

DC POWER DISTRIBUTION



 **Littelfuse®**
Expertise Applied | Answers Delivered

MARKET AND CUSTOM
SOLUTIONS FOR VEHICLE
DC POWER DISTRIBUTION



Selecting a Power Distribution Module

What you need to know when selecting a product for your application

Application Considerations

When specifying a power distribution module, your application should be the first area of focus. This can determine specific requirements that are crucial in selecting the right solution.

What is the Application?

Power distribution modules provide applications with centralized, safe power distribution, preventing excess downtime due to service. Generally, PDMs can be found on heavy-duty truck, agriculture, and construction equipment. With the advancement in telecom, PDMs are now being found in more places than just vehicles. From Class 8 tractors to data centers, PDMs are used to keep DC applications protected and powered safely.



Mounting Locations

Mounting locations and space restrictions can vary by application but can have a big impact on determining your available options.

Common Mounting Locations Include:

- Under Hood
- Chassis
- Battery Box
- Equipment Box



Electrical Considerations

Power Distribution Modules are installed into applications to ensure circuits are protected, controlled and/or sensed. These units' primary focus is to protect and distribute current throughout an application. There are many variables that affect the selection of the right module for your application and these are the following considerations that should be taken prior to selecting your module.

Circuits

DC applications can have many powered accessories as features and benefits. These accessories need to be powered and/or controlled and PDMs are the ideal solution to protect, sense and control the desired applications through a centralized, safe location.

Amperage

A system's amperage should be considered by total current and current per circuit. Total current will be controlled by a unit's ability to disperse heat created by continuous current. Continuous and maximum current is the working amperage (individual circuit current de-rated by 70%). A PDM should have the proper amperage calculated to ensure proper system protection.

Bussing

The electrical bus is how the PDM moves current around the module. Common bussing can be:

- **Bus Bar:** a matrix of copper bars and connections to form a circuit
- **PCBA** (Printed Circuit Board Assembly): PCBA traces make all connections
- **Hybrid:** Includes Bus Bars, PCBA and direct wiring

I/O

Also known as Input/Output, this term refers to the connection to a device. A PDM is used to protect and control electrical systems. Connections to these devices should allow mechanical and protective devices to be changed so that the module can last the life of the application.

Connector Type

Connectors can come in either standard or custom configurations. Custom terminals will be sculpted to fit the application and the module. This will allow users the most configurability with their harness selection. Standard connectors are off the shelf with better market availability.

Smart Connectivity

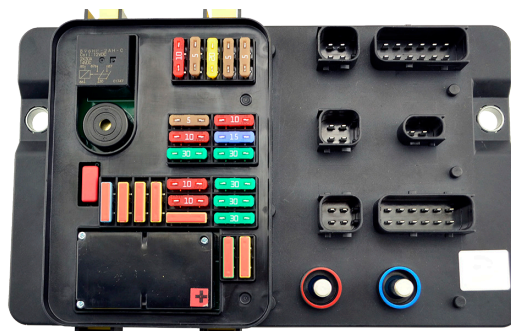
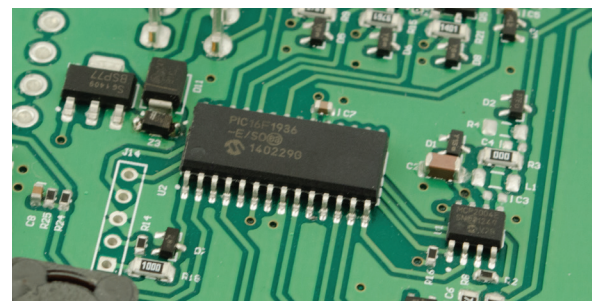
Smart Connectivity - better known as on-board micro processing is the ability to add bus based communications to your PDM. Some examples are CAN SAE J1939 and ISO 11898 high speed communications protocols, LIN and current sensors.

Devices / Components

- Fuses
- Relays
- Circuit Breakers/PTCs
- CAN/LIN Modules
- Current Sensing Components

Voltage

Direct Current (DC), is electrical current that flows consistently in one direction. Common maximum application voltage is 32V DC, but with emerging electric vehicle popularity voltages are reaching up to 1,000V DC.





