

# IGBT Module Replacement for Fx09-Fx12 and E1h–E4h

## iC7 Series Frequency Converters and VLT® FC Series Drives

### 1 Overview

#### 1.1 Description

This IGBT module replacement kit contains all components required to replace 1 IGBT module or 1 brake IGBT module. For the number of IGBTs installed in the frequency converter, see [Table 1](#) and [Table 2](#).

### N O T I C E

#### SPARE PARTS COMPATIBILITY

Danfoss recommends replacement of all IGBT modules or all brake IGBT modules when 1 or more modules fail.

- For best results, replace modules with parts from the same lot number.

**Table 1: Number of IGBT Modules Required by iC7 Series Frequency Converters**

Frame designation	IGBT modules	Brake IGBT modules
FX09–Fx10 (no brake)	3	0
FX09–Fx10 (with brake option)	3	1
FX11–Fx12 (no brake)	6	0
FX11–Fx12 (with brake option)	6	2

**Table 2: Number of IGBT Modules Required by VLT® FC Series Drives**

Drive designation	IGBT modules	Brake IGBT modules
E1h–E4h (no brake)	6	0
E1h–E4h (with brake option)	6	2

#### 1.2 Kit Numbers

Use these instructions with the following kits.

**Table 3: IGBT Module Replacement Kits for iC7 Series Fx09–Fx12 Frequency Converters**

Kit number	Description
176F3944	IGBT dual module 300 A 1200 V Fx09
176F3945	IGBT dual module 450 A 1200 V Fx09
176F3949	IGBT dual module 600 A 1200 V Fx09
176F3943	IGBT module 900 A 1200 V Fx10
176F4141	IGBT brake module 450 A 1700 V Fx09
176F4143	IGBT brake module 650 A 1700 V Fx10
176F3950	IGBT dual module 600 A 1200 V Fx11
176F3956	IGBT module 900 A 1200 V Fx12

Kit number	Description
176F3957	IGBT module 1200 A 1200 V Fx12
176F3946	IGBT brake module 450 A 1700 V Fx11
176F4012	IGBT brake module 450 A 1700 V Fx12

Table 4: IGBT Module Replacement Kits for VLT® FC Series E1h-E4h Drives

Kit number	Description
176F6641	IGBT module 600 A T4/T5
176F6642	IGBT module 900 A T4/T5
176F6643	IGBT module 600 A 1700 V T7
176F6644	IGBT module 650 A 1700 V T7
176F6711	IGBT brake module 450 A E1, E3
176F6646	IGBT brake module 450 A E2, E4

### 1.3 Items Supplied

The following parts are contained in the kit.

Table 5: Items Supplied in IGBT Module Kits

Item	Quantity
IGBT module	1
Fasteners	varies depending on IGBT type
Syringe of thermal grease	1

## 2 Installation

### 2.1 Safety Information

#### N O T I C E

**QUALIFIED PERSONNEL**

Only qualified, Danfoss authorized personnel are allowed to install the parts described in these installation instructions.

- Disassembly and reassembly of the frequency converter must be done in accordance with the service guide.
- Use the standard fastener torque values from the service guide, unless the torque value is specified in these instructions.

#### ⚠ W A R N I N G ⚠

**ELECTRICAL SHOCK HAZARD**

Danfoss frequency converters contain dangerous voltages when connected to mains voltage. Improper installation, and installing or servicing with power connected, can cause death, serious injury, or equipment failure.

- Only use qualified electricians for the installation.
- Disconnect the frequency converter from all power sources before installation or service.
- Treat the frequency converter as live whenever the mains voltage is connected.
- Follow the guidelines in these instructions and local electrical safety codes.

#### ⚠ W A R N I N G ⚠

**DISCHARGE TIME**

The frequency converter contains DC-link capacitors, which can remain charged even when the frequency converter is not powered. High voltage can be present even when the warning LED indicator lights are off. Failure to wait the specified time after power has been removed before performing service or repair work can result in death or serious injury.

- Stop the motor.
- Disconnect AC mains and remote DC-link power supplies, including battery back-ups, UPS, and DC-link connections to other frequency converters.
- Disconnect or lock the motor.
- Disconnect any brake option.
- Disconnect any regen/load share option.
- Wait for the capacitors to discharge fully. The minimum waiting time is listed on the frequency converter label and also in the following discharge time table.
- Before performing any service or repair work, use an appropriate voltage measuring device to make sure that the capacitors are fully discharged.

