Demand more

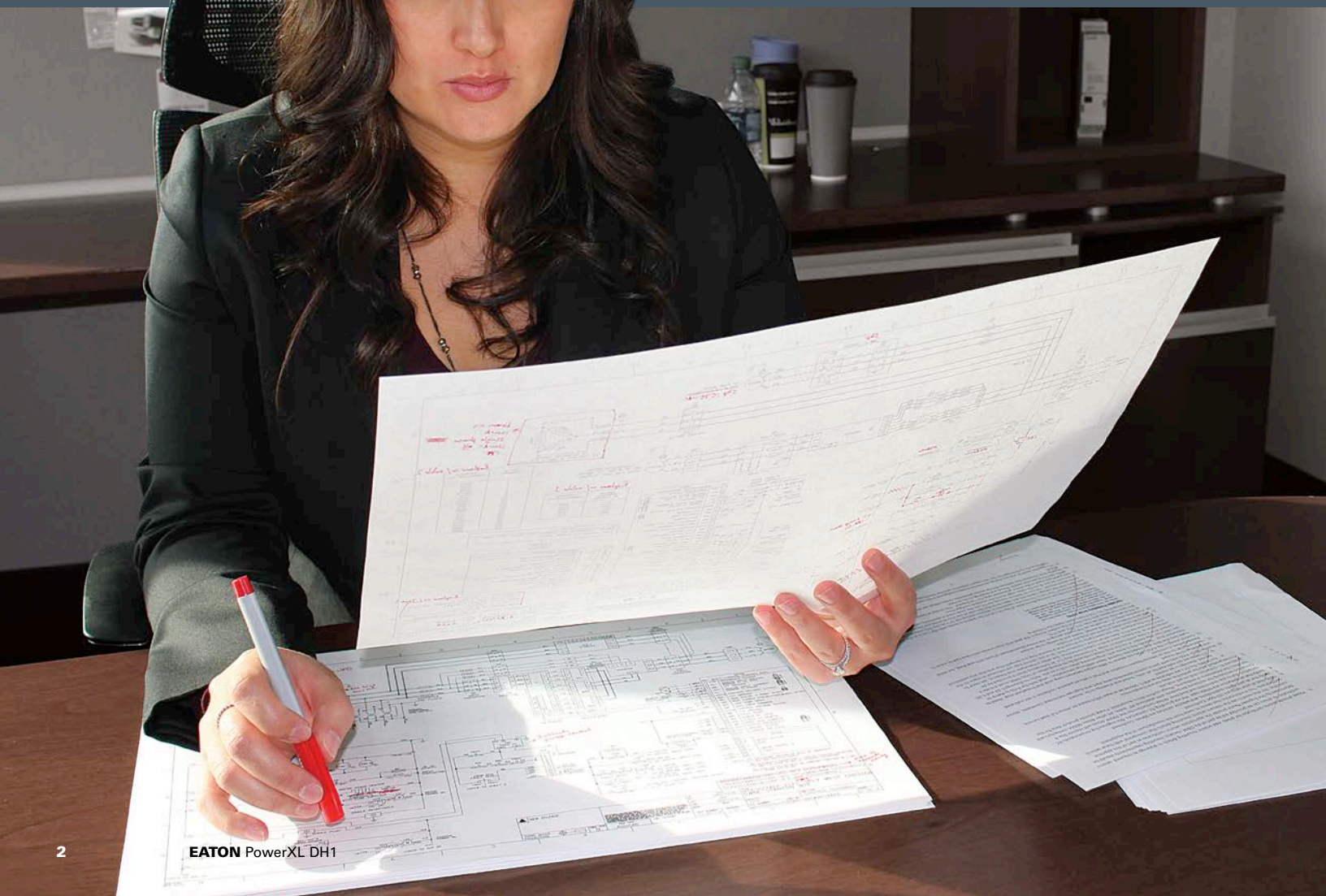
Eaton's PowerXL DH1 HVAC/R variable frequency drives

Powering Business Worldwide

Demand more expertise

Work with a VFD supplier for whom every detail, every idea and every concept counts. High short-circuit current ratings (SCCR), robust design and exceptional serviceability offer increased safety, efficiency and reliability. These are the innovative features and capabilities built into the PowerXL DH1 HVAC variable frequency drive.

Eaton's team of solid-state motor control experts have worked tirelessly to craft a device that is feature-rich, reduces energy consumption by up to 10% above a standard VFDs and offers a value to our HVAC customers.



