

# SEMICONDUCTOR FABRICATION EQUIPMENT POWER SUPPLY & EMI FILTER SOLUTIONS

*Standard and customizable power solutions for demanding applications worldwide*

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# WHO WE ARE...

Astrodyne TDI manufactures dependable Power and EMI Filter solutions that enhance, protect, and save lives. As a global leader in demanding power conversion applications, where reliability is critical, we are known for delivering high precision variable DC sources, resolving EMC & RF issues, and delivering quick-turn and integrated power distribution units. With over 60 years in the power industry and over 1000 employees worldwide, we guarantee unmatched U.S. ENGINEERING SUPPORT to the semi fab equipment market.

## TECHNOLOGY LEADERS

Astrodyne TDI offers the world's most advanced liquid-cooled power solutions, with power modules from 5kW to 16kW. High precision wide range DC power supplies feature low latency (<1ms), voltages up to 2.5kV, and provide power up to 500kW. The Astrodyne TDI engineering team also specializes in EMI/EMC/RF solutions and is currently established among the top 3 largest suppliers of EMC solutions globally.

***Our expertise in power supply for semiconductor processes includes:***

- ▶ High power levels (10kW to 100kW)
- ▶ "Non-standard" voltages (up to 2000V, or more)
- ▶ Voltage, current, or power control
- ▶ High precision setpoints & readbacks (as tight as 100ppm)
- ▶ High-speed serial digital interface (<1ms latency)
- ▶ Flexible cooling options (convection, forced-air, or liquid)
- ▶ Low power AC-DC modules for localized power needs



## POWER SUPPLIES & EMI FILTER SOLUTIONS

### *Programmable AC-DC Power Supplies & E-Chucks*

Standard AC/DC rectifier modules range from **1kW** to **16.5kW** with custom options available upon request. Programmable solutions provide a fully adjustable, wide-range DC output **0 - 2000V**.

### *AC-DC & DC-DC Adapter and Embedded Power Supplies*

Standard adapters and embedded power supplies are available from **5W** to **1kW**, with customizations available upon request.

### *EMI, EMC and RF Filter Solutions*

Medium to high current and voltage EMI Filter options are available in single phase, three-phase, and DC configurations selectable Y-capacitors for leakage current optimization. Select from a broad range of standard products that cover full performance spectrum and come with many interconnection options OR request a mod-standard or fully custom solution

# POWER SOLUTIONS WITH RELIABILITY ASSURANCE

Designing and integrating power solutions into semiconductor fabrication equipment can create many unique challenges, due to the need for reliability, precision, and flexibility. Astrodyne TDI engineers have the technical expertise to produce solutions that meet the unique demands of semiconductor fabrication equipment and comply with agency requirements including Semi F47, Semi S2, UL 508, and IEC62368-1.

## ***Highly Accelerated Stress Screening (HASS)***

Highly Accelerated Stress Screening (HASS) is performed on 100% of all Astrodyne TDI high power, production-ready products (each and every product produced). More stressful than Environmental Stress Screening (ESS), HASS subjects units under test to a rigid temperature, shock vibration and electrical parameters profile.

## ***Highly Accelerated Life Testing (HALT)***

Highly Accelerated Life Testing (HALT) is a pre-production process performed to uncover limitations in product design, component selection, and manufacturing that would not otherwise be found through conventional qualification methods. The process subjects the unit to progressively higher stress levels, incorporating thermal dwells, rapid temperature transitions, vibration, and a combination of temperature and vibration to precipitate inherent defects. Astrodyne TDI performs HALT on each and every high-power design.

# SEMI F47 COMPLIANT

## KEY CAPABILITES FOR SEMICONDUCTOR PROCESSES

- ✓ **Power Converter Design:** AC or DC Input, DC or AC Output
- ✓ **Embedded Control Systems & External Control Interface:** RS232, RS485, I2C, Modbus, CAN, Ethernet, EtherCAT, etc.
- ✓ **EMC Solutions:** AC line filters, RF filters, High-voltage EMI filters, optimized solutions for different power conversion schemes
- ✓ **Integration of Batteries:** Lithium-Ion, Lead Acid, NiMH
- ✓ **Packaging:** Design for manufacture, design for cost, design for reliability, liquid cooling
- ✓ **Power Systems:** Cabinets, power distribution, AC step-down, EMO
- ✓ **Design for Severe Environments:** Electrical or Mechanical



# LET US WORRY ABOUT THE POWER...

## PROGRAMMABLE AC-DC POWER

### *Air-Cooled Solutions*

#### *Flex™ Series*

##### Latest Generation Air-Cooled AC-DC Power Supply



The **Flex Series** offers the flexibility to service multiple applications. These power supplies provide a wide range of outputs from 0-500V and are parallel and series compatible for higher voltage and or power needs. Flex series come equipped with the ability to control output characteristics based on either voltage, current, or power and switch seamlessly between operating modes. Control interfaces include analog or high-speed digital.

