



## ***PowerPhase 100 Traction System***

***For Electric, Hybrid Electric, and Fuel Cell Powered Vehicles***



### ***A powerful design that incorporates:***

- ◆ 550 Nm Peak Torque
- ◆ 100 kW peak, 55 kW continuous motor power
- ◆ 100 kW peak, 85 kW continuous generator power
- ◆ Regenerative braking
- ◆ Full power @ 250-400 VDC input



| SR286 Brushless PM Motor/Generator                       |                                    |           |
|--|------------------------------------|-----------|
| <b>Dimensions</b>  |                                    |           |
| Length   | 14.24 in                           | 362 mm    |
| Diameter   | 14.66 in                           | 372 mm    |
| Weight   | 190 lb                             | 86 kg     |
| <b>Performance</b>                                       |                                    |           |
| Motoring power (peak)                                    | 133 hp                             | 100 kW    |
| Motoring torque (peak)                                   | 405 lbf-ft                         | 550 N·m   |
| Regeneration power (peak)                                | 133 hp                             | 100 kW    |
| Regeneration torque (peak)                               | 368 lbf-ft                         | 500 N·m   |
| Maximum Speed  | 4400 rpm                           |           |
| Maximum Efficiency                                       | 90%                                |           |
| Power density (based on 100 kW)                          | 0.71 hp/lb                         | 1160 W/kg |
| CD40-400L Inverter/Controller                            |                                    |           |
| <b>Dimensions</b>  |                                    |           |
| Length   | 14.96 in                           | 380 mm    |
| Width  | 14.37 in                           | 365 mm    |
| Height   | 4.69 in                            | 119 mm    |
| Weight   | 35.0 lb                            | 15.9 kg   |
| <b>Operating Voltage</b>                                 |                                    |           |
| Nom. battery input range                                 | 270 to 336 Vdc                     |           |
| Operating voltage input range                            | 250 to 400 Vdc                     |           |
| Minimum voltage limit                                    | 180 V (with derated power output)  |           |
| Input current limitation                                 | 300 A                              |           |
| <b>Inverter Type</b>                                     |                                    |           |
| Control type - PWM & phase advance, 3-phase brushless dc |                                    |           |
| Applicable max. current                                  | 475 A peak                         |           |
| Power device   | IGBT module half bridge x 3        |           |
| Switching frequency                                      | 20 kHz                             |           |
| Standby power consumption                                | 17 W (inverter and microprocessor) |           |
| <b>Liquid Cooling System</b>                             |                                    |           |
| Min. inlet coolant flow                                  | 8 l/min (50/50 water/glycol mix)   |           |
| Max. inlet T of controller                               | 131 °F                             | 55 °C     |
| Inner diameter of hose                                   | 5/8 in                             | 16 mm     |
| Max. inlet pressure                                      | 10 psig                            | 0.7 bar   |
| EVPH332 Microprocessor (internally packaged)             |                                    |           |
| Nominal input voltage                                    | 12 V                               |           |
| Input supply voltage range                               | 8 to 15 V                          |           |
| Input supply current range                               | 0.3 to 0.5 A                       |           |

## Key Features

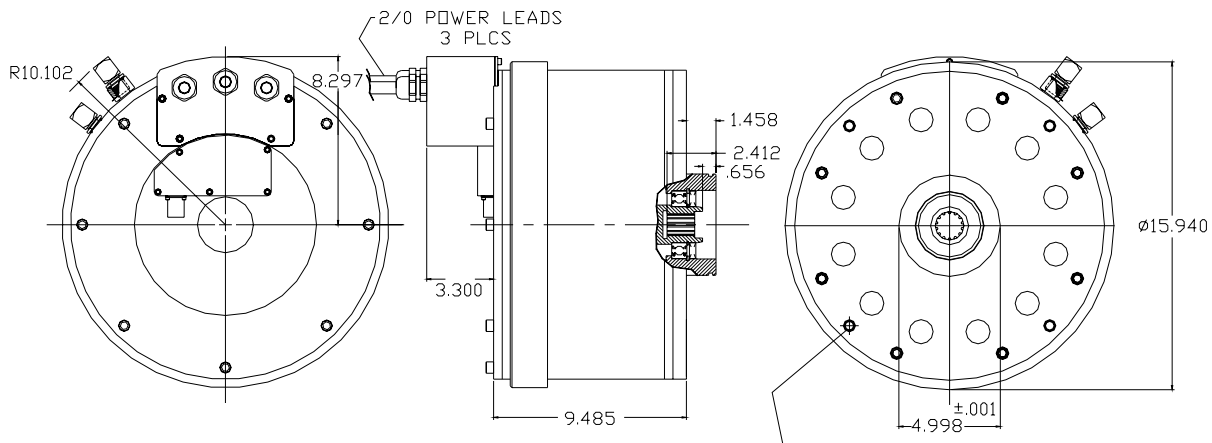
- EV/HEV traction drive or HEV starter/generator system
- 100 kW / 550 N·m
- Efficient, power dense, brushless permanent magnet motor
- Wheel hub configuration
- Compact package
- Microprocessor- controlled inverter with phase advance
- CAN bus compatible (option)
- Liquid cooling
- User/application-friendly interface
- Light weight

