Main Catalogue

DC Power Supplies

FuG Elektronik GmbH

http://www.fug-elektronik.de

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

ZERTIFIKAT

TÜV MANAGEMENT SERVICE

Die Zertifizierungsstelle der TÜV Management Service GmbH

bescheinigt, dass das Unternehmen

F.u.G. Elektronik GmbH
Florianstraße 2
D-83024 Rosenheim

für den Geltungsbereich

Entwicklung, Konstruktion, Fertigung und Vertrieb von Nieder- und Hochspannungsnetzgeräten

ein Qualitätsmanagementsystem eingeführt hat und anwendet.

Durch ein Audit, Bericht-Nr. **70001967**

wurde der Nachweis erbracht, dass die Forderungen der

ISO 9001: 2000

erfüllt sind. Dieses Zertifikat ist gültig bis **2007-02-03**

Zertifikat-Registrier-Nr. **12 100 4472 TMS**

München, 2004-02-13

TÜV

Zertifizierungsstelle der TÜV Management Service GmbH Unternehmensgruppe TÜV Süddeutschland Ridlerstraße 65 D-80339 München

Deutscher Akkreditierungs Rat DAR

TGA-ZM-07-92

All Units

CE

Since 1994

DIN EN ISO 9001

Since 2004

DIN EN ISO 9001: 2000

This catalogue contains over 600 models, more than 100 of them available with short term delivery.

Content

Product overview

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	switched	MCA
Medium voltage power supplies	switched	MCP
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High voltage power supplies	switched	HCP
	switched	HCH
	thyristor regulated	HYN
High voltage cassette power supplies	switched	HCE
	switched	HCN 7E
High voltage capacitor charger	switched	HCK
Poer supplies for superconductors	linear regulated with thyristor pre-regulation	NTS
Linear and bipolar power supplies	linear regulated	NLN
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Cusomer specific power supplies		Typical examples
Options / interfaces		For the most F.u.G. power supplies

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Product overview

Upper and lower limits of the maximum output values of each type range								Page
V_{min} Volts	V_{max} Volts	I_{min} Amps	I_{max} Amps	P_{min} Watts	P_{max} Watts	E_{min} J/s	E_{max} J/s	
6,5	350	0.5	4.000	35	100.000			6
12,5	350	20	4.000	7.000	100.000			11
32	55	22,5	180	1.250	5.000			14
55	55	40	160	750	3.000			15
150	3.000	0.75	180	750	9.000			15
125	2.000	0.006	20	14	4.200			17
650	2.000	3	100	7.000	70.000			20
3.500	150.000	0.0005	1,2	14	4.200			22
650	200.000	0.0015	75	350	50.000			25
3.500	20.000	0.3	20	7.000	70.000			29
125	35.000	0.0002	2,5	7	350			31
125	35.000	0.0002	0.05	7	7			34
2.000	65.000	0.003	20			100	20.000	36
	65		10.000					39
6,5	500	0,06	120	35	1.400			41
± 6.5	± 350	± 0.1	± 120	35	1.400			44
± 1250	± 20.000	± 0.001	± 0.01	1,4	200			47
We manufacture according to customer specification. Please send us the detailed specification of your application.								49
a variety of options and modifications is available, including a number of interfaces.								52

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V 0108

Low voltage power supplies double stabilized
Series NTN from 6,5 V to 350 V / 35 W to 100 kW

Design examples

NTN 700 - 125
125V / 5A

NTN 10500 - 200
200V / 50A

NTN 4200M - 200
200V / 20A
Customer specific design with
polarity reversal

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V 0108

Low voltage power supplies double stabilized
Series NTN from 6,5 V to 350 V / 35 W to 100 kW

Design example **NTN 140 - 12,5**
12,5V / 8A

Features:

- High efficiency
- Short circuit proof and unlimited operation with full current in short circuit condition
- voltage and current regulation with automatic and sharp transition; control mode indicated by LEDs
- Voltage and current setting via 10-turn potentiometers with precision scale; the adjusting knob can be locked
- 4½ digit DVM for voltage and current (for table-top models)
- Sense terminals for the compensation of voltage drop on the load lines. The nominal voltage always refers to the output terminals
- Parallel and series connection possible
- Suitable also for inductive and capacitive loads
- for 700W nominal power and higher, limitation of inrush current on switching on
- Safety interlock loop and internal interlock is standard on three-phase units
- Elapsed-hour meter as a standard on three-phase units

Function:

The mains voltage is transformed to the appropriate level. On the secondary side of the transformer is a thyristor controlled rectifier stage (phase cutting circuit) the output of which is used to charge a capacitor bank. This capacitor bank is also connected to the final series regulating transistor output stage. By controlling the conduction angle of the thyristors after each zero-crossing of the sinusoidal voltage, the flow of energy is regulated in such a way as to have a defined voltage drop across the final series transistor stage (pre-regulation). The performance of the final series transistor stage defines the final stability of the output voltage (main regulation).

Design:

- Up to 140W nominal power ½19" table-top case
- For 350W nominal power or higher 19" table-top case
- 19" Rack-adapters for mounting into a 19" rack are available as accessory
- For 7kW nominal power or higher 19" cabinet. Height depending on type. The side covers are detachable and the rear door is lockable.
- All cabinets are equipped with fork-lift-compatible plinths and removable crane-eyes.
- Single 19"- cabinets up to 38U are easily transportable by fork-lift.
- Cooling is carried out via built-in fans, with the air being exhausted (depending upon type) either via the rear or the top. For high power units water cooling can also be used.

Output:

- Output isolation:
  The output is floating, maximum operating voltage with respect to earth: ±500V. Either the positive or the negative terminal may be connected to earth. For units equipped with the analogue programming: the "0V" of the analogue programming is connected to the positive output.
- Output terminals:
  Output terminals are on the rear panel. Up to 20A output current, 4mm safety connectors are used. For currents up to 300A - clamps are fitted whilst for higher currents we use copper bars.

Technical Data:

- Mains connection:

  up to 1400W nominal power:
  230V ±10% 47Hz to 53Hz

  for 2800W and 4200W:
  400V ±10% 47Hz to 53H; two-phase

  for 7000W and higher:
  400V ±10% 47Hz to 53Hz; three-phase

- Ambient temperature: 0°C to +40°C

The following data applies for voltage and current regulation, and refers to the rated value (unless otherwise stated):
(For explanations please refer to Definitions and Terms on page 61.)

- Setting range:
  from approx. 0,1% to 100%
- Setting resolution:
  $\pm 1 \times 10^{-4}$
- Residual ripple:
  $<1 \times 10^{-4}$pp + 10mVpp
- Recovery time:
  Voltage control:
  <50µs for load changes from 10% to 100% or from 100% to 10%

  Curent control:
  <500ms for load changes causing an output change of less than 10% of the rated voltage

  Units with >65V output voltage will switch off for a short time at high and fast load changes.
- Setting time at nominal load:
  100ms to 500ms for changes of the output voltage from 10% to 90% or 90% to 10%
- Discharging time constant for output without load:
  approx. 2sec. to 60sec., depending on type
- Deviation:
  for ±10% mains voltage variation:
  $<\pm 1 \times 10^{-5}$
  for no load / full load:
  $<2 \times 10^{-4}$
  over 8 h under constant conditions:
  $<\pm 1 \times 10^{-4}$
  within the temperature range:
  $<\pm 1 \times 10^{-4}$ / K

Possible Options:

- Coarse/fine-potentiometers (99% / 1%) for more accurate adjustment of voltage and / or current
- Analogue programming (The positive output has to be earthed; see also page 52)
- Analogue programming, floating (see page 52)
- Computer interface - IEEE 488, RS 232, RS 422, Profibus DP, USB, LAN (more on request) (see page 54)
- Roller blades for cabinet units
- Higher stability
- Power limitation

More options and special solutions on request. Some options may involve changes to the description of the unit - especially concerning the mechanical design.

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Low voltage power supplies double stabilized
Series NTN from 6,5 V to 350 V / 35 W to 100 kW

Type			Voltage	Current	Width	Height	Depth	Weight
NTN	35 - 6,5	●	0 - 6,5 V	0 - 5 A	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
NTN	140 - 6,5	●	0 - 6,5 V	0 - 10 A	½19" / 222 mm	3 U / 133 mm	350 mm	8 kg
NTN	350 - 6,5		0 - 6,5 V	0 - 30 A	19" / 443 mm	3 U / 133 mm	350 mm	18 kg
NTN	700 - 6,5		0 - 6,5 V	0 - 60 A	19" / 443 mm	4 U / 177 mm	450 mm	30 kg
NTN	1400 - 6,5		0 - 6,5 V	0 - 120 A	19" / 443 mm	7 U / 310 mm	550 mm	70 kg
NTN	2800 - 6,5	2)	0 - 6,5 V	0 - 250 A	19" / 443 mm	9 U / 399 mm	650 mm	120 kg
NTN	4200 - 6,5	3)	0 - 6,5 V	0 - 400 A	19" / 600 mm	29 U / 1500 mm	600 mm	300 kg
NTN	7000 - 6,5	3)	0 - 6,5 V	0 - 600 A	19" / 600 mm	38 U / 2000 mm	800 mm	360 kg
NTN	10500 - 6,5	3)	0 - 6,5 V	0 - 1000 A	19" / 600 mm	38 U / 2000 mm	800 mm	500 kg
NTN	14000 - 6,5	3)	0 - 6,5 V	0 - 1500 A	19" / 600 mm	38 U / 2000 mm	800 mm	550 kg
NTN	21000 - 6,5	3)	0 - 6,5 V	0 - 2000 A	19" / 600 mm	38 U / 2000 mm	800 mm	650 kg
NTN	28000 - 6,5	3)	0 - 6,5 V	0 - 2500 A	2 x 19" / 1200 mm	38 U / 2000 mm	800 mm	1000 kg
NTN	35000 - 6,5	3)	0 - 6,5 V	0 - 3000 A	2 x 19" / 1200 mm	38 U / 2000 mm	800 mm	1300 kg
NTN	35 - 12,5	●	0 - 12,5 V	0 - 2,5 A	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
NTN	140 - 12,5	●	0 - 12,5 V	0 - 8 A	½19" / 222 mm	3 U / 133 mm	350 mm	8 kg
NTN	350 - 12,5	●	0 - 12,5 V	0 - 20 A	19" / 443 mm	3 U / 133 mm	350 mm	15 kg
NTN	700 - 12,5		0 - 12,5 V	0 - 50 A	19" / 443 mm	4 U / 177 mm	450 mm	29 kg
NTN	1400 - 12,5		0 - 12,5 V	0 - 80 A	19" / 443 mm	4 U / 177 mm	550 mm	50 kg
NTN	2800 - 12,5	2)	0 - 12,5 V	0 - 150 A	19" / 443 mm	7 U / 310 mm	650 mm	110 kg
NTN	4200 - 12,5	2)	0 - 12,5 V	0 - 250 A	19" / 443 mm	9 U / 399 mm	650 mm	150 kg
NTN	7000 - 12,5	3)	0 - 12,5 V	0 - 500 A	19" / 600 mm	38 U / 2000 mm	800 mm	340 kg
NTN	10500 - 12,5	3)	0 - 12,5 V	0 - 800 A	19" / 600 mm	38 U / 2000 mm	800 mm	480 kg
NTN	14000 - 12,5	3)	0 - 12,5 V	0 - 1000 A	19" / 600 mm	38 U / 2000 mm	800 mm	520 kg
NTN	21000 - 12,5	3)	0 - 12,5 V	0 - 1500 A	19" / 600 mm	38 U / 2000 mm	800 mm	600 kg
NTN	28000 - 12,5	3)	0 - 12,5 V	0 - 2000 A	19" / 600 mm	38 U / 2000 mm	800 mm	900 kg
NTN	35000 - 12,5	3)	0 - 12,5 V	0 - 2500 A	2 x 19" / 1200 mm	38 U / 2000 mm	800 mm	1300 kg
NTN	50000 - 12,5	3)	0 - 12,5 V	0 - 4000 A	2 x 19" / 1200 mm	38 U / 2000 mm	800 mm	1500 kg
NTN	35 - 20	●	0 - 20 V	0 - 1,5 A	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
NTN	140 - 20	●	0 - 20 V	0 - 6 A	½19" / 222 mm	3 U / 133 mm	350 mm	8 kg
NTN	350 - 20	●	0 - 20 V	0 - 15 A	19" / 443 mm	3 U / 133 mm	350 mm	15 kg
NTN	700 - 20	●	0 - 20 V	0 - 30 A	19" / 443 mm	4 U / 177 mm	450 mm	26 kg
NTN	1400 - 20		0 - 20 V	0 - 60 A	19" / 443 mm	4 U / 177 mm	550 mm	45 kg
NTN	2800 - 20	2)	0 - 20 V	0 - 120 A	19" / 443 mm	7 U / 310 mm	550 mm	100 kg
NTN	4200 - 20	2)	0 - 20 V	0 - 200 A	19" / 443 mm	9 U / 399 mm	550 mm	145 kg
NTN	7000 - 20	3)	0 - 20 V	0 - 300 A	19" / 600 mm	29 U / 1500 mm	600 mm	300 kg
NTN	10500 - 20	3)	0 - 20 V	0 - 500 A	19" / 600 mm	38 U / 2000 mm	800 mm	440 kg
NTN	14000 - 20	3)	0 - 20 V	0 - 600 A	19" / 600 mm	38 U / 2000 mm	800 mm	480 kg
NTN	21000 - 20	3)	0 - 20 V	0 - 800 A	19" / 600 mm	38 U / 2000 mm	800 mm	580 kg
NTN	28000 - 20	3)	0 - 20 V	0 - 1200 A	19" / 600 mm	38 U / 2000 mm	800 mm	800 kg
NTN	35000 - 20	3)	0 - 20 V	0 - 1500 A	19" / 600 mm	38 U / 2000 mm	800 mm	1200 kg
NTN	50000 - 20	3)	0 - 20 V	0 - 2500 A	2 x 19" /1200 mm	38 U / 2000 mm	800 mm	1400 kg

2) Two phase mains connection
3) Three phase mains connection
● short term delivery

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V 0108

Low voltage power supplies double stabilized
Series NTN from 6,5 V to 350 V / 35 W to 100 kW

Type				Voltage		Current	Width	Height	Depth	Weight
NTN	35 - 35		●	0 - 35 V	0 -	1 A	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
NTN	140 - 35		●	0 - 35 V	0 -	4 A	½19" / 222 mm	3 U / 133 mm	350 mm	8 kg
NTN	350 - 35		●	0 - 35 V	0 -	10 A	19" / 443 mm	3 U / 133 mm	350 mm	15 kg
NTN	700 - 35		●	0 - 35 V	0 -	20 A	19" / 443 mm	4 U / 177 mm	450 mm	27 kg
NTN	1400 - 35		●	0 - 35 V	0 -	40 A	19" / 443 mm	4 U / 177 mm	550 mm	47 kg
NTN	2800 - 35	2)		0 - 35 V	0 -	80 A	19" / 443 mm	7 U / 310 mm	550 mm	90 kg
NTN	4200 - 35	2)		0 - 35 V	0 -	120 A	19" / 443 mm	9 U / 399 mm	550 mm	120 kg
NTN	7000 - 35	3)		0 - 35 V	0 -	200 A	19" / 600 mm	20 U / 1100 mm	600 mm	280 kg
NTN	10500 - 35	3)		0 - 35 V	0 -	300 A	19" / 600 mm	29 U / 1500 mm	600 mm	420 kg
NTN	14000 - 35	3)		0 - 35 V	0 -	400 A	19" / 600 mm	38 U / 2000 mm	800 mm	460 kg
NTN	21000 - 35	3)		0 - 35 V	0 -	600 A	19" / 600 mm	38 U / 2000 mm	800 mm	530 kg
NTN	28000 - 35	3)		0 - 35 V	0 -	800 A	19" / 600 mm	38 U / 2000 mm	800 mm	750 kg
NTN	35000 - 35	3)		0 - 35 V	0 -	1000 A	19" / 600 mm	38 U / 2000 mm	800 mm	950 kg
NTN	70000 - 35	3)		0 - 35 V	0 -	2000 A	2 x 19" / 1200 mm	38 U / 2000 mm	800 mm	1500 kg
NTN	35 - 65		●	0 - 65 V	0 -	0,5 A	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
NTN	140 - 65		●	0 - 65 V	0 -	2 A	½19" / 222 mm	3 U / 133 mm	350 mm	8 kg
NTN	350 - 65		●	0 - 65 V	0 -	5 A	19" / 443 mm	3 U / 133 mm	350 mm	15 kg
NTN	700 - 65		●	0 - 65 V	0 -	10 A	19" / 443 mm	4 U / 177 mm	350 mm	24 kg
NTN	1400 - 65		●	0 - 65 V	0 -	20 A	19" / 443 mm	4 U / 177 mm	450 mm	42 kg
NTN	2800 - 65	2)	●	0 - 65 V	0 -	40 A	19" / 443 mm	5 U / 221 mm	550 mm	60 kg
NTN	4200 - 65	2)		0 - 65 V	0 -	60 A	19" / 443 mm	9 U / 399 mm	550 mm	70 kg
NTN	7000 - 65	3)		0 - 65 V	0 -	100 A	19" / 600 mm	20 U / 1100 mm	600 mm	280 kg
NTN	10500 - 65	3)		0 - 65 V	0 -	150 A	19" / 600 mm	29 U / 1500 mm	600 mm	390 kg
NTN	14000 - 65	3)		0 - 65 V	0 -	200 A	19" / 600 mm	38 U / 2000 mm	800 mm	440 kg
NTN	21000 - 65	3)		0 - 65 V	0 -	300 A	19" / 600 mm	38 U / 2000 mm	800 mm	510 kg
NTN	28000 - 65	3)		0 - 65 V	0 -	400 A	19" / 600 mm	38 U / 2000 mm	800 mm	720 kg
NTN	35000 - 65	3)		0 - 65 V	0 -	500 A	19" / 600 mm	38 U / 2000 mm	800 mm	900 kg
NTN	70000 - 65	3)		0 - 65 V	0 -	1000 A	2 x 19" / 1200 mm	38 U / 2000 mm	800 mm	1400 kg
NTN	700 - 125		●	0 - 125 V	0 -	5 A	19" / 443 mm	4 U / 177 mm	350 mm	24 kg
NTN	1400 - 125		●	0 - 125 V	0 -	10 A	19" / 443 mm	4 U / 177 mm	450 mm	42 kg
NTN	2800 - 125	2)		0 - 125 V	0 -	20 A	19" / 443 mm	5 U / 221 mm	550 mm	60 kg
NTN	4200 - 125	2)		0 - 125 V	0 -	30 A	19" / 443 mm	9 U / 399 mm	550 mm	70 kg
NTN	7000 - 125	3)		0 - 125 V	0 -	50 A	19" / 600 mm	20 U / 1100 mm	600 mm	250 kg
NTN	10500 - 125	3)		0 - 125 V	0 -	80 A	19" / 600 mm	29 U / 1500 mm	600 mm	300 kg
NTN	14000 - 125	3)		0 - 125 V	0 -	100 A	19" / 600 mm	29 U / 1500 mm	600 mm	400 kg
NTN	21000 - 125	3)		0 - 125 V	0 -	150 A	19" / 600 mm	38 U / 2000 mm	800 mm	490 kg
NTN	28000 - 125	3)		0 - 125 V	0 -	200 A	19" / 600 mm	38 U / 2000 mm	800 mm	680 kg
NTN	35000 - 125	3)		0 - 125 V	0 -	250 A	19" / 600 mm	38 U / 2000 mm	800 mm	850 kg
NTN	50000 - 125	3)		0 - 125 V	0 -	400 A	19" / 600 mm	38 U / 2000 mm	800 mm	1200 kg
NTN	100000 - 125	3)		0 - 125 V	0 -	800 A	2 x 19" / 1200 mm	38 U / 2000 mm	800 mm	1700 kg

2) Two phase mains connection
3) Three phase mains connection
● short term delivery

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Low voltage power supplies double stabilized
Series NTN from 6,5 V to 350 V / 35 W to 100 kW

Type			Voltage	Current	Width	Height	Depth	Weight
NTN	700 - 200	●	0 - 200 V	0 - 3 A	19" / 443 mm	4 U / 177 mm	350 mm	24 kg
NTN	1400 - 200		0 - 200 V	0 - 6 A	19" / 443 mm	4 U / 177 mm	450 mm	42 kg
NTN	2800 - 200	2)	0 - 200 V	0 - 12 A	19" / 443 mm	5 U / 221 mm	550 mm	60 kg
NTN	4200 - 200	2)	0 - 200 V	0 - 20 A	19" / 443 mm	9 U / 399 mm	550 mm	70 kg
NTN	7000 - 200	3)	0 - 200 V	0 - 30 A	19" / 600 mm	20 U / 1100 mm	600 mm	240 kg
NTN	10500 - 200	3)	0 - 200 V	0 - 50 A	19" / 600 mm	29 U / 1500 mm	600 mm	360 kg
NTN	14000 - 200	3)	0 - 200 V	0 - 60 A	19" / 600 mm	29 U / 1500 mm	600 mm	400 kg
NTN	21000 - 200	3)	0 - 200 V	0 - 100 A	19" / 600 mm	38 U / 2000 mm	800 mm	490 kg
NTN	28000 - 200	3)	0 - 200 V	0 - 120 A	19" / 600 mm	38 U / 2000 mm	800 mm	650 kg
NTN	35000 - 200	3)	0 - 200 V	0 - 150 A	19" / 600 mm	38 U / 2000 mm	800 mm	800 kg
NTN	50000 - 200	3)	0 - 200 V	0 - 250 A	19" / 600 mm	38 U / 2000 mm	800 mm	1200 kg
NTN	100000 - 200	3)	0 - 200 V	0 - 500 A	2 x 19" / 1200 mm	38 U / 2000 mm	800 mm	1600 kg
NTN	700 - 350	●	0 - 350 V	0 - 2 A	19" / 443 mm	4 U / 177 mm	350 mm	24 kg
NTN	1400 - 350	●	0 - 350 V	0 - 4 A	19" / 443 mm	4 U / 177 mm	450 mm	42 kg
NTN	2800 - 350	2)	0 - 350 V	0 - 8 A	19" / 443 mm	5 U / 221 mm	550 mm	60 kg
NTN	4200 - 350	2)	0 - 350 V	0 - 12 A	19" / 443 mm	9 U / 399 mm	550 mm	70 kg
NTN	7000 - 350	3)	0 - 350 V	0 - 20 A	19" / 600 mm	20 U / 1100 mm	600 mm	240 kg
NTN	10500 - 350	3)	0 - 350 V	0 - 30 A	19" / 600 mm	29 U / 1500 mm	600 mm	275 kg
NTN	14000 - 350	3)	0 - 350 V	0 - 40 A	19" / 600 mm	29 U / 1500 mm	600 mm	400 kg
NTN	21000 - 350	3)	0 - 350 V	0 - 60 A	19" / 600 mm	38 U / 2000 mm	800 mm	490 kg
NTN	28000 - 350	3)	0 - 350 V	0 - 80 A	19" / 600 mm	38 U / 2000 mm	800 mm	650 kg
NTN	35000 - 350	3)	0 - 350 V	0 - 100 A	19" / 600 mm	38 U / 2000 mm	800 mm	800 kg
NTN	70000 - 350	3)	0 - 350 V	0 - 200 A	2 x 19" / 1200 mm	38 U / 2000 mm	800 mm	1350 kg
NTN	100000 - 350	3)	0 - 350 V	0 - 300 A	2 x 19" / 1200 mm	38 U / 2000 mm	800 mm	1600 kg

2) Two phase mains connection
3) Three phase mains connection
● short term delivery

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Low voltage power supplies thyristor regulated Series NYN from 12,5 V to 350 V / 7kW to 100 kW

NYN 70000 - 35
35V / 2000A

Design examples

NYN 42000M - 84
84V / 500A
customer specific design with current consumption unit
(Side covers removed)

Features:

- Simple construction
- Extremely robust
- High efficiency
- Short circuit proof and unlimited operation with full current in short circuit condition
- Voltage and current regulation with automatic and sharp transition; control mode indicated by LEDs
- Voltage and current setting with 10-turn potentiometers with precision scale; the adjusting knob can be locked
- Sense terminals for the compensation of voltage drop on the load lines. The nominal voltage always refers to the output terminals
- Limitation of inrush current on switching on
- Suitable also for inductive and capacitive loads
- Interlock loop to monitor the external load and internal loop as a standard
- Elapsed-hour meter as a standard

Function:

The mains voltage is first transformed to the appropriate level. On the secondary side of the transformer is a thyristor controlled rectifier stage (phase cutting circuit). The rectified voltage is smoothed by a LC - filter.

Design:

- Depending on Voltage and Power the units are built as single or double 19" cabinets of various height. The side covers are detachable, the rear door is lockable.
- All cabinets are equipped with fork-lift-compatible plinths and removable crane-eyes.
- Single 19"- cabinets up to 38U are easily transportable by fork-lift.
- Cooling is carried out via built-in fans, with the air being exhausted (depending upon type) either via the rear or the top.

Output:

- Output isolation:
  The output is floating, maximum operating voltage with respect to earth: ±500 V. Either the positive or the negative terminal may be connected to earth.
- Output terminals:
  All output terminals are located at the rear side of the cabinet. For Output current up to 300A feed though terminals are used; for higher current the output is via copper bars.

Technical Data:

- Mains connection:
  400V ±10% 47Hz to 53Hz; three-phase
- Ambient temperature:
  0°C to +40°C

The following data applies for voltage and current regulation, and refers to the rated value (unless otherwise stated):
(For explanations please refer to Definitions and Terms on page 61.)

