

HIGH VOLTAGE JUNCTION BOX (HVJB)

User Manual



Table of Contents

1 System Overview	4
1.1 What's in the Box?	5
1.2 Functionality	
2 Definitions	7
3 Technician Training Requirements	8
4 Uncrating and Inspection	8
5 Product Specifications	9
6 Integration — Mechanical	10
6.1 Mechanical Drawing	10
6.2 External Interfaces	11
6.3 Mounting	12
6.4 Dynamic Loads and Forces	13
7 Integration — Electrical	14
7.1 High Voltage Connector Interfaces	14
7.2 Low Voltage Connector Interfaces	16
7.3 COMS Connector	17
7.4 IMD Connector	18
7.5 High Voltage Accessory Connectors	19
7.6 Battery, Inverter, and CCS High Voltage Connectors	20
7.7 Wire Management	20
8 Operation	22
8.1 Power Distribution	22
8.2 CCS	23
8.3 IMD	24
8.4 IVT-S	24
9 Troubleshooting	25
10 Storage & Care	26

11 Safety	27
11.1 Overcurrent Protection	27
11.2 General Safety Guidelines	27
11.3 HVIL	27
11.4 Electrical Safety Rules	28
11.5 High Voltage PPE	28
11.6 Fire Safety	29
12 Support	31
13 Document Revision	32

1

System Overview

Designed for use with Hypercraft's powertrain systems, the High Voltage Junction Box (HVJB) offers an all-in-one solution for Power Distribution, HV Isolation Monitoring, and Current/Voltage/Temperature Sensing (IVT-S). HVJB serves as the confluence point of all high voltage circuitry in an EV build, directing the flow of hundreds of amps to and from various systems.

Robust: Engineered to withstand the dynamic forces and abuse of off-road racing, HVJB is built with solid mounting points. IP67 rated and finished in Type II black anodizing, HVJB can weather the elements.

Refined: Despite its heavy-duty construction, HVJB's eye-catching design is showroom ready and looks at home on everything from bespoke restomods to rock crawlers.

Plug-and-Play: Purpose-built for ease of integration, HVJB is a ready-to-use solution for your EV build.

Size & Weight Conscious: Engineered into the smallest form factor possible, Hypercraft's HVJB significantly reduces space consumption in your EV build by consolidating so many features into one product. Constructed of aluminum for lightweight and efficient heat dissipation, HVJB weighs in at less than 8 kg.

Versatility: Designed to mount in any orientation, facilitating fitment in a wide array of applications.

Safety Minded: Engineered with redundant safety measures, including High Voltage Interlock Loop (HVIL), FR-4 Insulation, Over-Current, Over-Voltage and Over-Temperature monitoring systems, HV Isolation Monitoring, Open-Lid Power Cutoff Switch, and position feedback contactors, every detail of the HVJB was designed with safety as a paramount consideration.

Utilizing CAN2.0B 500 Kbps high speed data transfer, the ubiquitous North American automotive communication standard.

Feature Packed: HVJB includes built-in pre-charge resistors for your inverter and A/C compressor circuits, along with their own dedicated pre-charge contactors. The inverter and A/C compressors also have their own main power contactors, providing multiple layers of protection for your EV components.

Designed for use with Hypercraft's HyperLynk™ technology, providing seamless integration of EV components with different communication protocols, frequencies, baud rates, and signal voltages—what was arguably the most difficult and frustrating aspect of an EV build is now made effortless.

Compatible with Hypercraft's PowerBlade™, HVJB facilitates Level 2 & DC Fast Charging, housing the contactors linking the charging circuit with the battery system.

All these capabilities have been brought together in one device: Hypercraft's HVJB — The perfect solution to simplify integration in your EV build, conveniently offered in one compact, tough, and stylish package.

1.1 What's in the Box?

High Voltage Junction Box (HVJB) includes:

- Charger/DC Converter Circuit
- HVDC Battery Circuit
- PowerBlade™ Adapter Circuit
- Isolation Monitoring Device (IMD)
- Current/Voltage/Temperature Sensing (IVT-S)
- HV Heater Circuit
- HV Accessory Circuit
- A/C Compressor Pre-Charge Circuit w/Contactor
- A/C Compressor Power Circuit w/Contactor
- Inverter Pre-Charge Circuit w/Contactor
- Main Power Circuit w/DC+ Contactor

Optional Add-ons:

- HV Harnesses
- LV Harnesses

1.2 Functionality

High Voltage Power Distribution:

Developed through years of hard-use and real-world testing, Hypercraft's HVJB is engineered from the ground-up for reliability under the harshest conditions. When failure is not an option, Hypercraft's HVJB is a necessity.

Built with internally economized contactors (relays rated for high current and voltage) for compactness and maximum efficiency, HVJB safely and reliably opens and closes circuits on command, distributing power throughout the high voltage system.

Leveraging the expertise of world-class electronics manufacturers such as TE, Molex, Amphenol and Sensata, HVJB is constructed with high quality, rigorously tested, industry standard components.

PowerBlade™ Compatibility:

HVJB is engineered for plug-and-play pairing with Hypercraft's PowerBlade, capable of delivering up to 70kW and 200A continuous at either 400V or 800V. Available in CCS Type 1, North America's DC Fast Charging (DCFC) standard, backwards compatible with SAE J1772, and readily adaptable to NACS, providing charging flexibility to the end user.

Built-in safety features including:

- Real-time cell temp monitoring with automatic system shutdown in the event of battery overheating.
- Battery State of Health (SoH) tracking, extending battery life.
- Battery State of Charge (SoC) indicator, down to the millivolt.

41-00072, User Manual, High Voltage Junction Box (HVJB)

- Failsafe modes, providing an additional layer of safety for your EV investment.
- Cell balancing, enhancing the long term performance of the battery.
- Charger plug position assurance with motor lock feature.

PowerBlade's management of battery charging with real-time battery feedback data ensures optimal performance without human intervention, increasing battery longevity and maximizing safety, all while providing a stress-free, user-friendly solution for DCFC.

High Voltage Isolation Monitoring:

A crucial safety feature, every HVJB features a high voltage Isolation Monitoring Device (IMD). This vital system continuously monitors the ohmic resistance between a vehicle's high voltage system and the chassis ground, watching for deterioration of insulation and potentially dangerous levels of leakage current.

Current/Voltage/Temperature Sensor (IVT-S):

Every HVJB includes a high-precision measurement system, installed in the DC circuitry. The IVT-S senses changes in current, voltage, and conductor temperature through a shunt-based measurement method. These measurements are transmitted via CAN to the Vehicle Control Unit (VCU), where it is logged in non-volatile memory. If the system detects an over-voltage, over-current, or over-temperature situation, embedded programming in the VCU will automatically derate output, or, if necessary, shut down the system.

