2,2				
3,0	A3	A3 (*5)	A5	A5
3,7				
4,0	N/A			
5,5	B3	B1	B1	B1
7,5				
11				
15	B4	B2	B2	B2
18,5		C1	C1	C1
22	C3	C2	C2	C2
30				
37				
45	C4	C2	C2	C2

• **FC-202: 380-480V (T4) & 380-500V (T5)**

Power rating [kW]	Enclosure type			
	IP 20 (*1)	IP 21 (*2)	IP 55 (*3)	IP 66 (*4)
0,25	N/A			
0,37	A2	A2(*5)	A4/A5	A4/A5
0,55				
0,75				
1,1				
1,5				
2,2				
3,0				
3,7	N/A			
4,0	A2	A2(*5)	A4+A5	A4+A5
5,5	A3	A3(*5)	A5	A5
7,5				
11				
15	B3	B1	B1	B1
18,5				
22	B4	B2	B2	B2
30				
37				
45				
55	C3	C1	C1	C1
75				
90				
			N/A	

• **FC-202: 525-690V (T7)**

Power rating [kW]	Enclosure type			
	IP 20(*1)	IP 21(*2)	IP 55(*3)	IP 66(*4)
1,1	A3	N/A		
1,5				
2,2*				
3,0*				
3,7*				
4,0*				
5,5*		B2		
7,5*				
11	B4			
15				
18,5				
22				
30				
37				
45	C3			
55	D3h	C2		
75				
90				

(\*1) IP 20 / Panel mount. All IP 20 versions can be upgraded to IP 21 with optional kit

(\*2) IP 21 / NEMA Type 1

(\*3) IP 55 / NEMA Type 12

(\*4) IP 66 / NEMA Type 4X

(\*5) IP 20 / Panel with IP 21 upgrade kit

H1; H2; H3; H4 RFI comply with IACS E10 requirements except radiated and conducted emissions

H5 RFI complies with IACS E10 requirements except radiated and conducted emissions.

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

\* For future product line expansion

\*\**Limitations*: Converters which exceed the limits for radiated and conducted emissions of IACS E10 can be installed in "special power distribution zone" according to IEC60533. For installations in "general power distribution zone" measures must be taken to attenuate the effects on the distribution system Planned EMC measures according to IEC60533 shall be assessed prior to installation on board.

**1.3 VLT Automation Drive FC301/ FC302 in the range 0.25 kW - 75 kW:****1.3.1 FC-30x power rating vs. enclosure type and IP rating**• **FC-301/302: 200-240V (T2)**

Power rating [kW]	Enclosure type			
	IP 20 (*1)	IP 21 (*2)	IP 55 (*3)	IP 66 (*4)
0,25	A2	A2(*5)	A4/A5	A4/A5
0,37				
0,55				
0,75				
1,1				
1,5				
2,2	A3	A3(*5)	A5	A5
3,0				
3,7	N/A			
4,0	N/A			
5,5	B3	B1	B1	B1
7,5	B4	B2	B2	B2
11		C1	C1	C1
15		C3	C2	C2
18,5				
22	C4	C2	C2	C2
30				
37	N/A			

• **FC-301/302: 380-480V (T4) & 380-500V (T5)**

Power rating [kW]	Enclosure type			
	IP 20 (*1)	IP 21 (*2)	IP 55 (*3)	IP 66 (*4)
0,37	A2	A2(*5)	A4/A5	A4/A5
0,55				
0,75				
1,1				
1,5				
2,2				
3,0	N/A			
3,7	N/A			
4,0	A2	A2(*5)	A4/A5	A4/A5
5,5	A3	A3(*5)	A5	A5
7,5				
11	B3	B1	B1	B1
15		B2	B2	B2
18,5		B4	C1	C1
22				
30	C3	C2	C2	C2
37				
45	C4	C2	C2	C2
55				
75	N/A			

• **FC-301/302: 525-690V (T7)**

Power rating [kW]	Enclosure type			
	IP 20(*1)	IP 21(*2)	IP 55(*3)	IP 66(*4)
1,1	A3	N/A		
1,5		N/A		
2,2		B2		
3,0		N/A		
3,7	A3	B2		
4,0		B2		
5,5		B2		
7,5		B2		
11	B4	C2		
15				
18,5				
22				
30	C3	C2		
37				
45	D3h	C2		
55				
75				

(\*1) IP 20 / Panel mount. All IP 20 versions can be upgraded to IP 21 with optional kit

(\*2) IP 21 / NEMA Type 1

(\*3) IP 55 / NEMA Type 12

(\*4) IP 66 / NEMA Type 4X

(\*5) IP 20 / Panel with IP 21 upgrade kit

H1; H2; H3; H4 RFI comply with IACS E10 requirements except radiated and conducted emissions

H5 RFI complies with IACS E10 requirements except radiated and conducted emissions.

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

\* For future product line expansion.

\*\**Limitations*: Converters which exceed the limits for radiated and conducted emissions of IACS E10 can be installed in "special power distribution zone" according to IEC60533. For installations in "general power distribution zone" measures must be taken to attenuate the effects on the distribution system Planned EMC measures according to IEC60533 shall be assessed prior to installation on board.

