

# Magna-Power Electronics Programmable DC Power Supplies

## Technology and Feature Overview

### Innovative and Scalable

Magna-Power Electronics programmable DC power supplies combine the best of DC power processing with microprocessor embedded control. A combination of high and medium frequency power processing technologies improves response, shrinks package size, and reduces cost. All Magna-Power Electronics DC power supplies are current-fed and are more tolerant to abusive loads than conventional switching power supplies. This technology allows the power supply to operate under short-circuit conditions, open-circuit conditions and everything in between.

The programmable DC power supplies offer both master/slave parallel and series operation. This enables two or more power supplies to be placed in parallel for increased output current or in series for increased output voltage, within the unit's isolation limits. With master/slave operation, power supplies operate at near equal voltage and current. The process of master/slaving power supplies is plug & play with the use of Magna-Power Electronics UID47 option, which can be added at any time.

All supplies can operate as a voltage source or current source depending on the control settings and load conditions. If the power supply is operating as a voltage source and the load increases to a point beyond the current command setting, the power supply automatically crosses over to current mode control and operates as a current source at that setting.

### Designed for Safety

Magna-Power Electronics programmable DC power supplies have extensive diagnostic functions—all of which, when activated, take command to shut down the system. Diagnostic functions include phase loss, excessive thermal conditions, over voltage trip, over current trip, fuse clearing, and program line. Program line monitors externally applied analog set point signals to insure they are within the specified range. Upon a diagnostic fault condition, main power is disconnected and the diagnostic condition is latched into memory. Pressing the clear key clears the memory. All diagnostic functions can be monitored through the rear connector and software. Furthermore, control functions can also be set through the rear connector to allow simultaneous control of one or more power supplies.

The power supplies have three levels of over voltage/current protection: shutdown of controlling insulated gate bipolar transistors (IGBTs), disconnect of main power and input fuses. After an over voltage/current trip condition, the supply fault must be cleared.

### Isolated External I/O for Automation

Using the rear isolated 37-pin I/O connector, the programmable power supplies can be completely controlled and monitored using external signals. The voltage, current, over voltage and over current set points are set by applying a 0-10V analog signal. Each diagnostic condition is given a designated pin, which reads +5V when high. Reference +5V and +10V signals are provided, eliminating the need for external voltage signals and allowing the use of dry contacts. Also, the power supply features a normally closed external interlock, which when enabled, allows the power supply to be tied in with other emergency stop equipment. All these pins are isolated to earth-ground as standard—no additional isolation equipment or options necessary.

### Fully Programmable

The Magna-Power Electronics programmable DC power supplies can be programmed and monitored using three possible sources:

- Stepless front panel programming knobs
- External analog/digital signals
- Computer interface through included software, LabVIEW, or other programming environment

The power supply can be programmed to have its control functions accessible from the front panel, rear connector, RS232 (standard), LXI TCP/IP Ethernet (+LXI), IEEE 488 GPIB (+GPIB), USB Edgeport (+USB), or RS485DSS (+RS485) communications. The included IVI driver enables programming in a variety of software environments, including: Visual C++, Visual C#, Visual Basic .NET, Visual Basic 6.0, LabVIEW, LabWindows/CVI, MATLAB, Measure Foundry, and Agilent VEE Pro. Basic programming requirements are satisfied by the instrument's supported Standard Commands for Programmable Instruments (SCPI). Sensing can be established at the output terminal of the power supply or through a rear remote sense terminals for sensing at the load. Even calibration has been simplified with front panel access to digital calibration potentiometers.

### Attention to Power Quality

All Magna-Power Electronics power supplies contain circuitry to work harmoniously with other power equipment. Step-start contactors are used to keep inrush current below full scale operating current. Filter components lower current harmonic content emanating from the power supply and increase power factor to levels beyond 90%. Every power supply is tested at 90% to 125% nominal line to insure satisfactory operation even under the worst line voltage conditions.

### Electronic Output Stage

The novel electronic output stage (XR/TS/MS Series) utilizes near constant power loading under all conditions via an electronic bleed resistance. This electronic bleeder means stability under all operating conditions and faster fall times, without affecting the overall system efficiency.



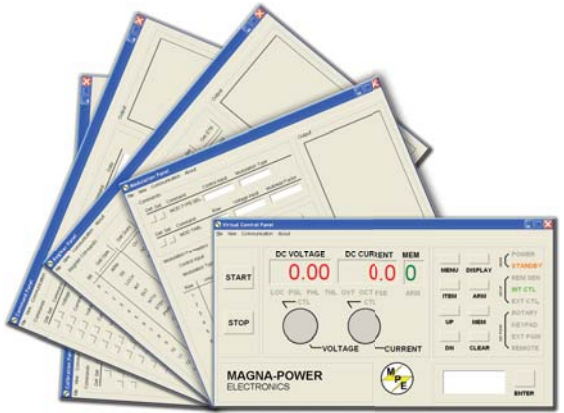
## Higher Quality Power Processing

### LXI TCP/IP Ethernet Interface Option (+LXI)



LXI is an instrumentation platform based on industry standard Ethernet technology designed to provide modularity, flexibility and performance to small- and medium-sized systems. Certified to the LXI Standard (Class C), Magna-Power Electronics +LXI option includes an embedded web-server, allowing web browser power supply control and monitoring from virtually anywhere and a universal IVI driver.