2

Definitions

Term	Definition
Amp (A)	The Ampere, or Amp for short, is the unit of measure for electrical current. Current is the quantity of electrons flowing through a conductor.
Ampacity	Ampacity refers to the maximum amount of electric current a conductor or device can carry before sustaining immediate or progressive deterioration.
Volt (V)	A Volt is defined as the potential difference between two points in a conductor when a current of one Ampere (A) dissipates one Watt (W) of power between those points.
Watt (W)	Unit of power, calculated by multiplying Voltage by the Amps being delivered or consumed. One Kilowatt (kW) = 1000 Watts.
Finger Safe	When access to live, high voltage is restricted so as to not allow a finger to come in contact, then a terminal is considered finger safe. See standards IEC 60529, NFPA 70E, and IP20.
Fireman's Loop	Wire to cut/pull which quickly shuts down operations of the vehicle's high voltage systems.
ESS	Energy Storage Systems (a.k.a. batteries)
IVT-S	Current, Voltage and Temperature Sensing instrument, mounted inside the HVJB on the high voltage busbars. This device reports its measurements to the VCU via CAN.
IMD	The Insulation Monitoring Device is a device connected to the high- and low-voltage side of the battery, and has sense lines connected to the chassis which monitors for HV leakage.
VCU	The Vehicle Control Unit is the main controller for all EV system functions, coordinating with subsystem controllers to manage the entire system.
HVIL	A high voltage safety feature. The high voltage connectors are equipped with an integrated High Voltage Interlock Loop (HVIL), a low voltage circuit that indicates an open (unsafe) or closed (safe) state for HV components.
PPE	Personal Protective Equipment is the safety gear required to safely perform work; e.g.: Insulated Tools, HV Gloves, Face Shield, Electrician's Hook, Arc Flash Rated Clothing, Safety Glasses, etc.)
Thermal Management System	A system for managing the temperature of the passenger cabin and power electronics (ESS, inverters, motors, chargers, converters.)

3 Technician Training Requirements

Hypercraft recommends that technicians are trained per NFPA 70E.

<https://www.nfpa.org/product/nfpa-70e-standard/p0070ecode>

https://en.wikipedia.org/wiki/NFPA_70E

Additional EV training may be obtained here:

<https://continue.weber.edu/professional/programs/evtraining/>

4 Uncrating and Inspection

Inspect all products for any signs of damage. If any damage is detected, reject the shipment from the carrier, and immediately contact Hypercraft Technical Service for assistance.

Customer Service (801) 317-8475 or email support@hypercraftusa.com

5 Product Specifications

Dimensions without Mating Connections:

439.29mm L x 270.97mm W x 132.77mm H (17.295" L x 10.668" W x 5.227" H)

Dimensions with Allowances for Mating Connectors & Harnesses:

540.89mm L x 372.57mm W x 132.77mm H (21.295" L x 14.668" W x 5.277" H)

Mass: 7.98 kg (17.6 lbs)

Ingress Protection Rating: IP67

Material: Aluminum

Finish: Type II Anodized, Black

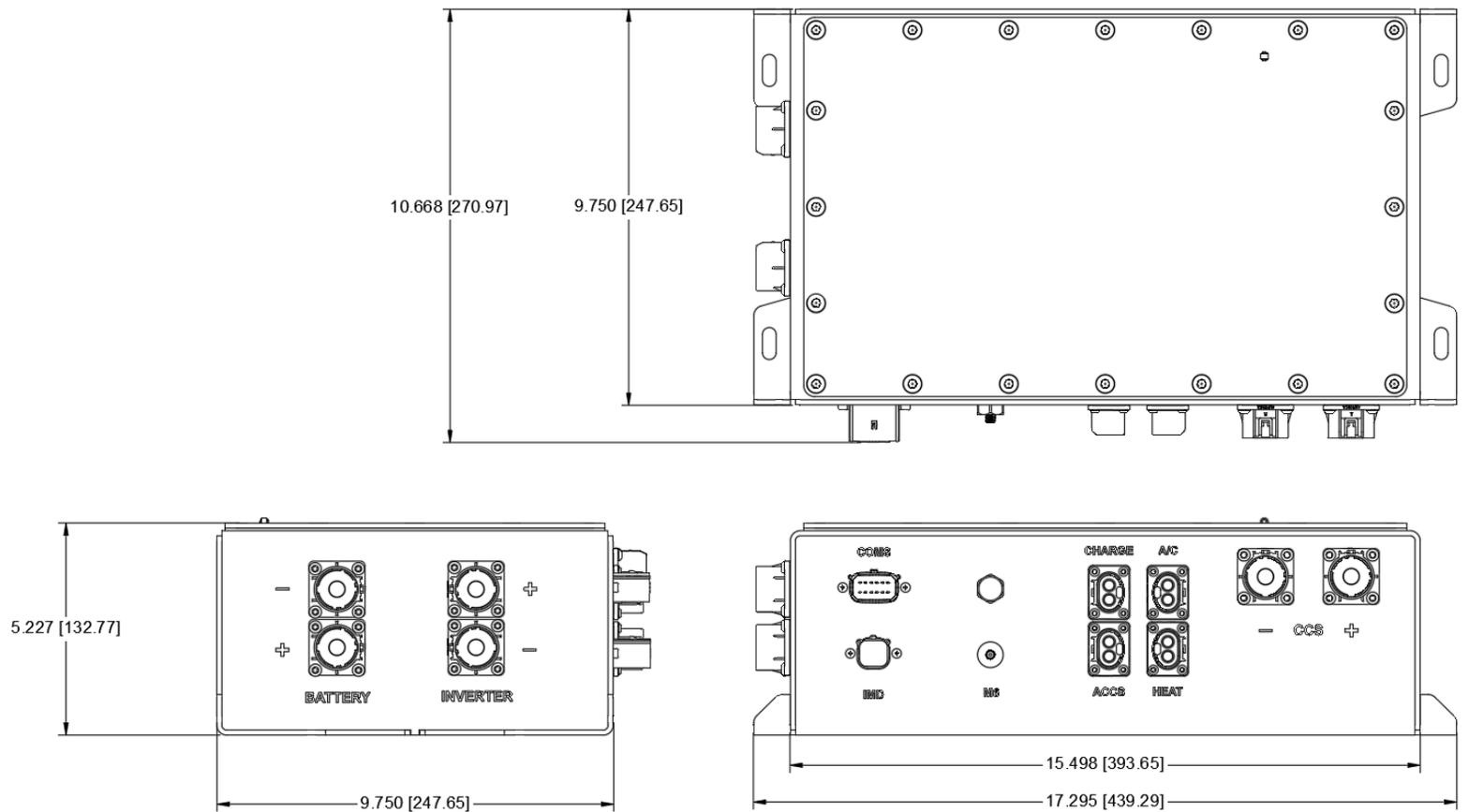
Recommended Storage Temperature: 25 C (77 F)

