1. SDB-1-2450-A

Product datasheet

The SmartD Clean Power Variable Frequency Drive is a compact AC drive that utilizes SmartD's patented algorithms, combined with Wide Bandgap (WBG) transistor technology.

Producing a clean and pure sine wave to power and control 3-phase AC induction motors has never been easier.

The SmartD VFD features essential built-in benefits for space, wiring, and time savings. It eliminates the need for filters on both the input and output, and guarantees a longer motor lifetime.



Variable Frequency Drive for AC motors

- 3-level inverter with SiC technology
- Pure sine wave 3-phase power output, no dV/dt or sine filter required
- Ultra-low harmonics — No input filter needed
- Long cable runs, legacy motor friendly
- V/f open and closed loop
- Field Oriented Control, open and closed loop
- Multifunctional, digital, and analog IOs
- Built-in Torque Deactivation inputs
- 24 VDC power supply input
- Dual Ethernet port
- Fire emergency mode
- Configurable Linear Ramps
- Starting torque boost
- Integrated EMC filters
- Set, monitor, and control it with an app
- Pluggable display
- Natural language user interface

Get the Clean Power VFD mobile App

User Guide:

Download on the App Store

Get it on Google Play

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2. Ratings SDB-1-2450-A

Power Supply

Supply Type		Wye, solidly grounded. TT and TN systems
Input Voltage	VAC	3 ~ 400 .. 480 | -15% .. +10%
Input Frequency	Hz	50 .. 60 | -5% .. +5%
Input Current	A	86
Apparent Power	kVA @ 480V	72
Prospective Line Isc (SCCR)	kA	100 (see Protection guide—USA/Canada or IEC—for required upstream protective device)
THDi Total Harmonic Distortion (current)	%	<3 % at load levels of 50% or greater
Imbalance max. of nominal phase to phase input voltage	%	-/+ 3%
Power factor		near unity

Electrical safety Characteristics

Overvoltage category		III (OVC III)
Protective Class of VFD		Class I

Output capabilities

Output Voltage	VAC	up to 400 .. 480, depending on input voltage
Continuous Output Current - Normal Duty	A	82 @ 460 VAC 85 @ 400 VAC
Continuous Output Current - Heavy Duty	A	68 @ 460 VAC 68 @ 400 VAC
Max Transient Output current - Normal Duty During 60s, every 10 minutes at 50 °C (122 °F)	A	91 @ 460 VAC 91 @ 400 VAC
Max Transient Output current - Heavy Duty During 60s, every 10 minutes at 50 °C (122 °F)	A	102 @ 460 VAC 102 @ 400 VAC
Output Speed Frequency	Hz	0.1 .. 120
Nominal Switching Frequency	kHz	105
Effective Switching Frequency	kHz	210

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Indicative Motor Power*

Motor power - Normal Duty	kW	45 - 3 ~ 400 VAC 50/60 Hz 45 - 3 ~ 460 VAC 50/60 Hz
Motor power - Normal Duty	hp	60 - 3 ~ 400 VAC 50/60 Hz 60 - 3 ~ 460 VAC 50/60 Hz
Motor power - Heavy Duty	kW	37.5 - 3 ~ 400 VAC 50/60 Hz 37.5 - 3 ~ 460 VAC 50/60 Hz
Motor power - Heavy Duty	hp	50 - 3 ~ 400 VAC 50/60 Hz 50 - 3 ~ 460 VAC 50/60 Hz

** Motor power values are indicative. They vary depending on the motor type, technology, and manufacturer. The Clean Power VFD must not be selected based on the motor power rating.*

The Clean Power VFD must be selected based on the motor Full Load Amperage (FLA), the load's driving force, the movement cycle, and the operating environment.

The Clean Power VFD must be chosen by skilled and experienced personnel.

