Confirmation of Product Type Approval

Company Name: DANFOSS DRIVES OY

Address: RUNSORINTIE 7 VAASA FI 65380 Finland

Product: Frequency Converter

Model(s): iC7-60SL

Endorsements:

Certificate Type	Certificate Number	Issue Date	Expiry Date
Product Design Assessment (PDA)	23-2453826-PDA	30-OCT-2023	29-OCT-2028
Manufacturing Assessment (MA)	24-6720163	25-NOV-2024	13-DEC-2029
Product Quality Assurance (PQA)	24-6728469-PQA	25-NOV-2024	13-DEC-2029

Tier
4 - Enrolled in PQA Program

Intended Service
Controlled for use in Propulsion, Bow thrusters, scrubbers, grid converter, DC/DC converter etc. for use on ABS classed vessels and offshore installations in accordance with the listed ABS Rules and International Standards.

Description
Danfoss iC7-60 system modules are used as building blocks for larger power systems. Modules consist of inverter units, front ends and other power handling building blocks.

System modules can be configured to different product functions like inverter units (INU), active front end units (AFE), brake chopper units (BCU), grid converter units (GC) and DC/DC converter units (DC).

All products share the same system module building block with AC/DC terminals, IGBTs, DC-capacitors and PCBA’s.

All electronics are inside IP55 enclosure.

Terminals are exposed so the IP rating is IP00.

Application software and options define the product function.

The product can be configured as basic system modules and loose filters or with integration units.

Integration units improves serviceability and allows input and output filters to be integrated to the same mechanical construction.

IC7 system modules can be equipped for example with following options: L filter, LC filter, Sin filter, Du/dt filter,

common mode filter, DC filter, pre-charging circuit and cooling modules (heat exchanger).

Ratings
Input voltage: 3 x 380…500 VAC (-15…+10%), 400…800 VDC (-0…+0%)

3 x 525…690 VAC (–15…+10%), 640…1200 VDC (–0…+0%)

Input frequency: 45 -66 Hz

Output voltage: 0 – Uin, 3-phase

Output frequency: 0 – 599 Hz

Temperature range in operation: 0 – 60 degree C

Temperature class: B

Vibration class: A

Humidity class: B

EMC class: DNV-CG-0339 / IEC 61800-3. To be used on EMC class A locations

Service Restrictions
- Unit Certification is required for semiconductor converters used to control motor drives having a rated power of 100 kW(135 hp) or over that are intended for essential services as 4-8-3/1.5 of ABS Marine Vessel Rules.

Detailed requirements for unit certification are in 4-8-3/8.7 of ABS Marine Vessel Rules.

- Environmental tests and approval are for hardware only.

- When incorporated in a system of Category I, II or III in accordance with 4-9-3/7.1 and 4-9-3/Table 1 of the ABS Marine Vessels Rules the documentation detailed in 4-9-3/Table 2 is to be submitted to ABS or to be available for review by ABS as applicable.

- If the manufacturer or purchaser request an ABS Certificate for compliance with a specification or standard, the specification or standard, including inspection standards and tolerances, must be clearly defined.

Comments
- The Manufacturer has provided a declaration about the control of, or the lack of Asbestos in this product.

- Arrangements and details are required to be submitted and reviewed by ABS for compliance with all other applicable Rule requirements prior to each such installation on board an ABS classed vessel.

- Where used in machinery space (i.e. engine room, boiler room) the units are to have an ambient rating of 45°C.

- The units are to have the appropriate enclosure IP rating as per 4-8-3/Table 2 based on their installed location.

- Details related to overload protection, running protection and motor starter disconnects are to be submitted for each installation.

- Each installation of the specific iC7-60 on board an ABS classed vessel is to be provided with main cables and fuses which sizes are as recommended by VACON.

Notes, Drawings and Documentation

Drawing No. =MIU+AR10L/3, Main circuit diagram AFE frame size 10 Liquid Cooled, Revision: 0, Pages: 1, Date: 10 February 2021,

Drawing No. =MIU+AR12L/3, Main circuit diagram AFE frame size 12 Liquid Cooled, Revision: 0, Pages: 1, Date: 10 February 2021,

Drawing No. =MIU+IR10L/3, Main circuit diagram Inverter unit Frame size 10 Liquid Cooled, Revision: 0, Pages: 1, Date: 10 February 2021,

Drawing No. =MIU+IR12L/3, Main circuit diagram Inverter unit Frame size 12 Liquid Cooled, Revision: 0, Pages: 1, Date: 10 February 2021,

Drawing No. =MIU+DR10L/3, Main circuit diagram DC-DC Converter frame size 10 Liquid Cooled, Revision: 0, Pages: 1, Date: 10 February 2021,

Drawing No. =MIU+DR12L/3, Main circuit diagram DC-DC Converter frame size 12 Liquid Cooled, Revision: 0, Pages: 1, Date: 10 February 2021,

Drawing No. 299288-1, EMC test report No.1, Revision: 0, Pages: 30, Date: 6 May 2020, issued by SGS,

Drawing No. HELEM2204000174-1, EMC test report No.2, Revision: 0, Pages: 30, Date: 17 May 2022, issued by SGS,