- Setting range:
  from approx. 1% to 100%
- Setting resolution:
  $\pm 1 \times 10^{-4}$
- Residual ripple:
  $<1 \times 10^{-2}$pp + 100mVpp
- Recovery time:
  <100ms to 500ms (depending on type) for load variations of ±10%
- Setting time at nominal load:
  <100ms to 2 sec (depending on type) for changes of the output voltage from 10% to 90% or 90% to 10%
- Discharging time constant for output without load:
  approx. 5sec. to 60sec., depending on type
- Deviation:
  for ±10% mains voltage variation:
  $<\pm 1 \times 10^{-4}$
  for no load / full load:
  $<\pm 1 \times 10^{-3}$
  over 8 h under constant conditions:
  $<\pm 3 \times 10^{-4}$
  within the temperature range:
  $<\pm 3 \times 10^{-4}$ / K

Possible Options:

- Analogue programming (One of the outputs on “0V” - potential; see also page 52)
- Analogue programming, floating (see page 52)
- Computer interface - IEEE 488, RS 232, RS 422, Profibus DP, USB, LAN (more on request) (see page 54)
- Internal resistance setting and regulation (see page 56)
- Power regulation with display
- Roller blades for cabinet units

More options and special solutions on request. Some options may involve changes to the description of the unit - especially concerning the mechanical design.

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Low voltage power supplies thyristor regulated
Series NYN from 12,5 V to 350 V / 7kW to 100 kW

Type		Voltage		Current		Width	Height	Depth	Weight
NYN	7000 - 12,5	0 -	12,5 V	0 -	500 A	19" / 600 mm	20 U / 1100 mm	600 mm	300 kg
NYN	10500 - 12,5	0 -	12,5 V	0 -	800 A	19" / 600 mm	38 U / 2000 mm	800 mm	440 kg
NYN	14000 - 12,5	0 -	12,5 V	0 -	1000 A	19" / 600 mm	38 U / 2000 mm	800 mm	480 kg
NYN	21000 - 12,5	0 -	12,5 V	0 -	1500 A	19" / 600 mm	38 U / 2000 mm	800 mm	550 kg
NYN	28000 - 12,5	0 -	12,5 V	0 -	2000 A	19" / 600 mm	38 U / 2000 mm	800 mm	820 kg
NYN	35000 - 12,5	0 -	12,5 V	0 -	2500 A	19" / 600 mm	38 U / 2000 mm	800 mm	1200 kg
NYN	50000 - 12,5	0 -	12,5 V	0 -	4000 A	2 x 19" / 1200 mm	38 U / 2000 mm	800 mm	1300 kg
NYN	7000 - 20	0 -	20 V	0 -	300 A	19" / 600 mm	20 U / 1100 mm	600 mm	280 kg
NYN	10500 - 20	0 -	20 V	0 -	500 A	19" / 600 mm	38 U / 2000 mm	800 mm	400 kg
NYN	14000 - 20	0 -	20 V	0 -	600 A	19" / 600 mm	38 U / 2000 mm	800 mm	440 kg
NYN	21000 - 20	0 -	20 V	0 -	800 A	19" / 600 mm	38 U / 2000 mm	800 mm	530 kg
NYN	28000 - 20	0 -	20 V	0 -	1200 A	19" / 600 mm	38 U / 2000 mm	800 mm	750 kg
NYN	35000 - 20	0 -	20 V	0 -	1500 A	19" / 600 mm	38 U / 2000 mm	800 mm	1100 kg
NYN	50000 - 20	0 -	20 V	0 -	2500 A	2 x 19" / 1200 mm	38 U / 2000 mm	800 mm	1250 kg
NYN	7000 - 35	0 -	35 V	0 -	200 A	19" / 600 mm	20 U / 1100 mm	600 mm	260 kg
NYN	10500 - 35	0 -	35 V	0 -	300 A	19" / 600 mm	29 U / 1500 mm	600 mm	380 kg
NYN	14000 - 35	0 -	35 V	0 -	400 A	19" / 600 mm	38 U / 2000 mm	800 mm	420 kg
NYN	21000 - 35	0 -	35 V	0 -	600 A	19" / 600 mm	38 U / 2000 mm	800 mm	500 kg
NYN	28000 - 35	0 -	35 V	0 -	800 A	19" / 600 mm	38 U / 2000 mm	800 mm	700 kg
NYN	35000 - 35	0 -	35 V	0 -	1000 A	19" / 600 mm	38 U / 2000 mm	800 mm	900 kg
NYN	70000 - 35	0 -	35 V	0 -	2000 A	19" / 600 mm	38 U / 2000 mm	800 mm	1070 kg
NYN	7000 - 65	0 -	65 V	0 -	100 A	19" / 600 mm	20 U / 1100 mm	600 mm	260 kg
NYN	10500 - 65	0 -	65 V	0 -	150 A	19" / 600 mm	29 U / 1500 mm	600 mm	360 kg
NYN	14000 - 65	0 -	65 V	0 -	200 A	19" / 600 mm	29 U / 1500 mm	600 mm	400 kg
NYN	21000 - 65	0 -	65 V	0 -	300 A	19" / 600 mm	38 U / 2000 mm	800 mm	480 kg
NYN	28000 - 65	0 -	65 V	0 -	400 A	19" / 600 mm	38 U / 2000 mm	800 mm	680 kg
NYN	35000 - 65	0 -	65 V	0 -	500 A	19" / 600 mm	38 U / 2000 mm	800 mm	850 kg
NYN	70000 - 65	0 -	65 V	0 -	1000 A	19" / 600 mm	38 U / 2000 mm	800 mm	1070 kg

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Low voltage power supplies thyristor regulated
Series NYN from 12,5 V to 350 V / 7kW to 100 kW

Type		Voltage		Current		Width	Height	Depth	Weight
NYN	7000 - 125	0 -	125 V	0 -	50 A	19" / 600 mm	20 U / 1100 mm	600 mm	220 kg
NYN	10500 - 125	0 -	125 V	0 -	80 A	19" / 600 mm	20 U / 1100 mm	600 mm	330 kg
NYN	14000 - 125	0 -	125 V	0 -	100 A	19" / 600 mm	29 U / 1500 mm	600 mm	400 kg
NYN	21000 - 125	0 -	125 V	0 -	150 A	19" / 600 mm	38 U / 2000 mm	800 mm	450 kg
NYN	28000 - 125	0 -	125 V	0 -	200 A	19" / 600 mm	38 U / 2000 mm	800 mm	650 kg
NYN	35000 - 125	0 -	125 V	0 -	250 A	19" / 600 mm	38 U / 2000 mm	800 mm	800 kg
NYN	50000 - 125	0 -	125 V	0 -	400 A	19" / 600 mm	38 U / 2000 mm	800 mm	1100 kg
NYN	100000 - 125	0 -	125 V	0 -	800 A	2 x 19" / 1200 mm	38 U / 2000 mm	800 mm	1600 kg
NYN	7000 - 200	0 -	200 V	0 -	30 A	19" / 600 mm	20 U / 1100 mm	600 mm	220 kg
NYN	10500 - 200	0 -	200 V	0 -	50 A	19" / 600 mm	20 U / 1100 mm	600 mm	330 kg
NYN	14000 - 200	0 -	200 V	0 -	60 A	19" / 600 mm	29 U / 1500 mm	600 mm	380 kg
NYN	21000 - 200	0 -	200 V	0 -	100 A	19" / 600 mm	38 U / 2000 mm	800 mm	450 kg
NYN	28000 - 200	0 -	200 V	0 -	120 A	19" / 600 mm	38 U / 2000 mm	800 mm	630 kg
NYN	35000 - 200	0 -	200 V	0 -	150 A	19" / 600 mm	38 U / 2000 mm	800 mm	750 kg
NYN	50000 - 200	0 -	200 V	0 -	250 A	19" / 600 mm	38 U / 2000 mm	800 mm	1100 kg
NYN	100000 - 200	0 -	200 V	0 -	500 A	2 x 19" / 1200 mm	38 U / 2000 mm	800 mm	1500 kg
NYN	7000 - 350	0 -	350 V	0 -	20 A	19" / 600 mm	20 U / 1100 mm	600 mm	220 kg
NYN	10500 - 350	0 -	350 V	0 -	30 A	19" / 600 mm	20 U / 1100 mm	600 mm	330 kg
NYN	14000 - 350	0 -	350 V	0 -	40 A	19" / 600 mm	29 U / 1500 mm	600 mm	380 kg
NYN	21000 - 350	0 -	350 V	0 -	60 A	19" / 600 mm	38 U / 2000 mm	800 mm	450 kg
NYN	28000 - 350	0 -	350 V	0 -	80 A	19" / 600 mm	38 U / 2000 mm	800 mm	630 kg
NYN	35000 - 350	0 -	350 V	0 -	100 A	19" / 600 mm	38 U / 2000 mm	800 mm	750 kg
NYN	70000 - 350	0 -	350 V	0 -	200 A	19" / 600 mm	38 U / 2000 mm	800 mm	1200 kg
NYN	100000 - 350	0 -	350 V	0 -	300 A	2 x 19" / 1200 mm	38 U / 2000 mm	800 mm	1500 kg

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Low voltage power supplies switched
Series NCN 30 V and 55 V / 1250 W to 5000 W

Design example

NCN 5000 - 55
55V / 90A

Features:

- floating output
- compact size (19" case)
- light-weight
- high efficiency
- short-circuit proof
- unlimited operation with nominal power (even in short-circuit conditions)
- voltage and current regulation with automatic, sharp transition and additional power limitation
- control mode indicated by LED
- voltage and current setting with10-turn potentiometers with precision scale; the adjusting knob can be locked
- 4½ digit DVM for voltage and current
- Suitable also for capacitive loads
- Sense connections to compensate voltage drop at the load cables
- Active down control

Function:

In principle, the rectified line voltage drives a square wave generator of variable frequency, whose AC voltage is transformed, rectified and filtered, producing the output voltage. For regulation, the square wave voltage is pulse width modulated. When fitted with the optional computer interface, the MCA/NCA series become versatile programmable power supplies.

Design:

- 19" table-top case (19" rack adapters available)

Output:

- Output isolation:
  The output is floating. Either the positive or the negative pole may be connected to earth. Maximum isolation voltage: ±500V.
  (Not valid with the option analogue programming. If the floating function should remain, the floating analogue programming must be chosen).

Output terminals:

Output terminals are 4mm safety connectors at the rear side of the unit. Units from 24A nominal current on have binding posts.

Technical Data:

- Mains connection:

  For 1500W nominal power:
  230V ±10% 47Hz to 63Hz;

  For 2500 and 5000W nominal power :
  400V ±10% 47Hz to 63Hz 3-phase
- Ambient temperature:

  0°C to +40°C

The following data applies for voltage and current regulation, and refers to the rated value (unless otherwise stated):
(For explanations please refer to Definitions and Terms on page 61.)

- Setting range:
  from approx. 0,1% to 100%
- Setting resolution:
  ±1 x 10^{-4}
- Residual ripple:
  <2 x 10^{-4}pp + 200mVpp
- Recovery time:

  Voltage control:
  <1ms for load changes from 10% to 100% or from 100% to 10%.

  Current control:
  <10ms for load changes causing an output change of less than 10% of the rated voltage
- Setting time at nominal load:
  <300ms for changes of the output voltage from 10% to 90% or 90% to 10%
- Discharging time for output without load:
  approx. 1sec. from 100% to 1% (active down)
- Deviation:
  for ±10% mains voltage variation:
  ± 1 x 10^{-5}
  for no load / full load:
  <5 x 10^{-4}
  over 8 h under constant conditions:
  <±2 x 10^{-4}
  within the temperature range:
  <±1 x 10^{-4} / K

Possible Options:

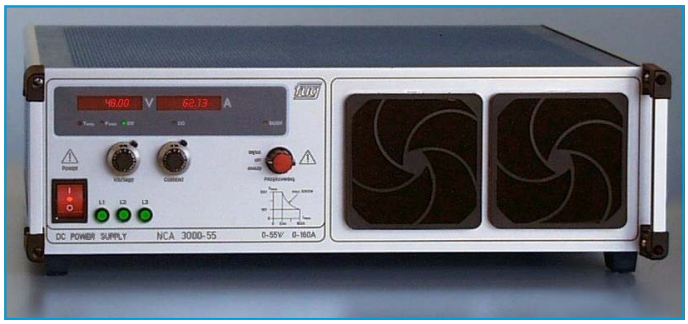
- Analogue programming (One of the outputs on “0V” - potential; see also page 52)
- Analogue programming, floating (see page 52)
- Computer interface - IEEE 488, RS 232, RS 422, Profibus DP, USB, LAN (more on request) (see page 54)

More options and special solutions on request. Some options may involve changes to the description of the unit - especially concerning the mechanical design.

Type			Voltage		Current		Width	Height	Depth	Weight
NCN	1250 - 30		0 -	30 V	0 -	40 A	19" / 443 mm	3 U / 133 mm	350 mm	14 kg
NCN	2500 - 30	3)	0 -	30 V	0 -	80 A	19" / 443 mm	3 U / 133 mm	550 mm	20 kg
NCN	5000 - 30	3)	0 -	30 V	0 -	160 A	19" / 443 mm	3 U / 133 mm	650 mm	25 kg
NCN	1250 - 55		0 -	55 V	0 -	22,5 A	19" / 443 mm	3 U / 133 mm	350 mm	14 kg
NCN	2500 - 55	3)	0 -	55 V	0 -	45 A	19" / 443 mm	3 U / 133 mm	550 mm	20 kg
NCN	5000 - 55	3)	0 -	55 V	0 -	90 A	19" / 443 mm	3 U / 133 mm	650 mm	25 kg

3) Three phase mains connection

Autoranging power supplies
Series NCA / MCA from 55 V to 3000 V / 750 W to 9000 W



Features:

- Autoranging characteristic with constant power limitation
- 5 power classes: from 750W to 9kW
- 6 Voltages: 55V to 3000V
- Up to 1500V with floating output
- Compact size (19" case)
- Light-weight
- High efficiency
- Short-circuit proof
- Unlimited operation with nominal power (even in short-circuit conditions)
- Voltage and current regulation with automatic, sharp transition and additional power limitation
- Control mode indicated by LED
- Voltage and current setting with10-turn potentiometers with precision scale; the adjusting knob can be locked
- 4½ digit DVM for voltage and current
- Suitable also for capacitive loads
- Sense connections to compensate voltage drop at the load cables for NCA
- Active down control for NCA

Function:

The NCA/MCA series is an autoranging power supply design in which the power supplies operate over the full range of their output voltage & current - up to the units maximum rated output power. This results in an operating range which is up to 3-times wider than that of a more conventional power supply. When fitted with the optional computer interface, the MCA/NCA series become versatile programmable power supplies.

In principle, the rectified line voltage drives a square wave generator, whose AC voltage is transformed, rectified and filtered, producing the output voltage. For regulation, the square wave voltage is pulse width modulated.

Design:

- 19" table-top case (19" rack adapters available)

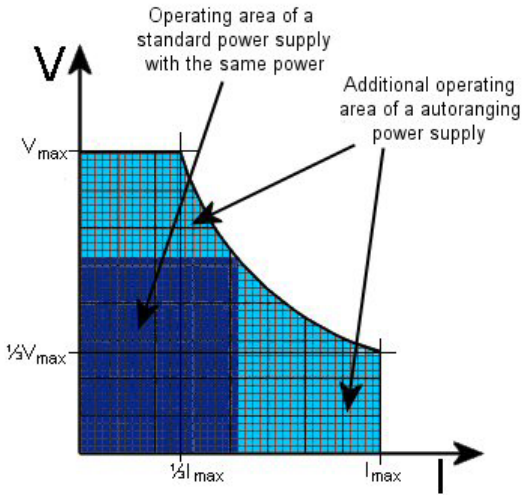
Output:

- Output isolation:
  up to 1500V nominal voltage the output is floating. Either the positive or the negative pole may be connected to earth.
  (Not valid with the option analogue programming. If the floating function should remain, the floating analogue programming must be chosen).

  Maximum isolation voltage:
  Up to 400V nominal voltage:
  ±500V.
  At 750V nominal voltage:
  ±1000V.
  At 1500V nominal voltage:
  ±2000V.
  At 3000V nominal voltage one pole is earthed, the polarity must be indicated when ordering.
- Output terminals:
  Units up to 750V nominal voltage have 4mm safety connectors.
  From 1500V nominal voltage on SHV connectors are provided. HV-cable connectors are included.
  Units from 24A nominal current on have binding posts.

Design example

NCA 3000 - 55
55V /160A, max. 3000W



Technical Data:

- Mains connection:

  Up to 1500W nominal power:
  230V ±10% 47Hz to 63Hz;

  For nominal power 3000W and higher:
  400V ±10% 47Hz to 63Hz 3-phase
- Ambient temperature:

  0°C to +40°C

The following data applies for voltage and current regulation, and refers to the rated value (unless otherwise stated):
(For explanations please refer to Definitions and Terms on page 61.)

- Setting range:
  from approx. 0,1% to 100%
- Setting resolution:
  ±1 x 10^{-4}
- Residual ripple:
  <2 x 10^{-4}pp + 200mVpp
- Recovery time:

  Voltage control:
  <1ms for load changes from 10% to 100% or from 100% to 10%.

  Current control:
  <10ms for load changes causing an output change of less than 10% of the rated voltage
- Setting time at nominal load:
  <300ms for changes of the output voltage from 10% to 90% or 90% to 10%
- Discharging time constant for output without load:
  approx. 10sec for MCA
  NCA have active down regulation.
- Deviation:
  for ±10% mains voltage variation:
  ± 1 x 10^{-5}
  for no load / full load:
  <5 x 10^{-4}
  over 8 h under constant conditions:
  <±2 x 10^{-4}
  within the temperature range:
  <±1 x 10^{-4} / K

Possible Options:

- Analogue programming (One of the outputs on “0V” - potential; see also page 52)
- Analogue programming, floating (see page 52)
- Computer interface - IEEE 488, RS 232, RS 422, Profibus DP, USB, LAN (more on request) (see page 54)

More options and special solutions on request. Some options may involve changes to the description of the unit - especially concerning the mechanical design.

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Autoranging power supplies
Series NCA / MCA from 55 V to 3000 V / 750 W to 9000 W

	Type		Pow. (max.)	Voltage	Current	Width	Height	Depth	Weight
NCA	750 - 55		750 W	0 - 55 V	0 - 40 A	19" / 443 mm	3 U / 133 mm	350 mm	12 kg
NCA	1500 - 55		1500 W	0 - 55 V	0 - 80 A	19" / 443 mm	3 U / 133 mm	550 mm	20 kg
NCA	3000 - 55	3)	3000 W	0 - 55 V	0 - 160 A	19" / 443 mm	3 U / 133 mm	650 mm	25 kg
MCA	750 - 150	●	750 W	0 - 150 V	0 - 15 A	19" / 443 mm	3 U / 133 mm	350 mm	10 kg
MCA	1500 - 150		1500 W	0 - 150 V	0 - 30 A	19" / 443 mm	4 U / 177 mm	450 mm	16 kg
MCA	3000 - 150	3)	3000 W	0 - 150 V	0 - 60 A	19" / 443 mm	4 U / 177 mm	650 mm	37 kg
MCA	6000 - 150	3)	6000 W	0 - 150 V	0 - 120 A	19" / 443 mm	8 U / 355 mm	650 mm	61 kg
MCA	9000 - 150	3)	9000 W	0 - 150 V	0 - 180 A	19" / 443 mm	12 U / 535 mm	650 mm	90 kg
MCA	750 - 400	●	750 W	0 - 400 V	0 - 6 A	19" / 443 mm	3 U / 133 mm	350 mm	10 kg
MCA	1500 - 400		1500 W	0 - 400 V	0 - 12 A	19" / 443 mm	4 U / 177 mm	450 mm	16 kg
MCA	3000 - 400	3)	3000 W	0 - 400 V	0 - 24 A	19" / 443 mm	4 U / 177 mm	650 mm	35 kg
MCA	6000 - 400	3)	6000 W	0 - 400 V	0 - 48 A	19" / 443 mm	8 U / 355 mm	650 mm	61 kg
MCA	9000 - 400	3)	9000 W	0 - 400 V	0 - 72 A	19" / 443 mm	12 U / 535 mm	650 mm	90 kg
MCA	750 - 750	●	750 W	0 - 750 V	0 - 3 A	19" / 443 mm	3 U / 133 mm	350 mm	10 kg
MCA	1500 - 750		1500 W	0 - 750 V	0 - 6 A	19" / 443 mm	4 U / 177 mm	450 mm	16 kg
MCA	3000 - 750	3)	3000 W	0 - 750 V	0 - 12 A	19" / 443 mm	4 U / 177 mm	650 mm	33 kg
MCA	6000 - 750	3)	6000 W	0 - 750 V	0 - 24 A	19" / 443 mm	8 U / 355 mm	650 mm	61 kg
MCA	9000 - 750	3)	9000 W	0 - 750 V	0 - 36 A	19" / 443 mm	12 U / 535 mm	650 mm	90 kg
MCA	750 - 1500	●	750 W	0 - 1500 V	0 - 1,5 A	19" / 443 mm	3 U / 133 mm	350 mm	10 kg
MCA	1500 - 1500		1500 W	0 - 1500 V	0 - 3 A	19" / 443 mm	4 U / 177 mm	450 mm	16 kg
MCA	3000 - 1500	3)	3000 W	0 - 1500 V	0 - 6 A	19" / 443 mm	4 U / 177 mm	650 mm	32 kg
MCA	6000 - 1500	3)	6000 W	0 - 1500 V	0 - 12 A	19" / 443 mm	8 U / 355 mm	650 mm	61 kg
MCA	9000 - 1500	3)	9000 W	0 - 1500 V	0 - 18 A	19" / 443 mm	12 U / 535 mm	650 mm	90 kg
MCA	750 - 3000	●	750 W	0 - 3000 V	0 - 0,75 A	19" / 443 mm	3 U / 133 mm	350 mm	10 kg
MCA	1500 - 3000		1500 W	0 - 3000 V	0 - 1,5 A	19" / 443 mm	4 U / 177 mm	450 mm	16 kg
MCA	3000 - 3000	3)	3000 W	0 - 3000 V	0 - 3 A	19" / 443 mm	4 U / 177 mm	650 mm	32 kg
MCA	6000 - 3000	3)	6000 W	0 - 3000 V	0 - 6 A	19" / 443 mm	8 U / 355 mm	650 mm	61 kg
MCA	9000 - 3000	3)	9000 W	0 - 3000 V	0 - 9 A	19" / 443 mm	12 U / 535 mm	650 mm	90 kg

3) Three phase mains connection
● short term delivery

For orders of power supplies with 3000V nominal voltage please state the required output polarity.

For 1500V and higher, the mating high voltage connectors are included in the scope of delivery. Mating high voltage cables you'll find beginning with page 59.

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Medium voltage power supplies
Series MCP from 125 V to 2000 V / 14 W to 4200 W

Design example **MCP 140 - 1250**
1250V / 100mA

Floating output
(rear side)

Features:

- Compact size and light weight
- Efficiency approx. 90%
- Short-circuit & flashover proof
- Unlimited operation with rated current in a short-circuit condition
- Unlimited operation with rated power
- Voltage and current regulation with automatic sharp transition, indicated by LEDs
- Adjustable overvoltage protection (limitation of set value)
- 4½ digit DVM's for voltage and current for all models
- Voltage and current setting by means of 10-turn potentiometers with precision scale; the adjusting knob can be locked
- Indication of set point values by means of button for switch-over of the displays
- Set point adjustment possible with locked output, release of output voltage by means of an "ON" / "OFF" switch
- Suitable for inductive and capacitive loads
- Suitable for photomultipliers

Function:

In principle, the rectified line voltage drives a square wave generator of fixed frequency, whose AC voltage is transformed, rectified and filtered, producing the output voltage. For regulation, the square wave voltage is pulse width modulated.
A low residual ripple of the output voltage, together with a high stability, high regulation speed and a low stored energy are all achieved by virtue of the high switching frequency.

Design:

- ½19" or 19" table-top case (depending on output voltage and power).
- 19" Rack-adapters for mounting into a 19" rack are available as accessory.

Output:

- Output isolation:
  The output is floating. Either the positive or the negative terminal may be connected to earth.
  Units with nominal voltage up to 350V are isolated for ±500V.
  Units with nominal voltage from 650V up to 2000V are isolated for ±2000V. (Not valid with the option analogue programming. If the floating function should remain, the floating analogue programming must be chosen).
- Output terminals:
  All output terminals are located at the rear side of the unit.
  Units up to 350V nominal voltage are equipped with 4mm safety connectors.
  For nominal voltage of 650V and higher, high voltage connectors with the appropriate dielectric strength are delivered with the power supply.

Technical Data:

- Mains connection:

  up to 1400W nominal power:
  230V ±10% 47Hz to 63Hz

  for 2800W and higher:
  400V ±10% 47Hz to 63Hz, three-phase

- Ambient temperature:

  0°C to +40°C

(Continued at next page.)

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Medium voltage power supplies
Series MCP from 125 V to 2000 V / 14 W to 4200 W

The following data applies for voltage and current regulation, and refers to the rated value (unless otherwise stated):
(For explanations please refer to Definitions and Terms on page 61.)

- Setting range:
  from approx. 0,1% to 100%
- Setting resolution:
  ±1 x 10^{-4}
- Residual ripple

  up to 350W nominal power:
  <5 x 10^{-5}pp + 50mVpp

  for 700W and higher:
  <2 x 10^{-4}pp + 200mVpp

- Recovery time:
  Voltage control:
  <1ms for load changes from 10% to 100% or from 100% to 10%
  Current control:
  <10ms for load changes causing an output change of less than 10% of the rated voltage
- Setting time at nominal load:
  <300ms for changes of the output voltage from 10% to 90% or 90% to 10%
- Discharging time constant for output without load:
  approx. 2sec. to 10sec., depending on type

- Deviation:
  for ±10% mains voltage variation:
  <± 1 x 10^{-5}
  for no load / full load:
  <1 x 10^{-4}
  over 8 h under constant conditions:
  <±1 x 10^{-4}
  within the temperature range:
  <±1 x 10^{-4} / K

Possible Options:

- Coarse/fine-potentiometers (99% / 1%) for more accurate adjustment of voltage and / or current
- Analogue programming (One of the outputs on "0V" - potential; see also page 52)
- Analogue programming, floating (see page 52)
- Computer interface - IEEE 488, RS 232, RS 422, Profibus DP (more on request) (see page 54)
- Lower ripple (see page 56)
- Higher stability (see page 56)
- Lower stored energy (see page 56)
- Power limitation (see page 56)

More options and special solutions on request. Some options may involve changes to the description of the unit - especially concerning the mechanical design.

