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## Contents

1.	Introduction .....	4
2.	WARNINGS & SAFETY INSTRUCTIONS .....	4
3.	Disposal .....	5
4.	Related Documents.....	5
5.	Dry-Out Procedure *** Important *** .....	5
6.	Product Variants .....	6
6.1	Grades.....	6
6.2	Plumbing Option .....	7
6.3	Capacitor Cooling Fans .....	8
6.4	Table of Supported Avid PEDL800/ PEDL1000 Units .....	9
6.5	Intended Applications.....	9
7.	Specification.....	10
7.1	Electrical – Power Section .....	10
7.2	Cooling .....	11
7.3	Environmental .....	12
7.4	Mechanical .....	13
7.5	Power Connections.....	15
7.6	Low Voltage & Network Customer Connections .....	16
7.7	Additional DC Connections .....	18
8.	Contact Details for Sales, Service and Support.....	19
9.	Document Revision History .....	19

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## 1. Introduction

- The PEDL800 and PEDL1000 units are manufactured and remanufactured by Avid Controls Inc under a license agreement with the General Electric Company.
- The PEDL800 and PEDL1000 are AC Inverter power modules for use in MV3000 variable speed drive systems for the control of AC motors in marine and other applications and generators within certain wind turbine converters. They are controlled by a PECe Drive Controller.
- Maximum current: 880A AC / 1100A AC
- Operational Voltages
  - Working AC Voltage: up to 690 V AC
  - Maximum Nominal Internal Voltage: 1200 V DC
- IGBT based Transistor Bridge Module
- Liquid Cooled
- Weight: 105kg (231 lb.)

## 2. WARNINGS & SAFETY INSTRUCTIONS

- This equipment may be connected to more than one live circuit.
- Wait at least 8 minutes after isolating supplies and check that the voltage between DC+ and DC- has reduced to a safe level before working on the equipment.
- Surfaces on the coolant pipes can reach high temperatures and remain hot for some time after power is removed.
- Ensure that all coolant has cooled to a safe temperature and the equipment is suitably drained and isolated before the external pipework is disconnected from the equipment.
- Unit is heavy: 105kg (231 lb.)
- Care has been taken with the design of this product to ensure that it is safe. However, in common with all products of this type, misuse can result in injury or death. Therefore, it is especially important that the instructions in this technical data sheet and the manual as well as on the product are observed during transportation, commissioning, operation, maintenance and disposal.
- This technical data sheet and the manual must be regarded as part of the product. It should be stored with the product and must be passed on to any subsequent owner or user.
- Local safety laws and regulations must always be observed.
- Persons working on the product must be suitably skilled and should have been trained in that work for these products.
- The product is a component designed for incorporation in installations, apparatus and machines.
- The product must not be used as a single item safety system. In applications where maloperation of the product could cause danger, additional means must be used to prevent danger to persons.
- Product approvals and certifications will be invalidated if the product is transported, used or stored outside its ratings or if the instructions in the manual are not observed.

- In the European Union:
  - Products within the scope of the Low Voltage Directive, 2006/95/EC are CE marked.
  - The product complies with the essential protection requirements of the EMC directive 2004/108/EC, when installed and used as described in the manual.
  - The requirements of the EMC Directive should be established before any installation, apparatus or machine, which incorporates the product, is taken into service.
  - A machine must not be taken into service until the machine has been declared in conformity with the provisions of the Machinery (Safety) Directive, 2006/42/EC.

### 3. Disposal

- This equipment or any part of the equipment should be disposed of in accordance with the laws of the country of use.
- Modern high technology materials have been used in the manufacture of the equipment to ensure optimum performance. Care has been taken with the selection of these materials to minimize risks to health and safety. However, some materials require special consideration during the disposal.
- In common with all products of this type, the high voltage electrolytic capacitors contain an electrolyte, which must be disposed of as hazardous waste. The electrolytes are solutions of organic and/or boric acid. The major solvents in the capacitors are butyrolactone and ethylene glycol. The electrolyte is non-carcinogenic but may cause irritation to the skin if contact is prolonged.
- Liquid coolant is subject to special considerations during handling, storage and disposal. Refer to the manufacturer's instructions.

