SOLID-STATE POWER DISTRIBUTION UNIT

SSPDU-28D-16-238-CXX

SSPDU-28D-16-238-CXX is a high-power density, low profile power distribution unit with 16 channel outputs designed for use in various platforms. It distributes the input voltage in the range of 6-48V to the loads via semiconductor switches with overload and short circuit protection. The SSPDU-28D-238-CXX is designed for air, sea and land vehicle platforms in accordance with the harshest environmental conditions and superior performance targets.

- 16 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 8A, 10A and 25A
- Channel Paralleling Option for High Output Currents
- Cooling by Conduction
- Continuous Built-in Test
- Protection Override (Battle Mode)
- Emergency Shutdown
- CAN and RS422/RS485 Interface
- Discrete Control Interface
- User Configuration Settings Stored in Internal Memory

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VERTE Elektronik's SSPDU-28D-238-CXX series is designed as a high-power density, low-profile power distribution unit. This unit, which has 16 channel outputs, distributes the input voltage in the range of 6-48V 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. Designed for air, sea, and land vehicle platforms, this unit is manufactured to meet superior performance targets under the harshest environmental conditions.

The SSPDU-28D-238-CXX series features 16 independent channel outputs, user-adjustable I^2T protection and thermal memory, high capacitance load control, and controlled output voltage rise time. With channel outputs of different nominal currents such as 8A, 10A, and 25A, the unit offers channel paralleling options for high current requirements. Equipped with safety features like emergency shutdown and battle mode, this unit supports continuous built-in testing, SAE J1939 compliant CAN and RS-422/RS485 interfaces, 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-28D-238-CXX series is a high-power density, low profile power distribution unit with 16 channel outputs designed for use in various platforms. It distributes the input voltage in the range of 6-48V to the loads via semiconductor switches with overload and short circuit protection. Device control and configuration can be done and status information can be displayed via CAN and RS-422/485 communication interfaces. The SSPDU-28D-238-CXX is designed for air, sea and land vehicle platforms in accordance with the harshest environmental conditions and superior performance targets.

1.1. Capabilities

- 16 independent channel output
- User adjustable I^2Tprotection / Thermal memory
- High capacitance load control with controlled output voltage rise time
- Channel outputs with rated current of 8A, 10A and 25A
- 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

• 20 x more MTBF value compared to traditional electromechanical PDUs

• High density, durable design

• Minimized maintenance

• Configurable power distribution

Electrical Specifications

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2. ELECTRICAL SPECIFICATIONS

Table 1: Absolute Maximum Ratings

PARAMETER	VALUE	UNIT
Switched Power In	48	V_{DC}
Continuous Output Current	238	A
Operating Temperature (with Thermal Interface)	-40 to +85	°C
Ambient Temperature (Air Cooled Configuration)	-40 to +71	°C
Storage Temperature	-40 to +105	°C

Table 2: Recommended Operating Conditions

PARAMETER	UNIT	MIN	TYP	MAX
Switched Power In	V_{DC}	6	28	48
Control Power In	V_{DC}	6	28	48
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	900		1250
Hardware Instant Trip Time	µs		100	
Hardware Instant Fall Time	µs		300	
Rise Time	µs		1000	
Accuracy of Current Measurement	% of programmed current		5	
Current Measurement Range	% of rated max current		1000	
Accuracy of Voltage Measurement	% of 28 V_{DC}		5	
28V Voltage Measure Range	V_{DC}		60	
Accuracy of On-Board Temperature Measurement	°C		3	

Table 4: Environmental Specifications

DESCRIPTION	PROCEDURE
Vibration	MIL-STD-810G, Method 514.6, Operational, Ground Platform, Tracked Vehicles
Shock	MIL-STD-810G, Method 516.6, Procedure 1
Acceleration	MIL-STD-810G, Method 513.6, Procedure 1
High Temperature	MIL-STD-810G, Method 501.5, Procedure 1 MIL-STD-810G, Method 501.5, Procedure 2
Low Temperature	MIL-STD-810G, Method 502.5, Procedure 1 MIL-STD-810G, Method 502.5, Procedure 2
Temperature Shock	MIL-STD-810G, Method 503.5, Procedure 1-C
Altitude	MIL-STD-810G, Method 500.5, Procedure 2
Humidity	MIL-STD-810G, Method 507.5, Procedure 2
EMI & EMC	CE102, CS101, CS114, CS115, CS116 (MIL-STD 461F)
Input Power Characteristics	MIL-STD-1275E, Injected Voltage Spike, Injected Voltage Surge & Starting Operation

Figure 1:SSPDU-28D-16-238-CXX

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 and RS-422/485 interfaces. The SSPDU can also switch on channels pre-configured for operating modes via discrete signals.