A drive for every HVAC/R application

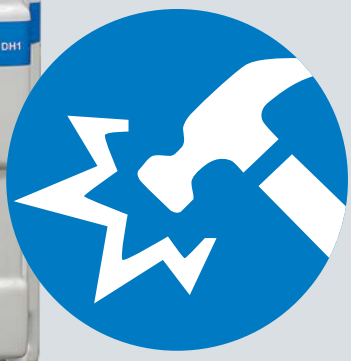
Increased **energy savings** through patented Active Energy Control® energy optimization algorithm that improves energy consumption based on system demand

Improved safety and control with on-board HVAC/R-specific system applications

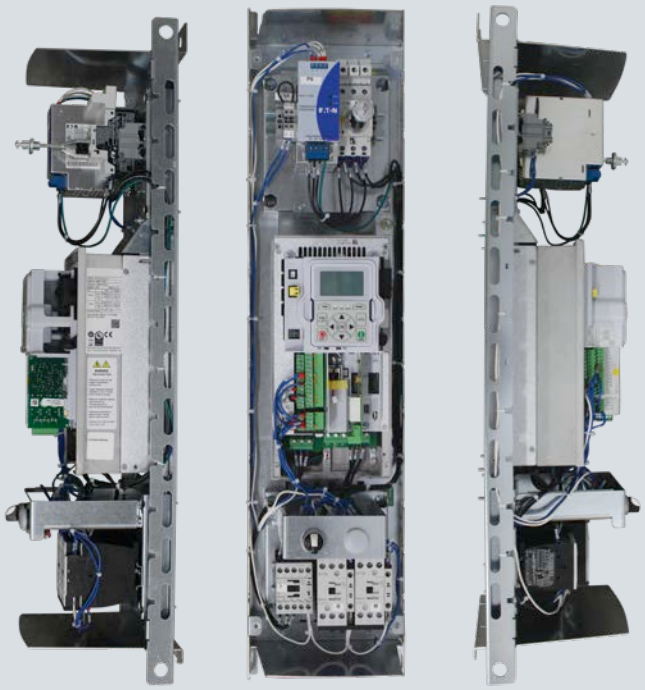
Reduced system costs through advanced system control, allowing for elimination of additional controllers

Best-in-class integral SCCR ratings provides peace of mind that your equipment will always be protected, even in bypass mode