Recommended Storage Humidity: 0%–15%

Ambient Operating Temperature: -10 C to 50 C

6 Integration — Mechanical

6.1 Mechanical Drawing

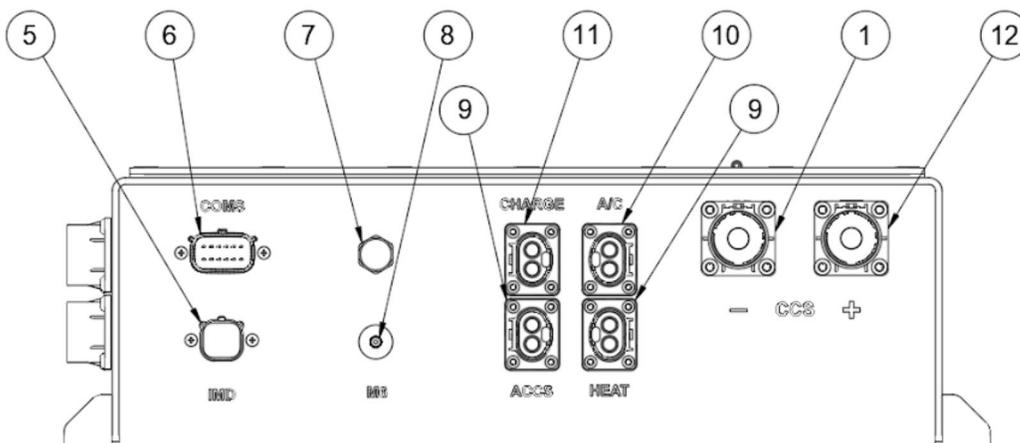
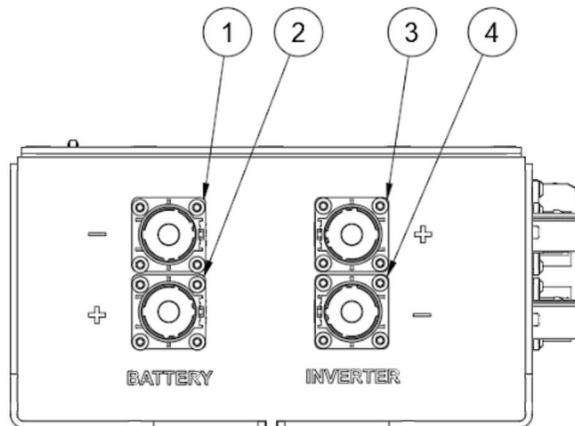


41-00072, User Manual, High Voltage Junction Box (HVJB)

6.2 External Interfaces

Connectors, Balloon ID

1. 21-00104 - PowerLok G1, 300A, 1KV, Y-Key, PL00Y-301-10M8
2. 21-00101 - PowerLok G1, 300A, 1KV, X-Key, PL00X-301-10M8
3. 21-00098 - PowerLok G1, 300A, 1KV, W-Key, PL00W-301-10M8
4. 21-00095 - PowerLok G1, 300A, 1KV, V-Key, PL00V-301-10M8
5. 21-01110 - Molex MX150, 6 Pin, 148028-6001
6. 21-01002 - Molex MX150, A Key, 12 Pin, 47725-6010
7. 11-01001 - .25 Inch Breather Valve
8. 12-05424 - M6 - 1.0 X 15 Press-Fit Stud Zinc Steel
9. 21-00115 - Amphenol Auxiliary Power Receptacle, PL082Y-61-10
10. 21-00113 - Amphenol Auxiliary Power Receptacle, PL082X-61-10
11. 21-00117 - Amphenol Auxiliary Power Receptacle, PL082U-61-10
12. 21-00092 - PowerLok G1, 300A, 1KV, U-Key, PL00U-301-10M8



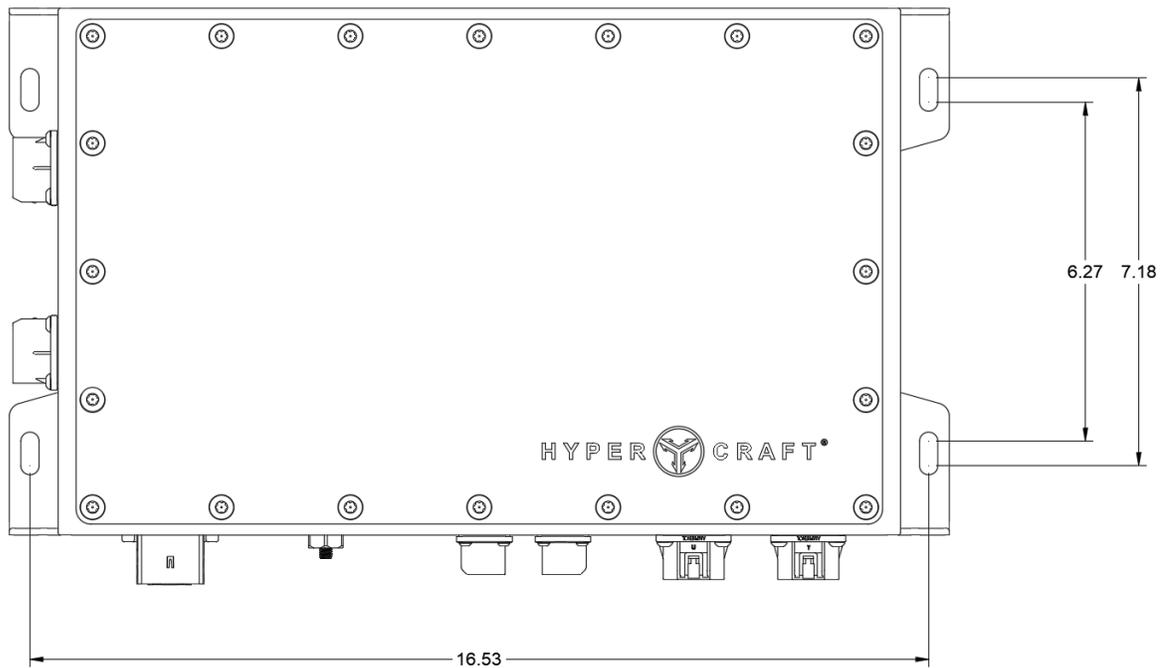
41-00072, User Manual, High Voltage Junction Box (HVJB)