To minimize mean time to recovery (MTTR) and ensure reliable up-time during critical operations, this series features a blind-mate hot-plug solution to simplify module replacement. The **Flex Series** also offers low input harmonic currents to provide full power factor correction. These rugged designs are SEMI F47 compliant with 20ms holdup at full power and are designed to meet shock and vibration standards of MIL-STD-810. The Flex series is utilized in a number of high-end industrial and semiconductor fabrication processes.

#### *PowerNode*

##### The "Industrial-Grade" replacement for the typical Lab Supply



The PowerNode air-cooled AC-DC power system offers up to 10kW power in a 2U, 19-inch rackmount shelf. This power supply can support 208VAC (180-253) 3-phase delta input. This power supply also features the blind mate field-replaceable modules for improved reliability as part of the Flex Series. Local control is available via an LCD touch panel display. Control interfaces include industry-standard analog, ethernet and CANbus. As a part of the **Flex Series**, PowerNode provides 0-450VDC out and can operate in constant voltage, constant current, or constant power mode.



# SO YOU DON'T HAVE TO.

## PROGRAMMABLE AC-DC POWER *Liquid-Cooled Solutions*

### LiquaBlade™

#### LiquaBlade™ Liquid-cooled AC-DC Power Supply



The high-frequency switch-mode design employed in LiquaBlade™ offers full active power factor correction, near unity power factor, and excellent output responsiveness. The wide operating AC input range of 380-480V 50/60Hz permits global three-phase application usage without the need for an external step-down transformer. LiquaBlade™ is fully programmable FROM 0-500VDC- a perfect solution for applications that require a flexible power supply solution for their unique requirements. The LiquaBlade™ is SEMIF47 compliant with 20ms holdup. The sealed power supply is designed to operate in a wide range of environmental conditions.

### Kodiak™

#### Latest Generation Liquid-Cooled AC-DC Power Supply



The Kodiak™ series is the new generation of liquid-cooled AC-DC power supplies by Astrodyne TDI and the most compact liquid-cooled power solution yet with 300mm x 100mm x 85mm (38W/in<sup>3</sup>). The Kodiak™ features three-phase input with full power factor correction and offers 4.5kW of power at 220VAC and 6kW of power at 480VAC. To optimize efficiency this power solution includes bridgeless input rectification. Kodiak is parallel/ series compatible to service higher power needs. This is the best solution for process control applications that require a wide range of output suites (0-60V).



# LOW POWER AC-DC MODULES

Power solutions available with open-frame & enclosed form factors

## ASM30 Series | 30W

- ✓ Input voltage range of 80 to 264 VAC
- ✓ 50/60Hz frequency
- ✓ 30 Watts of regulated DC output
- ✓ DoE Efficiency Level VI Compliant
- ✓ RoHS-compliant
- ✓ Compact 3" x 1.6" x 0.97"



## ASM65 Series | 65W

- ✓ Input voltage range of 80 to 264 VAC
- ✓ 50/60Hz frequency
- ✓ 65 Watts of regulated DC output
- ✓ DoE Efficiency Level VI Compliant
- ✓ RoHS-compliant
- ✓ Compact 3" x 2" x 0.95"



## ASM201 Series | 200W

- ✓ Input voltage range of 80 to 264 VAC
- ✓ 50-60Hz frequency
- ✓ 200 Watts Output, Forced Air
- ✓ 140 Watts Output, Convection
- ✓ 12V Auxiliary Fan Output
- ✓ Miniature 2" x 4" x 1.21"



## PMMK320 Series | 320W

- ✓ Input voltage range of 90 to 264 VAC
- ✓ 5VDC to 48VDC Output
- ✓ 320 Watts Output Power
- ✓ Active Power Factor Correction
- ✓ Size 3.86" x 8.03" x 1.57"



## ASM400 Series | 400W

- ✓ Input voltage range of 90 to 264 VAC
- ✓ 50/60Hz frequency
- ✓ 400 Watts of regulated DC output
- ✓ 230W rating with natural convection
- ✓ 5V Auxiliary and 12V fan output
- ✓ Standard 3" x 5" form factor



## ASM550 Series | 550W

- ✓ Input voltage range of 80 to 275 VAC
- ✓ 50-60Hz frequency
- ✓ 550 Watts of regulated DC output
- ✓ Compliant with DoE Level VI efficiency
- ✓ 5V and 12V Auxiliary Outputs
- ✓ 1U low profile form factor



# EMI/EMC FILTERS

## RP130 Series | 3-40A

- ✓ High Performance Design
- ✓ Single Stage
- ✓ Current Rating: 3-40 Amps
- ✓ Single-Phase Filters
- ✓ Agency Approved to UL1283/60929, CSA C22.2, EN60939



