



Danfoss D1h-D8h VLT Frequency Converters Installation Guide

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Danfoss D1h-D8h VLT Frequency Converters



Product Information

The product being referred to in the user manual is a drive manufactured by Danfoss. The drive is used for various applications and requires installation, commissioning, and maintenance by qualified personnel. The user manual provides important safety information and precautions that should be followed to prevent injury, damage to the equipment, or system failure.

Instructions

Safety and Installation Awareness

Before starting installation, read all safety guidelines and precautions in this installation guide. Additional documentation such as the product-specific operating guide, design guide, and programming guide, as well as the functional safety guides can be accessed by scanning the QR code on the front cover. PC tools and MyDrive® ecoSmart™ can be downloaded at www.danfoss.com.

Qualified Personnel

Only qualified personnel are allowed to install, commission, and maintain drives. Qualified personnel are trained individuals who are familiar with and authorized to mount and wire the drive in accordance with pertinent laws and regulations. Also, qualified personnel must be familiar with the instructions and safety measures described in this installation guide.

Safety Symbols

The following symbols are used in this guide:

- **DANGER:** Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
- **WARNING:** Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION:** Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
- **NOTICE:** Indicates information considered important, but not hazard-related (for example, messages relating to property damage).

Safety Precautions

WARNING: LACK OF SAFETY AWARENESS

- This guide gives important information on preventing injury and damage to the equipment or the system. Ignoring this information can lead to death, serious injury, or severe damage to the equipment.
- Make sure to fully understand the dangers and safety measures present in the application.
- Before performing any electrical work on the drive, lock out and tag out all power sources to the drive.

WARNING: LIFTING HEAVY LOAD

- The drive is heavy. Lifting heavy objects incorrectly can result in death, injury, or property damage.
- Follow local safety regulations on lifting.
- Check the weight of the drive. The weight is provided on the outside of the shipping box.
- If lifting equipment is used, ensure that it is in proper working condition and can safely lift the weight of the drive.
- Test lift the drive to verify the proper center of gravity lift point. Reposition if not level.

WARNING: HAZARDOUS VOLTAGE

- AC drives contain hazardous voltage when connected to the AC mains or connected on the DC terminals. Failure to perform installation, start-up, and maintenance by qualified personnel can result in death or serious injury.
- Only qualified personnel must perform installation, start-up, and maintenance.

WARNING: DISCHARGE TIME

- 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 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 all power sources, including permanent magnet type motors.
- Wait for capacitors to discharge fully. The discharge time is shown on the nameplate. See Illustration 1.
- Verify full discharge by measuring the voltage level.

WARNING: UNINTENDED START

- When the drive is connected to the AC mains or connected on the DC terminals, the motor may start at any time, causing risk of death, serious injury, and equipment or property damage.
- Stop the drive and motor before configuring parameters.
- Make sure that the drive cannot be started by external switch, a fieldbus command, an input reference signal from the control panel, or after a cleared fault condition.
- Disconnect the drive from the mains whenever safety considerations make it necessary to avoid unintended motor start.
- Check that the drive, motor, and any driven equipment are in operational readiness.

CAUTION: INTERNAL FAILURE HAZARD

- An internal failure in the drive can result in serious injury when the drive is not properly closed.
- Ensure that all safety covers are in place and securely fastened before applying power.

WARNING: ELECTRICAL SHOCK AND FIRE HAZARD

- The drive can cause a DC current in the ground conductor. Failure to use a Type B residual current-operated protective device (RCD) can lead to the RCD not providing the intended protection which can result in death, fire, or other serious hazard.
- Use an RCD device.
- When an RCD is used for protection against electrical shock or fire, use only a Type B device on the supply side.

WARNING: INDUCED VOLTAGE

- Induced voltage from output motor cables that run together can charge equipment capacitors, even with the equipment turned off and locked out/tagged out. Failure to run output motor cables separately, or to use shielded cables, could result in death or serious injury.
- Run output motor cables separately or use shielded cables.
- Simultaneously lock out/tag out all the drives.

WARNING: ELECTRICAL SHOCK HAZARD

- Due to the stray capacitance of the shielded motor cable, the leakage currents exceed 3.5 mA. Failure to properly ground the drive can result in death or serious injury.
- Ensure that minimum size of the ground conductor complies with the local safety regulations for high touch current equipment.
- Use a reinforced ground conductor according to IEC 60364-5-54 cl. 543.7 or local safety regulations for equipment with leakage current >3.5 mA.

For reinforced grounding

Use a ground conductor with a cross-section of at least 10 mm² (8 AWG) Cu or 16 mm² (6 AWG) Al, or an extra ground conductor of the same cross-sectional area as the original ground conductor as specified by IEC 60364-5-54, with a minimum cross-sectional area of 2.5 mm² (14 AWG) mechanically protected or 4 mm² (12 AWG) not

mechanically protected. Use a ground conductor inside an enclosure or otherwise protected throughout its length against mechanical damage. Use a ground conductor that is part of a multi-conductor power cable with a minimum PE conductor cross-section of 2.5 mm² (14 AWG) that is permanently connected or plugged in by an industrial connector. The multi-conductor power cable must be installed with an appropriate strain relief.

CAUTION: THERMISTOR INSULATION

- Risk of personal injury or equipment damage.
- To meet PELV insulation requirements, use only thermistors with reinforced or double insulation.

NOTICE: EXCESSIVE HEAT AND PROPERTY DAMAGE

- Overcurrent can generate excessive heat within the drive. Failure to provide overcurrent protection can result in risk of fire and property damage.
- Use additional protective devices such as short-circuit protection or motor thermal protection between the drive and the motor for applications with multiple motors.
- Input fusing is required to provide short circuit and overcurrent protection. If fuses are not factory-supplied, the installer must provide them.

NOTICE: PROPERTY DAMAGE

- Protection against motor overload is not active by default. The ETR function provides class 20 motor overload protection. Failure to set the ETR function means that motor overload protection is not provided and property damage can occur if the motor overheats.
- Enable the ETR function. See the application guide for more information.

Required Tools

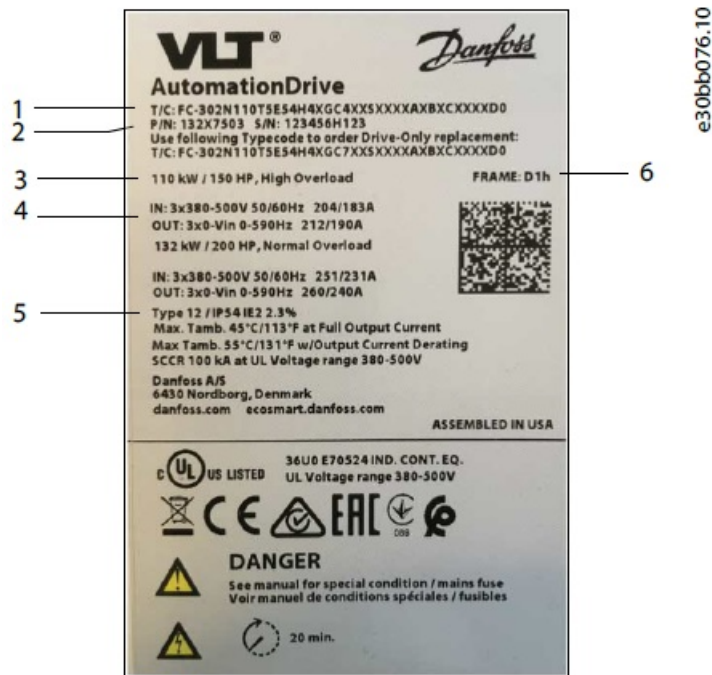
- Lifting aid
- Tape measure
- Drill with assorted bits
- Screwdrivers (Torx, Phillips, slotted)
- Wrench with 7–17 mm sockets
- Socket extensions
- Sheet metal punch and/or pliers
- Wire crimper

Verifying the Shipment and the Contents

- Make sure that the items supplied and the information on the nameplate match the order. The nameplate is on the exterior of the drive.

NOTICE

The type code is used in the fuse table. Write down the type code (T/C) and serial number (S/N) for future reference.



1. Type code
2. Part number and serial number
3. Power rating
4. Input/output voltage, frequency, and current
5. Enclosure protection rating
6. Enclosure size

EMC-compliant Installation

- For more information, refer to the product-specific operating guide.
- Use shielded cables for motor (unshielded cables in metal conduit are acceptable), brake, DC, and control wiring.
- Ensure that motor, brake, and DC cables are as short as possible to reduce the interference level from the entire system. Provide a minimum space of 200 mm (7.9 in) between mains input, motor cables, and control cables.
- Convey the currents back to the drive using a metal mounting plate. Ensure good electrical contact from the mounting plate through the mounting screws to the metal frame of the enclosure.
- If the shield connection points have a voltage potential difference, connect a low impedance equalizing wire parallel to the shielded cable.
- When using relays, control cables, a signal interface, fieldbus, or brake, connect the shield to the enclosure at both ends. If the ground path has high impedance, is noisy, or is carrying current, break the shield connection on 1 end to avoid ground current loops.

Installing the Drive

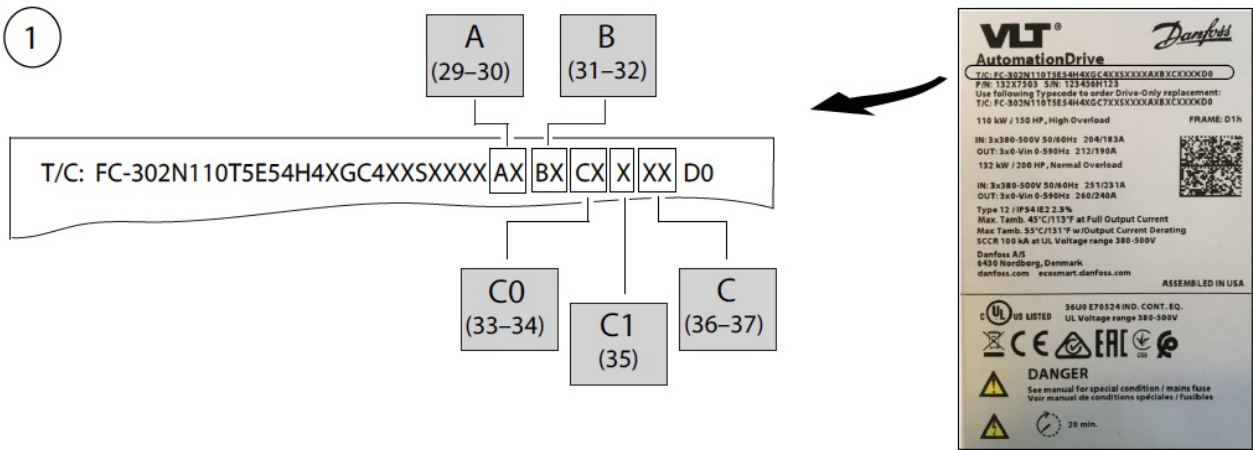
The installation location is important. Full output current is available when the following installation conditions are met. For temperatures and altitudes outside this range, consult the Derating sections in the product-specific design guide.

