SOLID-STATE POWER DISTRIBUTION UNIT

SSPDU-270D-14-140-CXX

The SSPDU-270D-14-140-CXX is a high-power density, low-profile solid-state power distribution unit designed to efficiently manage and distribute input voltages ranging from 100 to 400 VDC across 14 independent output channels. Each channel is capable of delivering 10A and offers advanced features such as user-configurable I^2T protection, programmable overload protection, and controlled voltage rise and fall times to reduce electromagnetic interference and inrush currents.

- 14 Independent Channel Outputs
- User Adjustable I^2t Protection / Thermal Memory
- High Capacitance Load Control with Controlled Output Voltage Rise Time
- Channel Outputs with Rated Current of 10A
- Channel Paralleling Option for High Output Currents
- Cooling by Conduction
- Continuous Built-in Test
- Protection Override (Battle Mode)
- CAN and RS422/RS485 Interface
- Discrete Control Interface
- User Configuration Settings Stored in Internal Memory

VERTE Elektronik's SSPDU-270D-14-140-CXX series is designed as a high-power density, low-profile power distribution unit. This unit, which has 14 channel outputs, distributes the input voltage in the range of 100-400 V to the loads via semiconductor switches and provides overload and short circuit protection. The device can be controlled and configured via CAN and RS-422/485 communication interfaces, and status information can be displayed.

The SSPDU-270D-14-140-CXX series features 14 independent channel outputs, user-adjustable I^2T protection and thermal memory, high capacitance load control, and controlled output voltage rise time. With 10A nominal current channel output, the unit offers channel paralleling options for high current requirements. Equipped with safety features like emergency shutdown and battle override mode, this unit supports continuous built-in testing, and user configuration settings stored in internal memory. It boasts 20 times higher MTBF value compared to traditional electromechanical PDUs and requires minimal maintenance.

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Product Overview

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1. PRODUCT OVERVIEW

VERTE Elektronik SSPDU-270D-14-140-CXX is a high-power density, low-profile solid-state power distribution unit designed to efficiently manage and distribute input voltages ranging from 100 to 400 VDC across 14 independent output channels. Each channel is capable of delivering up to 10A and offers advanced features such as user-configurable I²T protection, programmable overload safeguards, and controlled voltage rise and fall times to reduce electromagnetic interference and inrush currents. The unit supports real-time monitoring and control through CAN and RS-422/485 interfaces, with user settings securely stored in internal memory. Built for harsh environments, it operates reliably across a wide temperature range and adheres to stringent MIL-STD standards for durability and performance. Its compact design, coupled with innovative functionalities like emergency shutdown, battle override mode, and channel paralleling for high current applications, makes it a versatile and dependable solution for modern power management needs.

1.1. Capabilities

• 14 independent channel output

• User adjustable I²Tprotection / Thermal memory

• High capacitance load control with controlled output voltage rise time

• Channel outputs with rated current of 10A

• Channel paralleling option for high output currents

• Cooling by conduction

• Continuous built-in testing

• Protection override (Battle Mode)

• Emergency shutdown

• SAE J1939 compliant CAN and RS-422/RS485 interface

• Discrete control interface

• User configuration settings are stored internal memory

1.2. Features

• Channel status view

• Channel paralleling for high current

• Adjustable I^2T, error trip values

• Define On-Off scenario

• Record data for analysis

• Load prioritization

1.3. Benefits

• 20x more MTBF value compared to traditional electromechanical PDUs

• High density, durable design

• Minimized maintenance

• Configurable power distribution

Figure 1: SSPDU-270D-14-140-CXX

Electrical Specifications

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2. ELECTRICAL SPECIFICATIONS

Table 1: Absolute Maximum Ratings

PARAMETER	VALUE	UNIT
Switched Power In	270	V_{DC}
Continuous Output Current	140	A
Operating Temperature	–32 to +50	°C
Storage Temperature	–40 to +65	°C

Table 2: Recommended Operating Conditions

PARAMETER	UNIT	MIN	TYP	MAX
Switched Power In	V_{DC}	100	270	400
Operating Thermal Interface Temperature	°C	–40		+71

