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Instruction Manual

P2005048

Technologic Intelligent Pump Controller

E1 & E3 Frames Addendum

Bell & Gossett
a xylem brand

Table of Contents

1 Introduction and Safety

1.1 Purpose of this manual

This guide only provides information for the E1 and E3 frames of the Technologic Intelligent Pump Controller. See P2003509 Technologic Intelligent Pump Controller Instruction Manual (current version) for the complete Safety and other information.

2 Product Description

2.1 Dimensions

2.1.1 Mechanical dimensions and rated power

Table 1: Mechanical dimensions and rated power for E1 & E3

Frame size		E1	E3
Normal overload rated power 110% overload torque		500–600 hp (355–450 kW) at 400 V (380–480 V) 450–600 hp (450–560 kW) at 690 V (525–690 V)	
Enclosure protection	IP	21/54	20
	NEMA	Type 1/Type 12	Chassis
Shipping dimensions inch (mm)	Height	86.3 (2191)	69.3 (1759)
	Width	30.2 (768)	29.4 (746)
	Depth	34.3 (870)	31.3 (794)
Drive dimensions inch (mm)	Height	80.4 (2043)	62.1 (1578)
	Width	23.7 (602)	19.9 (506)
	Depth	20.2 (513)	19.0 (482)
Maximum Weight lbs (kg)		650 (295)	600 (272)
			

NOTE: The typical power loss is at nominal load conditions and expected to be in ±15% (tolerance relates to variety in voltage and cable conditions). The losses are based on the default switching frequency. The losses increase significantly at higher switching frequencies.

2.1.2 E1 exterior dimensions

Dimensions in the following drawings are in mm (in.).

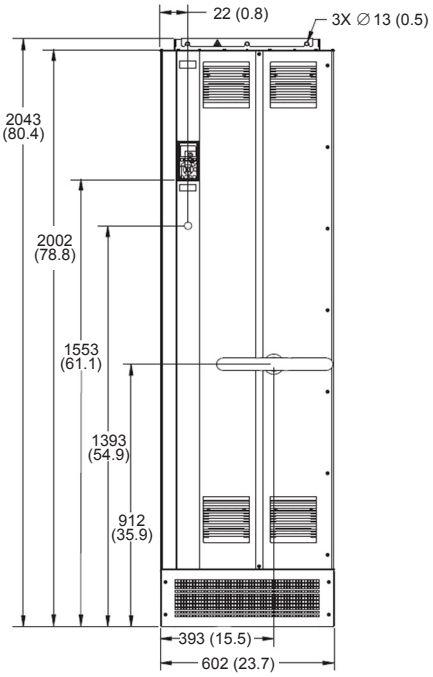
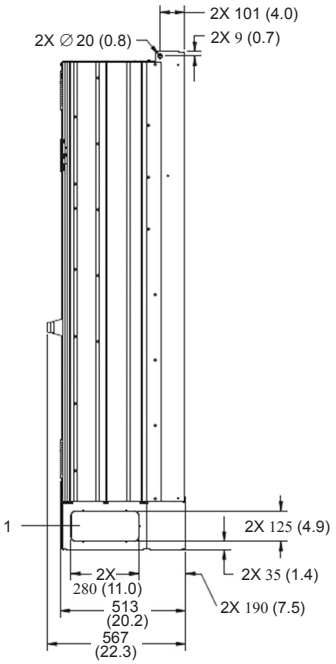
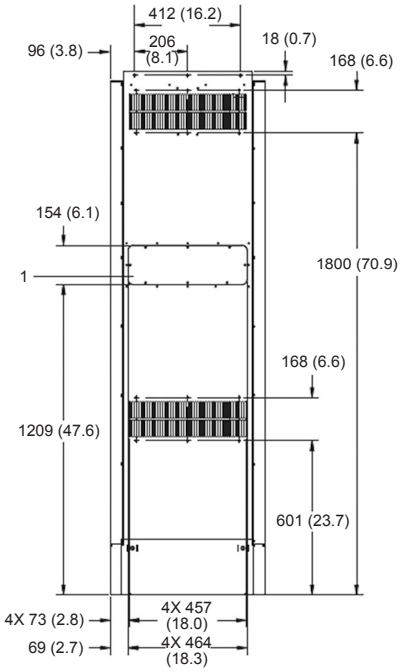


Figure 1: E1h front view



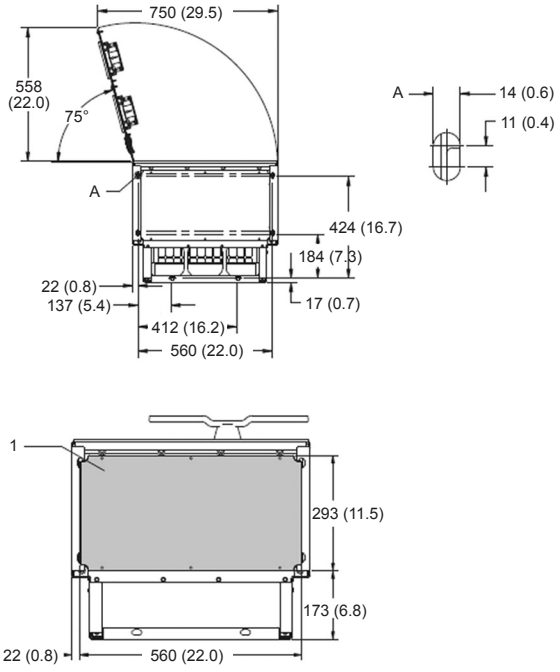
1. Knockout panel

Figure 2: E1h side view



1. Optional heat sink access panel

Figure 3: E1h back view



1. Gland plate

Figure 4: E1h door clearance and gland plate

2.1.3 E1 terminal dimensions

Dimensions in the following drawings are in mm (in.).