- Maximum surrounding air temperature: 45 °C (113 °F) average over 24 hours and 50 °C (122 °F) for 1 hour.
- Minimum surrounding air temperature: 0 °C (32 °F).
- Altitude < 1000 m (3280 ft) above sea level.

Procedure

1. Identify the enclosure size. See Illustration 1.
2. Identify any options that need extra wiring and setup by using the type code. See step 1 in the Illustrations section.
 - Scanning the QR code on the cover opens the documentation search page. Use the option number to search for related documentation. For example, use MCA 120 to search for VLT® PROFINET MCA 120 documentation.
3. Make sure that the operating environment and electrical installation meet the following standards.
 - Indoor unconditioned/pollution degree 2.
 - Overvoltage category 3.
4. Review the wiring diagram. See step 2 in the Illustrations section.
 - All wiring must comply with local and national regulations regarding cross-section and ambient temperature requirements.
 - Loose connections can cause equipment faults or reduced performance. Tighten the terminals according to the proper torque value shown in step 9 in the Illustrations section.
5. Review the fuse specifications. See step 3 in the Illustrations section.
 - The drive can be suitable for use on a circuit capable of delivering up to 100 kA short circuit current rating (SCCR) at 480/600 V. For circuit breaker and switch SCCR ratings, see the product-specific design guide.
6. Review the power cable specifications. See step 4 in the Illustrations section.
 - Use copper wire with a minimum 70 °C (158 °F) rating. For aluminum wire, see the product-specific design guide.
7. Install the drive following the numbered steps in the Illustrations section. Certain illustrations/steps pertain to specific enclosure sizes and are marked as such.
 - Attach accessory bag components to the drive (step 5).
 - Mount the drive on or against a solid, non-combustible mounting surface such as concrete or metal (step 6). Ensure proper cooling by providing minimum clearance above and below the drive.
 - D3h–D4h are wall mounted, D1h–D2h and D5h–D6h are wall or floor mounted, and D7h–D8h are floor mounted.
 - Create cable openings in the cable entry plate (step 7).
 - Install the control wiring (step 8).
 - Install the motor, mains, and ground wiring (step 9).
 - Route the control cables (step 10)
8. Securely fasten the cover to the drive.
9. Perform initial drive and motor setup. Consult the product-specific programming guide.
 - Functional safety options require extra wiring and parameter configuration. See the specific functional safety operating guide, such as the Safe Torque Off Operating Guide, for more information on installing the safety option.

Descriptions



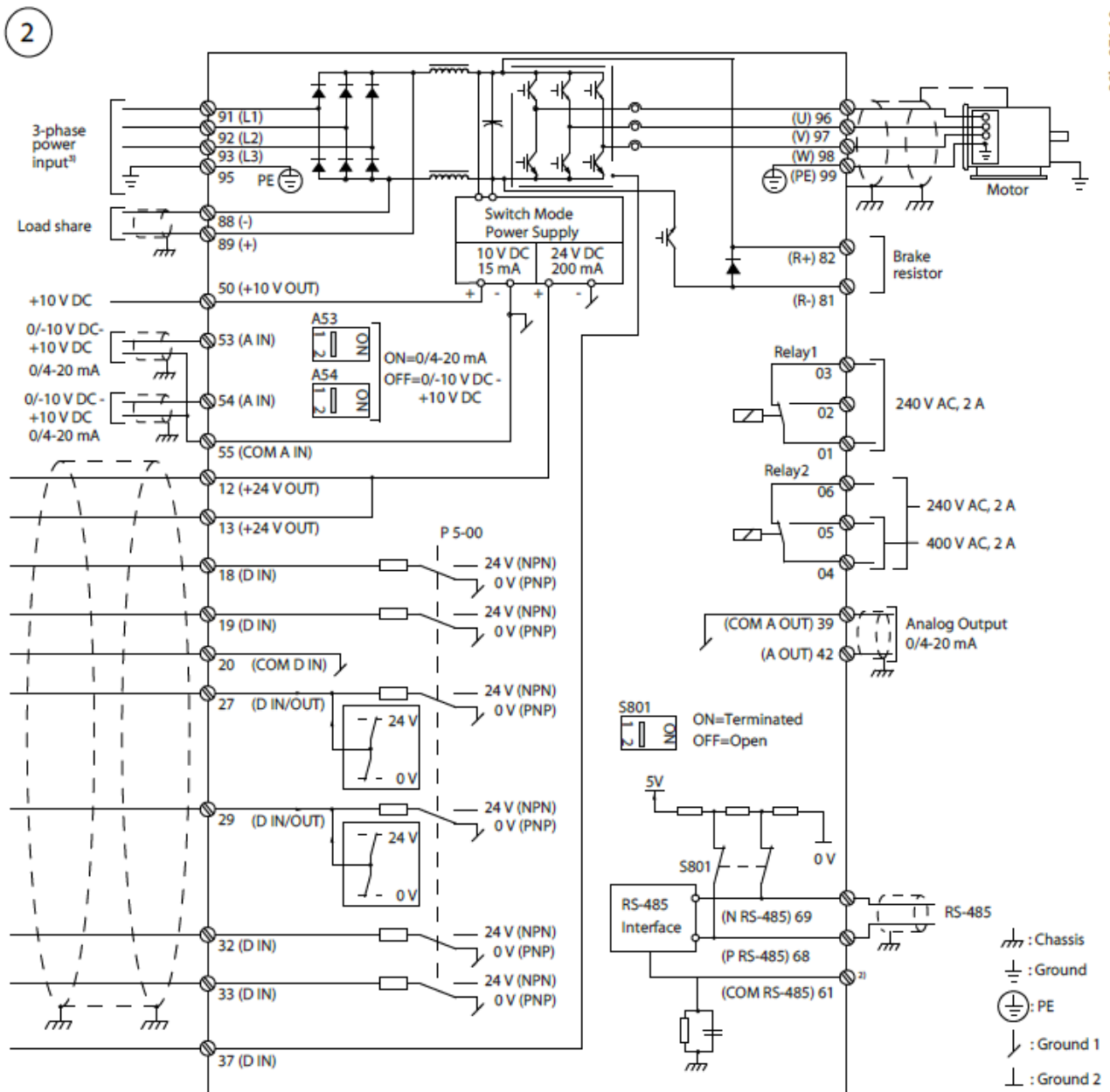
B (31–32)	
BX	–
B0	VLT® Analog I/O Option MCB 109
B2	VLT® PTC Thermistor Card MCB 112
B4	VLT® Sensor Input MCB 114
B6	VLT® Safety Option MCB 150
B7	VLT® Safety Option MCB 151
B8	VLT® Safety Option MCB 152
BK	VLT® General Purpose I/O MCB 101
BP	VLT® Relay Card MCB 105
BR	VLT® Encoder Input MCB 102
BU	VLT® Resolver Input MCB 103
BY	VLT® Extended Cascade Controller MCO 101
BZ	VLT® Safe PLC I/O MCB 108

C1 (35)	
X	–
R	VLT® Extended Relay Card MCB 113
7	VLT® Sensorless Safety MCB 159

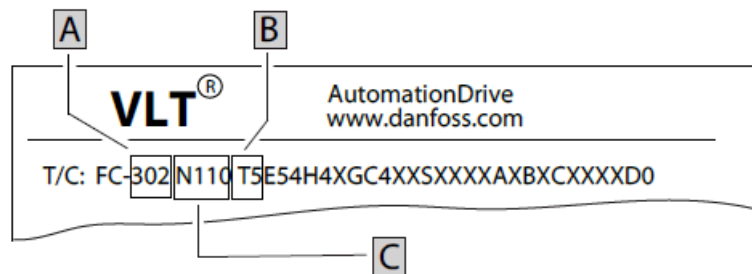
C0 (33–34) + C (36–37)

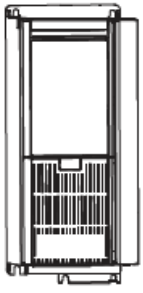
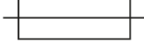
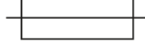
CX_XX	–
C4_XX	VLT® Motion Control Option MCO 305
C4_10	VLT® Synchronizing Controller MCO 350
C4_11	VLT® Position Controller MCO 351

Wiring Diagram

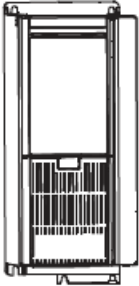




Wiring



A	B	C		
			IEC	UL
			 Bussmann P/N	 Bussmann P/N
102/103/202	T2	N55K	170M2620	170M2620
102/103/202	T2	N75K	170M2621	170M2621
102/103/202	T2	N90K	170M4015	170M4015
102/103/202	T2	N110	170M4015	170M4015
102/103/202	T2	N150	170M4016	170M4016
102/103/202	T2	N160	170M4018	170M4018
102/103/202	T4	N110	170M2619	170M2619
102/103/202	T4	N132	170M2620	170M2620
102/103/202	T4	N160	170M2621	170M2621
102/103/202	T4	N200	170M4015	170M4015
102/103/202	T4	N250	170M4016	170M4016
102/103/202	T4	N315	170M4018	170M4018
102/103/202	T7	N75K	170M2616	170M2616

102/103/202	T7	N90K	170M2619	170M2619
102/103/202	T7	N110	170M2619	170M2619
102/103/202	T7	N132	170M2619	170M2619
102/103/202	T7	N160	170M2619	170M2619
102/103/202	T7	N200	170M4015	170M4015
102/103/202	T7	N250	170M4015	170M4015
102/103/202	T7	N315	170M4015	170M4015
102/103/202	T7	N400	170M4015	170M4015

