

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Frequency Converter

with type designation(s)
FC102 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 Asynchronous Motors Range: 1,1 kW to 90 kW 200-240 / 380-500 / 525-690 VAC supply.

This Certificate is valid until **2015-06-30**.

Issued at **Høvik** on **2014-12-18**

DNV GL local station: **Fredericia**

Approval Engineer: **Nicolay Horn**

for **DNV GL**

.....
Marit Laumann
Head of Section

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.

Certificate No: **E-12941**
 File No: **822.21**
 Job Id: **262.1-004066-3**

Product description

Frequency converter / Variable speed controller for asynchronous motors used for HVAC application.
 Constant / variable torque applications.

Model: VLT® HVAC Drive series FC102

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

FC-102: 200-240V (T2)				
Power rating	Enclosure type			
[kW]	IP20	IP21	IP55	IP66
1,1	A2	A2 (*5)	A4+A5	A4+A5
1,5				
2,2				
3,0	A3	A3 (*5)	A5	A5
3,7				
5,5	B3	B1	B1	B1
7,5				
11				
15	B4	B2	B2	B2
18,5				
22	C3	C1	C1	C1
30				
37	C4	C2	C2	C2
45				

FC-102: 380-480/500V (T4/T5)				
Power rating	Enclosure type			
[kW]	IP20	IP21	IP55	IP66
1,1	A2	A2 (*5)	A4+A5	A4+A5
1,5				
2,2				
3,0	A2	A2 (*5)	A4+A5	A4+A5
4,0				
5,5	A3	A3 (*5)	A5	A5
7,5				
11				
15	B3	B1	B1	B1
18,5				
22				
30	B4	B2	B2	B2
37				
45	C3	C1	C1	C1
55				
75	C4	C2	C2	C2
90			N/A	
45	C3	C2		
55				
75	D3h			
90				

Certificate No: **E-12941**
 File No: **822.21**
 Job Id: **262.1-004066-3**

FC-102: 525-690V (T7)				
Power rating	Enclosure type			
[kW]	IP20 (*1)	IP21 (*2)	IP55 (*3)	IP66 (*4)
1,1	A3	N/A		
1,5		N/A		
2,2*		B2	B2	B2
3,0*		N/A		
3,7*		N/A		
4,0*		N/A		
5,5*		N/A		
7,5*		N/A		
11	B4	B2	B2	B2
15		B2	B2	B2
18,5		B2	B2	B2
22		B2	B2	B2
30		B2	B2	B2
37	C3	C2	C2	C2
45		C2	C2	C2
55		C2	C2	C2
75	D3h	C2	C2	C2
90		C2	C2	C2

(*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

* For future product line expansion

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

Selection types for Type Codes for FC 100

----- (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

Certificate No: **E-12941**
File No: **822.21**
Job Id: **262.1-004066-3**

Power size (character 7-10)

P1K1 : 1.1 kW / 1.5 HP

P90K : 90 KW / 125 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)

AF-600	Equals to FC-102
AKD10 2	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

Application/Limitation

Supply voltage range: 200-240, 380-500, 525-690 V, 50/60 Hz

Voltage variation: $\pm 10\%$

Frequency variation: $\pm 10\%$

Certificate No: **E-12941**
File No: **822.21**
Job Id: **262.1-004066-3**

Output frequency: 0 – 1000 Hz.
Temperature range in operation: In accordance with Danfoss design guide
IP Protection: IP 20, IP21, IP55 & IP66
Temperature class: A
Vibration class: A
Humidity class: B
EMC class: A*

The FC102 shall be regarded as a component. The actual installation to be designed according to Danfoss design guide MG.11.BX.YY – VLT and according to the applicable DNV Rules for the actual application.

This type approval can not replace the requirement for a product certificates in accordance with the DNV Rules for drives > 100 kVA

* Converters with EMC classed C3 according to IEC 61800-3 can be installed in "special distribution zone" and "general power distribution zone", in accordance with IEC60533 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 to installation onboard.

Type Approval documentation

Technical info:

Product overview "FC-102 power rating vs enclosure type and IP rating", part of email from Danfos dated 2009-04-14.

"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
P462-454_R0123T03v110a dated 2013-04-30
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

Certificate No: **E-12941**
File No: **822.21**
Job Id: **262.1-004066-3**

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 interruptions" dated 2008-11-25

P429 -154_R0122T02v110a "Power supply variation and interruptions" 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

Danfoss test reports P401-749, -758,--1093, -1094,-1095,-1096, -1098 & -1129, Document version 1.00a

Danfoss test reports P404-363, -682, -683, -684, -685, -686, -688, -689, -698, -691, -692, -697, & -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

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:

- 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