

NEMA-3R Kit for E3h–E4h Enclosures

VLT® FC Series FC 102, FC 103, FC 202, FC 302

1 Overview

1.1 Description

The NEMA-3R kit fits E3h and E4h drives. The kit is designed for drives that use back-channel cooling (in-back/out-back) and are mounted in Rittal TS8 enclosures with widths of 600 mm (24 in) or 800 mm (32 in). In addition to directing air in from and out of the back of the drive, the NEMA-3R kit adds covers to the rear vents of the unit. The covers provide a degree of protection against weather, including rain, sleet, and snow. Refer to [illustration 1](#).

NOTICE

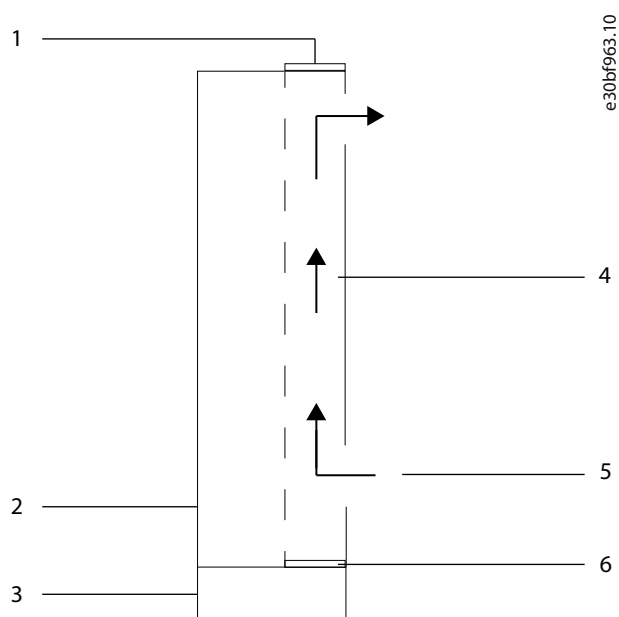
CURRENT RATING

When the NEMA-3R kit is added to a drive, the current rating of the drive is derated by 3%.

NOTICE

FAN REQUIREMENTS

Door fans are required on the Rittal enclosure to remove the heat losses not contained in the back channel of the drive. The minimum airflow required (at the maximum ambient temperature) for E3h–E4h drives is 782 m³/hr (460 cfm). If extra heat losses are added within the enclosure, include these losses in the calculation of required cooling to ensure proper airflow inside the enclosure.



1 Top cover	2 Enclosure
3 Pedestal	4 Cooling back channel
5 Airflow direction	6 Bottom cover

Illustration 1: Direction of Airflow with Kit Installed

1.2 Kit Numbers

Use these instructions with the following kits.

Table 1: Kit Numbers for NEMA-3R Kits for E3h–E4h Drives

Kit number	Kit description
176F3924	NEMA-3R kit for E3h drive with 600-mm Rittal enclosure
176F3925	NEMA-3R kit for E3h drive with 800-mm Rittal enclosure
176F3926	NEMA-3R kit for E4h drive with 800-mm Rittal enclosure

1.3 Items Supplied

The following parts are contained in the kit.

Table 2: Items Supplied in NEMA-3R Kit for E3h–E4h Drives

Item	Quantity
Top cover	1
Top gasket	1

Item	Quantity
Bottom cover	1
Bottom gasket	1
Mounting plate	1
Back duct	2
6-hole gasket	4
8-hole gasket	4
Clip-on nut	16
M5x14 screw	8–10
M5x18 screw	30
M6x12 screw	12
M5x10 thread-forming screw	16
NEMA-3R duct cover	2
Exhaust cover plate	1
Intake cover plate	1

2 Installation

2.1 Safety Information

NOTICE

QUALIFIED PERSONNEL

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

- Disassembly and reassembly of the drive must be done in accordance with the corresponding service manual.

⚠ WARNING ⚠

ELECTRICAL SHOCK HAZARD

VLT® FC series drives 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 drive from all power sources before installation or service.
- Treat the drive as live whenever the mains voltage is connected.
- Follow the guidelines in these instructions and local electrical safety codes.

⚠ WARNING ⚠

DISCHARGE TIME (40 MINUTES)

The drive contains DC-link capacitors, which can remain charged even when the drive is not powered. High voltage can be present even when the warning indicator lights are off.

Failure to wait 40 minutes after power has been removed before performing service or repair work can result in death or serious injury.

- Stop the motor.
- Disconnect AC mains, permanent magnet type motors, and remote DC-link supplies, including battery back-ups, UPS, and DC-link connections to other drives.
- Wait 40 minutes for the capacitors to discharge fully before performing any service or repair work.
- Measure the voltage level to verify full discharge.

⚠ CAUTION ⚠

ELECTROSTATIC DISCHARGE

Electrostatic discharge can damage components.

- Ensure discharge before touching the safety option, for example by touching a grounded, conductive surface or by wearing a grounded armband.