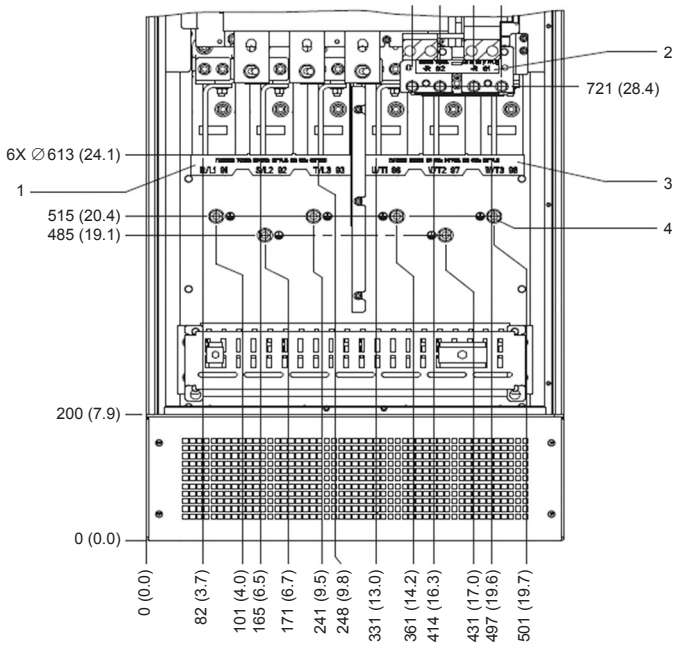


Figure 5: E1h front view

1. Mains terminals
2. Brake or regen terminals
3. Motor terminals
4. Ground terminals, M10 nut

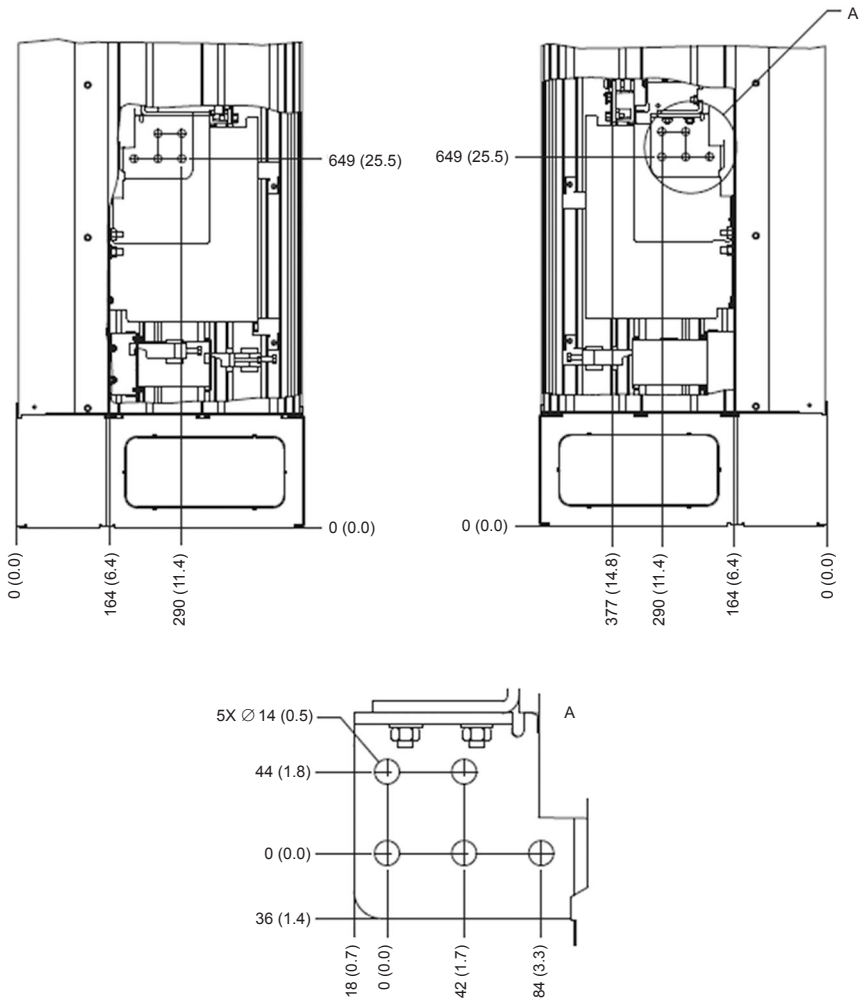


Figure 6: E1h side view

2.1.4 E3 exterior dimensions

Dimensions in the following drawings are in mm (in.).