Type			Voltage	Current	Width	Height	Depth	Weight
MCP	35 - 125	●	0 - 125 V	0 - 250 mA	½19" / 222 mm	3 U / 133 mm	350 mm	4 kg
MCP	140 - 125	●	0 - 125 V	0 - 1 A	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
MCP	350 - 125	●	0 - 125 V	0 - 2,5 A	½19" / 222 mm	3 U / 133 mm	350 mm	6 kg
MCP	700 - 125		0 - 125 V	0 - 5 A	19" / 443 mm	3 U / 133 mm	350 mm	9 kg
MCP	1400 - 125		0 - 125 V	0 - 10 A	19" / 443 mm	3 U / 133 mm	450 mm	12 kg
MCP	2800 - 125	3)	0 - 125 V	0 - 20 A	19" / 443 mm	3 U / 133 mm	550 mm	23 kg
MCP	35 - 200	●	0 - 200 V	0 - 150 mA	½19" / 222 mm	3 U / 133 mm	350 mm	4 kg
MCP	140 - 200	●	0 - 200 V	0 - 600 mA	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
MCP	350 - 200	●	0 - 200 V	0 - 1,5 A	½19" / 222 mm	3 U / 133 mm	350 mm	6 kg
MCP	700 - 200	●	0 - 200 V	0 - 3 A	19" / 443 mm	3 U / 133 mm	350 mm	9 kg
MCP	1400 - 200		0 - 200 V	0 - 6 A	19" / 443 mm	3 U / 133 mm	450 mm	12 kg
MCP	2800 - 200	3)	0 - 200 V	0 - 12 A	19" / 443 mm	3 U / 133 mm	550 mm	23 kg
MCP	35 - 350	●	0 - 350 V	0 - 100 mA	½19" / 222 mm	3 U / 133 mm	350 mm	4 kg
MCP	140 - 350	●	0 - 350 V	0 - 400 mA	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
MCP	350 - 350	●	0 - 350 V	0 - 1 A	½19" / 222 mm	3 U / 133 mm	350 mm	6 kg
MCP	700 - 350		0 - 350 V	0 - 2 A	19" / 443 mm	3 U / 133 mm	350 mm	9 kg
MCP	1400 - 350		0 - 350 V	0 - 4 A	19" / 443 mm	3 U / 133 mm	450 mm	12 kg
MCP	2800 - 350	3)	0 - 350 V	0 - 8 A	19" / 443 mm	3 U / 133 mm	550 mm	23 kg

3) Three phase mains connection
● short term delivery

For 650V and higher the mating high voltage connectors are included in the scope of delivery. Mating high voltage cables you'll find beginning with page 59.

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V 0108

Medium voltage power supplies
Series MCP from 125 V to 2000 V / 14 W to 4200 W

Type			Voltage	Current	Width	Height	Depth	Weight
MCP	14 - 650	●	0 - 650 V	0 - 20 mA	½19" / 222 mm	3 U / 133 mm	350 mm	4 kg
MCP	35 - 650	●	0 - 650 V	0 - 50 mA	½19" / 222 mm	3 U / 133 mm	350 mm	4 kg
MCP	140 - 650	●	0 - 650 V	0 - 200 mA	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
MCP	350 - 650	●	0 - 650 V	0 - 500 mA	½19" / 222 mm	3 U / 133 mm	350 mm	6 kg
MCP	700 - 650	●	0 - 650 V	0 - 1 A	19" / 443 mm	3 U / 133 mm	350 mm	9 kg
MCP	1400 - 650	●	0 - 650 V	0 - 2 A	19" / 443 mm	3 U / 133 mm	450 mm	12 kg
MCP	2800 - 650	3)	0 - 650 V	0 - 4 A	19" / 443 mm	3 U / 133 mm	550 mm	23 kg
MCP	4200 - 650	3)	0 - 650 V	0 - 6 A	19" / 443 mm	4 U / 177 mm	550 mm	30 kg
MCP	14 - 1250	●	0 - 1250 V	0 - 10 mA	½19" / 222 mm	3 U / 133 mm	350 mm	4 kg
MCP	35 - 1250	●	0 - 1250 V	0 - 25 mA	½19" / 222 mm	3 U / 133 mm	350 mm	4 kg
MCP	140 - 1250	●	0 - 1250 V	0 - 100 mA	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
MCP	350 - 1250	●	0 - 1250 V	0 - 250 mA	½19" / 222 mm	3 U / 133 mm	350 mm	6 kg
MCP	700 - 1250	●	0 - 1250 V	0 - 500 mA	19" / 443 mm	3 U / 133 mm	350 mm	9 kg
MCP	1400 - 1250	●	0 - 1250 V	0 - 1 A	19" / 443 mm	3 U / 133 mm	450 mm	12 kg
MCP	2800 - 1250	3)	0 - 1250 V	0 - 2 A	19" / 443 mm	3 U / 133 mm	550 mm	23 kg
MCP	4200 - 1250	3)	0 - 1250 V	0 - 3 A	19" / 443 mm	4 U / 177 mm	550 mm	30 kg
MCP	14 - 2000	●	0 - 2000 V	0 - 6 mA	½19" / 222 mm	3 U / 133 mm	350 mm	4 kg
MCP	35 - 2000	●	0 - 2000 V	0 - 15 mA	½19" / 222 mm	3 U / 133 mm	350 mm	4 kg
MCP	140 - 2000	●	0 - 2000 V	0 - 60 mA	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
MCP	350 - 2000	●	0 - 2000 V	0 - 150 mA	½19" / 222 mm	3 U / 133 mm	350 mm	6 kg
MCP	700 - 2000	●	0 - 2000 V	0 - 300 mA	19" / 443 mm	3 U / 133 mm	350 mm	9 kg
MCP	1400 - 2000	●	0 - 2000 V	0 - 600 mA	19" / 443 mm	3 U / 133 mm	450 mm	12 kg
MCP	2800 - 2000	3)	0 - 2000 V	0 - 1 A	19" / 443 mm	3 U / 133 mm	550 mm	23 kg
MCP	4200 - 2000	3)	0 - 2000 V	0 - 2 A	19" / 443 mm	4 U / 177 mm	550 mm	30 kg

3) Three phase mains connection
● short term delivery

For 650V and higher the mating high voltage connectors are included in the scope of delivery. Mating high voltage cables you'll find beginning with page 59.

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Medium voltage power supplies thyristor regulated Series MYN from 650 V to 2000 V / 7kW to 70 kW

Design examples

MYN 14000 - 650
650V / 20A

MYN 105000 - 1500
1500V / 70A

Features:

- Simple construction
- Extremely robust
- High efficiency
- Short circuit proof and unlimited operation with full current in short circuit condition
- Voltage and current regulation with automatic and sharp transition; control mode indicated by LEDs
- Voltage and current setting with 10-turn potentiometers with precision scale; the adjusting knob can be locked
- Limitation of inrush current on switching on
- Suitable also for inductive and capacitive loads
- Interlock loop to monitor the external load and internal loop as a standard
- Elapsed-hour meter as a standard

Function:

A transformer is used to transform the mains supply to high voltage. Either on the primary side or on the secondary side of this transformer a phase controlled thyristor rectifier circuit is fitted. A series LC . filter is used to smooth the resulting rectified voltage.

Design:

- Depending on Voltage and Power the units are built as single or double 19" cabinets of various height. The side covers are detachable, the rear door is lockable.
- All cabinets are equipped with fork-lift-compatible plinths and removable crane-eyes.
- Single 19"- cabinets up to 38U are easily transportable by fork-lift.
- Cooling is carried out via built-in fans, with the air being exhausted (depending upon type) either via the rear or the top.

Output:

- Output isolation:
  The output is floating with isolation voltage ±2000V against earth. Either the positive or the negative terminal may be connected to earth.
- Output terminals:
  All output terminals are located at the rear side of the cabinet. For Output current up to 10A high voltage connectors with the appropriate dielectric strength are installed. Mating connectors are delivered with the power supply. For higher current feed through terminals.

Technical Data:

- Mains connection:
  400V ±10% 47Hz to 53Hz, three-phase
- Ambient temperature:
  0°C to +40°C

The following data applies for voltage and current regulation, and refers to the rated value (unless otherwise stated):
(For explanations please refer to Definitions and Terms on page 61.)

- Setting range:
  from approx. 1% to 100%
- Setting resolution:
  ±1 x 10^{-4}
- Residual ripple:
  <1 x 10^{-2}pp + 100mVpp
- Recovery time:
  <100ms to 500ms (depending on type) for load variations of ±10%
- Setting time at nominal load:
  <100ms to 2 sec (depending on type) for changes of the output voltage from 10% to 90% or 90% to 10%
- Discharging time constant for output without load:
  approx. 5sec. to 60sec., depending on type
- Deviation:
  for ±10% mains voltage variation:
  <±1 x 10^{-4}
  for no load / full load:
  <±1 x 10^{-3}
  over 8 h under constant conditions:
  <±3 x 10^{-4}
  within the temperature range:
  <±3 x 10^{-4} / K

Possible Options:

- Analogue programming (One of the outputs on “0V” - potential; see also page 52)
- Analogue programming, floating (see page 52)
- Computer interface - IEEE 488, RS 232, RS 422, Profibus DP (more on request) (see page 54)
- Internal resistance setting and regulation (see page 56)
- Power regulation with display (see page 56)
- Roller blades for cabinet units

More options and special solutions on request. Some options may involve changes to the description of the unit - especially concerning the mechanical design.

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Medium voltage power supplies thyristor regulated
Series MYN from 650 V to 2000 V / 7kW to 70 kW

Type		Voltage	Current	Width	Height	Depth	Weight
MYN	7000 - 650	0 - 650 V	0 - 10 A	19" / 600 mm	20 U / 1100 mm	600 mm	230 kg
MYN	10500 - 650	0 - 650 V	0 - 15 A	19" / 600 mm	29 U / 1500 mm	600 mm	340 kg
MYN	14000 - 650	0 - 650 V	0 - 20 A	19" / 600 mm	29 U / 1500 mm	600 mm	400 kg
MYN	21000 - 650	0 - 650 V	0 - 30 A	19" / 600 mm	38 U / 2000 mm	800 mm	480 kg
MYN	28000 - 650	0 - 650 V	0 - 40 A	19" / 600 mm	38 U / 2000 mm	800 mm	600 kg
MYN	35000 - 650	0 - 650 V	0 - 50 A	19" / 600 mm	38 U / 2000 mm	800 mm	800 kg
MYN	70000 - 650	0 - 650 V	0 - 100 A	19" / 600 mm	38 U / 2000 mm	800 mm	1400 kg
MYN	7000 - 1250	0 - 1250 V	0 - 5 A	19" / 600 mm	20 U / 1100 mm	600 mm	230 kg
MYN	10500 - 1250	0 - 1250 V	0 - 8 A	19" / 600 mm	29 U / 1500 mm	600 mm	340 kg
MYN	14000 - 1250	0 - 1250 V	0 - 10 A	19" / 600 mm	29 U / 1500 mm	600 mm	400 kg
MYN	21000 - 1250	0 - 1250 V	0 - 15 A	19" / 600 mm	38 U / 2000 mm	800 mm	480 kg
MYN	28000 - 1250	0 - 1250 V	0 - 20 A	19" / 600 mm	38 U / 2000 mm	800 mm	600 kg
MYN	35000 - 1250	0 - 1250 V	0 - 25 A	19" / 600 mm	38 U / 2000 mm	800 mm	800 kg
MYN	70000 - 1250	0 - 1250 V	0 - 50 A	19" / 600 mm	38 U / 2000 mm	800 mm	1400 kg
MYN	7000 - 2000	0 - 2000 V	0 - 3 A	19" / 600 mm	20 U / 1100 mm	600 mm	230 kg
MYN	10500 - 2000	0 - 2000 V	0 - 5 A	19" / 600 mm	29 U / 1500 mm	600 mm	340 kg
MYN	14000 - 2000	0 - 2000 V	0 - 6 A	19" / 600 mm	38 U / 2000 mm	800 mm	400 kg
MYN	21000 - 2000	0 - 2000 V	0 - 10 A	19" / 600 mm	38 U / 2000 mm	800 mm	480 kg
MYN	28000 - 2000	0 - 2000 V	0 - 12 A	19" / 600 mm	38 U / 2000 mm	800 mm	600 kg
MYN	35000 - 2000	0 - 2000 V	0 - 15 A	19" / 600 mm	38 U / 2000 mm	800 mm	800 kg
MYN	50000 - 2000	0 - 2000 V	0 - 25 A	19" / 600 mm	38 U / 2000 mm	800 mm	1200 kg

Mating high voltage connectors for units with up to 10A output current are included in the scope of delivery. Mating high voltage cables you'll find beginning with page 59.

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High voltage power supplies
Series HCP from 3,5 kV to 150 kV / 14 W to 4200 W

Design example **HCP 140 - 12500**
12500V / 10mA

Features:

- Compact size and light weight
- Efficiency approx. 90%
- For units from 12.5kV nominal voltage on, all HV components are moulded in (removable) silicon
- Short-circuit & flashover proof
- Unlimited operation with rated current in a short-circuit condition
- Unlimited operation with rated power
- Voltage and current regulation with automatic sharp transition, indicated by LEDs
- Adjustable overvoltage protection (limitation of set value)
- 4½ digit DVM's for voltage and current for all models
- Voltage and current setting by means of 10-turn potentiometers with precision scale; the adjusting knob can be locked
- Indication of set point values by means of button for switch-over of the displays
- Set point adjustment possible with locked output, release of output voltage by means of "ON" / "OFF" switch
- Suitable also for inductive and capacitive loads
- Suitable for photomultipliers

Function:

In principle, the rectified line voltage drives a square wave generator of fixed frequency, whose AC voltage is transformed, rectified and filtered, producing the output voltage. For regulation, the square wave voltage is pulse width modulated.
A low residual ripple of the output voltage, together with a high stability, high regulation speed and a low stored energy are all achieved by virtue of the high switching frequency.

Design:

- ½19" or 19" table-top case (depending on output voltage and power).
- 19" Rack-adapters for mounting into a 19" rack are available as accessory.

Output:

- Output isolation:
  The required output polarity must be stated with the order. The requested output polarity will then be available at the HV connector and the “0V” terminal will be firmly connected to earth.
  If required, the "0V" terminal can be made floating against earth up to ± 300V. A polarity reversal switch is optionally available.
- Output terminals:
  All output terminals are located at the rear side of the unit. High voltage connectors with the appropriate dielectric strength are delivered with the power supply.
  For nominal voltage of 65kV and higher the HV- plug will be delivered ready mounted to 3m cable.

Technical Data:

- Mains connection:

  up to 1400W nominal power:
  230V ±10% 47Hz to 63Hz

  for 2800W and higher:
  400V ±10% 47Hz to 63Hz, three-phase
- Ambient temperature:

  0°C to +40°C

The following data applies for voltage and current regulation, and refers to the rated value (unless otherwise stated):
(For explanations please refer to Definitions and Terms on page 61.)

- Setting range:
  from approx. 0,1% to 100%
- Setting resolution:
  ±1 x 10^{-4}
- Residual ripple:
  <1 x 10^{-4}pp + 50mVpp,
  typ. 5 x 10^{-5}pp
- Recovery time:

  Voltage control:
  <1ms for load changes from 10% to 100% or from 100% to 10%

  Curent control:
  <10ms for load changes causing an output change of less than 10% of the rated voltage
- Setting time at nominal load:
  <500ms for changes of the output voltage from 10% to 90% or 90% to 10%
- Discharging time constant for output without load:
  approx. 2sec. to 10sec., depending on type
- Deviation:
  for ±10% mains voltage variation:
  <± 1 x 10^{-5}
  for no load / full load:
  <2 x 10^{-4}
  over 8 h under constant conditions:
  <±1 x 10^{-4}
  within the temperature range:
  <±1,5 x 10^{-4} / K

Possible Options:

- Coarse/fine-potentiometers (99% / 1%) for more accurate adjustment of voltage and / or current
- Analogue programming (see page 52)
- Analogue programming, floating (see page 52)
- Computer interface - IEEE 488, RS 232, RS 422, Profibus DP (more on request) (see page 54)
- electronically controlled polarity reversal switch (Up to 35kV remotely controllable when ordered with a programming or interface, please ask us for higher voltages.) Please specify the output polarity, when ordering without polarity reversal switch. (see page 56)
- Lower ripple (see page 56)
- Higher stability (see page 56)
- Lower stored energy (see page 56)
- Power limitation (see page 56)

More options and special solutions on request. Some options may involve changes to the description of the unit - especially concerning the mechanical design.

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V 0108

High voltage power supplies
Series HCP from 3,5 kV to 150 kV / 14 W to 4200 W

Type			Voltage	Current	Width	Height	Depth	Weight
HCP	14 - 3500	●	0 - 3500 V	0 - 4 mA	½19" / 222 mm	3 U / 133 mm	350 mm	3 kg
HCP	35 - 3500	●	0 - 3500 V	0 - 10 mA	½19" / 222 mm	3 U / 133 mm	350 mm	4 kg
HCP	140 - 3500	●	0 - 3500 V	0 - 40 mA	½19" / 222 mm	3 U / 133 mm	350 mm	6 kg
HCP	350 - 3500	●	0 - 3500 V	0 - 100 mA	½19" / 222 mm	3 U / 133 mm	450 mm	7 kg
HCP	700 - 3500	●	0 - 3500 V	0 - 200 mA	19" / 443 mm	3 U / 133 mm	350 mm	11 kg
HCP	1400 - 3500		0 - 3500 V	0 - 400 mA	19" / 443 mm	3 U / 133 mm	450 mm	13 kg
HCP	2800 - 3500	3)	0 - 3500 V	0 - 800 mA	19" / 443 mm	3 U / 133 mm	550 mm	25 kg
HCP	4200 - 3500	3)	0 - 3500 V	0 - 1,2 A	19" / 443 mm	5 U / 221 mm	550 mm	35 kg
HCP	14 - 6500	●	0 - 6500 V	0 - 2 mA	½19" / 222 mm	3 U / 133 mm	350 mm	3 kg
HCP	35 - 6500	●	0 - 6500 V	0 - 5 mA	½19" / 222 mm	3 U / 133 mm	350 mm	4 kg
HCP	140 - 6500	●	0 - 6500 V	0 - 20 mA	½19" / 222 mm	3 U / 133 mm	350 mm	6 kg
HCP	350 - 6500	●	0 - 6500 V	0 - 50 mA	½19" / 222 mm	3 U / 133 mm	450 mm	7 kg
HCP	700 - 6500	●	0 - 6500 V	0 - 100 mA	19" / 443 mm	3 U / 133 mm	350 mm	11 kg
HCP	1400 - 6500		0 - 6500 V	0 - 200 mA	19" / 443 mm	3 U / 133 mm	450 mm	13 kg
HCP	2800 - 6500	3)	0 - 6500 V	0 - 400 mA	19" / 443 mm	3 U / 133 mm	650 mm	25 kg
HCP	4200 - 6500	3)	0 - 6500 V	0 - 600 mA	19" / 443 mm	5 U / 221 mm	650 mm	35 kg
HCP	14 - 12500	●	0 - 12500 V	0 - 1 mA	½19" / 222 mm	3 U / 133 mm	350 mm	4 kg
HCP	35 - 12500	●	0 - 12500 V	0 - 2,5 mA	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
HCP	140 - 12500	●	0 - 12500 V	0 - 10 mA	½19" / 222 mm	3 U / 133 mm	350 mm	7 kg
HCP	350 - 12500	●	0 - 12500 V	0 - 25 mA	19" / 443 mm	3 U / 133 mm	450 mm	11 kg
HCP	700 - 12500	●	0 - 12500 V	0 - 50 mA	19" / 443 mm	3 U / 133 mm	550 mm	16 kg
HCP	1400 - 12500		0 - 12500 V	0 - 100 mA	19" / 443 mm	3 U / 133 mm	650 mm	21 kg
HCP	2800 - 12500	3)	0 - 12500 V	0 - 200 mA	19" / 443 mm	5 U / 221 mm	650 mm	35 kg
HCP	4200 - 12500	3)	0 - 12500 V	0 - 300 mA	19" / 443 mm	6 U / 266 mm	650 mm	45 kg
HCP	14 - 20000	●	0 - 20000 V	0 - 0,6 mA	½19" / 222 mm	3 U / 133 mm	350 mm	4 kg
HCP	35 - 20000	●	0 - 20000 V	0 - 1,5 mA	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
HCP	140 - 20000	●	0 - 20000 V	0 - 6 mA	½19" / 222 mm	3 U / 133 mm	350 mm	7 kg
HCP	350 - 20000	●	0 - 20000 V	0 - 15 mA	19" / 443 mm	3 U / 133 mm	450 mm	11 kg
HCP	700 - 20000	●	0 - 20000 V	0 - 30 mA	19" / 443 mm	3 U / 133 mm	550 mm	16 kg
HCP	1400 - 20000		0 - 20000 V	0 - 60 mA	19" / 443 mm	3 U / 133 mm	650 mm	21 kg
HCP	2800 - 20000	3)	0 - 20000 V	0 - 120 mA	19" / 443 mm	5 U / 221 mm	650 mm	35 kg
HCP	4200 - 20000	3)	0 - 20000 V	0 - 200 mA	19" / 443 mm	6 U / 266 mm	650 mm	45 kg
HCP	35 - 35000	●	0 - 35000 V	0 - 1 mA	19" / 443 mm	3 U / 133 mm	450 mm	10 kg
HCP	140 - 35000	●	0 - 35000 V	0 - 4 mA	19" / 443 mm	3 U / 133 mm	450 mm	11 kg
HCP	350 - 35000	●	0 - 35000 V	0 - 10 mA	19" / 443 mm	3 U / 133 mm	450 mm	12 kg
HCP	700 - 35000		0 - 35000 V	0 - 20 mA	19" / 443 mm	3 U / 133 mm	550 mm	17 kg
HCP	1400 - 35000		0 - 35000 V	0 - 40 mA	19" / 443 mm	3 U / 133 mm	650 mm	25 kg
HCP	2800 - 35000	3)	0 - 35000 V	0 - 80 mA	19" / 443 mm	5 U / 221 mm	650 mm	45 kg
HCP	4200 - 35000	3)	0 - 35000 V	0 - 120 mA	19" / 443 mm	7 U / 310 mm	650 mm	50 kg

3) Three phase mains connection
● short term delivery

Mating high voltage connectors are included in the scope of delivery. Mating high voltage cables you'll find beginning with page 59.

All units up to 35kV optionally available with electronically controlled polarity reversal switch.

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High voltage power supplies
Series HCP from 3,5 kV to 150 kV / 14 W to 4200 W

Type			Voltage		Current		Width	Height	Depth	Weight
HCP	35 - 65000		0 - 65000 V	0 -	0,5 mA		19" / 443 mm	3 U / 133 mm*	450 mm**	17 kg
HCP	140 - 65000		0 - 65000 V	0 -	2 mA		19" / 443 mm	3 U / 133 mm*	450 mm**	21 kg
HCP	350 - 65000		0 - 65000 V	0 -	5 mA		19" / 443 mm	6 U / 266 mm*	450 mm**	45 kg
HCP	700 - 65000		0 - 65000 V	0 -	10 mA		19" / 443 mm	8 U / 355 mm	550 mm	55 kg
HCP	1400 - 65000		0 - 65000 V	0 -	20 mA		19" / 443 mm	8 U / 355 mm*	550 mm**	65 kg
HCP	2800 - 65000	3)	0 - 65000 V	0 -	40 mA		19" / 443 mm	8 U / 355 mm*	550 mm**	70 kg
HCP	140 - 100000		0 - 100000 V	0 -	1 mA		19" / 443 mm	5 U / 221 mm	550 mm	50 kg
HCP	350 - 100000		0 - 100000 V	0 -	3 mA		19" / 443 mm	5 U / 221 mm	550 mm	55 kg
HCP	700 - 100000		0 - 100000 V	0 -	6 mA		19" / 443 mm	8 U / 355 mm	550 mm	73 kg
HCP	1400 - 100000		0 - 100000 V	0 -	12 mA		19" / 443 mm	8 U / 355 mm	550 mm	90 kg
HCP	140 - 150000		0 - 150000 V	0 -	0,5 mA		19" / 443 mm	8 U /355 mm	750 mm	110 kg
HCP	350 - 150000		0 - 150000 V	0 -	2 mA		19" / 443 mm	8 U /355 mm	750 mm	130 kg
HCP	700 - 150000		0 - 150000 V	0 -	4 mA		19" / 443 mm	8 U /355 mm	750 mm	140 kg

3) Three phase mains

● short term delivery

Mating high voltage connectors are included in the scope of delivery. Mating high voltage cables you'll find beginning with page 59.

All units with 65kV optionally available with manually operated polarity reversal switch. For orders without polarity switch please state the required output polarity.

*) With polarity reversal switch these units will be 2U higher.

**) With polarity reversal switch these units will be 100 mm deeper.

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High voltage power supplies, high power
Series HCH from 650 V to 200 kV / to 50 kW

Features:

- Efficiency up to 90%
- Short-circuit & flashover proof
- In units up to 20kV nominal voltage the HV-components are isolated in air. From 35kV on the isolation is with oil.
- Unlimited operation with rated current in a short-circuit condition
- Unlimited operation with rated power
- Voltage and current regulation with automatic sharp transition, indicated by LEDs
- Limitation of inrush current on switching on
- Voltage and current setting by means of 10-turn potentiometers with precision scale; the adjusting knob can be locked
- Interlock loop to monitor the external load and internal loop as a standard

Function:

In principle, the rectified line voltage drives a square wave generator of fixed frequency, whose AC voltage is transformed, rectified and filtered, producing the output voltage. For regulation, the square wave voltage is pulse width modulated.

Design:

Depending on Voltage and Power the units are built as single or double 19" cabinets, or as a oil- filled HV container with the power electronics on the top or in a separate rack.

