



Certificate No:
TAP00002RG

TYPE APPROVAL DESIGN CERTIFICATE

This is to certify:

That the **Liquid cooling unit**

with type designation(s)
iC7-60 Cooling module

Issued to

Danfoss Drives Oy
VAASA, Finland

is found to comply with

DNV rules for classification – Ships Pt.4 Ch.6 Piping systems

DNV class guideline DNV-CG-0339 – Environmental test specification for electrical, electronic and programmable equipment and systems

Application :

Approved for cooling of semi-conductor converters onboard DNV Classed vessels.

Issued at **Høvik** on **2024-08-16**

This Certificate is valid until **2029-08-15** .

for **DNV**

DNV local unit: **Finland CMC**

Approval Engineer: **Dag Harald Williksen**

Olaf Drews
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.



Form code: TA 291

Revision: 2022-12

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Product description

Danfoss iC7-60 cooling modules are used for cooling of semi-conductor converters.

The function of the cooling module is to transfer heat from the drives into the external circuit. Cooling module is capable of controlling the inlet temperature and a heat exchanger is used between the drive circuit and external circuit.

System with option "+SCXX" (no plate heat exchanger), requires an external heat exchanger provided by customer.

Cooling module is a configurable product with options related to cooling power, pump amount, supply voltage, inlet and outlet piping positions, etc. Below is described all variants covered by this type approval certificate.

Code	Description
iC7-60	Product group
SL	Product category SL = system module, liquid-cooled EL = enclosed drive, liquid-cooled
LQ	Product type LQ = cooling module
40	Voltage rating 40 = 400 VAC (380–415 VAC ±5%) 50 Hz/ 60Hz 46 = 460 VAC (440–480 VAC ±5%) 60 Hz 50 = 500 VAC (500–525 VAC ±5%) 50 Hz 60 = 600 VAC (575–600 VAC ±5%) 60 Hz 69 = 690 VAC (660–690 VAC ±5%) 50 Hz/ 60 Hz
-152	Cooling power -0076 = 76 kW -0152 = 152 kW
E54	Protection rating E23 = IP23 (standalone cooling module) E54 = IP54 (enclosed cooling module)
F2	EMC level F2 = C2 Industry environment
+SAP1	Pump amount +SAP1 = single-pump +SAP2 = dual-pump
+XXXX	Options

Reference to document no 172F0589B: "Operating Guide iC7 Series Cooling Modules 76kW and 152kW".

Example: iC7-60SLLQ40-0152E54F2+XXXX(+XXXX)

This type approval also includes design approval of the metallic hose produced by Dunlop Hiflex.

The iC7-60 unit is controlled by a separate control system which is covered by this certificate.

The following iC7-60 software version covered by this type approval is as follows: AMFI1256V220

Place of manufacture

Scanfil OÜ, Vana-Sauga 40, Pärnu, 80010 Pärnu maakond, Estonia

Application/Limitation

The design of the iC7 cooling module is approved for liquid cooling of semi-conductor converters onboard DNV classed vessels and may be configured as follows:

Specifications:

Input voltage	3 x 380–415 V AC ±5% 3 x 440–480 V AC ±5% 3 x 500–525 V AC ±5% 3 x 575–600 V AC ±5% 3 x 660–690 V AC ±5%
Input frequency	>50/>60 Hz
Supply network	TN-S, TN-C, IT and TT

Environmental conditions Ambient operating temperature values in brackets limited performance	Ambient temperature (inside cabinet) –15°C (–30°C) up to +55°C Surrounding temperature (installation space) –30°C up to +60°C
Temperature of coolant	External circuit: < +38°C (–30°C...+55°C) Drive circuit: +45°C (–30°C...+55°C)
System maximum pressure	External circuit: 1000 kPa Drive circuit: 600 kPa
Maximum supply pressure AC drive side	150 kPa @ 360 l/min (152 kW single-pump and dual-pump)
Temperature class	B
Vibration class	A
Humidity class	A
EMC class	DNV-CG-0339 / IEC 61800-3, Approved for the use on EMC class A locations

Reference to document no 172F0589B: "Operating Guide iC7 Series Cooling Modules 76kW and 152kW", Section 11

Type Approval documentation

Drawing No	Rev	Title
00778734	B1	Parts list iC7 Cooling module part data
172F0589	B	Operating Guide iC7 Series Cooling Modules 76kW and 152kW

Piping system

Piping system according to P&I diagrams and parts list:

Drawing No	Rev	Title
00778712		P&I diagram 1-pump 75kW and 152kW, 2023-05-29
00778713		P&I diagram 2-pump 75kW and 152kW, 2023-05-29
00778986		P&I diagram 1-pump external HEX without upper block, 2023-06-27
00778732		P&I diagram 2-pump external HEX, 2023-05-31

Metallic hose assemblies

Dunlop Hiflex Oy, Pirkkala, Finland, hose type designation 21-UNM1-050TU.

Tubiflex, DNV TAP00001T1.

