

# Installation Instructions

## Back-channel Cooling (In-back/Out-back) for Rittal Enclosure D3h-D4h (FC Series FC 102, FC 202, and FC 302)

### 1.1 Description

The back-channel cooling (in-back/out-back) kit is designed for the VLT® HVAC Drive FC 102, VLT® AQUA Drive FC 202, and VLT® AutomationDrive FC 302 D3h or D4h-size frequency converter mounted in a Rittal TS8 enclosure. Instead of airflow entering the bottom of the unit and exiting the top, the kit directs air in from and out of the back of the unit. See *Illustration 1.1*.

The kit contains the following parts:

#### Base duct assembly

- Duct enclosure (1)
- Gasket, left side enclosure (1)
- Gasket, right side enclosure (1)
- Gasket, top of enclosure (1)
- Gasket, back of enclosure (1)
- Gasket, base of enclosure (1)
- Grill (1)
- Gasket, grill (1)
- Cover, base of duct enclosure (1)
- Cover, back of duct enclosure (1)
- Nuts, M5 (21)
- Gasket, slot (1)
- Gasket, base cover (1)
- Cover, base of frequency converter (1)
- Screws, M5x12 (21) D3h or (24) D4h

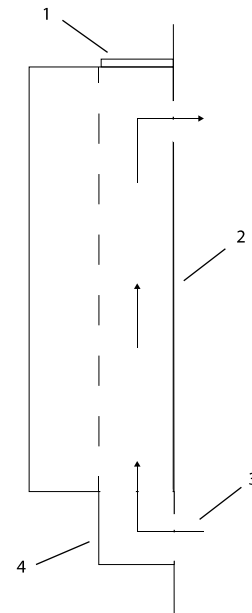
#### Top plate assembly

- Top cover (1)
- Gasket, top cover (1)
- Gasket, cut out (1)
- Screws, M5x12 (11)

#### Enclosure mounting assembly

- Base mounting plate, 38 mm [1.5 in.] (2)
- Gasket, base mounting plate (2)
- Gasket, frequency converter exhaust vent (1)
- Screws, M5x12 (11)
- Nuts, M10 (4)

- Adapter plate (1)
- Gasket, enclosure exhaust vent (1)
- Gasket, enclosure intake vent (1)
- Torx screws, M5x12 (12) D3h or (14) D4h



130BX518.10

1	Top plate assembly
2	Back panel of Rittal enclosure
3	Back-channel airflow
4	Base duct assembly

Illustration 1.1 Direction of Airflow with the Kit Installed

### 1.2 Kit Part Numbers

Part number	Kit description
176F3625	D3h, fabricated steel for a Rittal enclosure
176F3654	D3h, stainless steel for a Rittal enclosure
176F3626	D4h, fabricated steel for a Rittal enclosure
176F3655	D4h, stainless steel for a Rittal enclosure

Table 1.1 Part Numbers for all the D3h/D4h In-back/Out-back Kits

### 1.3 Preparing for Installation

#### **⚠ WARNING**

##### DISCHARGE TIME

The frequency converter contains DC-link capacitors, which can remain charged even when the frequency converter is not powered. Failure to wait the specified time after power has been removed before performing service or repair work, could result in death or serious injury.

1. Stop the motor.
2. Disconnect AC mains, permanent magnet type motors, and remote DC-link power supplies, including battery back-ups, UPS, and DC-link connections to other frequency converters.
3. Wait for the capacitors to discharge fully, before performing any service or repair work. The duration of waiting time is specified in *Table 1.2*.
4. Remove frequency converter from the wall or panel.

Voltage [V]	Power range [kW]	Minimum waiting time (min)
3x400	90-250	20
3x400	110-315	20
3x500	110-315	20
3x500	132-355	20
3x525	75-250	20
3x525	90-315	20
3x690	90-250	20
3x690	110-315	20

Table 1.2 Discharge Time

### 1.4 Installation

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.