Design example

HCH 50000 - 20000
20kV / 2,5 A

Output:

- Output isolation:
  The required output polarity must be stated with the order. The requested output polarity will then be available at the HV connector and the “0V” terminal will be firmly connected to earth.
  If required, the "0V" terminal can be made floating against earth up to ± 50V. A polarity reversal switch is optionally available.
- Output terminals:
  All output terminals are located at the rear side of the cabinet or at the top of the HV container. High voltage connectors with the appropriate dielectric strength are delivered with the power supply. For nominal voltage of 65kV and higher the HV-plug will be delivered ready mounted to 10m cable.

Technical Data:

- Mains connection:

  up to 1400W nominal power:
  230V ±10% 47Hz to 63Hz

  for 2800W and higher:
  400V ±10% 47Hz to 63Hz, three-phase
- Ambient temperature:

  0°C to +40°C

The following data applies for voltage and current regulation, and refers to the rated value (unless otherwise stated):
(For explanations please refer to Definitions and Terms on page 61.)

- Setting range:
  from approx. 0,1% to 100%
- Setting resolution:
  ±1 x 10^{-4}
- Residual ripple:
  <2 x 10^{-3}pp + 50mVpp
- Recovery time:

  Voltage control:
  <1ms for load changes from 10% to 100% or from 100% to 10%

  Curent control:
  <10ms for load changes causing an output change of less than 10% of the rated voltage
- Setting time at nominal load:
  <100ms for changes of the output voltage from 10% to 90% or 90% to 10%
- Discharging time constant for output without load:
  approx. 1sec. to 10sec., depending on type
- Deviation:
  for ±10% mains voltage variation:
  <± 1 x 10^{-4}
  for no load / full load:
  <5 x 10^{-4}
  over 8 h under constant conditions:
  <±2 x 10^{-4}
  within the temperature range:
  <±1,5 x 10^{-4} / K

Possible Options:

- Analogue programming (see page 52)
- Analogue programming, floating (see page 52)
- Computer interface - IEEE 488, RS 232, RS 422, Profibus DP (more on request) (see page 52)
- Polarity reversal switch. Please specify the output polarity, when ordering without polarity reversal switch. (see page 56)
- Lower ripple (see page 56)
- Higher stability (see page 56)
- Shorter setting time (see page 56)
- Roller blades for cabinet units

More options and special solutions on request. Some options may involve changes to the description of the unit - especially concerning the mechanical design.

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High voltage power supplies, high power
Series HCH from 650 V to 200 kV / to 50 kW

Design example

HCH 350 - 200000
200kV / 1,5 mA

Type			Voltage		Current		Width	Height	Depth	Weight
HCH	10000 - 650	3)	0 -	650 V	0 -	15 A	19" / 600 mm	20 U / 1100 mm	600 mm	120 kg
HCH	15000 - 650	3)	0 -	650 V	0 -	22,5 A	19" / 600 mm	29 U / 1500 mm	600 mm	170 kg
HCH	20000 - 650	3)	0 -	650 V	0 -	30 A	19" / 600 mm	29 U / 1500 mm	600 mm	240 kg
HCH	30000 - 650	3)	0 -	650 V	0 -	45 A	19" / 600 mm	38 U / 2000 mm	800 mm	300 kg
HCH	40000 - 650	3)	0 -	650 V	0 -	60 A	19" / 600 mm	38 U / 2000 mm	800 mm	360 kg
HCH	50000 - 650	3)	0 -	650 V	0 -	75 A	19" / 600 mm	38 U / 2000 mm	800 mm	420 kg
HCH	10000 - 1250	3)	0 -	1250 V	0 -	8 A	19" / 600 mm	20 U / 1100 mm	600 mm	120 kg
HCH	15000 - 1250	3)	0 -	1250 V	0 -	12 A	19" / 600 mm	29 U / 1500 mm	600 mm	170 kg
HCH	20000 - 1250	3)	0 -	1250 V	0 -	16 A	19" / 600 mm	29 U / 1500 mm	600 mm	240 kg
HCH	30000 - 1250	3)	0 -	1250 V	0 -	24 A	19" / 600 mm	38 U / 2000 mm	800 mm	300 kg
HCH	40000 - 1250	3)	0 -	1250 V	0 -	32 A	19" / 600 mm	38 U / 2000 mm	800 mm	360 kg
HCH	50000 - 1250	3)	0 -	1250 V	0 -	40 A	19" / 600 mm	38 U / 2000 mm	800 mm	420 kg
HCH	10000 - 2000	3)	0 -	2000 V	0 -	5 A	19" / 600 mm	20 U / 1100 mm	600 mm	120 kg
HCH	15000 - 2000	3)	0 -	2000 V	0 -	7,5 A	19" / 600 mm	29 U / 1500 mm	600 mm	170 kg
HCH	20000 - 2000	3)	0 -	2000 V	0 -	10 A	19" / 600 mm	29 U / 1500 mm	600 mm	240 kg
HCH	30000 - 2000	3)	0 -	2000 V	0 -	15 A	19" / 600 mm	38 U / 2000 mm	800 mm	300 kg
HCH	40000 - 2000	3)	0 -	2000 V	0 -	20 A	19" / 600 mm	38 U / 2000 mm	800 mm	360 kg
HCH	50000 - 2000	3)	0 -	2000 V	0 -	25 A	19" / 600 mm	38 U / 2000 mm	800 mm	420 kg
HCH	10000 - 3500	3)	0 -	3500 V	0 -	3 A	19" / 600 mm	20 U / 1100 mm	600 mm	120 kg
HCH	15000 - 3500	3)	0 -	3500 V	0 -	4 A	19" / 600 mm	29 U / 1500 mm	600 mm	170 kg
HCH	20000 - 3500	3)	0 -	3500 V	0 -	6 A	19" / 600 mm	29 U / 1500 mm	600 mm	240 kg
HCH	30000 - 3500	3)	0 -	3500 V	0 -	8 A	19" / 600 mm	38 U / 2000 mm	800 mm	300 kg
HCH	40000 - 3500	3)	0 -	3500 V	0 -	12 A	19" / 600 mm	38 U / 2000 mm	800 mm	360 kg
HCH	50000 - 3500	3)	0 -	3500 V	0 -	15 A	19" / 600 mm	38 U / 2000 mm	800 mm	420 kg

3) Three phase mains connection

Mating high voltage connectors for units with up to 10A output current are included in the scope of delivery. Mating high voltage cables you'll find beginning with page 59.

All units are available with polarity reversal switch. For orders without polarity switch please state the required output polarity.

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High voltage power supplies, high power
Series HCH from 650 V to 200 kV / to 50 kW

Design example

HCH 4200 - 65000
65kV / 60 mA

Type			Voltage		Current		Width	Height	Depth	Weight
HCH	10000 - 6500	3)	0 -	6500 V	0 -	1,5 A	19" / 600 mm	20 U / 1100 mm	600 mm	120 kg
HCH	15000 - 6500	3)	0 -	6500 V	0 -	2 A	19" / 600 mm	29 U / 1500 mm	600 mm	170 kg
HCH	20000 - 6500	3)	0 -	6500 V	0 -	3 A	19" / 600 mm	29 U / 1500 mm	600 mm	240 kg
HCH	30000 - 6500	3)	0 -	6500 V	0 -	4 A	19" / 600 mm	38 U / 2000 mm	800 mm	300 kg
HCH	40000 - 6500	3)	0 -	6500 V	0 -	6 A	19" / 600 mm	38 U / 2000 mm	800 mm	360 kg
HCH	50000 - 6500	3)	0 -	6500 V	0 -	7,5 A	19" / 600 mm	38 U / 2000 mm	800 mm	420 kg
HCH	10000 - 12500	3)	0 -	12500 V	0 -	0,8 A	19" / 600 mm	20 U / 1100 mm	600 mm	120 kg
HCH	15000 - 12500	3)	0 -	12500 V	0 -	1,2 A	19" / 600 mm	29 U / 1500 mm	600 mm	170 kg
HCH	20000 - 12500	3)	0 -	12500 V	0 -	1,6 A	19" / 600 mm	29 U / 1500 mm	600 mm	240 kg
HCH	30000 - 12500	3)	0 -	12500 V	0 -	2,4 A	19" / 600 mm	38 U / 2000 mm	800 mm	300 kg
HCH	40000 - 12500	3)	0 -	12500 V	0 -	3,2 A	19" / 600 mm	38 U / 2000 mm	800 mm	360 kg
HCH	50000 - 12500	3)	0 -	12500 V	0 -	4 A	2x19" / 1200 mm	38 U / 2000 mm	800 mm	480 kg
HCH	10000 - 20000	3)	0 -	20000 V	0 -	0,5 A	19" / 600 mm	29 U / 1500 mm	600 mm	120 kg
HCH	15000 - 20000	3)	0 -	20000 V	0 -	0,75 A	19" / 600 mm	29 U / 1500 mm	600 mm	170 kg
HCH	20000 - 20000	3)	0 -	20000 V	0 -	1 A	19" / 600 mm	38 U / 2000 mm	800 mm	240 kg
HCH	30000 - 20000	3)	0 -	20000 V	0 -	1,5 A	19" / 600 mm	38 U / 2000 mm	800 mm	300 kg
HCH	40000 - 20000	3)	0 -	20000 V	0 -	2 A	19" / 600 mm	38 U / 2000 mm	800 mm	360 kg
HCH	50000 - 20000	3)	0 -	20000 V	0 -	2,5 A	2x19" / 1200 mm	38 U / 2000 mm	800 mm	480 kg
HCH	10000 - 35000	3)	0 -	35000 V	0 -	0,3 A	19" / 600 mm	38 U / 2000 mm	800 mm	390 kg
HCH	15000 - 35000	3)	0 -	35000 V	0 -	0,4 A	19" / 600 mm	38 U / 2000 mm	800 mm	420 kg
HCH	20000 - 35000	3)	0 -	35000 V	0 -	0,6 A	19" / 600 mm	38 U / 2000 mm	800 mm	450 kg
HCH	30000 - 35000	3)	0 -	35000 V	0 -	0,8 A	2x19" / 1200 mm	38 U / 2000 mm	800 mm	640 kg
HCH	40000 - 35000	3)	0 -	35000 V	0 -	1,2 A	2x19" / 1200 mm	38 U / 2000 mm	800 mm	720 kg
HCH	50000 - 35000	3)	0 -	35000 V	0 -	1,5 A	2x19" / 1200 mm	38 U / 2000 mm	800 mm	790 kg

3) Three phase mains connection

Mating high voltage connectors for units with up to 10A output current are included in the scope of delivery. Mating high voltage cables you'll find beginning with page 59.

All units are available with polarity reversal switch. For orders without polarity switch please state the required output polarity.

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High voltage power supplies, high power
Series HCH from 650 V to 200 kV / to 50 kW

Type			Voltage		Current		Width	Height	Depth	Weight
HCH	4200 - 65000	3)	0 - 65000 V	0 -	60 mA		700 mm*	750 mm*	630 mm*	240 kg
HCH	10000 - 65000	3)	0 - 65000 V	0 -	150 mA		19" / 600 mm	38 U / 2000 mm	800 mm	460 kg
HCH	15000 - 65000	3)	0 - 65000 V	0 -	200 mA		19" / 600 mm	38 U / 2000 mm	800 mm	480 kg
HCH	20000 - 65000	3)	0 - 65000 V	0 -	300 mA		19" / 600 mm	38 U / 2000 mm	800 mm	500 kg
HCH	30000 - 65000	3)	0 - 65000 V	0 -	400 mA		19" / 600 mm	29 U / 1500 mm	600 mm**	170/430 kg
HCH	40000 - 65000	3)	0 - 65000 V	0 -	600 mA		19" / 600 mm	29 U / 1500 mm	600 mm**	200/470 kg
HCH	50000 - 65000	3)	0 - 65000 V	0 -	750 mA		19" / 600 mm	38 U / 2000 mm	800 mm**	250/500 kg
HCH	2800 - 100000	3)	0 - 100000 V	0 -	25 mA		800 mm*	1200 mm*	760 mm*	550 kg
HCH	4200 - 100000	3)	0 - 100000 V	0 -	40 mA		800 mm*	1200 mm*	760 mm*	550 kg
HCH	10000 - 100000	3)	0 - 100000 V	0 -	100 mA		19" / 600 mm	38 U / 2000 mm	800 mm	500 kg
HCH	15000 - 100000	3)	0 - 100000 V	0 -	150 mA		19" / 600 mm	38 U / 2000 mm	800 mm	520 kg
HCH	20000 - 100000	3)	0 - 100000 V	0 -	200 mA		19" / 600 mm	38 U / 2000 mm	800 mm	545 kg
HCH	30000 - 100000	3)	0 - 100000 V	0 -	300 mA		19" / 600 mm	29 U / 1500 mm	600 mm**	170/500 kg
HCH	40000 - 100000	3)	0 - 100000 V	0 -	400 mA		19" / 600 mm	31 U / 2000 mm	600 mm**	200/550 kg
HCH	50000 - 100000	3)	0 - 100000 V	0 -	500 mA		19" / 600 mm	38 U / 1700 mm	800 mm**	250/600 kg
HCH	1400 - 150000		0 - 150000 V	0 -	8 mA		800 mm*	1400 mm*	760 mm*	760 kg
HCH	2800 - 150000	3)	0 - 150000 V	0 -	15 mA		800 mm*	1400 mm*	760 mm*	760 kg
HCH	4200 - 150000	3)	0 - 150000 V	0 -	25 mA		800 mm*	1400 mm*	760 mm*	760 kg
HCH	10000 - 150000	3)	0 - 150000 V	0 -	60 mA		19" / 600 mm	20 U / 1100 mm	600 mm**	100/600 kg
HCH	15000 - 150000	3)	0 - 150000 V	0 -	100 mA		19" / 600 mm	20 U / 1100 mm	600 mm**	115/600 kg
HCH	20000 - 150000	3)	0 - 150000 V	0 -	130 mA		19" / 600 mm	29 U / 1500 mm	600 mm**	150/680 kg
HCH	30000 - 150000	3)	0 - 150000 V	0 -	200 mA		19" / 600 mm	29 U / 1500 mm	600 mm**	170/680 kg
HCH	40000 - 150000	3)	0 - 150000 V	0 -	250 mA		19" / 600 mm	29 U / 1500 mm	800 mm**	200/680 kg
HCH	50000 - 150000	3)	0 - 150000 V	0 -	300 mA		19" / 600 mm	38 U / 2000 mm	800 mm**	250/680 kg
HCH	350 - 200000		0 - 200000 V	0 -	1,5 mA		950 mm*	1700 mm*	700 mm*	910 kg
HCH	700 - 200000		0 - 200000 V	0 -	3 mA		955 mm*	1650 mm*	760 mm*	910 kg
HCH	1400 - 200000		0 - 200000 V	0 -	6 mA		955 mm*	1650 mm*	850 mm*	960 kg
HCH	2800 - 200000	3)	0 - 200000 V	0 -	12 mA		955 mm*	1650 mm*	850 mm*	960 kg
HCH	4200 - 200000	3)	0 - 200000 V	0 -	20 mA		955 mm*	1830 mm*	850 mm*	1000 kg
HCH	10000 - 200000	3)	0 - 200000 V	0 -	50 mA		19" / 600 mm	20 U / 1100 mm	600 mm**	100/650 kg
HCH	15000 - 200000	3)	0 - 200000 V	0 -	75 mA		19" / 600 mm	20 U / 1100 mm	600 mm**	115/650 kg
HCH	20000 - 200000	3)	0 - 200000 V	0 -	100 mA		19" / 600 mm	29 U / 1500 mm	600 mm**	150/750 kg
HCH	30000 - 200000	3)	0 - 200000 V	0 -	150 mA		19" / 600 mm	29 U / 1500 mm	600 mm**	170/750 kg
HCH	40000 - 200000	3)	0 - 200000 V	0 -	200 mA		19" / 600 mm	29 U / 1500 mm	600 mm**	200/850 kg
HCH	50000 - 200000	3)	0 - 200000 V	0 -	250 mA		19" / 600 mm	38 U / 2000 mm	800 mm**	250/850 kg

3) Three phase mains connection

Mating high voltage connectors for units with up to 10A output current are included in the scope of delivery. Mating high voltage cables you'll find beginning with page 59.

All units are available with polarity reversal switch. For orders without polarity switch please state the required output polarity.

*) The dimensions are valid for the high voltage part with power part. on top. They are non-binding guidelines.

**) The dimensions are valid for the power part. The high voltage part is housed in a separate oil filled container. Weight is stated: Power part / High voltage container

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High voltage power supplies thyristor regulated
Series HYN from 3,5 kV to 20 kV / 7 kW to 50 kW

Design example

HYN 35000 - 3500
3,5kV / 10 A

Features:

- Simple construction
- Extremely robust
- High efficiency
- Short circuit proof and unlimited operation with full current in short circuit condition
- Voltage and current regulation with automatic and sharp transition; control mode indicated by LEDs
- Voltage and current setting with 10-turn potentiometers with precision scale; the adjusting knob can be locked
- Limitation of inrush current on switching on
- Suitable also for inductive and capacitive loads
- Interlock loop to monitor the external load and internal loop as a standard
- Elapsed-hour meter as a standard

Function:

The mains voltage is transformed to high voltage potential. Either on the primary side or on the secondary side, a phase cutting circuit with thyristors is installed. The rectified voltage is smoothed by a LC - filter.

Design:

- Depending on Voltage and Power the units are built as single or double 19" cabinets of various height. The side covers are detachable, the rear door is lockable.
- All cabinets are equipped with fork-lift-compatible plinths and removable crane-eyes.
- Single 19"- cabinets up to 38U are easily transportable by fork-lift.
- Cooling is carried out via built-in fans, with the air being exhausted (depending upon type) either via the rear or the top.

Output:

- Output isolation:
  The required output polarity must be stated with the order. The requested output polarity will then be available at the HV connector and the “0V” terminal will be firmly connected to earth. A polarity reversal switch is optionally available.
- Output terminals:
  All output terminals are located at the rear side of the cabinet. For Output current up to 10A high voltage connectors with the appropriate dielectric strength are installed. Mating connectors are delivered with the power supply.

Technical Data:

- Mains connection:
  400V ±10% 47Hz to 53Hz, three-phase
- Ambient temperature:
  0°C to +40°C

The following data applies for voltage and current regulation, and refers to the rated value (unless otherwise stated):
(For explanations please refer to Definitions and Terms on page 61.)

- Setting range:
  from approx. 1% to 100%
- Setting resolution:
  $\pm 2 \times 10^{-4}$
- Residual ripple:
  $<1 \times 10^{-2}$pp + 100mVpp
- Recovery time:
  <100ms to 500ms (depending on type) for load variations of ±10%
- Setting time at nominal load:
  <100ms to 2 sec (depending on type) for changes of the output voltage from 10% to 90% or 90% to 10%
- Discharging time constant for output without load:
  approx. 5sec. to 60sec., depending on type
- Deviation:
  for ±10% mains voltage variation:
  $<\pm 1 \times 10^{-4}$
  for no load / full load:
  $<\pm 1 \times 10^{-3}$
  over 8 h under constant conditions:
  $<\pm 3 \times 10^{-4}$
  within the temperature range:
  $<\pm 3 \times 10^{-4}$ / K

Possible Options:

- Analogue programming (see page 52)
- Analogue programming, floating (see page 52)
- Computer interface - IEEE 488, RS 232, RS 422, Profibus DP (more on request) (see page 54)
- Polarity reversal switch. Please specify the output polarity, when ordering without polarity reversal switch. (see page 56)
- Internal resistance setting and regulation (see page 56)
- Power regulation with display (see page 56)
- Roller blades for cabinet units

More options and special solutions on request. Some options may involve changes to the description of the unit - especially concerning the mechanical design.

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High voltage power supplies thyristor regulated
Series HYN from 3,5 kV to 20 kV / 7 kW to 50 kW

Design example

HYN 200000 - 20000
20kV / 10 A
customer specific design, puls load capability for 20A

Type		Voltage		Current		Width	Height	Depth	Weight
HYN	7000 - 3500	0 -	3500 V	0 -	2 A	19" / 600 mm	29 U / 1500 mm	600 mm	230 kg
HYN	10500 - 3500	0 -	3500 V	0 -	3 A	19" / 600 mm	29 U / 1500 mm	600 mm	340 kg
HYN	14000 - 3500	0 -	3500 V	0 -	4 A	19" / 600 mm	29 U / 1500 mm	600 mm	400 kg
HYN	21000 - 3500	0 -	3500 V	0 -	6 A	19" / 600 mm	38 U / 2000 mm	800 mm	480 kg
HYN	28000 - 3500	0 -	3500 V	0 -	8 A	19" / 600 mm	38 U / 2000 mm	800 mm	600 kg
HYN	35000 - 3500	0 -	3500 V	0 -	10 A	19" / 600 mm	38 U / 2000 mm	800 mm	800 kg
HYN	70000 - 3500	0 -	3500 V	0 -	20 A	2 x 19" / 1200 mm	38 U / 2000 mm	800 mm	1400 kg
HYN	7000 - 6500	0 -	6500 V	0 -	1 A	19" / 600 mm	29 U / 1500 mm	600 mm	230 kg
HYN	10500 - 6500	0 -	6500 V	0 -	1,5 A	19" / 600 mm	29 U / 1500 mm	600 mm	340 kg
HYN	14000 - 6500	0 -	6500 V	0 -	2 A	19" / 600 mm	38 U / 2000 mm	800 mm	400 kg
HYN	21000 - 6500	0 -	6500 V	0 -	3 A	19" / 600 mm	38 U / 2000 mm	800 mm	480 kg
HYN	28000 - 6500	0 -	6500 V	0 -	4 A	19" / 600 mm	38 U / 2000 mm	800 mm	600 kg
HYN	35000 - 6500	0 -	6500 V	0 -	5 A	19" / 600 mm	38 U / 2000 mm	800 mm	800 kg
HYN	70000 - 6500	0 -	6500 V	0 -	10 A	2 x 19" / 1200 mm	38 U / 2000 mm	800 mm	1400 kg
HYN	7000 - 12500	0 -	12500 V	0 -	0,5 A	19" / 600 mm	29 U / 1500 mm	600 mm	230 kg
HYN	10500 - 12500	0 -	12500 V	0 -	0,8 A	19" / 600 mm	29 U / 1500 mm	600 mm	340 kg
HYN	14000 - 12500	0 -	12500 V	0 -	1 A	19" / 600 mm	38 U / 2000 mm	800 mm	400 kg
HYN	21000 - 12500	0 -	12500 V	0 -	1,5 A	19" / 600 mm	38 U / 2000 mm	800 mm	480 kg
HYN	28000 - 12500	0 -	12500 V	0 -	2 A	19" / 600 mm	38 U / 2000 mm	800 mm	600 kg
HYN	35000 - 12500	0 -	12500 V	0 -	2,5 A	19" / 600 mm	38 U / 2000 mm	800 mm	800 kg
HYN	50000 - 12500	0 -	12500 V	0 -	4 A	2 x 19" / 1200 mm	38 U / 2000 mm	800 mm	1200 kg
HYN	7000 - 20000	0 -	20000 V	0 -	0,3 A	19" / 600 mm	29 U / 1500 mm	600 mm	230 kg
HYN	10500 - 20000	0 -	20000 V	0 -	0,5 A	19" / 600 mm	29 U / 1500 mm	600 mm	340 kg
HYN	14000 - 20000	0 -	20000 V	0 -	0,6 A	19" / 600 mm	38 U / 2000 mm	800 mm	400 kg
HYN	21000 - 20000	0 -	20000 V	0 -	1 A	19" / 600 mm	38 U / 2000 mm	800 mm	480 kg
HYN	28000 - 20000	0 -	20000 V	0 -	1,2 A	19" / 600 mm	38 U / 2000 mm	800 mm	600 kg
HYN	35000 - 20000	0 -	20000 V	0 -	1,5 A	19" / 600 mm	38 U / 2000 mm	800 mm	800 kg
HYN	50000 - 20000	0 -	20000 V	0 -	2,5 A	2 x 19" / 1200 mm	38 U / 2000 mm	800 mm	1200 kg

Mating high voltage connectors for units with up to 10A output current are included in the scope of delivery. Mating high voltage cables you'll find beginning with page 59.
All units are available with polarity reversal switch. For orders without polarity switch please state the required output polarity.

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High voltage cassette power supplies EURO-size
Series HCE from 125 V to 35 kV / 7 W to 350 W

Design examples

from left:

HCE 7 - 6500
6,5kV / 1 mA

HCE 7 - 20000
20kV / 0,3 mA

HCE 35 - 35000
35kV / 1 mA

HCE 350 - 2000
2kV / 150 mA

Features:

- Compact size
- Light-weight
- For units from 6.5kV nominal voltage on, all HV components are moulded in (removable) silicon
- Short circuit and flashover proof
- Unlimited operation with rated current in a short-circuit condition
- Unlimited operation with rated power
- Voltage regulation
- Adjustable current limit
- Control mode indicated by LEDs
- Screwdriver adjustment of voltage and current on the front panel
- Standard analogue programming plus HV ON/OFF input and monitor outputs
- Measuring terminals for voltage and current monitors on the front panel
- Suitable for use with capacitive loads
- Suitable for use with photomultipliers

Function:

In principle, the rectified line voltage drives a square wave generator of fixed frequency, whose AC voltage is transformed, rectified and filtered, producing the output voltage. For regulation, the square wave voltage is pulse width modulated.

Design:

- EURO-cassette design. Width depending on type.
- 19" frames are available as an option.

Output:

- Output isolation:
  The polarity is positive or negative and has to be indicated with the order.
  The "0V" - terminal of the output is connected to earth but may be disconnected as needed. When disconnected, the "0V" (earthy) terminal may float with respect to earth up to ±125V.
- Output terminals:
  Outputs are located on the rear of the units.
  For units up to 650V nominal voltage, the output is on 4 mm safety connectors.
  From 1250V nominal voltage on, HV-connectors are provided. The mating HV-connectors are delivered with the unit.

Technical Data:

- Mains connection:
  230V ±10% 47Hz to 63Hz
- Ambient temperature:
  0°C to +40°C

The following data applies for voltage and current regulation, and refers to the rated value (unless otherwise stated):
(For explanations please refer to Definitions and Terms on page 61.)

