

Installation Instructions

Back-channel Cooling (Bottom/Top) D3h-D4h, FC Series FC 102, FC 103, FC 202, and FC 302

1.1 Description

The back-channel cooling (bottom/top) kit is designed for D3h–D4h enclosure sizes mounted inside either an 1800 mm or 2000 mm tall Rittal housing for the following frequency converters:

- VLT® HVAC Drive FC 102
- VLT® Refrigeration Drive FC 103
- VLT® AQUA Drive FC 202
- VLT® AutomationDrive FC 302

This back-channel cooling kit provides a lower and upper duct system to retrieve cool air from the bottom of the Rittal housing and exhaust the hot air out the top.

The kit contains the following parts:

Upper duct assembly

- Duct enclosure (1)
- Cover plate (1)
- Mounting plate (1)
- Gasket, bottom of duct enclosure (1)
- Gasket, between mounting plate and frequency converter (1)
- Grill (1)
- Gasket, between grill and Rittal housing (1)
- Gasket, between duct enclosure and grill (1)
- Gasket, cover plate, top (1)
- Gasket, cover plate, bottom (1)
- Gasket, cover plate, left side (1)
- Gasket, cover plate, right side (1)
- Gasket, large vent seal (1)
- Gasket, small vent seal (1)
- Plate for M10 x 30 screw (2)
- Plate gasket for M10 x 30 screw (2)
- Screws, M10 x 30 (4)
- Screws, 5 x 12 (6)
- Nuts, M5 (30) D3h or (34) D4h
- Nut, M10 (4)

Lower duct assembly

- Duct enclosure (1)
- Grill (1)
- Top plate (1)
- Cover plate (1)
- Support plate (1)
- Gasket, between frequency converter and support plate (1)
- L-bracket (3)
- Cable bracket (1)
- Gasket, inside of grill (1)
- Gasket, cover plate, right side (1)
- Gasket, cover plate, left side (1)
- Gasket, cover plate, top (1) - D3h only
- Gasket, top plate (1)
- Gasket, top of duct enclosure (1)
- Gasket, between grill plate and Rittal housing (1)
- Clamp (1)
- Nuts, M5 (29) D3h or (24) D4h
- Nuts, M10 (2)
- Screws M5 x 18 (3)
- Screws, M10 x 30 (2)
- Torx screws, M5 x 16 (7)

1.2 Kit Part Numbers

Part number	Kit description
176F3627	Back-channel cooling kit for D3h enclosure in an 1800 mm Rittal housing
176F3628	Back-channel cooling kit for D4h enclosure in an 1800 mm Rittal housing
176F3629	Back-channel cooling kit for D3h enclosure in an 2000 mm Rittal housing
176F3630	Back-channel cooling kit for D4h enclosure in an 2000 mm Rittal housing

Table 1.1 Part Numbers for the Back-channel Cooling (Bottom/Top) Kit

1.3 Safety Instructions

Only qualified personnel are allowed to install the parts described in these installation instructions. Make sure to read and save these instructions.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

VLT® 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.

To avoid 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 (including when the frequency converter is tripped or waiting for a command).
- Follow the guidelines in these instructions and local electrical safety codes.

⚠ WARNING

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 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 supplies, including battery back-ups, UPS, and DC-link connections to other frequency converters.
- Disconnect or lock PM motor.
- Wait for the capacitors to discharge fully. The minimum duration of waiting time is specified in *Table 1.2*.
- Before performing any service or repair work, use an appropriate voltage measuring device to make sure that the capacitors are fully discharged.

Voltage [V]	Frequency converter model	Minimum waiting time (minutes)
3x400	N110-N315	20
	N90K-N250	20
3x690	N75K-N400	20
	N55K-N315	20