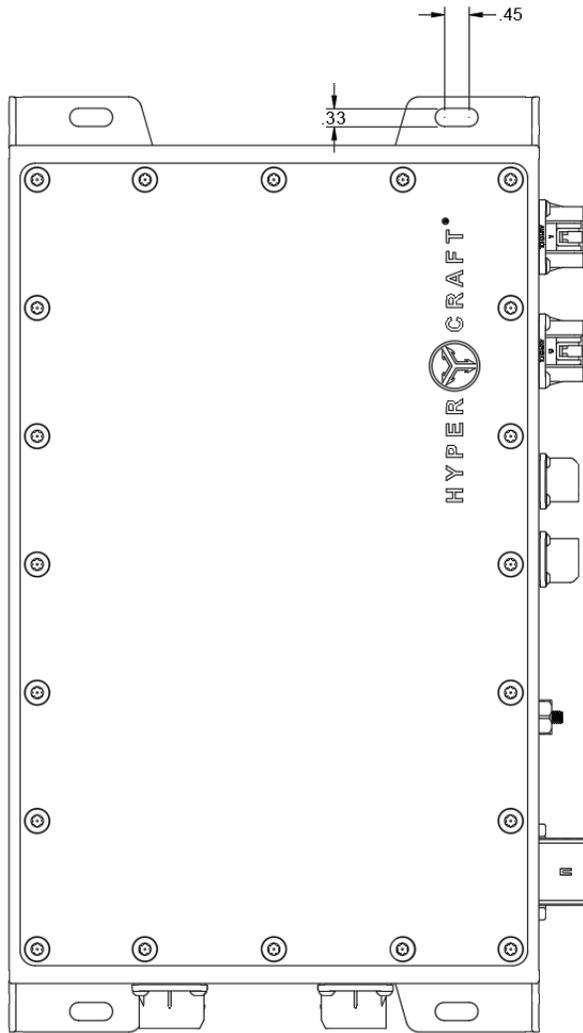
6.3 Mounting

Mounting Points: 4 X 8.5mm wide slotted through holes

Mounting Fasteners Required: Four M8-1.25 Grade 8.8 Bolts torqued to 30 Nm (22 ft-lbs) with Red Thread Locker, Washer + Lock Washer

Mounting Orientations: Product can mount in any orientation, most ideal mounting would be bottom of HVJB parallel with ground, spun in any direction OR (as shown in images below) perpendicular to ground with connectors facing the ground. Always consider the stress of the cables when mounting in the vehicle.





6.4 Dynamic Loads and Forces

Protect your HVJB from excessive shock loads and vibration that could compromise safety or performance.

1. Dampen as required to absorb heavy shock and maintain natural vibration to above 18Hz. Damping isolators with a Shore hardness rating of 80–90A are recommended.
2. The HVJB must be mounted in such a manner to ensure the connected electrical harnesses are not stressed or load bearing, and conductor terminals must not be strained. Each harness must be secured independently within 6 inches of the connector, in order to maintain electrical and mechanical integrity throughout the life of the device.

41-00072, User Manual, High Voltage Junction Box (HVJB)

7 Integration — Electrical

7.1 High Voltage Connector Interfaces

HVJB is available in two continuous current ratings: 300A & 500A. Please reference the tables below for the HV connector interfaces for your model.

300 Amp HVJB						
Purpose	Qty	Positions	Continuous Current	Peak Current	Connector [Device Side]	Connector [Harness Side]
Battery HV DC+	1	1	300 A	1000 A	Amphenol PL00X-301-10M8 (Receptacle)	Amphenol PL18X-301-70 (Straight) PL28X-301-70 (90 Deg)
Battery HV DC-	1	1	300 A	1000 A	Amphenol PL00Y-301-10M8 (Receptacle)	Amphenol PL18Y-301-70 (Straight) PL28Y-301-70 (90 Deg)
Inverter HV DC+	1	1	300 A	1000 A	Amphenol PL00W-301-10M8 (Receptacle)	Amphenol PL18W-301-70 (Straight) PL28W-301-70 (90 Deg)
Inverter HV DC-	1	1	300 A	1000 A	Amphenol PL00V-301-10M8 (Receptacle)	Amphenol PL18V-301-70 (Straight) PL28V-301-70 (90 Deg)
CCS HV DC+	1	1	300 A	1000 A	Amphenol PL00U-301-10M8 (Receptacle)	Amphenol PL18U-301-70 (Straight) PL28U-301-70 (90 Deg)
CCS HV DC-	1	1	300 A	1000 A	Amphenol PL00Y-301-10M8 (Receptacle)	Amphenol PL18Y-301-70 (Straight) PL28Y-301-70 (90 Deg)

500 Amp HVJB						
Purpose	Qty	Positions	Continuous Current	Peak Current	Connector [Device Side]	Connector [Harness Side]
Battery HV DC+	1	1	500 A	1750 A	Amphenol PL00X-501-10M8-2 (Receptacle)	Amphenol PL19X-501-70-2-5 (Straight) PL29X-501-70-2-5 (90 Deg)
Battery HV DC-	1	1	500 A	1750 A	Amphenol PL00Y-501-10M8-2 (Receptacle)	Amphenol PL19Y-501-70-2-5 (Straight) PL29Y-501-70-2-5 (90 Deg)
Inverter HV DC+	1	1	500 A	1750 A	Amphenol PL00W-501-10M8-2 (Receptacle)	Amphenol PL19W-501-70-2-5 (Straight) PL29W-501-70-2-5 (90 Deg)
Inverter HV DC-	1	1	500 A	1750 A	Amphenol PL00V-501-10M8-2 (Receptacle)	Amphenol PL19V-501-70-2-5 (Straight) PL29V-501-70-2-5 (90 Deg)
CCS HV DC+	1	1	500 A	1750 A	Amphenol PL00U-501-10M8-2 (Receptacle)	Amphenol PL19U-501-70-2-5 (Straight) PL29U-501-70-2-5 (90 Deg)
CCS HV DC-	1	1	500 A	1750 A	Amphenol PL00Y-501-10M8-2 (Receptacle)	Amphenol PL19Y-501-70-2-5 (Straight) PL29Y-501-70-2-5 (90 Deg)

High Voltage Accessory Connectors				
Purpose	Qty	Positions	Connector [Device Side]	Connector [Harness Side]
High Voltage Charger (CHARGE)	1	2	Amphenol PL082U-61-10 (Receptacle)	Amphenol PL182U-61-10 (Plug)
High Voltage Heater (HEAT)	1	2	Amphenol PL082Y-61-10 (Receptacle)	Amphenol PL182Y-61-10 (Plug)
High Voltage A/C Compressor (A/C)	1	2	Amphenol PL082X-61-10 (Receptacle)	Amphenol PL182X-61-10 (Plug)
High Voltage Accessory (ACCS)	1	2	Amphenol PL082Y-61-10 (Receptacle)	Amphenol PL182Y-61-10 (Plug)

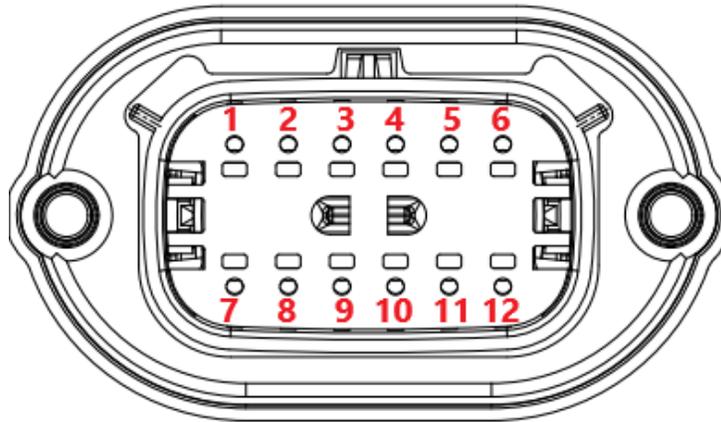
7.2 Low Voltage Connector Interfaces

HVJB Low Voltage Connectors				
Purpose	Qty	Positions	Connector [Device Side]	Connector [Harness Side]
Low Voltage Communication (COMS)	1	12	Molex 47725-6010 (Male)	Molex 33472-1206 (Female)
Insulation Monitoring Device (IMD)	1	6	Molex 148028-6001 (Male)	Molex 33472-0606 (Female)
Grounding Point	1	1	M6-1.0 x 15mm (Male Stud)	—

The HVJB is equipped with one M6-1.0 x 15mm earth bonding stud, which must be grounded to the chassis prior to energizing. Failure to ground the HVJB can result in faulty operation or damage to the internal components.