**Table 6: Discharge Time**

Frame	Minimum waiting time
Fx09-Fx10	20 minutes
E1h-E4h	40 minutes
Fx11-Fx12	40 minutes

NOTICE

ELECTROSTATIC DISCHARGE

Electrostatic discharge can damage components.

- Ensure discharge before touching internal frequency converter components, for example by touching a grounded, conductive surface or by wearing a grounded armband.

2.2 Installing the IGBT Module

For IGBT module disassembly procedures, refer to service guide. To install the replacement IGBT module or brake IGBT module, use the following steps.

NOTICE

THERMAL INTERFACE

A proper thermal interface is required between the IGBT module and heat sink. Failure to follow these instructions results in a poor thermal bond and causes premature IGBT failure.

- Ensure that the environment is free of airborne dust and contaminants while applying the thermal grease.

1. Clean the heat sink using a cloth and solvent or alcohol solution to remove debris and remaining thermal grease.
2. With the syringe, apply a layer of thermal grease to the bottom of the IGBT module in the pattern shown in [Illustration 1](#).

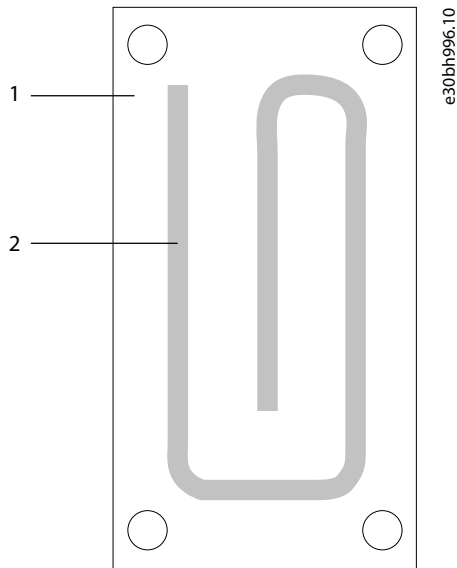
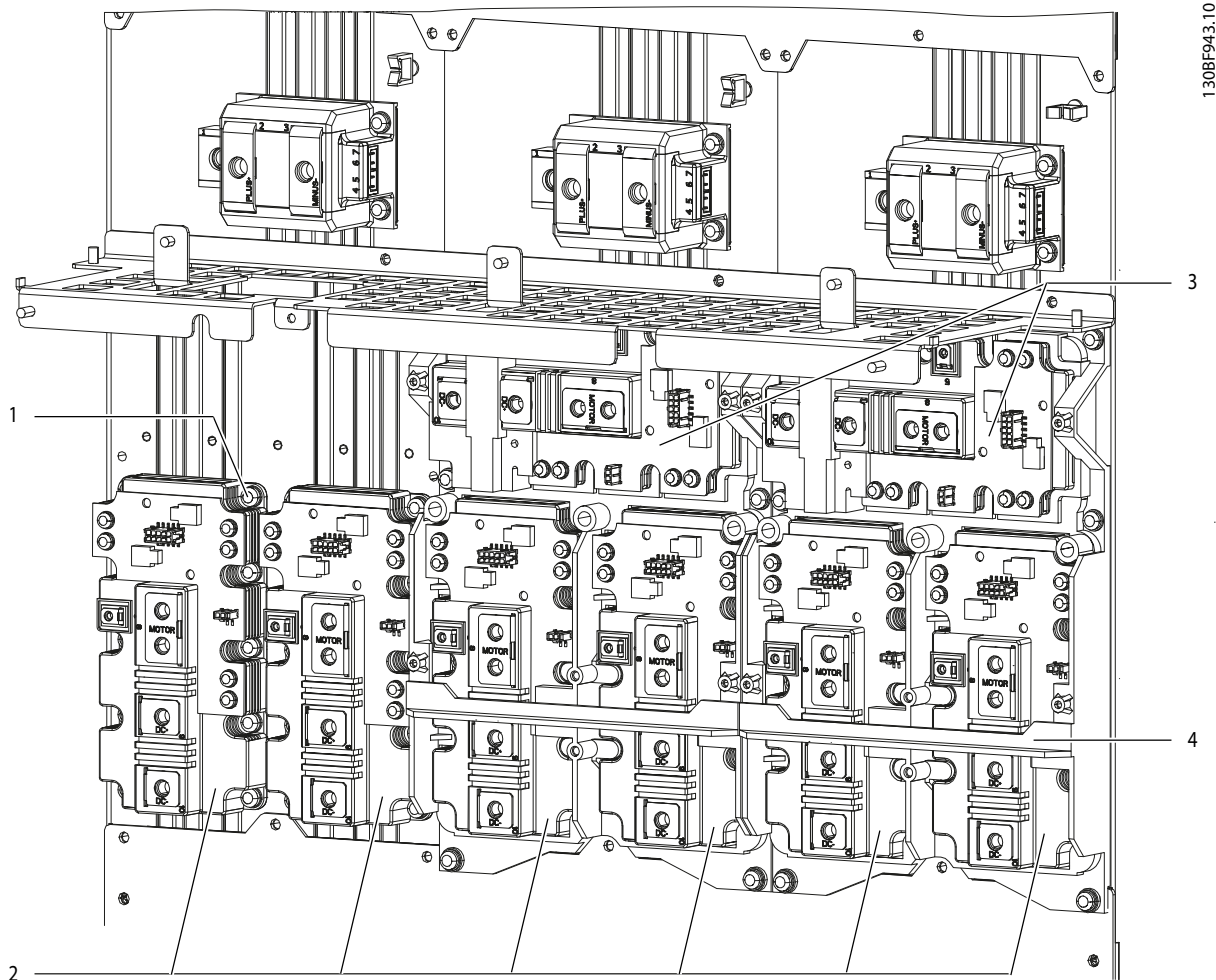