Active Energy Control



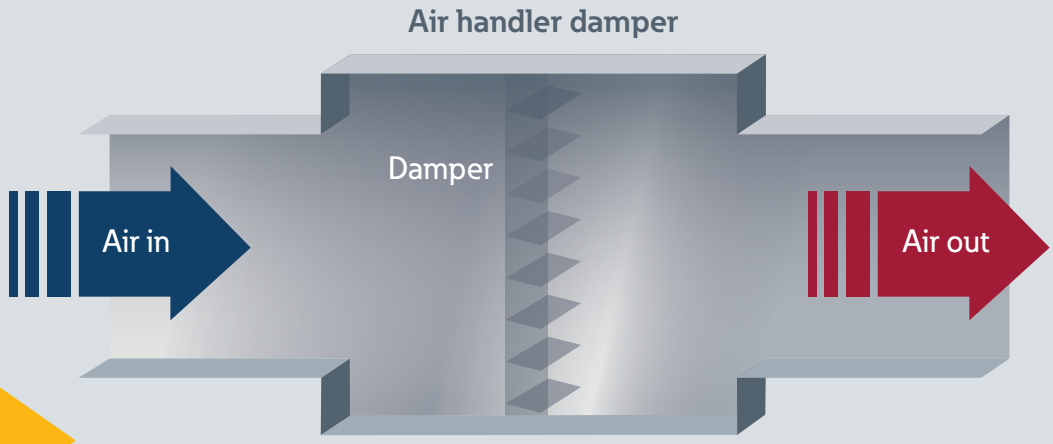
Impact resistant enclosure design



Best-in-class serviceability

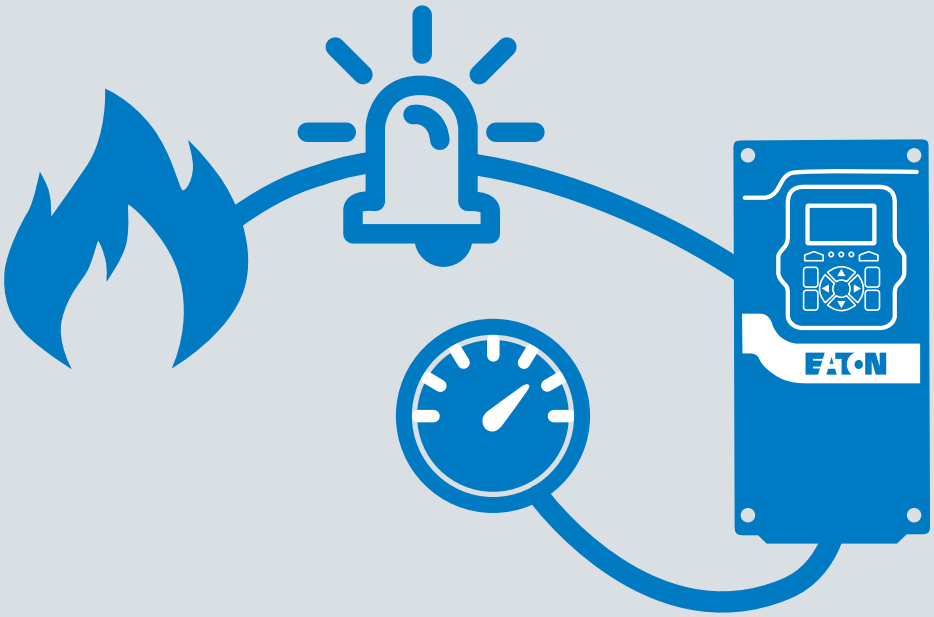
Intuitive keypad design

Damper control

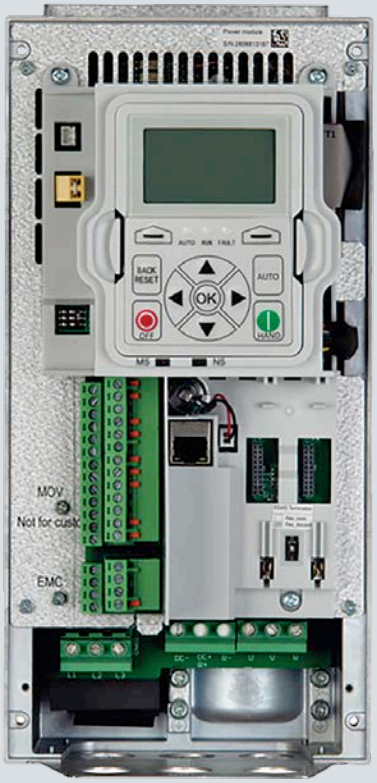


Damper control capability built-in, allowing for proper sequencing of dampers and other interlocks, protecting your equipment from improper startup.

Built-in fire mode



Best-in-class on-board I/O



- **8** digital inputs
- **1** digital output
- **2** analog inputs
- **2** analog outputs
- **3** relay outputs

BMS ready

On-board communications include:

- BACnet MS/TP
- BACnet/IP
- Modbus®/TCP
- Modbus RTU

PowerXL series—DH1 technical data and specifications

Technical data and specifications

Attribute	Description	Specification
Input ratings	Input voltage U_{in}	208 V to 240 V, 380 V to 500 V, 525 V to 600 V, –15 to 10%
	Input frequency	50 Hz to 60 Hz (variation up to 45 Hz to 66 Hz)
	Connection to power	Once per minute or less
	Starting delay	3 s (FR1 to FR2), 4 s (FR3), 5 s (FR4), 6 s (FR5 and FR6)
	Short-circuit withstand rating	100 kAIC (fuses and circuit breakers); 5 kAIC (without fuses or breakers)
Output ratings	Output voltage	0 to U_{in}
	Continuous output current	I_L: ambient temperature maximum 40 °C, up to 60 °C with derating, overload 1.1 x I_L (1 min./10 min.)
	Overload current	110% for variable torque
	Initial output current	200% (2 s / 20 s)
	Output frequency	0–400 Hz (standard)
	Frequency resolution	0.01 Hz
Control characteristics	Control methods	Frequency control
		Speed control
		Open-loop speed control
		Open-loop torque control
	Switching frequency	230 V / 480 V range: FR1–3: 1 kHz to 12 kHz FR4–6: 1 kHz to 10 kHz 230 V / 480 V defaults: FR1–3: 4 kHz FR4–5: 3.6 kHz FR6: 2 kHz 575 V range: FR1–6: 1 kHz to 6 kHz 575 V defaults: FR1–4: 3 kHz FR5–6: 2 kHz Automatic switching frequency derating in case of overload
	Frequency reference	Analog input: resolution 0.1% (10-bit), accuracy +1% Analog output: resolution 0.1% (10-bit), accuracy +1% Panel reference: resolution 0.01 Hz
	Field weakening point	20 Hz to 400 Hz
	Acceleration time	0.1 s to 3000 s
	Deceleration time	0.1 s to 3000 s
	Braking torque	DC brake: 30% x Motor Rated Torque (Tn) (without brake chopper) Dynamic braking (with optional brake chopper using an external brake resistor): 100% continuous maximum rating
Ambient conditions	Ambient operating temperature	–10 °C (no frost) to +50 °C, up to +60 °C with derating (CT) –10 °C (no frost) to +40 °C, up to +60 °C with derating (VT)
	Storage temperature	–40 °C to +70 °C
	Relative humidity	0–95% RH, noncondensing, non-corrosive
	Air quality: • Chemical vapors • Mechanical particle	Tested according to IEC 60068-2-60 Test Key: Flowing mixed gas corrosion test, Method 1 (H2S [hydrogen sulfide] and SO2 [sulfur dioxide]) Designed according to: IEC 60721-3-3, unit in operation, class 3C2 IEC 60721-3-3, unit in operation, class 3S2
	Altitude	100% load capacity (no derating) up to 3280 ft (1000 m); 1% derating for each 328 ft (100 m) above 3280 ft (1000 m); max. 9842 ft (3000 m) (2000 m for corner grounded earth main systems) For 575 V product, maximum altitude is 6561 ft (2000 m) regardless of main system
	Vibration: EN 61800-5-1 EN 60668-2-6	5–150 Hz Displacement amplitude: 1 mm (peak) at 5 Hz to 15.8 Hz (FR1–FR6) Maximum acceleration amplitude: 1g at 15.8 Hz to 150 Hz (FR1–FR6)

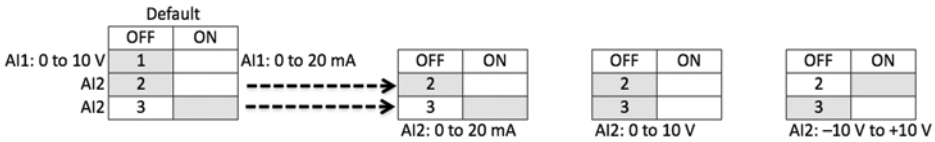
Technical data and specifications (continued)

Attribute	Description	Specification
Ambient conditions, (continued)	Shock: ISTA 1 A EN 60068-2-27	Storage and shipping: maximum 15 g, 11 ms (in package)
	Overvoltage	Overvoltage Category III
	Pollution degree	Pollution Degree 2
	Enclosure class	IP21/Type 1 standard in entire kW/hp range IP54/Type 12 option Note: Keypad or keypad hole plug required to be mounted in drive for IP54/Type 12 rating
	Immunity	Fulfills EN 61800-3 (2004), first and second environment
	MTBF	FR1: 165,457 hours FR2: 134,833 hours FR3: 102,515 hours FR4: 121,567 hours FR5: 108,189 hours FR6: 100,000 hours
	Noise	FR1: 51.2 dB FR2: 58.6 dB FR3: 61.0 dB FR4: 68.0 dB FR5: 69.1 dB FR6: 73.2 dB
Standards	Safety	UL® 508C, CSA® C22.2 No. 274-13 and EN 61800-5-1
	EMC	+EMC2: EN 61800-3 (2004), Category C2 The drive can be modified for IT networks and corner grounding TN system
	Electrostatic discharge	Second environment, IEC 61000-4-2, 4 kV CD or 8 kV AD, Criterion B
	Fast transient burst	Second environment, IEC 61000-4-4, 2 kV/5 kHz, Criterion B
	Dielectrical strength	Primary to secondary: 3600 Vac/5100 Vdc Primary to earth: 2000 Vac/2828 Vdc
	Approvals	EAC, RCM (C-Tick), RoHS, CE, UL and cUL® (see nameplate for more detailed approvals)
Fieldbus connections		Onboard: BACnet/IP, BACnet MS/TP, Modbus TCP, Modbus RTU
Safety/ protections	Overvoltage protection	Yes
	Overvoltage trip limit	230 V drives: 456 V 480 V drives: 911 V 575 V drives: 1100 V
	Undervoltage protection	Yes
	Undervoltage trip limit	230 V drives: 211 V 480 V drives: 370 V 575 V drives: 550 V
	Earth fault protection	Yes Default: 15% motor FLA Minimum: 0% motor FLA Maximum: 30% motor FLA
	Input phase supervision	Yes
	Motor phase supervision	Yes
	Overcurrent protection	Yes
	Unit overtemperature protection	Yes
	Motor overload protection	Yes
	Motor stall protection	Yes
	Motor underload protection	Yes
	DC bus overvoltage control	Yes
	Short-circuit protection of 24 V reference voltages	Yes
	Surge protection	Yes (differential mode 2 kV; common mode 4 kV) 230 V drives: 275 Vac, 10,000 A 480 V drives: 320 Vac, 8000 A 575 V drives: 385 Vac, 10,000 A
	Common coated boards	Yes (prevents corrosion)