Table 1.2 Discharge Time

1.4 Installation

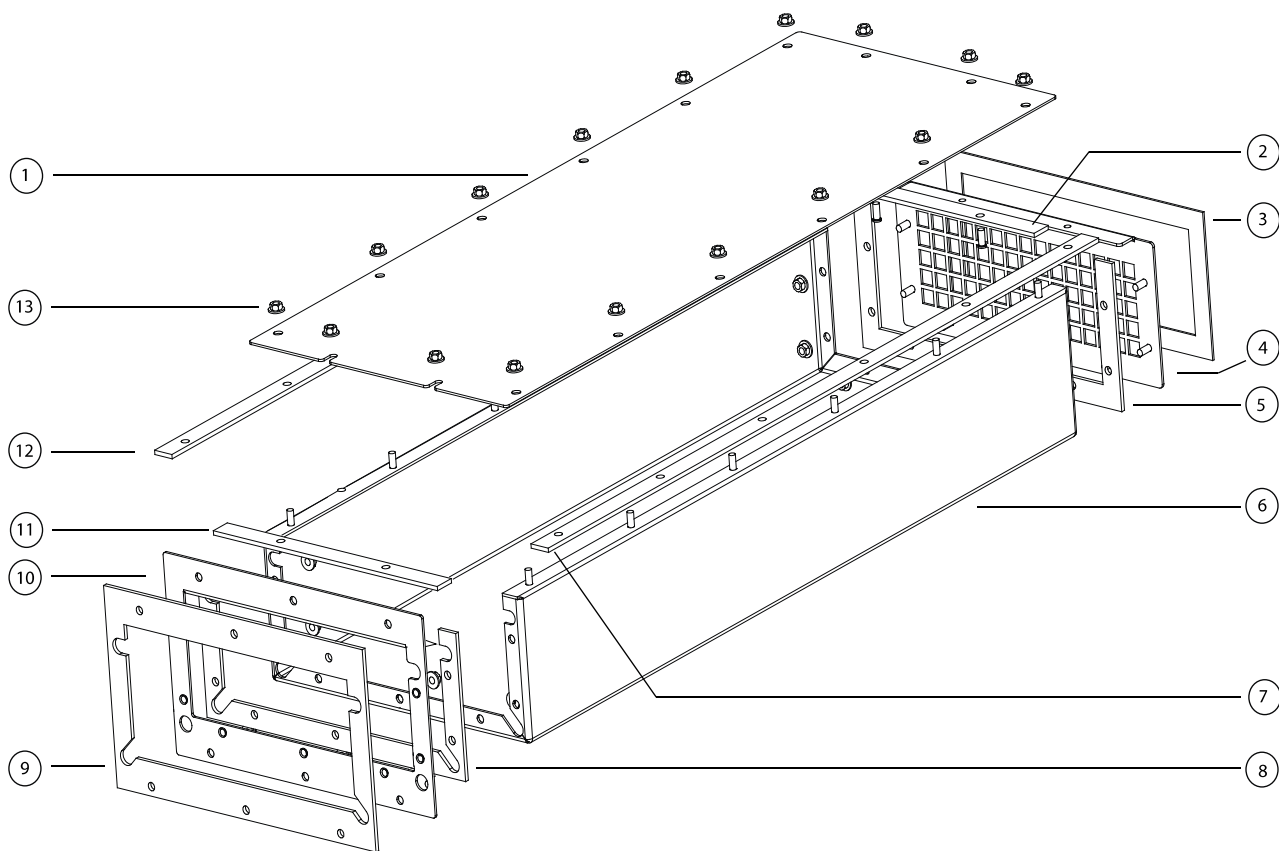
NOTICE

APPLYING GASKETS

This kit contains gaskets to ensure a proper seal between metal parts. Before adhering a gasket to a part, check that the part matches the gasket and that no holes are covered. Remove paper backing and place the sticky side on the part.

1.4.1 Assembling the Upper Duct Enclosure

1. Place the duct enclosure (6) on a level surface with the open side facing up. Refer to *Illustration 1.1*.
2. Install the left, bottom, right, and top side gaskets (12, 11, 2, 7) along the open edges of the duct enclosure. The gasket holes line up with the studs on the duct enclosure.
3. Install the bottom gasket (8) on one end of the duct enclosure, making sure the holes line up.
4. Install the mounting plate (10) with the studs facing into the holes in the bottom gasket (8). Secure the mounting plate to the enclosure using 1 nut on each stud. Torque to 2.3 Nm (20 in-lb).
5. Install the gasket (9) on top of the mounting plate.
6. On the other end of the duct enclosure, install the gasket (5), making sure the holes line up.
7. Place the grill (4) on the gasket (5). The threaded studs in the grill go through the holes in the gasket and into the enclosure. Secure the grill to the enclosure using 1 M5 nut on each stud. Torque to 2.3 Nm (20 in-lb).
8. Attach the gasket (3) to the top of the grill.
9. Install the cover plate (1) over the open side of the duct enclosure. Secure with 7 (D3h) or 9 (D4h) M5 nuts and torque to 2.3 Nm (20 in-lb).



