DNV·GL

Certificate No:
TAE000033D

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Frequency Converter

with type designation(s)
SPX & LCX

Issued to
Eaton Industries GmbH
Bonn, Nordrhein-Westfalen, Germany

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 SPX (aircooled) and LCX (water-cooled) series.
Range: 0,55 kW to 2750 kW 208 - 690 VAC supply.

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.

Issued at **Hamburg** on **2018-08-15**
This Certificate is valid until **2023-08-14**.
DNV GL local station: **Vaasa**

Approval Engineer: **Thomas Hartmann**

for **DNV GL**

Arne Schaarmann
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.

Name and place of manufacturer

Customer ID :111287

Product description

Variable speed controller for asynchronous motor. Constant / variable torque applications.
Air and liquid cooled.SPX = Air cooled, LCX = liquid cooled

Type designation	Frame size	Mains supply (V)	Number of phases	Motor shaft power (kW) [1) 2)]
SPXF07A-	FR4	208 - 240	3	0,55 /-
SPX001A-	FR4	208 - 240	3	0,75 /-
SPXF15A-	FR4	208 - 240	3	1,1 /-
SPX002A-	FR4	208 - 240	3	1,5 /-
SPX003A-	FR4	208 - 240	3	2,2 /-
SPX004A-	FR5	208 - 240	3	3 /-
SPX005A-	FR5	208 - 240	3	4 /-
SPX007A-	FR5	208 - 240	3	5,5 /-
SPX010A-	FR6	208 - 240	3	7,5 /-
SPX015A-	FR6	208 - 240	3	11 /-
SPX020A-	FR7	208 - 240	3	15 /-
SPX025A-	FR7	208 - 240	3	18,5 /-
SPX030A-	FR7	208 - 240	3	22 /-
SPX040A-	FR8	208 - 240	3	30 /-
SPX050A-	FR8	208 - 240	3	37 /-
SPX060A-	FR8	208 - 240	3	45 /-
SPX075A-	FR9	208 - 240	3	55 /-
SPX100A-	FR9	208 - 240	3	75 /-
SPX001A-	FR4	380 - 500	3	1,1 /-
SPXF15A-	FR4	380 - 500	3	1,5 /-
SPX002A-	FR4	380 - 500	3	2,2 /-
SPX003A-	FR4	380 - 500	3	3 /-
SPX005A-	FR4	380 - 500	3	4 /-
SPX006A-	FR4	380 - 500	3	5,5 /-
SPX007A-	FR5	380 - 500	3	7,5 / 11
SPX010A-	FR5	380 - 500	3	11 / 15
SPX015A-	FR5	380 - 500	3	15 / 18,5
SPX020A-	FR6	380 - 500	3	18,5 / 22
SPX025A-	FR6	380 - 500	3	22 / 30
SPX030A-	FR6	380 - 500	3	30 / 37
SPX040A-	FR7	380 - 500	3	37 / 45
SPX050A-	FR7	380 - 500	3	45 / 55
SPX060A-	FR7	380 - 500	3	55 / 75
SPX075A-	FR8	380 - 500	3	75 / 90
SPX100A-	FR8	380 - 500	3	90 / 110
SPX125A-	FR8	380 - 500	3	110 / 132
SPX150A-	FR9	380 - 500	3	132 / 160