Hose drawing no	Revision
172K0881	A
172K0806	A
172K0804	A
172K0800	A
172K0798	A
172F2575B	B
172F0617	C
172F0614	C
172F0337	B
70CWC1100119	B
70CWC1100115	B
70CTC1113487	C
70CTC1113411	D

Welding documentation

Butt weld (pipe to flange) – WPS DH-WP 05/1_WPQR H12270
Edge weld and filled (hose to pipe) WPS DH-WP 25/04_WPQR H12447
Overview Welder Approval Test Certificates, rev.6

Non-metallic piping system

Manufacturer Parker Hannifin Manufacturing France SAS, Rennes – France
DNV Type Approval Design certificate TAK00002A8

Control and monitoring system

Project/Drawing No	Rev	Project/Drawing Title
ECAD-iC7-60SLLQxx+SAP2+SLXX+VAXX	V003	iC7 Cooling Module +SAP2, +SLXX, +VAXX
ECAD-iC7-60SLLQxx+SAP2+SLEH+VAXX	V003	iC7 Cooling Module +SAP2, +SLEH, +VAXX

ECAD-iC7-60SLLQxx+SAP1+SLXX+VAXX V003 iC7 Cooling Module +SAP1, +SLXX, +VAXX
ECAD-iC7-60SLLQxx+SAP1+SLEH+VAXX V003 iC7 Cooling Module +SAP1, +SLEH, +VAXX
DNV Test Report

Tests carried out

- Production testing of the iC7-60 cooling module carried out with module no DD000028 on the 2023-10-18 at Danfoss Drives Oy, Vaasa, Finland
- iC7-60 control system test carried out with module no DD000028 on the 2024-05-17 at Danfoss Drives Oy, Vaasa, Finland

Test laboratory Eurofins, Finland:

Test report	Test standard	Equipment under test
EUF129-19006179-T1 4.12.2019	IEC 60529 (2013-08). Tightness tests for IP54	Viking ECM P2 (Rittal cabinet) 152kW – 1pump Class IP5X, IPX4
EUF129-20000665-T1 3.2.2020	IEC 60529 (2013-08). Tightness tests for IP23	CM P3 (no cabinet) 152kW 2-pumps Class IP2X, IPX3
EUF129-19005230-T1, T2 18.10.2019	IEC 60068-2-6, Test Fc Vibration test	Viking ECM P3 (Rittal cabinet) with IP54 control box 152kW–2pumps
EUF129-19005230-T4 18.10.2019	IEC 60068-2-6, Test Fc Vibration test	Viking ECM P2 (Rittal cabinet VX XFIVXMOD) with IP54 control box), 152kW-1Pump.
EUF129-19005230-T6 18.10.2019	IEC 60068-2-6, Test Fc Vibration test	Viking CM P2 (no cabinet) with IP54 control box, 152kW–2pumps
EUF129-19005230-T8 18.10.2019	IEC 60068-2-6, Test Fc (2007-12)	Viking CM P3 (no cabinet) with IP54 control box, 152kW–2pumps

Test laboratory SGS Finland:

Test report	Test standard	Equipment under test (EUT)
300477-1-2 2020-10-28	Electromagnetic Compatibility EMC IEC 60533 Ed.3 IACS Req. 1991/Rev. 7 DNVGL-CG-0339	ECM P2 (Rittal cabinet) 152kW-1pump
300477-1-1 2020-10-28	Electromagnetic Compatibility EMC IEC 61000-6-2, IEC 61000-6-4	ECM P2 152kW-1pump

Marking of product

- The iC7-60 cooling module is to be marked with manufacturer's name or trademark and type number identification.
- The metallic hoses produced by Dunlop Hiflex to be marked to ensure traceability to this certificate.

Approval conditions

- Any alarm condition in the cooling module system shall be relayed to the main alarm system.
- When the iC7-60 cooling system serves essential functionality and remote control of the cooling pump(s) is provided for, this shall be arranged so that the pump continues to run in case of broken control cable, ie. through fieldbus.
- Correct setup to be tested during commissioning.

The clause for application software control:

- All changes in software are to be recorded as long as the system is in use on board. Records of major changes are to be forwarded to DNV for evaluation and approval and shall be approved before implemented on board.
- Major changes to the type approved system affecting future deliveries shall be informed to DNV. If the changes are considered to affect functionality for which rule requirements apply, a new functional type test may be required, and the certificate may have to be renewed to identify the new version.

Product, material and type approval certificates

The iC7-60 cooling module to be assembled by components listed in document 00778734 - "iC7 Cooling module part data".

iC7-60 cooling module field instrumentation is accepted based on document "Electrical Component List.

Production testing

A product certificate can be issued to the iC7-60 cooling module if it is built according to this type approval certificate and tested according to AJL 20230530 – "Production test specification" and reported according to form "Production test report for Danfoss Drives 05/2023".



Job Id: **262.1-037279-1**
Certificate No: **TAP00002RG**

Periodical assessment

For retention of the Type Approval, a DNV surveyor shall perform an assessment after 2 years and after 3.5 years to verify that the conditions of the type approval are complied with. A renewal assessment will be performed at renewal of the certificate. Refer to the Class Programme DNV-CP-0338, Sec.4.

To check the validity of this certificate, please look it up in <https://approvalfinder.dnv.com>

Other Conditions

- Flexible hoses used to connect the iC7-60 cooling module to the ship system to be type approved by DNV.

END OF CERTIFICATE