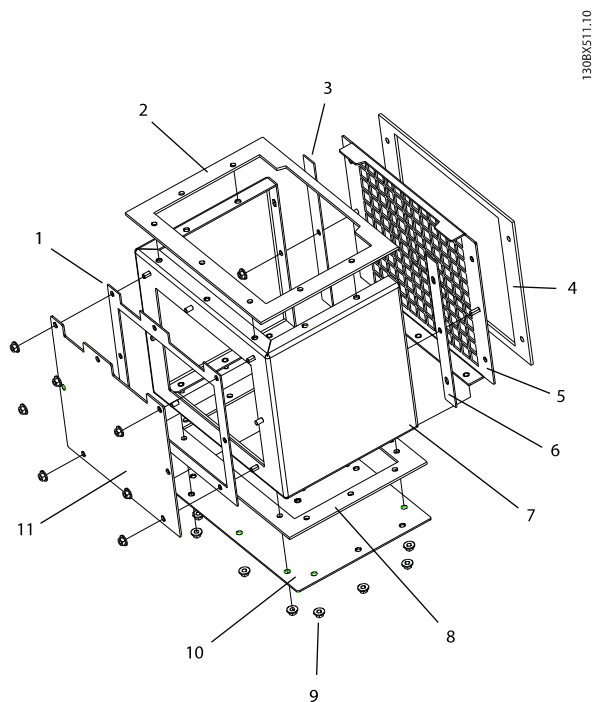
#### 1.4.1 Assembling the Duct Enclosure

1. Place the left and right side gaskets (3, 6) against the side of the duct enclosure (7), making sure the holes in the enclosure and gaskets line up. Refer to *Illustration 1.2*.
2. Place the grill (5) on top of the gaskets, with the threaded studs in the grill going through the middle holes in the gasket and into the enclosure. Secure the grill to the enclosure using one nut on each stud. Torque to 2.3 N-m [20 in-lb].
3. Place the gasket (4) on top of the grill.

4. Place the gasket (8) and then the cover (10) on the enclosure base. Secure with 12 (D3h) or 14 (D4h) M5 nuts and torque to 2.3 N-m [20 in-lb].
5. Place the gasket (1) on the back side of the enclosure, making sure the holes in the enclosure and gasket line up.
6. Place the gasket (2) on top of the duct enclosure.

#### **NOTICE**

The back cover (11) is left off until the duct assembly is attached to the frequency converter. The opening is needed to secure the duct assembly to the frequency converter.



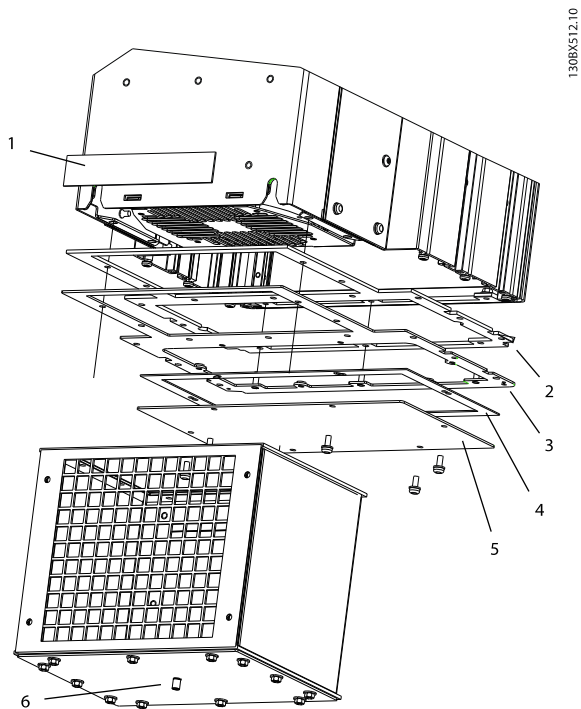
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1	Gasket, back of enclosure
2	Gasket, top of enclosure
3	Gasket, left side of enclosure
4	Gasket, grill
5	Grill
6	Gasket, right side of enclosure
7	Duct enclosure
8	Gasket, base of enclosure
9	M5 nuts
10	Cover, base of duct enclosure
11	Cover, back of duct enclosure