Table 3: Electrical Specifications

PARAMETER	UNIT	MIN	TYP	MAX
Trip Reset Time	ms		200	
Software Instant Trip Level (Never Trip)	% of programmed current		100	
Hardware Instant Trip Level	% of rated max current	700		850
Hardware Instant Trip Time	µs		50	
Hardware Instant Fall Time	µs		300	
Accuracy of Current Measurement	% of programmed current		5	
Current Measurement Range	% of rated max current		1000	
Accuracy of Voltage Measurement	% of 270 V_{DC}		1	
270V Voltage Measure Range	V_{DC}	100		400
Accuracy of On-Board Temperature Measurement	°C		3	

Table 4: Environmental Specifications

DESCRITION	PROCEDURE
Steady State Limits for Voltage	MIL-STD-704F, HDC102
Voltage Distortion Spectrum	MIL-STD-704F, HDC103
Total Ripple	MIL-STD-704F, HDC104
Normal Voltage Transients	MIL-STD-704F, HDC105
Power Interrupt	MIL-STD-704F, HDC201
Steady State Limits for Voltage	MIL-STD-704F, HDC301
Abnormal Voltage Transients	MIL-STD-704F, HDC302
Steady State Limits for Voltage	MIL-STD-704F, HDC401
Starting Voltage Transients	MIL-STD-704F, HDC501
Power Failure	MIL-STD-704F, HDC601
Phase Reversal	MIL-STD-704F, HDC602
Temperature & Altitude	RTCA/DO-160G Section 4, Category D2
Temperature Variation	RTCA/DO-160G Section 5, Category B
Operational Shocks and Crash Safety	RTCA/DO-160G Section 7, Category B
Vibration	RTCA/DO-160G Section 8, Category S
Explosive Atmosphere	RTCA/DO-160G Section 9, Category H
Salt Fog	RTCA/DO-160G Section 14, Category T
Icing	RTCA/DO-160G Section 24, Category A
Electrostatic Discharge	RTCA/DO-160G Section 25, Category A

Detailed Structure

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3. DETAILED STRUCTURE

3.1. On / Off Channel

The SSPDU allows to switch on and off the output channels independently through its CAN, RS-422/485 and Ethernet interfaces. The SSPDU can also switch on channels pre-configured for operating modes via discrete signals.

3.2. I²T Protection & Instant Trip

Depending on the maximum capacity of the channel, the current rating for each SSPDU channel can be programmed via communication interfaces CAN, RS-422/RS485 interface.

There are predefined channels in SSPDU as 10A maximum current limit. These channels also can be programmed to lower current limits.

The I2t algorithm is executed by the controller in the SSPDU while a continuous calculation is made. Each channel or group can be specially modeled with user-defined inrush peak current, inrush duration and nominal current values.

SSPDU have both software or hardware protection for instant trip. In software, the user can assign a value to be determined as instant trip current value. The hardware instant trip protection will be activated at 700%-850% of the maximum channel current as shown in Table 1. Hardware instant trip circuit detects fault in 50 µs and turns off the channel or group at 300µs.

Table 5: Hardware Instant Trip Limits

Channel	Nominal Trip Current	Rated Current Percentage
10A Channel	75A	700%-850%

3.3. Programmable Protections

The SSPDU has some general adjustable protection features independent of channels.

Table 6: Adjustable Error Table

ERROR TYPE	DESCRIPTION
Input Voltage Low Error	An error is generated when the input voltage drops below the set voltage
Input Voltage High Error	An error is generated when the input voltage goes above the set voltage
Temperature High Error [1,2]	An error is generated when the ambient temperature goes above the set temperature
Temperature Low Error [1,2]	An error is generated when the ambient temperature drops below the set temperature

[1] SSPDU has predefined fixed temperature limits to ensure maximum operating conditions.

[2] In case the measured ambient temperature is sent to SSPDU via RS-485/CAN.

3.4. Channel Programming / Paralleling

Within a 100mA range, each channel can be independently programmed by the user to meet the necessary current requirements for a specific implementation. Channels with the same current rating can be paralleled together to increase current capacity for high power loads. SSPDU allows a total of 7 different groups.

3.5. Controlled Turn On / Off

The channels rise and fall times are set to be on the order of 1ms for turning on and off individual channels. This reduces EMI, false tripping and inrush currents when switching into loads like motors, capacitive devices, or incandescent lamps. The channel's programmed rated load current determines the maximum load capacitance. The permitted load capacitance for each channel type is shown in the Table 9 at 270V bus voltage and 100% (max) rated current.

 The SSPDU also minimizes transient voltages caused by inductive load currents.

