PM100 and PM150 Family Propulsion Inverters

**PRODUCT SUMMARY**
The PM Family of Propulsion Inverters are designed for on- and off-road Electric (EV) or Hybrid Electric (HEV) applications. These motor controllers convert the DC power from the vehicle ESS (Energy Storage System / Battery) to the 3-phase AC required by the motor.

**FEATURE SUMMARY**
- 6 (0-5V) Analog Inputs
- 2 selectable PT100 / PT1000 RTD Inputs
- 8 Digital Inputs STB/STG
- 4 High Side Driver Outputs
- 2 Low Side Driver Outputs
- 1 Resolver Interface
- 1 Quadrature Encoder Intf
- 1 Sin-Cos Encoder Intf
- 1 3-ph Hall Position Sensor Intf
- 2 CAN 2.0A/B Ports 1MB
- RS232 Programming Port

**SYSTEM INTEGRATION**
Rinehart has extensive experience in automotive, motorsports, and military vehicle propulsion and power electronics applications.
- consultation in propulsion system design,
- propulsion system integration
- vehicle development
- Multi-wheel propulsion

A Family of compact, robust, reliable, easy to integrate, and cost effective propulsion inverters for 60—200Hp class OEM and specialty heavy equipment builders. Applications include high-performance road cars, professional motorsports, heavy vehicle hybrid propulsion, static energy conversion, hybrid range extender or ISG controller, and many more. Suitable for military COTS usage.

<table>
<thead>
<tr>
<th>Controller Model</th>
<th>PM100DX</th>
<th>PM100DZ</th>
<th>PM150DX</th>
<th>PM150DZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Voltage – operating</td>
<td>50—400</td>
<td>100—800</td>
<td>50—400</td>
<td>50—800</td>
</tr>
<tr>
<td>DC Overvoltage Trip</td>
<td>420</td>
<td>840</td>
<td>420</td>
<td>840</td>
</tr>
<tr>
<td>Maximum DC Voltage – non-operating</td>
<td>500</td>
<td>900</td>
<td>500</td>
<td>900</td>
</tr>
<tr>
<td>Motor Current Continuous</td>
<td>300</td>
<td>150</td>
<td>450</td>
<td>225</td>
</tr>
<tr>
<td>Motor Current Peak *</td>
<td>350</td>
<td>200</td>
<td>450*</td>
<td>300</td>
</tr>
<tr>
<td>Output Power Peak (elect) *</td>
<td>100</td>
<td>100</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>DC Bus Capacitance</td>
<td>440</td>
<td>300</td>
<td>880</td>
<td>600</td>
</tr>
<tr>
<td>Size and Volume</td>
<td>200 x 87 x 314</td>
<td>200 x 87 x 436</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>7.5</td>
<td>7.5</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Cable Gland Size</td>
<td>M24</td>
<td>M24</td>
<td>M32</td>
<td>M24</td>
</tr>
<tr>
<td>Minimum Conductor Size</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Maximum Conductor Size</td>
<td>1</td>
<td>1</td>
<td>3/0</td>
<td>1</td>
</tr>
<tr>
<td>Minimum Cable O.D.**</td>
<td>9</td>
<td>9</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>Maximum Cable O.D.</td>
<td>16.5</td>
<td>16.5</td>
<td>21</td>
<td>16.5</td>
</tr>
</tbody>
</table>

* peak is 10seconds, PM150DX is terminal / wire size limited.
** depending on cable type, if diameter is too small it may be necessary to sleeve the cable.

Ratings subject to change without notice—consult factory.
PM100 PM150 Propulsion Inverters

Automotive quality design and manufacturing
- Automotive qualified or temp range components, IPC Class 3 PCB fab
- TS16949-compliant formal product development processes
- Automotive design verification and product validation with full DVPnR

Full set of flexible integrated I/O
- 5V analog power for external transducers and
- 5V digital power for external encoder operation
- All external inputs can be used by the system controller as distributed I/O

On the fly mode switching and parameter update over CAN
- speed or torque mode on command at Start
- Torque limits can be changed every 6msec
- Active DC Link discharge on command

Configurable as vehicle master or slave
- CAN network and throttle pot interface options
- Multi-controller coordination, BMS and DC-DC Interface, custom options

Simplest setup and operation
- 1 motor type parameter selects 90% of required settings
- Simple file download to clone a working setup

Description | Value
--- | ---
Short Circuit Protection | Yes
Hardware Over-current, Over-voltage Protection | Yes
Vehicle System Power | 9 .. 16Vdc (12V Systems)
Isolation – High-Voltage to Low-Voltage or to Case | 2500Vrms
Isolation – Low-Voltage to Case | 50V
Operating Temperature Range – coolant water – no derating | -40 .. +80°C
Derated Coolant Temperature Range – derate 100% -> 0% | +80° .. +105°C
Non-Operating Temperature | -40 .. +105°C
-55 .. +105°C
Coolant Type | 50/50 EGW
Coolant Flow Rate | 8—10 LPM (2 GPM min)
Coolant Pressure Drop (60°C coolant at 10 LPM) | 0.35 bar (35kPa/5psi) PM150
Maximum Coolant Pressure (absolute) | 4.5 bar (450kPa / 65psia)
Operating Shock (ISO 16750-3, Test 4.2.2.2) | 500 m/s² (50g), pending
Operating Vibration (ISO 16750-3, 4.1.2.4 Test IV) | 27.8 m/s² (3g rms), pending
Environmental Protection Class (see ISO 20653) | IP6K9K, IP67
EMC compatibility | IEC61000 / FCC Part 15 Class B, pending

These Propulsion Inverter products are designed and manufactured to comply with the following international standards: ISO6469, ISO6493-3, ISO16750, ISO20653, IEC60950, <IEC61000 pending>

Racing Version are available under special order:
- PM100DXR provides 450Arms peak current in the smallest package for 400V-class applications
- PM150DZR provides 400Arms peak current for 800V-class applications for 300kW peak output

These version trade useful operating life for increased peak power handling in transients. Example applications include:
- Motorcycle racing
- LMP prototype and FormulaE constructors
- Hybrid Supercar makers

Consult factory for more information on suitability of these product variants in your application, and to place orders

Rinehart Motion Systems LLC
Hybrid vehicles, power hybrid packaging, power electronics and propulsion controls