



TYPE APPROVAL CERTIFICATE

Certificate No:
TAE00001HC
Revision No:
3

This is to certify:

That the Frequency Converter

with type designation(s)
Emotron FDU 2.X

Issued to

CG Drives & Automation Sweden AB
Helsingborg, Sweden

is found to comply with

DNV GL rules for classification – Ships, offshore units, and high speed and light craft

Application :

Frequency Converter for Asynchronous Motors Emotron FDU 2.X series.
Range: 0.75/0.55 kW to 3000/2400 kW, 230 - 690 VAC supply.

Products approved by this certificate are accepted for installation on all vessels classed by DNV.

Issued at **Høvik** on **2021-03-16**

for **DNV**

This Certificate is valid until **2026-01-29**.

DNV local station: **Sweden CMC**

Approval Engineer: **Nicolay Horn**

Marta Alonso Pontes
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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.



Product description

Variable speed controller for asynchronous motor. Variable torque applications. Air and liquid cooled.

480 V Series:

Model	Max. output current [A]*	Normal duty (120%, 1 min. every 10 min)		Heavy duty (150%, 1 min every 10 min)		Frame size
		Power 400 V [kW]**	Rated current [A]	Power 400 V [kW]**	Rated current [A]	
FDU48-003	3.0	0.75	2.5	0.55	2.0	B
FDU48-004	4.8	1.5	4.0	1.1	3.2	
FDU48-006	7.2	2.2	6.0	1.5	4.8	
FDU48-008	9.0	3.0	7.5	2.2	6.0	
FDU48-010	11.4	4.0	9.5	3.0	7.6	
FDU48-013	15.6	5.5	13.0	4.0	10.4	
FDU48-018	21.6	7.5	18.0	5.5	14.4	
FDU48-026	31	11.0	26.0	7.5	21.0	C
FDU48-031	37	15.0	31.0	11.0	25.0	
FDU48-037	44	18.5	37.0	15.0	29.6	
FDU48-046	55	22.0	46.0	18.5	37.0	
FDU48-061	73	30	61	22	49	D
FDU48-074	89	37	74	30	59	
FDU48-090	108	45	90	37	72	E
FDU48-109	131	55	109	45	87	
FDU48-146	175	75	146	55	117	
FDU48-175	210	90	175	75	140	
FDU48-210	252	110	210	90	168	
FDU48-228	300	110	228	90	182	F
FDU48-250	300	132	250	110	200	
FDU48-295	354	160	295	132	236	
FDU48-300	360	160	300	132	240	G
FDU48-365	438	200	365	160	292	FA
FDU48-375	450	200	375	160	300	G
FDU48-430	516	220	430	200	344	H
FDU48-500	600	250	500	220	400	
FDU48-600	720	315	600	250	480	I
FDU48-650	780	355	650	315	520	
FDU48-750	900	400	750	355	600	
FDU48-860	1032	450	860	400	688	J
FDU48-1K0	1200	560	1000	450	800	
FDU48-1K15	1380	630	1150	500	920	KA
FDU48-1K25	1500	710	1250	560	1000	
FDU48-1K35	1620	710	1350	600	1080	K
FDU48-1K5	1800	800	1500	630	1200	
FDU48-1K75	2100	900	1750	800	1400	L
FDU48-2K0	2400	1120	2000	900	1600	M
FDU48-2K25	2700	1250	2250	1000	1800	N
FDU48-2K5	3000	1400	2500	1120	2000	O

* Available during limited time and as long as allowed by the drive temperature

** Values applicable for 40 °C, to be modified for ships application at 45 °C. See under “Application / limitation”.

525 V series:

Model	Max. output current [A]*	Normal duty (120%, 1 min. every 10 min)		Heavy duty (150%, 1 min every 10 min)		Frame size
		Power 525 V [kW]**	Rated current [A]	Power 525 V [kW]**	Rated current [A]	
FDU52-003	3.0	1.1	2.5	1.1	2.0	B
FDU52-004	4.8	2.2	4.0	1.5	3.2	
FDU52-006	7.2	3	6.0	2.2	4.8	
FDU52-008	9.0	4	7.5	3	6.0	
FDU52-010	11.4	5.5	9.5	4	7.6	
FDU52-013	15.6	7.5	13	5.5	10.4	
FDU52-018	21.6	11.0	18.0	7.5	14.4	
FDU52-026	31	15.0	26.0	11.0	20.1	C
FDU52-031	37	18.5	31.0	15.0	25.0	
FDU52-037	44	22.0	37.0	18.5	29.6	
FDU52-046	55	30	46	22	37	
FDU52-061	73	37	61	30	49	D
FDU52-074	89	45	74	37	59	