### Remote Interface Software



The Remote Interface Software ships with all power supplies. The software provides the user with an easy and intuitive method to operate a Magna-Power Electronics power supply with computer control. The Remote Interface Software has six windows: Virtual Control Panel, Command Panel, Register Panel, Calibration Panel, Firmware Panel, and Modulation Panel.

### Key Product Line Features:

Magna-Power Electronics has designed its products from the ground up to provide synergy across the entire product line. The following are some of the company's programmable DC power supplies key features:

- **Industry leading power density**  
Rack-mount space is always at a premium. Magna-Power Electronics power supplies are continuously refined with new technology and devices to drive down size and increase power density.
- **High accuracy programming**  
±0.075% full scale programming accuracy on all models and programming interfaces.
- **High power factor: > 0.92 on all 3Φ models:**  
Attention to AC power quality and input inductance enables a high power factor, consistent across all 3Φ input voltages.
- **Standard 37-pin isolated I/O and RS232**
- **Multiple front panel types for flexibility**
- **Extensive programming interface options**
- **CE Mark safety and EMI/EMC certification**
- **Made in USA**   
All products are designed and manufactured at Magna-Power Electronics vertically integrated headquarters in Flemington, NJ USA

### Protective Diagnostic Features:

- Over-voltage protection (OVT) (*Programmable*)
- Over-current protection (OCT) (*Programmable*)
- Over-temperature protection (THL)
- Interlock fault (LOC)
- Fuse fault (FUSE)
- Phase loss alarm (PHL)
- Analog programming line voltage fault (PGM LN)
- Remote sense lead detection (REM SEN)

# TS Series IV: 5 kW to 45 kW



TS Series IV 5 kW, 10 kW, and 15 kW Models (3U)



TS Series IV 20 kW, 25 kW, and 30 kW Models (6U)



TS Series IV 45 kW Models (9U)

## Available Options

- 208/240 Vac Single-Phase Input (SP) (5 kW Only)
- Cabinet and Integrations (+CAB1, +CAB2, +CAB3)
- High Isolation Output (+ISO)
- High Slew Rate Output (+HS)
- IEEE 488.2 GPIB Interface (+GPIB)
- LXI TCP/IP Ethernet Interface (+LXI)
- Photovoltaic Power Profile Emulation (+PPPE)
- RS-485DSS Interface (External) (+RS485)
- UID47: Universal Interface Device (+UID)
- USB Edgeport Interface (External) (+USB)
- Water Cooling (+WC)

Product Name:	TS Series IV
Number of Models:	80
Power Levels:	5 kW, 10 kW, 15 kW, 20 kW, 25 kW, 30 kW, and 45 kW
Voltage Range:	Models from 0-5 Vdc to 0-4000 Vdc
Current Range:	Models from 0-1.2 Adc to 0-375 Adc
Enclosure	Rack-mount, 3U to 9U

## Overview

Magna-Power Electronics TS Series IV provides a wide voltage and current range while still maintaining among the highest power density rack-mount packaging. The TS Series IV covers voltages from 5 Vdc up to 4000 Vdc (floating) and current levels from 1.2 Adc up to 2700 Adc. Models 5 kW to 15 kW are available in a 3U chassis, models 20 kW to 30 kW are available in a 6U chassis, and 45 kW models are available in a 9U chassis. In addition, there are several special low voltage high current models (Page 23), enabling a more cost-effective solution for these requirements.

All TS Series IV power supplies come standard with isolated 37-pin external I/O, RS232, Remote Interface Software, IVI drivers for integration into a variety of programming environment. Three front panel types are available (Page 22) for maximum application flexibility. The A Version provides front panel control and calibration, start and stop buttons, and a digital display for voltage and current. The D Version front panel adds a 10-key digital front panel entry, memory sequencing, and modulation capabilities for non-linear output profile emulation.



Mobile TS Series IV Power Supplies, Part of the F-35 Joint Strike Fighter (JSF) Program





## 3U to 9U Rack-Mount Power Supplies

### TS Series IV Specifications

#### Input Specifications

<b>Nominal Voltage</b>	208 Vac, 3 $\Phi$ (operating range 187 - 229 Vac)
<b>3 phase, 3 wire + ground</b>	240 Vac, 3 $\Phi$ (operating range 216 - 264 Vac) 380 Vac, 3 $\Phi$ (operating range 342 - 418 Vac) 415 Vac, 3 $\Phi$ (operating range 373 - 456 Vac) 440 Vac, 3 $\Phi$ (operating range 396 - 484 Vac) 480 Vac, 3 $\Phi$ (operating range 432 - 528 Vac)
<b>1 phase, 2 wire + ground (5 kW Models Only)</b>	208 Vac, 1 $\Phi$ (operating range 187 - 229 Vac) 240 Vac, 1 $\Phi$ (operating range 216 - 264 Vac)
<b>Frequency</b>	50 Hz - 400 Hz (operating range 45 - 440 Hz)
<b>Power Factor</b>	> 0.92 at maximum power for 3 $\Phi$ units > 0.70 at maximum power for 1 $\Phi$ units