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1	Cover plate	8	Gasket, bottom of duct enclosure
2	Gasket, cover plate, top	9	Gasket, between mounting plate and frequency converter
3	Gasket, between grill and Rittal housing	10	Mounting plate
4	Grill	11	Gasket, cover plate, bottom
5	Gasket, between duct enclosure and grill	12	Gasket, cover plate, left side
6	Duct enclosure	13	Nut, M5
7	Gasket, cover plate, right side		

Illustration 1.1 Assembling the Upper Duct Assembly for the D3h Enclosure (D4h is similar)

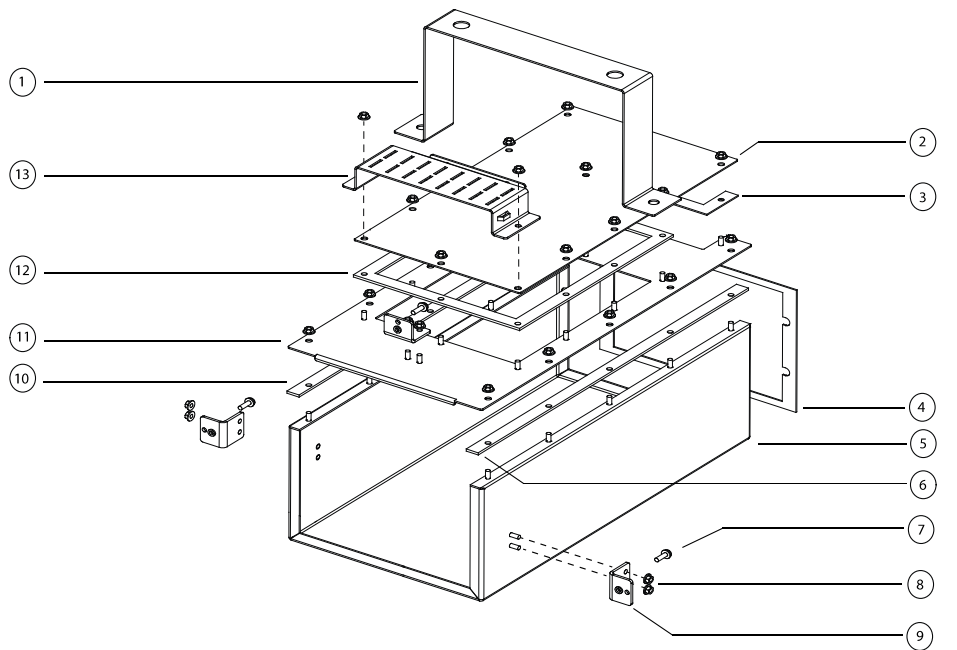
1.4.2 Assembling the Lower Duct Enclosure

1. Place the duct enclosure (5) on a level surface with the open side facing up. Refer to *Illustration 1.2*.
2. Place the left and right side gaskets (10, 6) against the open edges of the duct enclosure (5). The gasket holes line up with the studs on the duct enclosure.
3. Install the cover plate (11) over the open side of the duct enclosure. Secure with 10 (D3h) or 6 (D4h) M5 nuts along the outer edge of the cover plate. Torque to 2.3 Nm (20 in-lb).
4. Install the gasket (12) around the large opening of the cover plate. For D3h enclosures only, install the gasket (3) toward the smaller opening near the top.
5. Place the top plate (2) over the gasket(s). Align the cable bracket (13) at the bottom of the plate, making sure that the top plate and cable bracket holes are aligned. Secure the top plate/cable bracket assembly to the enclosure using 1 M5 nut on each stud. Torque to 2.3 Nm (20 in-lb).
6. Install an L-bracket (9) to the front and both sides of the duct enclosure. The L-brackets are held in place by 2 studs toward the bottom of the duct enclosure and are secured using 2 M5 nuts per bracket. Torque to 2.3 Nm (20 in-lb).
7. Install the gasket (4) on the other end of the duct enclosure. Make sure the holes line up.

NOTICE

EXTRA PARTS

Not all the parts included in the lower duct assembly are used at this point. They are used in subsequent steps.



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1	Clamp	8	Nut, M5
2	Top plate	9	L-bracket
3	Gasket, cover plate, top (D3h only)	10	Gasket, cover plate, left side
4	Gasket, between duct enclosure and support plate	11	Cover plate
5	Duct enclosure	12	Gasket, top plate
6	Gasket, cover plate, right side	13	Cable bracket
7	Screw, M5 x 18		

Illustration 1.2 Assembling the Lower Duct Assembly for the D3h Enclosure (D4h is similar)

1.4.3 Preparing for Mounting

1. Remove all exterior panels (front, back, top, and bottom) from the Rittal housing except the back sub plate.
2. Drill 6 holes into the back sub plate of the Rittal housing, which is (3) in *Illustration 1.6*. For mounting hole locations, use *Illustration 1.3* for D3h enclosures or *Illustration 1.4* for D4h enclosures
3. On the back of the frequency converter, attach the large vent seal gasket (1) to the opening near the top. Then, apply the small vent seal gasket (2) to the opening near the base, making sure that the holes are aligned. Refer to *Illustration 1.5*.
4. On the frequency converter base, attach the gasket (13) between the duct enclosure and the support plate. Make sure the holes are aligned. Refer to *Illustration 1.6* for this step and the next step.
5. Place the support plate (11) on top of the gasket (13) and secure with 7 M5 x 16 Torx screws. Torque to 2.3 Nm (20 in-lb).