3.2. I^2T 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-485/422.

There are predefined channels in SSPDU as 8A, 10A and 25A 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 900%-1250% of the maximum channel current as shown in Table 5. Hardware instant trip circuit detects fault in 100µs and turns off the channel or group at 300µs.

Table 5: Hardware Instant Trip Limits

Channel Type	Nominal Trip Current	Rated Current Percentage
8A Channel	100A	900%-1250%
10A Channel	100A	900%-1000%
25A Channel	250A	900%-1000%

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 Low 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 28V 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
8A	2300µF
10A	2960µF
25A	7470µF

3.6. Internal Supply

SSPDU has an internal DC-DC converter structure that allows it to operate between 5-60V 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 28V_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 28V_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 28V_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.

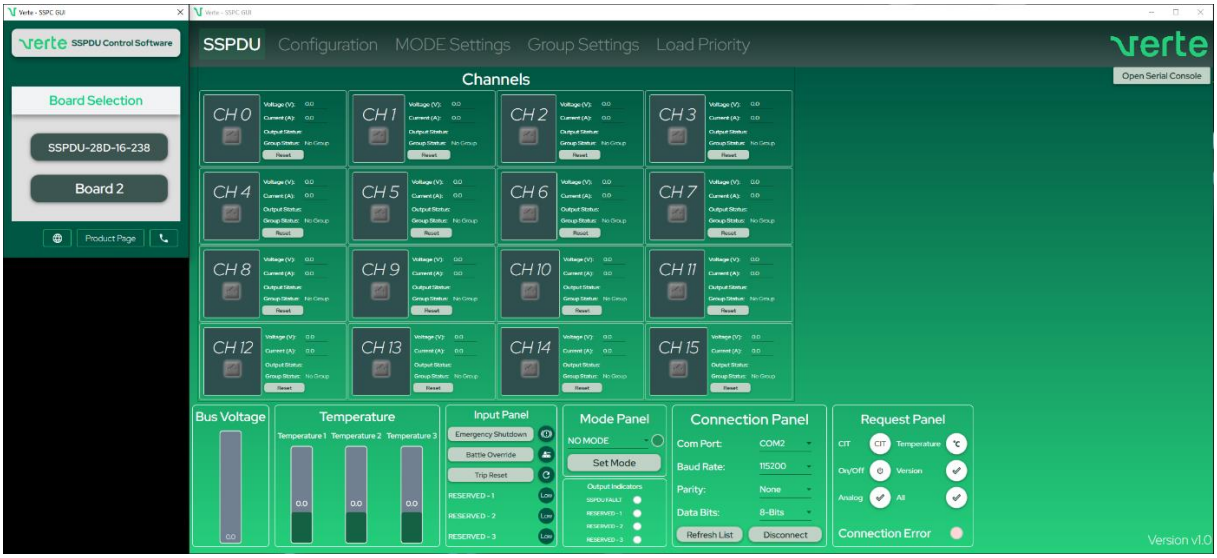

Figure 2: SSPDU Control Software

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.