Efficiency

IE Class		2
Efficiency	%	96

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3. Cable and Environment

Motor cable length

Max Motor Cable Length	m / ft	up to 4500 / 15,000 without output filter
Sine Wave Cable Compatibility		Standard industrial-grade cables (shielding optional)
Voltage Drop Limit	%	Max 3% of rated motor voltage ($\sqrt{3} \cdot R \cdot L \cdot I$)

Important Installation Guidance for Clean Power VFD: Cable Selection, Performance Impacts, and Autotuning Tips:

The Clean Power VFD outputs a pure sine wave, allowing for very long cable lengths without the need for filters or VFD-rated cable. However, performance depends on proper cable sizing:

- Undersized cables increase voltage drop and motor heating
- Excessive length or shielding raises reactive current (charging)
- For best autotuning results, use short cable or manual motor data
- Always evaluate ampacity, voltage drop, and terminal compatibility before final installation.

Environment and deratings

The Clean Power VFDs are manufactured with precision electronic components.

Therefore, the installation environment can impact the lifespan and reliability of the product.

The information below describes the recommended operation and installation conditions for the Clean Power VFD.

The user must comply with the environmental conditions listed below to ensure the Clean Power VFD operates safely and correctly.

Failure to adhere to these environmental conditions may shorten the device's lifespan, lead to malfunctioning and failure, and void the warranty.

Installation area	The Clean Power VFD must be mounted in a well-ventilated electrical cabinet, respecting the clearance distances described in this document.
Operating temperature	The normal operating range of the Clean Power VFD is **-15 to 50°C** without derating**, 50 to 60°C with derating of 2% per °C**. If not specified otherwise (e.g., SDB-1-2220-AL) The reliability of the Clean Power VFD increases in environments where temperature fluctuations are limited. When using an enclosure, install a cooling fan or air conditioner in the area to ensure the air temperature inside the housing does not exceed the specified levels. Do not allow ice to form on the frequency converter.
Relative humidity	Below 95% non-condensing.
Surrounding environment pollution degree	2, conforming to IEC61800-5-1
Storage temperature	-40...70 °C / -40...158 °F
Surrounding area	Mount in an area free of • oil mist and dust-metal shavings, oil, water, or other foreign materials • radioactive materials • combustible materials • toxic or corrosive gases and liquids • excessive vibration • chlorides • direct sunlight • EMI source and other electronic devices that are sensitive to EMI

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Altitude	**Lower than 2000 m/6600 ft.** Contact SmartD Technologies Inc. if you intend to use the Clean Power VFD at a higher altitude.
Vibrations	Mount in a location where vibrations are less than an amplitude of 1.5 mm peak to peak (f= 2...13 Hz) and acceleration lower than 1 gn (f= 13...200 Hz).

Best practices:

To prevent high surrounding air temperature, users should design their electrical panel following the listed best practices:

- No heat stagnation in the panel.
- Sufficient heat dissipation of the panel (Size not too small, proper ventilation).
- Ventilation slits of the Clean Power VFD are not blocked by any object such as cable or cable trays.
- Avoid the proximity of any exothermic device.
- Ensure the mounting orientation of the Clean Power VFD allows an optimized airflow.
- Respect the clearance distances.