Environmental Considerations

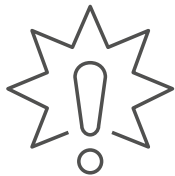
Littelfuse PDMs are developed and designed to operate in some of the harshest environments. Choosing the right environmental ratings for your PDM is an essential consideration that will directly affect the long-term performance on not only your PDM, but also your application.



Ingress Protection (IP)

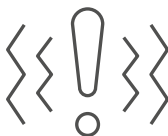
IP Rating: a set of criteria a product is tested to in order to ensure its level of sealing

- IP65 will be sufficient in most cases If the PDM will be mounted in an enclosure
- If the PDM will be exposed to spray and splash, IP66/IP69K should be a minimum



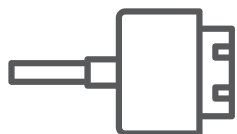
Shock

Mechanical Shock is the sudden acceleration caused by impact. This should be considered when mounting your PDM and what potential impacts it may experience. Littelfuse PDMs are tested to industry standards for road vehicles to ensure durability of our products.



Vibration

Mechanical vibration is the consistent oscillation a product may experience. PDMs will mostly experience this when they are mounted close to an engine or motor. Littelfuse PDMs are tested to industry standards for road vehicles to ensure durability of our products.



Connectors

Connectors not only aide in power input and output, but also to the level of sealing protection for the total PDM. When selecting a sealed PDM, IP rated connections should also be considered if the Power Distribution Module requires an IP rating.