Type designation	Frame size	Mains supply (V)	Number of phases	Motor shaft power (kW) [1) 2)]
SPX250A-	FR10	380 - 500	3	200 / 250
SPX300A-	FR10	380 - 500	3	250 / 315
SPX350A-	FR10	380 - 500	3	250 / 355
SPX400A-	FR11	380 - 500	3	315 / 400
SPX500A-	FR11	380 - 500	3	355 / 450
SPX550A-	FR11	380 - 500	3	400 / 500
SPX600A-	FR12	380 - 500	3	450 / 560
SPX650A-	FR12	380 - 500	3	500 / 600
SPX700A-	FR12	380 - 500	3	560 / 700
SPX800A-	FR13	380 - 500	3	630 / 750
SPX900A-	FR13	380 - 500	3	710 / -
SPXH10A-	FR13	380 - 500	3	800 / -
SPXH12A-	FR14	380 - 500	3	900 / -
SPXH16A-	FR14	380 - 500	3	1100 / -
SPX002A-	FR6	525 - 690	3	3 /-
SPX003A-	FR6	525 - 690	3	4 /-
SPX004A-	FR6	525 - 690	3	5,5 /-
SPX005A-	FR6	525 - 690	3	7,5 /-
SPX007A-	FR6	525 - 690	3	11 /-
SPX010A-	FR6	525 - 690	3	15 /-
SPX015A-	FR6	525 - 690	3	18,5 /-
SPX020A-	FR6	525 - 690	3	22 /-
SPX025A-	FR6	525 - 690	3	30 /-
SPX030A-	FR7	525 - 690	3	37,5 /-
SPX040A-	FR7	525 - 690	3	45 /-
SPX050A-	FR8	525 - 690	3	55 /-
SPX060A-	FR8	525 - 690	3	75 /-
SPX075A-	FR8	525 - 690	3	90 /-
SPX100A-	FR9	525 - 690	3	110 /-
SPX125A-	FR9	525 - 690	3	132 /-
SPX150A-	FR9	525 - 690	3	160
SPX175A-	FR9	525 - 690	3	200
SPX200A	FR10	525 - 690	3	200
SPX250A-	FR10	525 - 690	3	315
SPX300A-	FR10	525 - 690	3	355
N/A	FR10	525 - 690	3	400
SPX400A-	FR10	525 - 690	3	450
SPX450A-	FR10	525 - 690	3	500
SPX500A-	FR10	525 - 690	3	560
SPX550A-	FR11	525 - 690	3	630
SPX600A-	FR11	525 - 690	3	710
SPX700A-	FR11	525 - 690	3	800
SPX800A-	FR11	525 - 690	3	900
SPX900A-	FR12	525 - 690	3	1000
SPXH10A-	FR13	525 - 690	3	1150
SPXH13A-	FR13	525 - 690	3	1500

Type designation	Frame size	Mains supply (V)	Number of phases	Motor shaft power (kW) [1) 2)]
SPXH15A-	FR13	525 - 690	3	1800
SPXH20A-	FR14	525 - 690	3	2000
Type designation	Frame size	Mains supply (V)	Number of phases	Motor shaft power (kW) 1) 2)
LCX016A-	CH3	400- 500	3	10 / 9
LCX022A-	CH3	400 - 500	3	14 / 12
LCX031A-	CH3	400 - 500	3	20 / 18
LCX038A-	CH3	400 - 500	3	24 / 22
LCX045A-	CH3	400 - 500	3	29 / 26
LCX061A-	CH3/	400 - 500	3	39 / 36
LCX072A-	CH4	400 - 500	3	46 / 42
LCX087A-	CH4	400 - 500	3	56 / 51
LCX105A-	CH4	400 - 500	3	68 / 62
LCX105A-	CH4	400 - 500	3	90 / 82
LCX140A-	CH5	400 - 500	3	110 / 90
LCX170A-	CH5	400 - 500	3	125 / 110
LCX208A-	CH5	400 - 500	3	175 / 150
LCX300A-	CH61	400- 500	3	200 / 175
LCX385A-	CH61	400 - 500	3	250 / 225
LCX460A-	CH72	400 - 500	3	300 / 275
LCX520A-	CH72	400 - 500	3	325 / 300
LCX590A-	CH72	400 - 500	3	375 / 350
LCX650A-	CH72	400 - 500	3	425 / 375
LCX730A-	CH72	400- 500	3	475 / 425
LCX820A-	CH63	400 - 500	3	525 / 475
LCX920A-	CH63	400 - 500	3	600 / 525
LCXH10A-	CH63	400 - 500	3	650 / 600
LCXH11A-	CH63/	400 - 500	3	750 / 675
LCXH13A-	CH74	400 - 500	3	875 / 800
LCXH16A-	CH74	400 - 500	3	1050 / 950
LCXH20A-	CH74	400 - 500	3	1325 / 1200
LCXH23A-	CH74	400 - 500	3	1475 / 1350
LCXH24A-	2xCH74	400 - 500	3	1600 / 1450
LCXH29A-	2xCH74	400 - 500	3	1900 / 1725
LCXH37A-	2xCH74	400 - 500	3	2400 / 2175
LCXH41A-	2xCH74	400 - 500	3	2650 / 2425
LCX170A-	CH61	525 - 690	3	150 / 125
LCX208A-	CH61	525 - 690	3	175 / 150
LCX261A-	CH61	525 - 690	3	225 / 200
LCX325A-	CH72	525 - 690	3	275 / 250
LCX385A-	CH72	525 - 690	3	350 / 300
LCX416A-	CH72	525 - 690	3	375 / 325
LCX460A-	CH72	525 - 690	3	400 / 350
LCX502A-	CH72	525 - 690	3	450 / 400
LCX590A-	CH63	525 - 690	3	525 / 475
LCX650A-	CH63	525 - 690	3	575 / 525

