Sorensen ASD Series

Programmable Precision High Power DC Power Supply

10–320 kW

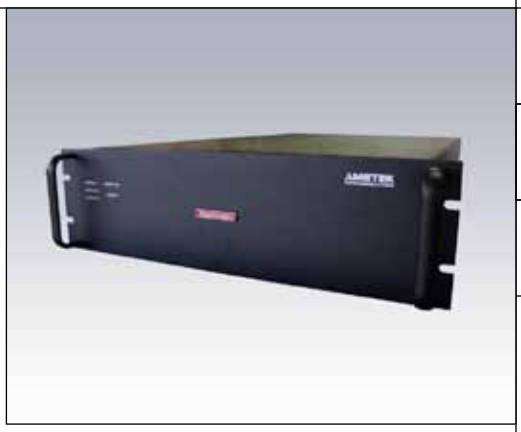
40–60 Vdc

167–8000 Adc

≋	380	400	480

ETHERNET (Modbus-TCP or Ethernet/IP) RS485 (Modbus-RTU) EtherCAT

- Highest Power Density: 30kW in 3U
- Water-Cooled
- Full Digital Control Loops
  - Stable operation over wide range of complex load impedances
- Advanced Digital Features
  - "Flight data" recorder-like function
  - Oscilloscope function
  - Output impedance measurement
  - Advanced fault detection
  - PLC feature: close loop on external variable such as temperature



The ASD with DaVinci Power™ technology represents the next generation of precision programmable AC-DC power conversion.

The ASD with its 3U, 30kW water-cooled packaging provides the highest power density available. The ASD is designed for industry leading load transient response with outstanding output ripple and noise. The water-cooling packaging allows for use in environments that normally exclude air-cooled power supplies.

The ASD advanced digital architecture, with real-time digital control and Graphical User Interface (GUI), enables many features to better control and monitor your process or application. The optional advanced features package includes a built-in oscilloscope function for measurement and display of: power, voltage, current, output impedance, output cable impedance and output cable voltage drop. The ASD allows you to program different "fault levels", enabling detection of output cabling, connections or load problems before they cause critical system problems. The ASD can replace your PLC device by closing the loop on an external parameter such as temperature. The ASD's Advanced Diagnostics And Maintenance (ADAM^{sm}) feature includes a flight data recorder feature that lets you access multiple recorded parameters, such as: voltage, current, power, load impedance, faults and input voltage. This allows you to easily determine "why" you had an unexpected outcome.

The advanced digital monitoring and control features combined with industry leading power density and reliability makes the Sorensen ASD the supply of choice for stringent and high value processes and applications.

Advanced features include:

- Precise programming of voltage and current slew rate for sensitive loads.
- Modules within one chassis can be connected to different loads and controlled independently.
- Industrial field bus interface (Modbus-TCP, Modbus-RTU, Ethernet/IP (Industrial Protocol)) enable real-time digital control.
- Built-in energy meter calculates the delivered energy throughout a process or period of time.
- Optional real time clock enables accurate timestamping of events.
- Built in power quality monitoring detects and saves input voltage anomalies which can be saved for later diagnostic analysis.
- Programmable analog interface scaling facilitates incorporating the ASD to existing systems with minimal effort.
- Load impedance measurement, including rate-of-change calculations, enable load "state of health" monitoring and implementation of system preventive maintenance algorithms
- Programmable filter bandwidth of the output voltage, current and power monitors let the user accommodate their response speed to particular needs.
- Full featured GUI (Graphical User Interface) helps to test and debug the system by communicating with the power supply in real time

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AMETEK® PROGRAMMABLE POWER

ASD Series : Product Specifications

Input	Type: 3-phase, 3-wire plus ground, neutral not required. Not phase rotation sensitive		
Voltage Ranges	342VAC to 440VAC (model D). Nominal rating is 380/400VAC. 432VAC to 528VAC (model E). Nominal rating is 480VAC		
Frequency	Rated 47 through 63 Hz		
Efficiency	>91% (typical), nominal line, full load.		
Max Current, per phase, low line		400/380Vac	480Vac
	10kW unit (1 module)	21Arms	17Arms
	20kW unit (2 modules)	42Arms	33Arms
	30kW unit (3 modules)	63Arms	50Arms
Current Inrush	200A Typical		
Power Factor	>0.9 @ Full Load and at nominal line		
Brownout Provisions	Designed to meet SEMI F47-0706, S3, S8, S14 at nominal input voltages		

Output					
Voltage Output	10kW	20kW	30kW	Noise (pk-pk)***	Noise (RMS)***
40Vdc	250A	500A	750A	150mV	40mV
60Vdc	167A	334A	501A	150mV	40mV

(*) Measured at the load terminals, with 1uF in parallel and 6ft of low-inductance load cable with supply operating at full load and nominal input line voltage.
(**) RMS noise is measured directly across the output terminal with supply operating at full load and nominal input line voltage.
(***) Value is for 30kW, single voltage models. Other variations may increase value by 2x.

Sense	To compensate load cables voltage drop, units can generate 2% additional voltage at full scale of output voltage.

