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PG Drives Technology, formerly known as Penny & Giles Drives Technology, has been designing, manufacturing and marketing sophisticated motor speed controllers for battery powered electric vehicles since 1976. PGDT are easily the world's No.1 manufacturer of powerchair and scooter control systems for the medical mobility market, and a leading manufacturer of integrated control systems for floorcare machines and mobile elevating work platforms. PGDT offers all OEMs excellent post-sales support and service across the globe from its offices in Europe, the USA, Taiwan and Hong Kong.



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Specifications subject to change without notice.
For further information refer to the Sigmadrive
Technical Manual.



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SIGMADRIVE AC INDUCTION AND DC MOTOR CONTROLLER FAMILY

The Sigmadrive family of motor controllers and ancillary products have been developed for use in a wide range of electric vehicle applications such as Materials Handling, Airport Ground Support, Industrial, Utility and Mobile Elevating Work Platforms. Sigmadrive controllers possess many features and capabilities that will benefit the electric vehicle designer.

Sigmadrive is available in three frame sizes covering AC induction and most DC motor types, for traction, pump and power steering functions over a wide range of battery voltages and power outputs.

Insulated Metal Substrate (IMS) technology is fully utilized to provide superior thermal performance and exceptional reliability. The innovative design eliminates all internal links and interconnections, and provides integral heat sinking for all components and terminals. This increases reliability and enables Sigmadrive to provide a higher continuous current and smaller physical size than other controllers of the same power rating.

Sigmadrive is designed for use in the challenging environments typical of electric vehicles, providing excellent protection against dust and water in an incredibly low profile, rugged package. An optional cable cover protects the power and control connections against water spray, allowing the controller to be mounted on the vehicle chassis without the need for additional protective enclosures.

CANbus communication as standard allows safe and reliable vehicle operation. Dual traction applications for all Sigmadrive variants can easily be configured using 2 individual traction controllers linked by CANbus. Multiple Sigmadrives can be interfaced via the CANbus to provide control of all vehicle functions, and also allows direct interfacing with ancillary products such as the Sigmagauge LCD vehicle display, Sigma I/O modules and other 3rd party equipment to ensure easy system building.

Sigmadrive based systems can be quickly configured using the powerful Hand Held Programmer, this device allows easy set-up using 'real' units such as Volts, Hz, Amps and Seconds.

Advanced design and functionality:

- Reliable, single board IMS construction
- Integral heat sinking of all controller components
- Exceptional thermal performance
- High continuous current rating
- No internal cabling or interconnections
- High efficiency, minimal switching losses
- Silent high frequency operation
- Superior power to size ratio
- Revolutionary low profile package
- Detachable cable splash cover
- Field upgradeable FLASH operating system
- CANbus communications



Features:

- 7 off low impedance digital inputs
- 3 off high resolution analogue inputs
- 3 off protected contactor drivers (2 off on small frame versions)
- In-built coil suppression
- Short circuit and open circuit contactor detect
- Thermal current limit compensation
- Throttle mapping
- Electromagnetic brake control
- Emergency reverse / Belly button
- Programmable creep speed
- Inching facility
- Power steer timer
- Regenerative and plug braking
- Braking proportional to accelerator position
- Braking in neutral
- Brake pedal analogue input mode
- Under and over-voltage protection
- Throttle wire-off detection
- 3 traction cutback speeds
- Easy dual traction control via 2 controllers
- 6 pump speeds with additive, priority and compensation
- Pump inhibit input
- Independent power steer speed and compensation
- +12V output pin, 20mA max
- Multiple hardware and software failsafe systems and watchdog
- Power On and Trip diagnostic LED indicators

Sigmadrive Controller Dimensions

Dimensions (mm)	Sigmadrive Frame Size		
	Small	Medium	Large
Length	177	225	320
Width	155	200	200
Height	38	56	56
Weight (kg)	1.2	4.1	6.1



AC INDUCTION AND DC MOTOR CONTROLLERS

Sigmadrive AC Model	Voltage	Current (2 min) rms	Current (1 hour)	Frame Size
Traction				
ACT950L	96V	460A	240A	Large
ACT865L	72-80V	460A	240A	Large
ACT835M	72-80V	250A	120A	Medium
ACT465L	24-48V	460A	260A	Large
ACT445M	24-48V	320A	180A	Medium
ACT425S	24-48V	180A	80A	Small
ACT817S	72-80V	125A	70A	Small
Pump				
ACP950L	96V	460A	240A	Large
ACP865L	72-80V	460A	240A	Large
ACP835M	72-80V	250A	120A	Medium
ACP465L	24-48V	460A	260A	Large
ACP445M	24-48V	320A	180A	Medium
ACP425S	24-48V	180A	80A	Small
ACP817S	72-80V	125A	70A	Small

Sigmadrive SEM Model	Voltage	Peak Current (2 min)	Current (1 hour)	Frame Size
SET865L	72-80V	650A	240A	Large
SET835M	72-80V	350A	120A	Medium
SET465L	24-48V	650A	260A	Large
SET445M	24-48V	450A	180A	Medium
SET425TS	24-48V	250A	80A	Small