Table 7: Allowed Capacitive Load

Channel Type	Max Capacitance
10A	40μF

3.6. Internal Supply

SSPDU has an internal DC-DC converter structure that allows it to operate between 100 –400V input voltages. There is no need further supply input for the internal power. The SSDPU generates the internal power through distributed power.

3.7. Discrete Control Inputs

SSDPU has 8 discrete control inputs. The features become active when these internally pulled-up inputs are connected to 270VDC_RTN or GND_ISO pins according to the SSPDU version.

Table 8: Discrete Input Signals

Pin	Description
MODE_1	SSPDU operating mode selection pins. Active low operation, internally pulled up high
MODE_2	
TRIP_RESET	Reset all trip function pin. Internally pulled up high. Transition from high to low will reset the trip status of all outputs
SHUTDOWN_N	Emergency shutdown pin. Shut down all channel. Active low operation, internally pulled up high
BATTLE_OVERRIDE	When this pin is active SSPDU ignores the trip conditions except short circuit. Active low operation, internally pulled up high
DCI_INPUT_N_1[1]	Discrete control interface pins. Active low operation, internally pulled up high
DCI_INPUT_N_2[1]	Discrete control interface pins. Active low operation, internally pulled up high
DCI_INPUT_N_3[1]	Discrete control interface pins. Active low operation, internally pulled up high

[1] Contact VERTE to assign functions to signals.

3.8. Discrete Output Indicators

SSPDU has two discrete open-drain outputs.

Table 9: Discrete Output Signals

Pin	Description
SSPDU_FAULT	SSPDU error indicator pin. Active low operation, open-drain output.
SPARE_OUTPUT_1[1]	Discrete output indicator pin. Active low operation, open-drain output.

[1] Contact VERTE to assign functions to signals.

3.9. Pre-defined Mode Selection

The SSPDU has an option for pre-defined operating modes for specific scenarios and usage cases. In these modes, the channels/groups selected by the user can be turned on and off automatically within defined delay times without sending any on-off command. Mods in GDB can be activated either software or hardware via discrete control pin.

3.10. Initial Mode Selection

The SSPDU has initial boot mode that can be defined separately from the mode selection state via the communication interface or discrete signals. Initial mode definitions are made through the SSPDU Control Software and when the SSPDU powered up, it starts to work in the defined mode without waiting for any signal or command. Initial mode can be activated or deactivated via SSPDU Control Software.

3.11. Battle Override

SSPDU has a Battle Override feature to work in critical situations. This mode can be activated both software and hardware via discrete control pins. This mode is activated when the BATTLE OVERRIDE pin is connected to the 270VDC_RTN or GND_ISO pin depending on the SSPDU version. In this mode the SSPDU ignores all trip conditions except short circuit. Also, Low/High Temperature Error or Low/High Voltage Error conditions are ignored on the SSPDU.

3.12. Trip Reset

This function can be activated both software and hardware via discrete control pin. User can reset all tripped channels or groups globally with the usage of this function. This function will reset the fault trip status on the channels/groups by hardware when SSPDU_RESET pin goes from high to low. The same function can be performed via the SSPDU control software.

3.13. Emergency Shutdown

This function can be activated both software and hardware via discrete control pin. In a critical situation, this function is activated, allowing all open outputs to be turned off immediately. SSPDU does not allow outputs to be opened when this function is active. This function is activated when the SHUTDOWN_N pin is connected to the 270VDC_RTN or GND_ISO pin depending on the SSPDU version.

3.14. Configuration Storage

SSPDU has internal EEPROM. Configuration settings of SSPDU set by user via Control Software. There is no loss of configuration in any power interruption. All configuration set by user via Control Software are stored in the EEPROM.