### 4. Related Documents

- This module is one component out of a range of components used for the MV3000 drive system. This data sheet gives details specifically for the items listed in section 5.4 of this document.
- For additional information on the installation, commissioning, operation, maintenance and performance of the complete drive system, please refer to all MV3000 documents, including:
  - T2058EN, PECe Liquid Cooled DELTA Manual
  - T2141EN, DIBe Data Sheet

### 5. Dry-Out Procedure \*\*\* Important \*\*\*

- This AVID DELTA module uses the same custom IGBT modules as the original DELTA module from Convertteam/GE.
- These modules can be susceptible to moisture ingress under certain circumstances which can lead to module failure.
- To mitigate this, Convertteam/GE specify a DRY-OUT process that must be followed before initially applying power to the DELTA module and after an extended period without power.
- This process must also be followed when commissioning and operating this AVID DELTA module.
- Failure to follow this procedure may result in failure of the DELTA module and the voiding of the product warranty.

## 6. Product Variants

### 6.1 Grades

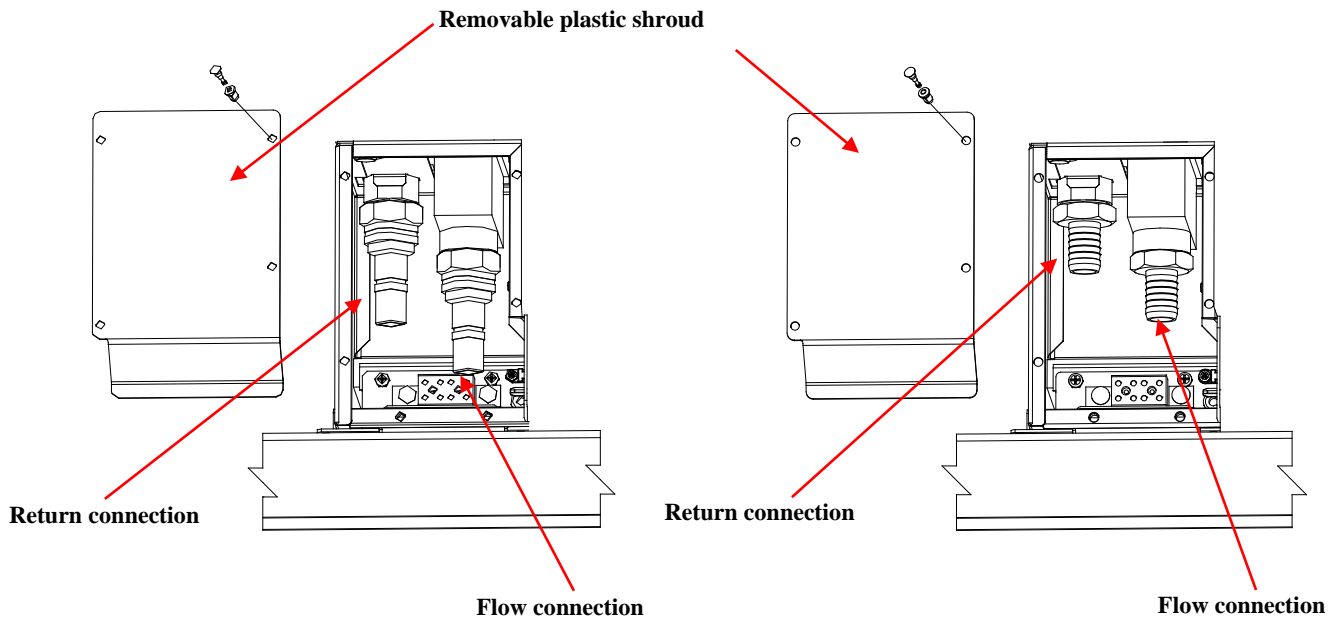
- There are three distinct grades of Avid PEDL800 / PEDL1000 products:

GRADE	NEW	REMANUFACTURED	REMANUFACTURED - ENHANCED
Identification	<i>MODEL NUMBER</i> ends in <i>-A</i>	<i>MODEL NUMBER</i> ends in <i>-REMAN</i>	<i>MODEL NUMBER</i> ends in <i>-REMAN-S</i>
IGBT Power Modules	Brand new to all GE specifications	Brand new to all GE specifications <b>OR</b> Reconditioned and re-certified by Avid using original parts from Power Module manufacturer	Brand new to all GE specifications
DC Link Capacitors	Brand new to all GE specifications	Brand new to all GE specifications <b>OR</b> Tested and recertified by Avid	Brand new to all GE specifications
Coolant sealing components	Brand new to all GE specifications		
Fasteners	Brand new to all GE specifications		
All other components	Brand new to all GE specifications	Recovered from returned Delta units and fully reconditioned	
Delta Unit Test	Full functional and extended load testing		

## 6.2 Plumbing Option

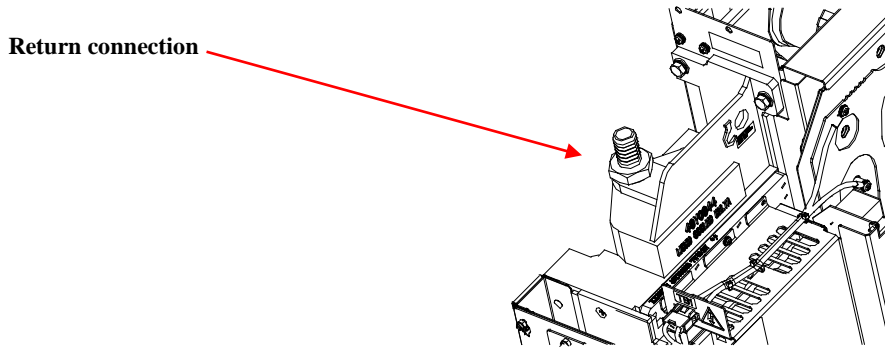
- There are three options for connection of coolant to the Delta unit:

OPTION	A	B	C
Identification	Embedded in <b>MODEL NUMBER</b> – see table in this section		
Coupling Type	¾” Hose Barb, Aluminum		Staubli RME 16 Quick Disconnect Plug
Coupling Location	Inlet and Outlet both at bottom of unit	Inlet at the bottom of the unit, outlet at the top	Inlet and Outlet both at bottom of unit
Air Bleed Valve Fitted	YES	NO	YES



**Option C** – Spring Loaded, Self-Sealing Connectors  
(Staubli RME 16)

**Option A** – Barbed Hosetail Connectors



### **Option B – Barbed Hosetail Connections, Return at Top and Flow at Bottom**

#### **6.3 Capacitor Cooling Fans**

- Avid Delta units are supplied with or without capacitor cooling fans, as required for different applications. The PEDL800 has no internal fans as cooling is provided in wind converter cubicle.
- Units supplied without fans **MUST** be installed in systems that separately provide sufficient air flow for capacitor cooling.



### 6.4 Table of Supported Avid PEDL800/ PEDL1000 Units

<i>MODEL NUMBER</i> for <i>NEW</i> units	<i>MODEL NUMBER</i> for <i>REMANUFACTURED</i> units	<i>MODEL NUMBER</i> for <i>REMANUFACTURED-ENHANCED</i> units	Description
PEDL800-47932010-A	PEDL800-47932010-REMAN	PEDL800-47932010-REMAN-S	<ul style="list-style-type: none"> <li>800A Unit, Plumbing Option B,</li> <li>Without capacitor fans</li> <li>With Additional DC Connects</li> </ul>
PEDL1000-57931101-A	PEDL1000-57931101-REMAN	PEDL1000-57931101-REMAN-S	<ul style="list-style-type: none"> <li>1000A Unit, Plumbing Option C,</li> <li>With capacitor fans</li> </ul>

- These are the only PEDL units currently available from Avid. Contact Avid Controls for information on standard/preferred products. These are intended for specific applications where shrouding is provided at the system level by the equipment manufacturer – they are not intended for general use.