Illustration 1.2 Assembling the Bottom Duct

### 1.4.2 Installing the Duct Assembly

1. Place the gasket (1) over the 2 slots at the bottom back of the frequency converter. Refer to *Illustration 1.3*.
2. Remove the gland plate (5) from frequency converter base by removing 6 M5x12 screws.
3. Remove base cover and gasket from frequency converter by removing 6 M4.8x19 screws and 3 M5x12 screws. Retain the screws, but discard old base cover and gasket.
4. Place the gasket (2) onto the new base cover (3). Then place the new base cover onto the base of the frequency converter. Secure the new base cover using the screws from old base cover. Torque to 2.3 N-m [20 in-lb].
5. Reinstall the gland plate (5) to the base cover using 6 M5x12 screws. Torque to 2.3 N-m [20 in-lb].
6. Set aside the duct assembly. It is attached to the unit after the frequency converter is mounted to the enclosure.

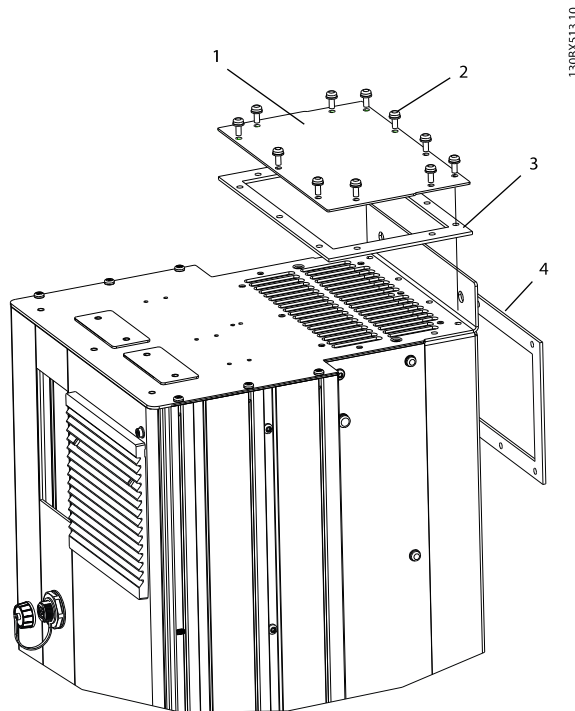


1	Gasket, slot
2	Gasket, base cover of frequency converter
3	Cover, base of frequency converter
4	Gasket, gland plate
5	Gland plate
6	Drain hose fitting

Illustration 1.3 Installing Duct Assembly, Back View of Duct Shown

### 1.4.3 Installing the Top Plate Assembly

1. Place the gasket (3) over the grill opening on the top of the unit. Refer to *Illustration 1.4*.
2. Place the top cover (1) over the gasket and secure it using the 11 screws included in the kit. Torque to 2.3 N-m [20 in-lb].