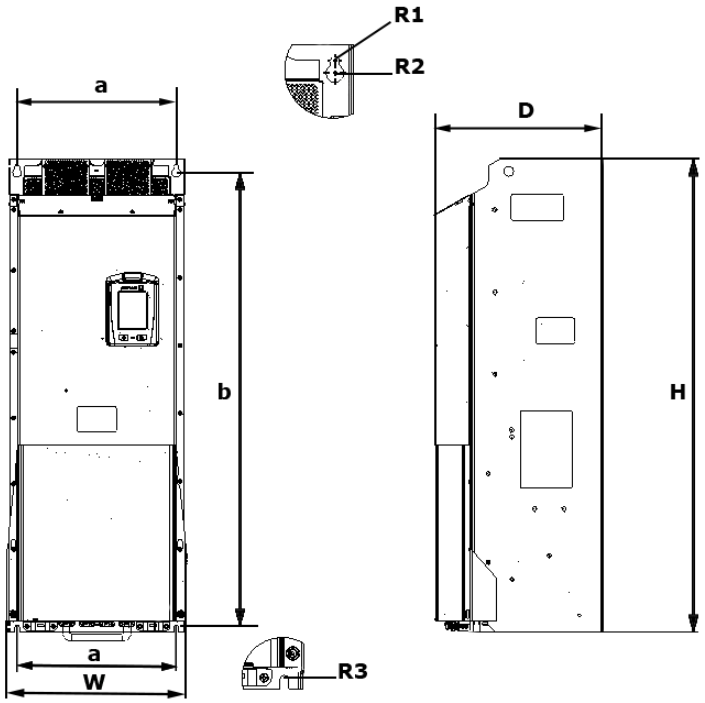
4. Enclosure

Enclosure

Enclosure type	UL type 1
Rating	IP 20 according to IEC60529
Material	UL94V0 Chassis: mild steel (galvanized) Body: ABS/PC

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5. Dimensions — Size S4 — SDB-1-2450-A



W	350mm	13.78 in.
H	940.5 mm	37.03 in.
D	329.5 mm	12.97 in.
Weight	60.4 kg	133.16 lb

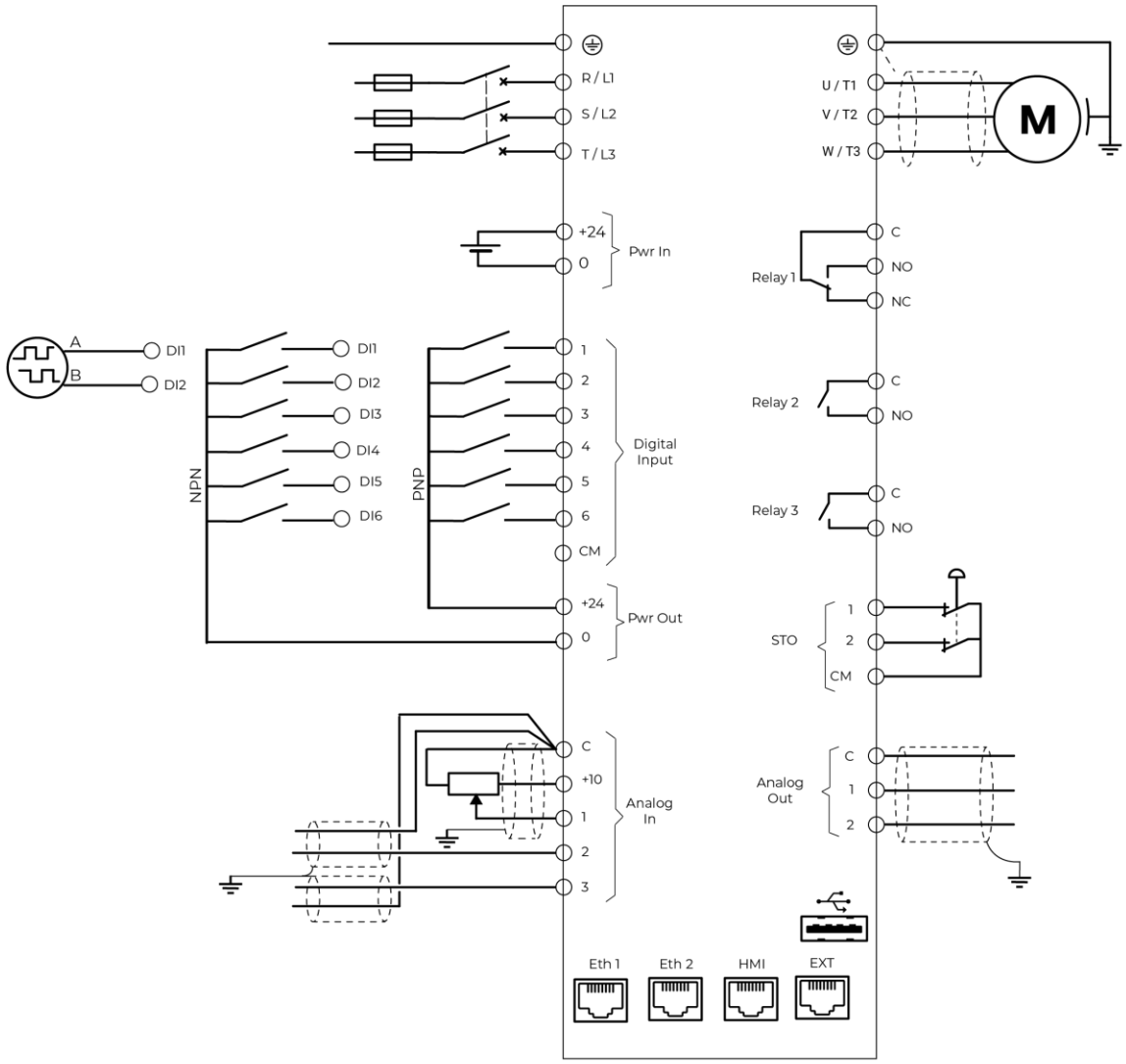
a	311 mm	12.24 in.
b	900 mm	35.43 in.
R1	4.5 mm	0.177 in.
R2	9 mm	0.354 in.
R3	4.5 mm	0.177 in.
Screw size	M8	5/16