SSPDU Control Software

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4. SSPDU CONTROL SOFTWARE

A user control software has been developed to control, monitor and configure the SSPDU. The software runs on the Windows platforms.
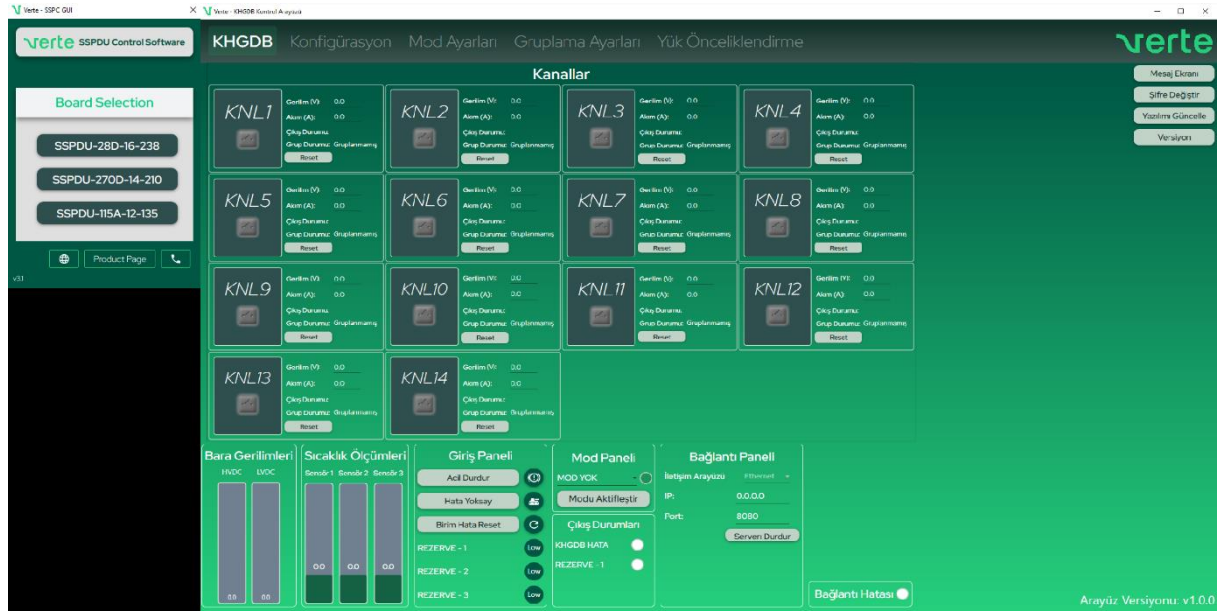

Figure 2:SSPDU Control Software

4.1. SSPDU Control & Monitoring Features

■ 4.1.1. Channel /Group Control & Status Monitoring

All channels and groups can be switched on and off individually via this screen shown on Figure 2. Channel and group-specific voltage and current values can be monitored continuously. In addition, when an error occurs, it can be seen in detail.

■ 4.1.2. SSPDU Control & Monitoring

SSPDU Control Software is also used to trigger the features of SSPDU such as EMERGENCY SHUTDOWN, BATTLE OVERRIDE, TRIP RESET. In addition, MODE selection is made from this screen.

4.2. SSPDU Configuration Features

■ 4.2.1. Channel / Group Configuration Settings

In this section, besides the "Voltage High/Low" and "Temperature High/Low" settings used across the SSPDU, I^2T and instant trip current adjustments can be made for each channel or group.All the settings made in this section can be exported into a configuration txt. file via the control software, and the settings of all channels or groups can be import automatically from this file in future uses.
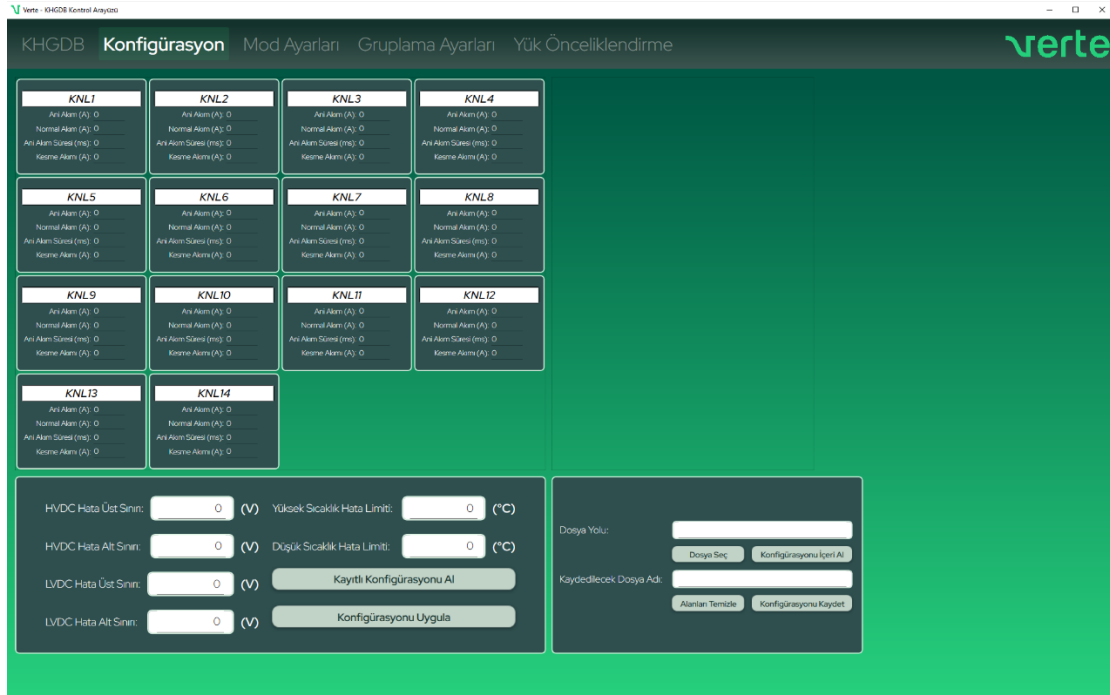
Figure 3: Configuration Page

