Hybrid

Electric

Explore our Technologies

AC Motor Controller

Gen4 Size 2/4/6

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AC Motor Controller Gen4 (Size 2/4/6)

The Gen4 range represents a well established design in compact AC controllers. These reliable controllers are intended for on-road and off-road electric vehicles and feature the smallest size in the industry for their power capacity.

Thanks to the high efficiency it is possible to integrate these controllers into very tight spaces without sacrificing performance. The design has been optimised for the lowest possible installed cost while maintaining superior reliability in the most demanding applications.

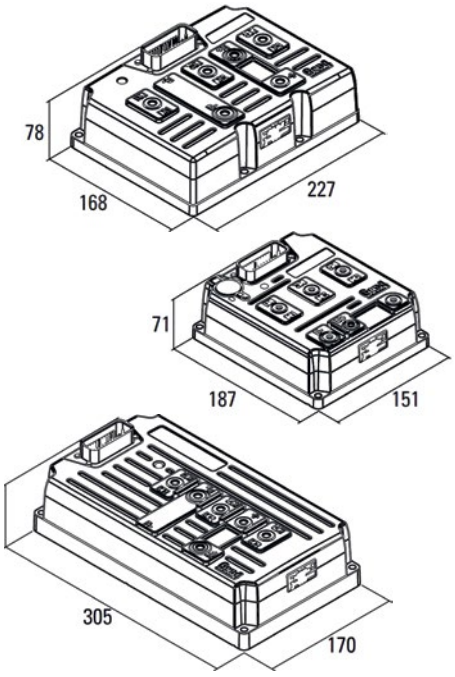
Integrated I/O

Gen4 includes a fully-integrated set of inputs and outputs (I/O) designed to handle a wide range of vehicle requirements. This eliminate the need for additional external I/O modules or vehicle controllers and connectors.

- 8 digital inputs
- 2 analogue inputs (can be configured as digital)
- 3 contactor/solenoid outputs
- 1 encoder supply output – programmable 5 V or 10 V
- Motor temperature sensor input
- Motor encoders supported include UVW hall effect sensors, Sin/Cos sensors and incremental AB encoders

Features

- Advanced Field Oriented Control
- AC Permanent Magnet Synchronous motor control, including salient, non-salient and BLDC motors
- AC induction motor control
- CAN communications bus allows for easy interconnection of controllers and devices such as Battery Management Systems, displays and VCUs
- CANopen protocols
- Configurable as a vehicle control master or as a motor control slave
- Autocheck system diagnostic
- Hardware & software failsafe watchdog operation
- Integrated fuse holder
- IP66 protection
- Highly configurable



Key Parameters

Model	Size 2	Size 4	Size 6	Size 2	Size 4	Size 6	Size 2	Size 4	Size 6	Size 4
Nominal Battery Voltage	24 VDC	24 – 36 VDC		36 – 48 VDC			72 – 80 VDC			96 – 120 VDC
Maximum Operating Voltage	34.8 VDC	52.2 VDC		69.6 VDC			116 VDC			150 VDC
Minimum Operating Voltage	12.7 VDC			19.3 VDC			39.1 VDC			48 VDC
Peak Phase Current (2 min)	300 A	450 A	650 A	275 A	450 A	650 A	180 A	350 A	550 A	300 A
Boost Phase Current (10 sec)	360 A	540 A	780 A	330 A	540 A	780 A	215 A	420 A	660 A	360 A
Continuous Phase Current (60 min)	120 A	180 A	260 A	110 A	180 A	260 A	75 A	140 A	220 A	120 A

For Additional BorgWarner Information
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AC Motor Controller

Gen4 Size 8

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AC Motor Controller Gen4 (Size 8)

An AC motor controller designed to meet the high performance requirements of on-road and off-road Electric (EV) and Hybrid Electric Vehicles (HEV).

A compact, rugged and cost effective design, the Gen4 Size 8 is well suited for EV OEMs, EV conversions and EV drive train system integrators. Its high voltage range, up to 400V DC, is well matched to the needs of the automotive and commercial transport markets. The same hardware platform handles both AC Induction and Permanent Magnet AC motor technologies.