Illustration 1: IGBT Thermal Grease Pattern

1	Bottom of IGBT module
2	Thermal grease

Once the module is mounted, thermal grease seeps out to coat the area between the module and heat sink. Excess grease is acceptable.

- Place the IGBT module on the heat sink by aligning the mounting holes in the module to those in the heat sink. Refer to [Illustration 2](#).



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**Illustration 2: Mounting the IGBT Module on the Heat Sink**

1	IGBT module fastener	3	Brake IGBT modules
2	IGBT modules	4	Plastic IGBT mounting frame

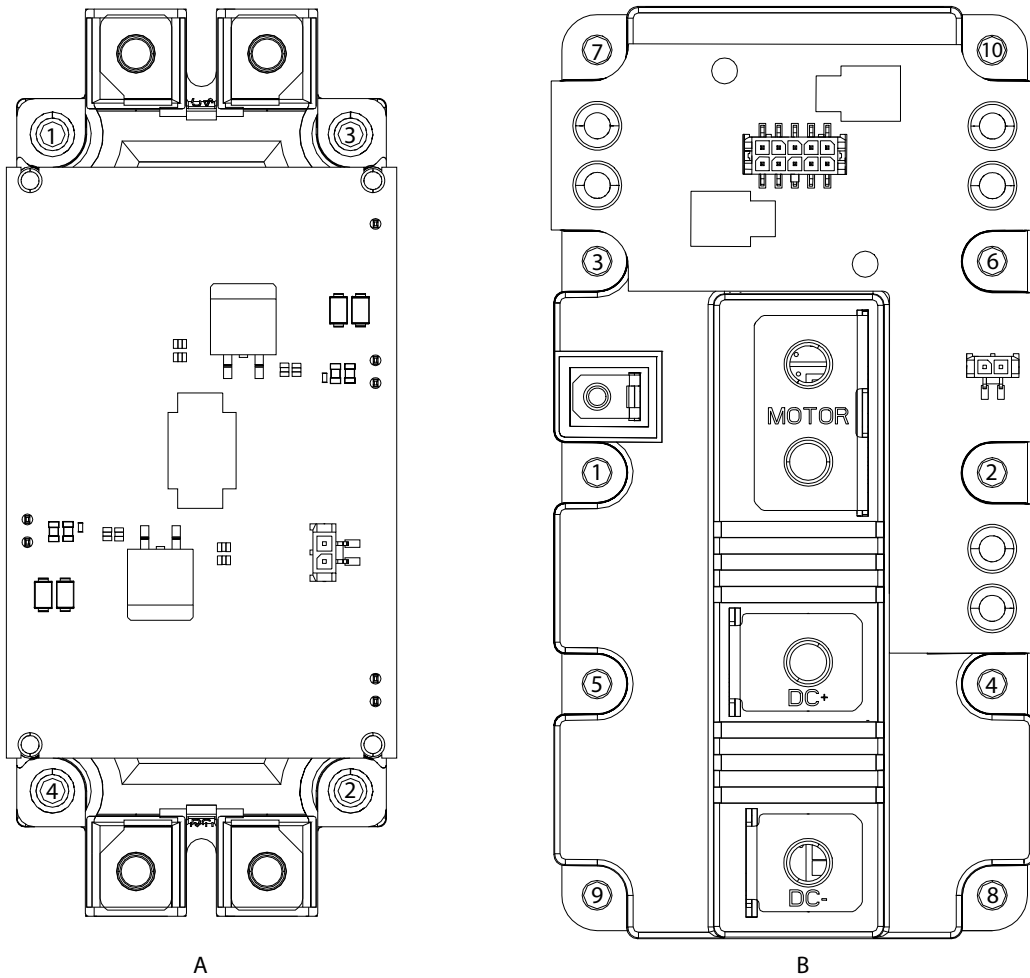
- Insert the mounting screws and hand tighten them.