| Drive Electronics Incorporate...             |   |
|--|---|
| Serial communication                         | Temperature sensing/alarm                 |
| CAN bus compatibility                        | Speed sensing                             |
| Diagnostic capability                        | Charger port and parking brake interlocks |
| Digital "power-up" control signals           | Coolant fan control                       |
| Software controlled, four quadrant operation | IGBT power switches                       |
| Operation tailorable for battery management  |   |
| Features                                     | Benefits                                  |
| Torque based traction control                | Smooth vehicle operation                  |
| Phase advance control                        | Eliminates gear change requirements       |
| Regenerative braking (selectable)            | Improved braking and extended range       |
| Rugged, weatherproof enclosure               | Suitable for automotive applications      |
| Liquid cooling                               | Enhanced thermal management               |
| Vehicle control software                     | Customized (optional)                     |

(All data subject to change without notice)

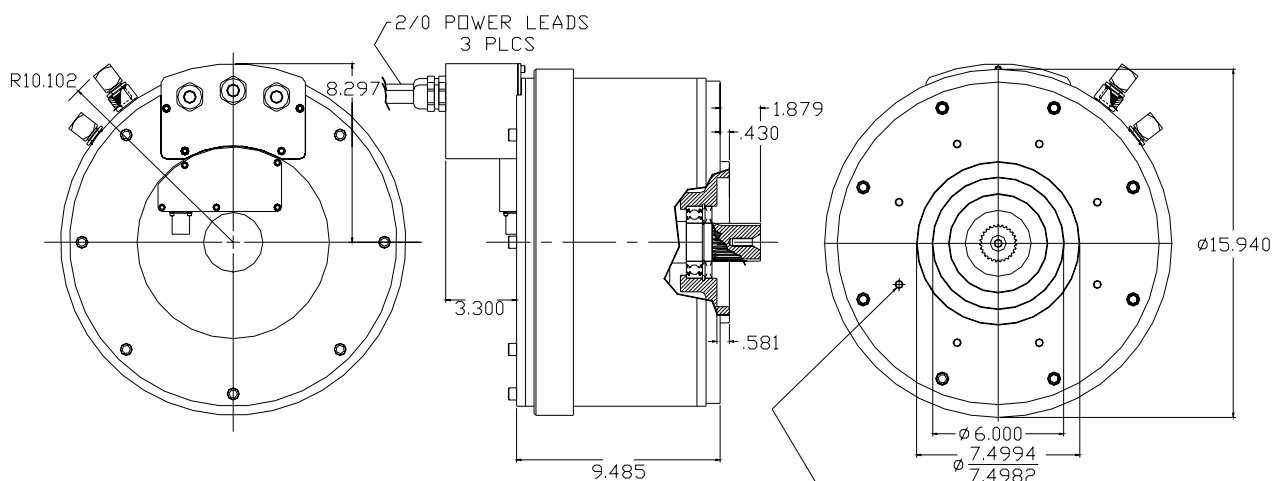


## SR286 Motor/Generator – Internal Spline Output Shaft



| INTERNAL SPLINE DATA     |                     |
|--------------------------|---------------------|
| ANSI 92.1-1970 - CLASS 5 | FLAT ROOT SIDE FIT  |
| NUMBER OF TEETH          | 14                  |
| PRESSURE ANGLE           | 30°                 |
| DIAMETRAL PITCH          | 12/24               |
| MAJOR DIAMETER           | 1.283 MAX           |
| MINOR DIAMETER           | 1.087-1.092         |
| INVOLUTE FORM DIAMETER   | 1.254 MIN           |
| CIRCULAR SPACE WIDTH     | .1309 MIN EFFECTIVE |
| MEASUREMENT UNDER WIRES  | .1338 MAX ACTUAL    |
| WIRE DIAMETER            | .9583-.9609         |
| PITCH DIAMETER           | .1440               |
|                          | Ⓢ.002 A-B           |