Features

- Advanced Field Oriented Control
- AC Permanent Magnet Synchronous motor control, including salient, non-salient and BLDC motors
- AC induction motor control
- CAN communications bus allows for easy interconnection of controllers and devices such as Battery Management Systems, displays and VCUs
- CANopen and J1939 protocols
- Configurable as a vehicle control master or as a motor control slave
- Integrated logic circuit, 12 V or 24 V nominal
- Up to 400 VDC supply voltage
- Up to 100 kW peak power output
- Up to 60 kW continuous power output
- Includes an additional dedicated safety supervisory processor
- Safety interlock pulsed enable signal
- IP66 protection
- Highly configurable

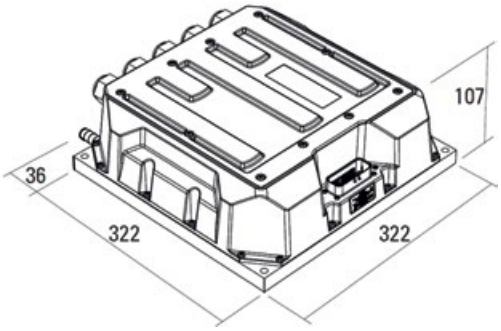
Key Parameters

- Operating voltage range 128 V to 400 VDC
- Output motor phase current:
  - 400 Arms (boost)
  - 360 Arms (30sec)
  - 300 Arms (2 min)
  - 200 Arms (continuous)
- Water/Glycol cooling
- Forced air or oil cooled options also available (output rating subject to change)
- Safety:
  - Electrical safety to ISO 6494, IEC 60664 and UL840
  - Pulsed safety enable input
  - Pulsed status output
- Environmental:
  - –40°C to +85°C operation
  - IP66 protection
  - ISO 16750

Integrated I/O

The Gen4 Size 8 includes a fully-integrated set of inputs and outputs (I/O) designed to handle a wide range of vehicle functions. This eliminates the need for additional external I/O modules or vehicle controllers and connectors.

- All I/O protected to 40 V
- 4 analogue inputs 0 – 10 V
- 4 digital inputs
- 3 power supplies 0 – 10 V 100 mA
- 3 contactor/solenoid outputs max 2 A
- Motor temperature sensor input
- Programmable 5 V to 10 V encoder supply
- Motor encoders supported include Resolver, UVW hall effect sensors, Sin/Cos sensors and incremental AB encoders



322 mm (L) x 322 mm (W) x 107 mm (H)

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AC Motor Controller

Gen4 Size 10

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AC Motor Controller Gen4 (Size 10)

An AC motor controller designed to meet the high performance requirements of on-road and off-road Electric (EV) and Hybrid Electric Vehicles (HEV).
The Gen4 Size 10 is capable of operation up to 800 VDC and up to 450 A rms phase current.

Features

- Advanced Field Oriented Control
- AC Permanent Magnet Synchronous motor control, including salient, non-salient and BLDC motors
- AC induction motor control
- CAN communications bus allows for easy interconnection of controllers and devices such as Battery Management Systems, displays and VCUs
- CANopen and J1939 protocols
- Configurable as a vehicle control master or as a motor control slave
- Integrated logic circuit, 12 V or 24 V nominal
- Up to 800 VDC supply voltage
- Up to 300 kW peak power output
- Up to 150 kW continuous power output
- Includes an additional dedicated safety supervisory processor
- Safety interlock pulsed enable signal
- Highly configurable

Integrated I/O

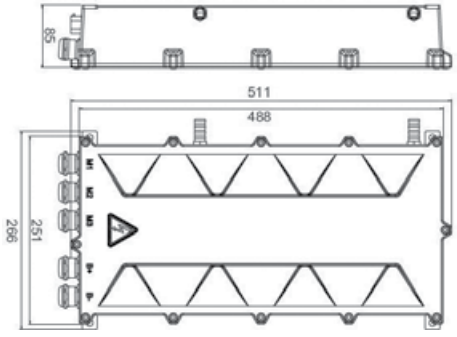
Gen4 Size 10 includes a fully-integrated set of inputs and outputs (I/0) designed to handle a wide range of vehicle requirements. This eliminated the need for additional external I/O modules or vehicle controllers and connectors.