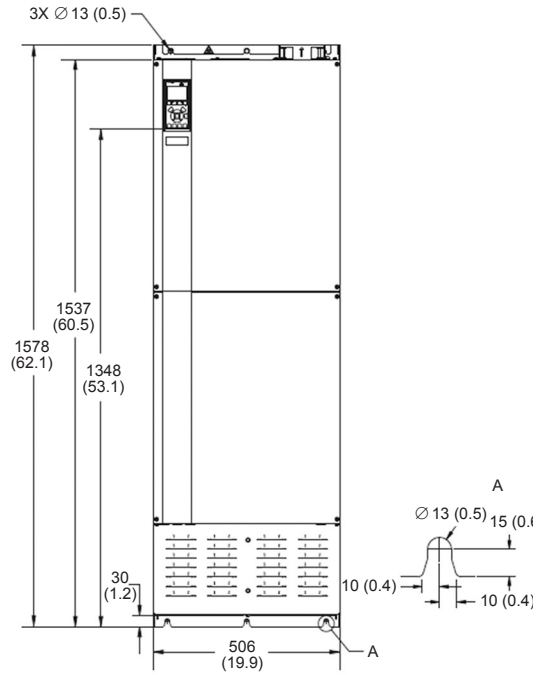


Figure 7: E3h front view

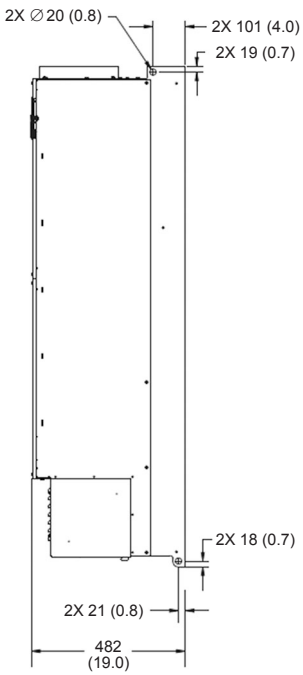
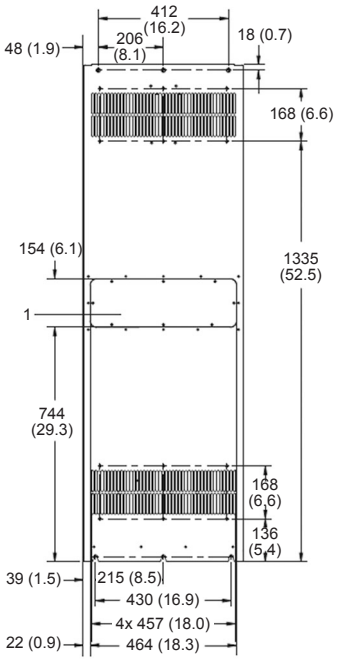


Figure 8: E3h side view



1. Optional heat sink access panel

Figure 9: E3h back view

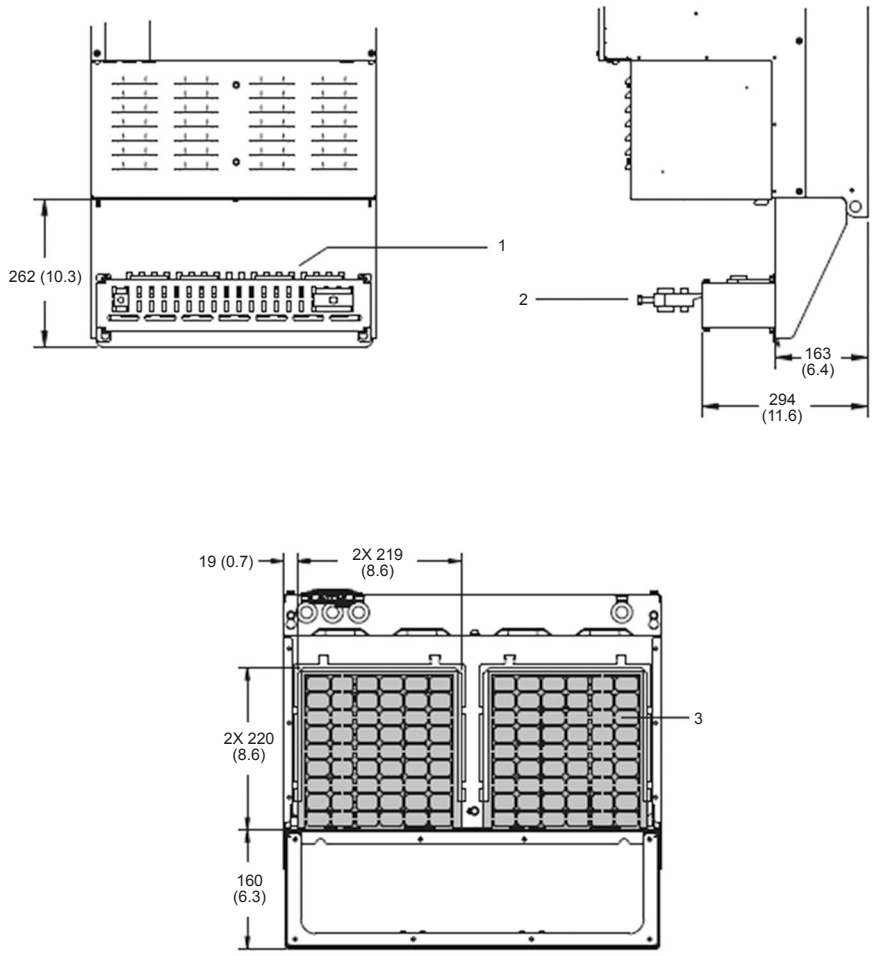


Figure 10: RFI Shield Termination and Gland Plate Dimensions for E3h

1. RFI shield termination (standard with RFI option)
2. Cable/EMC clamp
3. Gland plate

2.1.5 E3 terminal dimensions

Dimensions in the following drawings are in mm (in.).