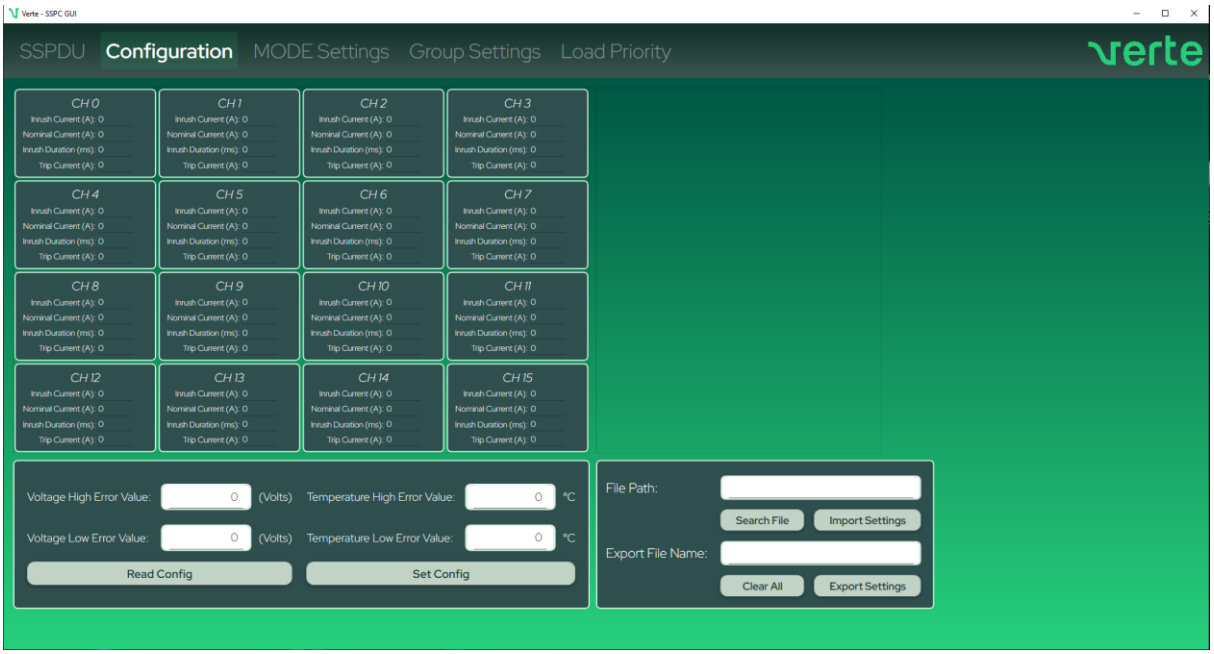

Figure 3: Configuration Page

4.2.2. Mode Settings

User can create operating modes for specific scenarios and use cases. On the screen shown in Figure 4, 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.

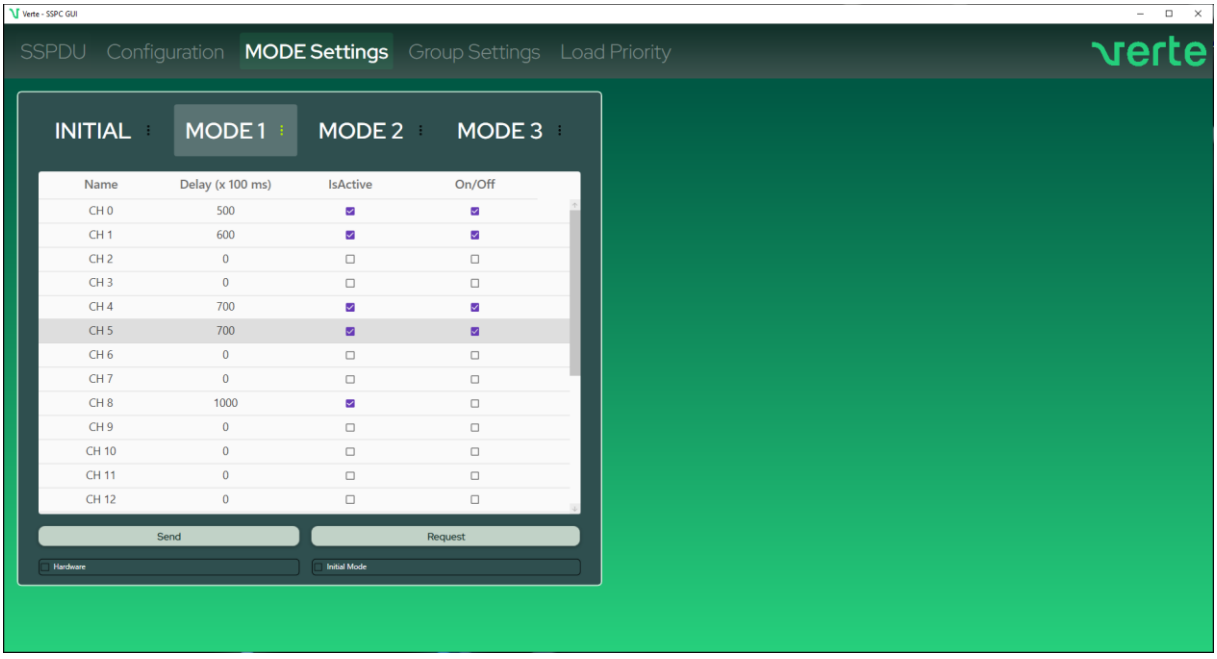

Figure 4: Mode Settings Page

4.2.3. Channel Grouping

The SSPDU consists of channels with three different rated current 8A, 10A and 25A. The channels in the SSPDU can be paralleled for loads that have a power requirement greater than these ratings. Channels with the same rated current 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.