Recommended grounding method: 4 AWG (25mm²), braided, tin-plated, copper grounding strap with M6 (~1/4") terminal lug, bolted to the vehicle chassis.

7.3 COMS Connector



HVJB Coms Connectors			
Cavity	Color	Current, Continuous	Signal
1	Yellow	<1 A	Main DC+ Contactor Coil
2	-	-	-
3	-	-	-
4	-	-	-
5	White	<1 A	CAN High
6	Orange	<1 A	HVIL, In
7	White	<1 A	A/C Pre-Charge Contactor Coil
8	Pink	<1 A	Inverter Pre-Charge Contactor Coil
9	Blue	<1 A	A/C Power Contactor Coil
10	-	-	-
11	Violet	<1 A	CAN Low
12	Orange	<1 A	HVIL, Out

If using harnesses purchased from Hypercraft, system communication will be plug-and-play.

41-00072, User Manual, High Voltage Junction Box (HVJB)

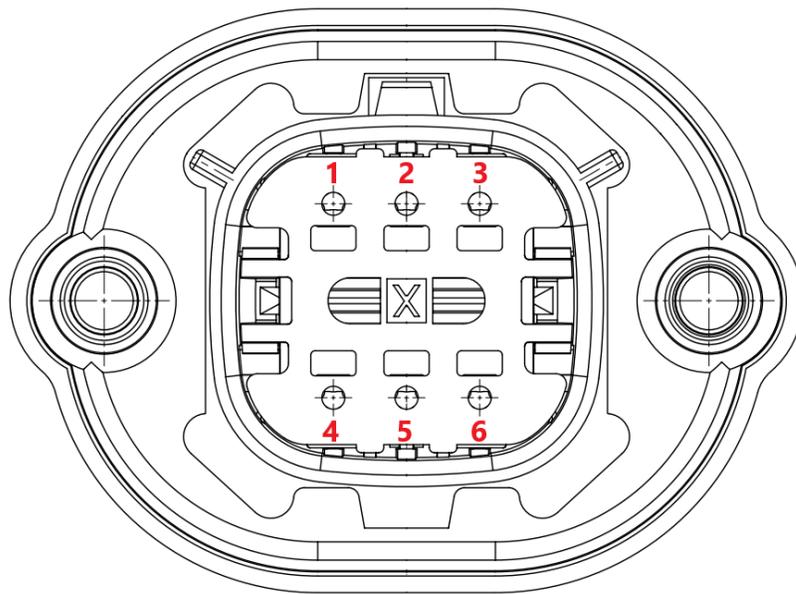
If building your own mating harness, ensure the wires are terminated and seated correctly, per the [manufacturer's assembly instructions](#).

All devices on the HVJB CAN network communicate at 500 Kbps baud rate. CAN network resistance must be $60 \Omega \pm 5\%$; use termination resistors to achieve this.

Both CAN High and CAN Low are biased at 2.5V. When a voltage signal is transmitted through one, this will increase the voltage differential relative to the other ($V_{diff} = V_{CANH} - V_{CANL}$), creating a signal. When routing CAN wires, be sure to use twisted pairs, in order to keep EMI noise uniform on both the High and Low side of the CAN network, as this helps inhibit a voltage differential, preventing unintended signaling.

For more information on implementing Controller Area Network (CAN) communication, please reference ISO 11898.

7.4 IMD Connector



HVJB IMD Connector			
Cavity	Color	Current, Continuous	Signal
1	Yellow	<1 A	Ignition Power
2	-	-	-
3	-	-	-
4	Black	<1 A	Ground
5	Light Green	<1 A	Chassis Ground 2

41-00072, User Manual, High Voltage Junction Box (HVJB)

6	Gray	<1 A	Chassis Ground 1
---	------	------	------------------

Device power and ground must be tied into the vehicle's 12VDC battery circuit, by way of the VCU. The IMD also has two pins that must be grounded to the chassis (cavities 5 & 6) on opposite sides of the vehicle. These serve as the sensing points through which the IMD can detect a breach of HV isolation. Ensure the chassis grounding points are securely fastened to clean metal surfaces in order to ensure reliable function. Loose connections and unclean metal surfaces (powder coated, corroded, muddy, greasy, etc.) can result in an undependable grounding point, causing intermittent faults or premature failure.

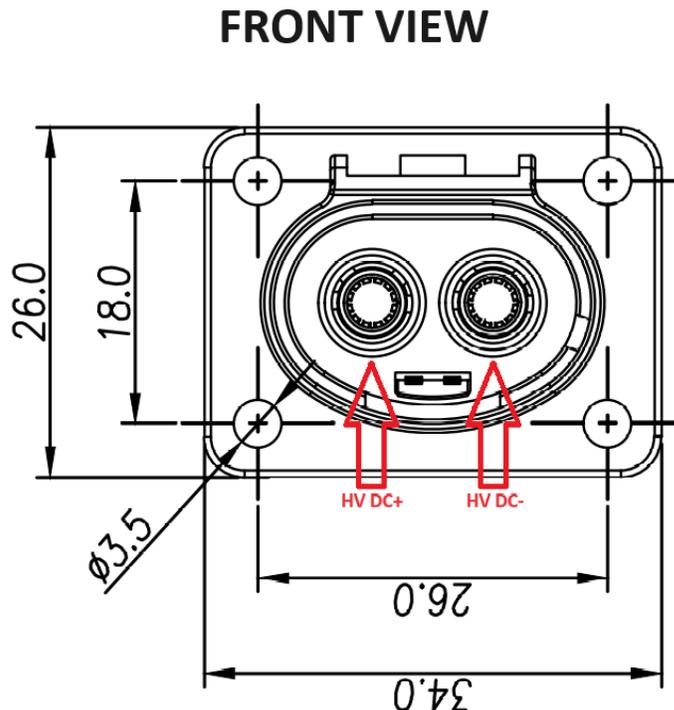
When building the mating connector harness, ensure the wires are terminated and seated correctly, per the [manufacturer's assembly instructions](#).

7.5 High Voltage Accessory Connectors

HVJB is fitted with four, two-position HV connectors, supplying power for HV devices, labeled A/C, HEAT, CHARGE, and ACCS.