- All I/O protected to 40 V
- 4 analogue inputs 0 - 10 V
- 4 digital inputs
- 3 power supplies 0 - 10 V 100 mA
- 3 contactor/solenoid outputs max 2 A
- Motor temperature sensor input
- Programmable 5 V to 10 V encoder supply
- Motor encoders supported include Resolver, UVW hall effect sensors, Sin/Cos sensors and incremental AB encoders

Key Parameters

- Operating voltage range at full current 50 V to 800 V
- Output motor phase current:
  - 400 A rms (2 min)
  - 200 A rms (Continuous)
- Water/Glycol coolant (oil cooling available for custom applications)
- Weight: 10.9 kg

Dimensions



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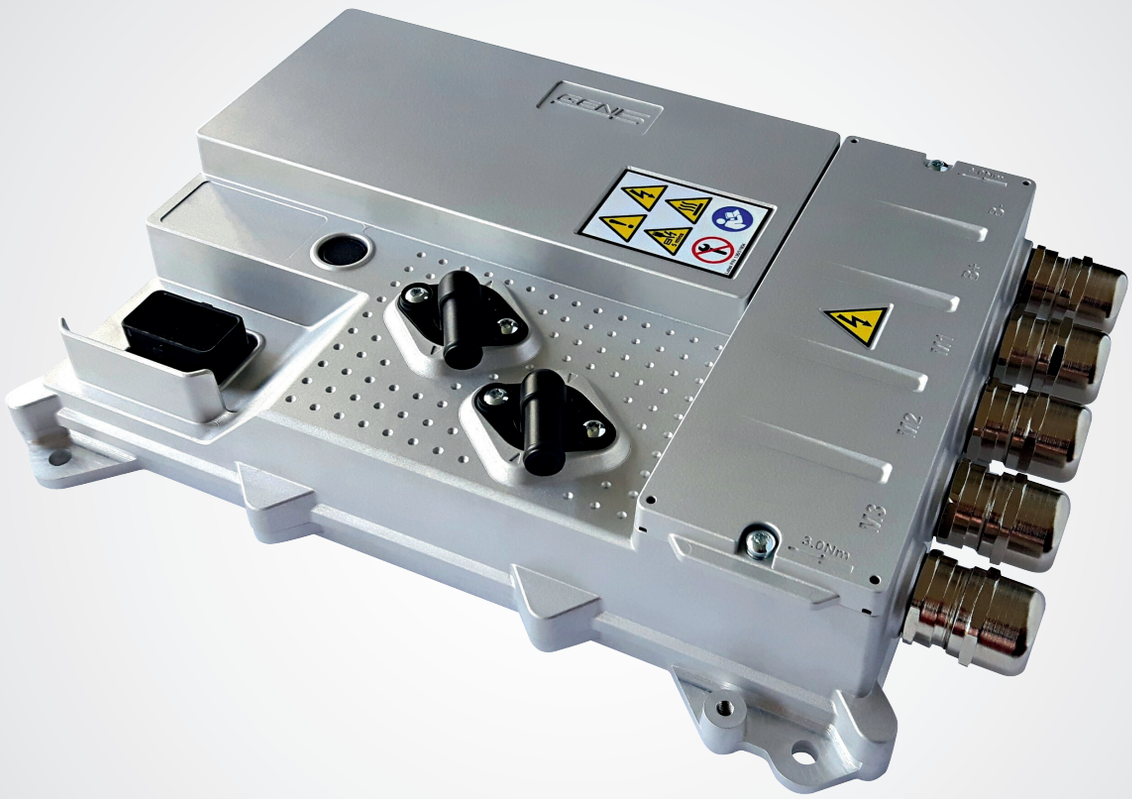

Hybrid Electric

Explore our Technologies

AC Motor Controller

Gen5 Size 9

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AC Motor Controller Gen5 (Size 9)

The Gen5 range of products is well-matched to satisfy automotive, commercial and construction markets' electrification needs. The Gen5 Size 9 is specifically aimed at vehicle OEMs and system integrators to offer them a compact, lightweight, robust and cost-effective, class-leading suite of solutions covering traction, hybridisation, power generation and sub-system electrification.