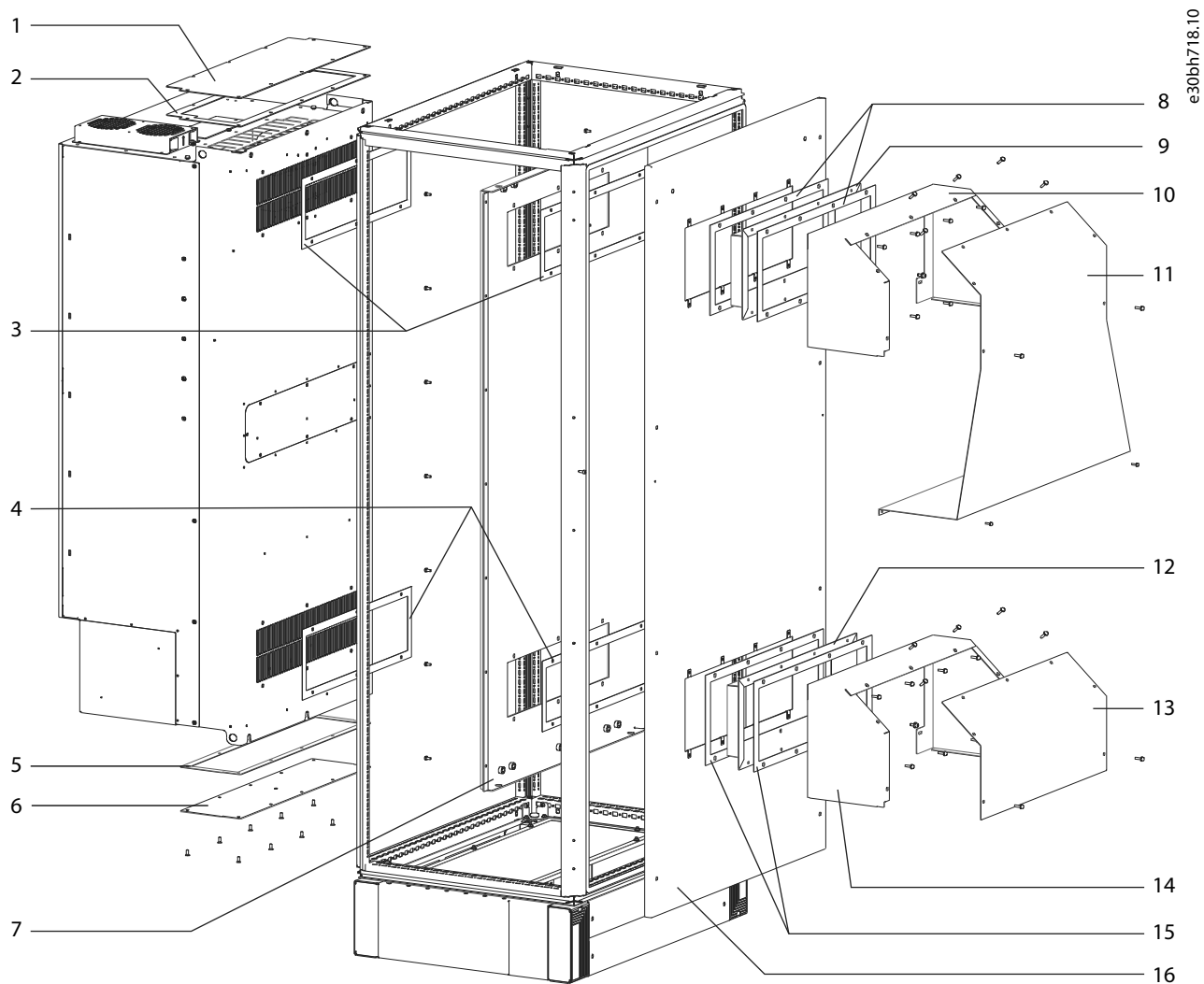
2.2 Installation Overview

NOTICE

APPLYING GASKETS

This kit contains self-adhesive gaskets to ensure a proper seal between metal parts.

- Before affixing a gasket, check that the part matches the gasket and that no holes are covered.



1 Top cover	2 Top gasket
3 6-hole gaskets	4 6-hole gaskets
5 Bottom gasket	6 Bottom cover
7 Mounting plate	8 8-hole gaskets
9 Upper back duct	10 Upper duct cover
11 Exhaust cover plate	12 Lower back duct

13 Intake cover plate	14 Lower duct cover
15 8-hole gaskets	16 Backplate

Illustration 2: Overview of NEMA-3R Kit for E3h–E4h Drives

2.3 Creating Vent Openings in the Backplate

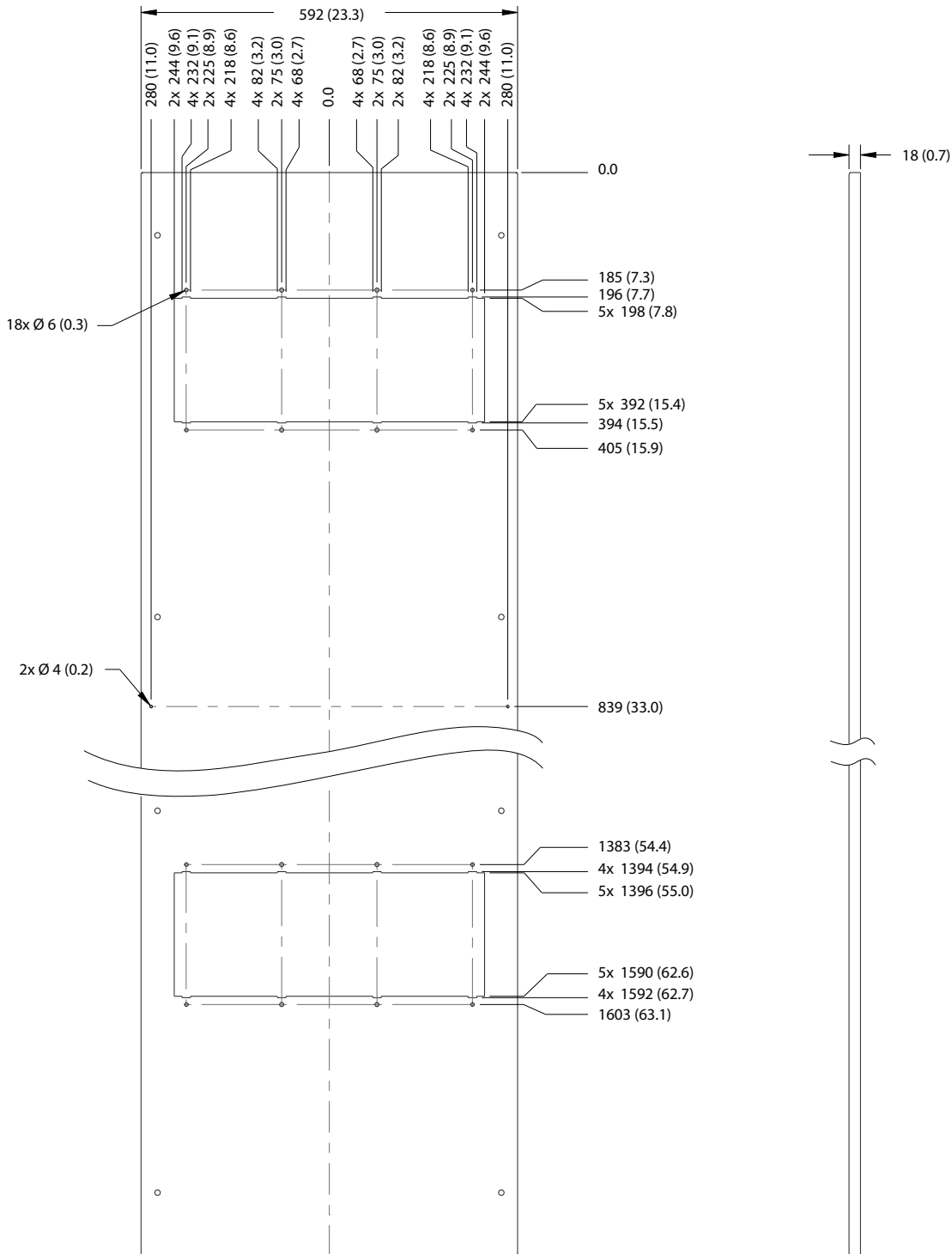
Context:

To create upper and lower vent openings in the enclosure backplate to match the openings in the mounting plate and drive, use the following steps. Refer to [illustration 3](#) for 600 mm (24 in) enclosures, and to [illustration 4](#) for 800 mm (32 in) enclosures.

Procedure

1. Cut out the vent openings in the enclosure backplate using the dimensions in [illustration 3](#) or [illustration 4](#). The openings must match the drive and mounting plate vent openings.
2. Drill 8 screw holes (6 mm) around each vent opening. The holes must match the holes in the drive and in the outer flange of the back duct.

Example:



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Illustration 3: Vent Dimensions for Backplate in 600 mm (24 in) Enclosure

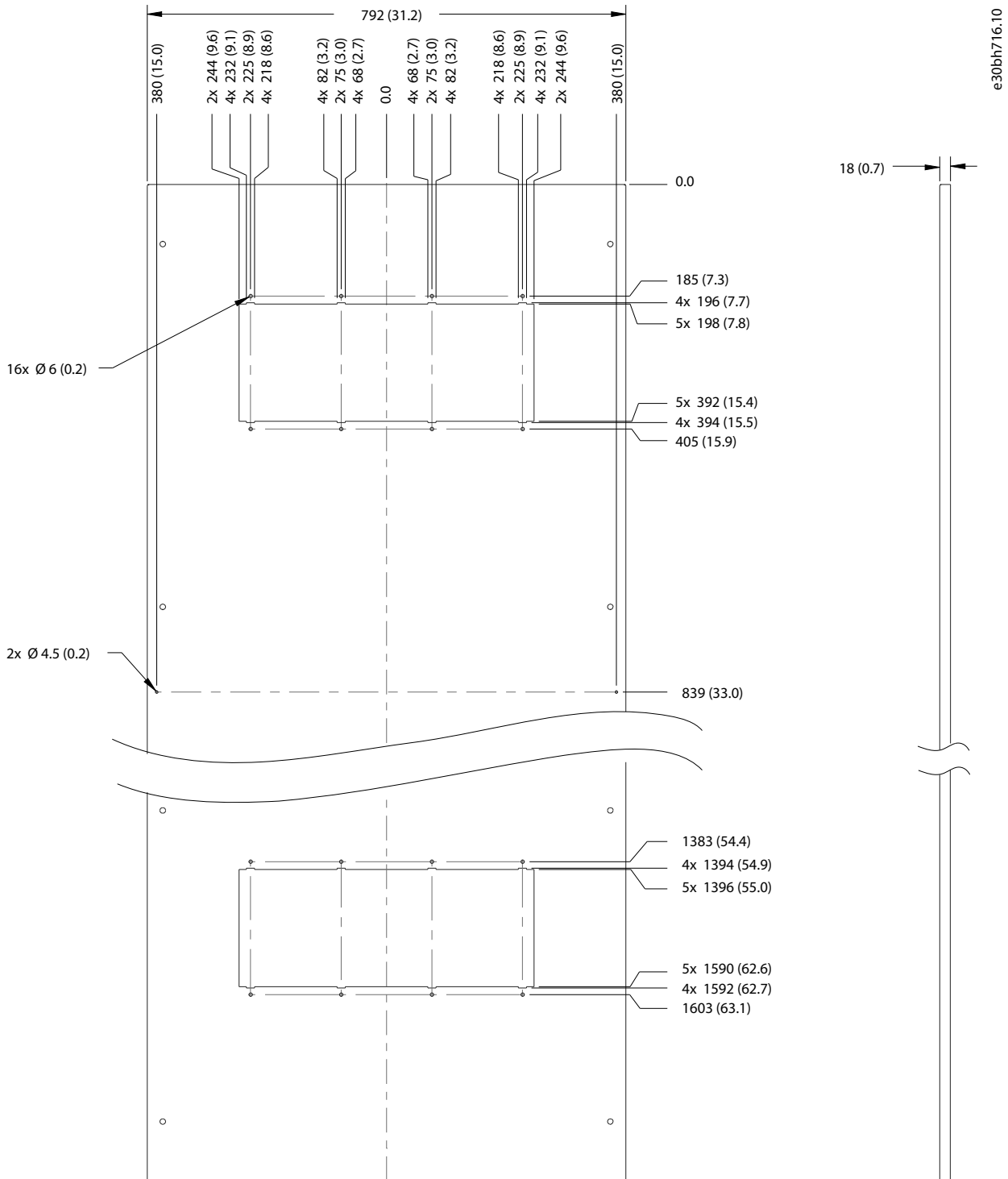


Illustration 4: Vent Dimensions for Backplate in 800 mm (36 in) Enclosure

2.4 Installing the Top Cover

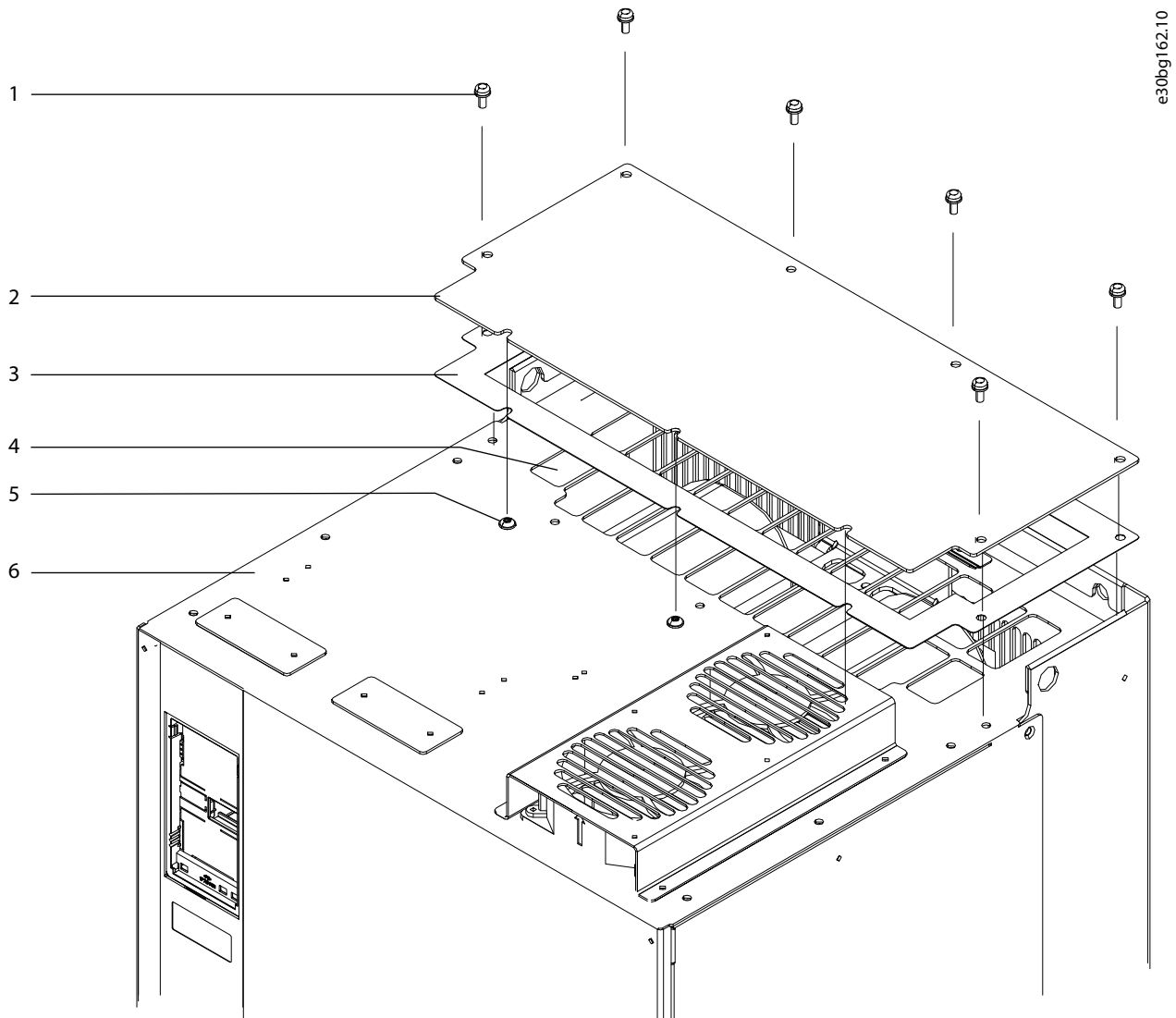
Context:

To install the top cover over the top vent in the drive, use the following procedure. See [illustration 5](#).

Procedure

1. Remove the paper backing from the top gasket, exposing the adhesive. Adhere the gasket to the top cover underside.
2. Remove 6–7 M5x14 screws (T25) surrounding the sides and back of the vent in the top of the drive. E3h drives have 6 screws; E4h drives have 7 screws. Retain the screws.
3. Loosen 3 M5x12 screws (T25) at the front of the vent in the top of the drive.
4. Slide the edge of the top cover under the 3 loosened screws, positioning the cover over the vent in the top of the drive.
5. Secure the top cover to the drive with 8 M5x14 screws (T25) previously removed. Torque fasteners to 2.3 Nm (20 in-lb).

Example:



1 M5x14 screw	2 Top cover
3 Top gasket	4 Top vent
5 M5x12 screws	6 Top of drive

Illustration 5: Installation of the Top Cover

2.5 Installing the Bottom Cover

Context:

NOTICE

DRAIN OPENING

The bottom cover features a drain opening in the middle of the plate.