#### Output Specifications

<b>Ripple</b>	(See Model Charts)
<b>Line Regulation</b>	Voltage Mode: $\pm 0.004\%$ of full scale Current Mode: $\pm 0.02\%$ of full scale
<b>Load Regulation</b>	Voltage Mode: $\pm 0.01\%$ of full scale Current Mode: $\pm 0.04\%$ of full scale
<b>Load Transient Response</b>	2 ms to recover within $\pm 1\%$ of regulated output, with a 50% to 100% or 100% to 50% step load change
<b>Efficiency</b>	$\geq 86\%$ at full load (See Model Charts)
<b>Stability</b>	$\pm 0.10\%$ for 8 hrs. after 30 min. warmup
<b>Isolation</b>	User inputs and outputs: referenced to earth ground.  Maximum input voltage to ground: $\pm 2500$ Vac.  Maximum output voltage to ground: $\pm 1000$ Vdc for models less than or equal to 1000 Vdc $\pm (2000 \text{ Vdc} + V_o/2)$ for models greater than 1000 Vdc or with High Isolation Option (+HSO) where $V_o$ is the unit's output voltage maximum
<b>Maximum Slew Rate</b>	Standard Models: 100 ms for output voltage change from 0 to 63% 100 ms for output current change from 0 to 63%  With High Slew Rate Option (+HS): 4 ms for output voltage change from 0 to 63% 8 ms for output current change from 0 to 63%
<b>Bandwidth</b>	Standard Models: 3 Hz for remote analog voltage programming 2 Hz for remote analog current programming  With High Slew Rate Option (+HS): 60 Hz for remote analog voltage programming 45 Hz for remote analog current programming

**Note:** Specifications are subject to change without notice. For three-phase configurations, input specifications are line-to-line. Unless otherwise noted, input voltages and currents are specified for three-phase configurations.

#### Physical Specifications

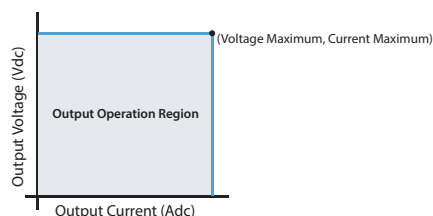
Power	Size (H" x W" x D")	Rack Units	Weight
5 kW	5.25 x 19 x 24 in (13.3 x 48.3 x 61.0 cm)	3U	74 lbs (33.60 kg)
10 kW	5.25 x 19 x 24 in (13.3 x 48.3 x 61.0 cm)	3U	94 lbs (42.64 kg)
15 kW	5.25 x 19 x 24 in (13.3 x 48.3 x 61.0 cm)	3U	114 lbs (51.71 kg)
20 kW	10.25 x 19 x 24 in (26.0 x 48.3 x 61.0 cm)	6U	197 lbs (89.36 kg)
25 kW	10.25 x 19 x 24 in (26.0 x 48.3 x 61.0 cm)	6U	217 lbs (98.43 kg)
30 kW	10.25 x 19 x 24 in (26.0 x 48.3 x 61.0 cm)	6U	237 lbs (107.50 kg)
45 kW	15.75 x 19 x 24 in (40.0 x 48.3 x 61.0 cm)	9U	349 lbs (158.30 kg)

#### Control Specifications

<b>Voltage Programming Accuracy</b>	$\pm 0.075\%$ of full scale voltage
<b>OVT Programming Accuracy</b>	$\pm 0.075\%$ of full scale voltage
<b>Current Programming Accuracy</b>	$\pm 0.075\%$ of full scale current
<b>OCT Programming Accuracy</b>	$\pm 0.075\%$ of full scale current
<b>Voltage Readback Accuracy</b>	$\pm 0.2\%$ of full scale voltage
<b>Current Readback Accuracy</b>	$\pm 0.2\%$ of full scale current
<b>External Analog Programming and Monitoring Levels</b>	0 - 10 Vdc
<b>External Analog Output Impedances</b>	Voltage output monitoring: 100 $\Omega$ Current output monitoring: 100 $\Omega$ +10 Vdc reference: 1 $\Omega$
<b>External Digital Programming and Monitoring Limits</b>	Input: 0 to 5 Vdc, 10 k $\Omega$ input impedance Output: 0 to 5 Vdc, 5 mA drive capacity
<b>Remote Sense Limits</b>	3% maximum voltage drop from output to load