Please carefully follow the [manufacturer's assembly instructions](#), and use shielded, 10 mm², stranded, single conductor HV cable rated for the system voltage.

It is critical the mating HV harnesses are correctly terminated. Improper termination can result in damage to electrical devices and is not covered under warranty. Reference diagram below for polarity.



41-00072, User Manual, High Voltage Junction Box (HVJB)

7.6 Battery, Inverter & CCS High Voltage Connectors

HVJB is fitted with six, one-position HV connectors, three DC+ and three DC-, carrying power to and from the device.

When building the mating connector harnesses, please carefully follow the [manufacturer's assembly instructions](#), and use shielded, 70 mm², stranded, single conductor HV cable rated for the system voltage.

It is critical the mating HV harnesses are correctly terminated. Improper termination can result in damage to electrical devices and is not covered under warranty. HV connector polarity is clearly marked on the HVJB.



7.7 Wire Management

Planning a Route:

Plan a route for the harnesses before connecting to the high voltage batteries or HVJB. Avoid manipulating any cables while connected.

Proper routing is crucial to safeguard against damage from vibration, moisture, and harsh conditions.

General Rules and Guidelines:

Connectors facing upwards must have a sealed backshell to prevent water pooling on the wire seals. If water is allowed to pool on wire seals, then the connector will not hold its given IP rating.

All connector cables and looms require a drip loop close to the connectors, this is a slight depression in the cable route to make water drip off the cable prior to reaching the connectors when possible. The same result can be achieved by routing upwards and then turning into the connectors.

1. Avoid routing near sharp edges, moving or rotating objects, and potential pinch points.
2. Avoid routing in areas that may encounter excess moisture and road debris.
3. Ensure High Voltage and Low Voltage harnesses intersect at a 90-degree angle rather than running parallel to minimize electromagnetic interference. If forced to route HV and LV cables parallel to each other, then maximize distance between the routes, and never bundle together.

Bends:

- a. Maintain a bend radius at least 5 times the cable diameter to prevent damage to the cable's insulation.
- b. Allow cables to exit the rear of the connector without bending for approximately 3 inches to prevent stress on the cable and ensure proper sealing.
- c. Handle cables with care, avoiding twisting, kinking, or excessive tension during installation.

Securing the Harness:

Secure the harness firmly to a static object every 12 inches, ensuring fasteners are tight enough to prevent slipping without damaging the conductor jacketing/insulation. Use cushioned clamps or grommets to prevent abrasion.

Managing Conflicts:

If conflicts arise between these guidelines and your vehicle's constraints, consult ISO standards for guidance. Additionally, consider consulting with qualified professionals or engineers experienced in high voltage cable and harness management for tailored solutions.

8 Operation

If you've purchased a complete powertrain system from Hypercraft, installation and operation of the HVJB will be plug-and-play.

If you're integrating your HVJB independently, its operation is VCU controlled. Your VCU must be programmed to send and receive communication signals to and from devices throughout the system. These signals are used to determine when to energize the contactor coils, opening and closing their HV circuits.

Please reference the LV connector pinout tables for the device controls. All contactor coils are high-side driven with <1A at 12VDC.

8.1 Power Distribution

All DC power into the HVJB from the battery system must be controlled by an external contactor. If you're using Hypercraft's HyperPack™, there is a contactor internal to the master pack used to control current flow, located on the DC- side of the circuit. Closing this contactor makes high voltage DC power available to the HVJB. Once the DC+ contactor is also closed, that power energizes the main bus inside the HVJB; this is the convergence point through which all high voltage in the system passes.

The inverter, A/C compressor, and ACCS circuits inside the HVJB have additional contactors that must be closed to operate those devices, as explained below:

Inverter Pre-Charge: The HVJB features a built-in 1kΩ pre-charge resistor and contactor. To energize this circuit, close the battery DC- contactor, then the inverter pre-charge contactor (see section 7.3).

If you are using an inverter purchased from Hypercraft, the pre-charge resistor and timing control will be properly calibrated for you.

If you are using your own inverter, please reference your user manual to determine the amount of pre-charge resistance required. If you need more than 1kΩ, additional resistance must be added in series external to the HVJB. Timing control must be carefully calculated, based on the DC-Link capacitance of your inverter.

Powering the Inverter: To energize this circuit, close the battery DC- contactor, then energize the main power DC+ contactor coil (see section 7.3). Never energize this circuit without first pre-charging the inverter.

If using an inverter purchased from Hypercraft, please reference the .dbc file on the Hypercraft website for the full CAN messaging exposition.

PowerBlade™: If pairing your HVJB with Hypercraft's PowerBlade, please reference the PowerBlade user manual for device controls and pinout information. The contactor controlling the CCS circuit is internal to PowerBlade, not the HVJB.

Charging: Close the battery DC- contactor to energize this circuit.

If using a charger purchased from Hypercraft, please reference the .dbc file on the Hypercraft website for the full CAN messaging exposition.

If your charger also has DC Converting capability, the HVDC current will pass through the HVJB, but the LVDC current will not; it must be routed directly to the low voltage battery.

Powering the Heater: To energize the heater, close the battery DC- contactor, then close the main DC+ contactor (see section 7.3).

Ensure HV polarity is correctly pinned out. If HV polarity is reversed, the heater will go into an uncontrolled heating state.

If pairing your HVJB with Hypercraft's ThermalBox, the HVJB's HEAT connector is intended for powering the battery heater.

HVJB is designed for use with Hypercraft's high voltage heaters, which do not require pre-charging, therefore there is no internal pre-charging componentry on the heater circuit. If you are using a heater not purchased through Hypercraft, please reference your user manual for pre-charge information. If it does require pre-charging, you must install your pre-charge componentry external to the HVJB.

A/C Compressor Pre-Charge: This circuit features a pre-charge contactor and a built-in 680Ω pre-charge resistor. To energize this circuit, close the battery DC- contactor, then close the A/C pre-charge contactor coil (see section 7.3).

The pre-charge resistor is designed for use with Hypercraft's high voltage A/C compressors. If using an A/C compressor purchased from Hypercraft, integration will be plug-and-play, as the pre-charge resistor and timing control will be properly calibrated for you.

If using your own A/C compressor, please reference your user manual to determine the amount of pre-charge resistance required. If you need more than 680Ω, additional resistance must be added in series external to the HVJB. Timing control must be carefully calculated, based on the DC-Link capacitance of your compressor.

Powering the A/C Compressor: Energize the battery DC- contactor to make power available to the HVJB, then energize the A/C compressor contactor coil (see section 7.3) to facilitate HV current flow to your A/C compressor. Never energize this circuit without first pre-charging the compressor.

Powering the Accessory Port (ACCS): HVJB features a High Voltage Accessory Power Connector for the convenience of the end user. This circuit is energized by closing the battery DC- contactor, then closing the main DC+ contactor (see section 7.3).