DH1 basic application control I/O configuration

- Run 240 Vac and 24 Vdc control wiring in separate conduit
- Communication wire to be shielded

I/O connection table

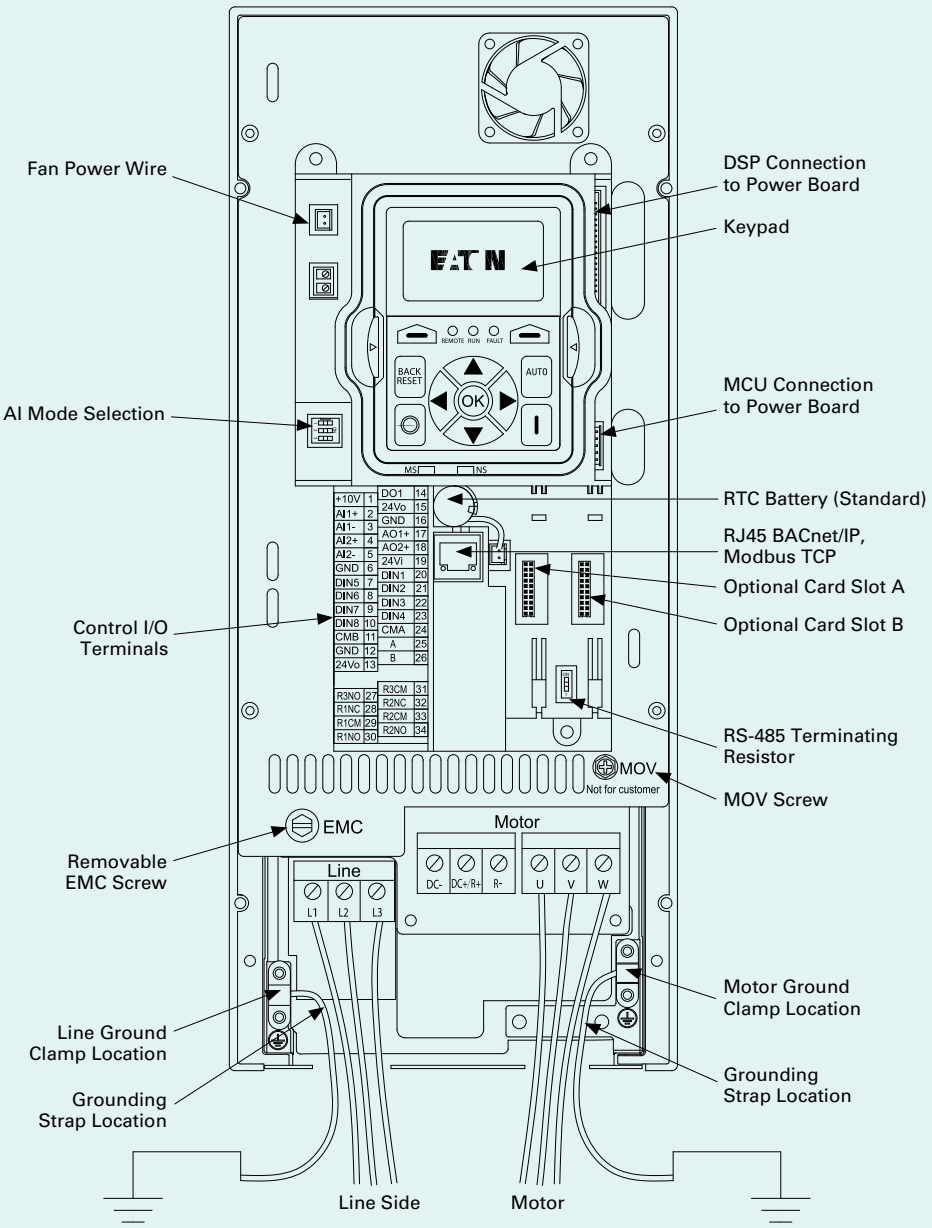


External wiring	Pin	Signal name	Signal	Default setting	Description
	1	+10 V	Ref. Output Voltage	—	10 Vdc Supply Source
	2	AI1+ ❶	Analog Input 1	0–10 V	Voltage Speed Reference (Programmable to 4–20 mA)
	3	AI1–	Analog Input 1 Ground	—	Analog Input 1 Common (Ground)
	4	AI2+ ❶	Analog Input 2	4–20 mA	Current Speed Reference (Programmable to 0–10 V)
	5	AI2–	Analog Input 2 Ground	—	Analog Input 2 Common (Ground)
	6	GND	I/O Signal Ground	—	I/O Ground for Reference and Control
	7	DIN5	Digital Input 5	Preset Speed B0	Sets frequency output to Preset Speed 1
	8	DIN6	Digital Input 6	Fire Mode	Enables drive into Fire Mode
	9	DIN7	Digital Input 7\TI+	Bypass Start	Enables drive into Bypass mode waiting for drive start
	10	DIN8	Digital Input 8\TI-	Force Auto	Input forces drive into Auto Control place
	11	CMB	DI5 to DI8 Common	Grounded	Allows source input
	12	GND	I/O Signal Ground	—	I/O Ground for Reference and Control
	13	24 Vo	+24 Vdc Output	—	Control voltage output (100 mA maximum)
	14	DO1	Digital Output 1	Ready	Shows the drive is ready to run
	15	24 Vo	+24 Vdc Output	—	Control voltage output (100 mA maximum)
	16	GND	I/O Signal Ground	—	I/O Ground for Reference and Control
	17	AO1+	Analog Output 1	Output Frequency	Shows Output frequency to motor 0–60 Hz (4–20 mA)
	18	AO2+	Analog Output 2	Motor Current	Shows Motor current of motor 0–FLA (4–20 mA)
	19	24 Vi	+24 Vdc Input	—	External control voltage input
	20	DIN1	Digital Input 1	Run Forward	Input starts drive in forward direction (start enable)
	21	DIN2	Digital Input 2	Run Reverse	Input starts drive in reverse direction (start enable)
	22	DIN3	Digital Input 3	External Fault	Input causes drive to fault
	23	DIN4	Digital Input 4	Fault Reset	Input resets active faults