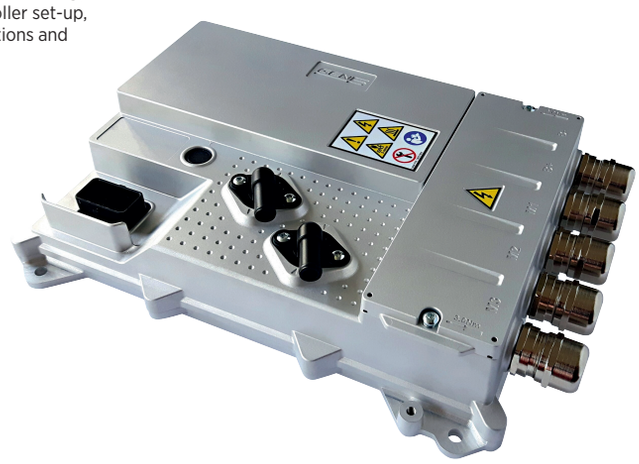
Key Parameters

- Operating voltage up to 450 Vdc (de-rating above 420 V)
- Output motor phase current
  - 450 Arms (1 min)
  - 200 Arms (1 hour+)
- Safety
  - HVIL safety functionality
- Environmental
  - –40°C to +85°C operation, IP6k9k, ISO 16750
  - Water/Glycol coolant flow rate 10 l/minute (de-rating above 55°C)

Note: key parameters can vary, depending on controller set-up, environmental conditions and motor conditions.

Features

- Advanced Field Orientated Control with support for Permanent Magnet Synchronous Motors and AC Induction Motors
- I/O and CAN are electrically isolated
- CAN communications bus allows for easy interconnection of controllers and devices such as Battery Management Systems, displays and VCUs
- CANopen and J1939 protocols
- Configurable as a vehicle control master or as a CAN motor torque slave
- 12 V or 24 V logic supply

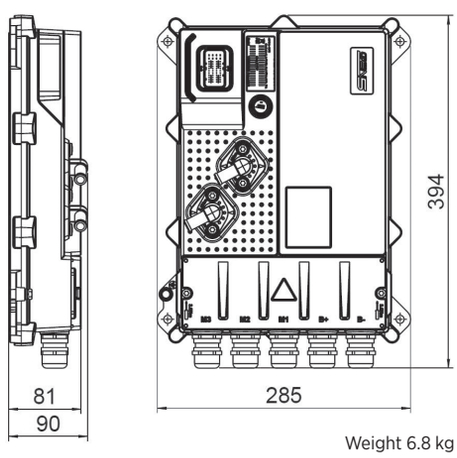


Intelligent I/O

The Gen5-S9 includes a fully-integrated set of inputs and outputs designed to handle a wide range of vehicle functions. This eliminates the need for additional external I/O modules or vehicle controllers and connectors.

- All I/O protected to 40 V
- 4 analogue inputs 0 – 10 V allowing for easy configuration of dual throttle and dual brake applications
- 2 PT1000/KTY84 thermocouple input
- 4 digital inputs
- 4 digital outputs PWM 2A (2 high side 2 low side)
- 3 programmable encoder power supplies (1x200 mA 2x100 mA voltage configurable)
- Motor encoders supported include Resolver (programmable gain), UVW hall effect sensors, Sin/Cos sensors and incremental AB encoders

Dimensions



Weight 6.8 kg

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Explore our Technologies

AC Motor Controller Dragon 8

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AC Motor Controller (Dragon 8)

The Dragon8 sets a new standard in AC motor controller performance and reliability. It is compatible with a wide range of motors – Asynchronous AC Induction and Synchronous Permanent Magnet AC (PMAC) or Brushless DC (BLDC).

Dragon8 has electrical isolation between high power battery/motor wiring and the lower voltage control signals and CANBus. This allows the IO to reference the 12 V (or 24 V) battery and vehicle chassis return path.

Features

- Integrated & isolated IO and logic circuit
- Supports AC Induction and PMAC/BLDC
- Isolated CAN communications bus allows for easy interconnection of controllers and devices such as Battery Management Systems, displays and VCUs
- CANopen and J1939 protocols
- Configurable as a vehicle control master or as a motor control slave
- Power up auto-check system fault diagnostics
- Programmable battery current limit
- IP66 protection
- Integrated power fuse holder

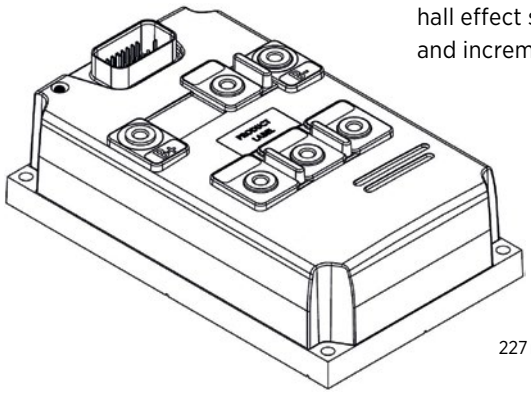
Integrated I/O

Dragon8 includes a fully integrated set of inputs and outputs (I/O) with vehicle control functionality, designed to handle a wide range of system requirements and functions. This frequently eliminates the need for additional external I/O modules, vehicle control units and connectors.