Output	
Load Regulation (Specified at No load to Full load change, nominal AC input)	
Voltage	0.1% of maximum output voltage/ current
Current	0.1% of maximum output voltage/ current
Line Regulation (Specified at ±10% of nominal AC input, constant load)	
Voltage	0.05% of maximum output voltage/ current
Current	0.05% of maximum output voltage/ current
Transient Response	A 50% step load will recover to within 0.75% of original value within 1mSec
Stability	±0.05% of set point after 8 hrs. at fixed line, load and temperature. After 30min warm-up.
Analog Remote Programming	
Voltage Accuracy	0.5% of full scale
Current Accuracy	1% of full scale
Power Accuracy	1.5% of full scale
Voltage Monitoring	0.5% of full scale
Current Monitoring	1% of full scale
Power Monitoring	1.5% of full scale
Programming range	0-10Vdc, 4-20mA

Output	
Output Float	Units maybe put in series with the float limit of output terminals must be within ±150V of chassis potential
Parallel	Multiple units can be paralleled to form higher power systems. Chassis control loops are tied together so that resulting higher power systems have the same transient response as a 30kW system. Control commands are only required to be sent to "master" supply. Parallel supplies require a shielded CAT 5 cable (STP) and appropriate output wiring connections by the user.
Calibration	End user calibration is supported. All standard and digital calibration can be performed without removing covers.
Digital Control (Optional)	Ethernet (Modbus-TCP or Ethernet/IP), RS-485 (MODBUS-RTU)
Analog Control	All control signals are isolated from the outputs

Advanced Digital Features (Requires Optional Digital Control):			
Graphical User Interface	Graphical User Interface (Windows based) enables remote control and display of the supply operation including the a dvanced features listed below:		
Oscilloscope Function (125 Hz)	Up to two parameters; Voltage, current, output impedance, output cable impedance, output cable voltage drop, power delivered…		
Data logging	Programmable update rate of 1 sec to 1000 sec (default 10 sec) with last 1000 points stored. Stored parameters include, output voltage/current, programmed set points, input voltage, output impedance, cable impedance, total power deliver, power meter, internal faults		
System fault reporting	Outside of set point, output impedance (detection of cabling, connection or load problems)		
Physical	**30 kW**	**20 kW**	**10 kW**
Width	19.00in (48.3cm)	19.00in (48.3cm)	19.00in (48.3cm)
Depth	30.00" (76.2 cm)	30.00" (76.2 cm)	30.00" (76.2 cm)
Height	3U - 5.22" rack mount (13.25 cm)	3U - 5.22" rack mount (13.25 cm)	3U - 5.22" rack mount (13.25 cm)
Weight	≤125 lbs (56.69 kg)		
Shipping Weight	Contact factory for more product & shipping weights		
Mounting provisions	EIA rack-mount with slide provisions. Recommended rack slide: Jonathan slide, P/N 370EZ-28		
AC Input Connector	Phoenix Contact terminal block		
Protective Ground	1/4-20 stud		
Output Connectors	bus bars with 3/8-16 inserted PEM nuts		
Water Connections	3/8-18 NPTF hex bulkhead		
Ambient Temperature	0 to 50ºC		
Humidity	Relative humidity up to 95%, non-condensing		
Water cooling specifications			
Flow	1.5 gpm nominal, 1.25gpm minimum, 1.75gpm maximum. Internal condensation must be prevented by ensuring that the temperature of the coolant is sufficiently high compared with the ambient air dew point		
Temperature	25ºC nominal, 20ºC minimum, 30ºC maximum		
Maximum pressure	80 PSI		
Pressure drop	typical 12 PSI @ 1.5gpm per chassis		

Regulatory

Certified to UL/CSA 61010 and IEC/EN 61010-1 by a NRTL, CE Compliant, LVD Categories: Installation Category II: Pollution Degree 2; Class II Equipment: for Indoor Use Only. Rack mount equipment requires proper enclosure provided in end use. EMC Directive, EN 61326:1998

Model Number Description

ASD V1 - V2 - V3 ACin Option Option

Where V1, V2, V3 (2 characters) indicate the individual module voltage levels:
- 40, for a 40V, 250A module.
- 60, for a 60V, 167A module.
- 00, for no module (empty slot).

ACin (1 character) indicates the AC input voltage:
- D, for 380/400Vrms line to line, nominal voltage.
- E, for 480Vrms line to line, nominal voltage.

Option (2 characters) indicates the optional interface type:
- 2A, Advanced digital feature package including full isolated analog interface and Ethernet (Modbus-TCP) or RS485 interface.
- 2B, Advanced digital feature package including full isolated analog interface and Ethernet (Industrial Protocol (IP)).
- 2G, Advanced digital feature package including full isolated analog interface (SG-compatible) and Modbus-RTU (serial) inteface
- 1E, Advanced digital feature package including full isolated analog interface and EtherCAT interface
- 1D, for SG-compatible isolated analog interface. No access to advanced digital features or GUI. Serial port is available with maintenance functions only.

Option (2 characters) indicates other optional features:
- AA, standard unit AC Real-time clock (must include advanced digital feature package).

ASD Series : Product Diagram