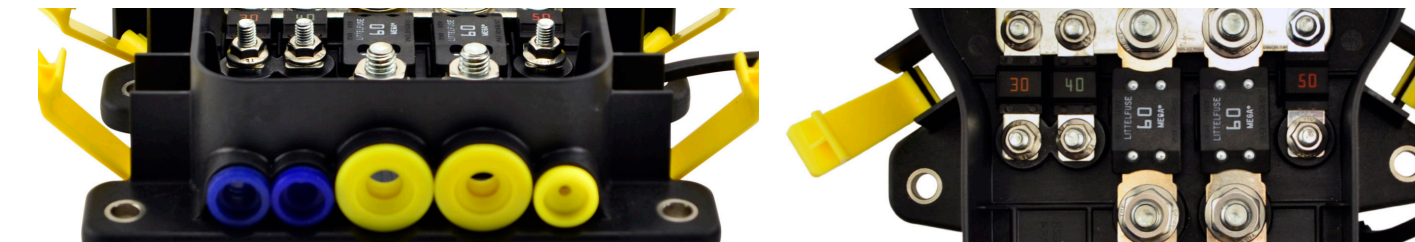
MDB5 Power Distribution Module

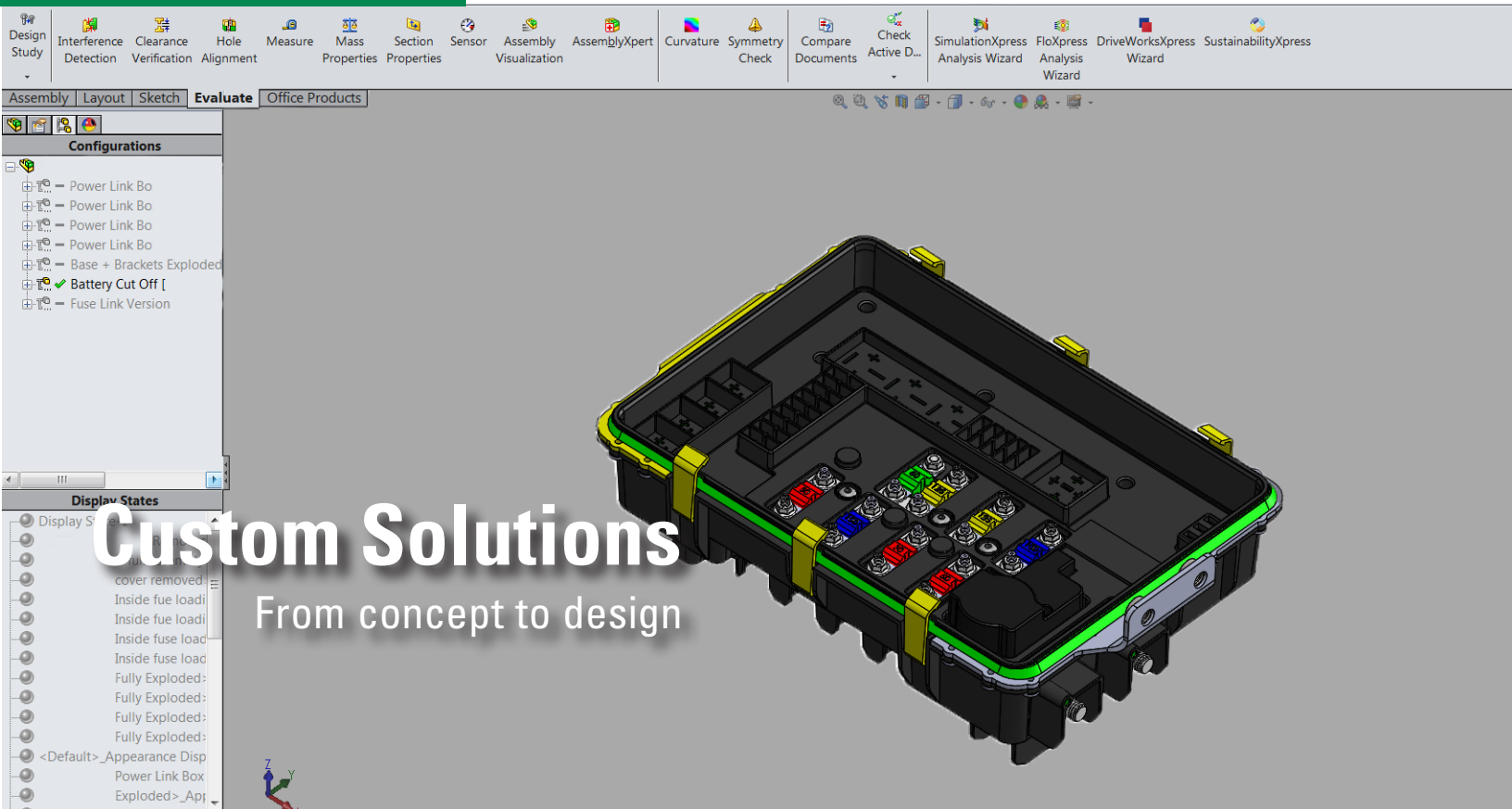
Sealed High Current Centralized Circuit Protection

Designed to handle standard voltage (32V) and the new 70V (48V application) MIDI® and MEGA® fuses. Configurable inputs allows for flexibility between high and low current applications.



PART NUMBERS	VOLTAGE RATING	INGRESS PROTECTION	MAX CURRENT RATING	NOTES
07985001ZXS	32 VDC	-	ONE 50mm ² INPUT WIRE: 200A TWO 50mm ² INPUT WIRES: 400A	Covered Mating Terminals, Not Sealed
07985002ZXS	70 VDC	-	ONE 50mm ² INPUT WIRE: 200A TWO 50mm ² INPUT WIRES: 400A	Covered Mating Terminals, Not Sealed
07985003ZXS	32 VDC	IP67/69K	ONE 50mm ² INPUT WIRE: 200A TWO 50mm ² INPUT WIRES: 400A	Sealed Mating Terminals to IP67/69K
07985004ZXS	70 VDC	IP67/69K	ONE 50mm ² INPUT WIRE: 200A TWO 50mm ² INPUT WIRES: 400A	Sealed Mating Terminals to IP67/69K





Custom Solutions

From concept to design

What is a semi-custom PDM?

Sometimes an off-the-shelf solution will not meet the needs of your application. In these instances, a semi-custom PDM may be the right solution to your design challenges. A semi-custom PDM means alterations to an existing market PDM that can consist, but is not limited to the following:

Custom Labels

Custom labels are some of the most common alterations that can be made to a PDM. These labels are used to identify circuits keeping maintenance downtime to a minimum.