690 V Series:

Model	Max. output current [A]*	Normal duty (120%, 1 min. every 10 min)		Heavy duty (150%, 1 min every 10 min)		Frame size
		Power 690 V [kW]**	Rated current [A]	Power 690 V [kW]**	Rated current [A]	
FDU69-002-54	3.2	1.5	2.0	0.75	1.6	C69
FDU69-003-54	4.8	2.2	3.0	1.5	2.4	
FDU69-004-54	6.4	3.0	4.0	2.2	3.2	
FDU69-006-54	9.6	4,0	6,0	3,0	4,8	
FDU69-008-54	12,8	5.5	8.0	4.0	6.4	
FDU69-010-54	16.0	7.5	10.0	5.5	8.0	
FDU69-013-54	20.8	11.0	13.0	7.5	10.4	
FDU69-018-54	29.0	15.0	18.0	11.0	14.4	
FDU69-021-54	34.0	18.5	21.0	15.0	16.8	
FDU69-025-54	40.0	22.0	25.0	18.5	20.0	
FDU69-033-54	53	30	33	22	26	D69
FDU69-042-54	67	37	42	30	34	
FDU69-050-54	80	45	50	37	40	
FDU69-058-54	93	55	58	45	46	
FDU69-082	98	75	82	55	66	F69
FDU69-090	108	90	90	75	72	
FDU69-109	131	110	109	90	87	
FDU69-146	175	132	146	110	117	
FDU69-175	210	160	175	132	140	
FDU69-200	240	200	200	160	160	
FDU69-250	300	250	250	200	200	H69
FDU69-300	360	315	300	250	240	
FDU69-375	450	355	375	315	300	
FDU69-400	480	400	400	315	320	
FDU69-430	516	450	430	315	344	
FDU69-500	600	500	500	355	400	I69
FDU69-595	720	600	600	450	480	

Model	Max. output current [A]*	Normal duty (120%, 1 min. every 10 min)		Heavy duty (150%, 1 min every 10 min)		Frame size
		Power 690 V [kW]**	Rated current [A]	Power 690 V [kW]**	Rated current [A]	
FDU69-650	780	630	650	500	520	J69
FDU69-720	864	710	720	560	576	
FDU69-800	960	800	800	630	640	
FDU69-905	1080	900	900	710	720	KA69
FDU69-995	1200	1000	1000	800	800	
FDU69-1K2	1440	1200	1200	900	960	K69
FDU69-1K4	1680	1400	1400	1120	1120	L69
FDU69-1K6	1920	1600	1600	1250	1280	M69
FDU69-1K8	2160	1800	1800	1400	1440	N69
FDU69-2K0	2400	2000	2000	1600	1600	O69
FDU69-2K2	2640	2200	2200	1700	1760	P69
FDU69-2K4	2880	2400	2400	1900	1920	Q69
FDU69-2K6	3120	2600	2600	2000	2080	R69
FDU69-2K8	3360	2800	2800	2200	2240	S69
FDU69-3K0	3600	3000	3000	2400	2400	T69

* Available during limited time and as long as allowed by the drive temperature

** Values applicable for 40 °C, to be modified for ships application at 45 °C. See under “Application / limitation”.

In cases where multiple drives are installed in parallel an improved insulation resistance to ground may be required to avoid false earth fault detection. In such cases drives may be equipped with an optional high impedance DC link measurement board based on an opto coupler.

Application/Limitation

Supply voltage range:	230 - 480 or 500 - 690 V, 50/60 Hz
Voltage variation:	±15 % + 10 % (steady state) at U ≥ 380V ±10 % + 10 % (steady state) at U = 230V
Frequency range:	45 - 65 Hz
Output frequency:	0 - 400 Hz
Temperature range in operation:	0 - 40 °C (40 - 45 °C when derated 1 %/°C)
Temperature class:	A
Vibration class:	A
Humidity class:	A
EMC class*:	IEC 61800-3 To be used on EMC class A locations

The FDU must be regarded as a component. The actual installation shall be designed according to CG Drives & Automation Sweden AB Users Manual and according to the applicable DNV-GL Rules for the actual application.

Product certificate:

Frequency converters rated equal or larger than 100kW serving essential or important functions as defined in DNV GL rules Pt.4 Ch.8 shall have a product certificate according to DNV GL Pt.4 Ch.8 Sec.1 Table 3 for each delivery to DNV GL classed vessels.

For product certification, the following documents should be submitted for approval, Ref. to DNV GL Pt.4 Ch.8 Sec.1 Table 2:

- Reference to this Type Approval Certificate
- (E180) A drawing showing external location of instruments and devices for operation (panel layout)
- (E240) Functional description for the intended use, configuration and interface (e.g. alarms, monitoring and auxiliary power supplies)
- (Z252) Test program at manufacturer for routine tests and functional tests as per DNV GL Pt.4 Ch.8 Sec.7, 2.1.1
- Single line diagram (only applicable for multi drive configuration)
- If additional components to the type approved frequency converter are delivered, documentation according to DNV GL rules Pt.4 Ch.8 Sec.1 table 2 shall be submitted for review.