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6. Wiring diagram

This diagram illustrates the typical connections of the Clean Power VFD, part numbers that embed an active front end (AFE)

Mandatory upstream protection is described in sections Selecting Power Cables in regions following IEC practices and Power cables and fuses specifications for USA and Canada



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7. Power terminals

Clean Power VFD models	Terminal	Screw	Tightening torque	 Conductor stripping length	 solid conductor cross-section
Models size S3 and size S4	Ground	- Thread: M5, - Slotted screwdriver size (Blade thickness x Width)(mm): 1.0x5.5 - Philips screwdriver size: PH2	-Rated: 3.8 N.m / 33.6 in-lbs -Recommended min: 3.73 N.m / 33.01 in-lbs -Recommended max: 4.5 N.m / 39.8 in-lbs	18 to 19 mm 0.71 to 0.75 in.	max 35 mm^2 max AWG 2
	R/L1, S/L2, T/L3	Thread: M5, - Slotted screwdriver size (Blade thickness x Width)(mm): 1.0x5.5 - Philips screwdriver size: PH2	-Rated: 3.8 N.m / 33.6 in-lbs -Recommended min: 3.73 N.m / 33.01 in-lbs -Recommended max: 4.5 N.m / 39.8 in-lbs	18 to 19 mm 0.71 to 0.75 in.	max 35 mm^2 max AWG 2
	U/T1, V/T2, W/T3	Thread: M5, - Slotted screwdriver size (Blade thickness x Width)(mm): 1.0x5.5 - Philips screwdriver size: PH2	-Rated: 3.8 N.m / 33.6 in-lbs -Recommended min: 3.73 N.m / 33.01 in-lbs -Recommended max: 4.5 N.m / 39.8 in-lbs	18 to 19 mm 0.71 to 0.75 in.	max 35 mm^2 max AWG 2

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8. Control specifications

Digital Input Signal Integrity:

Incorrect digital input states can lead to unintended drive behavior.