PCB Board Spins

The advantage of a PCBA is the ability to have all your circuits "traced" on one board. A board spin will incorporate all desired circuits to one centralize device.

Grid Changes

Grid changes allow for off-the-shelf solutions to be tailored to specific application requirements. Changing grid layout, allows for the addition or removal of required components, without a ground up design.

Custom PDM Development

When a market or semi-custom solution will not meet your applications needs, it is then time to design a custom application specific Power Distribution Module. Custom solutions will be tailored to exact application requirements.

Benefits of a Custom PDM:

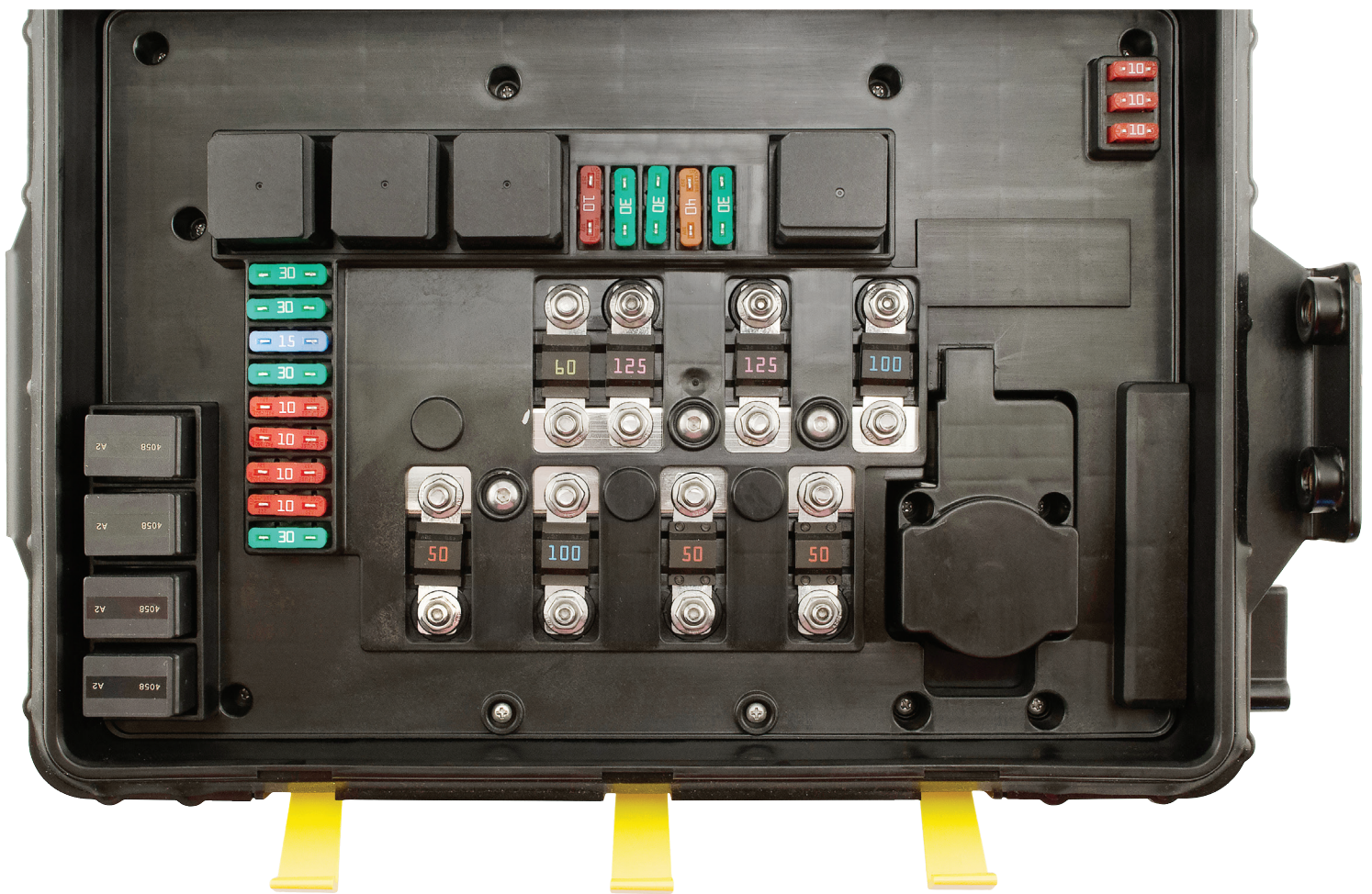
- Custom Connectors tailor to your application's harness
- Design to fit in specific locations
- Tailored circuitry to protect, control and sense all required circuits
- Smart micro-processing can be added via CAN/LIN bus protocols

