# DNV.GL

# TYPE APPROVAL CERTIFICATE

Certificate No: E-12943 File No: 822.21 Job Id: 262.1-004066-3

This is to certify: That the Frequency Converter

with type designation(s) **FC30X series**,

# Issued to Danfoss Drives A/S GRAASTEN, Denmark

is found to comply with Det Norske Veritas' Rules for Classification of Ships, High Speed & Light Craft and Det Norske Veritas' Offshore Standards

#### **Application :**

Frequency Converter for Asyncronous Motors Range: 0,25 kW to 75 kW 200-240 / 380-500 / 525-690 VAC supply.

This Certificate is valid until **2015-06-30**. Issued at **Høvik** on **2014-12-19** 

for **DNV GL** 

DNV GL local station: Fredericia

Approval Engineer: Nicolay Horn

Marit Laumann Head of Section

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This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid. The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

# **Product description**

**Product:** Frequency converter **/** Variable speed controller for asynchronous morors used for HVAC application. Constant / variable torque applications.

Model: VLT® HVAC Drive series FC300

FC-300: 200-240V (T2)				
Power rating	Power rating Enclosure type			
[kW]	IP20	IP21	IP55	IP66
0,25				
0,37				
0,55			A4 + AE	04 L 0 5
0,75	A2	A2 (*5)		
1,1			АЧТАЈ	Ачтаз
1,5				
2,2				
3,0	4.2	A2 (*E)		
3,7	AS	A3 (*5)	A5	A5
5,5	В3	D2 D1	D 1	D 1
7,5		DI	DI	DI
11	B4	B2	B2	B2
15				
18,5	C3	C1	C1	C1
22				
30	C4	<u> </u>	C2	C2
37		C2	CZ	C2

FC-300 power rating	vs. enclosure	type and IP	rating
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FC-300: 380-480/500V (T4/T5)				
Power rating	Enclosure type			
<b>F1</b> 34/3	IP20	IP21	IP55	IP66
[kW]	(*1)	(*2)	(*3)	(*4)
0,37				
0,55				
0,75				
1,1	A2	A2 (*5)	A4+A5	A4+A5
1,5				
2,2				
3,0				
4,0	A2	A2 (*5)	A4+A5	A4+A5
5,5	A3	A2 (*5)	45	45
7,5		A3 (*3)	AJ	AJ
11	- ВЗ	D1	D 1	D 1
15		DI	DI	DI
18,5	B4	<b>P</b> 2	<b>D</b> D	<b>P</b> 2
22		BZ	DZ	DZ
30		C1	C1	C1

Certificate No: **E-12943** File No: **822.21** Job Id: **262.1-004066-3** 

FC-300: 380-480/500V (T4/T5)				
Power rating	Enclosure type			
[kW]	<b>IP20</b> (*1)	<b>IP21</b> (*2)	<b>IP55</b> (*3)	<b>IP66</b> (*4)
37	63			
45	5			
55	C4	C2	<u> </u>	<u> </u>
75	C4	C2	CZ	C2

FC-300: 525-690V				
Power rating	rating Enclosure type			
[kW]	IP20	IP21	IP55	IP66
1,1			NI/A	
1,5			N/A	
2,2*	A3	<u>בם</u>	ED	<b>B</b> 2
3,0*		DZ	DZ	DZ
4,0*				
5,5*				
7,5*				
11	В4	B2	B2	B2
15				
18,5				
22				
30				
37	- C3			
45		C2	C2	C2
55	D2h	]		
75	D3h			

(\*1) IP20/Panel mount. All IP20 versions can be upgraded to IP21 with optional kit

(\*2) IP21/NEMA Type 1

(\*3) IP55/NEMA Type 12

(\*4) IP66/NEMA Type 4X.

(\*5) IP20/Panel with IP21 upgrade kit

H1, H2, H3 & H4 & H5 RFI complies with IACS E10 requirements except radiated and conducted emissions.

\* For future product line expansion

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

### Selection types for Type Codes for FC 30x

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

# Basic string definitions:

## Product Group (character 1-3)

FC- : Adjustable Frequency Converters

#### VLT series (character 4-6)

301 : VLT Automation Drive - Standard version 302 : VLT Automation Drive - Advanced version

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

PK25:0.25 kW/0.33 HP

P75K: 75 kW / 100 HP

#### 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) H5 : RFI for Maritime use. H5 RFI complies with IACS E10 requirements except radiated and conducted emissions H6 : RFI for Maritime use. H6 RFI complies with all IACS E10 requirements

#### 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)

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

Equals to FC-302
Equals to FC-302
Equals to FC-302
Equals to FC-301

# **Application/Limitation**

200 - 240, 380 - 500 V, 525 - 690 V, 50/60 Hz
± 10 %
± 10 %
0 - 1000 Hz.
In accordance with Danfoss Design Guide.
A
A
B*
A**
IP20, IP21, IP55 & IP66***

The FC300 shall be regarded as a component. The actual installation to be designed according to Danfoss design guide MG.33.B.X.YY – VLT and according to the applicable DNV Rules for the actual application.