Improper wiring or excessive input voltage may cause the VFD to misinterpret input signals (0/1 logic state). This can result in:

- Unexpected motor start when a stop command is intended
- Failure to start when a run command is issued
- Incorrect rotation direction selection

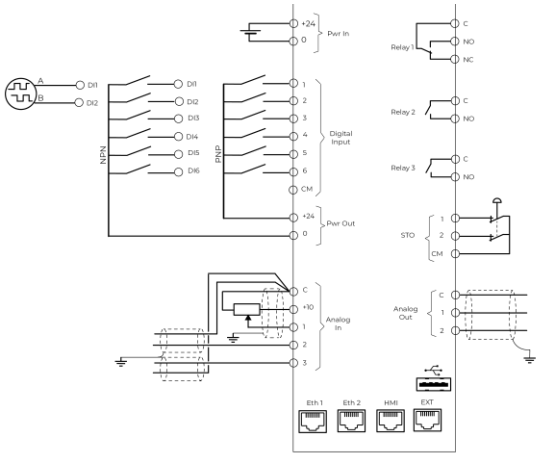
Instructions:

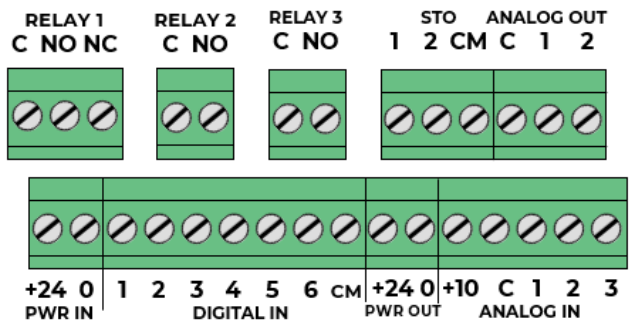
- Verify wiring against the control diagram before commissioning
- Confirm logic configuration (NO/NC) matches the application intent
- Measure input voltage levels to ensure they remain within specification
- Validate input status via HMI or mobile app before enabling motor operation

Failure to follow these instructions may result in unintended motor operation.

Control Circuit Connection Diagram and functions

The illustration below shows the detailed layout of control wiring terminals.





Control terminal blocks Features:

- Screw type: M3
- Tightening torque: 0,5 Nm / 4.5 in-lbs.
- Conductor type: copper only
- Conductor stripping length: 7 mm / 0.28 in
- Solid conductor cross-section: 0.05mm² ... 2,5 mm² / AWG 30 ...12
- Flexible conductor cross-section with Ferrule: 0,05 mm² ... 2,5 mm² / AWG 30 ... 12

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24VDC power in

The 24VDC auxiliary supply will power the Clean Power VFD control board without line power, allowing the control board, communications, and the HMI to continue to operate.

It is recommended that you connect a 24VDC to this auxiliary power input, as this allows you to export logs for support and troubleshooting purposes if needed.

If a 24VDC is used while commissioning the Clean Power VFD and line power is absent, the Clean Power VFD will be in the under-voltage alarm state.

Ensure to use a DC power supply that meets the following specifications:

- Nominal operating voltage: 24 VDC
- Minimum continuous operating voltage: 19.2 VDC
- Maximum continuous operating voltage: 28.8 VDC
- Maximum power supply requirement at 24V: 50 W
- Recommended protection fuse: 4A - 50 VDC

! To ensure proper operation and avoid potential issues like ground loops, noise interference, and malfunctions, do not connect the 24VDC common terminal to the ground.

Read carefully and apply the recommendations from the user guide chapter Grounding

24VDC power out

This power is used to energize the digital inputs or to energize some sensors.

Ensure that the maximum current level, as defined in the following specifications, is respected.