Requirements to Consider:

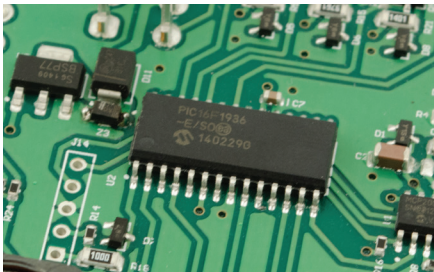
- Specialized tooling costs
- Design Non-Recurring Expenses
- Testing and validation costs

For more information or to request a consultation:

info.littelfuse.com/custom-power-distribution-modules

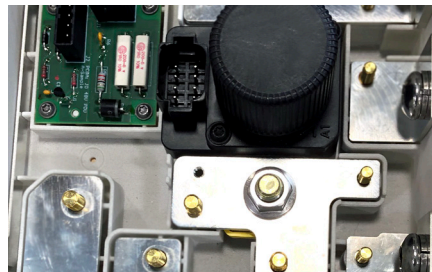


Customization Available for Every Challenge



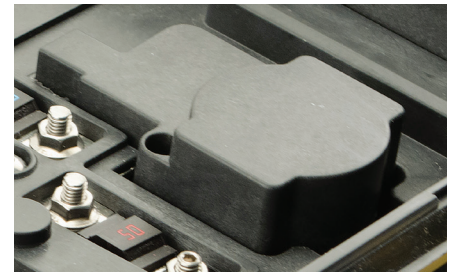
Smart Control: Integrated CAN / LIN Interface

Support CAN (LIN or J1939) protocols for on-board microprocessing.



High Current Capabilities

Expertise in design and production of high current system solutions.



High-Current Relay Integration

Eliminate cost and liability of connecting external high current relays for power control.



Combine High and Low Current Components

Simple and cost effective solution for high and low current circuits.



Custom Labeling

Minimize maintenance and downtime with Individual circuit identification.



Connector

Best in class connection systems for sealed, efficient and safe power transfer.

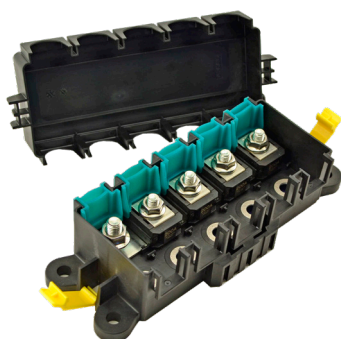
Medium - High Current



Fuses not included



	07985001ZXS	07985003ZXS	07985002ZXS	07985004ZXS
Fuse Type	2 - MEGA® 4 - MIDI®	2 - MEGA® 4 - MIDI®	2 - MEGA® 4 - MIDI®	2 - MEGA® 4 - MIDI®
Number of Circuits	5	5	5	5
Voltage Rating	32 VDC	32 VDC	70 VDC	70 VDC
Max Current Rating	ONE 50mm² INPUT WIRE: 200A TWO 50mm² INPUT WIRES: 400A	ONE 50mm² INPUT WIRE: 200A TWO 50mm² INPUT WIRES: 400A	ONE 50mm² INPUT WIRE: 200A TWO 50mm² INPUT WIRES: 400A	ONE 50mm² INPUT WIRE: 200A TWO 50mm² INPUT WIRES: 400A
IP Rating	-	-	IP67/69K	IP67/69K
Notes	■ Covered Mating Terminals	■ Covered Mating Terminals	■ Sealed Mating Terminals	■ Sealed Mating Terminals