If pairing your HVJB with Hypercraft's ThermalBox, the HVJB's ACCS connector is intended for powering the cabin heater.

The HVJB's ACCS circuit does not have internal pre-charge componentry. If using this circuit for powering a device requiring pre-charge, you must install pre-charge componentry external to the HVJB.

8.2 CCS

If pairing your HVJB with Hypercraft's PowerBlade™, please reference the user manual for full details.

Step 1: Vehicle must be turned OFF.

Step 2: Insert the charger plug into the CCS port. Fully seat the plug, ensuring proper contact and function.

Step 3: Vehicle will turn on and indicator lights will flash for visual confirmation.

Step 4: Charger plug will lock and CCS will begin the fast charging sequence.

Step 5: VCU will manage how much power is delivered to the batteries. This is controlled through data feedback from the batteries, including cell temperatures, battery State of Health (SoH), and battery State of Charge (SoC).

Step 6: When the charging sequence is complete, the system will begin balancing the cells and remain in that state until the CCS port is unplugged.

Step 7: To remove the charger plug, press the charge button to end the charge cycle and disengage the lock, then unplug the charger.

NOTE: It is best for battery health and longevity to not interrupt a charge and balancing cycle until it is complete.

8.3 IMD

The IMD reports data via CANbus through the COMS connector (section 7.3), but all power and ground pinouts are routed through the IMD connector (section 7.4). IMD can be programmed in the settings to send a HV isolation status signal in a frequency range from 1 Hz to 20 Hz (1 to 5 times per second).

If using harnesses purchased from Hypercraft, operation of the IMD will be plug-and-play.

For the full CAN messaging exposition, please reference the IMD .dbc file on the Hypercraft website.

Also reference the [Sensata SIM100MOD datasheet](#) for additional controls details.

8.4 IVT-S

IVT-S is fully integrated into the HVJB, mounted and wired internally. The end user interfaces with the IVT-S via the COMS connector, through which it is powered, grounded, and reports data on the CANbus network (see section 7.3).

IVT-S takes current, voltage, and temperature measurements at two tap points on the inverter circuit — one pre-inverter (DC-) and one post-inverter (DC+).

DC current can flow through the HVJB when the battery DC- contactor is closed. IVT-S will read voltage as DC- when charging and DC+ when discharging. This is normal.

If using harnesses purchased from Hypercraft, operation of the IVT-S will be plug-and-play.

For the full CAN messaging exposition, please reference the IVT-S .dbc file on the Hypercraft website.

Also reference the [Isabellenhuette IVT-S datasheet](#) for additional controls details.

9 Troubleshooting

Fault	Solution
HV Contactors Will Not Close	<ul style="list-style-type: none"> • Ensure HV connectors are fully seated with the latching tabs engaged. • Verify HVIL circuitry is complete and wires are undamaged. Contactors will not close unless the HVIL circuit is closed. • Ensure the high voltage system is insulated from the chassis. High voltage must float in isolation, otherwise the IMD will open contactors, and they can not be closed until high voltage isolation is achieved.
IMD Senses Breach of HV Isolation	<ul style="list-style-type: none"> • While wearing appropriate PPE, outlined in section 11.5, remove the fireman loop. The fireman loop ensures HV is disconnected and allows for safe connection/disconnection of cables. • Inspect the HV circuitry throughout the system, looking for anywhere a conductor could short to chassis ground, such as abrasions, cuts, and pinch points. • With a multimeter, check the ESS for isolation integrity. The terminal pins in the center of the HV connectors must have no continuity with the battery housing or chassis. • With a multimeter, check each HV harness segment for isolation integrity. The terminal pins must have no continuity with the connector housing. • With a multimeter, check each HV device for isolation integrity. The terminal pins must have no continuity with the device housing. • When the location of the IMD fault is found, replace the component and verify HV isolation integrity.
No Communication with HV Accessory Devices (Charger, Heaters, Compressor, etc.)	<ul style="list-style-type: none"> • Verify LV wires are correctly pinned out per section 7.1, sealed, and fully seated in the connector. • Reference the connector pinout table and check with an oscilloscope if the terminals are receiving command signals and power. • Verify CAN network resistance is $60 \Omega \pm 5\%$. System must be OFF when measuring resistance in your CAN network. Check your wire terminations and remove excess conductor length if necessary. • Ensure your CAN wires are twisted pairs. With an oscilloscope, check the CAN system for excessive EMI noise. If necessary, reroute CAN lines away from other harnesses and use shielded conductors or fit harnessing with external shielding.
Communication with HV Accessory Devices, but No HV	<ul style="list-style-type: none"> • Ensure all switches/knobs are in the "on" position. • Verify HV connectors are fully seated with locking tabs engaged and HVIL circuit properly wired. • Verify HV cables' polarity is not backwards (see section 7.4).

Contactors Remain Closed When Commanded to Open	<ul style="list-style-type: none"> If this happens, contact Hypercraft Customer Support immediately.
IMD Not Reporting Correctly	<ul style="list-style-type: none"> Check the quality and locations of IMD chassis grounding points (Section 7.4); they must be on opposite sides of the vehicle. Poor connections may cause their circuits to open intermittently, triggering the IMD to go into fault state. Ensure power to IMD is 12VDC.
IVT-S Not Reporting Correctly	<ul style="list-style-type: none"> Verify CAN network resistance is $60 \Omega \pm 5\%$. System must be OFF when measuring resistance in your CAN network. Check your wire terminations and remove excess conductor length if necessary. Ensure your CAN wires are twisted pairs. With an oscilloscope, check the CAN system for excessive EMI noise. CAN systems have a 0V-5V voltage range with a 2.5V floating zero, and their frequency directly correlates to their baud rate; for example, a 500kbps device sends CAN signals at 500kHz frequency. If you observe voltage or frequency in CAN wires outside the anticipated ranges for a given device, EMI may be the culprit. If necessary, reroute CAN lines away from other harnesses, and use shielded conductors or fit harnessing with external shielding. Ensure power to IVT-S is 12VDC.

10 Storage & Care

Cleaning

Wipe down with a dry or damp towel.

WARNING: Never pressure wash any electrical components. High pressure water can damage electrical components and may result in serious injury or death. Such damage will not be covered under warranty.

Storage

Store in a cool, dry place, away from direct sunlight and humidity. Moisture can lead to corrosion, and sunlight can degrade materials over time.

Do not drop, compress, deform or otherwise inflict excessive force to your HVJB.

11 Safety

11.1 Overcurrent Protection

HVJB is internally fused on each of its high voltage circuits. Do not exceed the rated currents listed below:

Circuit	Fuse Rating
Battery	300A or 500A, depending on model
Inverter	300A or 500A, depending on model
High Voltage Charger (CHARGE)	30A
High Voltage Heater (HEAT)	30A
High Voltage A/C Compressor (A/C)	30A
High Voltage Accessory (ACCS)	30A

Low voltage circuits must be fused external to the HVJB. If you've purchased a complete low voltage harness package from Hypercraft, low voltage fuses will be located in the fuse/relay box.