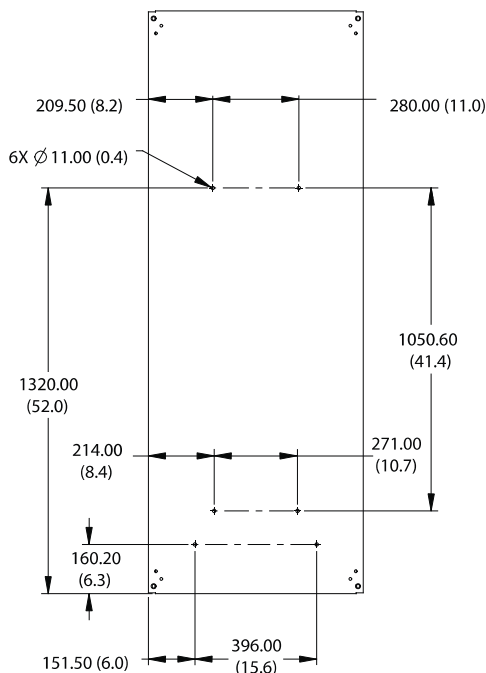


Illustration 1.4 Mounting Hole Locations for the D4h

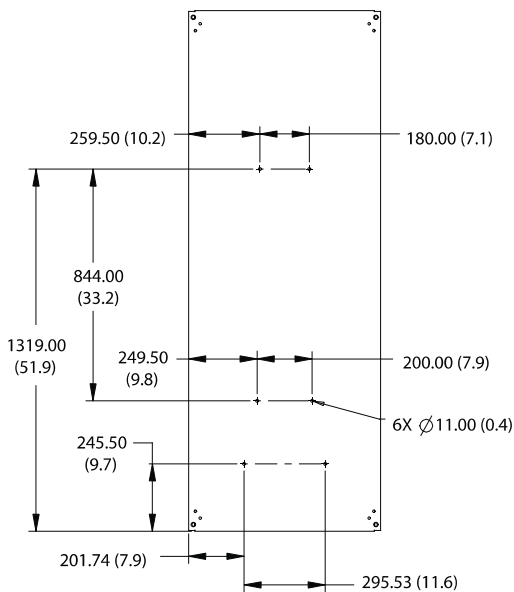
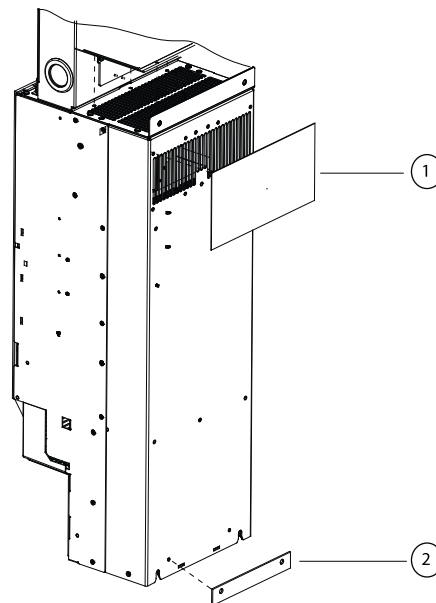