■ 4.2.2. Mode Settings

User can create operating modes for specific scenarios and use cases. On the screen shown in Figure 3, user can select the channels to be activated in SSPDU in the mode, it is selected whether to turn on or turn off these channels. Channel operation times can be determined with 100ms resolution.
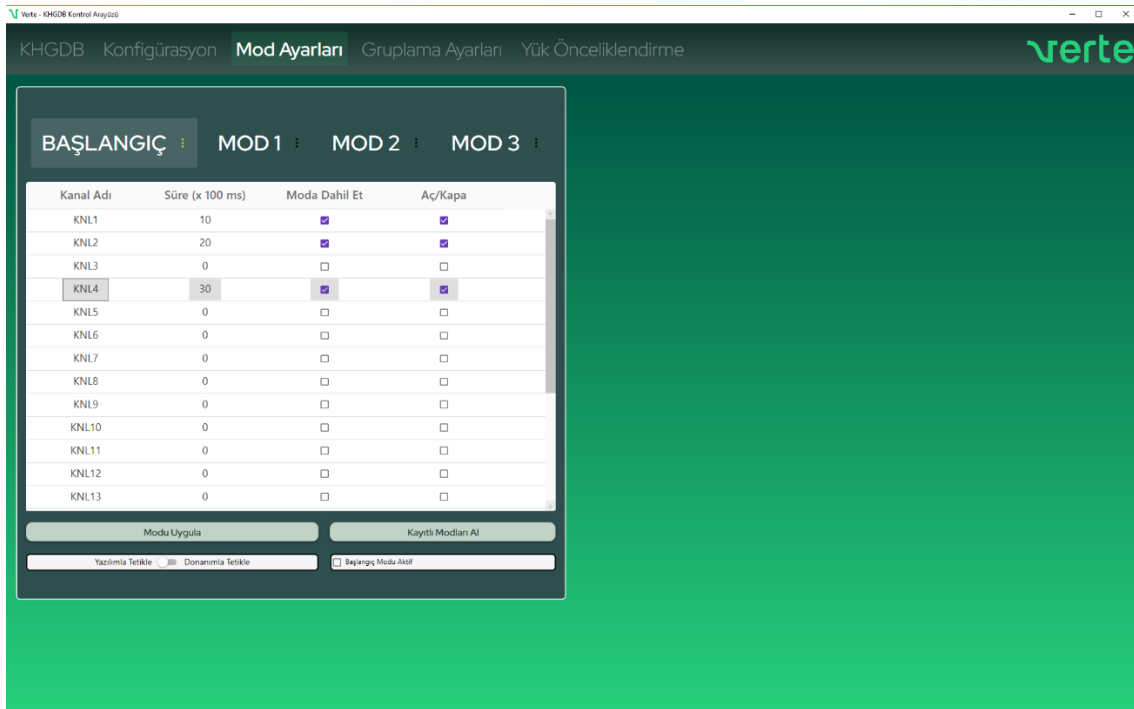