## RP230 Series | 3.5-40A

- ✓ High Performance Design
- ✓ Dual Stage
- ✓ Current Rating: 3.5-40 Amps
- ✓ Single-Phase Filters
- ✓ Agency Approved to UL1283/60929, CSA C22.2, EN60939



## RP240 Series | 6-150A

- ✓ High Performance Design
- ✓ Dual Stage
- ✓ Current Rating: 6-150 Amps
- ✓ Single-Phase Filters
- ✓ Agency Approved to UL1283/60929, CSA C22.2, EN60939



## RP305 Series | 6-80A

- ✓ Compact Design
- ✓ Single Stage
- ✓ Current Rating: 6-80 Amps
- ✓ 3-Phase Delta
- ✓ Agency Approved to UL1283/60929, CSA C22.2, EN60939



## RP330 Series | 10-250A

- ✓ Dual Stage
- ✓ Current Rating: 10-250 Amps
- ✓ 3-Phase Delta
- ✓ Agency Approved to UL1283/60929, CSA C22.2, EN60939



## RP360 Series | 20-60A

- ✓ Compact Design
- ✓ Single Stage
- ✓ Current Rating: 20-60 Amps
- ✓ 3-Phase Delta
- ✓ Agency Approved to UL1283/60929, CSA C22.2, EN60939



## RP405 Series | 6-40A

- ✓ Compact Design
- ✓ Single Stage
- ✓ Current Rating: 6-40 Amps
- ✓ 3-Phase WYE
- ✓ Agency Approved to UL1283/60929, CSA C22.2, EN60939



## RP425 Series | 15-300A

- ✓ Dual Stage
- ✓ Current Rating: 15-300 Amps
- ✓ 3-Phase WYE
- ✓ Agency Approved to UL1283/60929, CSA C22.2, EN60939



SELECTABLE OPTIONS FOR  
Y-CAPACITOR VALUES &  
INTERCONNECTIONS TYPES

# LOOKING FOR A COMPLEX POWER DESIGN?

## ASTRODYNE TDI DEVELOPS CUSTOM POWER SYSTEM SOLUTIONS

Custom Power Distribution Units (PDUs) offer effective and efficient implementation of power distribution, safety features, remote communication, output monitoring, and control. With experience in power supplies, EMI filters, and integration, we provide develop custom PDUs to support the semiconductor capital equipment market. Current capabilities range from small PDUs delivering 100's watts to large-scale Power Systems delivering 100's kilowatts. Supported power input sources include uninterruptible power supplies (UPS), power supplies (PSU), and utility power sources (AC Main), or battery power (DC); with the ability to support additional power sources available upon request.

### POWER CONVERSION

Astrodyne TDI's PDUs can provide power conversion elements, such as AC- DC, DC-DC, or DC-AC converters. They may also include AC-AC transformers for isolation, step-up, step-down, and/or power conditioning.

### POWER CONDITIONING

Integrate EMI filters that are specifically tailored to suppress noise generated by connected equipment, or from input power surges, such as those specified by IEC-61000.

### POWER CONTROL

Astrodyne TDI's PDU can provide DC bias voltage for connected system control functions and monitoring of input and delivered power. A bias voltage may be made independent of system interlock and EMO functions. It can also facilitate system maintenance and troubleshooting with some common protocols.

### POWER PROTECTION

PDUs can function as part of a system or safety interlock process, where power delivery to connected equipment is coordinated with various distributed system controls and switches.

System protection features

DC power distribution via heavy duty bus bars and cabling that interconnect module shelves

AC distribution to modules

Water cooling manifolds provide cooling liquid to each module with just one inlet and exit

## AC, DC, and Coolant Distribution & Management with Hot-Swap Modules





# **POWER. EVERYTHING DEPENDS ON IT.**

For over 60 years Astrodyne TDI has been designing and manufacturing power supply and EMI filter solutions. Our quality-oriented engineers have developed an extensive breadth of products with the most critical safety certifications, including SEMIF47, and ISO9001 for exceptional quality. Standard power supplies range from 1W and up, while EMI filter solutions range up to 2500A.

Thanks to our extensive experience as power solution providers, our large team of engineers is able to provide rapid prototypes of mod-standard designs. Our team can even design and manufacture fully custom solutions for demanding applications where packaging, connections, voltages, leakage currents, etc., must be modified, and value-added design services are required.

*Partner up with the Astrodyne TDI team to bring your design to market, in record time, with international safety and EMC compliance certifications.*

**Developing Power Technologies & Products that People Depend Upon, to Enhance, Protect, and Save Lives.**

**Astrodyne****TDI**  
Now you have power.

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