	0FHZ0001Z	0FHZ0002Z	0FHZ0003Z	0FHZ0005Z	0FHZ0006Z	0FHZ0007Z	0FHZ0008Z	0FHZ0009Z
Fuse Type	Configurable 1 - 4 M8 ZCASE	Configurable 1 - 4 M8 ZCASE	Configurable 1 - 4 M8 ZCASE	Configurable 1 - 4 M8 ZCASE	Configurable 1 - 6 M8 ZCASE	Configurable 1 - 6 M8 ZCASE	Configurable 1 - 6 M8 ZCASE	Configurable 1 - 6 M8 ZCASE
Number of Circuits	1-4	1-4	1-4	1-4	1-6	1-6	1-6	1-6
Voltage Rating	32 VDC	32 VDC	32 VDC	32 VDC	32 VDC	32 VDC	32 VDC	32 VDC
Max Current Rating	400A	400A	400A	400A	400A	400A	400A	400A
Temperature Range	-40° to 105° C	-40° to 105° C	-40° to 105° C	-40° to 105° C	-40° to 105° C	-40° to 105° C	-40° to 105° C	-40° to 105° C
IP Rating	-	-	-	-	-	-	-	-
Notes	■ Covered Mating Terminals	■ Covered Mating Terminals	■ Covered Mating Terminals	■ Covered Mating Terminals	■ Covered Mating Terminals	■ Covered Mating Terminals	■ Covered Mating Terminals	■ Covered Mating Terminals

Medium - High Current



	04980932ZXT	04980933ZXT	04980932.X	04980933.X
Fuse Type	MIDI®	MIDI®	MIDI®	MIDI®
Number of Circuits	2	3	2	3
Voltage Rating	58 VDC	58 VDC	58 VDC	58 VDC
Max Current Rating	200A	200A	200A	200A
Temperature Range	-40 to +85 °C	-40 to +85 °C	-40 to +85 °C	-40 to +85 °C
IP Rating	-	-	IP67/69K	IP67/69K
Notes	■ Covered Mating Terminals	■ Covered Mating Terminals	■ Sealed Mating Terminals	■ Sealed Mating Terminals



	07981002ZXS	880195400
Fuse Type	4 - MEGA® 2 - MIDI®	MEGA®
Number of Circuits	6	2
Voltage Rating	32 VDC	48 VDC
Max Current Rating	240A	600A
Temperature Range	-40 to +120 °C	-50°C to +105°C
IP Rating	IP66	IP67/69K
Notes	■ Sealed Mating Terminals	■ Covered Mating Terminals

Main PDM



	LFLX0006Z-01	LFMX0007Z-01	FLEC3000Z-0
Voltage Rating	24 VDC	24 VDC	24 VDC
Max Current Rating	160A	150A	300A
Temperature Range	-40° C to 85° C	-40°C to +85°C	-40 to +85°C
IP Rating	IP67 / IP69K	IP67/69K	IP67
Dimensions (LxWxH)	179x155x69 mm	157mm x 96mm x 126mm	180x197x75 mm
Mating Connectors	Tyco MCP 2.8mm & 1.5mm	Tyco HDSCS Connectors	Delphi GT
Components	27 - ISO 280 Cavities 3 - Form C 280 series relays 6 - Form A 280 series relays	11 - MINI® Fuse: 2-30A 2 - MCASE+® Fuse: 15-60A 3 - Form C 280 Series Micro Relays, 3 - Form A Ultra Micro Relays, 1 - ISO Micro Relay	Included Components 28 - MINI® Fuses 18 - ISO 280 Micro Relays



	880075	880076	880089	880094	880073
Voltage Rating	12 VDC	12 VDC	60 VDC	60 VDC	32 VDC
Max Current Rating	300A	300A	350A	350A	350A
Temperature Range	-50° C to +105° C	-50° C to +105° C	-50 °C to +125 °C	-50 °C to +125 °C	-55° C to +125° C
IP Rating	IP59K/IP66	IP59K/IP66	IP59K	IP59K	IP59K/IP66
Dimensions (LxWxH)	146x123x55 mm	146x123x55 mm	165x159x47mm	165x159x47mm	146x99x41 mm
Mating Connectors	Ring Terminal	Ring Terminal	Ring Terminal	Ring Terminal	Ring Terminal
Components	4 - ATO® 3 - MIDI®	4 - ATO® 3 - MIDI®	6 - ATO® 4 - MIDI®	6 - ATO® 4 - MIDI®	4 - ATO® 3 - MIDI®