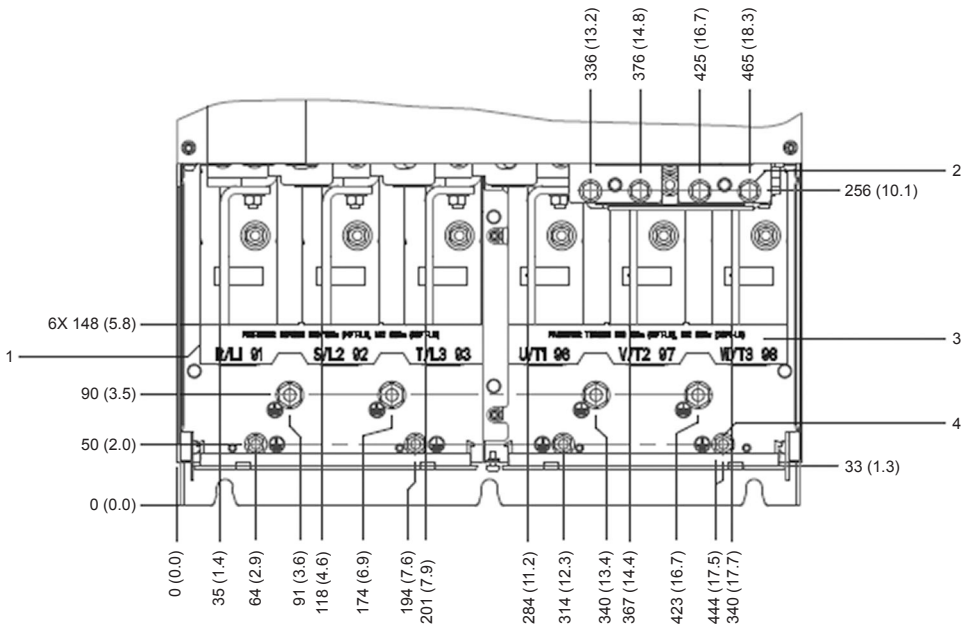


Figure 11: E3h front view

1. Mains terminals
2. Brake or regen terminals
3. Motor terminals
4. Ground terminals, M8 and M10 nuts

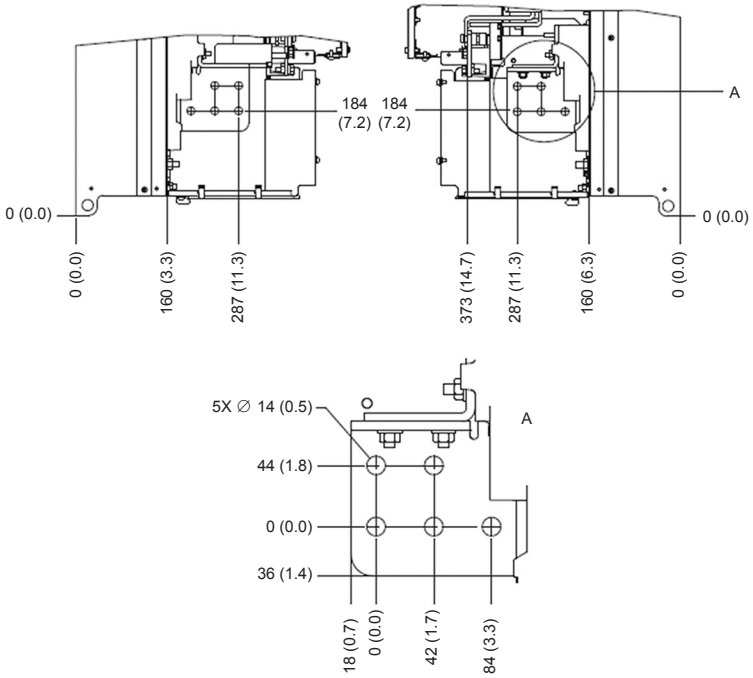


Figure 12: E3h side view: Mains, Motor, and Ground

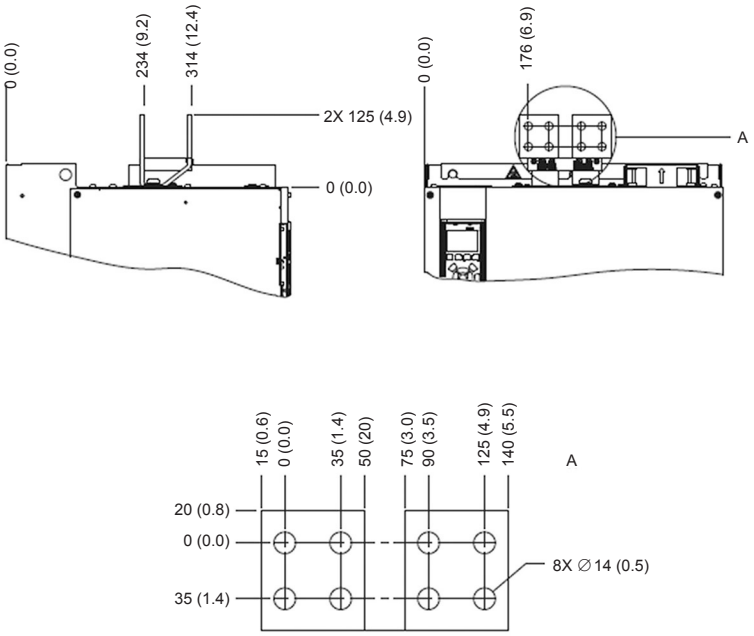


Figure 13: E3h Load share / regen terminal dimensions

2.1.6 E1 and E3 enclosure airflow

Dimensions in the following drawings are in mm (in.).

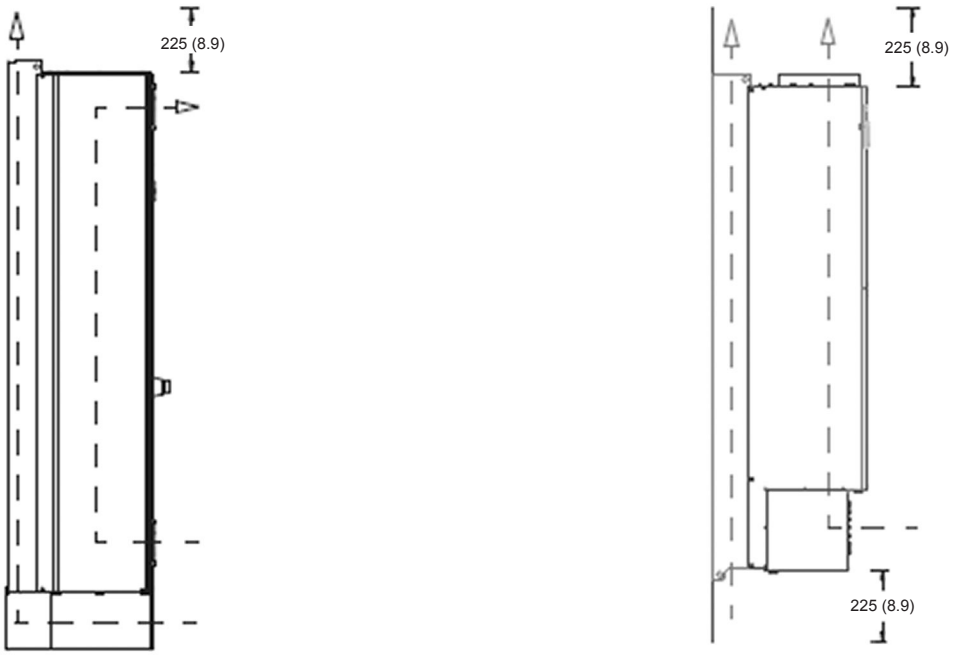


Figure 14: Standard airflow configuration for E1h on the left and E3h on the right