Drawing No. HELEM2204000174-2, EMC test report No.3, Revision: 0, Pages: 22, Date: 17 May 2022, issued by SGS,

Drawing No. vaihev#li.prg, EMC Surge Part 1, Revision: 0, Pages: 6,

Drawing No. ---, Propulsion Application Software Guide, Revision: 0, Pages: 86,

Drawing No. 00775653, IACS UR E10 specific tests report, Revision: 0, Pages: 24, Date: 9 May 2022, issued by DANFOSS,

Drawing No. ---, Operating manual iC7-60 Liquid Cooled Series, Revision: 0, Pages: 182,

Drawing No. FI-51319, Electrical safety reports for iC7-60 Liquid Cooled Drives, Revision: 0, Pages: 549,

Drawing No. EUFI29-19006315-T2, Vibration tests, Revision: 0, Pages: 556,

Drawing No. ---, Cover letter iC7-60 Liquid Cooled Drives, Revision: 0, Pages: 4,

Drawing No. ---, iC7-60 Liquid Cooled Drives General Product Information, Revision: 0, Pages: 2,

Drawing No. ---, Test Overview Document which connects test reports to requirements, Revision: 0, Pages: 1,

Term of Validity
This Product Design Assessment (PDA) Certificate remains valid until 29/Oct/2028 or until the Rules and/or Standards used in the assessment are revised or until there is a design modification warranting design reassessment (whichever occurs first).

Acceptance of product is limited to the "Intended Service" details prescribed in the certificate and as per applicable Rules and Standards.

This Certificate is valid for installation of the listed product on ABS units which exist or are under contract for construction on or previous to the effective date of the ABS Rules and standards applied at the time of PDA issuance. Use of the Product for non-ABS units is subject to agreement between the manufacturer and intended client.

ABS Rules
- Marine Vessels Rules (2023) 1-1-4/7.7, 1-1-A3, 1-1-A4, 4-8-3/5.7, 4-8-3/8.3, 4-8-3/8.5, 4-8-3/8.7, 4-9-3/5, 4-9-9/Table 1;

- Steel Vessels for Service on Rivers and Intracoastal Waterways (2023): 1-1-4/7.7, 1-1-A3, 1-1-A4

- Steel Barge Rules (2023): 1-1-4/7.9, 1-1-A3, 1-1-A4

- High Speed Crafts (2023): 1-1-4/11.9, 1-1-A2, 1-1-A3, 4-6-4/7.17, 4-6-4/10.3, 4-6-4/10.5, 4-6-4/10.7, 4-7-9/15.1 Table 9;

- Mobile Offshore Units (2023): 1-1-4/9.7, 1-1-A2, 1-1-A3, 4-1-1/7.9, 4-3-1/11, 6-1-1/9, 6-1-1/13, 6-1-7/9.15, 6-1-7/12.3, 6-1-7/12.5, 6-1-7/12.7

- Facilities on Offshore Installations (2023): 1-1-4/9.7, 1-1-A2, 1-1-A3, 3-6/11.7

International Standards
IEC 61800-5-1 :2007

IEC 61800-5-1 :2007/AMD1:2016

IEC 62477-1:2012

IEC 62477-1:2012/AMD1:2016

IEC 60068-2-6, Test Fc (2007-12)

EU-MED Standards
NA

National Standards
NA

Government Standards
NA

Other Standards
IACS UR E10 (Rev.8 Feb 2021)

IACS UR E22 (Rev.3 June 2023)

Corporate ABS Programs
American Bureau of Shipping
Print Date and Time: 08-Jan-2025 1:51

ABS has used due diligence in the preparation of this certificate, and it represents the information on the product in the ABS Records as of the date and time the certificate is printed.

If the Rules and/or standards used in the PDA evaluation are revised or if there is a design modification (whichever occurs first), a PDA revalidation may be necessary.

The continued validity of the MA is dependent on completion of satisfactory audits as required by the ABS Rules. The validity of both PDA and MA entitles the product to receive a **Confirmation of Product Type Approval**.

Acceptance of product is limited to the “Intended Service” details prescribed in the certificate and as per applicable Rules and Standards.

This Certificate is valid for installation of the listed product on ABS units which exist or are under contract for construction on or prior to the effective date of the ABS Rules and standards applied at the time of PDA issuance. ABS makes no representations regarding Type Approval of the Product for use on vessels, MODUs or facilities built after the date of the ABS Rules used for this evaluation.

Type Approval requires Drawing Assessment, Prototype Testing and assessment of the manufacturer's quality assurance and quality control arrangements. The manufacturer is responsible to maintain compliance with all specifications applicable to the product design assessment. Unless specifically indicated in the description of the product, certification under type approval does not waive requirements for witnessed inspection or additional survey for product use on a vessel, MODU or facility intended to be ABS classed or that is presently in class with ABS.

Due to wide variety of specifications used in the products ABS has evaluated for Type Approval, it is part of our contract that; whether the standard is an ABS Rule or a non-ABS Rule, the Client has full responsibility for continued compliance with the standard.

Questions regarding the validity of ABS Rules or the need for supplemental testing or inspection of such products should, in all cases, be addressed to ABS.