\* Relative humidity 5 to 95%, no condensation allowed.

\*\* Converters EMC classed C3 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.

\*\*\* To be installed in an enclosure with an IP degree in accordance with DNV Rules w.r.t. location.

# Type Approval documentation

Technical info:

Product overwiew "FC-30x power rating vs enclosure type and IP rating", part of email from Danfos dated2009-04-14.

"Type approval of Danfoss Drives frequency converters" letter from Danfoss to DNV dated 2006-01-18. FC 300 – Operating instructions.

Test reports: DD-DS3 P420 - Marine test overview version 1.00

P462-91 R0132T02v200c dated 2012-07-03 P462-120 R0101T02v200a dated 2012-11-20 P462-122 R0102T01v300b dated 2013-04-30 P462-159\_R0132T04v100d dated 2013-05-28 P462-164\_R0134T05v210a dated 2013-11-18 P462-308 R0132T02v200c dated 2013-11-18 P462-321 R0123T03v110a dated 2013-04-30 P462-329\_R0101T02v200a dated 2012-11-20 P462-308 R0132T02v200c dated 2012-07-03 P462-355\_R0134T05v210c dated 2013-11-18 P462-91 R0132T02v200c dated 2012-07-03 P462-362 R0102T01v300b dated 2013-04-30 P462-367 R0123T03v110a dated 2013-04-30 P462-391 R0102T01v300b dated 2013-04-30 P462-395\_R0101T02v200a dated 2012-11-20 P462-451 R0124T02v110a dated 2013-07-03

P462-456 R0132T02v200c dated 2013-07-03 P462-459 R0134T05v210 dated 2013-11-18 P462-473 R0122T01v110a dated 2013-09-18 P420-541 R0123T04v110a dated 2007-12-19 P420-321 R0123T03v110a dated 2007-12-19 P420-367 R0123T03v110a dated 2007-12-19 P420-368\_R0123T04v110a dated 2007-12-19 P420-454\_R0123T03v110a dated 2007-12-19 DocCM 00708685 DocCM 00709825 DocCM 0071489 CTR 13-0120 dated 2013-05-17 P429 -58 R0101T01v220a "Visual inspection, dated 2009-12-19 P429 -81 R0111T01v201a "Temperature test" dated 2008-06-02 P429 -151\_R0126T02v100a "Burst - fast transient" dated 2008-11-25 P429 -162\_R0126T02v100a "Burst - fast transient" dated 2008-11-25 P429 -150\_R0126T02v100a "Electrostatic discharge" dated 2008-11-25 P429 -161\_R0126T02v100a "Electrostatic discharge" dated 2008-11-25 P429 -159\_R0127T02v100b "Conducted emission" dated 2008-11-25 P429 -231\_R0127T02v100c "Conducted emission" dated 2008-11-25 P429 -165\_R0122T01v110a "Power supply variation and interuptions" dated 2008-11-25 P429 -154\_R0122T02v110a "Power supply variation and interuptions" dated 2008-11-25 P429 -144\_R0123T01v110a "Dry heat test" dated 2008-11-25 P429 -155\_R0123T01v110a "Dry heat test" dated 2008-11-25 P429 -163\_R0124T01v100a "Wide band random" dated 2008-11-26 P429 -164\_R0124T01v100a "Wide band random" dated 2008-12-22 130R0319 - Marine test overview FC302PK25T5 - FC302P7K5T5 130R0320 - Marine test overview FC302P11KT5 - FC302P75KT5 DANAK EMC test report no.19K0123, dated 2004-05-26 DANAK EMC test report no.19K0337, dated 2006-04-11 DANAK EMC test report no.19K0351, dated 2006-04-11 Danfos test reports P401-10, -749, -758, -1093, -1094,-1095,-1096, -1098 & -1129, Document version 1.00a Danfos test reports P404-363, -449, -682, -683, -684, -685, -686, -688, -689, -691, -692, -697, -698, & -699, Document version 1.00a.

## **Tests carried out**

Visual inspection, Performance, Power supply failure, Power supply variations, Voltage/frequency variation, Vibration/shock, Dry heat, Damp heat, Insulation resistance, High voltage. EMC: Electrical fast transient (Burst), electrical slow transient (Surge), RF-common mode Voltage, radiated RF-electromagnetic fields, electric discharge (ESD), radiated and conducted emission.

## **Marking of product**

Danfoss - Type designation - Power - Voltage

P462-454 R0123T03v110a dated 2013-04-30

## **Periodical assessment**

The scope of the Periodical assessment is to verify that the conditions stipulated for the Type Approval is complied with and that no alterations are made to the product design or choice of materials.

The main elements of the survey are:

Certificate No: E-12943 File No: 822.21 262.1-004066-3 Job Id:

- •
- Inspection on factory samples, selected at random from the production line (where practicable) Results from Production Sample Tests (PST) and Routines (RT) checked (if not available tests according to PST and RT to be carried out) Review of type approval documentation •
- •
- Review of possible change in design, materials and performance •
- Ensuring traceability between manufacturer's product type marking and Type Approval Certificate. •

Survey to be performed at least every second year.

END OF CERTIFICATE