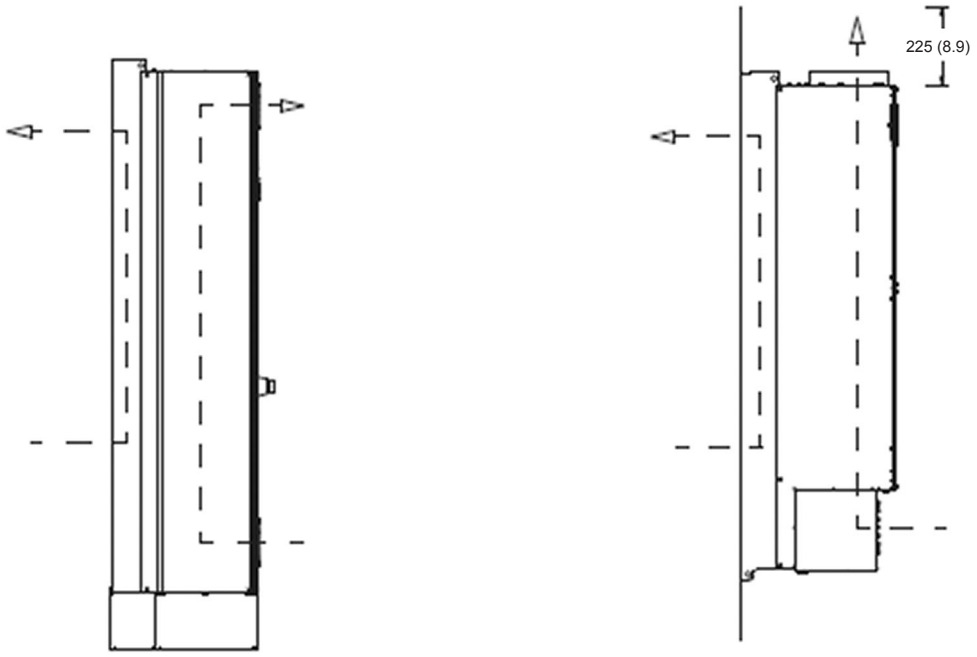


Figure 15: Optional airflow configuration for E1h on the left and E3h on the right

3 Electrical Installation

3.1 Motor connection

Example

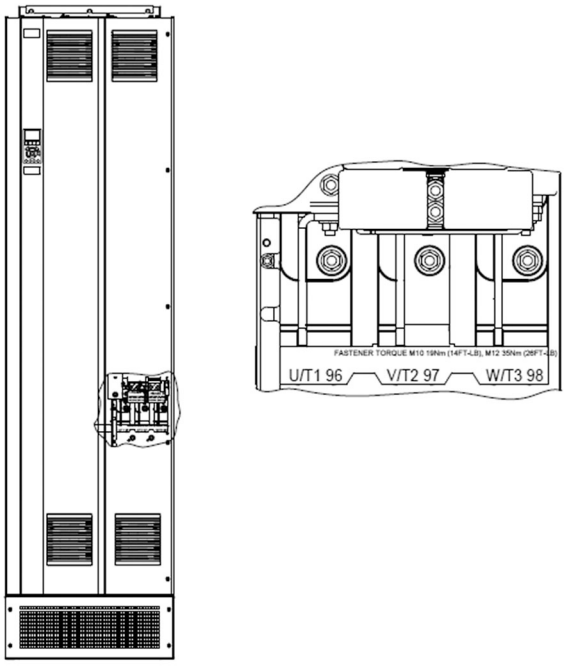


Figure 16: E1h AC Motor terminal

3.2 Power connection

Example

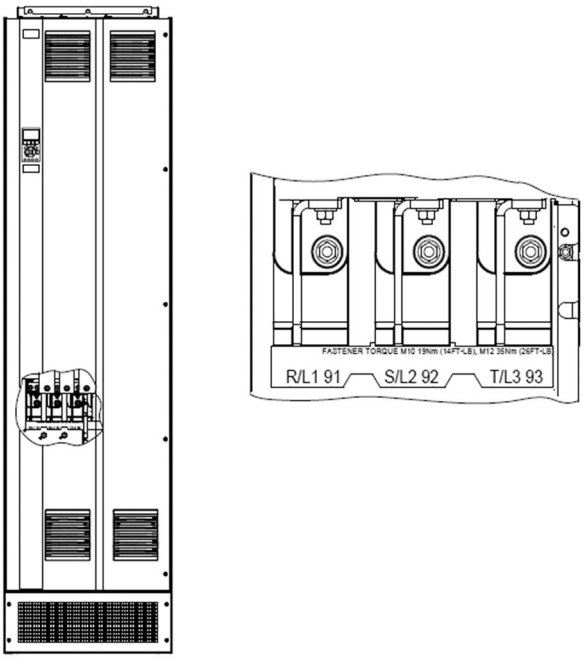


Figure 17: E1 AC Main terminals

3.3 Grounding

Example

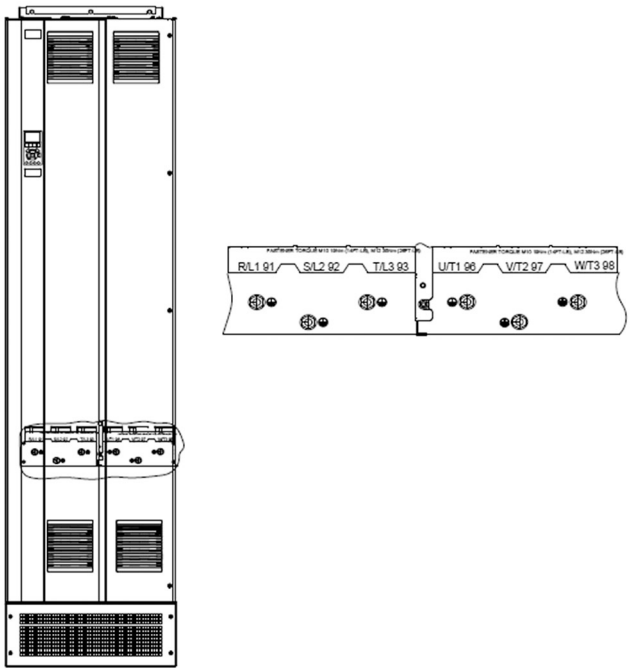


Figure 18: E1 Ground terminals

4 Technical Specification

4.1 Power-dependent specifications

Table 2: Mains supply 3 x 380-480 V AC — Normal overload 110% for 1 minute, N355 – N450