The IGBT module requires either 4 or 10 screws to fasten it to the heat sink.

- Following the fastener tightening sequence shown in [Illustration 3](#), slowly tighten (maximum 20 RPM) all screws to 50% of the torque values listed in [Table 7](#) and [Table 8](#).
- Repeat the same tightening sequence and slowly tighten (maximum 5 RPM) all screws to 100% of the torque value.

7. Tighten the busbar connection terminals to the torque value listed in [Table 7](#) and [Table 8](#).

**Example**



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**Illustration 3: IGBT Fastener Tightening Sequence**

**Table 7: Torque Tightening Values and Sequence for iC7 Series Frequency Converters**

Kit number	Mounting torque [Nm (in-lb)]	Busbar connection torque [Nm (in-lb)]	Diagram	Screw tightening order
176F3944	3.3 (29)	3.3 (29)	A	1-2-3-4
176F3945	3.3 (29)	3.3 (29)	A	1-2-3-4
176F3949	3.3 (29)	3.3 (29)	A	1-2-3-4
176F3943	4.5 (40)	9.0 (80)	B	1-2-3-4-5-6-7-8-9-10
176F4141	3.3 (29)	3.3 (29)	A	1-2-3-4
176F4143	4.5 (40)	9.0 (80)	B	1-2-3-4-5-6-7-8-9-10
176F3950	3.3 (29)	3.3 (29)	A	1-2-3-4
176F3956	4.5 (40)	9.0 (80)	B	1-2-3-4-5-6-7-8-9-10

Kit number	Mounting torque [Nm (in-lb)]	Busbar connection torque [Nm (in-lb)]	Diagram	Screw tightening order
176F3957	4.5 (40)	9.0 (80)	B	1-2-3-4-5-6-7-8-9-10
176F3946	3.3 (29)	3.3 (29)	A	1-2-3-4
176F4012	4.5 (40)	9.0 (80)	B	1-2-3-4-5-6-7-8-9-10

Table 8: Torque Tightening Values and Sequence for VLT® FC Series Drives

Kit number	Mounting torque [Nm (in-lb)]	Busbar connection torque [Nm (in-lb)]	Diagram	Screw tightening order
176F6641	3.3 (29)	4.0 (35)	A	1-2-3-4
176F6642	4.5 (40)	9.0 (80)	B	1-2-3-4-5-6-7-8-9-10
176F6643	3.3 (29)	4.0 (35)	A	1-2-3-4
176F6644	4.5 (40)	9.0 (80)	B	1-2-3-4-5-6-7-8-9-10
176F6711	3.3 (29)	4.0 (35)	A	1-2-3-4
176F6646	4.5 (40)	9.0 (80)	B	1-2-3-4-5-6-7-8-9-10

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