### 6.5 Intended Applications

<i>MODEL NUMBER</i> (All Grades)	PRINCIPLE APPLICATION	NOTE
PEDL800-47932010	3MW Wind Turbines	Refer to OEM Manuals for 3MW Wind Turbine Converter. This DELTA module relies on system level shrouding and so should only be used as a spare for this application
PEDL1000-57931101	Marine Drives and Other PECe Systems	Refer to OEM Manuals for Marine/System Converters

## 7. Specification

### 7.1 Electrical – Power Section

Specification	<i>PEDL800</i>	<i>PEDL1000</i>	Notes & Applicable Conditions
Current Rating with 110% Overload	800A	1000A	Overload = 150% / 110% for 60s once per 10 minutes Coolant Temp. = 60°C DC Link Voltage = 975V PWM Frequency = 1.25kHz (Generator) Power Factor = 0.89 Freq. > 30Hz  Refer to Avid Controls for ratings at different conditions
Current Rating with 150% Overload	587A	733A	
Overload Current	110% or 150%		For 60s once per 10 minutes RMS value must be below that specified above
Instantaneous Over-current Trip Level	2500A		
Current Clipping (“Brick Wall Limit”) Level	1518A		
Continuous DC Link Operating Voltage	1170 V		Limited by SMPS Over Voltage Trip
Short Term (7.5s) DC Link Operating Voltage	1275V		SMPS may have lower limit, which must be respected
Non-Operating DC Link Withstand Voltage	1315 V		SMPS may have lower limit, which must be respected
PWM Switching Frequency	1.25kHz, 2.5kHz and 5.0kHz		Values > 1.25kHz will affect rating
DC Link Capacitance	11600 $\mu$ F	16800 $\mu$ F	+20/-10 %
Input Voltage Imbalance	$\leq$ 3% Negative Sequence Voltage		
Network Type	TN or TT (grounded Neutral)		Can also be connected to IT network (i.e. isolated neutral) if IT network separated from public mains supply by an isolating transformer.

Specification	PEDL800	PEDL1000	Notes & Applicable Conditions
Insulation Standards	<b>UL 840</b> <b>CSA C22-2 No. 0.2</b> <b>EN 50178:</b> TN or TT network: Overvoltage Category III IT network: Overvoltage Category II		For full compliance with UL 508C, transient suppressers complying with UL 1449 must be fitted external to the drive.

## 7.2 Cooling

Specification	Value
Coolant Type	Water / Ethylene Glycol Maximum 50% Ethylene Glycol With suitable corrosion inhibitors
Minimum Coolant Flow	25 liters/min (6.6 US-GPM)
Maximum Coolant Inlet Pressure	300kPa (45psi)
Maximum Coolant Inlet Temperature	60°C
Minimum Coolant Inlet Temperature	0°C
Coolant Strainer	Coolant must be strained to remove particles Maximum recommended strainer mesh is 0.7mm (0.028") Inspect and clean strainer every six months
Coolant Lifetime	Check coolant constituent concentration every six months Remove coolant, flush system with de-ionized water and refill with new coolant every 24 months.
Coolant Connection Options	<ul style="list-style-type: none"> <li>1x hose-barb top, 1x hose-barb bottom (Option A)</li> <li>2x hose-barb at bottom of unit (Option B)</li> <li>2 x Quick-Disconnect at bottom of unit (Option C)</li> </ul>
Heat Load to Coolant	<ul style="list-style-type: none"> <li>At 975V DC Link, 1.25kHz PWM and 40°C coolant inlet:</li> <li>587A : 3887 W</li> <li>733A : 5114 W</li> <li>800A : 5715W</li> <li>1000A : 7687 W</li> </ul>