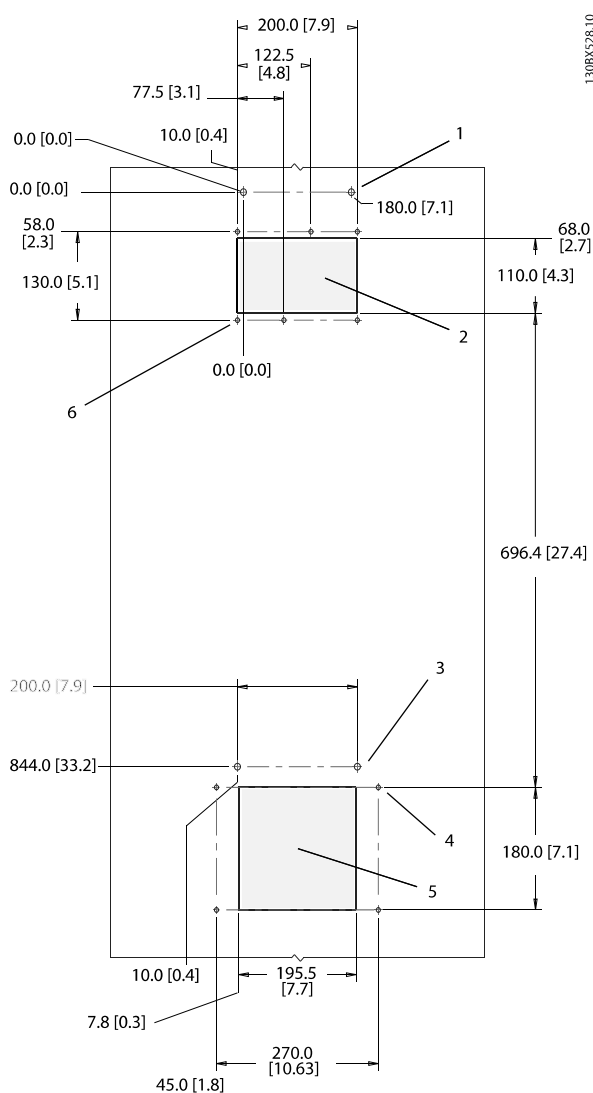
1	Top cover
2	M5x12 screws
3	Gasket, top cover
4	Gasket, cut out

Illustration 1.4 Installing the Top Plate Assembly

### 1.4.4 Creating Vent Openings

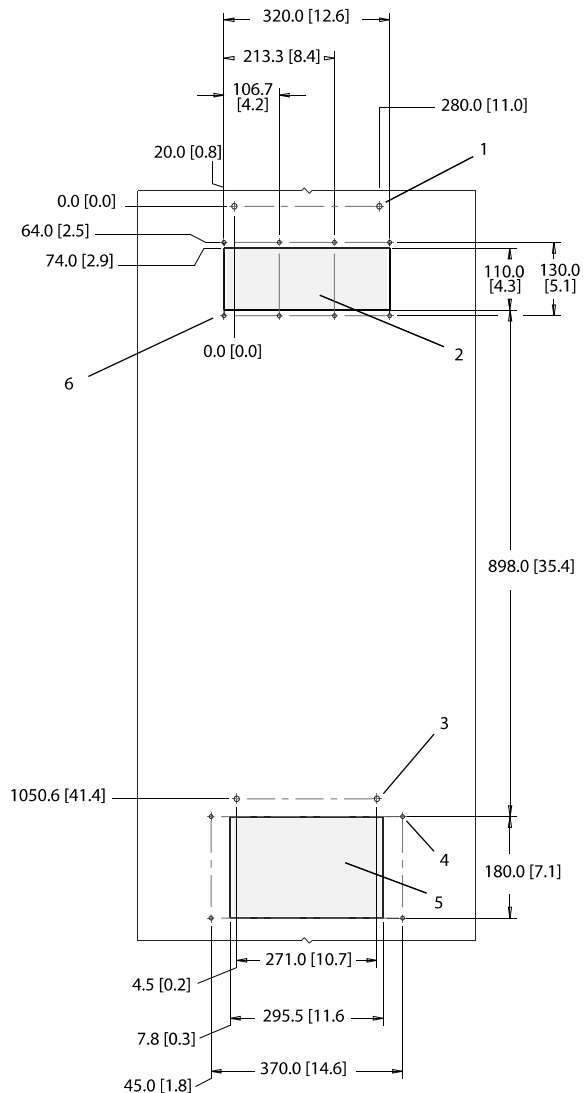
Before attaching the adapter plate, several modifications need to be made in the back of the Rittal enclosure.