- Up to 6 digital inputs (3 inputs dual use as UVW encoder input)
- Up to 4 analogue input (2 analogue inputs dual use as Sin/Cos encoder input)
- Up to 2 contactor drivers
- Dedicated 5 V, 200 mA output
- Dedicated 10 V, 200 mA output
- Motor temperature sensor input
- Motor encoders supported include Resolver (programmable gain), UVW hall effect sensors, Sin/Cos sensors and incremental AB encoders

Key Parameters

	96 V Version
Nominal Battery Voltage	48 V – 96 V
Maximum Operating Voltage	139 V
Minimum Operating Voltage	20 V
Boost Phase Current (10 seconds)	400 A rms
Peak Phase Current (2 minutes)	300 A rms
Continuous Phase Current (1 hour)	110 A rms



227 mm (L) x 138 mm (W) x 73 mm (H), Weight 2 kg

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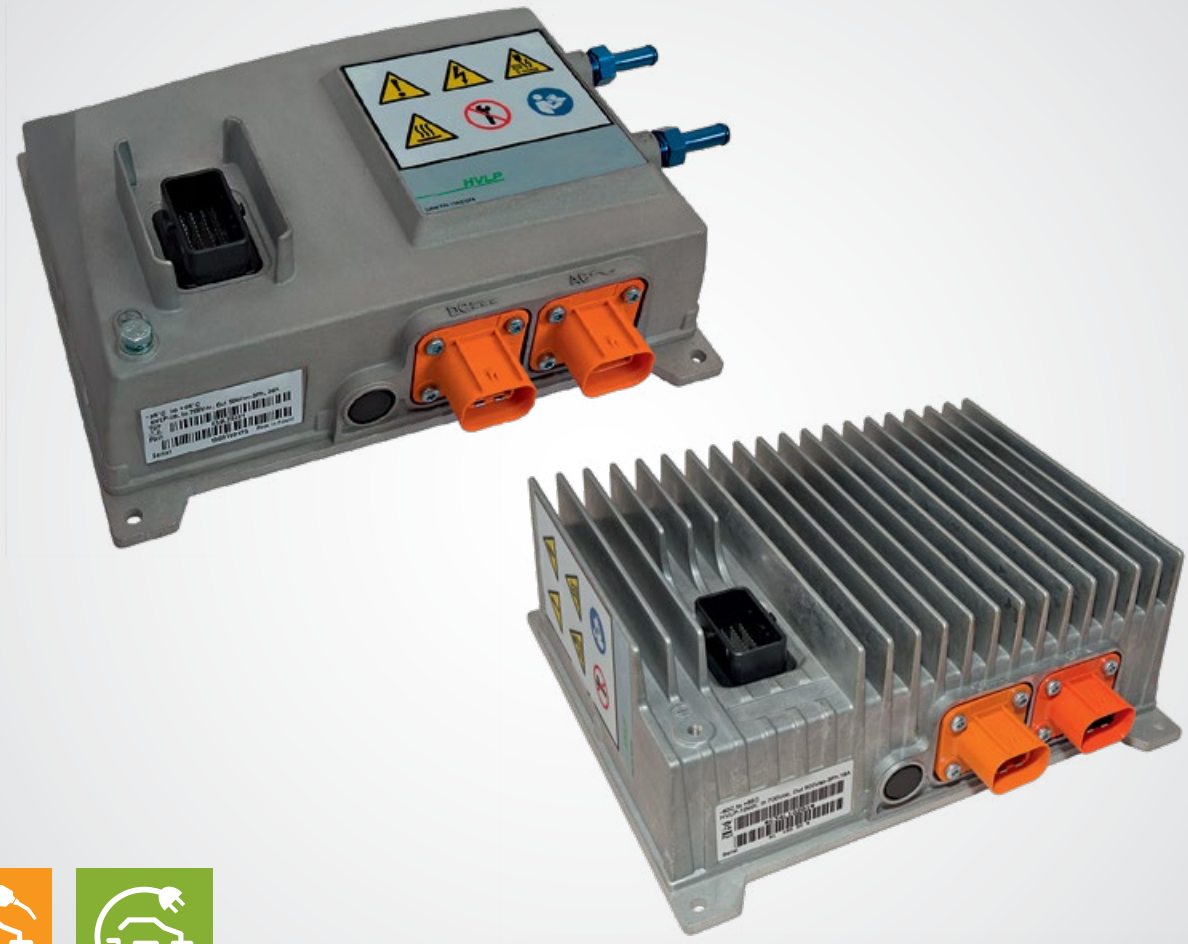