Hard Wired Boxes



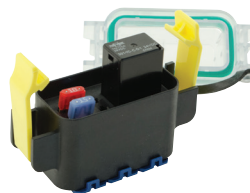
HWB60-AL



HWB60



HWB18



HWB12



HWB6

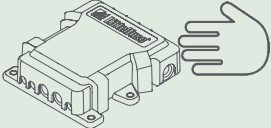
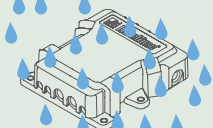
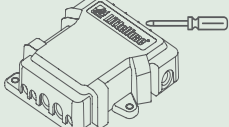
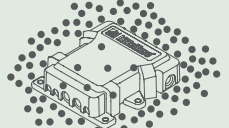
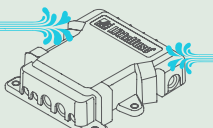
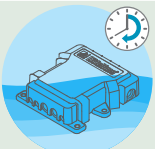
PART NUMBER	SERIES	MAX FUSE RATING (PER CIRCUIT)	MAX CONTINUOUS CURRENT	FUSE TYPE	ACCEPTS ISO 280 STYLE RELAYS	NUMBER OF CAVITIES	INGRESS PROTECTION RATING	MATING TERMINALS & SEALS	COVER		ASSURELATCH™		GASKET	GRID	MOUNTING BRACKET		TPAS
									BLACK	CLEAR	FINGER	TOOL			90°	30°	
PDM32001ZXM	HWB6	30A	68A	MINI		6	IP67/IP69K	Tyco MCP		•	•		•				•
PDM32002ZXM		30A	68A	MINI		6	IP67/IP69K	Tyco MCP	•		•		•				•
PDM32003ZXM		30A	68A	MINI		6	IP67/IP69K	Tyco MCP		•	•		•		•		•
PDM32004ZXM		30A	68A	MINI		6	IP67/IP69K	Tyco MCP	•		•		•		•		•
PDM33001ZXM	HWB12	30A	130A	MINI	•	12	IP67/IP69K	Tyco MCP		•	•		•				•
PDM33002ZXM		30A	130A	MINI	•	12	IP67/IP69K	Tyco MCP	•		•		•				•
PDM33003ZXM		30A	130A	MINI	•	12	IP67/IP69K	Tyco MCP		•	•		•		•		•
PDM33004ZXM		30A	130A	MINI	•	12	IP67/IP69K	Tyco MCP	•		•		•		•		•
PDM31001ZXM	HWB18	30A	100A	MINI	•	18	IP67/IP69K	Delphi Metri-Pack 280	•				•			•	•
PDM31002ZXM		30A	100A	MINI	•	18	IP67/IP69K	Delphi Metri-Pack 280	•				•				•
PDM31003ZXM		30A	100A	MINI	•	18	IP67/IP69K	Delphi Metri-Pack 280	•				•				
PDM71001ZXM	HWB60-AL	30A	250A	MINI	•	60	IP67/IP69K	Delphi Metri-Pack 280	•			•	•				•
PDM71003ZXM		30A	250A	MINI	•	60	IP67/IP69K	Delphi Metri-Pack 280	•		•		•				•
PDM71004ZXM		30A	250A	MINI	•	60	IP67/IP69K	Delphi Metri-Pack 280	•			•		•			•
PDM71006ZXM		30A	250A	MINI	•	60	IP67/IP69K	Delphi Metri-Pack 280	•			•	•				•
PDM71008ZXM		30A	250A	MINI	•	60	IP67/IP69K	Delphi Metri-Pack 280	•		•		•				•
PDM71009ZXM		30A	250A	MINI	•	60	IP67/IP69K	Delphi Metri-Pack 280	•			•		•			
PDM21001LXM	HWB60	30A	250A	MINI	•	60	IP67/IP69K	Delphi Metri-Pack 280	•				•				•

Ingress Protection Explained

Harsh Environments and Ingress Protection Ratings

Environmental factors play a huge role in a product's ability to do its job and survive the lifetime of the equipment. Ingress Protection, or IP, indicates the degree of protection of a power distribution module. IP ratings are a measure of how resistant a part is to environmental contaminants such as debris, dust, and water. IP rating selections should be based on where the PDM will be mounted and what type of environment the equipment will be used in.