A	B	C		
			IEC	UL
			 Busmann P/N	 Busmann P/N
302	T2	N45 K	170M2620	170M2620
302	T2	N55 K	170M2621	170M2621
302	T2	N75 K	170M4015	170M4015
302	T2	N90 K	170M4015	170M4015
302	T2	N110	170M4016	170M4016
302	T2	N150	170M4018	170M4018
302	T5	N90 K	170M2619	170M2619

302	T5		N110	170M2 620	170M26 20
302	T5		N132	170M2 621	170M26 21
302	T5		N160	170M4 015	170M40 15
302	T5		N200	170M4 016	170M40 16
302	T5		N250	170M4 018	170M40 18
302	T 7	N55K		170M2 616	170M26 16
302	T 7	N75K		170M2 619	170M26 19
302	T 7	N90K		170M2 619	170M26 19
302	T 7	N110		170M2 619	170M26 19
302	T 7	N132		170M2 619	170M26 19
302	T 7	N160		170M4 015	170M40 15
302	T 7	N200		170M4 015	170M40 15
302	T 7	N250		170M4 015	170M40 15
302	T 7	N315		170M4 015	170M40 15



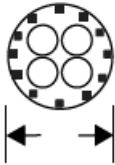
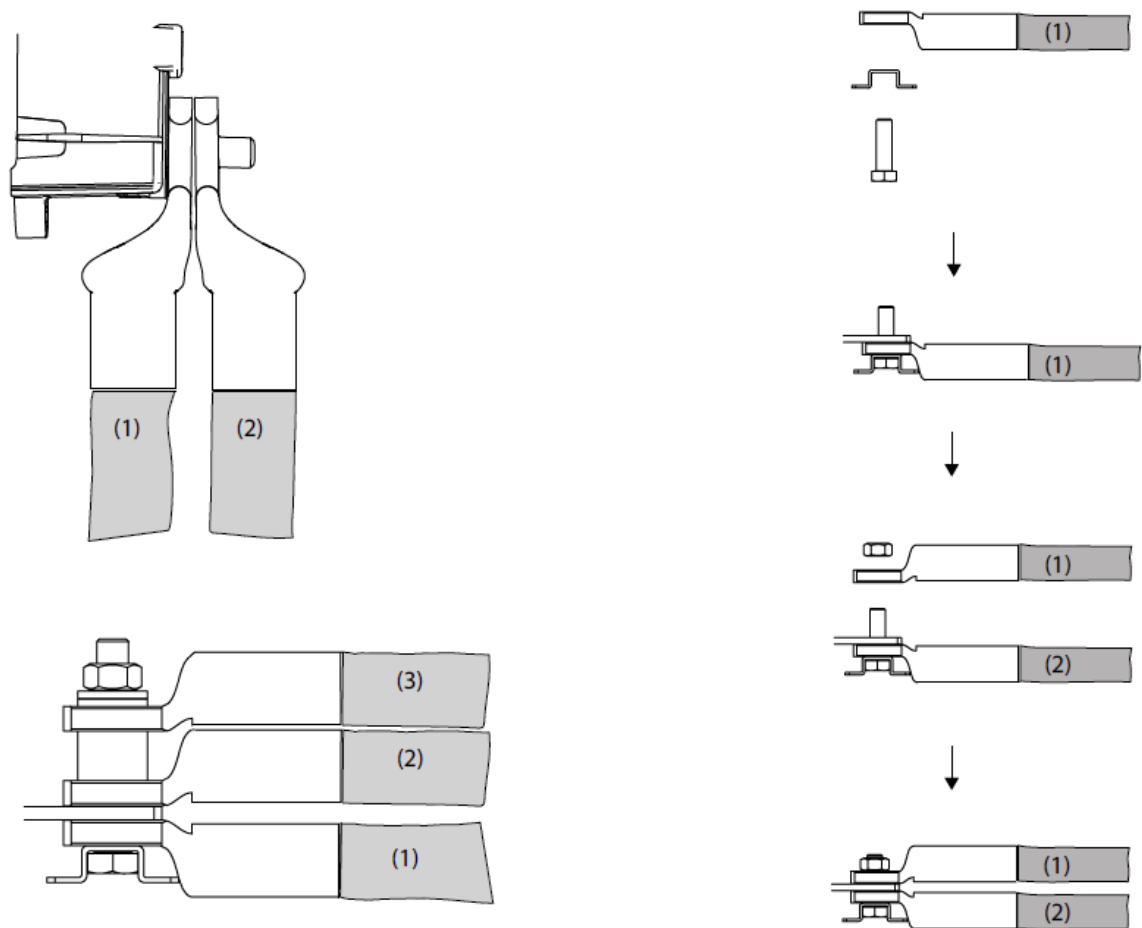
	<div style="display: flex; align-items: center; justify-content: center;">   </div> <p style="text-align: center;">[mm² (AWG)]</p>			
	L1/L2/L3	U/V/W	-DC/+DC	R+/R-
D1h	2 x 95 (2 x 3/0)	2 x 95 (2 x 3/0)	2 x 95 (2 x 3/0)	2 x 95 (2 x 3/0)
D2h	2 x 185 (2 x 350 mcm)	2 x 185 (2 x 350 mcm)	2 x 185 (2 x 350 mcm)	2 x 185 (2 x 350 mcm)
D3h	2 x 95 (2 x 3/0)	2 x 95 (2 x 3/0)	2 x 95 (2 x 3/0)	2 x 95 (2 x 3/0)
D4h	2 x 185 (2 x 350 mcm)	2 x 185 (2 x 350 mcm)	2 x 185 (2 x 350 mcm)	2 x 185 (2 x 350 mcm)
D5h	2 x 95 (2 x 3/0)	2 x 95 (2 x 3/0)	2 x 95 (2 x 3/0)	2 x 95 (2 x 3/0)
D6h	2 x 95 (2 x 3/0)	2 x 95 (2 x 3/0)	2 x 95 (2 x 3/0)	2 x 95 (2 x 3/0)
D7h	2 x 185 (2 x 350 mcm)	2 x 185 (2 x 350 mcm)	2 x 185 (2 x 350 mcm)	2 x 185 (2 x 350 mcm)
D8h	2 x 185 (2 x 350 mcm)	2 x 185 (2 x 350 mcm)	2 x 185 (2 x 350 mcm)	2 x 185 (2 x 350 mcm)

Illustration 5

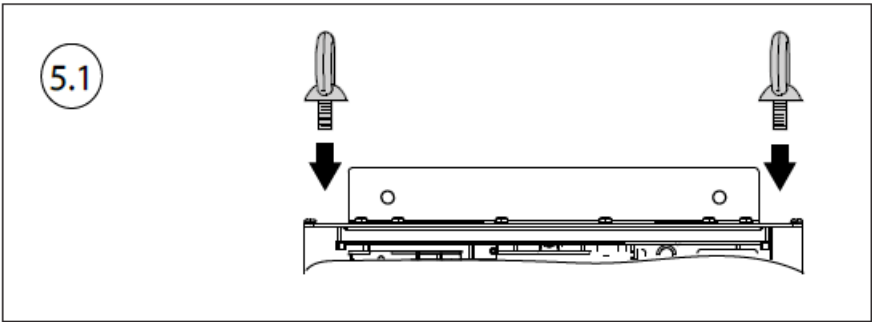
Illustration 5:



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D1h–D8h

5 D1h–D8h



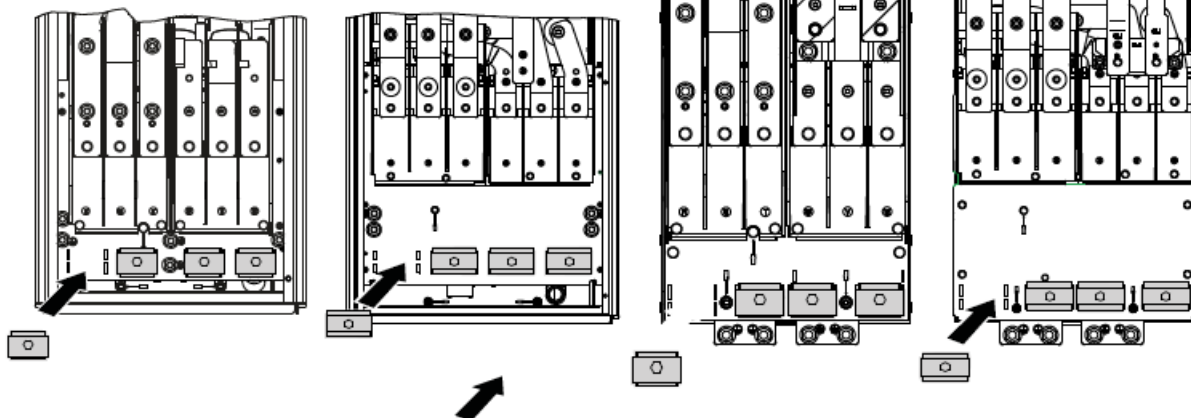
5.2

D1h

D2h

D3h

D4h

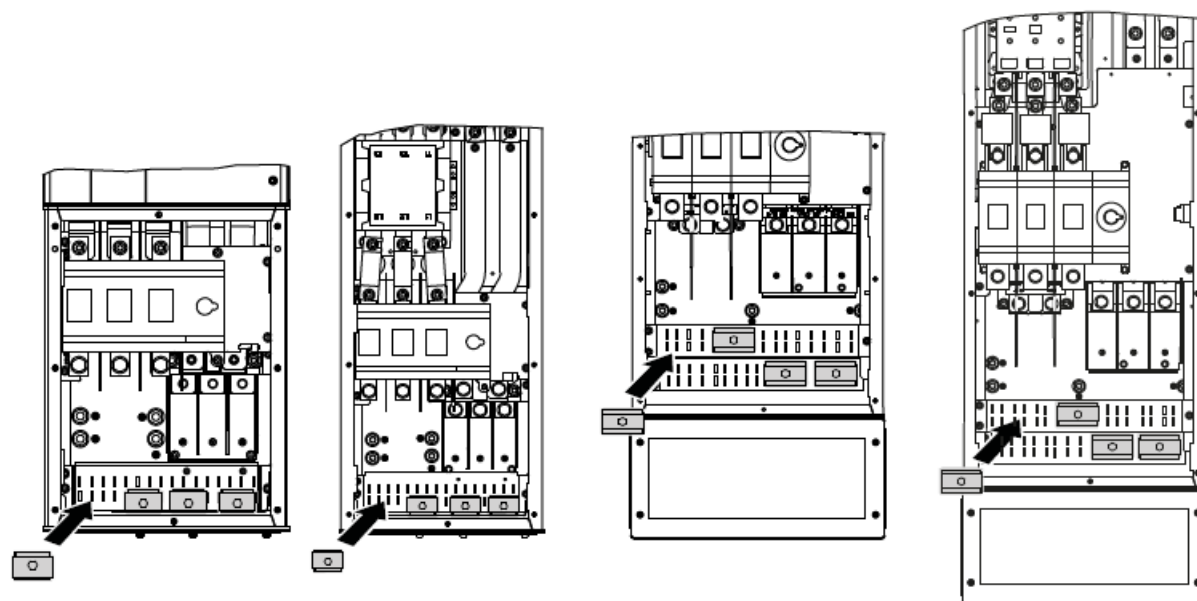


D5h

D6h

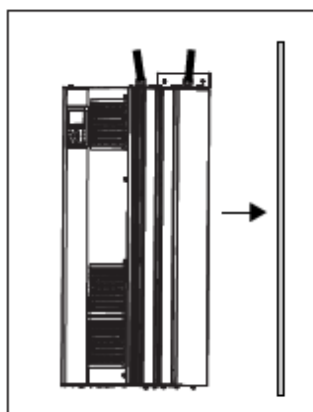
D7h

D8h



Dimensions And Installation

D1h–D6h

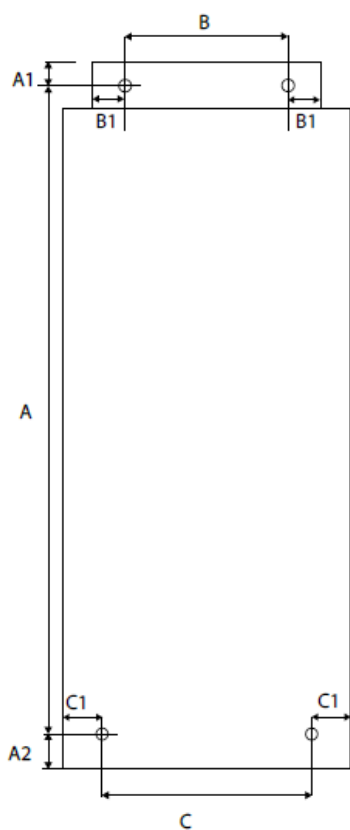


	A	A1	A2	B	B1	B2	C	C1	D	
D1h	844 (33.2)	25 (1.0)	20 (0.8)	180 (7.1)	33 (1.3)	–	200 (7.9)	63 (2.5)	225 (8.9)	4 x M10
D2h	1051 (41.4)	25 (1.0)	20 (0.8)	280 (7.1)	33 (1.3)	–	271 (10.7)	75 (2.9)	225 (8.9)	4 x M10
D3h	844 (33.2)	25 (1.0)	20 (0.8)	180 (7.1)	33 (1.3)	–	200 (7.9)	25 (1.0)	225 (8.9)	4 x M10
D4h	1051 (41.4)	25 (1.0)	20 (0.8)	280 (11.0)	33 (1.3)	–	271 (10.7)	40 (1.6)	225 (8.9)	4 x M10
D5h	1276 (50.2)	25 (1.0)	20 (0.8)	180 (7.1)	33 (1.3)	33 (1.3)	200 (7.9)	64 (2.5)	225 (8.9)	4 x M10
D6h	1615 (63.6)	25 (1.0)	20 (0.8)	280 (11.0)	33 (1.3)	33 (1.3)	271 (10.7)	40 (1.6)	225 (8.9)	4 x M10

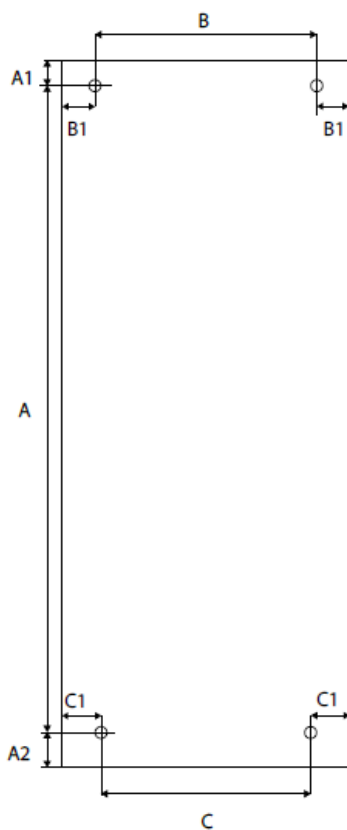
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6.1