Type Designation	N355	N400	N450
High/normal overload High overload=150% or 160% torque for a duration of 60 s. Normal overload=110% torque for a duration of 60 s.	NO	NO	NO
Typical shaft output at 400 V [kW]	355	400	450
Typical shaft output at 460 V [hp]	500	550	600
Typical shaft output at 480 V [kW]	400	500	530
Enclosure size	E1h/E3h	E1h/E3h	E1h/E3h
Output current (3-phase)			
Continuous (at 400 V) [A]	658	745	800
Intermittent (60 s overload) (at 400 V) [A]	724	820	880
Continuous (at 460/480 V) [A]	590	678	730
Intermittent (60 s overload) (at 460/480 V) [A]	649	746	803
Continuous kVA (at 400 V) [kVA]	456	516	554
Continuous kVA (at 460 V) [kVA]	470	540	582
Continuous kVA (at 480 V) [kVA]	491	564	607
Maximum input current			
Continuous (at 400 V) [A]	634	718	771
Continuous (at 460/480 V) [A]	569	653	704
Maximum number and size of cables per phase (E1h)			
Mains and motor without brake [mm2 (AWG)]	5x240 (5x500 mcm)	5x240 (5x500 mcm)	5x240 (5x500 mcm)
Mains and motor with brake [mm2 (AWG)]	4x240 (4x500 mcm)	4x240 (4x500 mcm)	4x240 (4x500 mcm)
Brake or regeneration [mm2 (AWG)]	2x185 (2x350 mcm)	2x185 (2x350 mcm)	2x185 (2x350 mcm)
Maximum number and size of cables per phase (E3h)			

Type Designation	N355	N400	N450
Mains and motor without brake [mm2 (AWG)]	6x240 (6x500 mcm)	6x240 (6x500 mcm)	6x240 (6x500 mcm)
Brake [mm2 (AWG)]	2x185 (2x350 mcm)	2x185 (2x350 mcm)	2x185 (2x350 mcm)
Load share or regeneration [mm2 (AWG)]	4x185 (4x350 mcm)	4x185 (4x350 mcm)	4x185 (4x350 mcm)
Maximum external mains fuses [A](1)	800	800	800
Estimated power loss at 400 V [W](2) (3)	6928	8036	8783
Estimated power loss at 460 V [W](2) (3)	5910	6933	7969
Efficiency(3)	0.98	0.98	0.98
Output frequency [Hz]	0–590	0–590	0–590
Heat sink overtemperature trip [°C (°F)]	110 (230)	110 (230)	110 (230)
Control card overtemperature trip [°C (°F)]	80 (176)	80 (176)	80 (176)
Power card overtemperature trip [°C (°F)]	85 (185)	85 (185)	85 (185)
Fan power card overtemperature trip [°C (°F)]	85 (185)	85 (185)	85 (185)
Active in-rush card overtemperature trip [°C (°F)]	85 (185)	85 (185)	85 (185)

Table 3: Electrical Data, 525–690 V AC

Type Designation	N450	N500	N560
High/normal overload High overload=150% or 160% torque for a duration of 60 s. Normal overload=110% torque for a duration of 60 s.	NO	NO	NO
Typical shaft output at 525 V [kW]	355	400	450
Typical shaft output at 575 V [hp]	450	500	600
Typical shaft output at 690 V [kW]	450	500	560
Enclosure size	E1h/E3h	E1h/E3h	E1h/E3h
Output current (3-phase)			
Continuous (at 525 V) [A]	470	523	596
Intermittent (60 s overload) (at 525 V) [A]	517	575	656

Type Designation	N450	N500	N560
Continuous (at 575/690 V) [A]	450	500	570
Intermittent (60 s overload) (at 575/690 V) [A]	495	550	627
Continuous kVA (at 525 V) [kVA]	427	476	542
Continuous kVA (at 575 V) [kVA]	448	498	568
Continuous kVA (at 690 V) [kVA]	538	598	681
Maximum input current			
Continuous (at 525 V) [A]	453	504	574
Continuous (at 575/690 V) [A]	434	482	549
Maximum number and size of cables per phase (E1h)			
- Mains and motor without brake [mm2 (AWG)]	5x240 (5x500 mcm)	5x240 (5x500 mcm)	5x240 (5x500 mcm)
- Mains and motor with brake [mm2 (AWG)]	4x240 (4x500 mcm)	4x240 (4x500 mcm)	4x240 (4x500 mcm)
- Brake or regeneration [mm2 (AWG)]	2x185 (2x350 mcm)	2x185 (2x350 mcm)	2x185 (2x350 mcm)
Maximum number and size of cables per phase (E3h)			
- Mains and motor [mm2 (AWG)])	6x240 (6x500 mcm)	6x240 (6x500 mcm	6x240 (6x500 mcm)
- Brake [mm2 (AWG)]	2x185 (2x350 mcm)	2x185 (2x350 mcm)	2x185 (2x350 mcm)
- Load share or regeneration [mm2 (AWG)]	4x185 (4x350 mcm)	4x185 (4x350 mcm)	4x185 (4x350 mcm)
Maximum external mains fuses [A](1)	800	800	800
Estimated power loss at 600 V [W](2) (3)	5758	6516	7629
Estimated power loss at 690 V [W](2) (3)	5935	6711	7846
Efficiency(3)	0.98	0.98	0.98
Output frequency [Hz]	0–590	0–590	0–590
Heat sink overtemperature trip [°C (°F)]	110 (230)	110 (230)	110 (230)
Control card overtemperature trip [°C (°F)]	80 (176)	80 (176)	80 (176)
Power card overtemperature trip [°C (°F)]	85 (185)	85 (185)	85 (185)
Fan power card overtemperature trip [°C (°F)]	85 (185)	85 (185)	85 (185)