The numbers following IP represent levels of sealing and can range from no sealing (IP00) to protection against dust and continuous immersion in water (IP68). The table below provides a description of the protection at each level.

1st Digit - SOLID Degree of protection against solid objects		2nd Digit - LIQUID Degree of protection against water	
	1 Protected against a solid object greater than 50mm		1 Protected against vertically falling water drops
	2 Protected against a solid object greater than 12.5mm		2 Protected against vertical water drops when enclosure tilted up to 15 degree angle
	3 Protected against a solid object greater than 2.5mm		3 Protected against spraying water from up to a 60 degree angle
	4 Protected against a solid object greater than 1.0mm		4 Protected against splashing water
	5 Dust Protected. Prevents ingress of dust sufficient to cause harm		5 Protected against water jets
	6 Dust tight. No ingress of dust.		6 Protected against powerful water jets
Example IP67 Dust tight. No ingress of dust. Protected against effects of temporary submersion in water.			7 Protected against the effects of temporary immersion in water between 15cm and 1m for 30 minutes
			8 Protected against the effects of continuous immersion in water under conditions agreed between manufacturer and user
			9K Protected against close-range high pressure, high temperature spray downs

KEY TERMS AND DEFINITIONS

Amp/Amperage – The strength of an electric current in Amperes (the basic unit of electrical current in the International System of Units).

Connectorized – Products that have an existing, integrally molded, female or male market available connector.

High Current – Nominal current range above 60A 32 VDC

Low Current – Nominal current range below 60A 32 VDC

Harsh Environments – Shock or vibration ratings in addition to IP or Ingress Protection ratings a product can be rated to.

Bussing – Slang term used to describe the method or configuration that is used to distribute power throughout a module.

Busbar – In electric power distribution, a busbar (also bus bar) is a metallic strip or bar, typically housed inside switchgear, panel boards, and busway enclosures for local power distribution.

PCBA – (Printed Circuit Board Assembly) is the board obtained after all printing solder paste on the PCB and then mounting various components like resistors, ICs (Integrated Circuits), capacitors and any other components like transformers depending on the application and desired characteristics of the board.

Voltage – is what makes electric charges move. It is the 'push' that causes charges to move in a wire or other electrical conductor.

Fuse Types – Denotes which variant of automotive fuse is accepted in a module.

Relay Types – Denotes which variant of Automotive relay is accepted in a module.

AssureLatch™ – Littelfuse latch technology ensuring “worry-free” positive latching with an audible “click”

Circuit – The path over which an electrical charge flows.

Continuous Rating – The rating meant to indicate what the device can handle forever with no interruption. It is usually measured as the amperage that a device can handle for one hour without exceeding the maximum allowed temperature rise at the terminals.

Inrush Rating – The short duration rating of the switch. This rating is meant to reflect the ability of the switch to withstand a short term, high current event like starting. A large diesel engine starting in cold weather can draw close to 2000A for about 30 seconds.

IP Rating – IP Rating - Formally known as an International Protection rating, but often referred to as Ingress Protection, this rating determines the resistance of a device to environmental contaminants

Short Circuit – An abnormal low resistance path between two polarities, or polar opposite, circuits. It will likely be accompanied by overheating, an explosion, or fire. A short-circuit is also likely to cause damage to components or equipment in that circuit.

Terminals – A reusable interface creating a point where external circuits can be connected. Terminals can be connected at the end of a wire and consist of either connectors or fasteners.

Common Applications...



AGRICULTURE

- Tractors
- Harvesters



CONSTRUCTION

- Excavators
- Loaders



MATERIAL HANDLING

- Fork Lifts
- Telehandlers
- Pallet Jacks