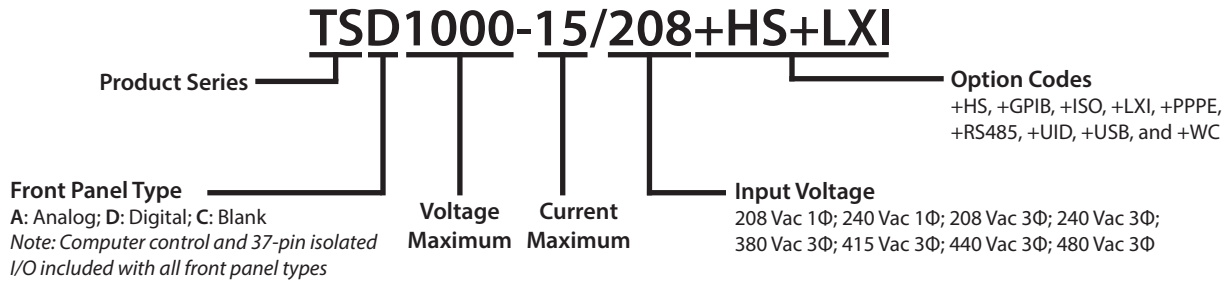
#### Environmental Specifications

<b>Ambient Operating Temperature</b>	0 $^{\circ}$ C to 50 $^{\circ}$ C
<b>Storage Temperature</b>	-25 $^{\circ}$ C to 85 $^{\circ}$ C
<b>Humidity</b>	Relative humidity up to 95% non-condensing
<b>Temperature Coefficient</b>	0.04 % / $^{\circ}$ C of maximum output voltage 0.06 % / $^{\circ}$ C of maximum output current
<b>Air Flow</b>	Side air inlet, rear exhaust
<b>Water Cooling (+WC Option) (Diagrams Available)</b>	Inlet temperature: 25 $^{\circ}$ C Flow rate (minimum): 1.5 GPM for 15 kW units 3.0 GPM for 20 to 30 kW units 4.5 GPM for 45 kW units 80 PSI maximum pressure



# TS Series IV Models

## Model Ordering Guide



## Models Chart

The following chart details the available standard TS Series IV models. The Current Maximum (A<sub>dc</sub>) column is separated by the available power levels. To determine the appropriate model, first select your output Voltage Maximum (V<sub>dc</sub>) to find appropriate row. Next, select one desired Current Maximum from the row that contains your desired Voltage Maximum. Then, construct your model number according to the model ordering guide, above. Non-standard voltage and current configurations are available.

Voltage Maximum (V <sub>dc</sub> )	5 kW	10 kW	15 kW	20 kW	25 kW	30 kW	45 kW	Ripple (mVrms)	Efficiency (%)
	Current Maximum (A <sub>dc</sub> )								
5	900	N/A	N/A	N/A	N/A	N/A	N/A	50	86
8	600	N/A	N/A	N/A	N/A	N/A	N/A	40	86
10	500	900	N/A	N/A	N/A	N/A	N/A	40	86
16	300	600	900	1200	1500	1800	2700	35	86
20	250	500	750	1000	1250	1500	2250	40	86
32	150	300	450	600	750	900	1350	40	86
40	125	250	375	500	625	750	1125	40	87
50	100	200	300	400	500	600	900	50	87
80	62	124	186	248	310	372	558	60	87
100	50	100	150	200	250	300	450	60	87
125	40	80	120	160	200	240	360	100	87
160	31	62	93	124	155	186	279	120	87
200	25	50	75	100	125	150	225	125	87
250	20	40	60	80	100	120	180	130	88
375	13	26	39	52	65	78	117	170	88
400	12	24	36	48	60	72	108	180	88
500	10	20	30	40	50	60	90	220	88
600	8	16	24	32	40	48	72	250	88
800	6	12	18	24	30	36	54	300	88
1000	5	10	15	20	25	30	45	350	88
1250	4	8	12	16	20	24	36	375	88
1500	3.3	6.6	9.9	13.2	16.5	19.8	27.7	400	88
2000	2.5	5.0	7.5	10.0	12.5	15.0	22.5	450	88
3000	1.6	3.2	4.8	6.4	8.0	9.6	14.4	500	88
4000	1.2	2.4	3.6	4.8	6.0	7.2	10.8	550	88
	Input Current (A <sub>ac</sub> )								
208/240 Vac, 3Φ	19	36	54	72	90	108	162		
380/415 Vac, 3Φ	10	21	30	40	50	60	90		
440/480 Vac, 3Φ	9	18	27	36	45	54	81		

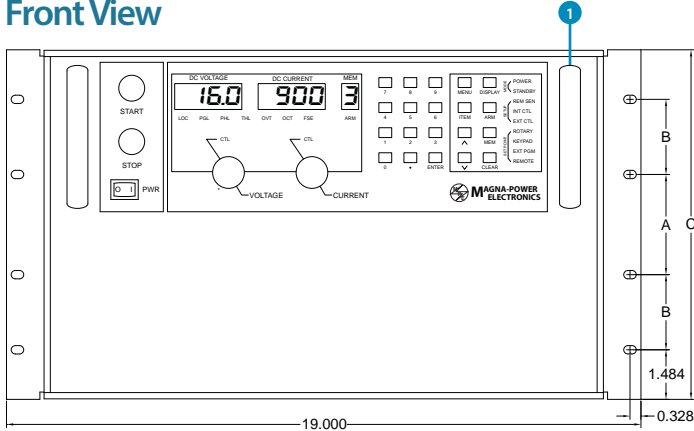
Note: 38 A<sub>ac</sub> input current for 208/240 Vac, 1Φ input (5 kW models only). Ripple specified for standard models. For models with the High Slew Rate Output Option (+HS), ripple will be higher.