Figure 4: Mode Settings Page

■ 4.2.3. Channel Grouping

The SSPDU consists of channels with rated current 10A. The channels in the SSPDU can be paralleled for loads that have a power requirement greater than these ratings. Channels can be paralleled up to 7 different groups. Paralleled channels are now treated as a single channel and are controlled from group zones created on the main page.
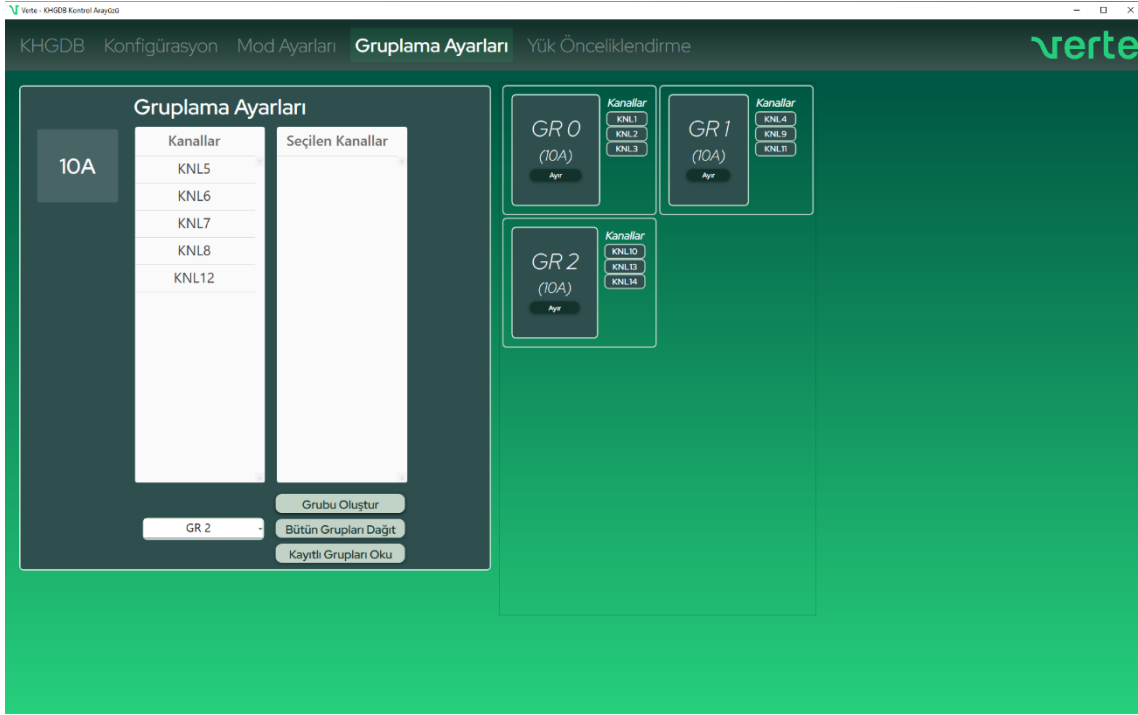

Figure 5: Group Settings Page

Mechanical
Specifications

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5. MECHANICAL SPECIFICATIONS

Table 10: Mechanical Specifications

PARAMETER	VALUE	UNIT
Dimensions	262x 195 x 25.4 (L×W×H)	mm
Weight	1.6	kg
Case Color [1]	-	-

[1] Please contact for a product with a different case color.

5.1. Connector Interface

Table 11: Mating Connectors

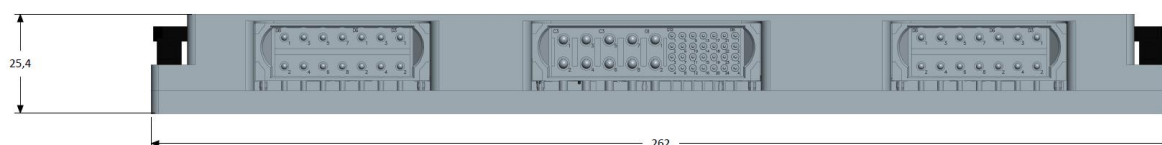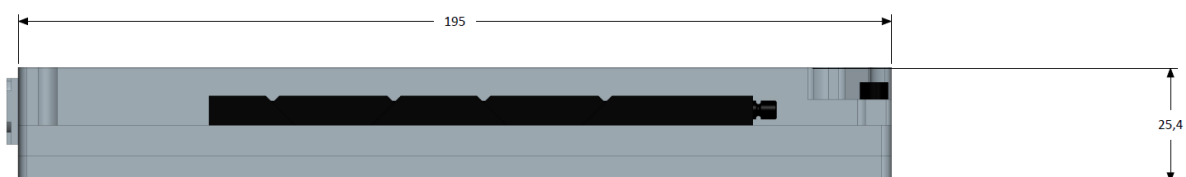| CONNECTOR #	MATING CONNECTOR	DESCRIPTION
J1	SP2DCB1F0001	Power Output Connector
J2	SP2YETH1F0001	Power Input and Signal Connector
J3	SP2DCB1F0001	Power Output Connector