## SR286 Motor/Generator – External Spline Output Shaft



| EXTERNAL SPLINE DATA     |                       |
|--------------------------|-----------------------|
| ANSI 92.1-1970           | FILLET ROOT SIDE FIT  |
| NUMBER OF TEETH          | 27                    |
| PRESSURE ANGLE           | 30 DEG                |
| DIAMETRAL PITCH          | 16/32                 |
| MAJOR DIAMETER           | 1.745-1.750 Ⓢ.005 A-B |
| MINOR DIAMETER           | 1.546 MIN             |
| INVOLUTE FORM DIAMETER   | 1.621 MAX             |
| CIRCULAR TOOTH THICKNESS | .0982 MAX EFFECTIVE   |
| MEASUREMENT OVER WIRES   | .0953 MIN ACTUAL      |
| WIRE DIAMETER            | 1.8663-1.8684         |
| TOOTH PARALLISM          | .1200                 |
| PITCH DIAMETER           | ///.001 A-B           |
|                          | Ⓢ.002 A-B             |

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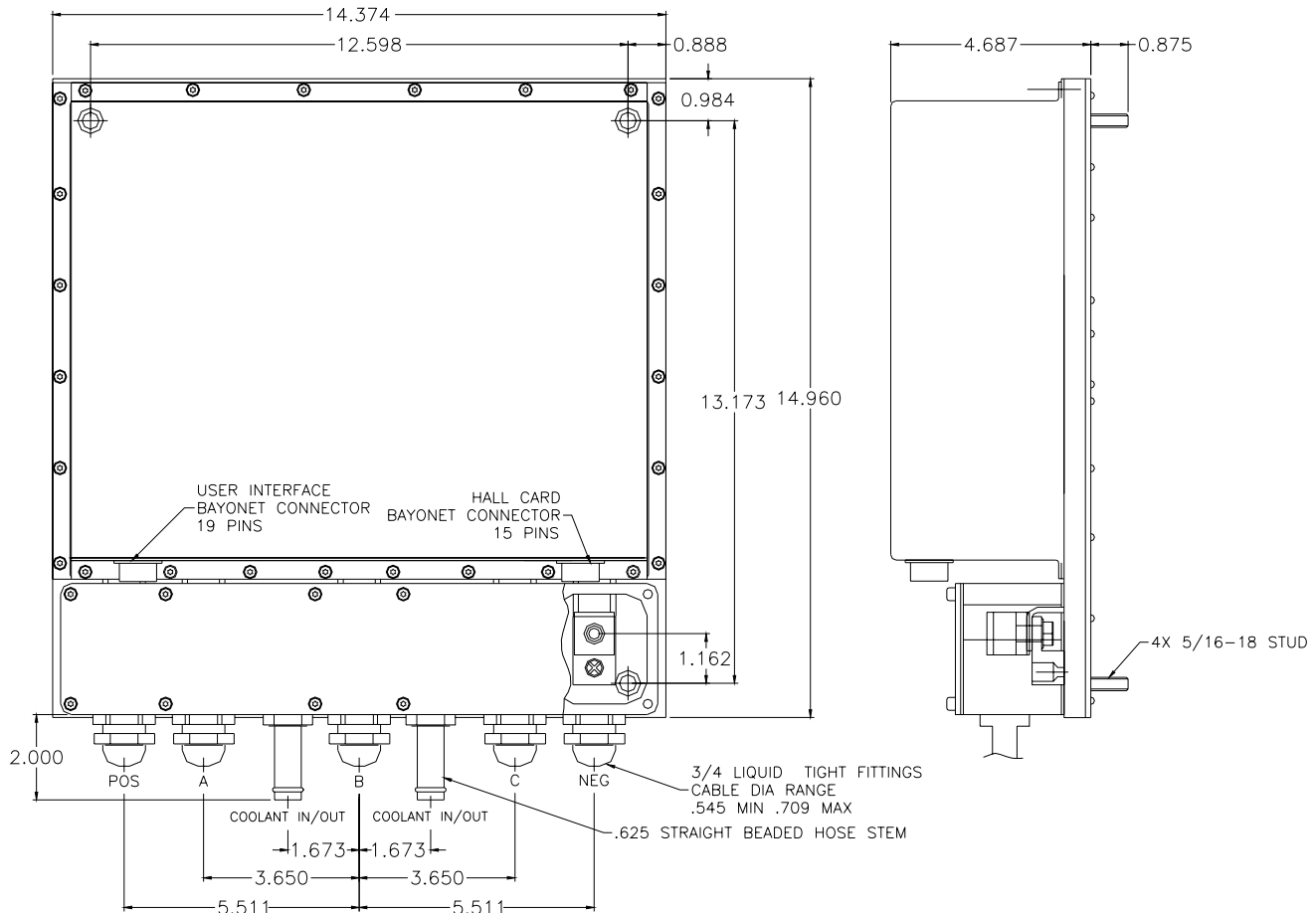
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## CD40-400L Inverter-Controller