Type Designation	N450	N500	N560
Active in-rush card overtemperature trip [°C (°F)]	85 (185)	85 (185)	85 (185)

Notes:

1 For fuse ratings, see *Fuses and Disconnect switch* on page 17.

2 Typical power loss is at normal conditions and expected to be within ±15% (tolerance relates to variety in voltage and cable conditions.) These values are based on a typical motor efficiency (IE/IE3 border line). Lower efficiency motors add to the power loss in the drive. Applies for dimensioning of drive cooling. If the switching frequency is higher than the default setting, the power losses can increase. LCP and typical control card power consumptions are included. For power loss data according to EN 50598-2, refer to www.danfoss.com/vltenergyefficiency. Options and customer load can add up to 30 W to the losses, though usually a fully loaded control card and options for slots A and B each add only 4 W.

3 Measured using 5 m (16.4 ft) shielded motor cables at rated load and rated frequency. Efficiency measured at nominal current. For energy efficiency class, see *Ambient conditions* on page 18. For part load losses, see www.danfoss.com/vltenergyefficiency.

4.2 Fuses and Disconnect switch

E1h–E3h recommended fuses

The fuses listed are suitable for use on a circuit capable of delivering 100000 Arms (symmetrical), depending on the drive voltage rating. With the proper fusing, the drive short circuit current rating (SCCR) is 100000 Arms. E1h and E2h drives are supplied with internal drive fusing to meet the 100 kA SCCR and to comply with UL 61800-5-1 enclosed drive requirements. E3h drives must be fitted with Type aR fuses to meet the 100 kA SCCR.

Table 4: E1h–E3h Fuse options

Input voltage (V)	Bussmann ordering number
380–480	170M7309
525–690	170M7342

Table 5: E1h Space Heater Fuse Recommendation

Bussmann	Rating
LPJ-21/2SP	2.5 A, 600 V

NOTICE:

DISCONNECT SWITCH

All units ordered and supplied with a factory-installed disconnect switch require Class L branch circuit fusing to meet the 100 kA SCCR for the drive. If a circuit breaker is used, the SCCR rating is 42 kA. The input voltage and power rating of the drive determines the specific Class L fuse. The input voltage and power rating is found on the product nameplate. For more information regarding the nameplate, see the operating guide.

Table 6:

Input voltage (V)	Power rating [kW (hp)]	Short circuit rating (A)	Required protection
380–480	355–450 (500–600)	42000	Circuit breaker
		100000	Class L fuse, 800 A
380–480	500–560 (650–750)	42000	Circuit breaker
		100000	Class L fuse, 1200 A
525–690	450–630 (450–650)	40000	Circuit breaker

Input voltage (V)	Power rating [kW (hp)]	Short circuit rating (A)	Required protection
		100000	Class L fuse, 800 A
525–690	710–800 (750–950)	42000	Circuit breaker
		100000	Class L fuse, 1200 A

4.3 Fastener torque rating

Apply the correct torque when tightening fasteners in the locations that are listed in the following table. Too low or too high torque when attaching an electrical connection results in an incorrect electrical connection. To verify correct torque, use a torque wrench.

Table 7: Fastener torque ratings

Location	Bolt size	Torque [Nm (lbf·in)]
Mains terminals	M10/M12	19 (168)/37 (335)
Motor terminals	M10/M12	19 (168)/37 (335)
Ground terminals	M8/M10	9.6 (84)/19.1 (169)
Brake terminals	M8	9.6 (84)
Load sharing terminals	M10/M12	19 (168)/37 (335)
Regen terminals (Enclosures E1h/E2h)	M8	9.6 (84)
Regen terminals (Enclosures E3h/E4h)	M10/M12	19 (168)/37 (335)
Relay terminals	–	0.5 (4)
Door/panel cover	M5	2.3 (20)
Cable entry plate	M5	2.3 (20)
Heat sink access panel	M5	2.3 (20)
Serial communication cover	M5	2.3 (20)

4.4 Ambient conditions

Enclosure	IP20/Chassis, IP21/Type 1, IP54/Type 12
Vibration test (standard/ruggedized)	0.7 g/1.0 g
Relative humidity	5%-95% (IEC 721-3-3; Class 3K3 (non-condensing) during operation)
Aggressive environment (IEC 60068-2-43) H2S test	Class Kd
Aggressive gases (IEC 60721-3-3)	Class 3C3
Test method according to IEC 60068-2-43	H2S (10 days)
Ambient temperature (at 60 AVM switching mode)	
- with derating	Maximum 55°C (131°F)(1)
- with full output power of typical EFF2 motors (up to 90% output current)	Maximum 50°C (122°F)(1)
- at full continuous FC output current	Maximum 45°C (113°F)(1)
Minimum ambient temperature during full scale operation	0°C (32°F)
Minimum ambient temperature at decreased speed performance	-10°C (14°F)
Temperature during storage/transport	-25 to +65/70 °C (-13 to +149/158 °F)
Maximum altitude above sea level without derating	1000 m (3280 ft)
Maximum altitude above sea level with derating	3000 m (9842 ft)

EMC standards, Emission	IEC/EN 61800-3
EMC standards, Immunity	IEC/EN 61800-3
Energy-efficiency class	IE2[2]

[1] For more information, see *Derating for ambient temperature and switching frequency* on page 19.