- Nominal operating voltage: 24 VDC
- Minimum continuous operating voltage: 19.2 VDC
- Maximum continuous operating voltage: 28.8 VDC
- Maximum output current at 24V: 100mA
- Recommended protection fuse: 4A - 50 VDC

Digital input terminals

Marking	Name	Default Operation
1	Digital input 1	User-settable. It can be used for an encoder, phase A. Default setting: unused
2	Digital input 2	User-settable. It can be used for an encoder, phase B. Default setting: unused
3	Digital input 3	Run forward
4	Digital input 4	Run Reverse
5	Digital input 5	Stop
6	Digital input 6	Select reference speed between preset 1 and analog input 1
+24	Common terminal for digital inputs	

The user can assign the digital inputs to various functions such as:

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- Rotation direction,
- Stop,
- Selection of the speed setpoint source
- Selection of the local/remote control mode

Check the complete list in the chapter "Digital Input Settings"

Their logic operation is also user-settable; the choices are between:

- rising or falling edge
- level high or low

Last, a debounce delay is also user-settable to avoid false input triggering. This timer's range is 0 to 5000 ms; its default value is 200 ms.

Analog Input Terminals

Marking	Name	Default Operation
1	Analog input 1	Speed reference (Hz) - preset to be used as potentiometer input
2	Analog input 2	un-assigned
3	Analog input 3	un-assigned
+10V	Reference power supply	10VDC - 10 mA max
C	Common terminal for Analog inputs	

The user can assign analog inputs from AI1 to AI3 to various functions and electrical signals.

Available choices for the functions are

- Speed (frequency - Hz) setpoint
- Velocity (RPM) setpoint
- PTC motor thermal sensor
- Unused.

Check the complete list in the chapter " Analog input settings"

The signal that can be wired to the Analog input can be either

- 0..10VDC,
- 4..20mA,
- PTC.

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Relay output terminals

Relay 1: SPDT

Marking	Name	Default Operation
C	Common of the contacts	Relay 1 (SPDT) is assigned by default to be the alarm relay. The relay is energized when there is no alarm present (C and NO connected). The relay is de-energized when there is an alarm or a loss of power supply (C and NC connected)
NO	Normally opened contact	
NC	Normally closed contact	

Relays 2 and 3: NO

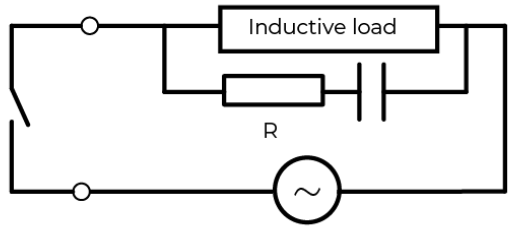
Marking	Name	Default Operation
C	Common of the contact	Relay 2 (NO) is the factory default setting to be closed when the drive is in the state “ready to run”. Relay 3 (NO) is the factory default setting to be closed when the drive is in the state of “running”.
NO	Normally opened contact	

The operation of the 3 independent relay outputs of the Clean Power VFD can be set by the user.

The settings are described in the chapter " Relays setting"

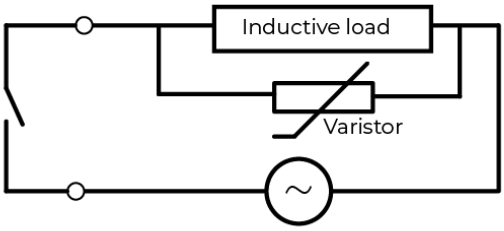
Relays protection

Always protect relay outputs from inductive load damage, using an appropriate external protective circuit or device.



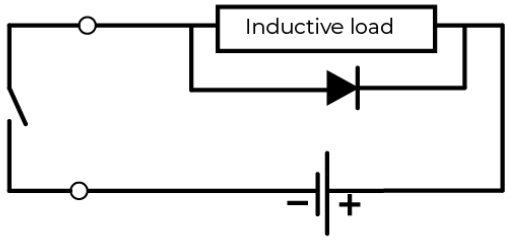
C: a capacitor from 0.1 to 1 μF.

R: resistor of approximately the same resistance value as the load.



In applications where the inductive load is switched on and off frequently and/or rapidly, ensure that the continuous energy rating (J) of the varistor exceeds the peak load energy by 20 % or more.