Frame sizes H69 to T69 / G to O are to be installed in an enclosure with an IP degree in accordance with DNV Rules w.r.t. location.

*Converters with conducted and radiated emission above the DNV-GL 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 the safe operation is assured. Planned EMC measures shall be submitted for approval prior to installation onboard. The EMC measures should be derived from an EMC analysis and plan in accordance with IEC 60533 Annex B and/or IEC 61800-3 Annex E.

Type Approval documentation

Technical info:

"Technical data Chapter 14 of Instruction manual Emotron FDU 2.1 AC Drive sw ver 5.0, CG Drives & Automation, 01-7491-01r0"

Schematic drawings, Template VFX_FDU48-1k5-6P MS dated 2010-06-30
Instruction manual Emotron FDU/VFX 2.0 Liquid Cooling, Emotron AB 01-4636-01r1

Test reports:

FORCE Test Report no. 119-24190-1 dated 2020-06-17.

CG Drives & Automation Type Test Reports dated 2020-07-07.

EGDC EMC test reports for FDU69-058-54 dated 2019-02-19 to 2019-03-04, FDU69-058-20 dated 2019-02-19 to 2019-03-11, FDU69-025-20 dated 2019-02-19 to 2019-03-04

FDU69-025-54 dated 2019-08-21, FDU69-042-54 dated 2019-02-19.

CG Drives LVD / type test reports for types with IP54 and Size D dated 2018-11-20 to 2018-12-06, with IP20 and size D dated 2013-01-31 to 2018-12-06 and IP20 and size C dated 2018-11-05 to 2018-12-06.

"DELTA Test report no. A506587 dated 2009-12-15 & "Binder no. 1 (part of CD rom "DNV Additional type tests dated 2010-03-10.) "DELTA Test report no. DANAK-1910574 dated 2009-08-26 & Serbert Trillingstechnik B.V.doc. no. M09.011-2009.7076 dated 2009-08-28, part 4 of Booklet "DNV SIZE E-K 690 V.

DECTRON test reports 06047 dated 2006-03-15, 07019 dated 2007-02-02, 07020 dated 2007-02-20, 07275 dated 2007-12-18 & 07276 dated 2007-12-19.

CG Drives & Automation Sweden AB doc. no "2.2.4 Protective impedance test – R40 doc", dated 2009-09-17; doc. no "2.2.9 Temperature rise 690 V – R61.doc", dated 2009-10-03; doc no. "5.2.4. Voltage unbalance and frequency variations – R50.doc" & 5.2.3 Voltage deviations dips and short interruptions – R5x.doc", dated 2009-03-17; KEMA test report 2097658.01-QUA/INC, dated 2007-01-31. UL test report "File no. E311216" dated 2008-04-29.

"DELTA report, ProjA506587", dated 2009-12-15.

"Serbert Trillingstechnik B.V. doc no. M10.001-2010.7017" dated 2010-01-26.

CG Drives & Automation Sweden AB report "Converter losses" dated 2010-01-29.

CG Drives & Automation, testreport "LC on stacked drive" dated 2014-03-26.

CG Drives & Automation, testreport on 2 x FDU69-720L 2014-02-28

Emotron type test report, 2.2.9 temperature rise 690V – R61 dated 2009-10-13

Description of High imp DC link measurement option board

Data Sheet: Precision Optically Isolated Voltage Sensor

Spesification for drive transformer T60403-F5046-X006 dated 27.02.2007

CG Drives & Automation, Schematic insulated DC meas/standby supply Drwg no 01-6415-00 dated 2016-09-07

FDU-295, FDU-365 test reports and documentation ref. NPS job 262.1-008042-14.

Tests carried out

Visual inspection, Performance/heat run, Power supply failure, Power supply variations, Voltage/frequency variation, Vibration, Dry heat, Damp heat, Insulation resistance, High voltage.

EMC: The following tests are in accordance with the DNV CN2.4/ IEC 61800-3: Electrical fast transient (Burst), electrical slow transient (Surge), RF-common mode Voltage, radiated RF-electromagnetic fields, electric discharge (ESD), radiated and conducted emission. (See under application limitation).

Marking of product

Type designation – Voltage – Current

Periodical assessment

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

The main elements of the assessment are:

- Inspection on factory samples, selected at random from the production line (where practicable)
- Results from Routine Tests (RT) checked (if not available tests according to RT to be carried out)



Job Id: **262.1-008042-18**
Certificate No: **TAE00001HC**
Revision No: **3**

- 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.

Periodical assessment is to be performed after 2 years and after 3.5 years. A renewal assessment will be performed at renewal of the certificate.

END OF CERTIFICATE