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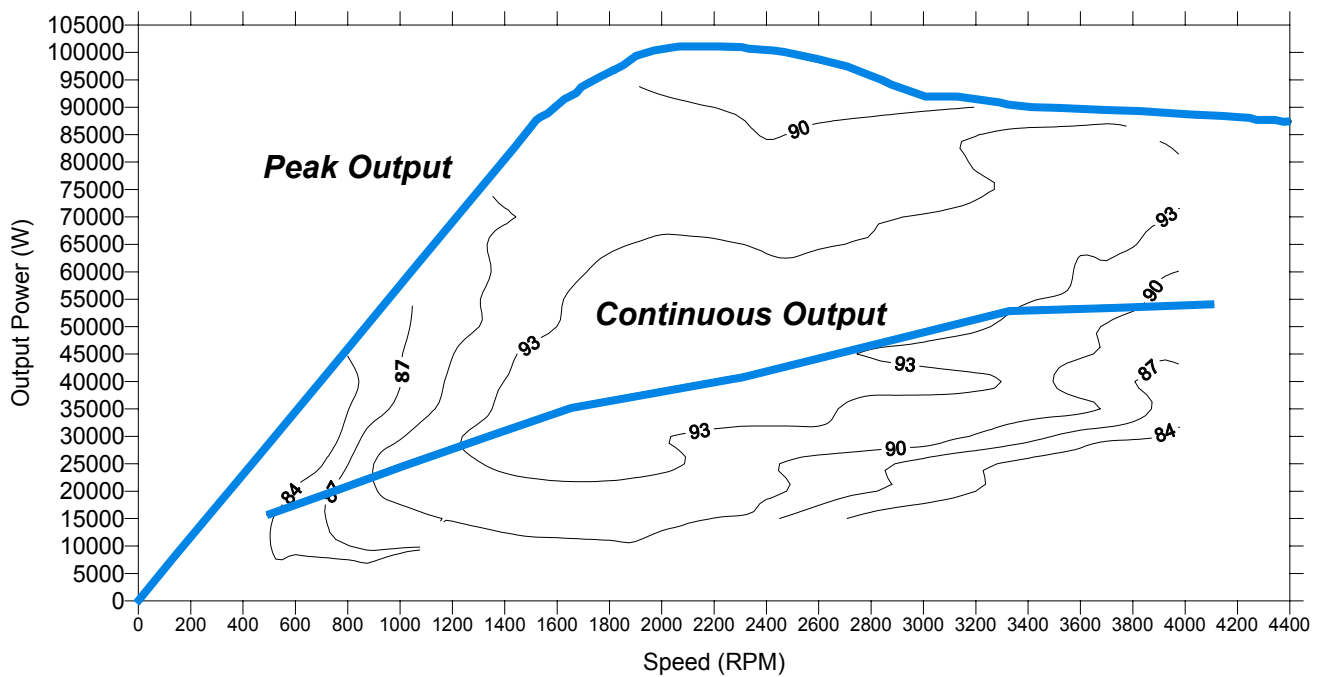
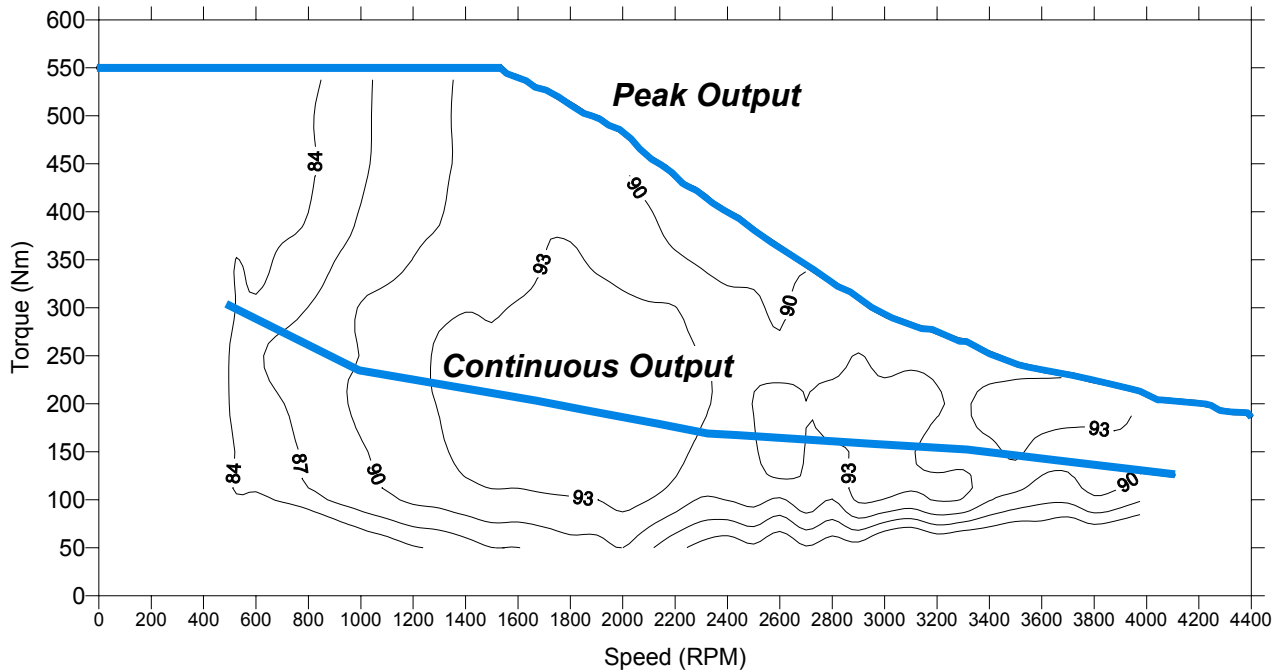
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## PowerPhase 100 System Efficiency Maps