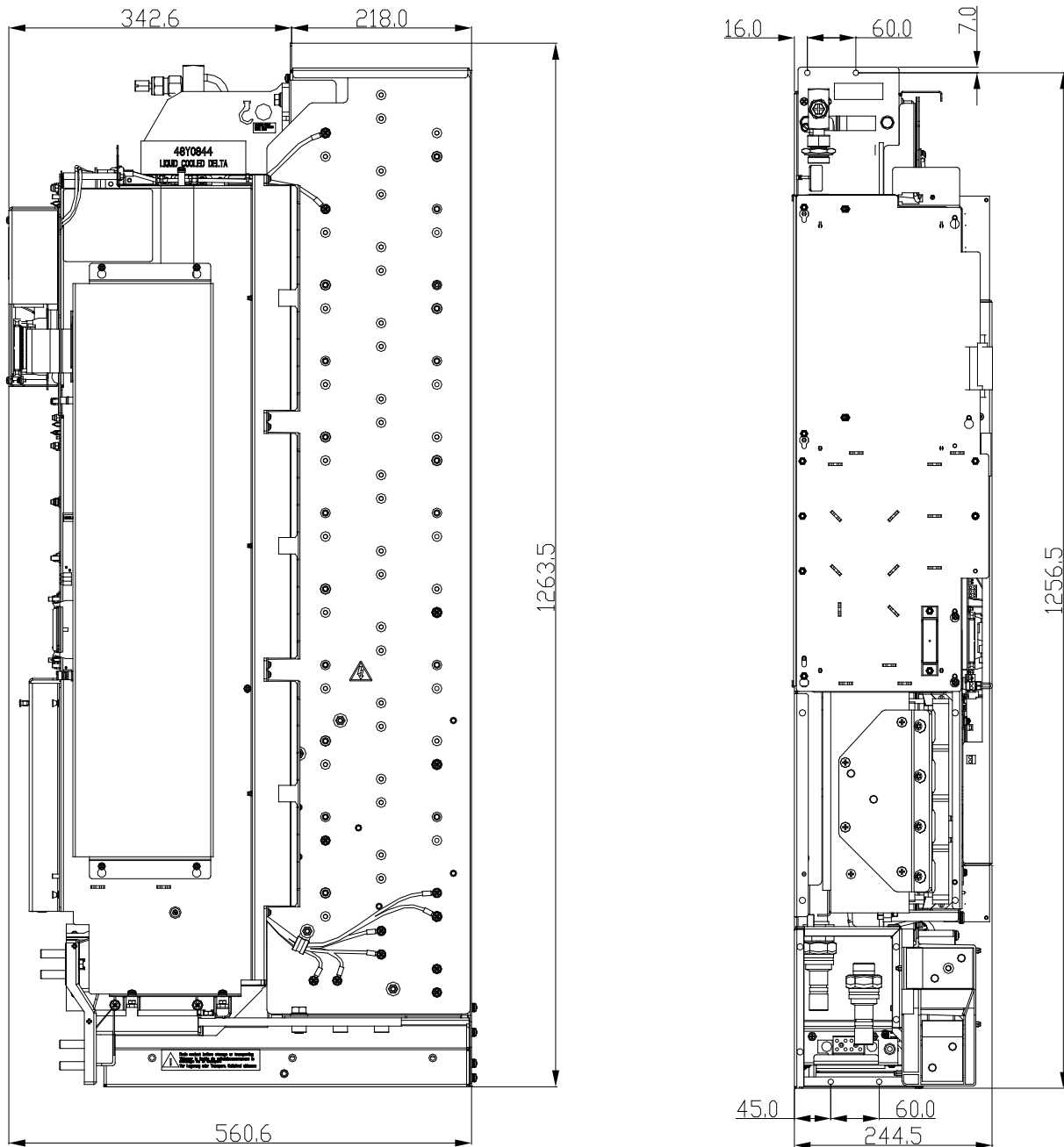
### 7.3 Environmental

Function	Specification				
Ambient Temperature (Internal cabinet temperature)	0 to 50°C				
Operating Relative Humidity	5 to 95% (non-condensing)				
Operating Altitude	Normal operating altitude up to 1000 m (3280 ft.) above sea level. From 1000 m (3280 ft.) to a maximum of 2000 m (6551 ft.) de-rate by 7.3% per 1000 m				
Operating Cabinet Air	Pollution Degree 2 (IEC 60664-1, UL 840 and CSA C22.2 No. 0.2-93) i.e. clean, free from dust, condensation and conductive or corrosive gases. If conductive pollution or condensation are expected (Pollution Degree 3), the drive must be placed in an enclosure which achieves Pollution Degree 2 by: <ul style="list-style-type: none"> <li>- excluding the conductive pollution e.g. by the use of filtered air;</li> <li>- preventing condensation e.g. by use of anti-condensation heaters.</li> </ul> In extreme environments dual circuit heat exchangers are recommended.				
Operating and Storage Chemicals (max.)	15 ppm H <sub>2</sub> S    25 ppm NO <sub>2</sub> 25 ppm SO <sub>2</sub>				
Storage Temperature	-25 to +55°C (-13°F to 131°F)				
Storage Relative Humidity	5 to 95% non-condensing				
Storage Altitude	Up to 3000 m (9842 ft.) above sea level				
Transport Temperature	-25 to +70°C (-13°F to 158°F)				
Transport Relative Humidity	5 to 95% (non-condensing)				
Transport Altitude	Will withstand air transport				