Illustration 1.3 Mounting Hole Locations for the D3h



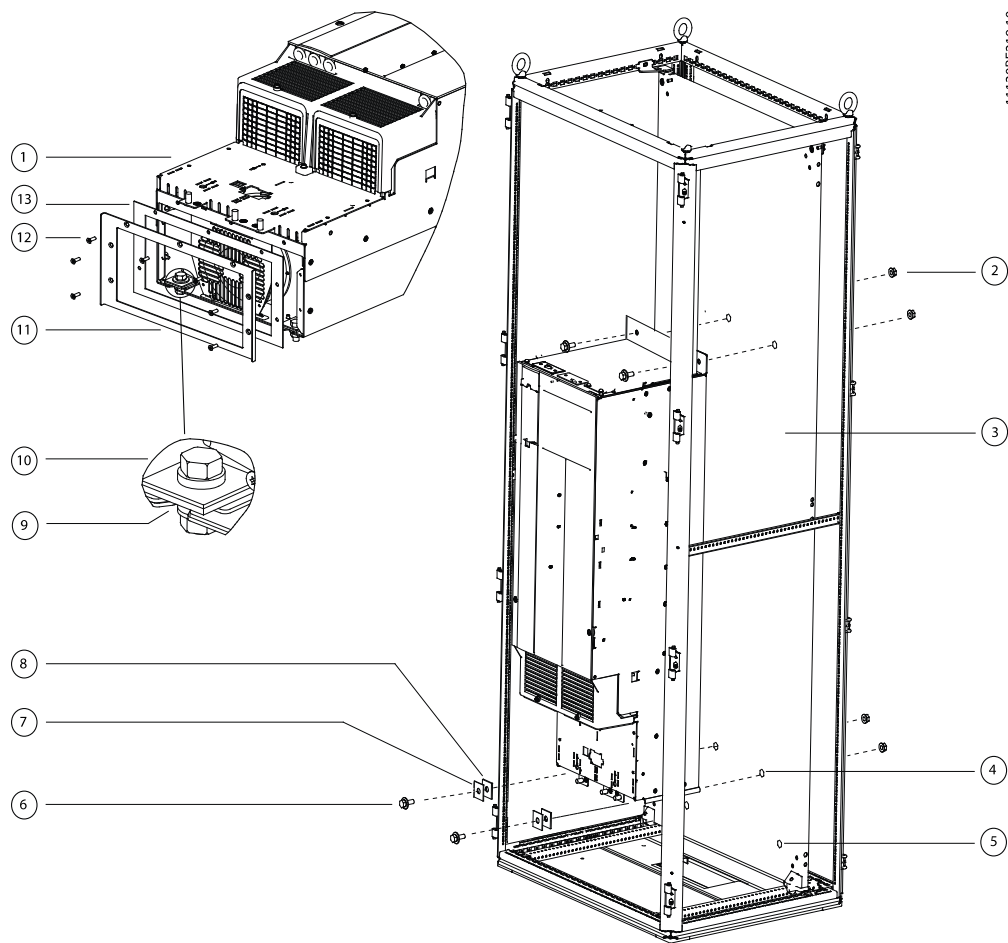
1	Large vent seal gasket	2	Small vent seal gasket
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Illustration 1.5 Vent Seal Gaskets Location on the Frequency Converter

1.4.4 Mounting the Frequency Converter

Refer to *Illustration 1.6* for the following steps.

1. Place the plate (7) and then the plate gasket (8) on each of the M10 x 30 base screws (6).
2. Fasten the 2 base screws halfway into the bottom mounting holes (4). Secure with 2 M10 nuts.
3. Slightly lean the top of the frequency converter forward. Set the cut-outs (9) in the base of the frequency converter onto the 2 base screws (6) on the back sub plate (3).
4. Slowly push the top of the frequency converter back until the top 2 holes in the back sub plate line up with the 2 mounting holes on the top of the unit. Secure the top of the frequency converter to the plate using 2 M10 x 30 screws and 2 M10 nuts (2). Torque to 19 Nm (170 in-lb).
5. Secure the base screws by torquing the nuts to 19 Nm (170 in-lb).



1	Base of the frequency converter	8	Plate gasket for M10 x 30 screw
2	M10 nut	9	Cut-outs in base of frequency converter
3	Back sub plate	10	M10 x 30 screw with plate and gasket
4	Mounting holes for base of frequency converter	11	Support plate
5	Mounting holes for lower duct clamp	12	M5 x 16 torx screw
6	M10 x 30 screw	13	Gasket between support plate and frequency converter
7	Plate for M10 x 30 screw		

Illustration 1.6 Mounting the Unit to the Rittal Housing

1.4.5 Installing the Upper Duct Assembly

Refer to *Illustration 1.7* for the following steps, unless otherwise noted.

1. Place the upper duct enclosure over the top vent on the frequency converter. The grill in the upper duct enclosure must be at the top of the Rittal housing.
2. Secure the upper duct assembly with 6 M5 x 12 screws. Torque to 2.3 Nm (20 in-lb).
3. Using the dimensions in *Illustration 1.8* for the D3h or *Illustration 1.9* for the D4h, cut out a vent opening in the top panel of the Rittal housing.
4. Align the vent openings and secure the top panel to the Rittal housing.