	24	CMA	DI1 to DI4 Common	Grounded	Allows source input
	25	A	RS-485 Signal A/+	—	Fieldbus Communication (Modbus, BACnet)
	26	B	RS-485 Signal B/–	—	Fieldbus Communication (Modbus, BACnet)
	27	R3NO	Relay 3 Normally Open	Fault	Relay output 3 shows VFD is Faulted
	28	R1NC	Relay 1 Normally Closed	Bypass Run	Relay output 1 shows VFD is in a bypass run state
	29	R1CM	Relay 1 Common	Bypass Run	Relay output 1 shows VFD is in a bypass run state
	30	R1NO	Relay 1 Normally Open	Bypass Run	Relay output 1 shows VFD is in a bypass run state
	31	R3CM	Relay 3 Common	Fault	Relay output 3 shows VFD is Faulted
	32	R2NC	Relay 2 Normally Closed	Run	Relay output 2 shows VFD is in a drive run state
	33	R2CM	Relay 2 Common	Run	Relay output 2 shows VFD is in a drive run state
	34	R2NO	Relay 2 Normally Open	Run	Relay output 2 shows VFD is in a drive run state

Notes: The above wiring demonstrates a SINK configuration. It is important that CMA and CMB are wired to ground (as shown by dashed line). If a SOURCE configuration is desired, wire 24 V to CMA and CMB and close the inputs to ground. When using the +10 V for AI1, it is important to wire AI1– to ground (as shown by dashed line). If using +10 V for AI1 or AI2, terminals 3, 5 and 6 need to be jumpered together.

❶ AI1+ and AI2+ support 10K potentiometer.

DH1 control board layout



We make what matters work.*

* At Eaton, we believe that power is a fundamental part of just about everything people do. Technology, transportation, energy and infrastructure—these are things the world relies on every day. That's why Eaton is dedicated to helping our customers find new ways to manage electrical, hydraulic and mechanical power more efficiently, safely and sustainably. To improve people's lives, the communities where we live and work, and the planet our future generations depend upon. Because that's what really matters. And we're here to make sure it works.

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