Enclosure Ingress Protection	IP00 (to IEC 60529; BS EN 60529), Open Type product (to UL508C, IEC 618005-1) These modules must always be installed in an appropriate enclosure with restricted				
<b>Vibration</b> - Operational	Type tested against the worst combination of the requirements of IEC 61800-2 (which specifies 'Class 3M1' of IEC 60721-3-3), EN 50178, IEC 61800-5-1 and DNV Rules for Ships, Jan. 2010 Part 4, Ch. 8, Section 3; summarized by the 'composite' column below:				
	Frequency	IEC 61800-2	IEC 81800-5-1	DNV	Composite
	2 to 5 Hz	0.3 mm amplitude			0.3 mm amplitude
	5 to 9 Hz	0.3 mm amplitude		20 mm amplitude	20 mm amplitude
	9 to 50 Hz	1 m/s <sup>2</sup>	0.075 mm (from 10 Hz)	20 mm amplitude	20 mm amplitude
	50 to 57 Hz	1 m/s <sup>2</sup>	0.075 mm		1 m/s <sup>2</sup>
	57 to 150 Hz	1 m/s <sup>2</sup>	9.81 m/s <sup>2</sup>		9.81 m/s <sup>2</sup>
	150 to 200	1 m/s <sup>2</sup>			1 m/s <sup>2</sup>

Function	Specification
<b>Vibration</b> - Storage and transport	To IEC 61800-2 which specifies Class 2M1 of IEC 60721-3-2 when equipment is packed for transport: 2 to 9 Hz                      3.5 mm amplitude 9 to 200 Hz                    10 m/s <sup>2</sup> 200 to 500 Hz                  15 m/s <sup>2</sup>
<b>Drop</b> - Transport	To IEC 61800-2 which specifies Class 2M1 of IEC 60721-3-2 when equipment is packed for transport: mass < 100 kg = 0.25 m; mass > 100 kg = 0.10 m
<b>Inclination</b>	- Static conditions; list 15°, trim 5° - Dynamic conditions; rolling ± 22.5°, pitch ± 7.5° (may occur simultaneously)