Type designation	Frame size	Mains supply (V)	Number of phases	Motor shaft power (kW) [1) 2)]
LCX750A-	CH63	525 - 690	3	675 / 600
LCX820A-	CH74	525 - 690	3	725 / 650
LCX920A-	CH74	525 - 690	3	825 / 750
LCXH10A-	CH74/IP00	525 - 690	3	925 / 825
LCXH11A-	CH74/IP00	525 - 690	3	1050 / 950
LCXH13A-	CH74/IP00	525 - 690	3	1150 / 1050
LCXH15A-	CH74/IP00	525 - 690	3	1350 / 1225
LCXH17A-	CH74/IP00	525 - 690	3	1500 / 1375
LCXH18A-	2xCH74/IP00	525 - 690	3	1650 / 1500
LCXH21A-	2xCH74/IP00	525 - 690	3	1900 / 1725
LCXH23A-	2xCH74/IP00	525 - 690	3	2100 / 1900
LCXH27A-	2xCH74/IP00	525 - 690	3	2400 / 2200
LCXH31A-	2xCH74/IP00	525 - 690	3	2750 / 2500

1) Values applicable for 40 °C, 10 % overload and highest voltage in each voltage class. To be modified for ships application at 45 °C. See under "Application / limitation".

2) Values applicable for 50 °C, 0 % overload and highest voltage in each voltage class.

In addition SPX can be substituted by SPI, Those units are exactly based on DC-fed Eaton SPX control and power electronics component platforms, excluding for rectifierunits and charging circuitry, which are not used in these products. Variation is made by application selection.

SPX FR10-FR14 and all LCXCH units will include external chokes.

Choke types
CHK0261
CHK0400
CHK0520
CHK0650
CHK0750
CHK0820
CHK1030
CHK1150

SPX & LCX units can also be accompanied with following L/LCL filters

L/LCL Filters
LCL 0261 5
LCL 0460 5
LCL 1300 5
LCL 0170 6
LCL 0325 6
LCL 1030 6
L 0300 5
L 0520 5
L 1450 5
L 0208 6
L 0416 6
L 1180 6

LCX_ Liquid cooled (CHxx) units can be accompanied with hoses attached to the modules.
LCX Liquid cooled (CHxx) units can be accompanied with following options: Heat Exchangers, Air-cooled Regenerative LCL filters IP00 (Naturally convected) and Liquid-cooled Regenerative LCL filters IP00. For details see Eaton documentation.

Application/Limitation

Supply voltage range: 208 - 690 V, 50/60 Hz
Voltage variation: - 10 % , + 10 %
Frequency variation: ± 10 %

Output frequency:	0 - 320 Hz
Temperature range in operation:	Air cooled: 0 - 40 °C (40 - 50 °C when derated 1,5% /°C, 50 - 55 when derated 2,5% /°C) Liquid cooled: 0 - 50 °C (CH6x series 50 – 55 °C when derated 2,5% / °C)
Temperature class:	A
Vibration class:	A
Humidity class:	A
Protection class:	IP00, IP21 & IP54
EMC class*:	DNV CN 2,4 / IEC 61800-3 To be used on EMC class A locations

The SPX - LCX must be regarded as a component. The actual installation shall be designed according to Eaton Users Manual and according to the applicable DNV GL Rules for the actual application. Documentation for the actual application are to be submitted for approval in each case in accordance with DNV GL Rules Pt.4, Ch.8, Sec.1 Table 2. A Product Certificate is required for converters ≥ 100 kW.

To be installed in an enclosure with an IP degree in accordance with DNV GL 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.

For marine applications size of drive to be derated with respect to an ambient temperature of 40°C (1,5% per deg. C for ambient above 40 - 50 °C) or choosen acc. to 50 °C rating. See manual.

Type Approval documentation

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

Eaton SPX / LCX – 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 assessment are:
- Inspection on factory samples, selected at random from the production line (where practicable)
- Results from Routines (RT) checked (if not available tests according to 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.

Assessment to be performed at 2 and 3.5 year and at renewal.

END OF CERTIFICATE