11.2 General Safety Guidelines

Important:

- Before energizing, ground the HVJB via the grounding point (see section 7.2).
- Never insert appendages or foreign objects into connectors.
- Before energizing, ensure HV connectors are correctly pinned out, double checking polarity is not reversed.
- Do NOT remove the lid or device-side connectors. Tampering with the internals of your HVJB will void the warranty.

11.3 HVIL

HVJB is equipped with heavy-duty Amphenol PowerLok 60 Series, 300 Series, and 500 Series connectors. These connectors are engineered to handle 1kV, and 60A, 300A, or 500A respectively. They are IP67 rated, finger safe, EMI shielded, and equipped with the HVIL.

HV connectors must be plugged in to create a closed HVIL circuit in your HV system. The system will not operate without a closed HVIL circuit, adding another level of safety to your HVJB.



11.4 Electrical Safety Rules

Never	Always
Never disconnect an energized connector.	Always keep connectors dry and free of debris when disconnected.
Connectors are physically keyed to their mates and should fit together without resistance. Never force two connectors together.	When mating two connectors together, always ensure they are fully seated with the cam or latching tab mechanism fully engaged.
Never pressure wash high voltage equipment.	Always ensure fluid can run off of electrical connectors. Do not allow fluid to collect inside the connectors.
Never mount the HVJB where fluid can pool in or on electrical connectors.	Always handle electrical circuitry with caution and appropriate PPE.
Never energize a circuit without forewarning while someone is working on it.	Always practice lock-out/tag-out. Always check the energized status of circuitry before working on it.

11.5 High Voltage PPE

Recommended High Voltage PPE:

- Class 0 (1000V AC / 1500V DC) Electrical-Insulating Glove Kit (Rubber Inner Glove with Leather Outer Glove)
- Arc Flash Rated Clothing, 12 cal/sq cm (Smock or Jumper, Leggings, and Balaclava)
- Arc Flash Rated Helmet with Face Shield, 20 cal/sq cm

11.6 Fire Safety

Like with all electrical devices, practice fire safety when energizing the HVJB. The HVJB contains High Voltage and Low Voltage electrical systems, both of which pose the risk of electrical fire if handled incorrectly.

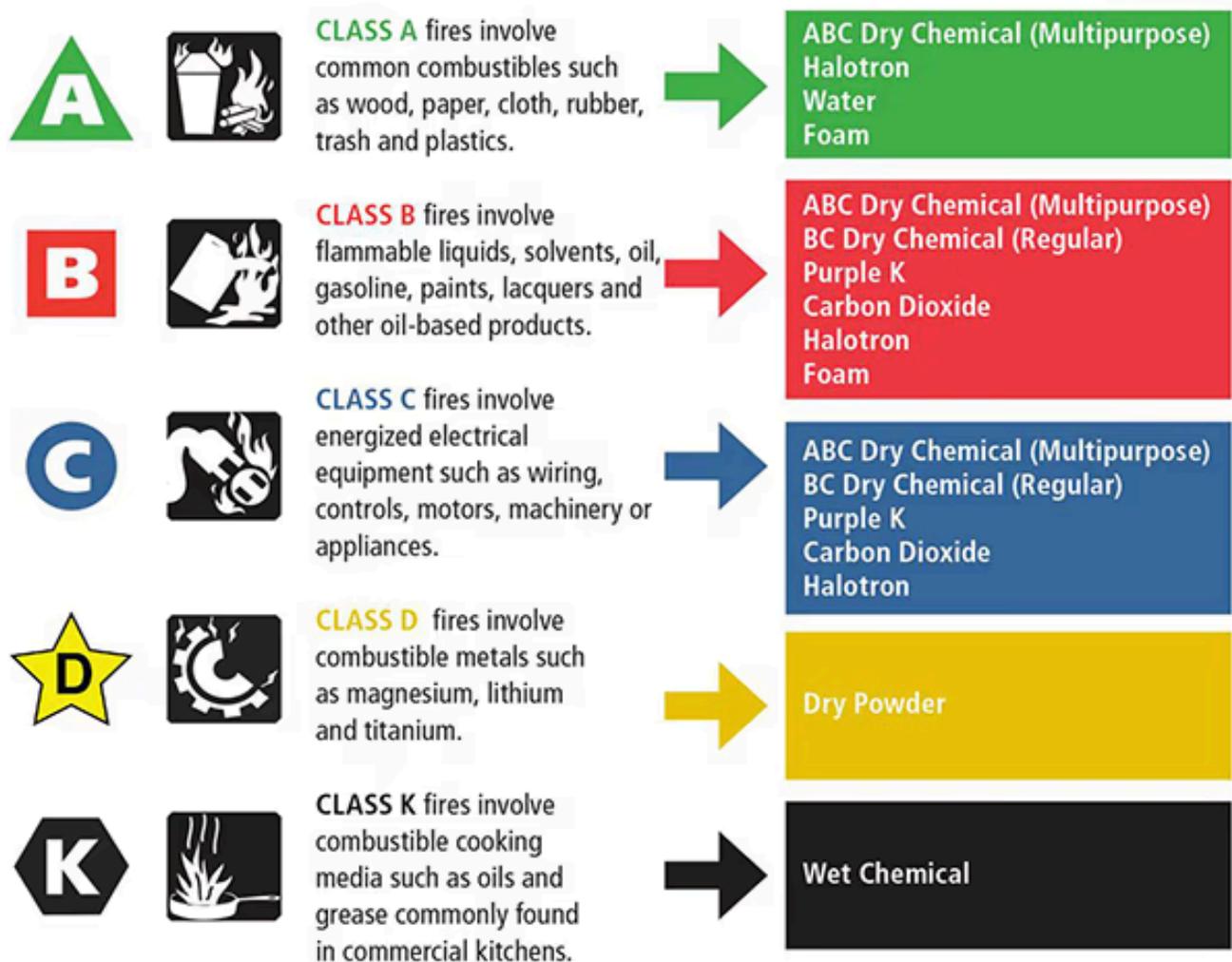
Ensure the correct wire gauges are used in the external harnesses for the amperage, ambient temperature, and conductor length.

Ensure conductor insulation is rated for the appropriate voltage and environment.

Ensure terminals are crimped, seated, and sealed to manufacturer specifications.

Should an electrical fire ignite, use the appropriate extinguishing method:

Fire Extinguishing Symbols, Classifications & Agents



Always refer to specific safety guidelines and protocols provided by your employer or regulatory agencies when working with electricity. Additionally, ensure that proper ventilation is available in the workspace, especially in enclosed areas, to minimize potential exposure to fumes or gasses.

12 Support

If you have any questions or concerns related to your product, please feel free to contact us:

Email: support@hypercraftusa.com

Phone: (801) 317-8475

13 Document Revision

Version	Change Description	Created By	Approved By	Release Date
0	Initial Release			

H Y P E R  C R A F T[®]

hypercraftusa.com