

SYSTEM 9700

Magnet Power Supply

SYSTEM 9700
MAGNET POWER SUPPLY
CONTROL UNIT



POWER

```
←SET CMD INTL POL LIMITS AD-CHAN →
CURRENT      Iset +999.999 Amp      LOC
CURRENTd     Iout  +0.14 A        ---
MEM           Uout  +0.0 V        OFF
MAX/MIN      (Use ▲▼◀▶ to edit, then ←)
```

RESET

System 9700
POWER UNIT



POWER



SYSTEM 9700 Magnet Power Supply

SYSTEM 9700 is part of Danfysik's portfolio of high performance power converters suitable for supplying magnets and applications where high current or voltage stability is required.

With the SYSTEM 9700 power converter program Danfysik now offers our customers a new generation of high performance current/voltage-controlled power converters ranging from 3 kW to 100 kW in a 10ppm superior price/performance class.

The SYSTEM 9700 is a compact 19 inch rack mount (3U) modular design where a control unit and multiple power units can be connected in parallel to increase the current capabilities up to 1600 A and up to 120 V, and incorporates a current transducer (DCCT) for superior performance. As options, the SYSTEM 9700 can be configured with a polarity switch.

The SYSTEM 9700 is available in both water-cooled and air-cooled versions.

The SYSTEM 9700 is based on a high efficiency primary full bridge phase modulated zero voltage-switching topology, which offers several benefits compared with traditional hard-switching technology, such as improved EMI performance and higher efficiency.

The SYSTEM 9700 can be controlled locally by the control panel or via remote. Using the analog and digital interfaces, various parameters can be set and read from the power supply via the remote applications and also trigger inputs.

System 9700 can be used in a wide range of applications:

- Powering electromagnets in accelerators for research and medical application
- Powering coils for establishment of stable magnetic fields
- Applications where high current stability is needed, e.g. correctors and dipoles

Detailing features

- Unipolar and bipolar versions
- Remote or local mode control
- Soft start mode
- Adjustable slew rate limit
- Protected against injected inductive energy
- Programmable ramp figures (optional)
- Water and Air cooled versions
- Analog (0-10 V) and digital interfaces (RS-422)

Other Danfysik Power supplies

Danfysik SYSTEM 8500 provides solutions for ultra-stable power supplies, 2 and 4 quadrant power supplies.

Performance

Warm up time (cold) : 30 min.
Warm up time (stand-by) : 15 min.

Drift

Long term 8 hours stability (fwhm) : 10ppm

Line regulation

±10% slow, T > 1 min. : ±5ppm
±1% fast, T > 3 m sec. : ±5ppm

Load regulation

±10% resistance change : ±5ppm

Output ripple and noise

Voltage spikes – peak to peak : < 100 mV @ 1-100 kHz
Switching frequency : 140 kHz

Load range

Time Constant (L/R) : 0 - 1 sec
Inductance (L) : 0 - 1 H (standard)
Resistance (Rmin) : >61 mOhm*

*only for Bipolar/Water cooled version

Temperature coefficient

Ambient 15 – 30°C : 1ppm/°C
Ambient 30 – 40°C : 5ppm/°C

Accuracy

Current setting resolution : 20 bit DAC
Current reproducibility : ±10ppm
Absolute current calibration : -0 / +400ppm at Imax
Current read-back resolution : 16 bit ADC
Voltage read-back resolution : 16 bit ADC

Current control range (setting range)

Unipolar : 1 – 100%
Bipolar : ±100%

Output Characteristics

Ramp speed (0 – 100%) : 0.1 – 10 sec (adjustable)
Current loop bandwidth : 2 – 100 Hz
Voltage loop bandwidth : >200 Hz

Isolation

Isolation test voltage (output to chassis) : 1 kV
Galvanic isolation : between mains and output

Control panel

Alphanumeric LCD display:

Pre-set output current	: 6 digits [A]
Actual output current	: 5 digits [A]
Output voltage	: 2 digits [V]
Interlock status	: text string
Menu system	: local control

Push buttons and status Indicators

OFF	: [Button]/[LED]
Reset (interlock)	: [Button]/[LED]
ON	: [Button]/[LED]
Menu	: [Button]
Ready (in regulation)	: [LED]

Interlock status

Over voltage
Over current
Over temperature
Fan fault
Earth leakage
AC fault
External interlock (ext. 1 – 4)
Summary interlock

Remote control interface

RS-422/RS-485 as standard (RS-232 or SPI are available on request)

Function	Command	Read-back status
ON/OFF	Yes	Yes
Reset	Yes	
Remote status	Yes	Yes
Output current	Yes (Current set value)	Yes
Output voltage	Yes (Voltage set value)	Yes
Ambient temperature		Yes
Ramp profile control (optional)	Yes	

Analog control interface

Analog input signals: 0-10 V (± 10 V for bipolar)

Function	Command	Read-back status
Output current	Yes (Current set value)	Yes
Output voltage	Yes (Voltage set value)	Yes
External trigger ramp profile control (optional)	Yes	

Technical specifications

AC INPUT

AC Mains input voltage 400-415 V $\pm 10\%$, 3 phase + neutral + ground, 47-63 Hz.
For other input voltages, contact Danfysik

DC OUTPUT

	<u>60V Unipolar</u>	<u>100V Unipolar</u>	<u>120V Unipolar</u>	<u>60V Bipolar</u>
Output current range	50 - 1600	30 - 960	25 - 800	$\pm 50 - \pm 150$ (± 100 for Air-cooled)
Control Unit (A)	50 - 200	30 - 120	25 - 100	$\pm 50 - \pm 150$
Power Unit (A)	200	120	100	N/A

Minimum configuration 1 control unit
1 control unit + 1 power unit (Internal DCCT)
1 control unit + 2 power units (External DCCT, rack installation required)

Maximum configuration 1 control unit + 7 power units (External DCCT, rack installation required)

Cooling Water and air-cooled system available

External Polarity Switch (optional) yes

Efficiency 90-93% depending of the AC input voltage

Regulation type Constant Current Regulation / Constant Voltage Regulation*
Automatic switch between CC or CV mode.
*Only via remote control

Converter topology Full-bridge primary Zero-Voltage-Switching with current doubler rectification.

Water Cooling (only for water cooled versions)

Water flow : 1 l/min pr unit @ max. Inlet temperature 35°C
Differential pressure : 1 bar
Test pressure : 15 bar
Connection : 3/8" hose stub
Quick Connectors (optional) : Rectus type, Snap coupling or ask for more options

Cabinet lay-out

Material : Steel
Unit Dimensions W x D x H : 482 mm x 550 mm x 132.5 (3U)
19 inch rack mount
Weight : 32 kg (shipping weight 35 kg)

Temperature ratings

Operation ambient temperature : 15 - 40°C
Storage temperature : -20 - 50°C, non-condensing

Norms

Immunity for industries : EN/IEC 61000-6-2:2005
Emission for industries : EN/IEC 61000-6-4:2007
Harmonic emission (single phase) : EN/IEC 61000-3-2:2000
Harmonic emission (three phase) : EN/IEC 61000-3-12:2005
Electromagnetic compatibility : EN/IEC 61000-3-11:2000
Safety requirements for electrical equipment : EN/IEC 61010-1:2001

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