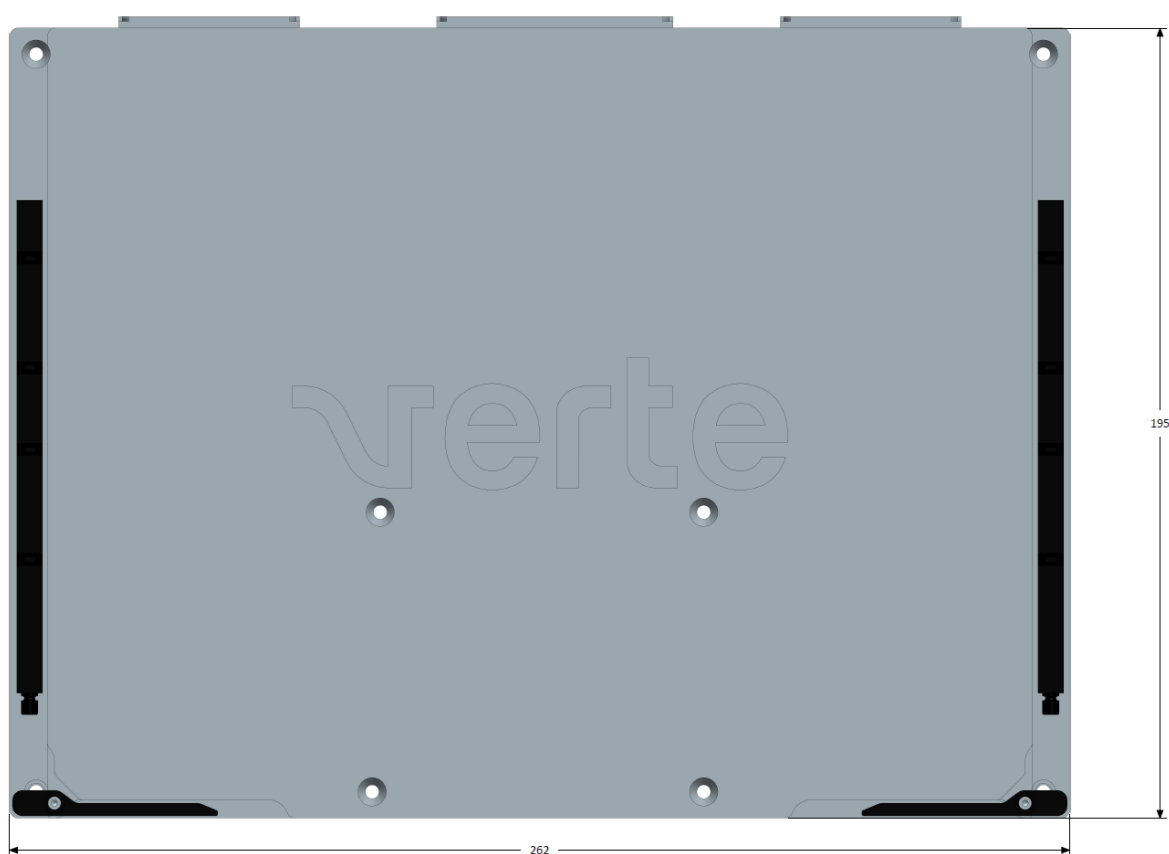## 5.2. SSPDU Dimensions

Figure 6: Front View

Figure 7: Side View

Figure 8:Top View

All dimensions in mm.

Ordering
Information

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6. ORDERING INFORMATION

SSPDU -XX-XX-XXX-X XX

Communication Interface:
01: Non-Isolated RS485 & CANbus
02: Isolated RS485 & CANbus

Mechanical Option:
A: Card Type
B: Enclosure With Circular Military Connector
C: Verte Custom Enclosure
D: 1U 19" Rack Mount
E: Marine Type

Configuration Option:
16-238: 16 Channel 238A
(6 each 8A; 4 each 10A; 6 each 25A)
14-140: 14 Channel 140A
(14 each 10A)
12-135: 12 Channel 235A
(6 each 7.5A; 6 each 15A)

Voltage Specification:
28D: 28VDC
270D: 270VDC
115A: 115VAC
230A: 230VAC