# TS Series IV Diagrams

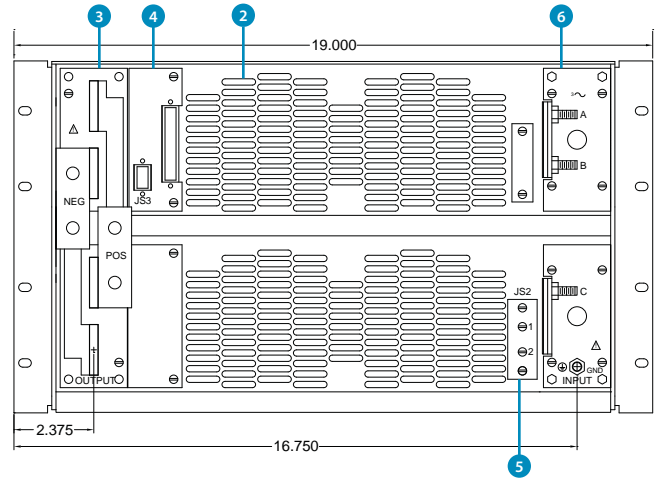
## Physical Specifications

Power	A (in)	B (in)	C (in)
5 kW	2.250	N/A	5.219
10 kW	2.250	N/A	5.219
15 kW	2.250	N/A	5.219
20 kW	3.000	2.250	10.469
25 kW	3.000	2.250	10.469
30 kW	3.000	2.250	10.469
45 kW	4.750	4.000	15.719

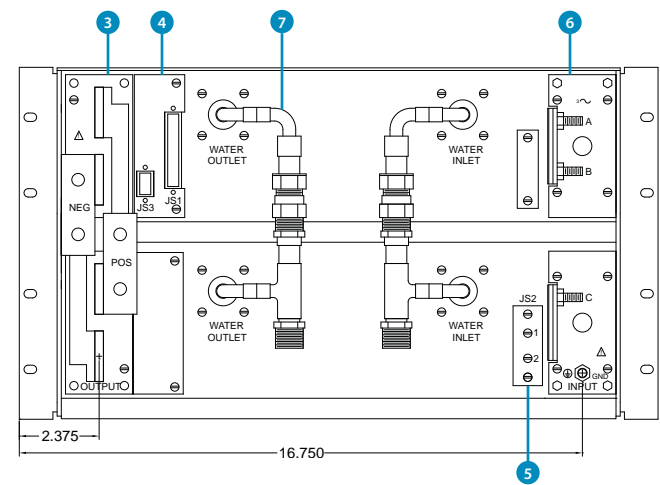
## Front View



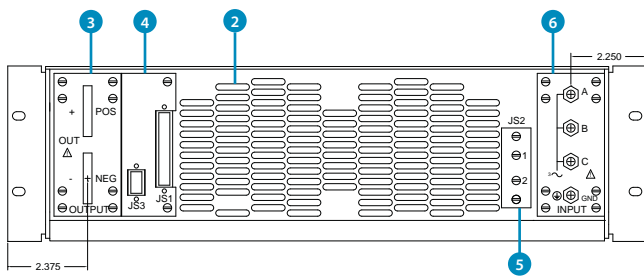
## Rear View, Air-Cooled (20 kW to 30 kW)



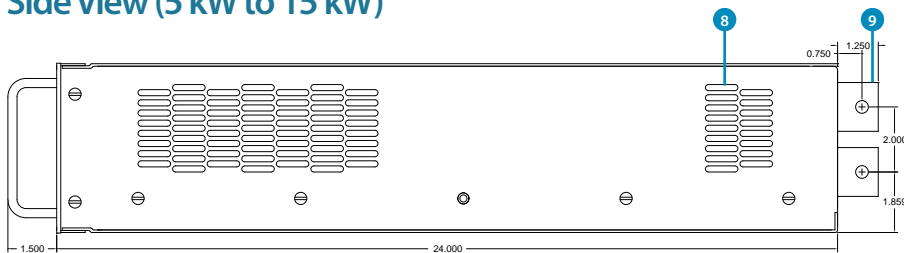
## Rear View, Water-Cooled (20 kW to 30 kW)



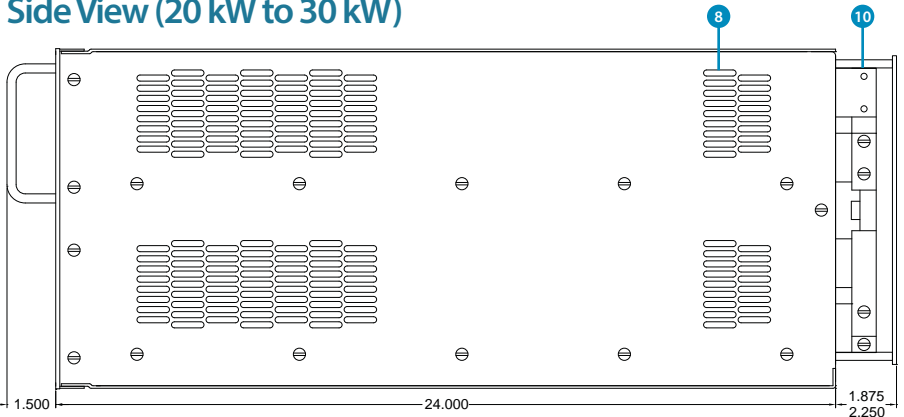
## Rear View, Air-Cooled (5 kW to 15 kW)



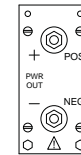
## Side View (5 kW to 15 kW)



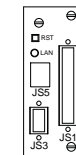
## Side View (20 kW to 30 kW)



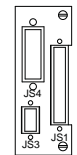
Output Bus for Models Greater Than 1000 Vdc