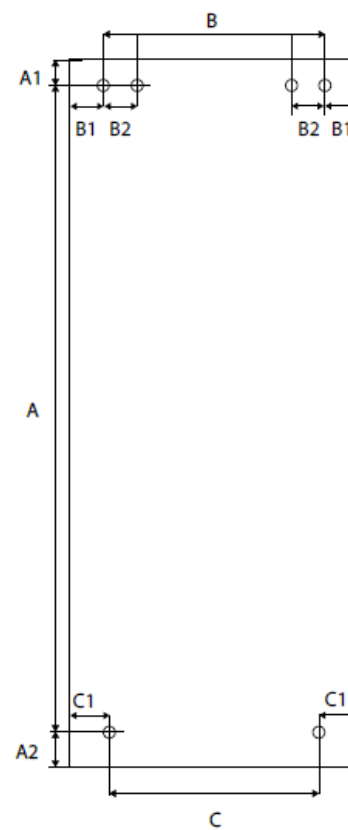
D1h/D2h



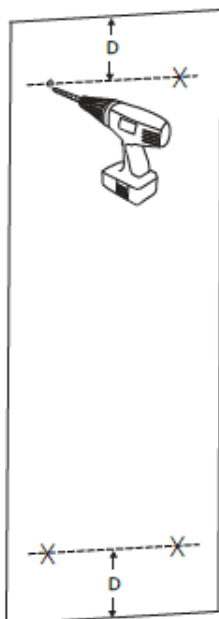
D3h/D4h



D5h/D6h



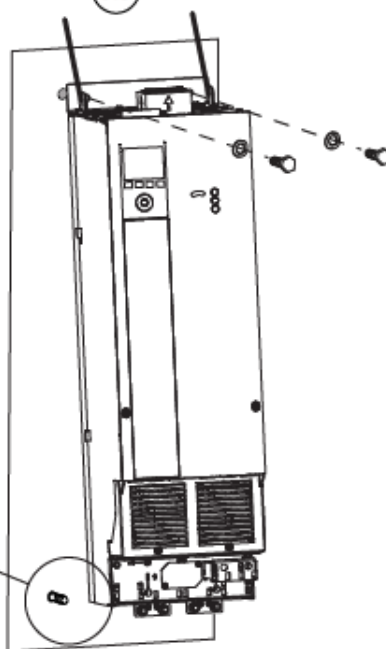
6.2



6.3



6.5

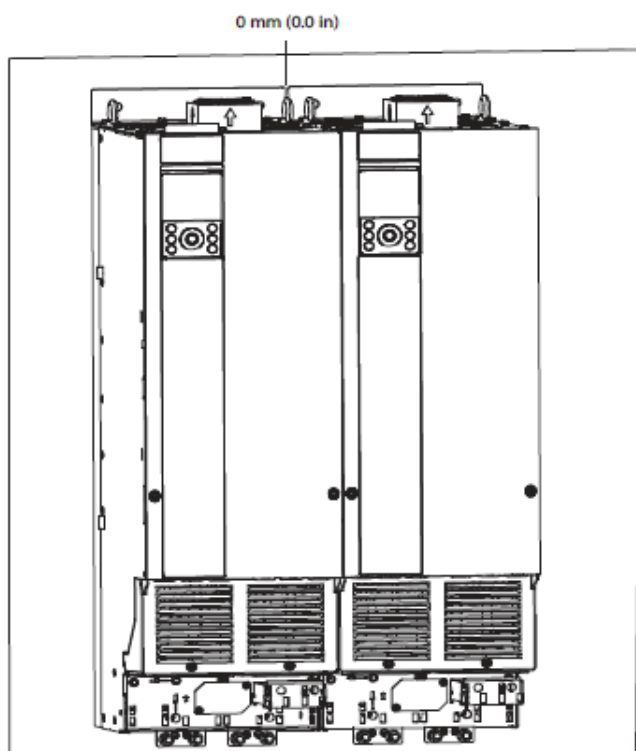


6.4

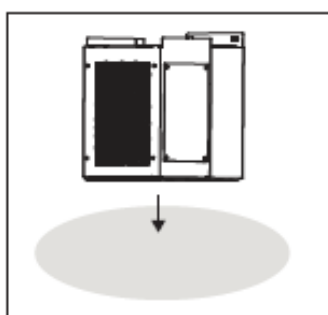


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6.6

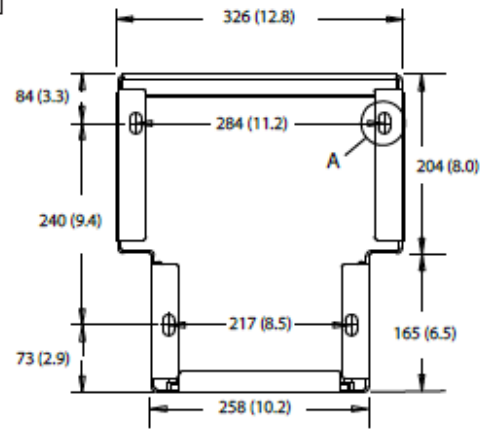


D1h-D2h

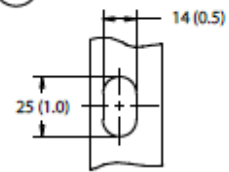


6.1

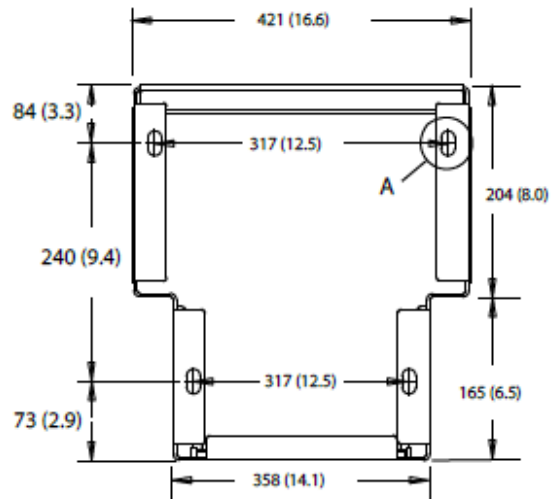
D1h



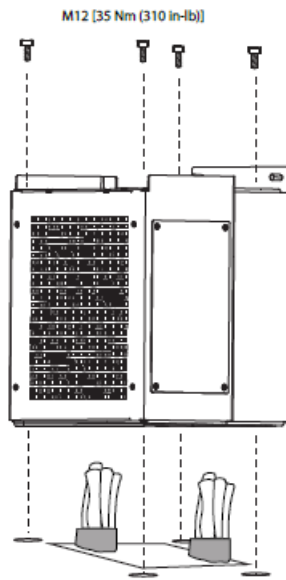
A



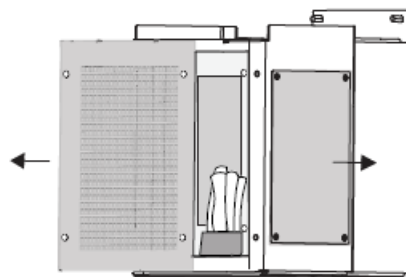
D2h



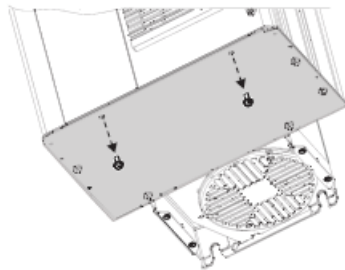
6.2



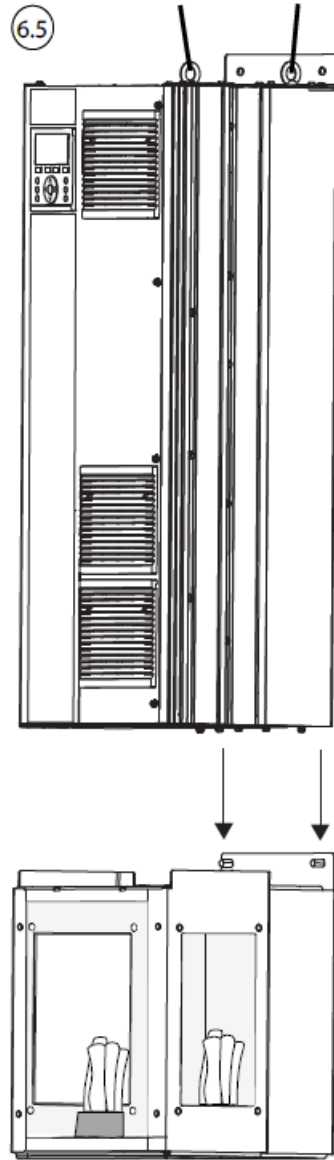
6.3



6.4

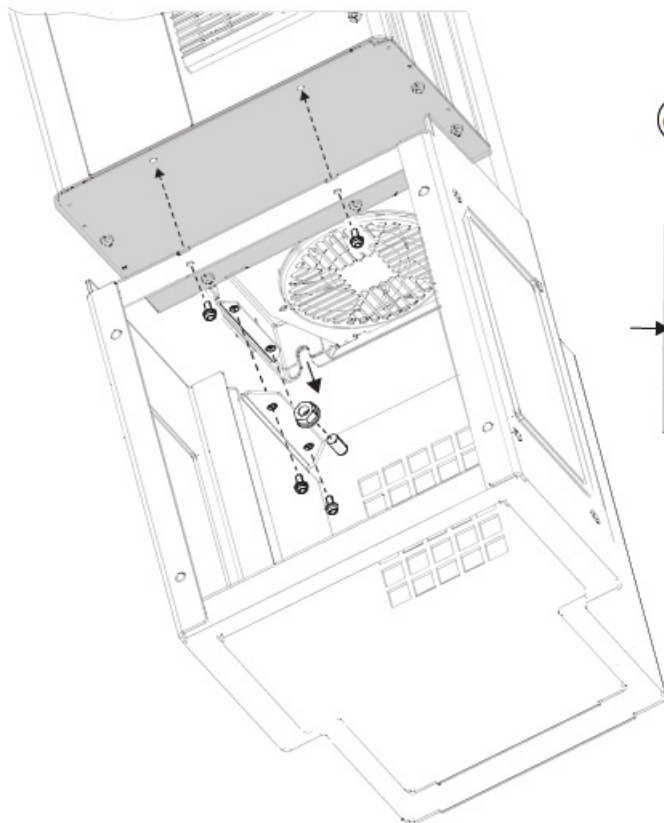


6.5

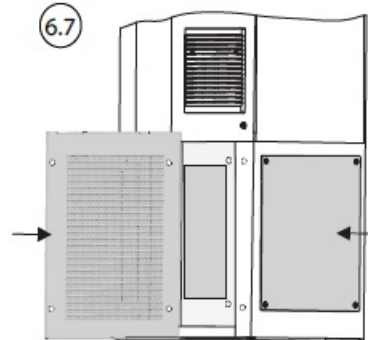


UNIVERSAL

6.6



6.7

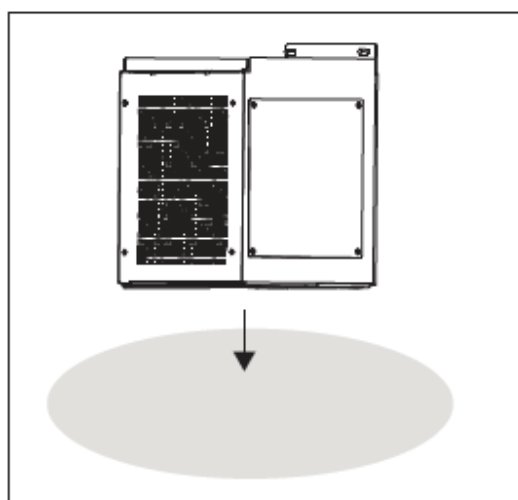


e3066097.10

T25

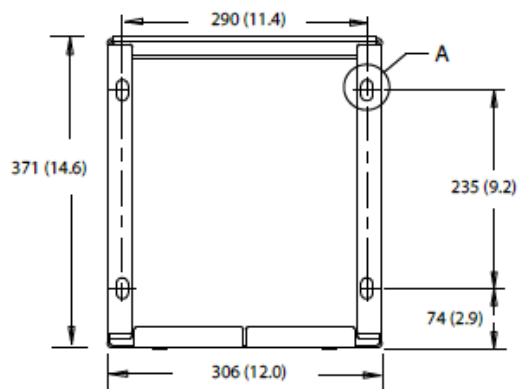
- [2.3 Nm (20 in-lb)]
- [19 Nm (168 in-lb)]

D5h–D8h

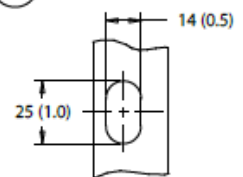


6.1

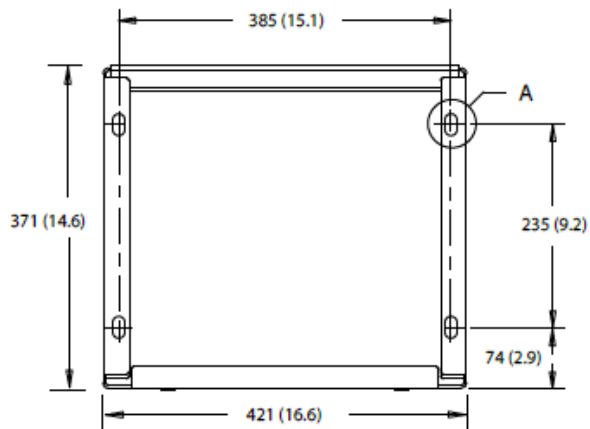
D5h-D6h



A

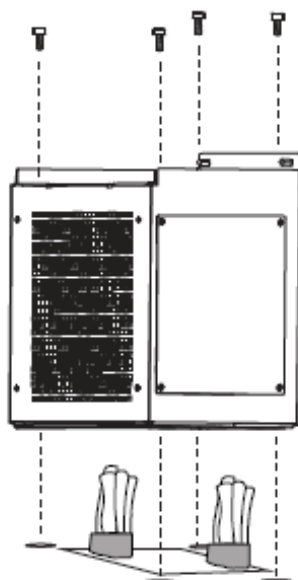


D7h-D8h

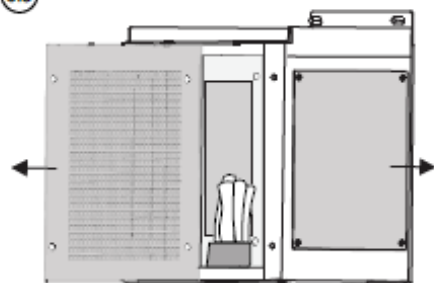


6.2

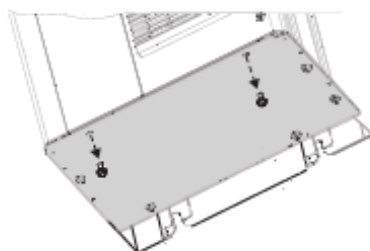
M12 [35 Nm (310 in-lb)]