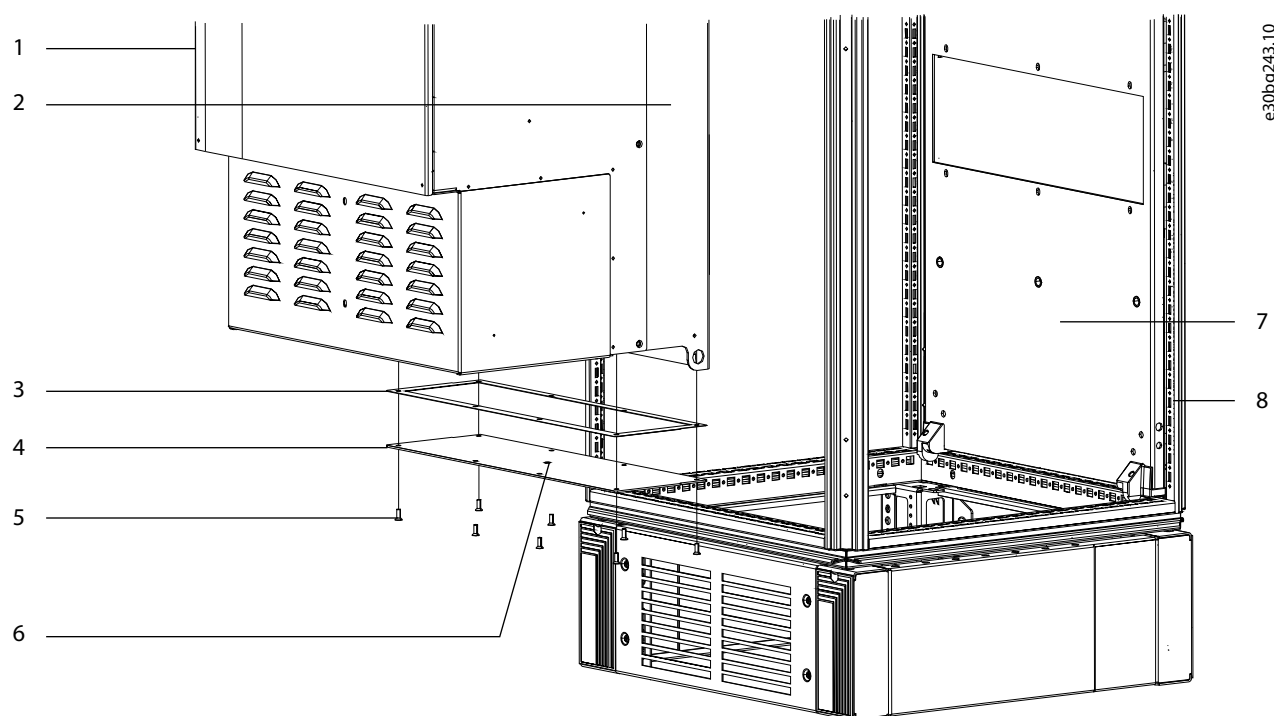
- To drain moisture in wet or humid environments, attach nylon tubing with interior diameter of 8 mm (0.3 in).
- To seal the drain in dry environments, fasten a screw in the drain hole.

To install the bottom cover at the lower end of the cooling back channel, use the following procedure. See [illustration 6](#).

Procedure

1. Remove paper backing from the bottom gasket. Adhere the bottom gasket to the upper side of the bottom cover.
2. Position the bottom cover and gasket over the opening at the lower end of the cooling channel.
3. Secure the bottom cover using the M5x14 screws (T25) provided with the kit. Installation in E3h drives requires 8 screws, and installation in E4h drives requires 10 screws. Torque screws to 2.3 Nm (20 in-lb).

Example:



1 Drive	2 Cooling backchannel
3 Bottom gasket	4 Bottom cover
5 M5x14 screws	6 Drain hole

7 Mounting plate	8 Enclosure rails
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Illustration 6: Installation of the Bottom Cover

2.6 Mounting the Drive in the Enclosure

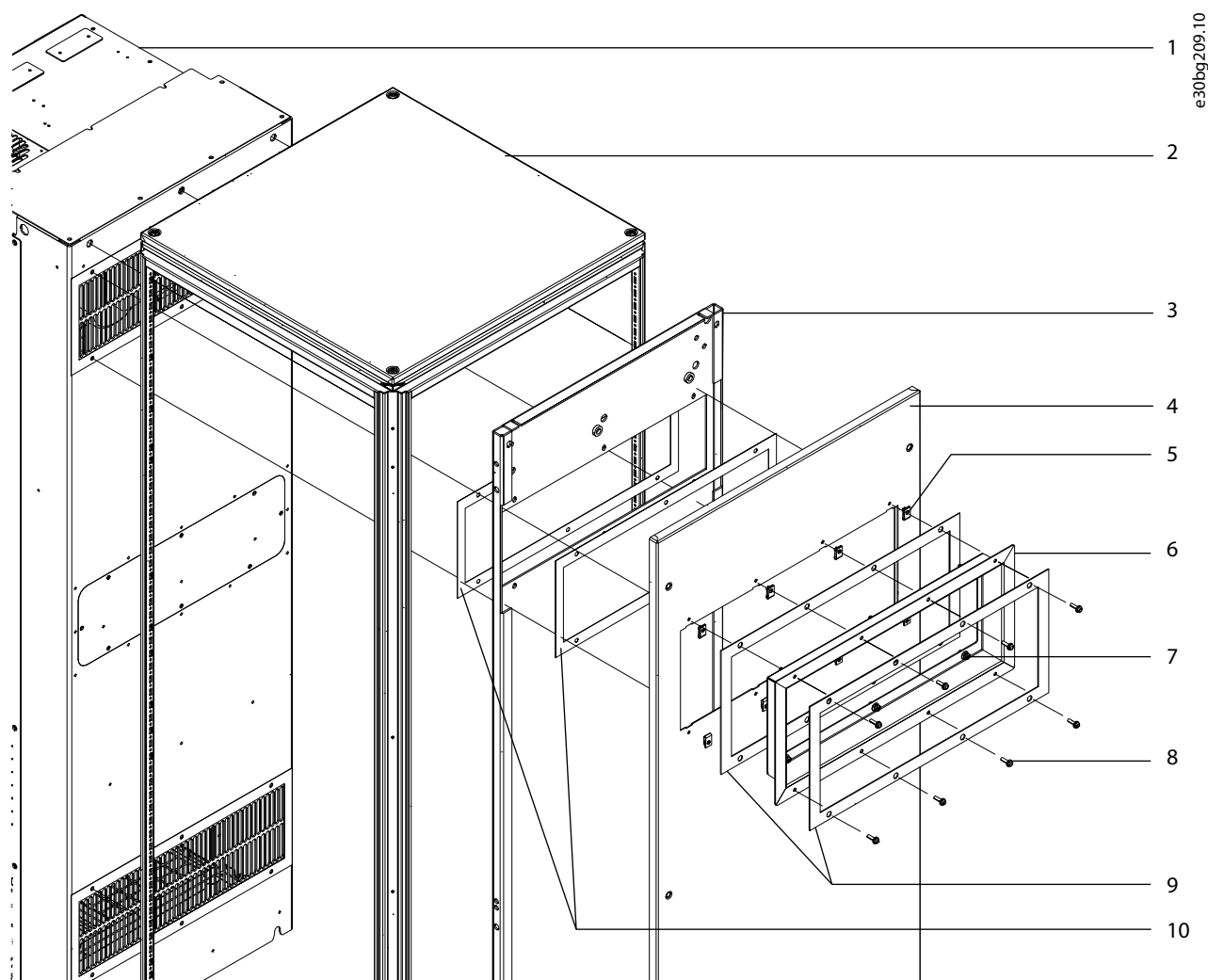
Context:

To install the mounting plate and drive in the enclosure, use the following steps. Refer to [illustration 7](#).