### Motoring Mode (From Test Data)



#### Testing Conditions

**Continuous Output:** 300 VDC input, 50 °C coolant

**Peak Output:** 300 VDC input, 50 °C coolant, duration 45-60 seconds

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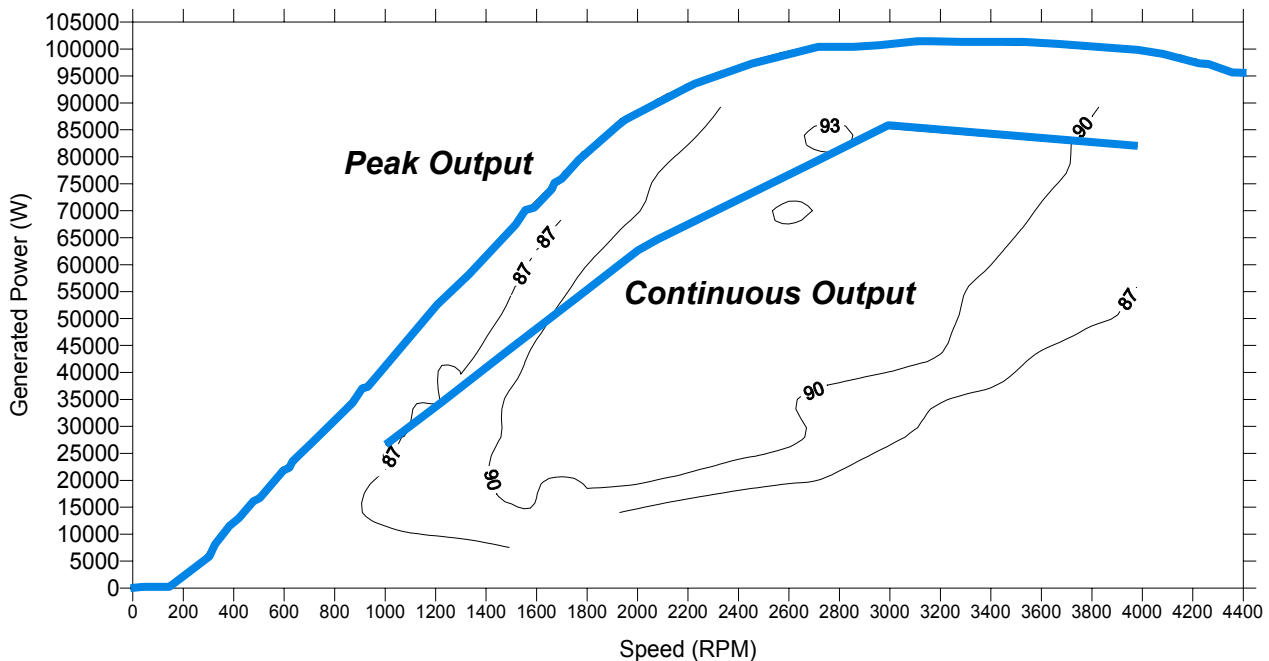
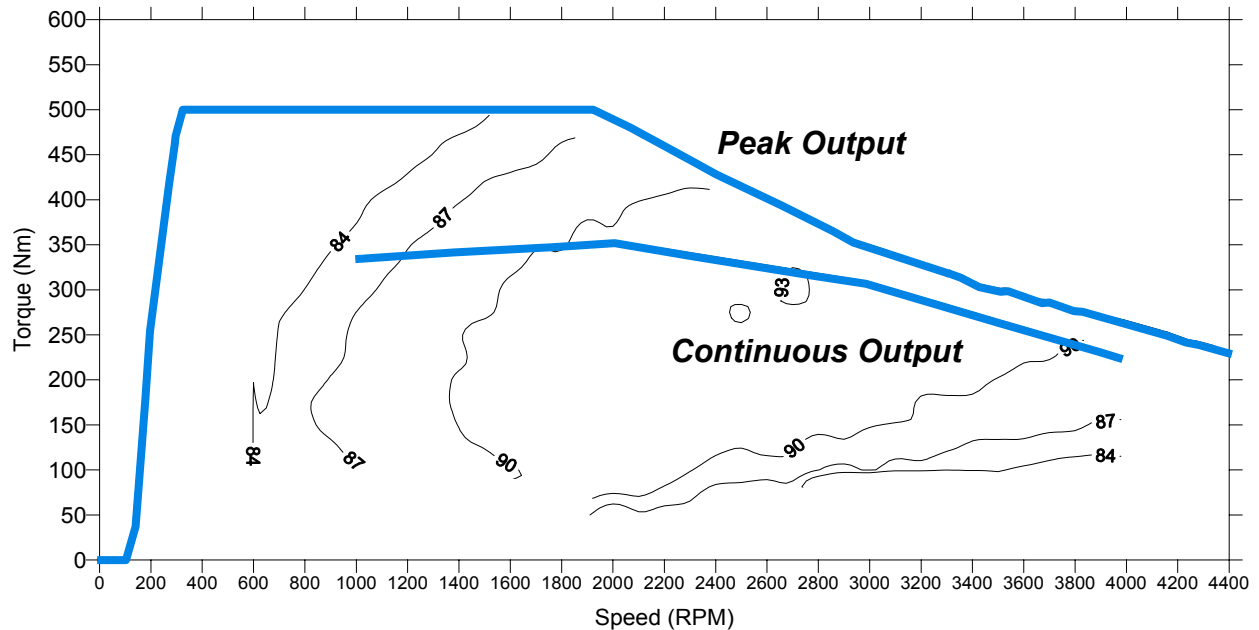
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## PowerPhase 100 System Efficiency Maps Regeneration Mode (From Test Data)



### Testing Conditions

**Continuous Output:** 300 VDC input, 50 °C coolant

**Peak Output:** 300 VDC input, 50 °C coolant, duration 45-60 seconds

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