- Setting range:
  from approx. 0,1% to 100%
- Setting resolution:
  $\pm 1 \times 10^{-4}$
- Residual ripple:
  $<1 \times 10^{-4}$pp + 50mVpp,
  typ. 5×10^{-5}pp
- Recovery time:
  <1ms for load changes from 10% to 100% or from 100% to 10%.
- Setting time at nominal load:
  <200ms for changes of the output voltage from 10% to 90% or 90% to 10%
- Discharging time constant for output without load:
  approx. 0,5sec. to 5sec., depending on type
- Deviation:
  for ±10% mains voltage variation:
  $<\pm 1 \times 10^{-5}$
  for no load / full load:
  $<2 \times 10^{-4}$
  over 8 h under constant conditions:
  $<\pm 1 \times 10^{-4}$
  within the temperature range:
  $<\pm 1{,}5 \times 10^{-4}$ / K

Voltage and current adjustment by screwdriver or via analogue programming.

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High voltage cassette power supplies EURO-size
Series HCE from 125 V to 35 kV / 7 W to 350 W

Rear side with mains connection, high voltage output and analogue programming as a standard

Type			Voltage		Current	Width	Height	Depth	Weight
HCE	7 - 125	●	0 - 125 V	0 -	50 mA	14 U / 71 mm	3 U / 133 mm	170 mm	1,2 kg
HCE	35 - 125	●	0 - 125 V	0 -	250 mA	21 U / 107 mm	3 U / 133 mm	170 mm	1,5 kg
HCE	140 - 125	●	0 - 125 V	0 -	1 A	21 U / 107 mm	6 U / 262 mm	230 mm	3,0 kg
HCE	350 - 125	●	0 - 125 V	0 -	2,5 A	21 U / 107 mm	6 U / 262 mm	230 mm	4,0 kg
HCE	7 - 200	●	0 - 200 V	0 -	30 mA	14 U / 71 mm	3 U / 133 mm	170 mm	1,2 kg
HCE	35 - 200	●	0 - 200 V	0 -	150 mA	21 U / 107 mm	3 U / 133 mm	170 mm	1,5 kg
HCE	140 - 200	●	0 - 200 V	0 -	600 mA	21 U / 107 mm	6 U / 262 mm	230 mm	3,0 kg
HCE	350 - 200	●	0 - 200 V	0 -	1,5 A	21 U / 107 mm	6 U / 262 mm	230 mm	4,0 kg
HCE	7 - 350	●	0 - 350 V	0 -	20 mA	14 U / 71 mm	3 U / 133 mm	170 mm	1,2 kg
HCE	35 - 350	●	0 - 350 V	0 -	100 mA	21 U / 107 mm	3 U / 133 mm	170 mm	1,5 kg
HCE	140 - 350	●	0 - 350 V	0 -	400 mA	21 U / 107 mm	6 U / 262 mm	230 mm	3,0 kg
HCE	350 - 350	●	0 - 350 V	0 -	1 A	21 U / 107 mm	6 U / 262 mm	230 mm	4,0 kg
HCE	7 - 650	●	0 - 650 V	0 -	10 mA	14 U / 71 mm	3 U / 133 mm	170 mm	1,2 kg
HCE	35 - 650	●	0 - 650 V	0 -	50 mA	21 U / 107 mm	3 U / 133 mm	170 mm	1,5 kg
HCE	140 - 650	●	0 - 650 V	0 -	200 mA	21 U / 107 mm	6 U / 262 mm	230 mm	3,0 kg
HCE	350 - 650	●	0 - 650 V	0 -	500 mA	21 U / 107 mm	6 U / 262 mm	230 mm	4,0 kg
HCE	7 - 1250	●	0 - 1250 V	0 -	5 mA	14 U / 71 mm	3 U / 133 mm	170 mm	1,2 kg
HCE	35 - 1250	●	0 - 1250 V	0 -	25 mA	21 U / 107 mm	3 U / 133 mm	170 mm	1,5 kg
HCE	140 - 1250	●	0 - 1250 V	0 -	100 mA	21 U / 107 mm	6 U / 262 mm	230 mm	3,0 kg
HCE	350 - 1250	●	0 - 1250 V	0 -	250 mA	21 U / 107 mm	6 U / 262 mm	230 mm	4,0 kg
HCE	7 - 2000	●	0 - 2000 V	0 -	3 mA	14 U / 71 mm	3 U / 133 mm	170 mm	1,2 kg
HCE	35 - 2000	●	0 - 2000 V	0 -	15 mA	21 U / 107 mm	3 U / 133 mm	170 mm	1,5 kg
HCE	140 - 2000	●	0 - 2000 V	0 -	60 mA	21 U / 107 mm	6 U / 262 mm	230 mm	3,0 kg
HCE	350 - 2000	●	0 - 2000 V	0 -	150 mA	21 U / 107 mm	6 U / 262 mm	230 mm	4,0 kg

● all cassette power supplies available from stock

For 1250V and higher, mating high voltage connectors are included in the scope of delivery. Mating high voltage cables you'll find beginning with page 59.

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High voltage cassette power supplies EURO-size
Series HCE from 125 V to 35 kV / 7 W to 350 W

19“- frames are available as an accessory

Type			Voltage	Current	Width	Height	Depth	Weight
HCE	7 - 3500	●	0 - 3500 V	0 - 2 mA	14 U / 71 mm	3 U / 133 mm	170 mm	1,2 kg
HCE	35 - 3500	●	0 - 3500 V	0 - 10 mA	21 U / 107 mm	3 U / 133 mm	170 mm	1,5 kg
HCE	140 - 3500	●	0 - 3500 V	0 - 40 mA	21 U / 107 mm	6 U / 262 mm	230 mm	3,0 kg
HCE	350 - 3500	●	0 - 3500 V	0 - 100 mA	21 U / 107 mm	6 U / 262 mm	230 mm	4,0 kg
HCE	7 - 6500	●	0 - 6500 V	0 - 1 mA	14 U / 71 mm	3 U / 133 mm	170 mm	1,3 kg
HCE	35 - 6500	●	0 - 6500 V	0 - 5 mA	21 U / 107 mm	3 U / 133 mm	170 mm	1,5 kg
HCE	140 - 6500	●	0 - 6500 V	0 - 20 mA	21 U / 107 mm	6 U / 262 mm	230 mm	5,0 kg
HCE	350 - 6500	●	0 - 6500 V	0 - 50 mA	21 U / 107 mm	6 U / 262 mm	230 mm	6,0 kg
HCE	7 - 12500	●	0 - 12500 V	0 - 0,5 mA	14 U / 71 mm	3 U / 133 mm	170 mm	1,3 kg
HCE	35 - 12500	●	0 - 12500 V	0 - 2,5 mA	21 U / 107 mm	3 U / 133 mm	170 mm	1,8 kg
HCE	140 - 12500	●	0 - 12500 V	0 - 10 mA	28 U / 142 mm	6 U / 262 mm	230 mm	5,0 kg
HCE	350 - 12500	●	0 - 12500 V	0 - 25 mA	28 U / 142 mm	6 U / 262 mm	230 mm	6,0 kg
HCE	7 - 20000	●	0 - 20000 V	0 - 0,3 mA	21 U / 107 mm	3 U / 133 mm	170 mm	2,3 kg
HCE	35 - 20000	●	0 - 20000 V	0 - 1,5 mA	21 U / 107 mm	3 U / 133 mm	170 mm	2,5 kg
HCE	140 - 20000	●	0 - 20000 V	0 - 6 mA	28 U / 142 mm	6 U / 262 mm	230 mm	5,0 kg
HCE	350 - 20000	●	0 - 20000 V	0 - 15 mA	28 U / 142 mm	6 U / 262 mm	230 mm	6,0 kg
HCE	7 - 35000	●	0 - 35000 V	0 - 0,2 mA	28 U / 142 mm	3 U / 133 mm	170 mm	2,5 kg
HCE	35 - 35000	●	0 - 35000 V	0 - 1 mA	28 U / 142 mm	3 U / 133 mm	170 mm	2,8 kg
HCE	140 - 35000	●	0 - 35000 V	0 - 4 mA	28 U / 142 mm	6 U / 262 mm	230 mm	5,0 kg
HCE	350 - 35000	●	0 - 35000 V	0 - 10 mA	28 U / 142 mm	6 U / 262 mm	230 mm	6,0 kg

● all cassette power supplies available from stock

For 1250V and higher, mating high voltage connectors are included in the scope of delivery. Mating high voltage cables you'll find beginning with page 59.

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High voltage cassette power supplies IMS-size
Series HCN7E from 125 V to 35 kV / 7 W

Design examples

HCN7E - 12500
12500V / 0,5 mA

HCN7E - 35000
35000V / 0,2 mA

Features:

- Compact size
- Light-weight
- For units from 6.5kV nominal voltage on, all HV components are moulded in (removable) silicon
- Short circuit and flashover proof
- Unlimited operation with rated current in a short-circuit condition
- Voltage regulation with current limitation
- Control mode indicated by LEDs
- Voltage setting with 10-turn potentiometers with precision scale; the adjusting knob can be locked
- Standard analogue programming plus HV ON/OFF input and monitor outputs
- Measuring terminals for voltage and current on the front panel
- Suitable for use with capacitive loads
- Suitable for use with photomultipliers

Function:

In principle, the rectified line voltage drives a square wave generator of fixed frequency, whose AC voltage is transformed, rectified and filtered, producing the output voltage. For regulation, the square wave voltage is pulse width modulated.

Design:

- IMS-cassette design. Width depending on type.
- Table-top-cases are available as an option

Output:

- Output isolation:
  The polarity is positive or negative and has to be indicated with the order.
  The "0V" - terminal of the output is connected to earth but may be disconnected as needed. When disconnected, the "0V" (earthy) terminal may float with respect to earth up to ±300V.
- Output terminals:
  Outputs are located on the rear of the units.
  For units up to 650V nominal voltage, the output is on 4 mm safety connectors.
  From 1250V nominal voltage on, HV-connectors are provided. The mating HV-connectors are delivered with the unit.

Technical Data:

- Mains connection:
  230V ±10% 47Hz to 63Hz
- Ambient temperature:
  0°C to +40°C

The following data applies for voltage and current regulation, and refers to the rated value (unless otherwise stated):
(For explanations please refer to Definitions and Terms on page 61.)

- Setting range:
  from approx. 0,1% to 100%
- Setting resolution:
  ±1 x 10^{-4}
- Residual ripple:
  <1 x 10^{-4}pp + 50mVpp, typ. 5 x 10-5pp
- Recovery time:
  <1ms for load changes from 10% to 100% or from 100% to 10%.
- Setting time at nominal load:
  <200ms for changes of the output voltage from 10% to 90% or 90% to 10%
- Discharging time constant for output without load:
  approx. 0,5sec. to 2sec., depending on type
- Deviation:
  for ±10% mains voltage variation:
  < ± 1 x 10^{-5}
  for no load / full load:
  <2 x 10^{-4}
  over 8 h under constant conditions:
  <±1 x 10^{-4}
  within the temperature range:
  <±1,5 x 10^{-4} / K

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V 0108

High voltage cassette power supplies IMS-size
Series HCN7E from 125 V to 35 kV / 7 W

Table top cases are available as an accessory

Type			Voltage		Current	Width	Height	Depth	Weight
HCN 7E	- 125	●	0 - 125 V	max.	50 mA	2/12 19" / 69 mm	4 U / 177 mm	250 mm	2 kg
HCN 7E	- 200	●	0 - 200 V	max.	30 mA	2/12 19" / 69 mm	4 U / 177 mm	250 mm	2 kg
HCN 7E	- 350	●	0 - 350 V	max.	20 mA	2/12 19" / 69 mm	4 U / 177 mm	250 mm	2 kg
HCN 7E	- 650	●	0 - 650 V	max.	10 mA	2/12 19" / 69 mm	4 U / 177 mm	250 mm	2 kg
HCN 7E	- 1250	●	0 - 1250 V	max.	5 mA	2/12 19" / 69 mm	4 U / 177 mm	250 mm	2 kg
HCN 7E	- 2000	●	0 - 2000 V	max.	3 mA	2/12 19" / 69 mm	4 U / 177 mm	250 mm	2 kg
HCN 7E	- 3500	●	0 - 3500 V	max.	2 mA	2/12 19" / 69 mm	4 U / 177 mm	250 mm	2 kg
HCN 7E	- 6500	●	0 - 6500 V	max.	1 mA	2/12 19" / 69 mm	4 U / 177 mm	250 mm	2 kg
HCN 7E	- 12500	●	0 - 12500 V	max.	0,5 mA	2/12 19" / 69 mm	4 U / 177 mm	250 mm	2 kg
HCN 7E	- 20000	●	0 - 20000 V	max.	0,3 mA	2/12 19" / 69 mm	4 U / 177 mm	250 mm	2 kg
HCN 7E	- 35000	●	0 - 35000 V	max.	0,2 mA	3/12 19" /104 mm	4 U / 177 mm	250 mm	3,5 kg

● all cassette power supplies available from stock

For 1250V and higher, mating high voltage connectors are included in the scope of delivery. Mating high voltage cables you'll find beginning with page 59.

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Capacitor charging power supplies
Series HCK from 2 kV to 65 kV / 100 J/s to 20 kJ/s

Design example

HCK 200 - 12500
12500V / 30 mA

Features:

- Efficiency approx. 90%
- In units of 20kV and higher, the HV-components are moulded in (removable) silicon resin. From 35kV / 5000 J/s on, the HV-components are isolated in oil
- Continuous charging or triggered charging selectable (external trigger input via opto coupler for 12 - 24V)
- Charging with adjustable constant current (without overshoot)
- Voltage and current setting by 10-turn potentiometers with precision scale; the adjusting knob can be locked
- Suitable for continuous or compensation charging
- No external protection resistor is required
- Permanent short-circuit proof
- 4½ digit DVM for charging current and output voltage (for table-top models)
- Pre-selection of the output voltage with display
- The charging process is either permanent or controlled via a potential free input
- End of charge signal, when the final voltage is reached, via front panel LED and a potential-free interface for signalling to an external control system (opto coupler output)
- Suitable for capacitive loads with resistive elements
- The nominal current can be permanently supplied at maximum output voltage

Function:

The capacitor charging high voltage DC power supplies are designed specifically to the requirements of capacitor charging or capacitor conditioning, i.e. they have a more heavily designed output resistor to withstand a pulsed load and a regulating circuit, optimized for fast switching over between current and voltage regulation and vice versa.
In principle, the rectified line voltage drives a square wave generator of fixed frequency, whose AC voltage is transformed, rectified and filtered, producing the output voltage. For regulation, the square wave voltage is pulse width modulated.

Design:

Up to 2500 J/s nominal power 19" table-top case, higher power in 19" cabinets (depending on type) with oil isolated external HV-container.

Output:

- Output isolation:
  The polarity is positive or negative and has to be indicated with the order.
  The "0V" - terminal of the output is connected to earth but may be disconnected as needed. When disconnected, the "0V" (earthy) terminal may float with respect to earth up to ±300V.
- Output terminals:
  For all HCK units the output is on the rear side of the unit or on a separate HV-container. Mating HV-connectors are included, from 35kV on, assembled with 3 m cable, from 65kV >5000 J/s on with 10 m cable.

Technical Data:

- Mains connection:

  Up to 800 J/s nominal power:
  230V ±10% 47Hz to 63Hz;

  For nominal power 1600 J/s and higher:
  400V ±10% 47Hz to 63Hz 3-phase

- Ambient temperature:
- 0°C to +40°C
- Setting range for the charging voltage:
  from approx. 1% to 100%
- Charging power:
  The specified max. charging power (see table) will be supplied for charging between "0" and the rated voltage. For charging of a partially discharged capacitor a considerably higher charging power, up to the doubles, can be supplied.
- Setting resolution:
  $\pm 1 \times 10^{-4}$
- Reproducibility of the charging voltage with respect to the rated value:
  for ±10% mains voltage variation:
  $< \pm 1 \times 10^{-4}$
  over 8 hours under constant conditions:
  $< \pm 1 \times 10^{-3}$
  within the temperature range:
  $< \pm 2 \times 10^{-4}$ /K
  for a repetition frequency of <10Hz:
  $< \pm 1 \times 10^{-3}$
  for a repetition frequency of >10Hz:
  $< \pm 1 \times 10^{-2}$
- Repetition frequency:
  max. 100Hz
- Residual ripple of the charging current:
  approx. 10%pp (20kHz / 40 kHz)

Possible Options:

- Analogue programming (see page 52)
- Analogue programming, floating (see page 52)
- Computer interface - IEEE 488, RS 232, RS 422, Profibus DP, USB, LAN (more on request) (see page 54)
- Polarity reversal switch available up to 1600 J/s (by request for higher powers) Please specify the output polarity, when ordering without polarity reversal switch. (see page 56)
- Dump switch for the output & the load
- Higher repetition frequency
- Built-in or external discharge circuit for pulse operation
- Higher stability and better reproducibility (see page 56)
- Roller blades for cabinet units

More options and special solutions on request. Some options may involve changes to the description of the unit - especially concerning the mechanical design.

Capacitor charging power supplies
Series HCK from 2 kV to 65 kV / 100 J/s to 20 kJ/s

HCK	100 - 2000		0 -	2000 V	0 -	100 mA	100 J/s	19" / 443 mm	3 U / 133 mm	350 mm	6 kg
HCK	200 - 2000		0 -	2000 V	0 -	200 mA	200 J/s	19" / 443 mm	3 U / 133 mm	350 mm	7 kg
HCK	400 - 2000		0 -	2000 V	0 -	400 mA	400 J/s	19" / 443 mm	3 U / 133 mm	450 mm	11 kg
HCK	800 - 2000		0 -	2000 V	0 -	800 mA	800 J/s	19" / 443 mm	3 U / 133 mm	450 mm	13 kg
HCK	1600 - 2000	3)	0 -	2000 V	0 -	1,6 A	1600 J/s	19" / 443 mm	5 U / 221 mm	550 mm	25 kg
HCK	2500 - 2000	3)	0 -	2000 V	0 -	2,5 A	2500 J/s	19" / 443 mm	7 U / 310 mm	550 mm	35 kg
HCK	5000 - 2000	3)	0 -	2000 V	0 -	5 A	5000 J/s	19" / 600 mm	20 U / 1100 mm	600 mm	120 kg
HCK	10000 - 2000	3)	0 -	2000 V	0 -	10 A	10000 J/s	19" / 600 mm	38 U / 2000 mm	800 mm	240 kg
HCK	20000 - 2000	3)	0 -	2000 V	0 -	20 A	20000 J/s	19" / 600 mm	38 U / 2000 mm	800 mm	360 kg
HCK	100 - 3500		0 -	3500 V	0 -	50 mA	100 J/s	19" / 443 mm	3 U / 133 mm	350 mm	6 kg
HCK	200 - 3500		0 -	3500 V	0 -	100 mA	200 J/s	19" / 443 mm	3 U / 133 mm	350 mm	7 kg
HCK	400 - 3500		0 -	3500 V	0 -	200 mA	400 J/s	19" / 443 mm	3 U / 133 mm	450 mm	11 kg
HCK	800 - 3500		0 -	3500 V	0 -	400 mA	800 J/s	19" / 443 mm	3 U / 133 mm	450 mm	13 kg
HCK	1600 - 3500	3)	0 -	3500 V	0 -	800 mA	1600 J/s	19" / 443 mm	5 U / 221 mm	550 mm	25 kg
HCK	2500 - 3500	3)	0 -	3500 V	0 -	1,4 A	2500 J/s	19" / 443 mm	7 U / 310 mm	550 mm	35 kg
HCK	5000 - 3500	3)	0 -	3500 V	0 -	2,8 A	5000 J/s	19" / 600 mm	20 U / 1100 mm	600 mm	120 kg
HCK	10000 - 3500	3)	0 -	3500 V	0 -	5,7 A	10000 J/s	19" / 600 mm	38 U / 2000 mm	800 mm	240 kg
HCK	20000 - 3500	3)	0 -	3500 V	0 -	11 A	20000 J/s	19" / 600 mm	38 U / 2000 mm	800 mm	360 kg
HCK	100 - 6500		0 -	6500 V	0 -	30 mA	100 J/s	19" / 443 mm	3 U / 133 mm	350 mm	6 kg
HCK	200 - 6500		0 -	6500 V	0 -	60 mA	200 J/s	19" / 443 mm	3 U / 133 mm	350 mm	7 kg
HCK	400 - 6500		0 -	6500 V	0 -	120 mA	400 J/s	19" / 443 mm	3 U / 133 mm	450 mm	11 kg
HCK	800 - 6500		0 -	6500 V	0 -	250 mA	800 J/s	19" / 443 mm	3 U / 133 mm	450 mm	13 kg
HCK	1600 - 6500	3)	0 -	6500 V	0 -	500 mA	1600 J/s	19" / 443 mm	5 U / 221 mm	550 mm	25 kg
HCK	2500 - 6500	3)	0 -	6500 V	0 -	750 mA	2500 J/s	19" / 443 mm	7 U / 310 mm	550 mm	35 kg
HCK	5000 - 6500	3)	0 -	6500 V	0 -	1,5 A	5000 J/s	19" / 600 mm	20 U / 1100 mm	600 mm	120 kg
HCK	10000 - 6500	3)	0 -	6500 V	0 -	3 A	10000 J/s	19" / 600 mm	38 U / 2000 mm	800 mm	240 kg
HCK	20000 - 6500	3)	0 -	6500 V	0 -	6 A	20000 J/s	19" / 600 mm	38 U / 2000 mm	800 mm	360 kg
HCK	100 - 12500		0 -	12500 V	0 -	15 mA	100 J/s	19" / 443 mm	3 U / 133 mm	350 mm	6 kg
HCK	200 - 12500		0 -	12500 V	0 -	30 mA	200 J/s	19" / 443 mm	3 U / 133 mm	350 mm	7 kg
HCK	400 - 12500		0 -	12500 V	0 -	60 mA	400 J/s	19" / 443 mm	3 U / 133 mm	450 mm	11 kg
HCK	800 - 12500		0 -	12500 V	0 -	120 mA	800 J/s	19" / 443 mm	4 U / 177 mm	450 mm	21 kg
HCK	1600 - 12500	3)	0 -	12500 V	0 -	250 mA	1600 J/s	19" / 443 mm	5 U / 221 mm	550 mm	35 kg
HCK	2500 - 12500	3)	0 -	12500 V	0 -	400 mA	2500 J/s	19" / 443 mm	7 U / 310 mm	550 mm	40 kg
HCK	5000 - 12500	3)	0 -	12500 V	0 -	800 mA	5000 J/s	19" / 600 mm	20 U / 1100 mm	600 mm	120 kg
HCK	10000 - 12500	3)	0 -	12500 V	0 -	1,5 A	10000 J/s	19" / 600 mm	38 U / 2000 mm	800 mm	240 kg
HCK	20000 - 12500	3)	0 -	12500 V	0 -	3 A	20000 J/s	19" / 600 mm	38 U / 2000 mm	800 mm	360 kg

3) Three phase mains connection

Mating high voltage connectors (from 35kV complete with 3m cable, from 65kV >5000J/s with 10m cable) are included in the scope of delivery. Mating high voltage cables you'll find beginning with page 59.

All units are available with polarity reversal switch. For orders without polarity switch please state the required output polarity.

Capacitor chargers with different from the type range voltage or power are available on request. (From approx. 100V to approx. 200 kV)

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Capacitor charging power supplies
Series HCK from 2 kV to 65 kV / 100 J/s to 20 kJ/s

HCK 150000M - 12000
12kV / to 35 A
customer specific design,
4-fould 19“ cabinet, cubical

HCK 6750M - 30000
(Side cover removed)
30kV / 450 mA
(650mA up to 15kV)

HCK 5000 - 12500
12,5kV / 800 mA

Design examples

Type			Voltage		Current	Charg. pow.	Width	Height	Depth	Weight
HCK	100 - 20000		0 - 20000 V	0 -	10 mA	100 J/s	19" / 443 mm	3 U / 133 mm	350 mm	6 kg
HCK	200 - 20000		0 - 20000 V	0 -	20 mA	200 J/s	19" / 443 mm	3 U / 133 mm	350 mm	9 kg
HCK	400 - 20000		0 - 20000 V	0 -	40 mA	400 J/s	19" / 433 mm	3 U / 133 mm	450 mm	14 kg
HCK	800 - 20000		0 - 20000 V	0 -	80 mA	800 J/s	19" / 443 mm	4 U / 177 mm	550 mm	25 kg
HCK	1600 - 20000	3)	0 - 20000 V	0 -	160 mA	1600 J/s	19" / 443 mm	5 U / 221 mm	550 mm	35 kg
HCK	2500 - 20000	3)	0 - 20000 V	0 -	250 mA	2500 J/s	19" / 443 mm	7 U / 310 mm	550 mm	40 kg
HCK	5000 - 20000	3)	0 - 20000 V	0 -	500 mA	5000 J/s	19" / 600 mm	29 U / 1500 mm	600 mm	120 kg
HCK	10000 - 20000	3)	0 - 20000 V	0 -	1 A	10000 J/s	19" / 600 mm	38 U / 2000 mm	800 mm	240 kg
HCK	20000 - 20000	3)	0 - 20000 V	0 -	2 A	20000 J/s	19" / 600 mm	38 U / 2000 mm	800 mm	360 kg
HCK	100 - 35000		0 - 35000 V	0 -	5 mA	100 J/s	19" / 443 mm	3 U / 133 mm	450 mm	12 kg
HCK	200 - 35000		0 - 35000 V	0 -	10 mA	200 J/s	19" / 443 mm	3 U / 133 mm	450 mm	12 kg
HCK	400 - 35000		0 - 35000 V	0 -	20 mA	400 J/s	19" / 433 mm	3 U / 133 mm	550 mm	30 kg
HCK	800 - 35000		0 - 35000 V	0 -	40 mA	800 J/s	19" / 443 mm	4 U / 177 mm	550 mm	30 kg
HCK	1600 - 35000	3)	0 - 35000 V	0 -	80 mA	1600 J/s	19" / 443 mm	6 U / 266 mm	550 mm	50 kg
HCK	2500 - 35000	3)	0 - 35000 V	0 -	140 mA	2500 J/s	19" / 443 mm	7 U / 310 mm	550 mm	50 kg
HCK	5000 - 35000	3)	0 - 35000 V	0 -	280 mA	5000 J/s	19" / 600 mm	38 U / 2000 mm	800 mm	390 kg
HCK	10000 - 35000	3)	0 - 35000 V	0 -	570 mA	10000 J/s	19" / 600 mm	38 U / 2000 mm	800 mm	450 kg
HCK	20000 - 35000	3)	0 - 35000 V	0 -	1,1 A	20000 J/s	2x19" / 1200 mm	38 U / 2000 mm	800 mm	720 kg
HCK	100 - 65000		0 - 65000 V	0 -	3 mA	100 J/s	19" / 443 mm	5 U / 221 mm*	450 mm**	45 kg
HCK	200 - 65000		0 - 65000 V	0 -	6 mA	200 J/s	19" / 443 mm	5 U / 221 mm*	450 mm**	50 kg
HCK	400 - 65000		0 - 65000 V	0 -	12 mA	400 J/s	19" / 433 mm	7 U / 310 mm*	550 mm	55 kg
HCK	800 - 65000		0 - 65000 V	0 -	25 mA	800 J/s	19" / 443 mm	7 U / 310 mm*	550 mm	60 kg
HCK	1600 - 65000	3)	0 - 65000 V	0 -	50 mA	1600 J/s	19" / 443 mm	8 U / 355 mm*	550 mm	80 kg
HCK	2500 - 65000	3)	0 - 65000 V	0 -	75 mA	2500 J/s	19" / 443 mm	10 U / 443 mm*	650 mm	120 kg
HCK	5000 - 65000	3)	0 - 65000 V	0 -	150 mA	5000 J/s	19" / 600 mm	38 U / 2000 mm	800 mm	460 kg
HCK	10000 - 65000	3)	0 - 65000 V	0 -	300 mA	10000 J/s	19" / 600 mm	38 U / 2000 mm	800 mm	500 kg
HCK	20000 - 65000	3)	0 - 65000 V	0 -	600 mA	20000 J/s	19" / 600 mm	29 U / 1500 mm	600 mm***	200/470 kg

3) Three phase mains connection

All units are available with polarity reversal switch. For orders without polarity switch please state the required output polarity.