Procedure

1. Remove the paper backing from both 6-hole gaskets, exposing the adhesive. Adhere 1 gasket around the vent opening on each side of the mounting plate.
2. Position the mounting plate in the Rittal enclosure, aligning the top mounting plate hole with the 5th hole from the top of the enclosure rails. Make sure that the pem nuts face the back of the enclosure.
3. Fasten the mounting plate to the enclosure rails with 14 M5x10 thread-forming screws.
4. Loosely fasten 3 M10 screws (not supplied in kit) into the pem nuts at the lower end of the mounting plate. Make sure that the screws are secure since the base of the drive rests on these screws.
5. Slightly lean the top of the drive forward and set the cutouts in the base onto the 3 screws in the mounting plate.
6. Slowly push the top of the drive back against the mounting plate until the top 3 pem nuts line up with the holes in the drive. Secure the top of the drive using 3 M10 screws.
7. Torque all 6 M10 screws to 19 Nm (170 in-lb).

Example:



1 Drive	2 Rittal enclosure
3 Mounting plate	4 Backplate
5 M5 clip-on nut	6 Back duct
7 M6x12 screw	8 M5x18 screw
9 8-hole gaskets	10 6-hole gaskets

Illustration 7: Installation of the Drive, Mounting Plate, Backplate, and Back Duct

2.7 Installing the Backplate and Back Ducts

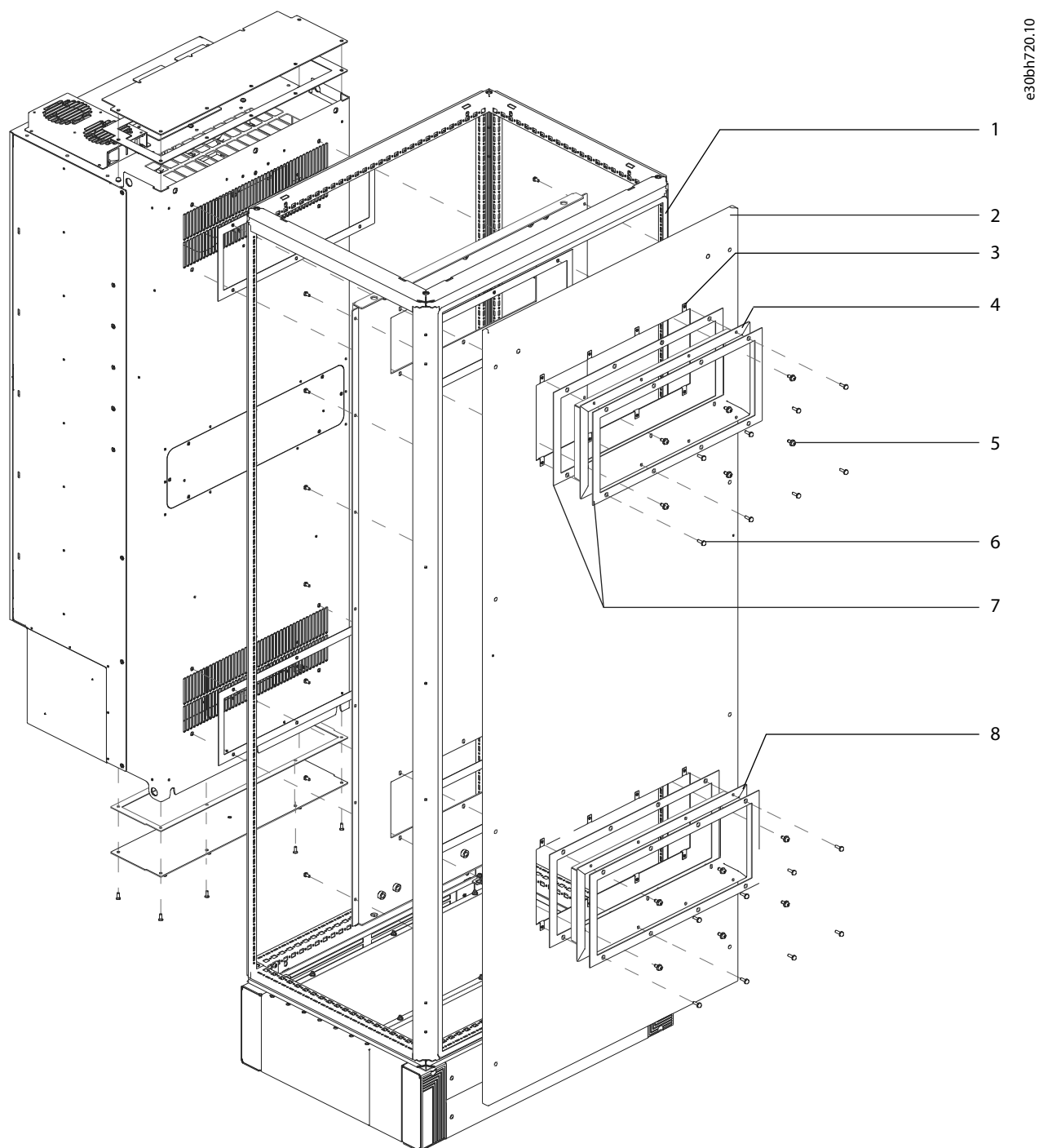
Context:

To attach the enclosure backplate and the upper and lower back ducts, use the following steps. Refer to [illustration 8](#).