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Use a diode with the following ratings:

Reverse withstand voltage: power voltage of the load circuit x 10.

Forward current: more than the load current.

Analog Output Terminals

Marking	Name	Default Operation
1	Analog output 1	Analog Output 1 is factory-preset to be assigned to the motor frequency. The preset signal is 0..10VDC
2	Analog output 2	Analog Out 2 is factory-preset to be assigned to the motor current I_{rms} total. The preset signal is 0..10VDC
C	Common terminal for Analog outputs	

The user can assign analog outputs 1 and 2 to various functions and electrical signals.

Available choices for the functions are

- Motor Current
- Motor Frequency
- Motor Torque
- Motor Power
- Unused.

Check the complete list in the chapter "Analog outputs setting"

The signal that is delivered by the analog output can be either

- 0..10VDC
- 0..20mA
- 4..20mA.

Selection and scaling are made using the mobile App.

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Torque Deactivation terminals

The Torque Deactivation enabling terminals are positive logic input only.

The user is responsible for ensuring the complete system is safe and designed correctly according to the relevant safety standards.

If the Torque Deactivation function is not required, the terminals STO1 and STO2 must remain connected to +24VDC.

Marking	Name	Default settings
STO1	Torque Deactivation - input 1	Open: Torque Deactivation is enabled, and the Clean Power VFD output is de-energized. Closed: Torque Deactivation is disabled, and the Clean Power VFD is in normal operation Note: Remove the jumper between STO1 and +24V using the torque deactivation input. The length of the wire should not exceed 30 m (98.4 ft).
STO2	Torque Deactivation - input 2	Open: Torque Deactivation is enabled, and the Clean Power VFD output is de-energized. Closed: Torque Deactivation is disabled, and the Clean Power VFD is in normal operation Note: Remove the jumper between STO1 and +24V using the torque deactivation input. The length of the wire should not exceed 30 m (98.4 ft).
+24 / CM	Torque Deactivation supply connection	Delivers +24V for the Torque Deactivation inputs when the VFD is configured in Source logic mode. Refer to the digital input logic connection section to wire the Torque Deactivation terminals correctly

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9. Certifications and marking

Overview

SmartD Technologies is committed to delivering Variable Frequency Drives (VFDs) that meet the highest standards of safety, reliability, and sustainability.

The Clean Power VFD family has been designed and tested following globally recognized standards for safety, electromagnetic compatibility (EMC), environmental performance, and product safety certification.

Compliance with these standards ensures that our drives are suitable for use in industrial environments, are compatible with other electrical equipment, and meet international requirements for energy efficiency and environmental responsibility.

Traceability of Standard Revisions

Standards listed on this page represent the regulatory scope applicable to the Clean Power VFD family.

Note on Versioning: As standards evolve, the specific revision year (e.g., *Edition 2* vs. *Edition 3*) applied to a product depends on its certification date.

To identify the exact standard revisions applied to your specific SKU, please refer to our **SmartD VFD Certification Matrix.**

Safety Standards Compliance

The Clean Power VFD is built in conformity with both North American and international safety standards applicable to adjustable speed electrical power drive systems.

Standard	Description	Region
UL 61800-5-1	Safety requirements for electrical power drive systems	United States
CSA C22.2 No. 274	Canadian national standard equivalent to UL 61800-5-1	Canada
IEC 61800-5-1	International standard for safety requirements of adjustable speed electrical power drive systems	International

Certification File: cULus Listed — File Number **E5231214**

Markings: cULus Listed (U.S. and Canada)

Electromagnetic Compatibility (EMC)

The Clean Power VFD conforms to the EMC requirements applicable to adjustable speed power drive systems, as defined by the following standards:

IEC 61800-3 – EMC requirements for variable speed electrical power drive systems

This includes both emission and immunity performance for second environment installations (all establishments other than those directly connected to a low voltage power supply network which supplies buildings used for domestic purposes). The Clean Power VFD supports installations compliant with Category C3 environments, as defined by IEC 61800-3 (PDS of rated voltage less than 1,000 V, intended for use in the second environment and not intended for use in the first environment).