Sigmadrive Series Model	Voltage	Peak Current (2 min)	Current (1 hour)	Frame Size	
Traction					
SRT865L	72-80V	650A	240A	Large	
SRT835M	72-80V	350A	120A	Medium	
SRT465M	24-48V	650A	126A	Medium	
SRT445M	24-48V	450A	2180A	Medium	
SRT425S	24-48V	250A	80A	Small	
Pump					
SRP865L	72-80V	650A	240A	Large	
SRP835M	72-80V	350A	120A	Medium	
SRP465M	24-48V	650A	260A	Medium	
SRP445M	24-48V	450A	180A	Medium	
SRP425S	24-48V	250A	80A	Small	
Dual Pump & Power Steer					
	Voltage	Lift pump Current (2min)	Current (1 hour)	Steering Pump (2 min)	Frame Size
SRD865L	72-80V	650A	240A	60A	Large
SRD445M	24-48V	450A	180A	50A	Medium

Sigmadrive PM Model	Voltage	Peak Current (2 min)	Current (1 hour)	Frame Size
Traction				
PMT835M	72-80V	350A	120A	Medium
PMT465L	24-48V	650A	260A	Large
PMT445M	24-48V	450A	180A	Medium
PMT425S	24-48V	250A	80A	Small
Electric Power Steer Assist				
PME817S	72-80V	175A	60A	Small
PME425S	24-48V	250A	80A	Small

● Sigmadrive AC

Sigmadrive AC Induction Motor Controllers are tuneable to any AC motor. Real-time high resolution current measurement combined with advanced flux control techniques provide smooth and highly efficient control of torque and speed. The algorithm employed provides enhanced performance over other methods, and is particularly power efficient with highly dynamic loads. Sigmadrive AC can be quickly set up to provide maximum torque, efficiency and best performance characteristics. The Sigmadrive AC Induction motor controllers are available in traction and pump configurations for the power and voltage ratings as shown. Dual traction applications for all Sigmadrive variants can be easily configured using 2 individual traction controllers linked by CANbus.

● Sigmadrive SEM

Sigmadrive Separately Excited Motor (SEM) controllers offer the same advanced technology and design features of the Sigmadrive AC controllers to provide a range of flexible, power efficient traction speed controllers with an exceptional power to size ratio, revolutionary low profile and excellent thermal characteristics.

● Sigmadrive Series

Sigmadrive Series Motor Controllers are available in traction and pump configurations plus an innovative dual pump and power steer assist version. Sigmadrive series controllers offer excellent continuous current ratings, and comprehensive protection from all overcurrent fault conditions due to the high-resolution current measurement. Sigmadrive series controllers also offer protected contactor drivers with inbuilt coil suppression. The dual pump models offer a high-power output for the main lift pump, and a secondary output for the smaller, power steering assist pump.

● Sigmadrive PM

Sigmadrive PM Motor Controllers offer smooth and predictable speed control of permanent magnet traction motors across a wide range of system voltages and power ratings. The Sigmadrive PM controllers share all of the advanced design features of the Sigmadrive family such as IMS technology, high-resolution current measurement, CANbus communications and extremely low heat dissipation. The Sigmadrive PM range can also be configured for dual traction applications, and includes dedicated Power Steer Assist controllers.



ACCESSORIES



● Sigma Gauge LCD vehicle display

The Sigma Gauge LCD is a highly versatile vehicle display, which can be easily configured and customized to meet OEM requirements. The backlit, dot-matrix display receives its information via CANbus, and presents vehicle status and diagnostic information to the operator using a graphic icon system.

- Large backlit dot-matrix LCD display
- Field upgradeable flash software
- CANbus communication
- Configurable membrane operator pushbuttons
- Programmable Battery Discharge Indication (BDI)
- Keyswitch On Time and Drive Time hour counter
- Service Timer
- Full icon-based diagnostic display



● Sigma Hand-Held Programmer

The Sigma hand-held programmer is a powerful programming tool used to configure all Sigmadrive controllers and the Sigma Gauge LCD vehicle display. It allows simple and easy matching of motors to the controllers to produce the desired vehicle driving characteristics. The status and test menus provide vehicle design and service engineers with extremely useful real-time system feedback data, making setup and diagnostics particularly intuitive. It also has a built-in RS232 interface which allows it to re-flash the Sigmadrive controllers, I/O modules and Sigma Gauge LCD in the field to update the operating system and software.

● Sigma CANbus I/O Modules

For vehicles with additional control requirements, the Sigma CANbus I/O modules provide a highly flexible, programmable means of system expansion. The I/O modules are available in basic and extended versions offering a range of additional digital inputs and outputs, analogue inputs, contactor drivers and other functions, which link to the Sigmadrive controllers via CANbus. The Sigma I/O modules are fully programmable with the Sigma Hand Held Programmer, which can also be used to perform field upgrades to the Flash memory. This feature allows OEM custom software to be easily installed.

- Powered by 12V+ supply from Sigmadrive controller
- CANbus connection to system
- Digital I/O configurable as inputs or outputs
- 0-5V analogue inputs
- 0-4V, 100mA analogue outputs
- 2.5A Contactor drivers with 15kHz PWM
- Programmable 'pull' and 'hold' voltages
- 2.5A PWM outputs, 50-300Hz
- I/O protected against reverse polarity and short circuit to B+
- 10mA potentiometer supply outputs
- Upgradeable Flash software