Hybrid Electric

Explore our Technologies
High Voltage Low Power Inverter

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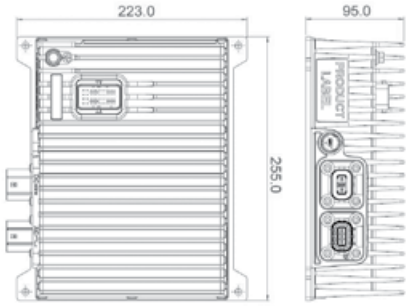
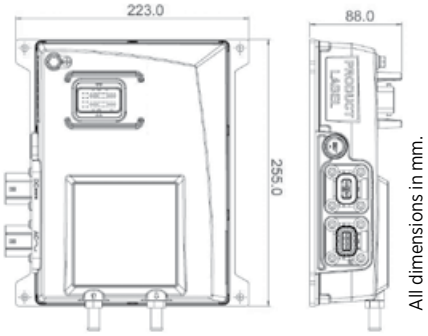
High Voltage Low Power Inverter

A new range of low power AC motor controllers/inverters designed primarily for ancillary control of pumps and fans on hybrid and electric buses, agricultural implements, tractors and other high voltage vehicles. There are two models in the range, which cover both liquid cooled and air cooled designs.



Air Cooled HVLP-10



Liquid Cooled HVLP-20

Features

- Advanced Field Oriented Control
- AC Permanent Magnet Synchronous motor control, including salient, non-salient and BLDC motors
- AC induction motor control without speed sensor
- Operation without a position sensor for PMSM motors supported for custom applications
- 200 V to 800 VDC battery voltage
- Up to 53 A peak current (HVLP-20)
- Up to 33 A continuous current (HVLP-20)
- CAN communications bus allows for easy interconnection of controllers and devices such as Battery Management Systems, displays and VCUs
- CANopen and J1939 protocols
- Configurable as a vehicle control master (including pump and generator control) or as a motor control slave
- High Voltage Interlock (HVIL)
- 12 V or 24 V nominal supply
- Highly configurable
- All I/O protected to 40 V
- 4 analogue inputs 0 - 10 V
- 4 digital inputs
- 2 power supplies 5 - 10 V (100 mA & 200 mA)
- 2 digital outputs
- Motor temperature sensor input
- Motor encoders supported include Resolver (programmable gain), UVW hall effect sensors, Sin/Cos sensors and incremental AB encoders

Integrated I/O

HVLP includes a fully-integrated set of inputs and outputs (I/O) designed to handle a wide range of requirements. This reduces the need for additional external I/O modules or vehicle controllers and connectors.

Key Parameters

HVLP-10 (air cooled)

- Operating voltage range at full current 200 V to 800 V
- Output motor phase current:
  - 24 A rms (1 min)
  - 19 A rms (Continuous)
- Ambient –40 °C up to +45 °C full operation
- Weight: 3.7 kg

HVLP-20 (liquid cooled)

- Operating voltage range at full current 200 V to 800 V
- Output motor phase current:
  - 53 A rms (1 min)
  - 33 A rms (Continuous)
- Water/Glycol coolant
  - Full operation up to 70 °C inlet temperature and at 6/l min flow
- Weight: 2.3 kg (dry)

Common Parameters

- Safety:
  - HVIL (High Voltage Interlock H/W & S/W)
  - Designed to meet the electrical isolation of electrically propelled vehicles ISO 6469
- Environmental:
  - IP6k9k and IP67 protection

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