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Immunity to Disturbances

The VFD has been tested and verified to ensure robustness in the presence of common electromagnetic disturbances. It complies with the following immunity standards:

Standard	Description
IEC 61000-4-2	Electrostatic discharge (ESD) immunity
IEC 61000-4-3	Radiated, radio-frequency, electromagnetic field immunity
IEC 61000-4-4	Electrical fast transient/burst immunity
IEC 61000-4-5	Surge immunity
IEC 61000-4-6	Conducted disturbances induced by radio-frequency fields
IEC 61000-4-11 and -4-34	Voltage dips, short interruptions, and voltage variations

Environmental and Eco-design Standards

SmartD's environmental practices and product design conform to international regulations on energy efficiency and hazardous substances.

Standard	Description
IEC 61800-9-2	Eco-design requirements for power drive systems and motor systems
IEC 63000	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances (RoHS)

These standards align with broader sustainability and circular economy goals and support compliance with the European **Eco-design Directive** and **RoHS Directive**.

CE Marking and EU Directives

Where applicable, Clean Power VFDs are marked with the CE logo and comply with the following European Union directives:

Directive	Description
2014/35/EU	Low Voltage Directive (LVD)
2014/30/EU	Electromagnetic Compatibility Directive (EMC)
2019/1782/EC	Eco-design requirements for power supplies
2011/65/EU	Restriction of Hazardous Substances (RoHS) Directive

⚠ **Note**: CE marking is available only for specific part numbers. Please consult the Declaration of Conformity or check the Certification Matrix

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REACH (EC 1907/2006)

SmartD's VFDs are supplied as articles under REACH and are not intended to release substances during normal or reasonably foreseeable use.

We maintain a supplier-to-product due diligence process to monitor the ECHA Candidate List of Substances of Very High Concern (SVHC) and Annex XVII restrictions.

To the best of our knowledge at the time of shipment, our products do not contain SVHCs above 0.1% w/w. If an SVHC were present above 0.1% w/w in any component, SmartD would fulfill Article 33 communication duties and, where applicable, submit a SCIP notification.

Note: REACH is separate from CE marking; a standalone REACH statement is available for download

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10. Certification

SmartD is committed to meeting the highest standards of safety and quality.

This certification matrix serves as the official reference for the conformity of our Variable Frequency Drives to key international standards, including UL, cUL, CE marking, and REACH regulations.

All information is current as of January 9th, 2026.

Section 1: North American Safety (UL / CSA)

Applicable for markets requiring cULus Listing.

VFD Model	UL:	CSA:
SDB-1-2450-A	UL 61800-5-1, 2nd Ed, Rev. 2022-06-24	CSA C22.2 No. 274, 2nd Ed, Issued 2017-04

Section 2: International & European Compliance (IEC / EN)

Applicable for CE Marking and Global markets.

VFD Model	CE mark	Directive	Standard	Applied Version
SDB-1-2450-A	yes	**Low Voltage directive**	IEC 61800-5-1	2007 - Including AMD1:2016
		Electro-magnetic compatibility	IEC 61800-3	2022
			(Product Standard)	• IEC 61000-4-2 Electrostatic discharge • IEC 61000-4-3Radiated, radio-frequency, electromagnetic field • IEC 61000-4-4Electrical fast transient/burst • IEC 61000-4-5Surge • IEC 61000-4-6Conducted disturbances induced by radio-frequency fields • IEC 61000-4-11 and -4-34 Voltage dips, short interruptions, and voltage variations
		Eco Design	IEC 61800-9-2	Edition 2.0 2023-10
		Restriction of Hazardous Substances 2	IEC 63000	2018

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