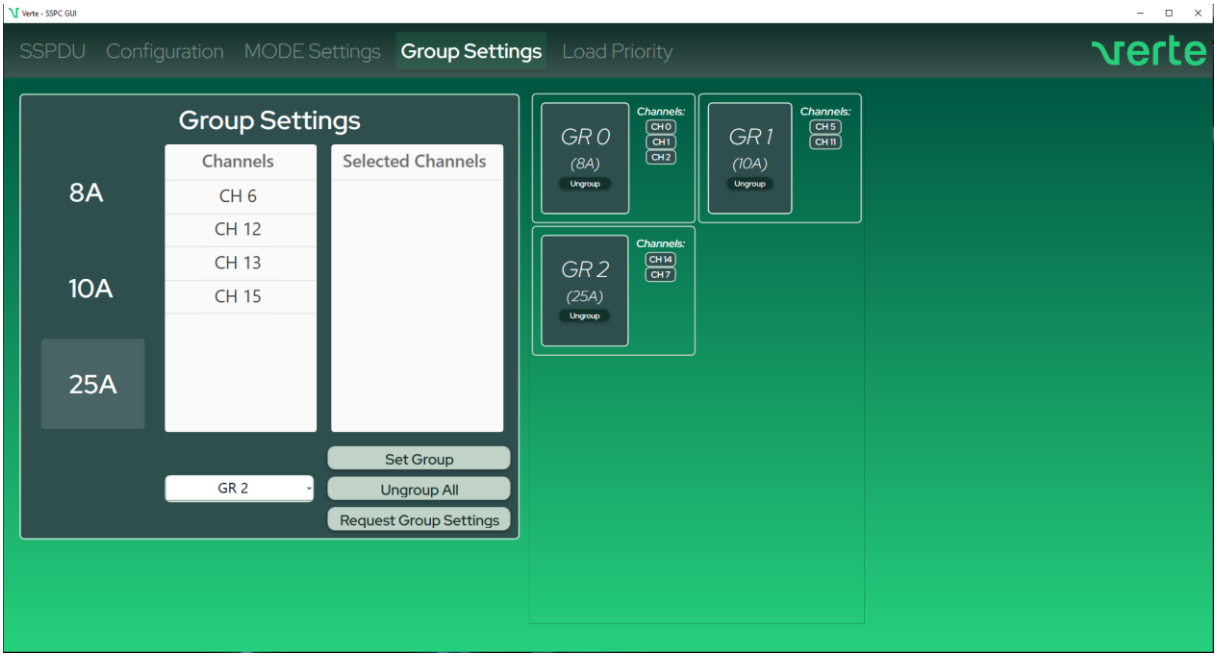

Figure 5: Group Settings Page

Mechanical Specifications

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5. MECHANICAL SPECIFICATIONS

Table 10: Mechanical Specifications

PARAMETER	VALUE	UNIT
Dimensions	261.86x 138 x 25.35 (L×W×H)	mm
Weight	1.57	kg
Case Color [1]	N/A	-

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

5.1. Connector Interface

Table 11: Connectors

CONNECTOR	DESCRIPTION
629-24W7240-4N3	Power Input and Signal Connector
630-8W8-240-4N3	Power Output Connector
630-8W8-240-4N3	Power Output Connector