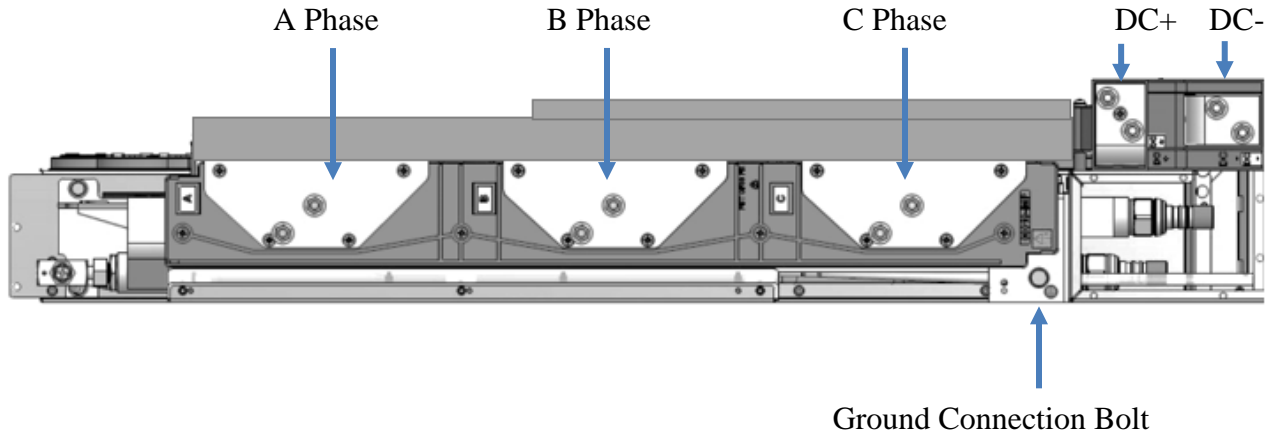
## 7.4 Mechanical

Specification	Value
Dimensions	248mm W x 1232mm H x 546mm D (9.75" W x 48.5" H x 21.5" D)
Enclosure	IP00 (IEC 60529:1989; BS EN 60529:1992) NEMA 1 Must always be installed within suitable enclosure with restricted access
Mass	103kg (227 lb.)



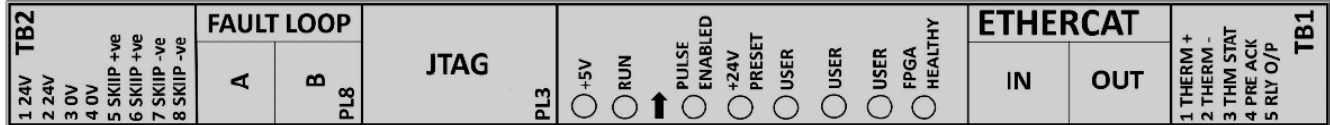
**7.5 Power Connections**

Connection	Value for PEDL800	Value for PEDL1000
AC Power Terminals	2 x M10 studs per phase Maximum cable size per stud is 120mm <sup>2</sup>	3 x M10 studs per phase Maximum cable size per stud is 120mm <sup>2</sup>
DC Power Terminals	2 x M10 studs each for DC+ and DC- Maximum cable size per stud is 120mm <sup>2</sup>	3 x M10 studs each for DC+ and DC- Maximum cable size per stud is 120mm <sup>2</sup>
Ground Connection	1 x M10 bolt	
DC High Voltage Control Connection	2-way Connector TB1 for SMPS & Voltage monitoring	



## 7.6 Low Voltage & Network Customer Connections

- Customer connections are made via the DIBe Module which is visible on the front of the DELTA module as shown below:



### Main DIBe Connections

Termination	Connection Type	Connection Name
Control signals	<b>1 EtherCAT in connection</b> <b>1 EtherCAT out connection</b> <b>1 Fault Loop in connection</b> <b>1 Fault Loop out connection</b>	<b>ETHERCAT</b>  <b>PL8 FAULT LOOP</b>
24V d.c. power supply	<b>8-pin connector</b>	<b>TB2</b>
MVM Connection	<b>16-pin ribbon cable</b>	<b>PL7</b>
Pre-charge and Rectifier monitor	<b>5-pin connector</b> (Not used for the Intended Applications)	<b>TB1</b>