*) With polarity reversal switch these units will be 2 units higher.
**) With polarity reversal switch these units will be 550 mm deep.
***) The dimensions are valid for the power part. The high voltage part is housed in a separate oil filled container. Weight is stated: Power part / High voltage container

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Power supplies for superconducting coils
Series NTS to 65 V / to 10000 A

Design example

NTS 250000M - 50
front plate

Features:

- High efficiency
- Short circuit proof and with unlimited operation at full current in short-circuit condition
- Sense terminals for the compensation of the voltage drop on the power lines. By presetting the voltage, a linear current ramp can be generated
- Energizing and de-energizing voltage can be preset with a single potentiometer
- Constant voltage operation for linear up and down control
- Linear de-energization, with reverse voltage permitted up to the nominal value of the output voltage (2-quadrant operation)
- 4½ digit DVM for current and voltage
- Interlock loop to monitor the external load and internal loop as a standard

Function:

Designed specifically for superconducting coil applications, this power supply family is series regulated via a set of parallel transistors which are driven from a pre-regulation stage which utilises phase controlled thyristors. In this manner, the power lost across the output transistors is kept to as minimum. Thus, the final control element always has a low power dissipation in energizing and static constant current mode.
In de-energizing mode, the transistor stage is working as a current sink and the power is dissipated by means of either air or water cooling.

Design:

- Up to 200A (or approx. 2.5 kW) table-top cases or plug-in units.
- Units with higher current or power are supplied as 19" cabinets. The side panels can be removed, the rear door can be locked.
- All cabinets have removable crane-eyes.
- All cabinets are suitable for fork lift transport.

Cooling:

Up to approx. 1000A (or approx. 5kW de-energizing power), air cooling. For higher currents, or higher powers, water cooling with thermostatic valves for the control of the water flow is used (depending on the power)

Output:

- Output isolation:

  The output is floating. Operating voltage with respect to earth: for air cooled units max. ±300V DC. For water cooled units max. ±100V DC.
- Output terminals:

  Up to 100 A, clamps on the rear. For higher currents we use copper bars.

Technical Data:

- Mains connection:

  Up to approx. 200A nominal current or approx. 1000W: 230V ±10% 47Hz to 53Hz;

  For higher current or power: 400V ±10% 47Hz to 53Hz 3-phase
- Ambient temperature:

  0°C to +40°C

All following data are guide values and will be modified according to the specification. (For explanations please refer to Definitions and Terms on page 61.)

- Setting range for current: from approx. 0,1% to 100%
- Setting range for voltage: from -100% to +100%
- Reproducibility: ±1 x 10^{-4} to ±1 x 10^{-6}
- Setting resolution: 1 x 10-4
- Residual ripple (Voltage): approx. 1 x 10^{-3}pp
- Residual ripple (Current): ±1 x 10^{-4}pp to ±1 x 10^{-6}pp depending on inductivity of the load
- Run up time: from 1sec. to 100 h
- Deviation: for ±10% mains voltage variation: <± 1 x 10^{-5} for no load / full load: <2 x 10^{-4} over 8 h under constant conditions: <±1 x 10^{-4} to ±1 x 10^{-5} within the temperature range: <±1 x 10^{-4} to ±5 x 10^{-6} / K

Possible Options:

- Analogue programming (see page 52)
- Analogue programming, floating (see page 52)
- Roller blades for cabinet units
- Computer interface - IEEE 488, RS 232, RS 422, Profibus DP (more on request) (see page 54)
- Higher stability
- Current control by electronic ramp with digital control; rise and fall times are adjustable manually or via computer interface
- Current limit setting either manually or via computer interface. Resolution up to 1 x 10^{-5} for external setting
- High speed turn-off input with adjustable threshold
- Quench detector to monitor the magnet
- Fast de-energizing in the event of quench or mains failure: A DC circuit breaker or a semiconductor switch disconnects the power supply from the magnet. De-energization takes place with a power resistor, actuated at quench, or via an external circuit
- Short circuit switch (Current source 100mA for heating a sector of the superconducting circuit)
- Water cooling

More options and special solutions on request.

For this type of power supplies we don't indicate a range of standard types since it is meaningful to adapt the power and equipment of the units for each single application.

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Power supplies for superconducting coils
Series NTS to 65 V / to 10000 A

Design examples

NTS 1200M - 10
10V / 120 A
customer specific design,
with remote control unit

NTS 20000M - 10
10V / 2000 A

NTS 250000M - 50
50V / 5000 A

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Linear regulated power supplies unipolar
Series NLN from 6,5 V to 500 V / 35 W to 1400 W

Design example **NLN 1400 - 20**
20V / 60A

Features:

- Output voltage and output current are fast programmable
- No output capacitor
- All units are short circuit proof and allow unlimited operation with full current in short circuit condition
- Voltage and current regulation with automatic and sharp transition; c
- Voltage and current setting with 10-turn potentiometers with precision scale; the adjusting knob can be locked
- 4½ digit DVM for voltage and current (for table-top models)
- Sense terminals for the compensation of voltage drop on the load lines, for units up to 350V nominal voltage.
- The rated voltage always refers to the output terminals
- Suitable also for inductive and capacitive loads
- Standard starting current limitation from 700W nominal power onwards

Function:

The mains voltage is transformed to the appropriate level and rectified. The rectified voltage charges a bank of capacitors of the intermediate circuit to a constant voltage, which it is given via a set of power transistors to the output. The series transistor defines the final stability of the output voltage and the regulation speed.
Optionally a set of power transistors parallel to the output can act as a current sink to provide active pull down ability. The design of linear regulated power supplies is optimized for fast programming speed.

Design:

- For 35W nominal power - ½19" table-top case,
- other models - 19" table-top case (19" rack adaptors available)
- Cooling: Convection or built-in fan with air outlet on the rear

Output:

- Output isolation:
  The output is floating. Operating voltage with respect to earth: max. ±500V.
  Each of the output terminals may be connected to earth.

Output terminals:

4 mm safety connectors up to 20A on the rear panel. For higher currents clamps installed on the rear

Technical Data:

- Mains connection:

  up to 1400W nominal power:
  230V ±10% 47Hz to 63Hz

  for 2800W and higher:
  400V ±10% 47Hz to 63Hz, three-phase

- Ambient temperature:

  0°C to +40°C

- Power loss:
  at nominal load approx. 25%, during short circuit at nominal current approx 125% of the nominal power.

The following data applies for voltage and current regulation, and refers to the rated value (unless otherwise stated):
(For explanations please refer to Definitions and Terms on page 61.)

- Setting range:
  from approx. 0,1% to 100%
- Setting resolution:
  $\pm 1 \times 10^{-4}$
- Residual ripple:
  $<5 \times 10^{-4}$pp + 10mVpp
- Recovery time:
  <50 µs for load changes from 10% to 100% or from 100% to 10%
- Setting time at nominal load:
  <1ms for full range
- Deviation:
  for ±10% mains voltage variation:
  $<\pm 2 \times 10^{-5}$
  for no load / full load:
  $<2 \times 10^{-4}$
  over 8 h under constant conditions:
  $<\pm 2 \times 10^{-4}$
  within the temperature range:
  $<\pm 2 \times 10^{-4}$ / K

Possible Options:

- Analogue programming (The positive output has to be earthed; see also page 52)
- Analogue programming, floating (see page 52)
- Computer interface - IEEE 488, RS 232, RS 422, Profibus DP (more on request) (see page 54)
- Active pull-down control. Parallel to the output is a set of power transistors operating as a current sink. (see page 56)
- Higher programming speed

More options and special solutions on request. Some options may involve changes to the description of the unit - especially concerning the mechanical design.

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Linear regulated power supplies unipolar
Series NLN from 6,5 V to 500 V / 35 W to 1400 W

Type		Voltage		Current		Width	Height	Depth	Weight
NLN	35 - 6,5	0 -	6,5 V	0 -	5 A	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
NLN	140 - 6,5	0 -	6,5 V	0 -	10 A	19" / 443 mm	3 U / 133 mm	350 mm	10 kg
NLN	350 - 6,5	0 -	6,5 V	0 -	30 A	19" / 443 mm	4 U / 177 mm	450 mm	19 kg
NLN	700 - 6,5	0 -	6,5 V	0 -	60 A	19" / 443 mm	4 U / 177 mm	550 mm	38 kg
NLN	1400 - 6,5	0 -	6,5 V	0 -	120 A	19" / 443 mm	7 U / 310 mm	550 mm	50 kg
NLN	35 - 12,5	0 -	12,5 V	0 -	2,5 A	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
NLN	140 - 12,5	0 -	12,5 V	0 -	8 A	19" / 443 mm	3 UH / 133 mm	350 mm	10 kg
NLN	350 - 12,5	0 -	12,5 V	0 -	20 A	19" / 443 mm	4 U / 177 mm	450 mm	19 kg
NLN	700 - 12,5	0 -	12,5 V	0 -	50 A	19" / 443 mm	4 U / 177 mm	550 mm	38 kg
NLN	1400 - 12,5	0 -	12,5 V	0 -	80 A	19" / 443 mm	7 U / 310 mm	550 mm	50 kg
NLN	35 - 20	0 -	20 V	0 -	1,5 A	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
NLN	140 - 20	0 -	20 V	0 -	6 A	19" / 443 mm	3 U / 133 mm	350 mm	10 kg
NLN	350 - 20	0 -	20 V	0 -	15 A	19" / 443 mm	4 U / 177 mm	450 mm	19 kg
NLN	700 - 20	0 -	20 V	0 -	30 A	19" / 443 mm	4 U / 177 mm	550 mm	35 kg
NLN	1400 - 20	0 -	20 V	0 -	60 A	19" / 443 mm	7 U / 310 mm	550 mm	50 kg
NLN	35 - 35	0 -	35 V	0 -	1 A	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
NLN	140 - 35	0 -	35 V	0 -	4 A	19" / 443 mm	3 U / 133 mm	350 mm	10 kg
NLN	350 - 35	0 -	35 V	0 -	10 A	19" / 443 mm	4 U / 177 mm	450 mm	19 kg
NLN	700 - 35	0 -	35 V	0 -	20 A	19" / 443 mm	4 U / 177 mm	550 mm	35 kg
NLN	1400 - 35	0 -	35 V	0 -	40 A	19" / 443 mm	7 U / 310 mm	550 mm	50 kg
NLN	35 - 65	0 -	65 V	0 -	0,5 A	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
NLN	140 - 65	0 -	65 V	0 -	2 A	19" / 443 mm	3 U / 133 mm	350 mm	10 kg
NLN	350 - 65	0 -	65 V	0 -	5 A	19" / 443 mm	4 U / 177 mm	450 mm	19 kg
NLN	700 - 65	0 -	65 V	0 -	10 A	19" / 443 mm	4 U / 177 mm	550 mm	35 kg
NLN	1400 - 65	0 -	65 V	0 -	20 A	19" / 443 mm	7 U / 310 mm	550 mm	50 kg

On request we deliver power supplies of this type also with higher power.

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Linear regulated power supplies unipolar
Series NLN from 6,5 V to 500 V / 35 W to 1400 W

Design example

NLN 22500M - 15
15V / 1500A für 0,5s

Special design:
Intermediate storage of energy
Adjustable internal resistance

Type		Voltage		Current		Width	Height	Depth	Weight
NLN	35 - 125	0 -	125 V	0 -	0,25 A	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
NLN	140 - 125	0 -	125 V	0 -	1 A	19" / 443 mm	3 U / 133 mm	350 mm	10 kg
NLN	350 - 125	0 -	125 V	0 -	2,5 A	19" / 443 mm	4 U / 177 mm	450 mm	19 kg
NLN	700 - 125	0 -	125 V	0 -	5 A	19" / 443 mm	4 U / 177 mm	550 mm	30 kg
NLN	1400 - 125	0 -	125 V	0 -	10 A	19" / 443 mm	7 U / 310 mm	550 mm	50 kg
NLN	35 - 200	0 -	200 V	0 -	0,15 A	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
NLN	140 - 200	0 -	200 V	0 -	0,6 A	19" / 443 mm	3 U / 133 mm	350 mm	10 kg
NLN	350 - 200	0 -	200 V	0 -	1,5 A	19" / 443 mm	4 U / 177 mm	450 mm	19 kg
NLN	700 - 200	0 -	200 V	0 -	3 A	19" / 443 mm	4 U / 177 mm	550 mm	30 kg
NLN	1400 - 200	0 -	200 V	0 -	6 A	19" / 443 mm	7 U / 310 mm	550 mm	50 kg
NLN	35 - 350	0 -	350 V	0 -	0,1 A	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
NLN	140 - 350	0 -	350 V	0 -	0,4 A	19" / 443 mm	3 U / 133 mm	350 mm	10 kg
NLN	350 - 350	0 -	350 V	0 -	1 A	19" / 443 mm	4 U / 177 mm	450 mm	19 kg
NLN	700 - 350	0 -	350 V	0 -	2 A	19" / 443 mm	4 U / 177 mm	550 mm	25 kg
NLN	1400 - 350	0 -	350 V	0 -	4 A	19" / 443 mm	7 U / 310 mm	550 mm	50 kg
NLN	35 - 500	0 -	500 V	0 -	0,06 A	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
NLN	140 - 500	0 -	500 V	0 -	0,25 A	19" / 443 mm	3 U / 133 mm	350 mm	10 kg
NLN	350 - 500	0 -	500 V	0 -	0,6 A	19" / 443 mm	4 U / 177 mm	450 mm	19 kg
NLN	700 - 500	0 -	500 V	0 -	1,2 A	19" / 443 mm	4 U / 177 mm	550 mm	25 kg
NLN	1400 - 500	0 -	500 V	0 -	2,5 A	19" / 443 mm	7 U / 310 mm	550 mm	50 kg

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Linear regulated power supplies bipolar
Series NLB from ±6,5 V to ±350 V / 35 W to 1400 W

Design example

NLB 350 - 20
± 20V / ± 15A

Features:

- 4-quadrant operation is possible for passive loads (and optionally for active loads)
- Output voltage and output current are fast programmable
- No output capacitor
- All units are short circuit proof and allow unlimited operation with full current in short circuit condition
- Voltage and current regulation with automatic and sharp transition
- Voltage and current setting with 10-turn potentiometers with precision scale; the adjusting knob can be locked
- One of the potentiometers is used for voltage or current regulation, the limiting values can be adjusted in addition
- 4½ digit DVM for voltage and current (for table-top models)
- Sense terminals for the compensation of voltage drop on the load lines, for units up to 350V nominal voltage.
- The rated voltage always refers to the output terminals
- Suitable also for inductive and capacitive loads
- Standard starting current limitation from 700W nominal power onwards

Function:

Bipolar linear regulated power supplies consist of two intermediate circuits, one for each polarity. The mains voltage is transformed to the appropriate level and rectified. The rectified voltage charges a bank of capacitors of the intermediate circuit to a constant voltage, which it is fed, via a set of power transistors, to the output. The output stages of the positive and the negative circuits are switched together in a push-pull manner. The regulation transistors define the final stability of the output voltage and the regulation speed. Bipolar power supplies are able to operate as 4-quadrant power amplifier. (optionally also for active loads).

Design:

- 19" table-top case (19" rack adaptors available)
- Cooling:
  Convection or built-in fan with air outlet on the rear

Output:

- Output isolation:
  The output is floating. Operating voltage with respect to earth: max. ±500V.
- Output terminals:
  4 mm safety connectors up to 20A on the rear panel. For higher currents clamps installed on the rear

Technical Data:

- Mains connection:

  up to 1400W nominal power:
  230V ±10% 47Hz to 63Hz

  for 2800W and higher:
  400V ±10% 47Hz to 63Hz, three-phase
- Ambient temperature:

  0°C to +40°C
- Power loss:
  at nominal load approx. 35%, during short circuit at nominal current approx 140% and at no load approx. 15% of the nominal power.

The following data applies for voltage and current regulation, and refers to the rated value (unless otherwise stated):
(For explanations please refer to Definitions and Terms on page 61.)

- Setting range:
  from -100% to +100%
- Setting resolution:
  $\pm 2 \times 10^{-4}$
- Residual ripple:
  $<5 \times 10^{-4}$pp + 10mVpp
- Recovery time:
  <50 µs for load changes from 10% to 100% or from 100% to 10%
- Setting time at nominal load:
  <1ms for full range
- Deviation:
  for ±10% mains voltage variation:
  $<\pm 2 \times 10^{-5}$
  for no load / full load:
  $<2 \times 10^{-4}$
  over 8 h under constant conditions:
  $<\pm 2 \times 10^{-4}$
  within the temperature range:
  $<\pm 2 \times 10^{-4}$ / K

Possible Options:

- Analogue programming (see page 52)
- Analogue programming, floating (see page 52)
- Computer interface - IEEE 488, RS 232, RS 422, Profibus DP (more on request) (see page 54)
- Full 4-quadrant operation, even with active loads
- Higher programming speed

More options and special solutions on request. Some options may involve changes to the description of the unit - especially concerning the mechanical design.

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Linear regulated power supplies bipolar
Series NLB from ±6,5 V to ±350 V / 35 W to 1400 W

Type		Voltage		Current		Width	Height	Depth	Weight
NLB	35 - 6,5	0 -	±6,5 V	0 -	±5 A	19" / 443 mm	4 U / 177 mm	350 mm	9 kg
NLB	140 - 6,5	0 -	±6,5 V	0 -	±10 A	19" / 443 mm	4 U / 177 mm	350 mm	12 kg
NLB	350 - 6,5	0 -	±6,5 V	0 -	±30 A	19" / 443 mm	4 U / 177 mm	550 mm	22 kg
NLB	700 - 6,5	0 -	±6,5 V	0 -	±60 A	19" / 443 mm	8 U / 355 mm	550 mm	35 kg
NLB	1400 - 6,5	0 -	±6,5 V	0 -	±120 A	19" / 443 mm	10 U / 443 mm	550 mm	55 kg
NLB	35 - 12,5	0 -	±12,5 V	0 -	±2,5 A	19" / 443 mm	4 U / 177 mm	350 mm	9 kg
NLB	140 - 12,5	0 -	±12,5 V	0 -	±8 A	19" / 443 mm	4 U / 177 mm	350 mm	12 kg
NLB	350 - 12,5	0 -	±12,5 V	0 -	±20 A	19" / 443 mm	4 U / 177 mm	550 mm	22 kg
NLB	700 - 12,5	0 -	±12,5 V	0 -	±50 A	19" / 443 mm	7 U / 310 mm	550 mm	35 kg
NLB	1400 - 12,5	0 -	±12,5 V	0 -	±80 A	19" / 443 mm	8 U / 355 mm	550 mm	55 kg
NLB	35 - 20	0 -	±20 V	0 -	±1,5 A	19" / 443 mm	4 U / 177 mm	350 mm	9 kg
NLB	140 - 20	0 -	±20 V	0 -	±6 A	19" / 443 mm	4 U / 177 mm	350 mm	12 kg
NLB	350 - 20	0 -	±20 V	0 -	±15 A	19" / 443 mm	4 U / 177 mm	550 mm	22 kg
NLB	700 - 20	0 -	±20 V	0 -	±30 A	19" / 443 mm	5 U / 221 mm	550 mm	35 kg
NLB	1400 - 20	0 -	±20 V	0 -	±60 A	19" / 443 mm	8 U / 355 mm	550 mm	55 kg
NLB	35 - 35	0 -	±35 V	0 -	±1 A	19" / 443 mm	4 U / 177 mm	350 mm	9 kg
NLB	140 - 35	0 -	±35 V	0 -	±4 A	19" / 443 mm	4 U / 177 mm	350 mm	12 kg
NLB	350 - 35	0 -	±35 V	0 -	±10 A	19" / 443 mm	4 U / 177 mm	550 mm	22 kg
NLB	700 - 35	0 -	±35 V	0 -	±20 A	19" / 443 mm	5 U / 221 mm	550 mm	35 kg
NLB	1400 - 35	0 -	±35 V	0 -	±40 A	19" / 443 mm	7 U / 310 mm	550 mm	55 kg
NLB	35 - 65	0 -	±65 V	0 -	±0,5 A	19" / 443 mm	4 U / 177 mm	350 mm	9 kg
NLB	140 - 65	0 -	±65 V	0 -	±2 A	19" / 443 mm	4 U / 177 mm	350 mm	12 kg
NLB	350 - 65	0 -	±65 V	0 -	±5 A	19" / 443 mm	4 U / 177 mm	550 mm	22 kg
NLB	700 - 65	0 -	±65 V	0 -	±10 A	19" / 443 mm	5 U / 221 mm	550 mm	35 kg
NLB	1400 - 65	0 -	±65 V	0 -	±20 A	19" / 443 mm	7 U / 310 mm	550 mm	55 kg

On request we deliver power supplies of this type also with higher power.

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Linear regulated power supplies bipolar
Series NLB from ±6,5 V to ±350 V / 35 W to 1400 W

Type		Voltage		Current		Width	Height	Depth	Weight
NLB	35 - 125	0 -	±125 V	0 -	±0,25 A	19" / 443 mm	4 U / 177 mm	350 mm	9 kg
NLB	140 - 125	0 -	±125 V	0 -	±1 A	19" / 443 mm	4 U / 177 mm	350 mm	12 kg
NLB	350 - 125	0 -	±125 V	0 -	±2,5 A	19" / 443 mm	4 U / 177 mm	550 mm	22 kg
NLB	700 - 125	0 -	±125 V	0 -	±5 A	19" / 443 mm	5 U / 221 mm	550 mm	35 kg
NLB	1400 - 125	0 -	±125 V	0 -	±10 A	19" / 443 mm	7 U / 310 mm	550 mm	55 kg
NLB	35 - 200	0 -	±200 V	0 -	±0,15 A	19" / 443 mm	4 U / 177 mm	350 mm	9 kg
NLB	140 - 200	0 -	±200 V	0 -	±0,6 A	19" / 443 mm	4 U / 177 mm	350 mm	12 kg
NLB	350 - 200	0 -	±200 V	0 -	±1,5 A	19" / 443 mm	4 U / 177 mm	550 mm	22 kg
NLB	700 - 200	0 -	±200 V	0 -	±3 A	19" / 443 mm	5 U / 221 mm	550 mm	35 kg
NLB	1400 - 200	0 -	±200 V	0 -	±6 A	19" / 443 mm	7 U / 310 mm	550 mm	55 kg
NLB	35 - 350	0 -	±350 V	0 -	±0,1 A	19" / 443 mm	4 U / 177 mm	350 mm	9 kg
NLB	140 - 350	0 -	±350 V	0 -	±0,4 A	19" / 443 mm	4 U / 177 mm	350 mm	12 kg
NLB	350 - 350	0 -	±350 V	0 -	±1 A	19" / 443 mm	4 U / 177 mm	550 mm	22 kg
NLB	700 - 350	0 -	±350 V	0 -	±2 A	19" / 443 mm	5 U / 221 mm	550 mm	35 kg
NLB	1400 - 350	0 -	±350 V	0 -	±4 A	19" / 443 mm	7 U / 310 mm	550 mm	55 kg

On request we deliver power supplies of this type also with higher power.

Bipolar high voltage power supplies
Series HCB from ±1250 V to ±20000 V / 1,4 W to 200 W

Design example

HCB 7 - 6500
± 6500V / ± 1 mA

Features:

- Light-weight
- In units with 6,5kV and higher the HV-components are moulded in (removable) silicon resin
- Unlimited operation with rated current in a short-circuit condition
- Unlimited operation with nominal power
- Voltage regulation and current limitation with automatic, sharp transition
- Control mode indicated by LED
- Voltage adjustment with 10-turn potentiometers with precision scale; the adjusting knob can be locked
- 4½ digit DVM for voltage and current (for table-top models)
- 4- quadrant operation possible also for active loads and unlimited power sinking
- Suitable for capacitive and resistive loads

Function:

Bipolar HV power supplies consist of 2 switch-mode controlled HV sources which are connected to the output. In principle, the rectified line voltage in each source drives a square wave generator of fixed frequency, whose AC voltage is transformed, rectified and filtered, producing the positive or negative output voltage. For regulation, the square wave voltage is pulse width modulated. The operation is contra-moving, and the output can be adjusted with continuous zero crossing.