[2] Determined according to IEC 61800-9-2 (EN 50598-2) at:

- Rated load
- 90% rated frequency
- Switching frequency factory setting
- Switching pattern factory setting

4.5 Derating for ambient temperature and switching frequency

FACTORY DERATING

The frequency converters are already derated for operational temperature (55 °C (131 °F) TAMB,MAX and 50 °C (122 °F) TAMB,AVG).

Use the following graphs to determine if the output current must be derated based on switching frequency and ambient temperature. When referring to the graphs, *Iout* indicates the percentage of rated output current, and *fsw* indicates the switching frequency.

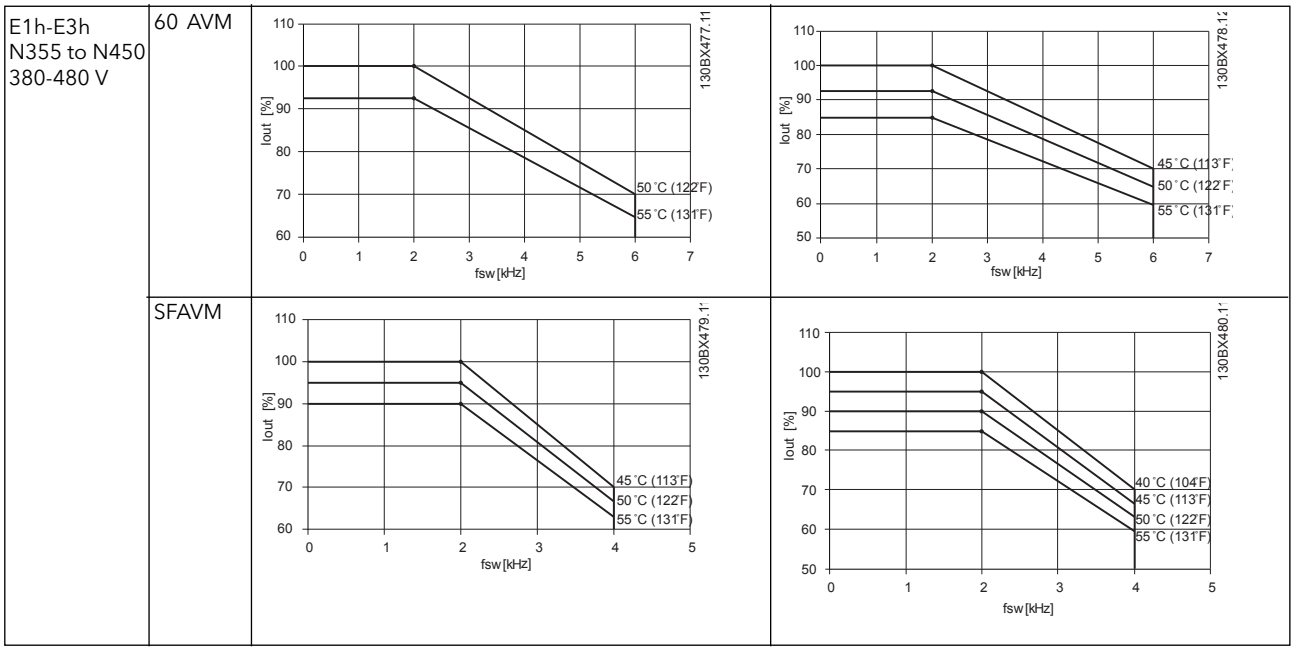


Figure 19: Derating tables for drives rated 380–480 V

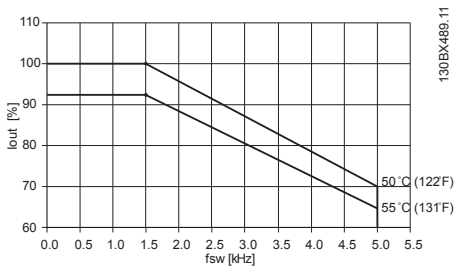
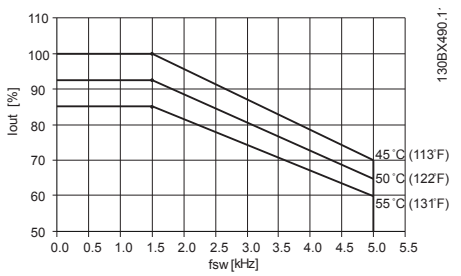
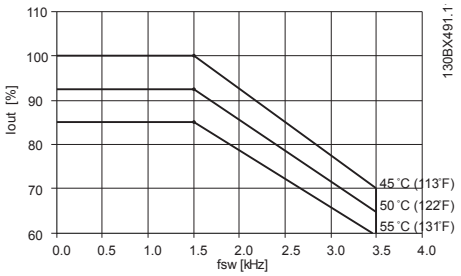
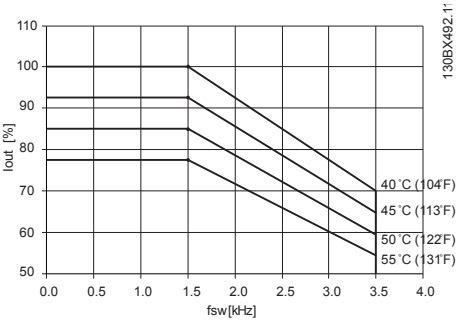
E1h-E3h N450 to N560 525-690 V	60 AVM		
	SFAVM		

Figure 20: Derating tables for drives rated 525–690 V

Xylem |’zīləm|

1) The tissue in plants that brings water upward from the roots;
2) a leading global water technology company.

We’re a global team unified in a common purpose: creating advanced technology solutions to the world’s water challenges. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. Our products and services move, treat, analyze, monitor and return water to the environment, in public utility, industrial, residential and commercial building services settings. Xylem also provides a leading portfolio of smart metering, network technologies and advanced analytics solutions for water, electric and gas utilities. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise with a strong focus on developing comprehensive, sustainable solutions.

For more information on how Xylem can help you, go to www.xylem.com

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The original instruction is in English. All non-English instructions are translations of the original instruction.