Optional (+LXI) Interface



Optional (+GPIB) Interface



- 1 Front Panel Handles
- 2 Rear Air Exhaust
- 3 Output DC Connections, 20 kW - 45 kW (Front View)  
3/8-16 Threaded Insert  
Qty (2) Inserts on 20 kW to 30 kW Models  
Qty (4) Inserts on 45 kW Models
- 4 Computer and External Control Connections
- 5 Remote Sensing Connector
- 6 Input AC Connections  
1/4-20 Bolt, Qty (4) PLC'S
- 7 Front Panel Handles
- 8 Side Air Intake (Air-Cooled Models Only)
- 9 Output DC Connections, 5 kW - 15 kW (Side View)  
3/8-16 Threaded Insert, Qty (2)
- 10 Output DC Connections, 20 kW - 45 kW (Side View)

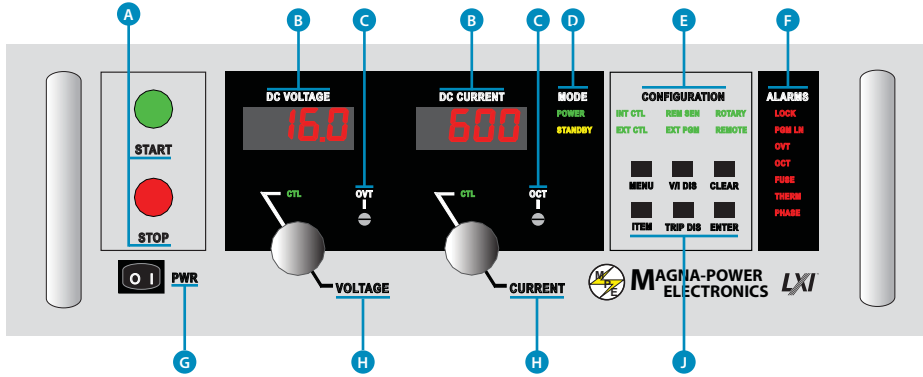
Note: Metal Cover included for rear panel on 5 kW to 15 kW models. Stand-offs included for all other models.

# Front Panel Types (TS/MS/MT Series)

This section details the various front panel types available for the TS Series, MS Series, and MT Series power supplies. For the XR Series front panels, refer to its diagram page.

## A Version Front Panel

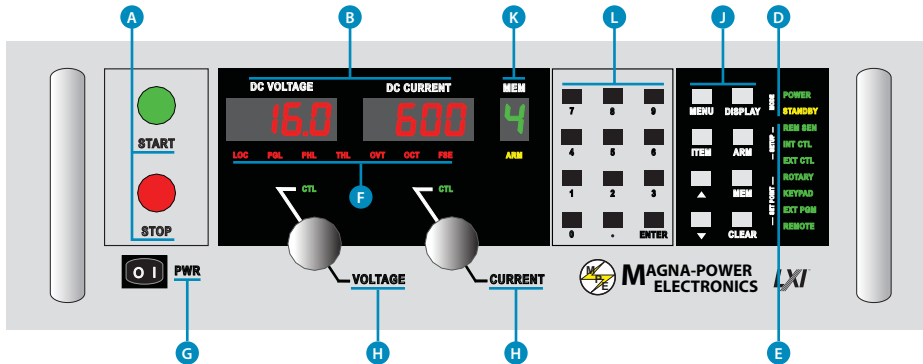
The A Version front panel provides a digital display with rotary front panel input, isolated 37-pin analog/digital I/O, and a RS232 computer interface.



- A** Engages and disengages main power
- B** Meters display output voltage, output current, voltage set point, current set point, over voltage trip, and over current trip
- C** Over voltage trip and over current trip setting potentiometers
- D** MODE  
POWER: Indicates power output  
STANDBY: Indicates control power only
- E** CONFIGURATION  
REM SEN: Remote sense enabled  
INT CTL: Front panel start/stop/clear enabled  
EXT CTL: External start/stop/clear enabled  
ROTARY: Front panel control  
EXT PGM: External voltage/current control  
REMOTE: Computer control
- F** DIAGNOSTIC ALARMS  
LOCK: Interlock  
PGM LN: External input voltage beyond limits  
OVT: Over-voltage protection has tripped  
OCT: Over-current protection has tripped  
THERM: Indicates over-temperature condition  
PHASE: Indicates under-voltage AC input

## D Version Front Panel

In addition to the features of the A Version front panel, the D Version front panel provides digital 10-key entry, auto-sequencing with memory capability, and modulation for non-linear power profile emulation.



- G** Power switch energized control circuits without engaging main power
- H** Stepless rotary knob to set voltage/current
- J** FUNCTION KEYS  
MENU: Selects function  
ITEM: Selects item within function  
V/I DIS: Displays voltage/current settings  
TRIP DIS: Displays OVT and OCT settings  
CLEAR: Clears setting or resets fault  
ENTER: Selects item  
MEM: Sets the memory location
- K** Memory location indicator, used for auto-sequencing applications
- L** Digital input keypad

## C Version Front Panel

The C Version front panel is blank, providing on a switch to enable control power. All control must be performed by the provided isolated 37-pin analog/digital I/O or through a computer interface.



## Low Voltage High Current Units

Magna-Power Electronics offers a range of standard low voltage high current units based on TS Series IV and MS Series IV that do not fit in these series' standard power envelopes. All of the product options are available for these models.