Procedure

1. Position the backplate on the rear rails of the enclosure behind the mounting plate.
2. Secure the backplate to the rails using the existing fasteners.
3. Slide 8 M5 clip-on nuts over the screw holes surrounding the upper duct opening in the backplate. Repeat for the lower duct opening.
4. Remove the paper backing from 1 pair of 8-hole gaskets, exposing the adhesive. Adhere 1 gasket to the back and 1 to the front of the upper back duct outer flange. Repeat for the lower duct.
5. Position each back duct in the hole created for it in the mounting plate and backplate.
6. Fasten the inner flanges of the back ducts with 12 M6x12 screws (T30), 6 screws in each duct. Torque to 3.9 Nm (35 in-lb).
7. Fasten the outer flanges of the back ducts with 16 M5x18 screws (T25), 8 screws in each duct. Torque fasteners to 2.3 Nm (20 in-lb).

Example:



1	Enclosure rails	2	Backplate
3	M5 clip-on nut	4	Upper back duct
5	M6x12 screws	6	M5x18 screws
		8	M5x18 screws

7 8-hole gaskets	8 Lower back duct
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Illustration 8: Backplate and Back Duct Installation

2.8 Installing the Duct Covers on the Enclosure

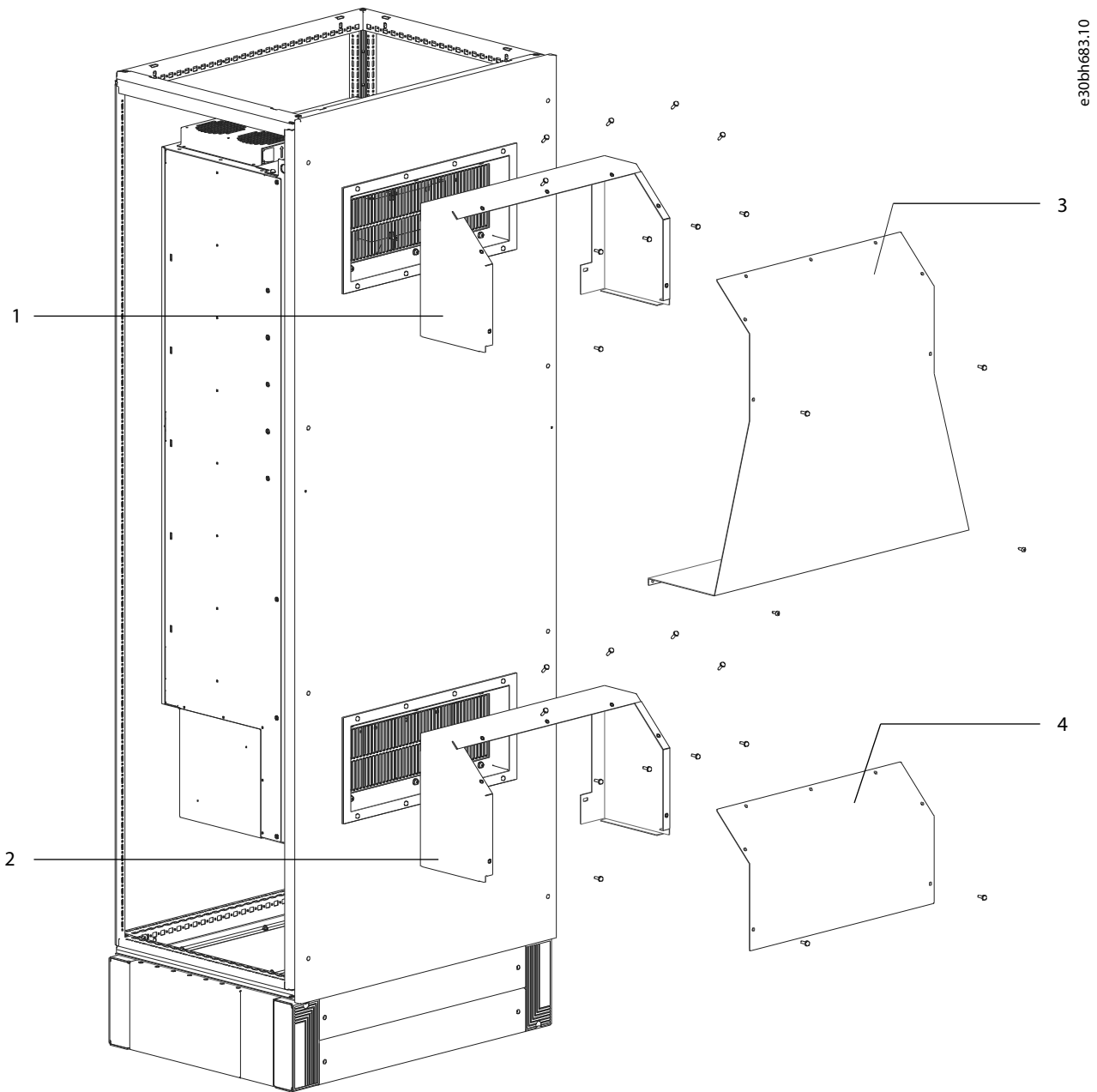
Context:

To attach the NEMA-3R duct covers to the upper and lower back ducts, use the following steps. Refer to [illustration 9](#).

Procedure

1. Secure the upper duct cover to the enclosure with 6 M5x18 screws. Torque to 2.3 Nm [20 in-lb].
2. Fasten the exhaust cover plate to the exhaust duct cover using 7 M5x18 screws. Torque to 2.3 Nm [20 in-lb].
3. Fasten the exhaust cover plate to the Rittal backplate using 2 M5x10 thread-forming screws. Torque to 2.3 Nm [20 in-lb].
4. Secure the lower duct cover to the back of the enclosure with 6 M5x18 screws. Torque to 2.3 Nm [20 in-lb].
5. Fasten the intake cover plate to the intake duct cover using 7 M5x18 screws. Torque to 2.3 Nm [20 in-lb].