5.2. SSPDU Dimensions

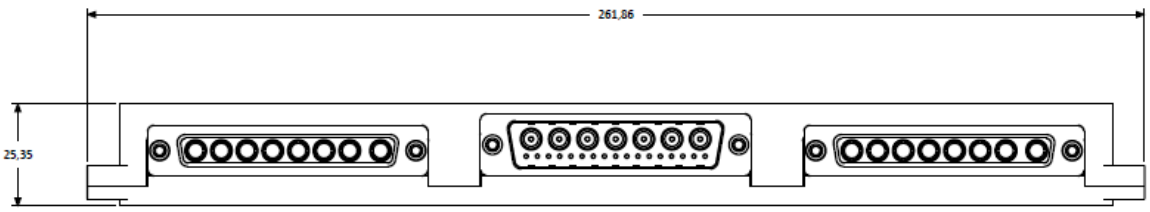

Figure 6: Back View

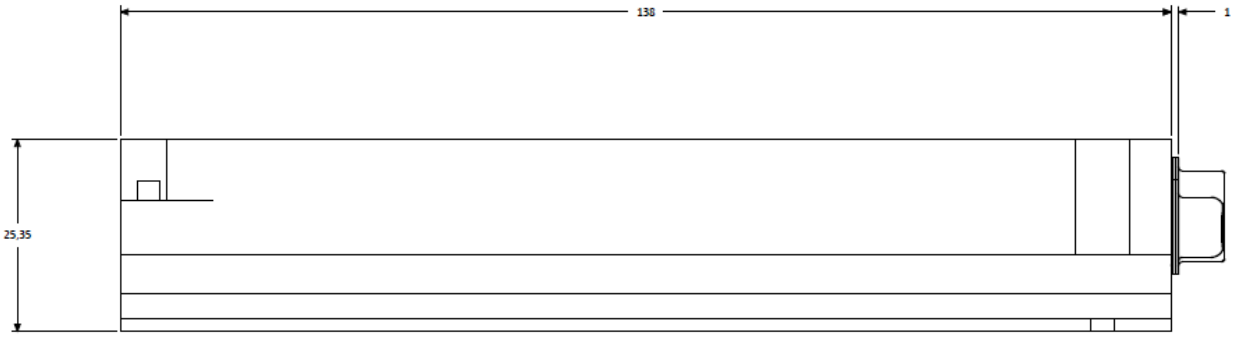

Figure 7: Side View

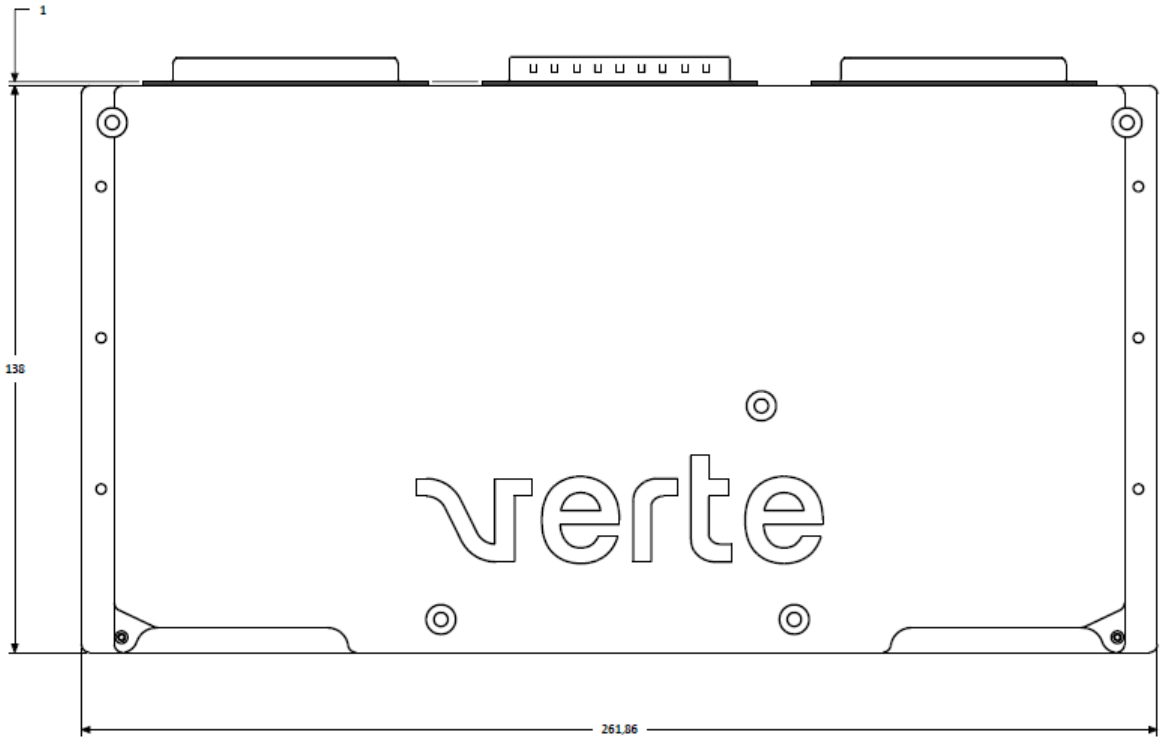

Figure 8: Top View

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

Configuration Option:
16-238: 16 Channel 238A
(6 each 8A; 4 each 10A; 6 each 25A)
14-140: 14 Channel 140A
(14 each 10A)

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