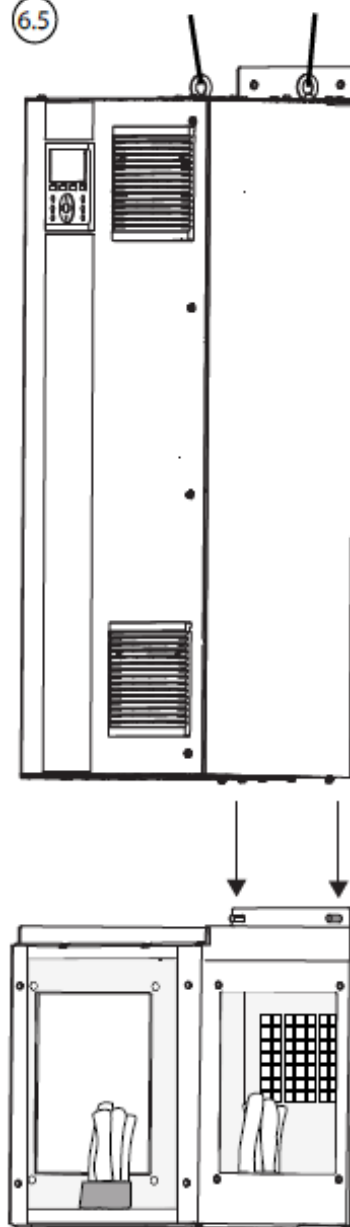
6.3



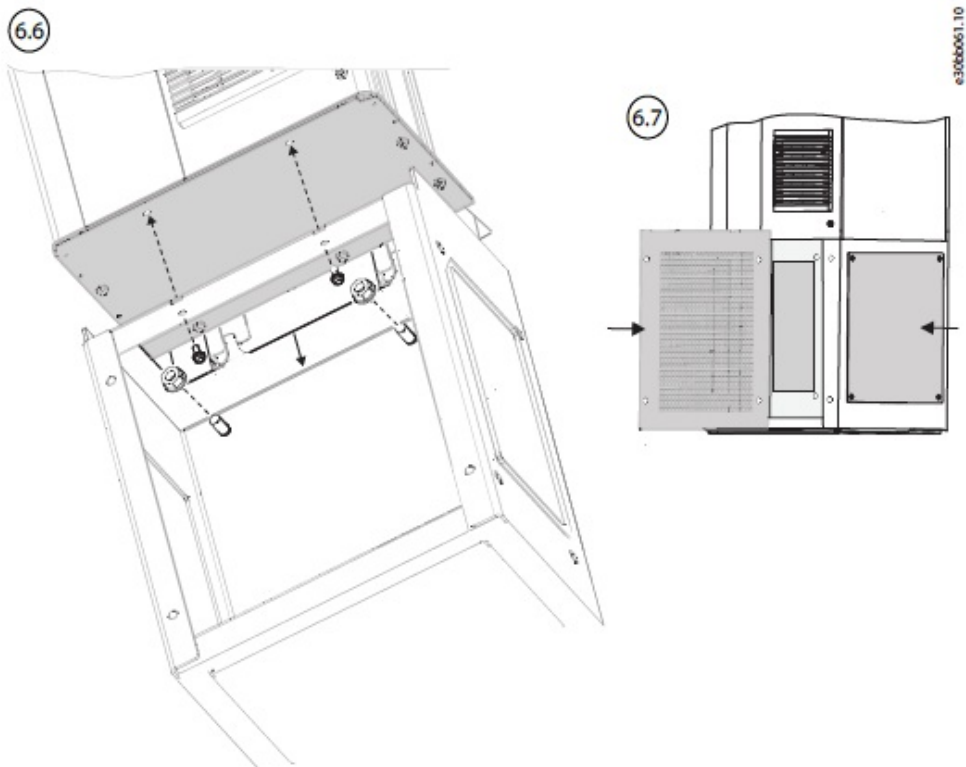
6.4



6.5



e3066096.10



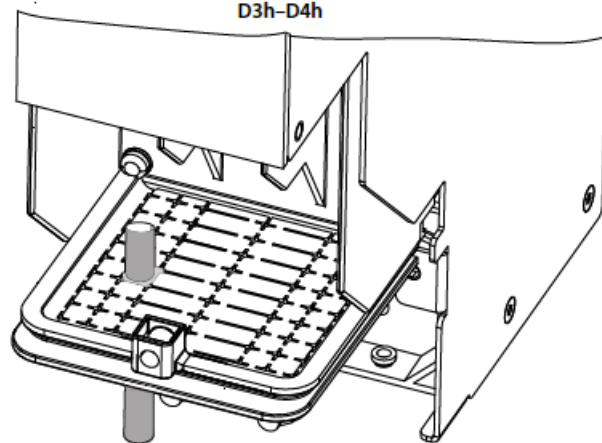
T25

- [2.3 Nm (20 in-lb)]
- [19 Nm (168 in-lb)]

D3h–D4h

7

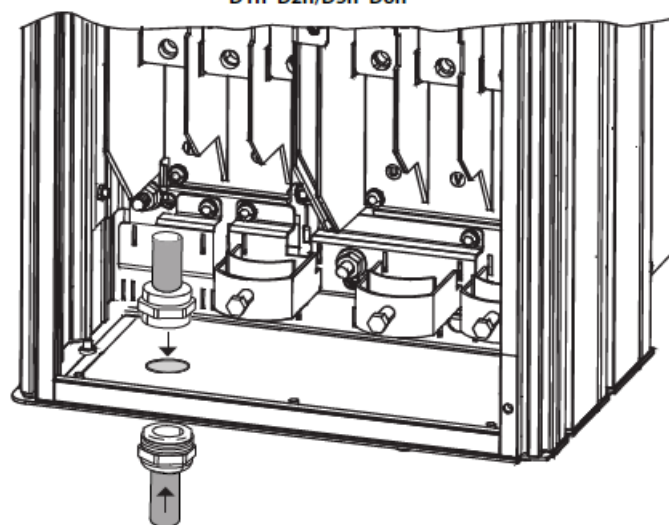
D3h-D4h



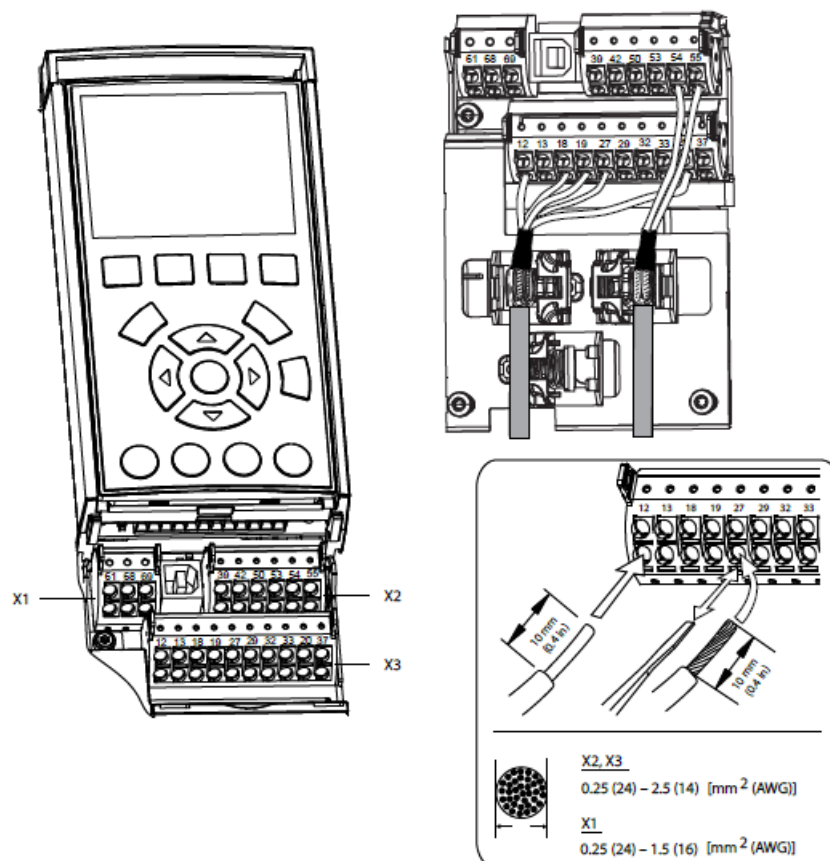
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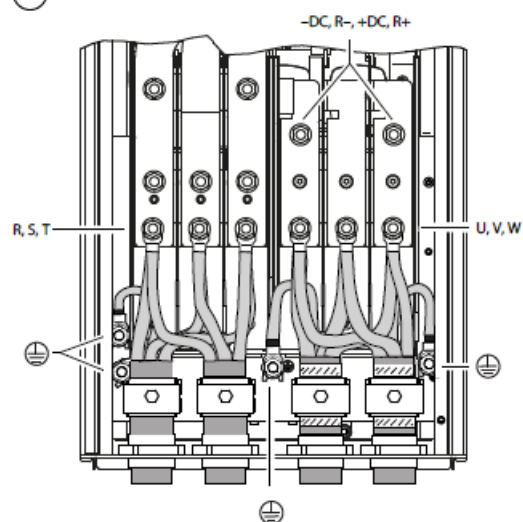
D1h-D2h/D5h-D8h