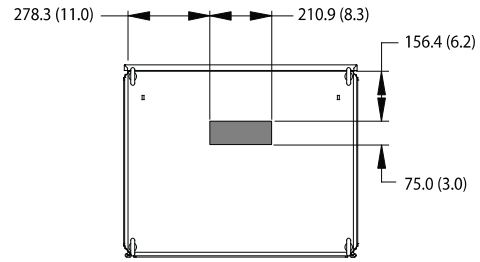


Illustration 1.8 Dimensions for Top Panel Vent Opening, D3h

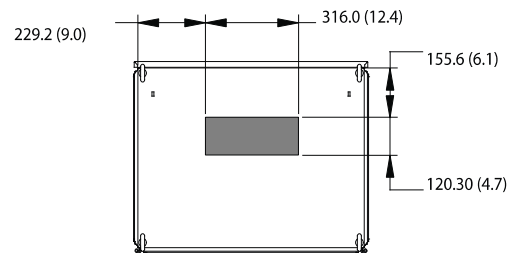
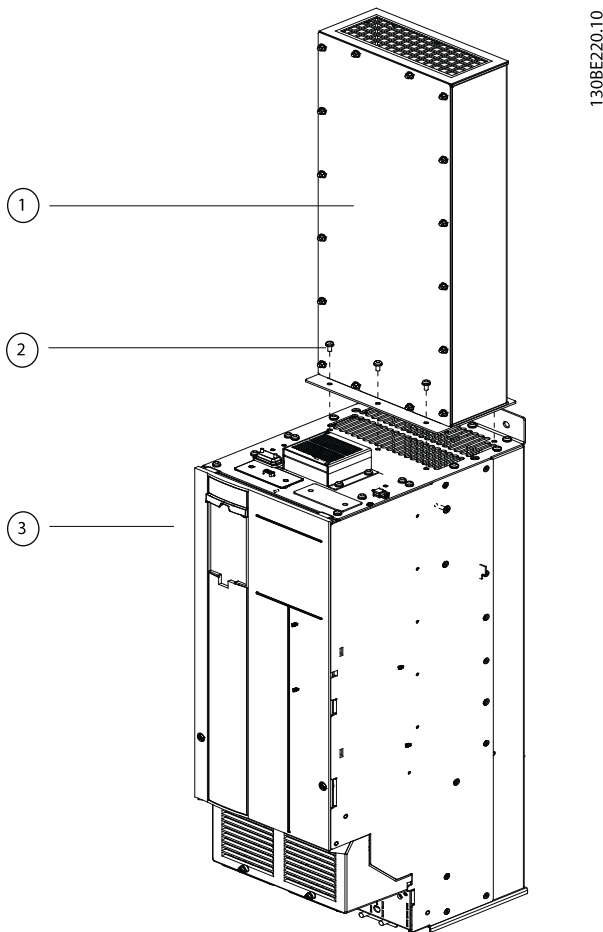