Model	Voltage Maximum (Vdc)	Current Maximum (Adc)	Power (kW)	Ripple (mVrms)	Efficiency (%)	Size	Input Current (Aac)		
							208/240 Vac	380/415 Vac	440/480 Vac
TS5-1800	5	1800	9.0	50	86	6U	38	22	18
TS8-1200	8	1200	9.6	40	86	6U	38	22	18
TS10-1000	10	1000	10.0	40	86	6U	38	22	18
TS5-2700	5	2700	13.5	50	86	9U	57	33	27
TSA10-1800	10	1800	18.0	40	86	6U	72	42	36
TSA10-2700	10	2700	27.0	40	86	9U	108	63	48
MS5-2700	5	2700	13.5	50	86	18U Cabinet	57	30	27
MS5-3600	5	3600	18.0	50	86	18U Cabinet	76	40	36
MS5-4500	5	4500	22.5	50	86	30U Cabinet	95	50	45
MS10-2700	10	2700	27.0	40	86	18U Cabinet	108	62	54
MS10-3600	10	3600	36.0	40	86	18U Cabinet	144	84	72
MS10-4500	10	4500	45.0	40	86	30U Cabinet	180	106	90



# Product Options

## Performance and Packaging Options

Magna-Power Electronics programmable DC power supplies are designed to be as versatile and expandable as possible. A variety of options are available allowing the product to deviate from its standard specifications. This section provides an overview of the available performance and packaging options and products supported.

### Cabinet and Integration

Option Code:	+CAB1, +CAB2, +CAB3
Products Supported:	XR Series, TS Series

Cabinet and integration services are offered for the rack-mount programmable DC power supply products. Cabinets are supplied with fans rated to installed products. Key features of the cabinet and integration option are as follows:

- Reliable Premier Metal (+CAB1, +CAB2) and Hoffman® (+CAB3) cabinets
- Casters installed, including (2) locking casters
- Special circuitry for product integration with cabinet fans
- Installation and testing as a complete system

Cabinet and Integration Specifications		
Cabinet Option	Dimensions (H"xW"x D")	Rack Units
Cabinet 1 (+CAB1)	38.75" x 22" x 31"	18U
Cabinet 2 (+CAB2)	49.25" x 22" x 31"	24U
Cabinet 3 (+CAB3)	67" x 24" x 31.5"	30U

### High Slew Rate Output

Option Code:	+HS
Products Supported:	XR Series, TS Series, MS Series, MT Series

The high slew rate option solves several limitations inherent in switching power supply design. Rapid voltage transitions require internal electronics to supply the energy to charge and discharge output capacitors. Peak currents internal to the power supply define slew rate; utilizing less capacitance enables voltage transitions in shorter time periods. Additionally, less capacitance reduces requirements for discharge demands during open circuit conditions.

The standard output stage Magna-Power Electronics power supplies has been designed to provide the lowest possible output ripple voltage within the constraints of available components, size, and cost. Part of the output stage consists of a bank of aluminum electrolytic capacitors which has the desired electrical properties to provide this function. These components require bleed resistors to discharge any voltage when the power supply has no load and is disabled. While the presence of these components and the resulting performance are normally industry accepted, there are applications where lower output capacitance is extremely desirable and higher ripple voltage is acceptable. To meet this need, a high-slew rate option is available which has an output stage consisting of low capacitance film and aluminum electrolytic capacitors. Applications for the high-slew rate option include battery charging, photovoltaic emulation, power waveform generation, and medium speed power pulsing. These applications all benefit from higher bandwidth and in many cases, can tolerate the increased ripple voltage of this option.

Slew Rate Specifications		
	Slew rate standard	Slew rate with +HS option
Voltage	100 ms	4 ms
Current	100 ms	8 ms

### High Isolation Output

Option Code:	+ISO
Products Supported:	TS Series, MS Series, MT Series

Certain applications require floating the output voltage to values beyond the power supply's standard isolation rating. Magna-Power Electronics High Isolation Output option (+ISO) enables any TS Series, MS Series, or MT Series model with a peak output voltage rating of 250 Vdc through 1000 Vdc to be rated for a higher voltage output isolation. Improved isolation is achieved by a novel output stage with improved controller isolation. In addition to being able to float the power supply to a higher output voltage, this option also enables lower voltage units to connected series up to the higher isolation rating.

The table below provides the output isolation rating for all available configurations, where  $V_o$  is the unit's rated maximum output voltage.

Output Isolation Specifications			
Product	Isolation, models 1000 Vdc and below	Isolation, models 1000 Vdc and below with +ISO option	Isolation, model above 1000 Vdc
XR Series	1000 Vdc	N/A	N/A
TS Series	1000 Vdc	$\pm (2000 \text{ Vdc} + V_o/2)$	$\pm (2000 \text{ Vdc} + V_o/2)$
MS Series	1000 Vdc	$\pm (2000 \text{ Vdc} + V_o/2)$	$\pm (2000 \text{ Vdc} + V_o/2)$
MT Series	1000 Vdc	4000 Vdc	4000 Vdc

## UID47: Universal Interface Device

Option Code:	+UID
Products Supported:	XR Series, TS Series, MS Series, MT Series

Magna-Power Electronics UID47 is a general purpose device for connection to Magna-Power Electronics' power supplies. The device contains the necessary circuitry for configuring power supplies for master/slave parallel or series operation.