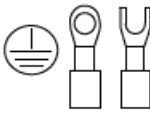



D1h-D8h

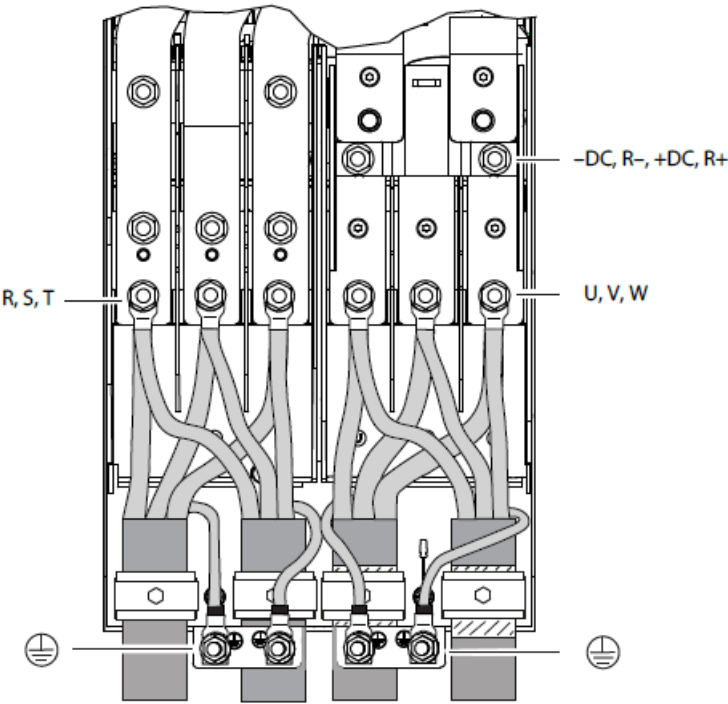




D1h



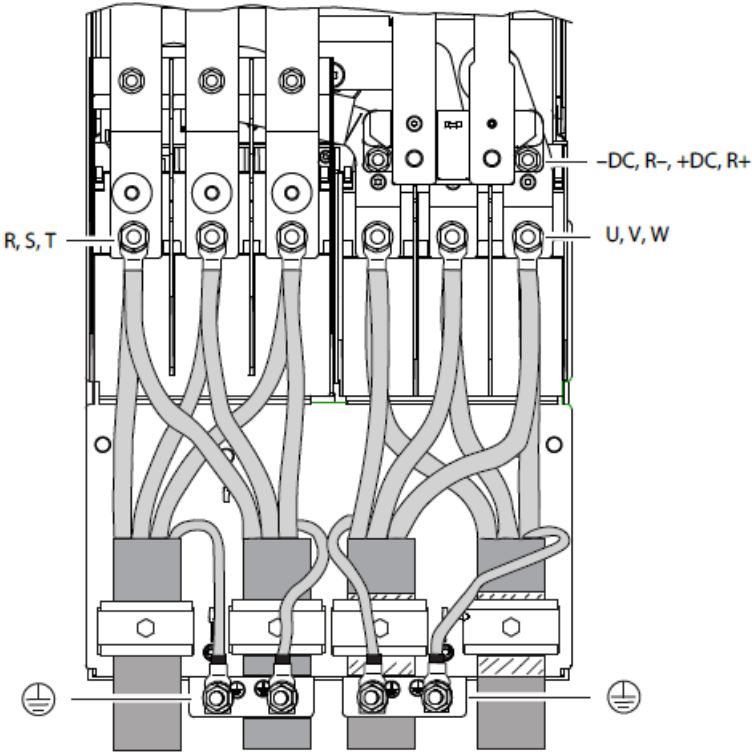
D1h	L1, L2, L3	M10 [19 Nm (168 in-lb)]
	U/T1, V/T2, W/T3	M10 [19 Nm (168 in-lb)]
	-DC, R-, +DC, R+	M10 [19 Nm (168 in-lb)]
		M8 [9.6 Nm (84 in-lb)] M10 [19 Nm (168 in-lb)]
		



D2h



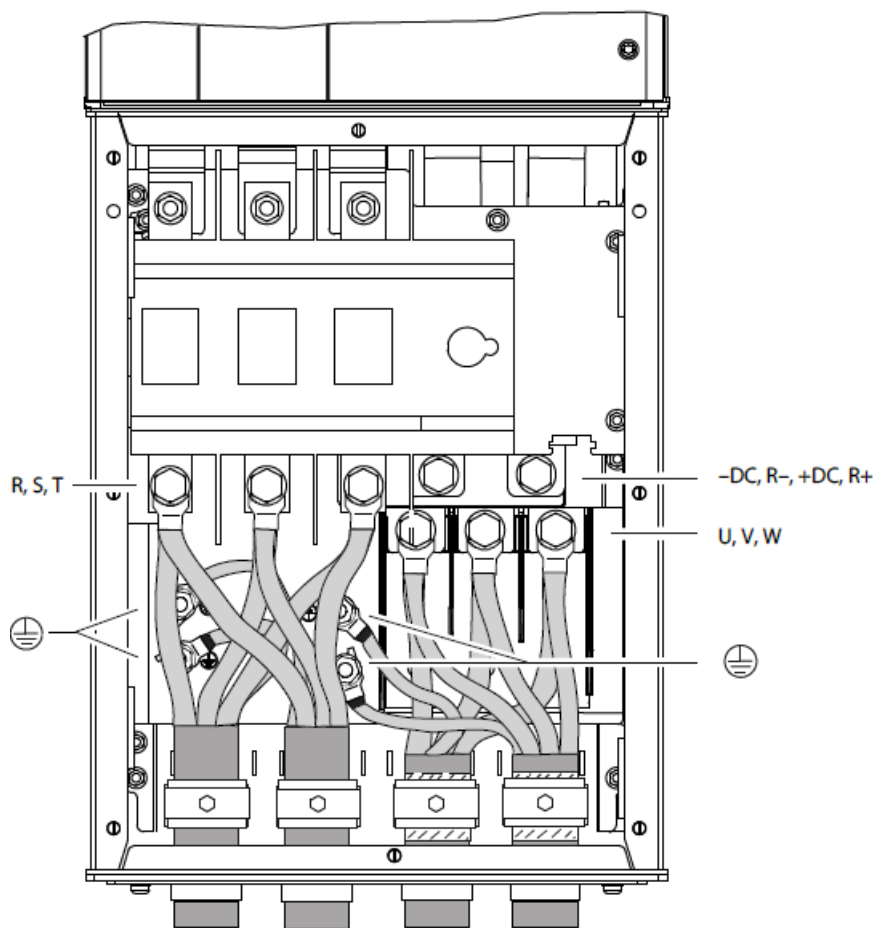
D2h	L1, L2, L3	M10 [19 Nm (168 in-lb)]
	U/T1, V/T2, W/T3	M10 [19 Nm (168 in-lb)]
	-DC, R-, +DC, R+	M10 [19 Nm (168 in-lb)]
		M8 [9.6 Nm (84 in-lb)] M10 [19 Nm (168 in-lb)]
		



D3h



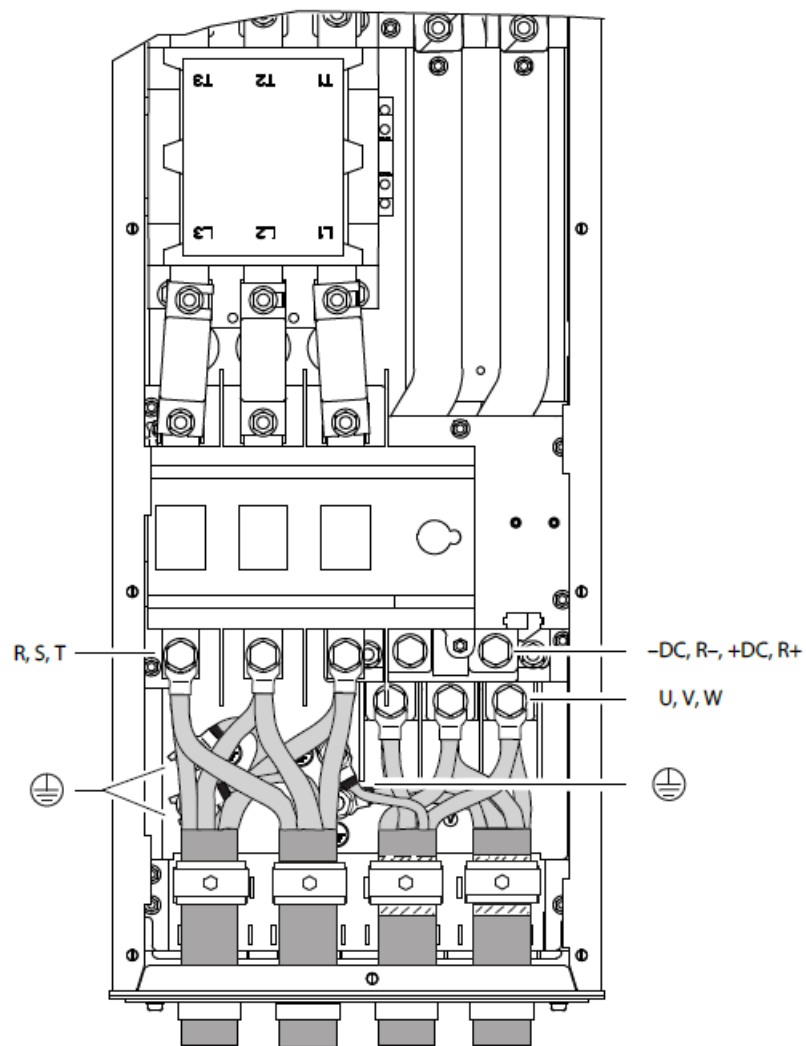
D3h	L1, L2, L3	M10 [19 Nm (168 in-lb)]
	U/T1, V/T2, W/T3	M10 [19 Nm (168 in-lb)]
	-DC, R-, +DC, R+	M10 [19 Nm (168 in-lb)]
		M8 [9.6 Nm (84 in-lb)] M10 [19 Nm (168 in-lb)]
		



D4h



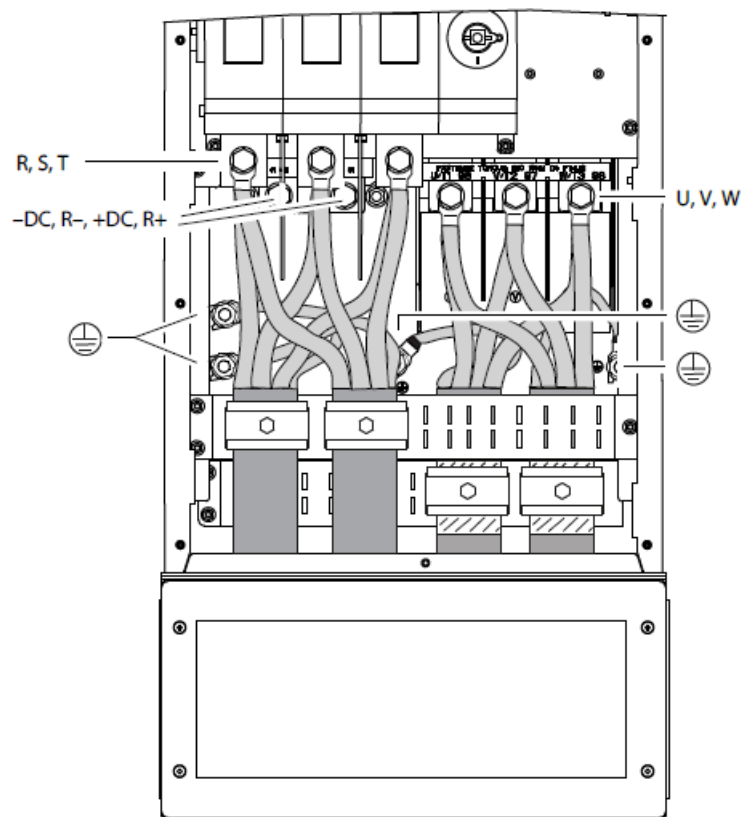
D4h	L1, L2, L3	M10 [19 Nm (168 in-lb)]
	U/T1, V/T2, W/T3	M10 [19 Nm (168 in-lb)]
	-DC, R-, +DC, R+	M10 [19 Nm (168 in-lb)]
		M8 [9.6 Nm (84 in-lb)] M10 [19 Nm (168 in-lb)]
		