Illustration 1.9 Dimensions for Top Panel Vent Opening, D4h



1	Upper duct assembly	3	Frequency converter
2	M5 x 12 screws		

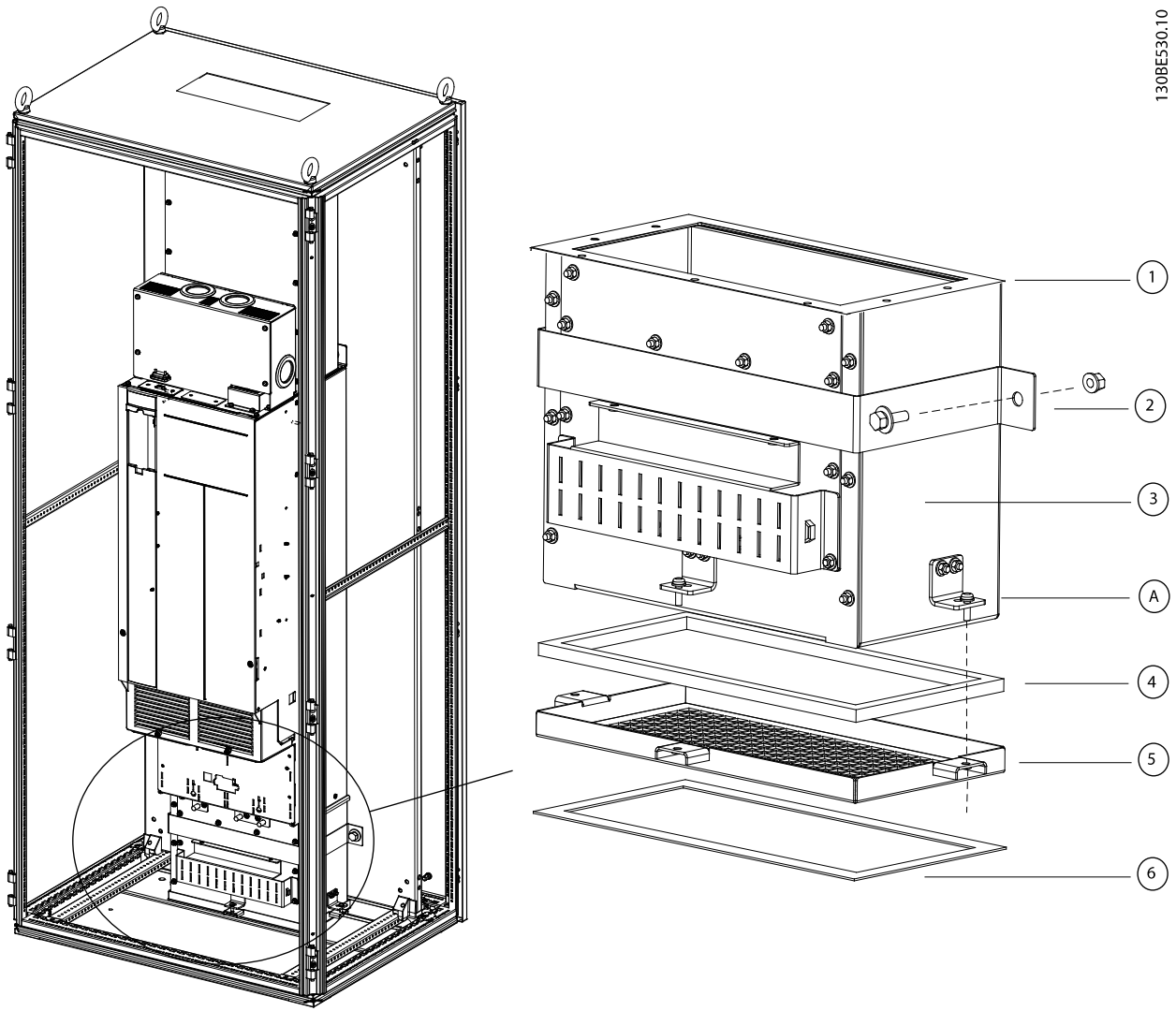
Illustration 1.7 Installing Upper Duct Assembly

1.4.6 Installing the Lower Duct Assembly

Refer to *Illustration 1.10* for the following steps, unless otherwise noted.

1. Place the grill (5) including the gaskets (4, 6) on the lower duct assembly (3).
2. Loosely tighten the L-bracket M5 x 18 screw into the outer hole of the grill bracket. Refer to *Illustration 1.11*. Perform this step for all 3 L-brackets.
3. Position the lower duct assembly behind the sheet metal flange on the base of the frequency converter. Refer to *Illustration 1.14*.
4. Attach the clamp (2) and secure it to the back sub plate using 2 M10 x 30 screws and M10 nuts.
5. Once the lower duct assembly is positioned properly, remove the L-bracket screws from the outer holes in the grill brackets and refasten the screws into the innermost holes. Refer to *Illustration 1.11*. Torque the 3 L-bracket screws to 2.3 Nm (20 in-lb).
6. Using the dimensions in *Illustration 1.12* for D3h enclosures or *Illustration 1.13* for D4h enclosures, cut out a vent opening in the bottom gland plate of the Rittal housing.
7. Align the vent openings and secure the gland plate to the Rittal housing.
8. Reattach the side panels and front door to the Rittal housing.

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1	Gasket between duct enclosure and support plate	5	Gasket inside grill
2	Clamp with M10 x 30 screws and M10 nuts	6	Grill
3	Lower duct assembly	7	Gasket, between grill plate and Rittal housing
4	L-bracket with M5 x 18 screw (See <i>Illustration 1.11</i>)		

Illustration 1.10 Installing the Lower Duct Assembly

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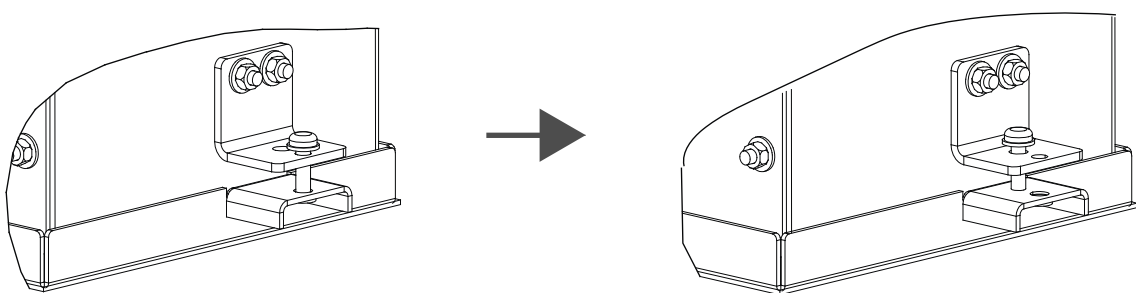