Master/slave parallel operation allows two or more power supplies to equally share output current when connected together. Master/slave series operation allows two or more power supplies to equally share output voltage when connected together. In either operation mode, the master unit will command the slave units to the proper voltage and current. Each unit will display its own individual voltage and current. Installation requires setting jumpers, placing included 37-conductor cables between the UID47 and power supplies, and wiring the power supply outputs in either parallel or series.

The UID47 can be used as an interface for connecting control and monitoring lines to external circuitry. It also contains an area on the printed circuit board for interconnecting wires and placing components for specific user applications.

Key features of the UID47 option are as follows:

- Compatible with all Magna-Power Electronics power supplies
- Interface for series and parallel master/slave operation
- User configurable screw terminal connector
- Pad area for custom circuitry
- (2) 6-foot 37-pin cables included



## Water Cooling

Option Code:	+WC
Products Supported:	TS Series, MS Series

Water cooling is available for Magna-Power Electronics TS Series and MS Series power supplies typically for use in corrosive environments, such as electroplating applications or in densely packaged system cabinets, where heat removal by air cooling presents a problem.

Water cooling is accomplished with chill plates and an integrated central heat exchanger. The chill plates provides a thermal conduction path for heat sensitive components and the central heat exchanger removes heat from air internal to the enclosure. Water cooled TS Series models have enclosures without vent holes and are basically sealed the unit from the environment. An internal solenoid valve enables water flow when the chill plate reaches 60 degrees celcius. Operation of the solenoid prevents internal condensation.

Water Cooling Specifications			
	5 kW - 15 kW Models	20 kW to 30 kW Models	45 kW to 75 kW Models
Inlet Coolant Temperature	25°C	25°C max	25°C max
Flow Rate (Min)	1.5 GPM	3.0 GPM	4.5 GPM
Pressure (Max)	80 psi	80 psi	80 psi
Inlet/Outlet Pipe Size	1/4" NPT male	1/2" NPT male	1/2" NPT male

Each 15 kW module has a 1/4" NPT female inlet and outlet for water flow. For models greater than 15 kW, external plumbing interconnects power supply modules. A minimum of 2.50" is recommended behind the enclosure for this hardware and user connections. For systems requiring more than one power supply, plumbing connections must be paralleled; that is, water should not flow from one power supply into another.

# Product Options

## Communication Interface Options

All Magna-Power Electronics programmable DC power supplies come standard with RS232 serial interface and 37-pin isolated analog/digital I/O. Additional available interface options are available, as detailed in this section.

### IEEE 488 GPIB

Option Code:	+GPIB
Products Supported:	XR Series, TS Series, MS Series, MT Series

The IEEE 488 interface, sometimes called the General Purpose Interface Bus (GPIB), is a general purpose digital interface system that can be used to transfer data between two or more devices. It is particularly well-suited for interconnecting computers and instruments. Some of its key features are:

- Up to 15 devices may be connected to one bus
- Total bus length may be up to 20 m and the distance between devices may be up to 2 m
- Communication is digital (as opposed to analog) and messages are sent one byte (8 bits) at a time
- Message transactions are hardware handshaked
- Data rates may be up to 1 Mbyte/sec

### LXI TCP/IP Ethernet

Option Code:	+LXI
Products Supported:	XR Series, TS Series, MS Series, MT Series

Certified to the LXI Standard (Class C), the TCP/IP Ethernet option includes an embedded web-server, allowing web browser power supply control and monitoring from virtually anywhere. LXI is an instrumentation platform based on industry standard Ethernet technology designed to provide modularity, flexibility, and performance to small- and medium-sized systems.

LXI's advantages are exemplified in its compact, flexible package providing high-speed I/O and reliable measurements. The Magna-Power Electronics LXI TCP/IP Ethernet option includes an embedded web-server, allowing web browser power supply control and monitoring from virtually anywhere.

### USB Edgeport

Option Code:	+USB
Products Supported:	XR Series, TS Series, MS Series, MT Series

Edgeport USB-to-serial converters offer instant I/O expansion for peripheral device connectivity. An out-of-the-box (external) alternative to PCI cards, Edgeport makes it easy to add serial port to a PC, server or thin client in minutes without opening the chassis, reconfiguring or rebooting the system.

The USB Edgeport device plugs directly into the back of the power supply, creating a seamless USB interface. Feature-rich design, reliability and unmatched operating system support make Edgeport USB-to-serial converters ideal for mission-critical enterprise applications. USB cable included along with associated drivers on the Magna-Power Electronics software CD.

### RS-485DSS

Option Code:	+RS485
Products Supported:	XR Series, TS Series, MS Series, MT Series

The 485DSS allows non-addressable, "dumb" RS-232 devices to be connected on an addressable RS-485 network. The master node controls all communications to connected devices. By distributing the switching intelligence along the RS-485 network, wiring cost savings are substantial compared to a single switched "star" configuration.

Devices can either be polled by the master node or request access to the bus through a RS-232 handshake line. This provides a versatile system for interconnecting devices that are designed for point to point communications. Because the units communicate using standard RS-485 signals, RS-232 devices can form their own network or be added to an existing system. Up to 32 nodes at up to 4000 feet can be on one bus without a repeater, and the 485DSS's addressing scheme allows up to 256 units on a single network with repeaters.