1. Determine the exact location of the vent openings and screw holes that need to be added to the back of the Rittal enclosure. Refer to the dimensions provided in *Illustration 1.5 - Illustration 1.6*. Another method is to loosely fasten the adapter plate to the inside of the enclosure and use it as a template for the vent openings and screw holes.
2. Cut out the intake and exhaust openings in the back of the Rittal enclosure. The openings must match to the intake and exhaust vent openings of the frequency converter.
3. Drill the 6 (D3h) or 8 (D4h) screw holes around the exhaust vent opening in the back of the Rittal enclosure.
4. Drill the 4 screw holes around the intake vent opening in the back of the Rittal enclosure.



1	Mounting stud, upper	4	M5 screw holes (4)
2	Rear exhaust vent	5	Rear intake vent
3	Mounting stud, lower	6	M5 screw holes (6)

Illustration 1.5 Vent Dimensions, D3h



1	Mounting stud, upper	4	M5 screw holes (4)
2	Rear exhaust vent	5	Rear intake vent
3	Mounting stud, lower	6	M5 screw holes (8)

Illustration 1.6 Vent Dimensions, D4h

### 1.4.5 Installing the Adapter Plate in the Enclosure

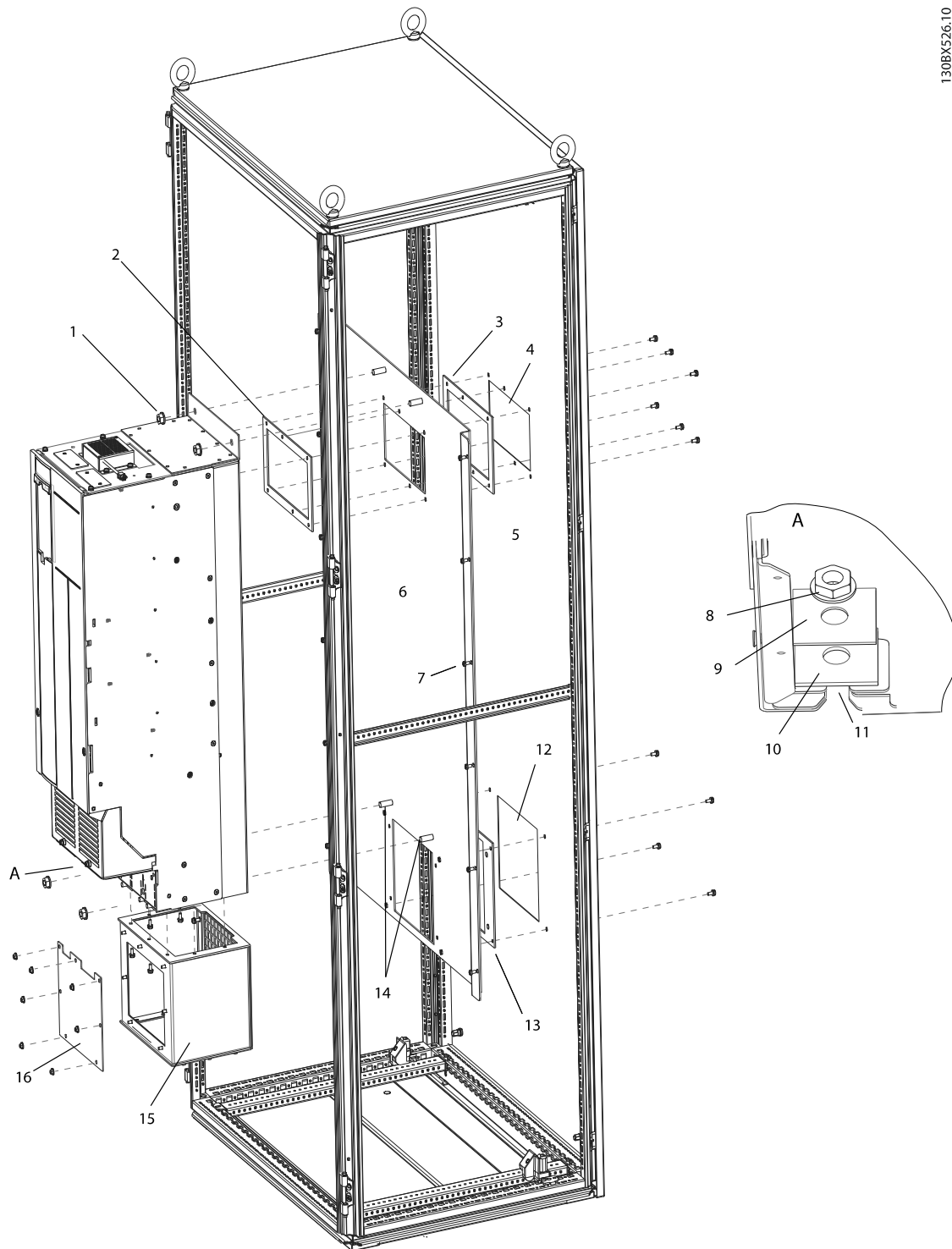
Refer to *Illustration 1.7* for the following steps.