Illustration 1.11 Fastening the L-brackets to the Grill Assembly, Initial Tightening (left) and Final Tightening (Right)

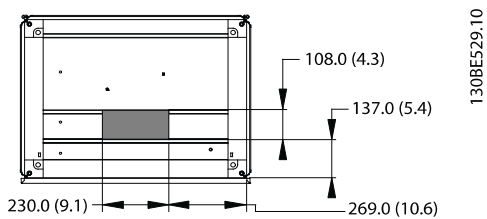


Illustration 1.12 Dimensions for Gland Plate Vent Opening, D3h

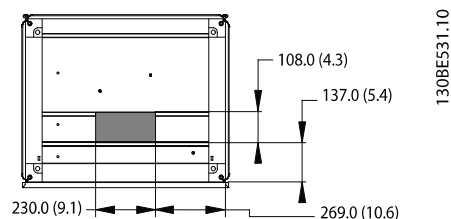


Illustration 1.13 Dimensions for Gland Plate Vent Opening, D4h

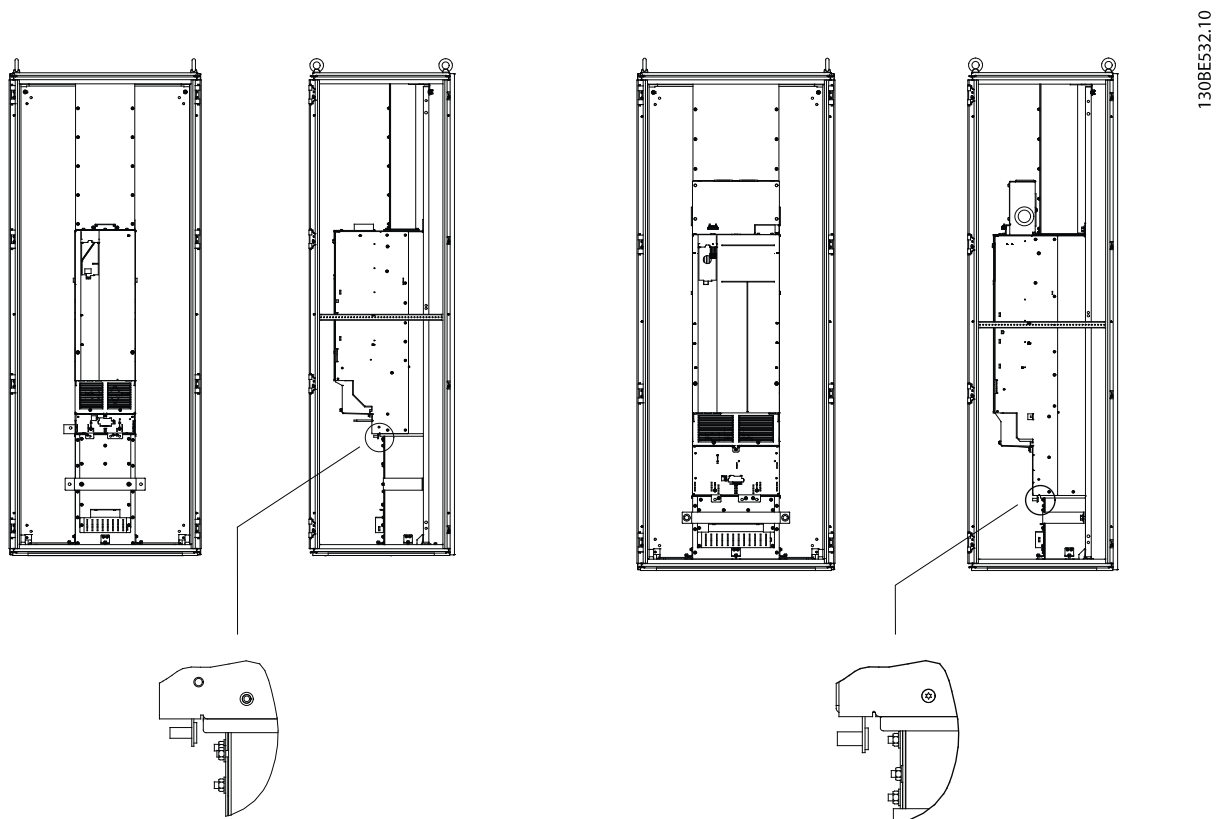


Illustration 1.14 Front and Side Views of Assembled Kit, D3h (left) and D4h (right)

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