### 1.3.2 Selection types for Type Codes for FC-102, FC-202, FC-301/302 (Low/Medium Power)

\_\_\_\_\_ ( 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

301 : VLT Automation Drive – Standard version

302 : VLT Automation Drive – Advanced version

#### **Power size (character 7-10)**

PK25 : 0.25 kW / 0.33 HP

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P75K : 75 kW / 100 HP

P90K : 90 kW / 125 HP

N75K : 75 kW / 100 HP (D3h)

N90K : 90 kW / 125 HP (D3h)

**Voltage: (character 11-12)**

T2 : Three phase 200-240 VAC  
 T4 : Three phase 380-480 VAC  
 T5 : Three phase 380-500 VAC  
 T7 : Three Phase 525-690 VAC

**Enclosure (character 13-15)**

E20 : IP20 / Chassis  
 E21 : IP21 / Type 1  
 E55 : IP55 / Type 12  
 E66 : IP66 / Type 4X

**Hardware (character 16-23)**

Hardware, RFI filter (character 16-17) – As follows:

H5: RFI for Maritime use. H5 RFI complies with IACS E10 requirements except radiated and conducted emissions  
 H4: RFI for Maritime use. H4 RFI complies with IACS E10 requirements except radiated and conducted emissions  
 H2: RFI Class A2 (C3)

Hardware, Brake & Stop (character 18)

Hardware, Display (character 19)

Hardware, Coating (character 20) – As follows:

C : Coated PCB ;  
 R : Coated PCB 3C3 + Ruggedized

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)

<b>Model</b>	<b>Description</b>	<b>Model</b>	<b>Description</b>
AF-600		LD-302	
AKD102		IR-302	
FC-103		IRV302	
ADS102	Same as FC-102	CD-302	
IVS102		MWU302	
TR-200		CDS302	
ITT102		DV-302	Same as FC-302
		3G3DV	
CUE202	Same as FC-202	LB-302	
FC-322		AFE302	
		AF-650	
FC-311	Same as FC-301	FCK302	
		FC-312	



**2. DOCUMENTS AND DRAWINGS:**

Documentation, drawings and schematics stored in AP 3763.

- Product overview complete Marine approval- Note, No.: 00714813 Rev. A.17, dated 2014-01-22.

**3. TEST REPORTS:**

3.1 P429-144_R0123T01v110a version 1.00a dated 25/11/2008	3.8 P429-151_R0126T02v100b version 1.00a dated 25/12/2008
3.2 P429-155_R0123T01v110a version 1.00a dated 25/11/2008	3.9 P429-154_R0122T01v100a version 1.00a dated 19/12/2008
3.3 P429-163_R0124T01v110a version 1.00a dated 26/11/2008	3.10 P429-159_R0127T01v100b version 1.00a dated 25/11/2008
3.4 P429-164_R0124T01v110a version 1.00a dated 22/12/2008	3.11 P429-161_R0126T01v100b version 1.00a dated 25/11/2008
3.5 DANAK - 1910390 dated 16/01/2009	3.12 P429-162_R0126T02v100a version 1.00a dated 25/11/2008
3.6 P429-150_R0126T01v100b version 1.00a dated 25/12/2008	3.13 P429-165_R0122T01v110a version 1.00a dated 19/12/2008
3.7 P429-151_R0126T02v100b version 1.00a dated 25/12/2008	3.13 P429-261_R0127T01v100c version 1.00a dated 25/11/2008

3.14 P401-749_R0104T03v200a	3.30 P404-688_R0132T01v100	3.46 P462-91_R0132T02v200c
3.15 P401-1093_R0123T01v110a	3.31 P404-689_R0132T02v100	3.47 P462-164_R0134T05v210a
3.16 P401-1094_R0123T03v110a	3.32 P404-691_R0132T04v100a	3.48 P462-355_R0134T05v210a
3.17 P401-1095_R0123T04v110a	3.33 P404-692_R0132T05v100	3.49 P462-459_R0134T05v300a
3.18 P401-1096_R0124T01v100a	3.34 P404-697_R0122T01v110a	3.50 CTR-12-0125
3.18 DANAK 19K0337	3.35 P404-699_R0126T06v110a	3.51 CTR-12-130
3.19 DANAK 19K0123	3.36 P462_A3_Visual Inspection V2.1	3.52 CTR-13-0120
3.20 P401-1098_R0131T01v100	3.37 P462-451_R0124T02v100a	3.53 CTR-13-0155
3.21 P401-1129_R0121T01v100a	3.38 P462-467_R0124T02v100a	3.54 P462-305_R0131T01v100e
3.22 P404-363_R0104T03v200a	3.39 P462-469_R0124T02v100a	3.55 CTR-13-0120
3.23 P404-682_R0123T01v110a	3.40 P462-473_R0122T01v110a	3.56 P462-159_R0132T04v100d
3.24 P404-683_R0123T03v110a Annex	3.41 P462-120_R0101T02v200a	3.57 P462-317_R0132T04v100d
3.25 P404-683_R0123T03v110a	3.42 P462-329_R0101T02v200a	3.58 P462-122_R0102T01v300b
3.26 P404-684_R0123T04v110a	3.43 P462-395_R0101T02v200a	3.59 P462-362_R0102T01v300b
3.27 P404-685_R0124T01v100a	3.44 P462-308_R0132T02v200c	3.60 P462-391_R0102T01v300b
3.28 DANAK 19K0351	3.45 P462-456_R0132T02v200c	3.61 P420-367_R0123T03v110a
3.29 P404-686_R0131T01v100		3.62 P462-321_R0123T03v100a
		3.63 P462-454_R0123T03v100a
		3.64 P420-368_R0123T04v110a
		3.65 P420-541_R0123T04v110a

**4. APPLICATION / LIMITATION :**

4.1 - According to B.V. Rules for the Classification of Steel Ships.

4.2 - Approval valid for ships granted with the following 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.

**5. PRODUCTION SURVEY REQUIREMENTS :**

5.1 - The Drives frequency converters **FC-30x, FC-202, FC-102** are to be supplied by **DANFOSS POWER ELECTRONICS A/S** 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 - 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 POWER ELECTRONICS A/S** 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. 21623/A2 BV issued on 29 July 2014 by the Society.

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