1. Place gasket (3) and gasket (13) around the vent openings inside the Rittal enclosure. Make sure the screw holes in the enclosure and the gaskets line up.
2. From inside the enclosure, position the adapter plate (6) against the back of the enclosure, making sure that the vent openings and screw holes line up. Fasten the plate to the side frame rails of the enclosure using 12 (D3h) or 14 (D4h) M5x12 Torx screws (7). Torque to 2.3 N-m [20 in-lb].
3. Place gasket (2) around the top vent opening on the adapter plate, making sure that the adapter plate and gasket screw holes line up.

### 1.4.6 Mounting the Frequency Converter to the Adapter Plate

Refer to *Illustration 1.7* for the following steps.

1. Assemble the 2 base mounting plates by attaching the 38 mm [1.5 in] gasket (10) onto the 38 mm [1.5 in] base mounting plate (9). Put aside for later use.
2. Slightly lean the top of the frequency converter forward and set the cut-outs in the base of the frequency converter (11) onto the lower 2 threaded studs (14) on the adapter plate.
3. Slowly push the top of the frequency converter back against the adapter plate until the top 2 threaded studs 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 nuts. Torque to 19 N-m [170 in-lb].
4. Secure the frequency converter base by placing 1 base mounting plate (gasket side first) onto each of the lower threaded studs, followed by an M10 nut. Torque to 19 N-m [170 in-lb].
5. Attach the top of the duct assembly to the base of the frequency converter. Make sure the gasket on top of the duct assembly is in place. Using the opening in the duct assembly, secure the duct assembly to the frequency converter using 4 M4.8x19 screws. Torque to 2.3 N-m [20 in-lb].
6. Using the opening in the duct assembly, secure the duct assembly to the adapter plate using 4 M5x12 screws. Torque to 2.3 N-m [20 in-lb].
7. Attach the back cover (16) to the duct assembly and secure with 7 (D3h) or 8 (D4h) M5 nuts. Torque to 2.3 N-m [20 in-lb].
8. At the back exterior of the Rittal enclosure, secure the vent gaskets by using 6 (D3h) or 8 (D4h) M5x12 screws for the exhaust vent and 4 M5x12 screws for the intake vent. Torque to 2.3 N-m [20 in-lb].
9. Reconnect the wiring. For additional set-up information, refer to the Operating Instructions.



1	M10 nut	9	Base mounting plate, 38 mm [1.5 in]
2	Gasket, frequency converter exhaust vent	10	Gasket, base mounting plate, 38 mm [1.5 in]
3	Gasket, enclosure exhaust vent	11	Cut-out in frequency converter base that rests on threaded stud
4	Exhaust vent opening in enclosure	12	Intake vent opening in enclosure
5	Rittal enclosure back panel	13	Gasket, enclosure intake vent
6	Adapter plate	14	Threaded studs, adapter plate
7	Torx screws, M5x12	15	Duct assembly
8	M10 nut	16	Cover, back of duct enclosure

Illustration 1.7 Exploded View of Mounting Components



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