Design:

19" table-top case (19" rack adaptors available)

Output:

- Output isolation:
  One output terminal each leads the high voltage, the "0V" terminal is connected firmly to earth. If required, the "0V" terminal can be made floating against earth up to ± 300V.
- Output terminals:
  All output terminals are located at the rear plate of the unit. High voltage connectors with the appropriate dielectric strength are delivered with the power supply.

Technical Data:

- Mains connection:

  Up to 700W nominal power:
  230V ±10% 47Hz to 63Hz

  For 1400W nominal power and more:
  400V±10% 47Hz to 63Hz, three phase
- Ambient temperature:

  0°C to +40°C

The following data applies for voltage regulation, and refers to the rated value (unless otherwise stated):
(For explanations please refer to Definitions and Terms on page 61.)

- Setting range:
  from -100% to +100%
- Setting resolution:
  $\pm 1 \times 10^{-4}$
- Residual ripple:
  <3 x 10-4pp + 50mVpp,
  typ. 2 x 10^{-4}pp
- Recovery time for voltage control:
  <1ms for load changes from 10% to 100% or from 100% to 10%
- Setting time at nominal load:
  <200ms for changes of the output voltage from 10% to 90% or 90% to 10%
- Deviation:
  for ±10% mains voltage variation:
  $<\pm 2 \times 10^{-5}$
  for no load / full load:
  $<2 \times 10^{-4}$
  over 8 h under constant conditions:
  $<\pm 2 \times 10^{-4}$
  within the temperature range:
  $<\pm 2 \times 10^{-4}$ / K

Possible Options:

- Analogue programming (see page 52)
- Analogue programming, floating (see page 52)
- Computer interface - IEEE 488, RS 232, RS 422, Profibus DP (more on request) (see page 54)
- Lower ripple (see page 56)
- Higher stability (see page 56)
- Lower stored energy and shorter setting time (see page 56)

More options and special solutions on request. Some options may involve changes to the description of the unit - especially concerning the mechanical design.

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Bipolar high voltage power supplies
Series HCB from ±1250 V to ±20000 V / 1,4 W to 200 W

Type		Voltage		Current		Width	Height	Depth	Weight
HCB	1,4 - 1250	0 -	±1250 V	0 -	±1 mA	19" / 443 mm	3 U / 133 mm	350 mm	6 kg
HCB	14 - 1250	0 -	±1250 V	0 -	±10 mA	19" / 443 mm	3 U / 133 mm	350 mm	7 kg
HCB	2 - 2000	0 -	±2000 V	0 -	±1 mA	19" / 443 mm	3 U / 133 mm	350 mm	6 kg
HCB	20 - 2000	0 -	±2000 V	0 -	±10 mA	19" / 443 mm	3 U / 133 mm	350 mm	9 kg
HCB	3,5 - 3500	0 -	±3500 V	0 -	±1 mA	19" / 443 mm	3 U / 133 mm	350 mm	7 kg
HCB	35 - 3500	0 -	±3500 V	0 -	±10 mA	19" / 443 mm	3 U / 133 mm	450 mm	10 kg
HCB	7 - 6500	0 -	±6500 V	0 -	±1 mA	19" / 443 mm	3 U / 133 mm	350 mm	10 kg
HCB	70 - 6500	0 -	±6500 V	0 -	±10 mA	19" / 443 mm	3 U / 133 mm	550 mm	15 kg
HCB	14 - 12500	0 -	±12500 V	0 -	±1 mA	19" / 443 mm	3 U / 133 mm	350 mm	30 kg
HCB	140 - 12500	0 -	±12500 V	0 -	±10 mA	19" / 443 mm	6 U / 266 mm	550 mm	42 kg
HCB	20 - 20000	0 -	±20000 V	0 -	±1 mA	19" / 443 mm	6 U / 266 mm	550 mm	35 kg
HCB	200 - 20000	0 -	±20000 V	0 -	±10 mA	19" / 443 mm	6 U / 266 mm	550 mm	45 kg

On request we deliver power supplies of this type also with different from the type range voltage or power.

Examples for customer specific power supplies:
We design and manufacture according to your requests!

MCP 140 - 2000
Medium voltage precision power supply
equipped with the options: coarse/fine potentiometers for voltage and current, digital interface, analogue programming and power limitation.

HCV 3,1M - 12000
Power supply for VUV-spectrometer
3 outputs in series:
0 - ±100V; 0 - 1 mA
0 - +2000V; 0 - 1mA
0 - +10000V; max. 0,1 mA

HCV 57M - 20000
Multiple output high voltage supply
19 voltage sources with 11 output voltages
from 6kV to 20 kV

NLV 27M - 400
Power supply for beam deflection
5 double outputs with countermoving voltages:
0 - ±400 V; max. 1mA

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Examples for customer specific power supplies:
We design and manufacture according to your requests!

HCK 800M - 13000
Cable testing unit
13kV / 120 mA
Many special functions

HCH 4950M - 90000
Ion source power supply (extractor)
0 - 90 kV; 0 - 55 mA
Stability over 8h and TK: $1x10^{-5}$ from nominal value

NTN 100M - 12,5
Isolated low voltage power supply
designed for floating operation up to 20kV
0 - 12,5 V, 0 - 8 A

HCN 35M - 50000
Isolation test unit
0 - 50 kV, 0 - 0,6 mA
Two high resolution measuring circuits for current

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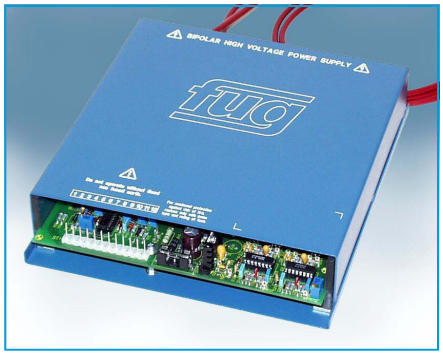
Examples for customer specific power supplies:
We design and manufacture according to your requests!

HCN7E - 7000
Customer specific test equipment
0 - 7 kV, max. 1 mA
with test pistol

HCE 2,4M - 12000
Customer specific high voltage module
0 - 12 kV, max. 200 µA
For picture tube testing



HCM 7,5B - 30000
Customer specific high voltage module
bipolar
0 - ± 30 kV, 0 - ±0,25mA
for mass spectrometers

NLV 299M - 50
Multiple magnet power supply
2 linear regulated deflection amplifiers ±50V,
±1A, to 1000Hz
4 adjustment supplies ±12V, ±500mA
1 lens power supply ± 35V, to 3A
High regulation stability

HCV 349M - 6500
High voltage supply for backward wave tube
0 - 6,5 kV, 0 - 50 mA
with floating heater supply
Special design for airborne use (vibration hard)

Multi output HV power supply
Based on standard cassettes of the HCE type range
Basic unit HCN 350 - 12500

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Options and modifications: Analogue programming

Many FuG- power supplies are available which differ from the standard design or equipment. On this pages we highlight some of the most common options and modifications. Other customer-specific units having different technical data, different mechanical construction, alternative customer defined interfaces or with extended features are available even for single piece orders.

Analog programming:

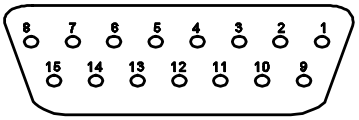
With this option the output voltage and current of the power supply can be set via analogue voltages (0-10V) or by external potentiometers. Monitor signals of voltage and current (0-10V) available on the programming terminal. An external "ON"-command enables the regulation loop.
Selection of manual operation or external programming is possible by a switch on the front panel. This option is also available as a retrofit set for later upgrade of your unit.
Usually the "0V" of the programming voltage is connected to one of the outputs of the unit. If this is not wanted, the unit may be equipped with the floating analogue programming.

The following versions are available:

- Isolation max. 600V DC with respect to the unit output, 30V DC with respect to ground,
- Isolation max. 2kV DC with respect to the unit output, 30V DC with respect to ground.
- On request we can also supply a fibre optic option with isolation capabilities up to 200 kV and more.

For the most models the floating analogue programming can be installed later at our site.

Pin configuration: SUB-D 15 pol



(Solder side of the plug)

Pin	Description	Comment
1	Status report: current regulation	regulation active ≙ approx. +15V via 10kΩ
2	Status report: voltage regulation	regulation active ≙ approx. +15V via 10kΩ
3	Monitor-signal current	0…nominal value ≙ 0...+10V; Ri = 10kΩ (always positive, independent of output polarity)
4	Slider front plate voltage potentiometer	0...+10V depending from position of potentiomer knob (not used with isolated analogue programming)
5	Slider front plate current potentiometer	0...+10V depending from position of potentiomer knob (not used with isolated analogue programming)
6	0V for digital signals	
7	Polarity change for units with electronic polarity reversal (otherwise not used)	open = positive connected to 6) = negative
8	Set value voltage	0...+10V ≙ 0…nominal value
9	0Vfor analogue signals	
10	+ 10 V reference	with reference to pin 9; load up to approx. 2mA
11	Monitor-signal voltage	0…nominal value ≙ 0...+10V; Ri = 10kΩ (always positive, independent of output polarity)
12	Command: „output ON / OFF“	open = OFF connected to pin 6 = ON no mains interruption!
13	Polarity signalization for units with electronic polarity reversal (otherwise not used)	+12V = positive 0V = negative
14	not used	
15	Set value current	0...+10V ≙ 0…nominal value

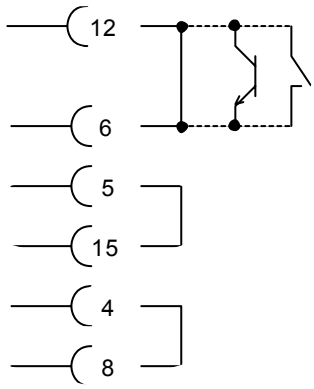
For single types of equipment deviations from this configuration are possible (especially for HCN7E, HCB, NLB and custom-designed equipment). In these cases the equipment description is valid.
For proper function of the analogue programming at least pin 12 (Output ON/OFF - link to 0V) and both pins 8 and 15 (set values ≠ 0) have to be connected. Using external set value signals, the "0V" line also has to be connected.

On request we also deliver a complete **remote control** with indicating instruments and set-point potentiometers in a separate case (cable length to 10 m), matching to the analogue programming.

Options and modifications:
Analogue programming

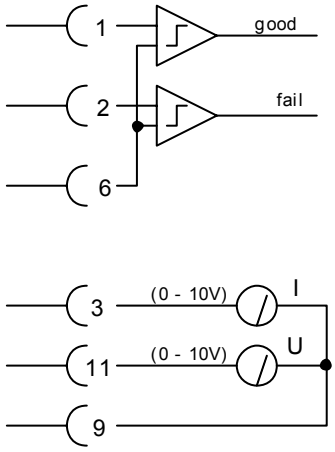
Application notes for the analogue programming:

- **Only external ON / OFF, front side potentiometers stay active:**



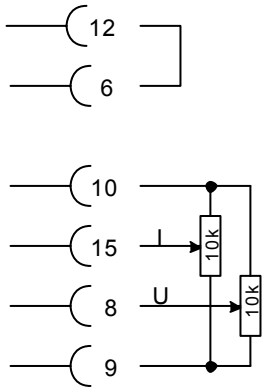
A Link from pin 12 to pin 6 releases the output, a disconnection between these pins locks it. The link can be made by switch, relay contact, wire link, transistor or optocoupler output (care for right polarity in the last two cases).
Links between pins 15 and 5 and also between 8 and 4 forward the signals of the front plate potentiometers.

- **Read signals in local mode:**



These signals can be read out also when the unit is set to local mode by the mode switch at the front plate (switch in position "local"), so that the values are set by the front plate control elements. By analyzing the status signals (pins 1 and 2) via threshold switches for example a good / fail recognising for isolation tests can be created.
The indication of monitor values by appropriately calibrated measuring instruments with 0 - 10V is also always possible, independently of the mode of control.

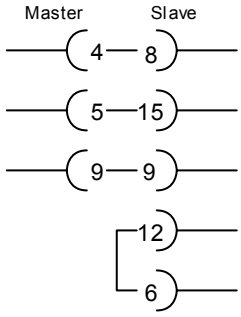
- **Output always ON, external input of set values for voltage and current:**



Link between pins 12 and 6 to release the output.

0 - 10V set value input at pins 8 (voltage) and 15 (current). The graphic shows the generation of set values by voltage divider potentiometers, using the internal reference at pin 10. External generation of set values is also possible by digital analogue converters or other signal sources.

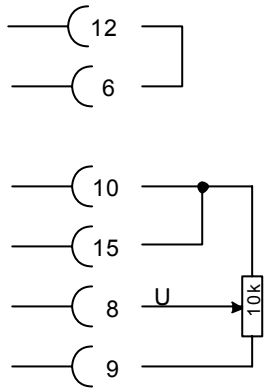
- **Master slave circuit 1:**



The wipers of the front plate potentiometers (pins 4 and 5) of the master unit are connected to the set value inputs of the slave unit (pins 8 and 15). This allows a symmetrical control of two power supplies.

Link between pins 12 and 6 is necessary to release the output for the slave unit. (For the master unit this depends on the mode of control.)

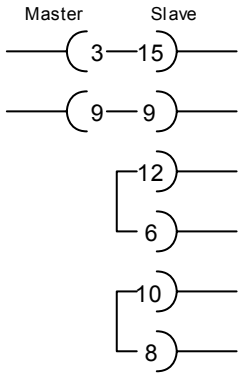
- **Output always ON, only of set value for voltage with external input, current limited to maximum value.**



Link between pins 12 and 6 to release the output.

Input of set value only for voltage, pin 15 (set value current) connected to +10V reference, limiting the current to the maximum value by this.

- **Master slave circuit 2:**



The current monitor output (pin 3) of the master is connected to the current set value input (pin 15) of the slave, while the voltage value of the slave is limited to the maximum value (link between pins 10 and 8). This circuit ensures an equal distribution of current with two parallel switched power supplies. The voltage setting is carried out at the master power supply („local" - or „remote"- control possible.)

Link between pins 12 and 6 is necessary to release the output for the slave unit. (For the master unit this depends on the mode of control.)

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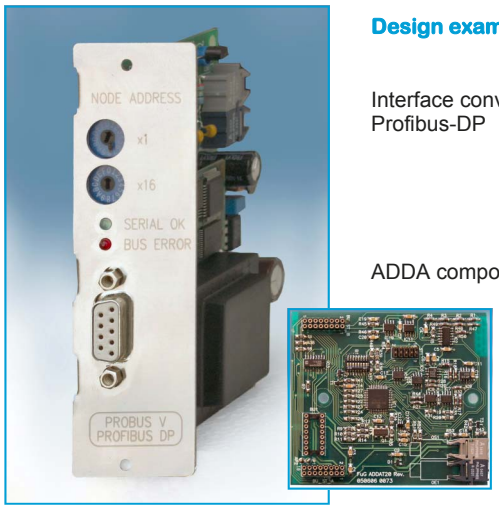
Options and modifications:
Probus V (digital interface system)



Design example

Interface converter
Profibus-DP

ADDA component

General:

The modular interface system **PROBUS V** allows to connect FuG- power supplies with various interfaces and bus-systems.

Available versions:

- IEEE 488
- RS 232 active or passive
- RS 422
- USB
- Profibus DP
- LAN (Ethernet)
- more on request

Every version can be integrated completely into the power supply or delivered with an external interface converter. In the last case the connection is connected via optical fiber cables.

Features:

- Easy programming with SCPI-like syntax; Standard set of commands compatible to previous version PROBUS IV.
- Extended set of commands for special functions.
- Most modern RISC-Microcontroller techniques with SMD.
- Completely digitally adjusted for highest precision.
- Isolation between interface converter and ADDA component via optical fiber, though extremely immune against interferences.
- more than one ADDA components addressable in one optical fiber chain.

Technical data:

- Instruction processing time approx. 300µs (without serial data transfer time)
- at 625kBd at least 1000 settings per second programmable (typ. 2000/sec)
- up to 100 measurements per second
- two outputs 0..+/-10V, effective resolution 14 to 20 bit incl. sign (depending on integration time), theoretical resolution 24 bit.
- setting time of outputs <500us
- Tc < $1x10^{-5}$/K, typ. 3ppm/K, better Tc on request
- two inputs 0..+/-10V, programmable resolution, max. 22 bit incl. sign, input impedance >1GΩ
- several digital I/Os for control of the power supply
- Optical connectors: Standard Agilent (HP) HFBR-0500 series. Optionally HFBR-0400 series.

Design:

The **PROBUS V** system consist of two assemblies respectively:

- Intelligent analog-digital and digital-analog converter: (short: ADDA).
  This part always is in the power supply and communicates by a serial ASCII protocol via optical fibers. It evaluates the programmed commands, controls the power supply by reference voltages and makes available serially the feed back data of the power supply .
- Interface converter
  This part converts the optical signals to the respective bus- or interface standard. The converter can be installed into the rear of the power supply unit or delivered as a separate module.

  The external interface converters are Euro-cassettes of 71mm (14TE) width, 133mm (3HE) height and 170mm depth.
  For the passive RS 232– connection, the interface converter has the shape of a Sub- D– connector.
  The length of the optical fiber from the external interface converter to the power supply may be up to 30m. (Synthetic material fiber) resp. more than 1000m with special design (glass fiber).

IEEE 488:

- Delay time of the data transfer: <100us.
- Baud rates on the serial side of the optical link: 38400Bd or 625kBd selectable.
- SRQ (Service Request) programmable.
- LED indicators for "addressed" und "SRQ" conditions.
- together with ADDA commonly compatible to the IEEE-488 mode of the predecessor PROBUS IV.
- Optical connectors: Standard Agilent (HP) HFBR-0500 series. Optionally HFBR-0400 series.
- IEEE-488 address selectable by switch near the IEEE-488 connector (outside the unit).

RS 232 electrical (active):

- own power supply, 3-wire connection sufficient (Rx, Tx, GND).
- Baud rates up to 115200Bd possible.
- Connector: 9-pol. Sub-D.
- together with ADDA commonly compatible to the RS-232 mode of the predecessor PROBUS IV.
- Optical connectors: Standard Agilent (HP) HFBR-0500 series. Optionally HFBR-0400 series.

RS 232 optical (passive):

- Like RS 232 active, but:
- Power supply by interface signals:
- Optical connectors: Direct sticking connection for standard 1mm POF optical link.
- Guaranteed distance to the power supply: up to 30m (typical up to 50m).
- The complete interface converter is housed in a Sub-D-connector-like case.

RS 422:

- Baud rates up to 625kBd possible.
- Optical connectors: Standard Agilent (HP) HFBR-0500 series. Optionally HFBR-0400 series.

USB:

- Control via virtual COM-Port or directly via USB-driver. (Virtual Com-Port driver for the most common operation systems available, very simple programming, no USB-programming knowledge necessary.)
- Optical connectors: Standard Agilent (HP) HFBR-0500 series. Optionally HFBR-0400 series.
- Delay time typical approx. 1ms due to USB principle.

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Options and modifications:
Probus V (digital interface system)

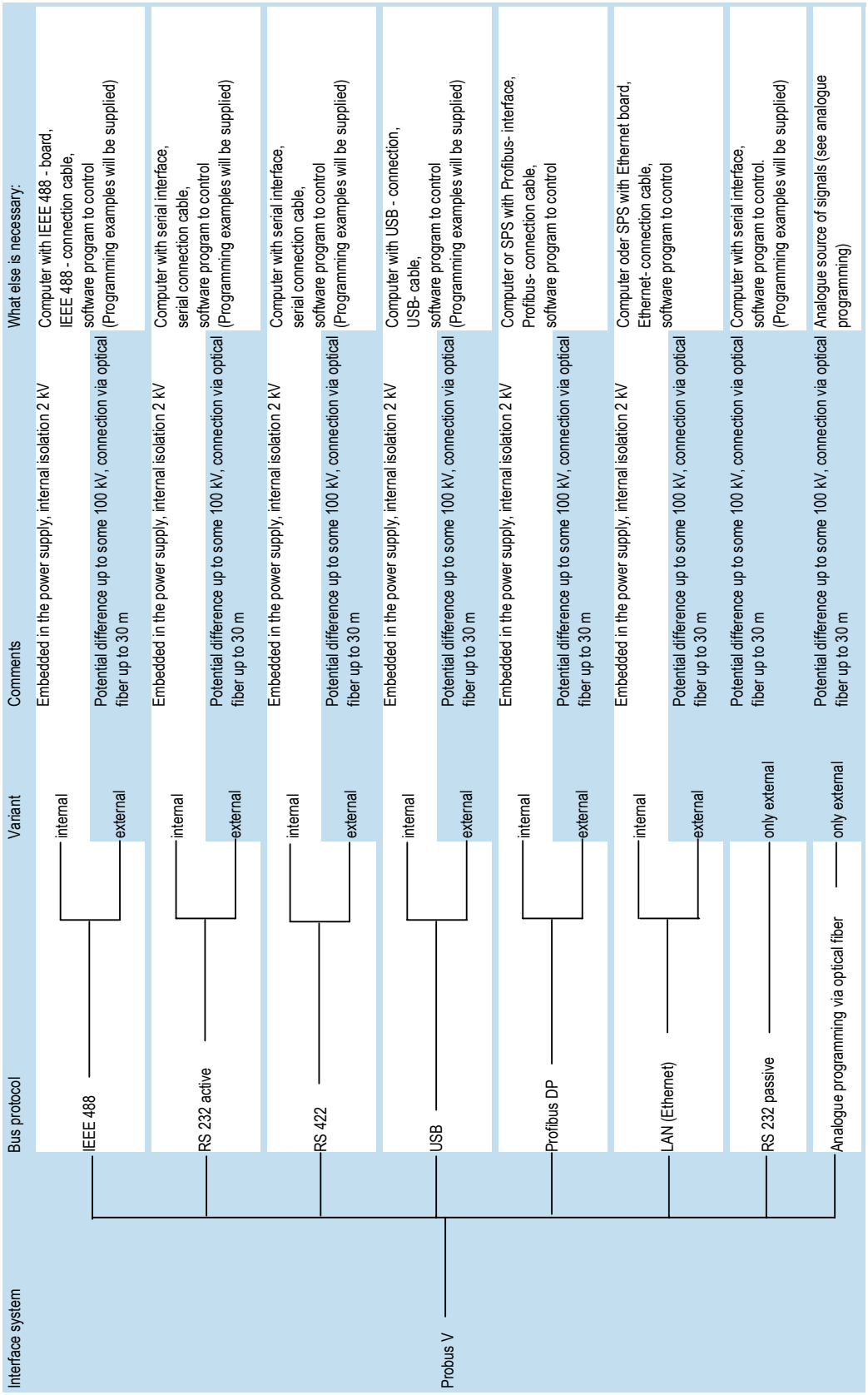
Profibus DP:

- An initial data block is made available on the Profibus-DP side. Into this the primary SPS writes the required set points and control commands.
- This initial data block is transferred cyclically by the converter via optical link to the ADDA part.
- The feedback data (e.g. measurements) of the ADDA part is questioned cyclically and provided n the exit data block of the converter to the primary SPS.
- Cycle time 40ms.
- Profibus address selectable by code-switch outside the unit.
- Mode indication for Profibus connection (red Error-LED).
- Mode indication for optical link.

LAN (Ethernet):

- Control via virtual COM-Port or directly by TCP/IP-programming.
  (Virtual Com-Port driver for the most common operation systems available, very simple programming, no profound knowledge of TCP/IP-programming necessary.)
- Optical connectors: Standard Agilent (HP) HFBR-0500 series. Optionally HFBR-0400 series.
- Delay time approx. 20ms.

Application notes for Probus V



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Options and modifications: Further possibilities

Polarity reversal:
By this switch the polarity of the output voltage of a high voltage power supply (Nearly all of the HCP, HCK or HYN types) can be changed.
With HCP up to 35kV it is possible to remote control the polarity change if the units are equipped additionally with an analogue programming or with an digital interface. For the most models the polarity reversal can be installed later at our site. On request please ask us!

Higher stability:
Voltage and/or current regulation with better long-term stability and lower temperature coefficient. With a lot of models, using components with a better specification and lower temperature coefficient the following data can be reached:

- Stability over 8 hours under constant conditions: $<\pm 1 \times 10^{-5}$
- Temperature coefficient: $<\pm 1 \times 10^{-5}$ /K within the specified temperature range

On request we can achieve for certain units even a higher stability.
These options can be incorporated only in new units. A later modification is not possible. These options are not available for cassette power supplies.

Lower output ripple:
On several series a lower ripple can be achieved by better smoothing. This option can be supplied only with new units. A later modification is not possible. The following data will be achieved:

- For MCP / HCP up to 35W: $<1 \times 10^{-5}$ + 10mV p-p
- For MCP / HCP 140W to 700W: $<1 \times 10^{-5}$ + 20mV p-p
- For MCP / HCP of 1400W and higher power: $<1 \times 10^{-5}$ + 100mV p-p

This option is not available for cassette power supplies and for power supplies of the NTN series.

Lower stored energy:
Especially for the operation of gas discharge processes, arcs or similar loads with a negative dynamic resistance characteristic, the quantity of stored energy can be decreased by smaller output capacitors. Those units will have than a higher ripple up to 1%. This option is available for units of the series MCP, HCP or HCH.

Digital meters with higher resolution:
For units, which are equipped with 3½ digit DVM in the standard version (display of max."1999"), instead of the standard DVM a DVM with higher resolution (4½ digit) can be offered.
This replacement is also possible later at our site. For customer specific units even higher display resolutions are possible (Only for new units in combination with a higher stability).
Units of MCP or HCP type are equipped as a standard with 4½ digit meters.

Higher adjustment resolution:
By an additional ten-turn potentiometer for fine adjustment of current and/or voltage the resolution will be increased by a factor of 100. Adjustment range 0 - 99% and a window of approx. 1%.

Power regulation with display and adjustment:
Besides the standard voltage regulation and current regulation, the units may be equipped with an additional regulation loop for constant power.

