

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Frequency Converter

with type designation(s)
FRENIC-VG, RHC-D & RHF-D

Issued to

Fuji Electric Co., Ltd
Shinagawa-ku Tokyo, Japan

is found to comply with

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

Application :

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

Range:

90 kW to 450 kW 575 - 690 V AC supply

This Certificate is valid until **2021-10-16**.

Issued at **Høvik** on **2016-10-17**

DNV GL local station: **Yokohama**

Approval Engineer: **Nicolay Horn**

for **DNV GL**

Andreas Kristoffersen
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.

Product description

I) FRENIC-VG: High-Performance Vector Control Inverters.

Type designation		Mains supply (V)	Number of phases	Motor power output (kW)
MD 150%	LD 110%			
FRN90SVG1S-69#	-	690 V	3	90
FRN110SVG1S-69#	FRN90SVG1S-69#	690 V	3	110
FRN132SVG1S-69#	FRN110SVG1S-69#	690 V	3	132
FRN160SVG1S-69#	FRN132SVG1S-69#	690 V	3	160
FRN200SVG1S-69#	FRN160SVG1S-69#	690 V	3	200
-	FRN200SVG1S-69#	690 V	3	220
FRN250SVG1S-69#	-	690 V	3	250
FRN280SVG1S-69#	FRN250SVG1S-69#	690 V	3	280
FRN315SVG1S-69#	FRN280SVG1S-69#	690 V	3	315
FRN355SVG1S-69#	FRN315SVG1S-69#	690 V	3	355
FRN400SVG1S-69#	FRN355SVG1S-69#	690 V	3	400
FRN450SVG1S-69#	FRN400SVG1S-69#	690 V	3	450

II) RHC-D: High power factor PWM converter

Type designation		Mains supply (V)	Number of phases	Motor power output (kW)
MD 150%	LD 110%			
RHC132S-69D#	-	690 V	3	132 max.
RHC160S-69D#	RHC132S-69D#	690 V	3	160 max.
RHC200S-69D#	RHC160S-69D#	690 V	3	200 max.
-	RHC200S-69D#	690 V	3	220 max.
RHC250S-69D#	-	690 V	3	250 max.
RHC280S-69D#	RHC250S-69D#	690 V	3	280 max.
RHC315S-69D#	RHC280S-69D#	690 V	3	315 max.
RHC355S-69D#	RHC315S-69D#	690 V	3	355 max.
RHC400S-69D#	RHC355S-69D#	690 V	3	400 max.
RHC450S-69D#	RHC400S-69D#	690 V	3	450 max.

III) RHF-D: Filter stack for high power factor PWM converter "RHC-D series"

Type designation	Mains supply (V)	Number of phases	Applicable PWM converter type	
			MD 150%	LD 110%
RHF160S-69D#	690 V	3	RHC132S-69D#	-
RHF160S-69D#	690 V	3	RHC160S-69D#	RHC132S-69D#
RHF220S-69D#	690 V	3	RHC200S-69D#	RHC160S-69D#
RHF220S-69D#	690 V	3	-	RHC200S-69D#
RHF280S-69D#	690 V	3	RHC250S-69D#	-
RHF280S-69D#	690 V	3	RHC280S-69D#	RHC250S-69D#
RHF355S-69D#	690 V	3	RHC315S-69D#	RHC280S-69D#
RHF355S-69D#	690 V	3	RHC355S-69D#	RHC315S-69D#
RHF450S-69D#	690 V	3	RHC400S-69D#	RHC355S-69D#
RHF450S-69D#	690 V	3	RHC450S-69D#	RHC400S-69D#

May be followed by any letter(s) and/or number(s) for region code and additional specifications.

Application/Limitation

Supply voltage range: 575-690 V 50/60 Hz
Voltage variation: +10 - 15 % stationary, $\pm$ 20% transient
Frequency variation: $\pm$ 5 % stationary, $\pm$ 10% transient
Output frequency: 0 - 150 Hz
Temperature range in operation: - 10 to + 40 °C
For temperatures 40 to 45 °C see table:

FRENIC-VG Type	RHC-D Type	current derating (%/°C)
FRN90SVG1S-69#	-	1,5
FRN110SVG1S-69#	-	2,5
FRN132SVG1S-69#	RHC132S-69D#	1,5
FRN160SVG1S-69#	RHC160S-69D#	2,0
FRN200SVG1S-69#	RHC200S-69D#	2,5
FRN250SVG1S-69#	RHC250S-69D#	2,5
FRN280SVG1S-69#	RHC280S-69D#	2,5
FRN315SVG1S-69#	RHC315S-69D#	2,5
FRN355SVG1S-69#	RHC355S-69D#	1,0
FRN400SVG1S-69#	RHC400S-69D#	1,5
FRN450SVG1S-69#	RHC450S-69D#	2,0

Protection degree: IP00
Temperature class: A
Vibration class: A
Humidity class: A
EMC class: A

The FRENIC-VG, RHC-D and RHF-D must be regarded as components. The 3 types can be combined. Examples of combinations and the actual installation to be designed according to Fuji Technical Construction File and according to the applicable DNV GL Rules for the actual application.

Documents for the actual application are to be submitted for approval in each case in accordance with DNVGL Rules Pt.4, Ch.8, Sec.1 Table 2. A product certificate is required case by case in accordance with Rule requirement Pt.4. Ch.8. Sec.1 for units $\geq$ 100 kW.

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

For IT installations, Earth Monitoring System compatibility, must be investigated prior to installation onboard.

To be installed in climatically controlled areas.

Type Approval documentation

Tests carried out

Type tests in accordance with the IEC 61800 series. Environmental tests in accordance with DNVGL-CG-0339 as Visual inspection, Performance, Power supply failure, Power supply variations,

Job Id: **262.1-021957-1**
Certificate No: **TAE00001DK**

Voltage/frequency variation, Vibration, Dry heat, Damp heat static, Insulation resistance, High voltage.

EMC: The following tests are in accordance with DNVGL-CG-0339 / 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.

Marking of product

Fuji Electric Co.Ltd – FRENIC-VG / RHC-D/ RHF-D - Type designation – Power – Voltage

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)
- 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 least every second year.

END OF CERTIFICATE