Example:



1 Upper duct cover	2 Lower duct cover
3 Exhaust cover plate	4 Intake cover plate

Illustration 9: NEMA-3R Duct Cover Installation

2.9 Field Installation Guidelines

NOTICE

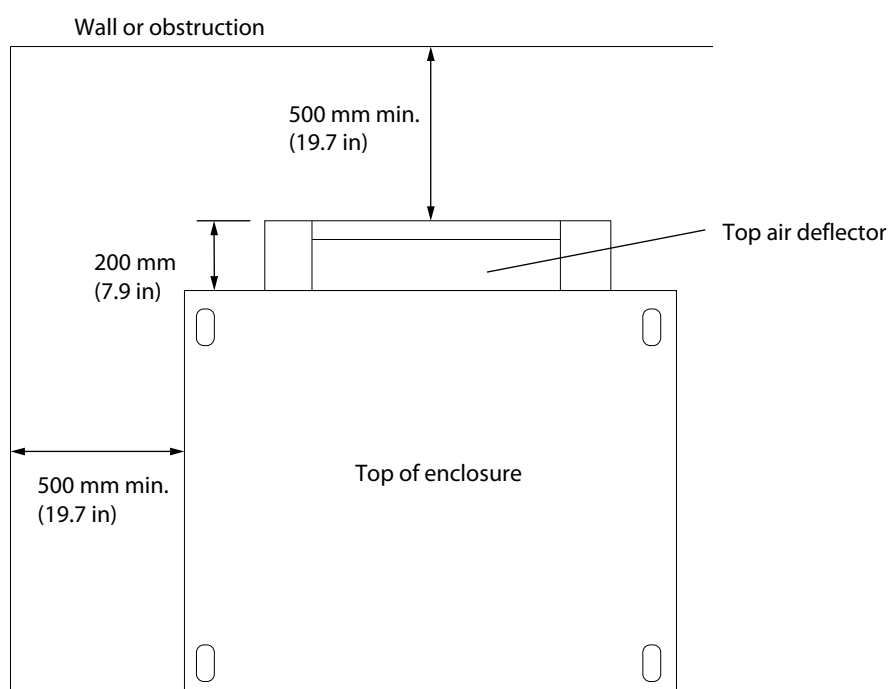
DRIVE CLEARANCE

Adequate drive clearance is required. Without this clearance, recirculated exhaust air can negatively impact drive performance.

- Use the following installation guidelines for appropriate clearance.

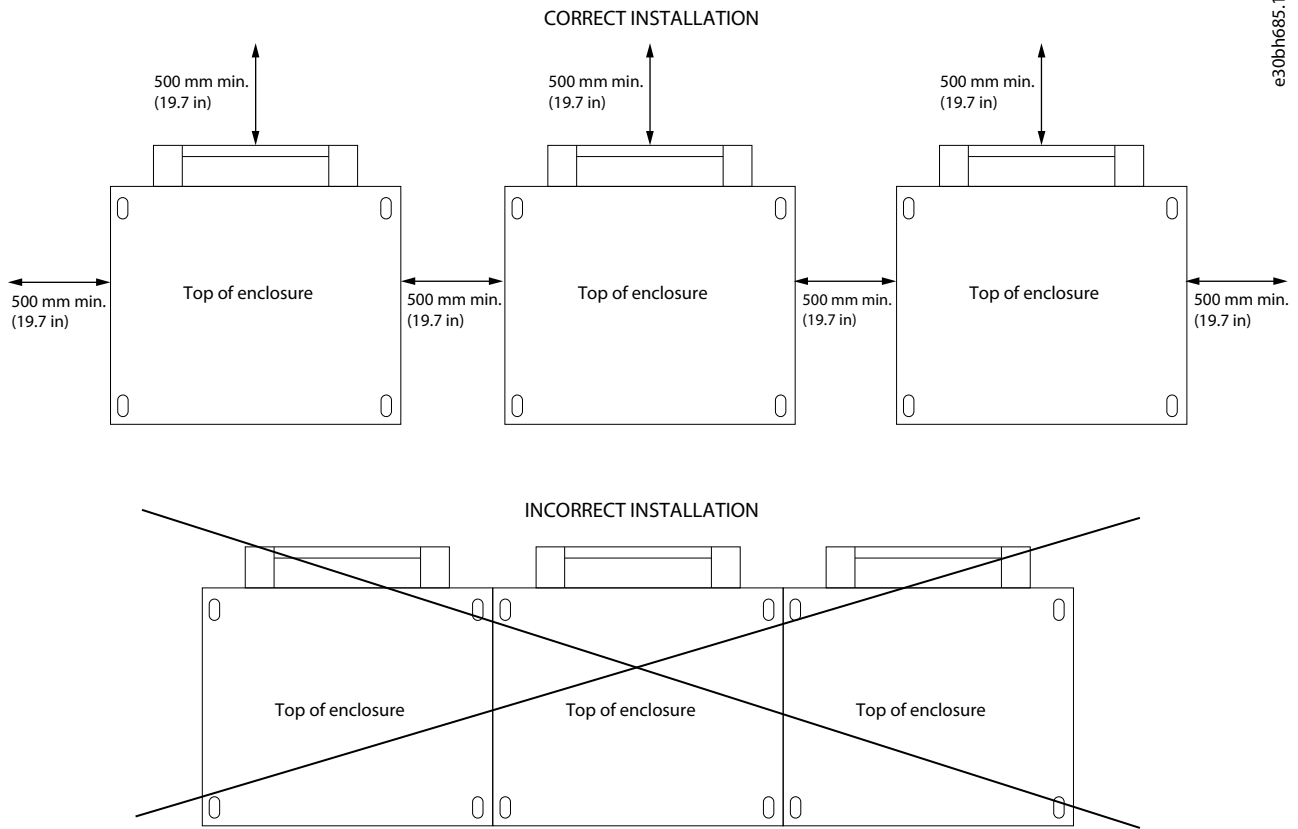
- Do not install the drive with more than 2 walls or obstructions near the drive. A surface at the back of the drive and 1 surface at either side is allowed. See [illustration 10](#). The minimum distance to walls or obstructions is 500 mm (20 in).
- Avoid side-by-side installation of drive enclosures with NEMA-3R kits. Maintain 500 mm (20 in) between drives. Refer to [illustration 10](#).

Example:



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Illustration 10: Installation of Single Drive with NEMA-3R Kit



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Illustration 11: Installation of Multiple Drives with NEMA-3R Kit

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