D5h



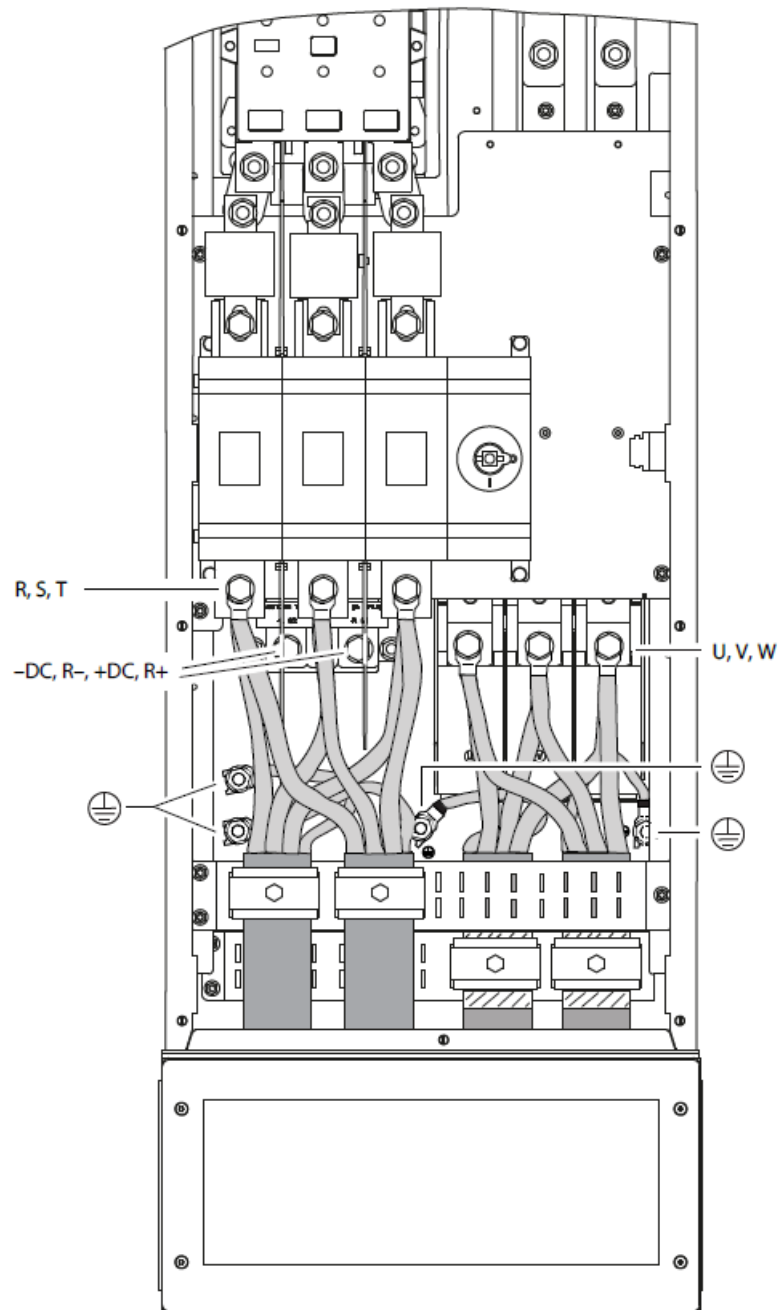
D5h	L1, L2, L3	M10 [19 Nm (168 in-lb)]
	U/T1, V/T2, W/T3	M10 [19 Nm (168 in-lb)]
	-DC, R-, +DC, R+	M10 [19 Nm (168 in-lb)]
		M8 [9.6 Nm (84 in-lb)] M10 [19 Nm (168 in-lb)]
		

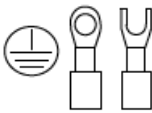

D6h



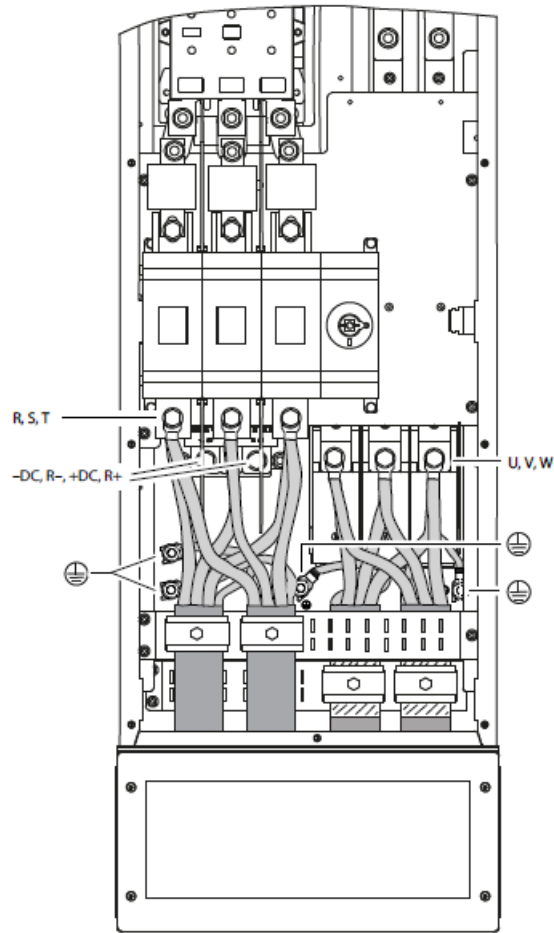
D6h	L1, L2, L3	M10 [19 Nm (168 in-lb)]
	U/T1, V/T2, W/T3	M10 [19 Nm (168 in-lb)]
	-DC, R-, +DC, R+	M10 [19 Nm (168 in-lb)]
		M8 [9.6 Nm (84 in-lb)] M10 [19 Nm (168 in-lb)]
		

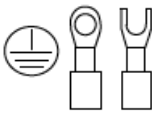

D7h



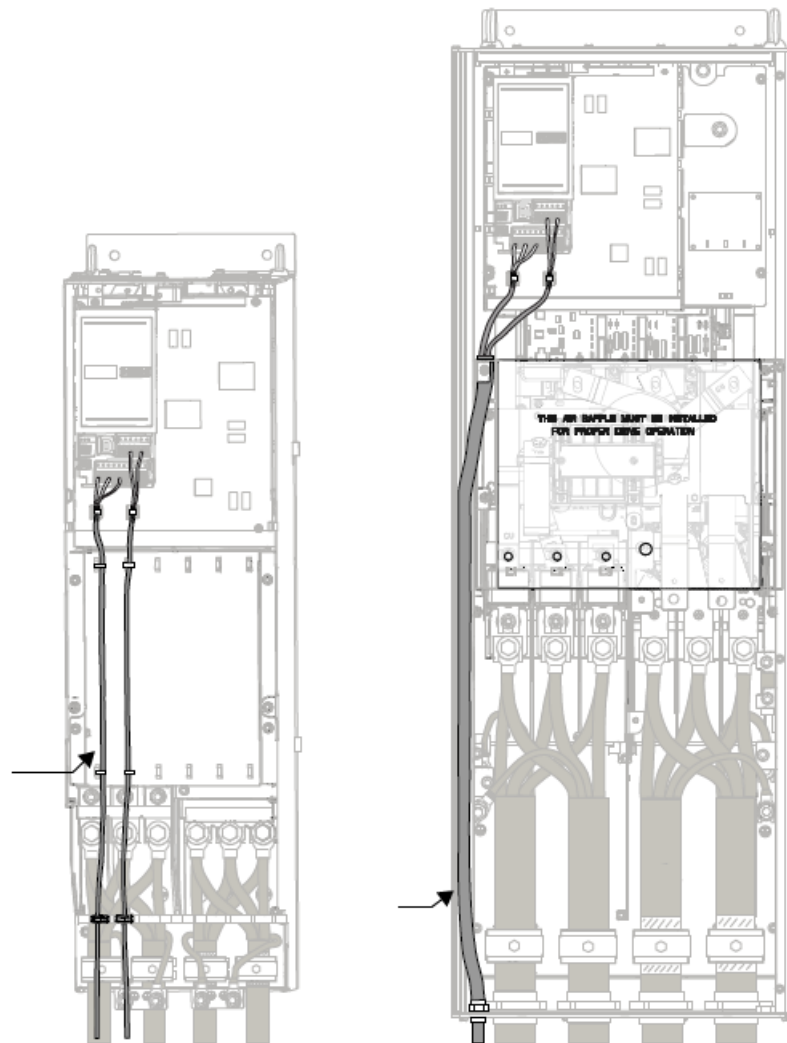
D7h	L1, L2, L3	M10 [19 Nm (168 in-lb)]
	U/T1, V/T2, W/T3	M10 [19 Nm (168 in-lb)]
	-DC, R-, +DC, R+	M10 [19 Nm (168 in-lb)]
		M8 [9.6 Nm (84 in-lb)] M10 [19 Nm (168 in-lb)]
		

D8h



D8h	L1, L2, L3	M10 [19 Nm (168 in-lb)]
	U/T1, V/T2, W/T3	M10 [19 Nm (168 in-lb)]
	-DC, R-, +DC, R+	M10 [19 Nm (168 in-lb)]
		M8 [9.6 Nm (84 in-lb)] M10 [19 Nm (168 in-lb)]
		

D3h–D4h



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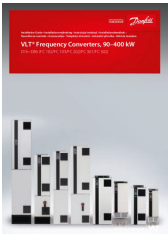
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D1h D8h VLT Frequency Converters, D1h D8h, VLT Frequency Converters, Frequency Converters, Converters

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