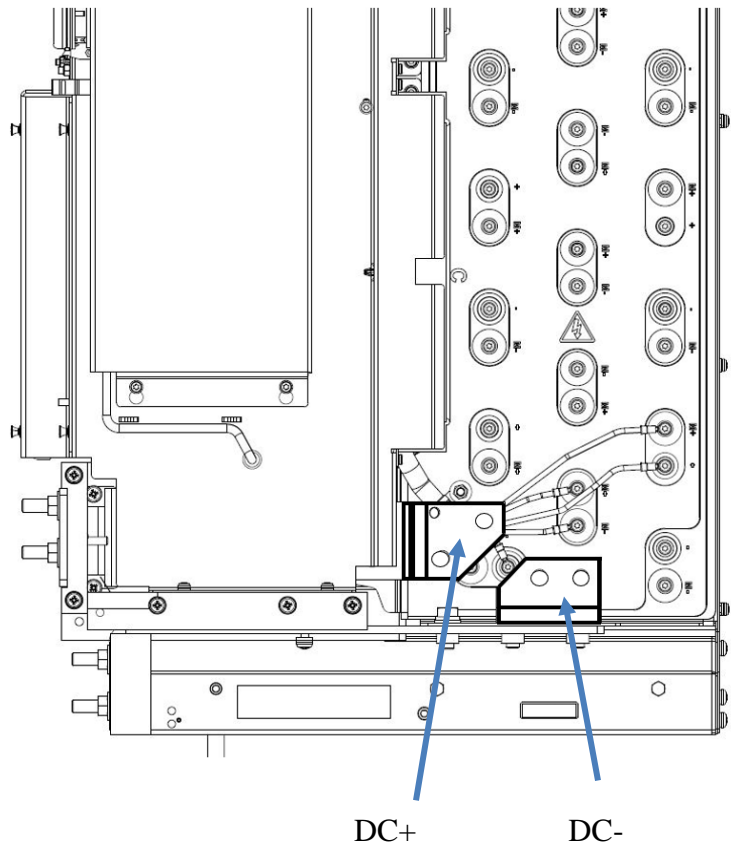


Connector	Function	Note
<b>DIBe TB2</b>	<b>DIBe and IGBT module supplies</b>	<b>Specifications</b>
<b>Pin Signal</b>	<b>Note 1</b>	<b>Note 2</b>
1 +24V DIBe supply in	24V DIBe supply input	24V supply input for DIBe not including SKiiP requirements. Supply = 24 V d.c. +/- 10% at 250mA
2 +24V DIBe supply out	24V DIBe2 daisy chain output for connection to next DIBe in chain	Out connection to next DIBe. Can be linked directly to TB2 pin 5 to provide the same 24V supply to the SKiiP
3 0V DIBe and SKiiP 0V in	0V DIBe supply input	0V for DIBe and SKiiP
4 0V DIBe and SKiiP 0V out	0V DIBe daisy chain output	0V for DIBe and SKiiP
5 SKiiP Positive supply in	Positive supply input for SKiiP devices	24V supply for SKiiP devices. Supply = 24 V d.c. +/- 10% at 2700mA per DELTA
6 SKiiP Positive supply out	Positive supply for SKiiP devices, output for connection to next DIBe in chain <b>Note: A maximum of two modules can be daisy chained together to comply with power rating on the PCB</b>	Out connection to next DIBe for SKiiP devices
7 & 8 SKiiP Negative supply	Not used	Not applicable
<b>DIBe PL2</b>	<b>Communications</b>	<b>Specifications</b>
<b>Pin Signal</b>	<b>Note 1</b>	<b>Note 2</b>
1 Fault loop IN	Fault loop connection input to DIBe	The first connection on the fault loop chain is the PIBe in which the terminations must be connected to terminate the line. A standard ECAT style connection is to be used for the fault loop
2 Fault loop OUT	Fault loop connection output from DIBe	The ECAT connection from the OUT port, connects to the IN port of the next DELTA. NOTE: The last OUT port is unterminated
<b>BECKHOFF ECAT PCB</b>	<b>Communications</b>	<b>Specifications</b>
1 ECAT IN	EtherCAT Input from PIBe controller	The ECAT connection route is: Controller ECAT OUT to PIBe ECAT IN PIBe ECAT OUT to DELTA1 ECAT IN DELTA1 ECAT OUT to DELTA2 ECAT IN
2 ECAT OUT	EtherCAT output to next DELTA	The ECAT OUT connects to the next modules IN port. The last OUT port is not terminated.

Connector	Function	Note
<b>DIBe PL1</b>	<b>Programming</b>	<b>Specifications</b>
JTAG programming port	Programming port	Factory use only
<b>DIBe PL7</b>	<b>Mains voltage monitor</b>	<b>Specifications</b>
Mains voltage monitor connection	16-way ribbon connector for Mains voltage monitoring	16-way ribbon connector for DC. link volts monitoring and supply input monitoring

### 7.7 Additional DC Connections

- The PEDL800 modules have additional DC connections (sometimes called Fish Plates) to the right-hand side of the unit.



## 8. Contact Details for Sales, Service and Support

- Please refer to your local technical support center if you have any queries about this product.

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## 9. Document Revision History

Rev.	Date	Author	Changes
00	Nov 27 2020	Mark Woods	Document created
01	Aug 2 2021	Gary Pace	5-minute warning changed to 8-minutes
02	Jul 8 2022	Gary Pace	DRY-OUT section added
03	June 10 2024	Mark Woods	Correction of Staubli types from RMI to RME