

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 0,6 kW to 100kW 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 magnets 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
- Water cooled version
- 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
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Line regulation

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

Load regulation

±10% resistance change	±5ppm
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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 or Customized)
Resistance (Rmin)	>61 mOhm

Other load capabilities available on request

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 I _{max}
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

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 V $\pm 10\%$, 3 phase + neutral + ground, 47-63 Hz
For other input voltages, contact Danfysik

DC OUTPUT

	<u>15V Unipolar</u>	<u>60V Unipolar</u>	<u>100V Unipolar</u>	<u>120V Unipolar</u>	<u>60V Bipolar</u>
1 Control Unit	50A – 200A	50A – 200A	30A – 120A	25A – 100A	$\pm 50A - \pm 150A^{*)}$
1 Power Unit	250A – 400A	250A – 400A	150A – 240A	125A – 200A	N/A
2 Power Units	450A – 600A	450A – 600A	270A – 360A	225A – 300A	N/A
3 Power Units	650A – 800A	650A – 800A	390A – 480A	325A – 400A	N/A
4 Power Units	850A – 1000A	850A – 1000A	510A – 600A	425A – 500A	N/A
5 Power Units	1050A – 1200A	1050A – 1200A	630A – 720A	525A – 600A	N/A
6 Power Units	1250A – 1400A	1250A – 1400A	750A – 840A	625A – 700A	N/A
7 Power Units	1450A – 1600A	1450A – 1600A	870A – 960A	725A – 800A	N/A

^{*)} Max. $\pm 100A$ for air cooled version

Note: Systems comprising 2 or more power units use an external DCCT and require rack installation

Cooling	Water and air-cooled system available
External Polarity Switch (optional)	yes
Efficiency	90-93% depending on 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 265 (6U) (19 inch rack mount)
Weight	64 kg (shipping weight 85 kg)

Temperature ratings

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

Norms

AC Mains input voltage	EN/IEC 60038:2009
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

Company Address

Danfysik A/S
Gregersensvej 8
DK-2630 Taastrup
Denmark

Phone +45 7220 2400
Fax +45 7220 2410
Email: sales@danfysik.dk
www.danfysik.dk

Production facilities

Gregersensvej 7-8
DK-2630 Taastrup