Internal impedance:
For electronic simulation of a changing internal impedance of the unit (e.g. battery characteristic). The technical design is similar to the power regulation.

Preset indication:
The preset values can be displayed by a button besides the appropriate meter. (For MCP– and HCP– units standard.)

Electronical sweep of nominal value:
Ramp function especially for superconductor power supplies.

Flashover sensor:
Supervising on overcurrent/ high voltage flashover with signalization, shut down or spark counter.

Interlock loop for supervising of the connected load (e.g. door contacts):
At interrupting the interlock loop, the unit will be shut down by disconnecting the mains. Only after pressing a "RESET"-button, the unit can be put into operation again.

Fast discharge of the output:
When the unit is shut down, e.g. together with the interlock loop, additionally the output capacitor will be discharged within a distinct time.

Active down regulation:
for fast controlled decrease of the output voltage.

Different mains voltage and frequency:
As a standard our units are designed for a 230V, 50Hz or 400V, 50Hz three phase mains input. But most of our units can be modified for other mains values, like they are used in other countries.

Higher isolation of the output and/or the mains input:
For special applications (e.g. the operation at a high voltage platform), the standard isolation of the unit may be not sufficient. We can deliver units with isolation up to > 200 kV.

Customer specific design of the power output:
For several types of our units the output as a standard is at the front or at the rear plate. Optionally on request it can be moved to an other place.

Temperature regulated fan:
Switch on of the fans of a cooled by forced air unit only at higher power request. This option can be delivered for some models only if there are no strong requests to the stability of the current regulation.

Please take into account that many of the options and modification possibilities mentioned here require a further technical specification. Furthermore we gladly will offer you more special equipment and modifications on request.

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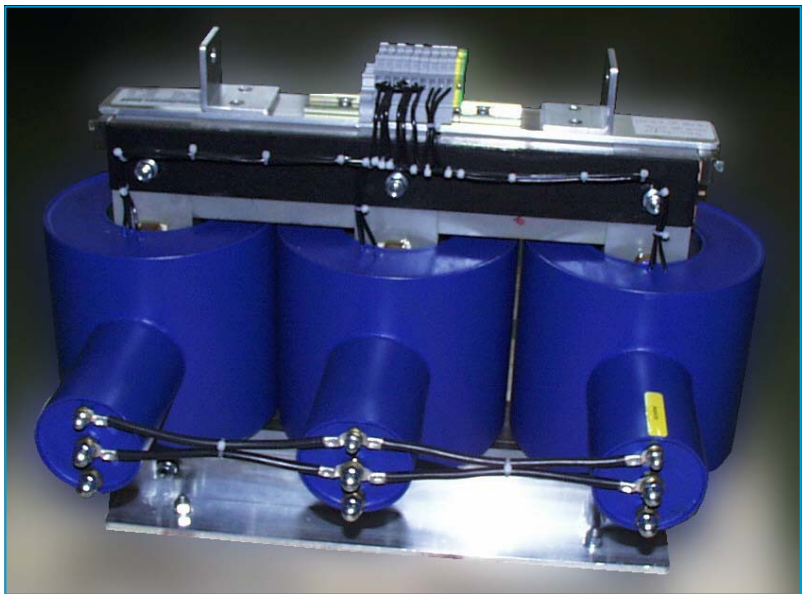
Accessories:
Isolating transformers

Design examples **HTS 200 - 50**



HTS 3000 - 50 3p
Three phase version

Function:
High voltage isolating transformers are used to provide mains supply to loads located on a high voltage potential. The primary winding is earthy.

Features:
- Compact size
- Moulded in artificial resin
- Low capacity
- Double screened

Technical data:
- Input voltage:
  230V 47 - 63Hz
- Output voltage:
  230V 47 - 63Hz
- Isolation:
  primary / secondary: 50kV DC
- Test voltage:
  75kV DC for 1 min.
- Test voltage between primary winding, primary screen and core: 7.5kV DC
- Test voltage between secondary winding and secondary screen: 7,5kV DC

Design:
- Mechanical design:
  Core and windings are completely moulded in artificial resin with isolating cross-pieces between the connections. Attachment at the bottom with 4 x M8 female thread.
- Connections:
  Primary and secondary side by threaded bolts M6 on top, screen connections free wire endings.

Special designs:
- different voltages
- different isolation voltages
- higher power
- three pase versions (see picture above)

Type			Nominal power	Width	Hight	Depth	Weight
HTS	100 -	50	100 VA	165 mm	220 mm	160 mm	15 kg
HTS	500 -	50	500 VA	210 mm	230 mm	200 mm	21 kg
HTS	1000 -	50	1000 VA	210 mm	200 mm	200 mm	25 kg
HTS	2000 -	50	2000 VA	252 mm	260 mm	252 mm	40 kg
HTS	3000 -	50	3000 VA	252 mm	270 mm	250 mm	43 kg

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Accessories:
Mechanical components

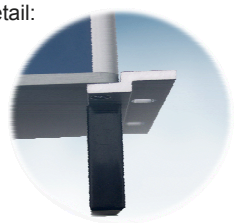
Rack adapters

We offer rack adapters for the installation of all FuG- tabletop models into 19" systems. They are available for mounting heights from 2U to 9U and both for 19” and for ½ 19" units.

For retrofitting of 19" rack adapters please state the height of the front panel!

Rack adapter for a 19"- unit

Detail:



Rack adapter for a ½19" unit with ½19" blind panel

Rack adapter for two ½19" units

19“ frames and tabletop cases

For our cassette power supplies of the HCE series, there are 19“ frames (on the left),
for HCN7E - we have tabletop cases (on the right).

Empty cases and milled front plates according to your specification
we are pleased to offer to you on request.

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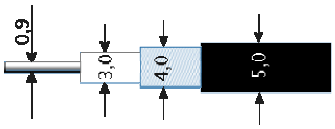
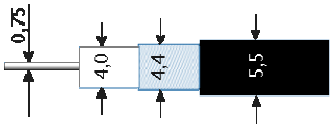
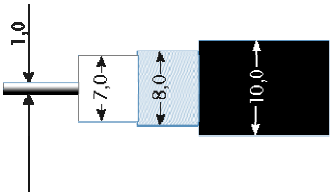
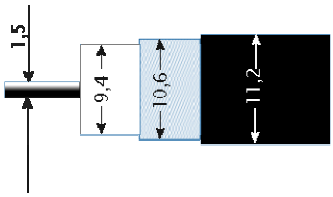
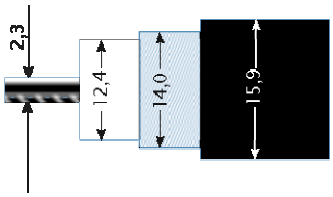
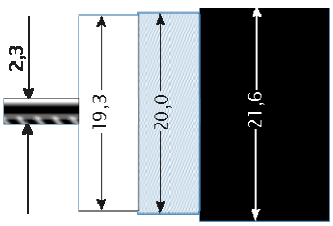
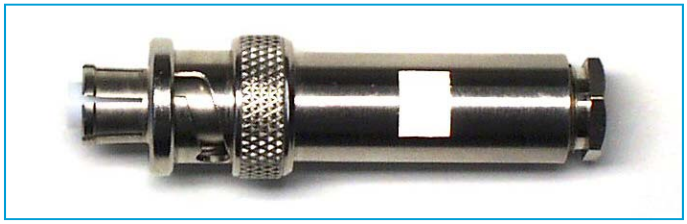
Accessories:
High voltage cables

Type		Construction (Diameter in mm)	Max. operating voltage cable	Mating connector (Operating voltage connector)
RG 58	Mat.- Nr.: 0502030100			
Capacitance/m: Impedance: Ambient temperature: Bending radius: Max. current:	101 pF 50 Ω -50 °C … +80°C 10 cm (repeated) 2,5 cm (once) max. 10 A		**10 kV DC**	SHV 6,5 kV
130660	Mat.- Nr.: 0502030130			
Capacitance/m: Impedance: Ambient temperature: Bending radius: Max. current:	82,7 pF 20 Ω -5 °C … +85°C 20 cm (repeated) 3 cm (once) max. 4 A		**30 kV DC**	HS21 F3415 20 kV
RG 11	Mat.- Nr.: 0502030200			
Capacitance/m: Impedance: Ambient temperature: Bending radius: Max. current:	68 pF 75 Ω -50 °C … +80°C 20 cm (repeated) 5 cm (once) max. 6 A		**50 kV DC**	F3430 35 kV
C 2124	Mat.- Nr.: 0502032124			
Capacitance/m: Impedance: Ambient temperature: Bending radius: Max. current:	99 pF 61 Ω -50 °C … +60°C 15,2 cm max. 27 A		**100 kV DC**	HVS 65 65 kV HVS 100 100 kV
C 2121	Mat.- Nr.: 0502032121			
Capacitance/m: Impedance: Ambient temperature: Bending radius: Max. current:	95 pF 59 Ω -50 °C … +60°C 21,6 cm max. 30 A		**150 kV DC**	Special plug, available only complete with cable
C2134	Mat.- Nr.: 0502032134			
Capacitance/m: Impedance: Ambient temperature: Bending radius: Max. current:	102 pF 64 Ω -50 °C … +60°C 25,4 cm max. 55 A		**200 kV DC**	Special plug, available only complete with cable

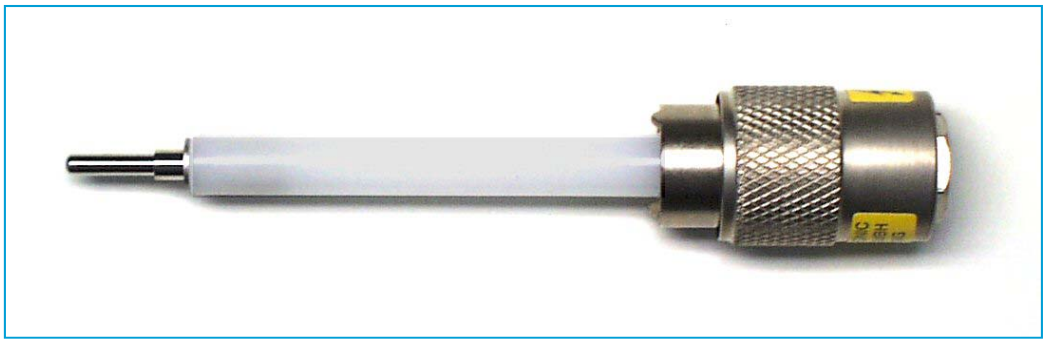
Accessories:
High voltage connectors

The appropriate output connectors for all power supplies (excluding banana plugs) are included to the delivery of the unit . Additional connectors, as shown here, can be delivered on request.



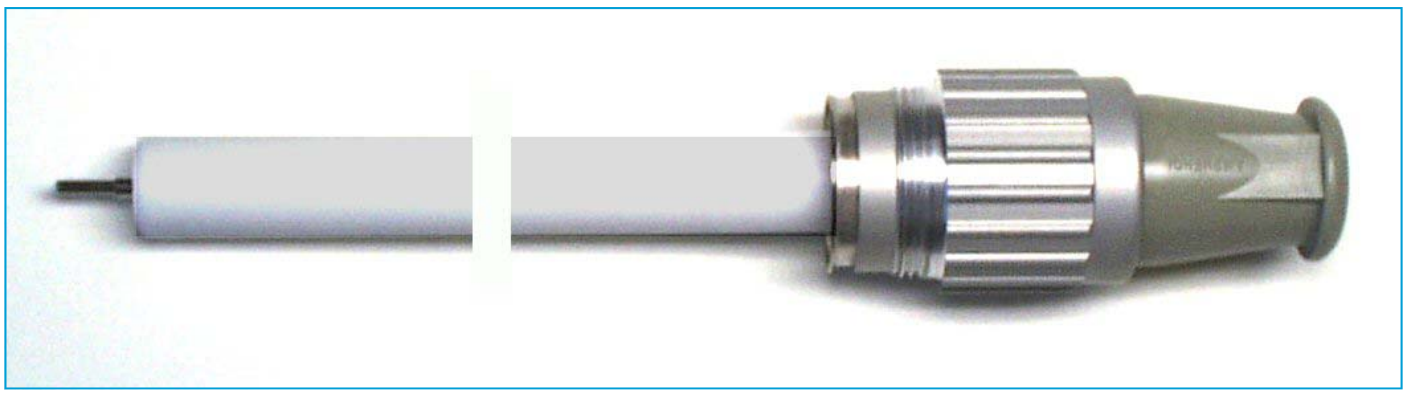
SHV- cable jack

F 3415



HS 21

F 3430



S 150, HVS 65, HVS 100, HVS 150 (Difference only in length)

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Definitions and Terms

Absolute accuracy
The stated figure refers to the absolute deviation of the DVM, or of the monitors of the analogue programming. They are independent of the stability data of the individual series.

For all families with standard data the following absolute accuracy values apply:

- for all nominal voltages:
  < ± 0,2% of the nominal value
- for all nominal currents within the range > 5mA up to < 200A:
  < ± 0,2% of the nominal value
- without this range:
  < ± 0,5% of the nominal value
- additional error of the DVM:
  < ± 2 Digits

Active pull-down control
Available on demand especially for the NLN series: Power transistors parallel to the output acting as a current sink.

Autoranging power supply
Power supply with automatic ranging of the operating point. without steps. These power supplies can provide any combination of the rated current and voltage - limited only by the rated maximum available output power.

Bipolar power supply
A bipolar power supply can be adjusted from positive output voltage and current to negative with continuous zero crossing. All bipolar power supply units of FuG Elektronik GmbH are designed for restricted 4-quadrant operation. The electrical power stored within the load
can be subsequently reabsorbed by the power supply. On request the units can be equipped for full 4-quadrant capability.

CE mark
All FuG- power supplies have a CE label - a guarantee of compliance with the current EMC and safety standards.

Certificate of calibration
All FuG- power supplies can be calibrated at the factory. The certificate of calibration, which can be supplied on request, confirms the compliance of the output data with the catalogue data:

- Indication on the DVM
- Monitor voltages*)
- Computer output data*)
- Reference voltage*)
- Linear coherence between control voltage and output value*)

*) Options

Charging current
FuG- capacitor charging power supplies operate with constant current. It is adjustable to every value up to the nominal value. On request units available with enhanced charging current at low voltage.

Charging power
Power specification for capacitor charging power supplies. The data is in J/s, and is valid for charging from "0" to the nominal voltage. For charging of a partially discharged capacitor a considerably higher charging power, up to double, can be supplied.

Chopper controlled
see Switch mode power supply.

Deviation (Stability data)
This term is always referred to the nominal parameter value and is valid for operation under constant operating conditions. Constant operating conditions means that, in each case, all other conditions such as the load, ambient temperature and mains voltage are constant:

a) Deviation of the output voltage (or output current when specified) for ±10% variation of the line voltage.
b) Deviation of the output voltage (or output current when specified) over a period of 8 hours, after an appropriate warm up time.
c) Deviation of the output voltage at load changes from full load to no load.

DIN EN ISO 9001
Since 1994 FuG has maintained this quality assurance system. All supplied units are tested (using calibrated measuring instruments) and the results recorded in our test department, so as to ensure that all units shipped are fully in accordance with their specification.

Discharge time constant
This data always relates to the unconnected output. It is the time taken for the output voltage to decay to approx. 37% of the adjusted voltage after the output has been switched off.

Double stabilized power supply
Such units are equipped with a thyristor pre-regulator followed by a linear transistor regulator stage. The high efficiency of the thyristor pre-regulator stage is combined with the high regulation characteristics of a linear regulator.

Dumpswitch
Rapid discharge switch for the controlled discharging of internal and external capacitors. (see also Interlock)

Efficiency
The efficiency of the units depends on the respective operating point. At full load a figure of 85 -95 % will be reached with switched and thyristor regulated power supplies whilst 70 -90 % is achievable with linear regulated power supplies with thyristor pre-regulation.

Electronic load
A unit, which has the behaviour of an adjustable load resistor. Usually, it is used for testing power supplies. Depending on the design, it is possible to adjust and regulate the resistance, the load power or the load current.

EMC
Electro Magnetic Compatibility - see regulations and standards.

EURO-size
19" cassette system cases, 3U

Fast de-energizing
Option for super conductor supplies for controlled deenergization of super conducting coils/ magnets at quench.

Final charging voltage
Preset voltage for capacitor charging power supplies up to which the capacitor shall be charged.

Floating output
The specified output terminals have no DC connection to other parts of the unit or to ground. The maximum potential difference (isolation voltage) is indicated.

IMS-size
Older size of plug-in cases, 4U

Interlock
Loop for safety switching off when disconnected. Mains disconnection, but without any forced discharging of the output or load. (see also Dumpswitch)

Linear regulation
Control of energy flow by one or more of bipolar or field effect transistors. The transistors are operated with the linear part of their characteristic and switched in series to the load.

Mains connection
Stated is the mains voltage, the permissible tolerance (±10%), the line frequency range and the type of mains connection, e.g. single phase, two-phase or three-phase. Connection of N (neutral) and PE (protective earth) are always necessary.

Mains Fuses
The mains fuse for a power supply shall be the next bigger value to the built in input fuse. Required mains fuses for power supplies with two or three phase mains input see table below. For power supplies with one phase input usually a 16A fuse will be good.

Nominal current
Maximum available current.

Nominal power
Maximum available power from the power supply. No higher power is available - even for a short time. For FuG- power supplies the first number in the type name is the power class or the main component of the power supply. This value is approximately (but may be not exactly) the nominal power.

Definitions and Terms

Nominal voltage
Maximum adjustable voltage. For FuG- power supplies the second number in the type name is usually the nominal voltage of the power supply.

Output isolation
On units where the "0V" terminal is not firmly connected to earth (or may be optionally disconnected from earth), it is always shown up to which maximum voltage the terminal may be allowed to float with respect to earth.
For units with floating output (all low and medium voltage power supplies up to 2kV - except cassettes) this value is valid for either of the output terminals.

PROBUS
FuG name for our system of computer interfaces.

PWM-Regulator
Regulator utilising Pulse Width Modulation. Such regulators are used in switch mode power supplies and in drives.

Quench
The transition of a super conducting coil / magnet from super conducting to normally conducting condition. If no special measures are taken, the energy, stored in the magnetic field, will be converted into thermal energy, within a short time, when quench occurs.

Quench detector
Circuit to detect a quench.

Recovery time
This characteristic is stated independently for voltage and current:
For voltage control, it is the time which the power supply requires to return to the adjusted voltage after a load variation from 10% to 100%, or from 100% to 10%.
For current control, it is the time which the power supply requires to return to the adjusted current after a load variation where the output voltage does not change by more than 10% of the nominal voltage.

Regulations and standards
The design and production of our power supplies is in accordance with the latest standards for EMC and safety. Depending on the type of the respective unit, different standards are valid:
EMC:
EN61000-6-1 and EN61000-6-3 (single-phase mains connection)
EN61000-6-2 and EN61000-6-4 (two- and three-phase mains connection)
Safety:
EN 61010

Repetition frequency
This frequency corresponds to the repetitive charge and discharge of a capacitor by a capacitor charging power supply.

Reproducibility
Repeatability of setting of a desired output value under constant conditions - it is always referred to the nominal value of the supply.

Residual Ripple
If not otherwise stated the residual voltage ripple is the referred-to parameter. It is always referred to the nominal value independent of the set value. The frequency of the ripple is the frequency of the mains rectifier and its harmonics. For chopper controlled units there is also a component of the switching frequency (usually 20kHz/40 kHz). For capacitor charging power supplies the value of the charging current is the referred-to parameter.
For FuG- power supplies the residual ripple usually is stated as “Peak to peak”. (“p-p”) value. It is different to the “RMS” value since this measurement also takes into account the shortterm voltage peaks on full scale.

RMS
The energetically equivalent DC value (also effective value) to an alternating voltage. It corresponds to the square root of the integral of squares (Root Mean Square). For a purely sinusoidal voltage the rms value corresponds to about 36% ($1/(2x\sqrt{2})$) of the "peak-to-peak" value. At a pulse range consisting of narrow peaks (which is typically the case for the residual ripple of a switched mode power supply) the difference can be considerably larger.

Safety
See at Regulations and Standards.

Sense terminals
For low voltage power supplies, sense lines can be connected to these terminals to measure the voltage immediately at the load and by this to compensate for any voltage drop on the load-lines. The nominal output voltage always refers to the actual output terminals and does not take account of any voltage drop on the load-lines. The compensation of the voltage drop on the load-lines is restricted to a maximum of 5% of the nominal voltage (minimum of 1V) and has to be considered when choosing a supply.

Setting resolution
Smallest possible steps for the adjustment of voltage or current - always referred to the nominal value.

Setting time
The time required before the output value of a power supply reaches the set value

Stability
See deviation.

Standards
See regulations and standards.

Switch mode power supply
Power supply where the transmission of energy is performed by high frequently alternating voltage.

Temperature coefficient (Tc)
In addition to the value for long-term stability (see deviation), we also refer to the 'drift' of an output value as a function of the variation in the ambient temperature whilst the supply is operating under otherwise constant conditions. The data is specified as 'per Kelvin' and is only valid within the stated operating temperature range. The Tc is always referred to the nominal value. When the option "higher stability" is integrated, then the Tc figure improves.

Thyristor regulation
Control of energy flow by a phase cutting circuit with thyristors, operating at the frequency of the mains input.

Unipolar power supply
Units with only one polarity and with no regulation through zero.

Warm-up time
Stability data is only valid after a warm-up time of min. 30 minutes.

2-quadrant operation
The unit operates as a current source and also as current sink (electronic load) with only one polarity of the output voltage. (See active pull-down.)

4-quadrant operation
The unit operates as a current source and also as current sink (electronic load) with both polarities of the output voltage. (See also bipolar power supply.)

How to reach us:

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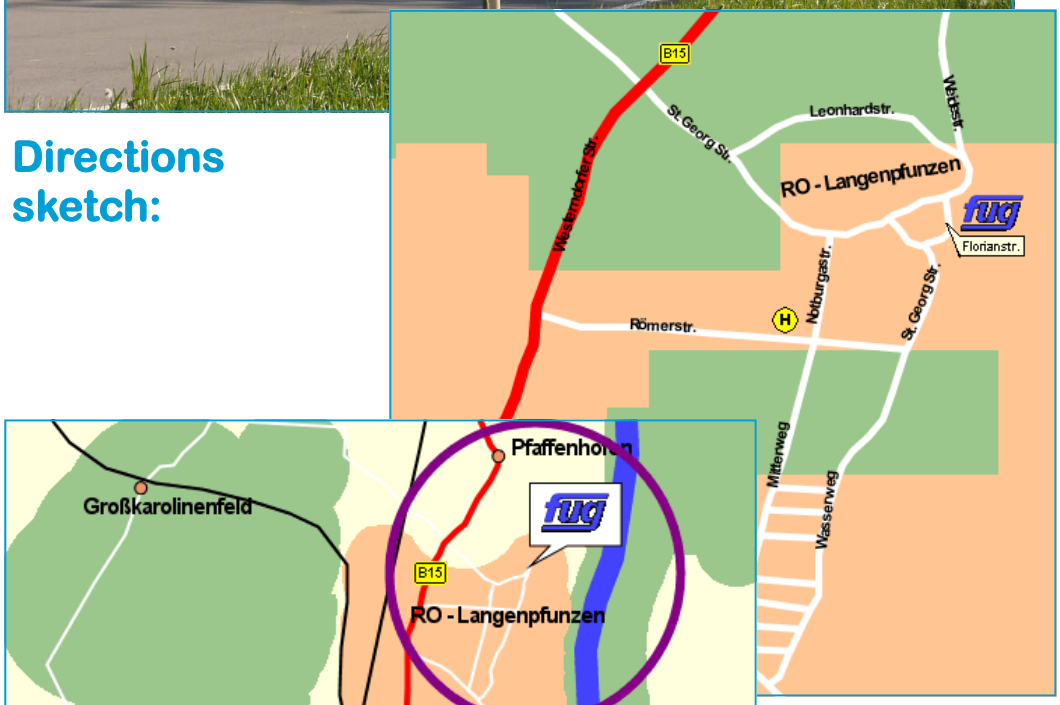
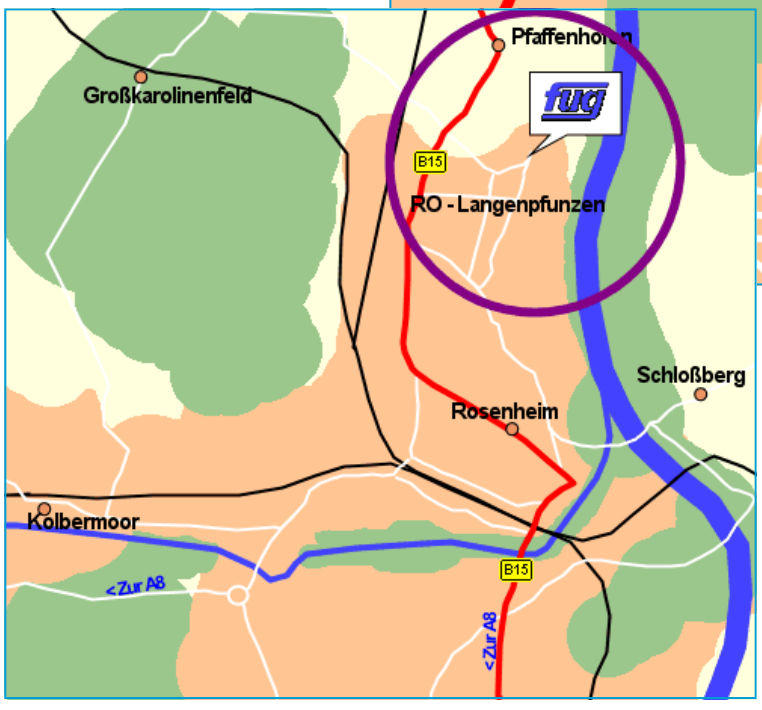
Directions sketch:





All technical data
in this catalogue correspond to the date of printing and have been found accurate to the best of our knowledge. Nevertheless mistakes and printing errors are out of our obligation. Statements are for more precise descriptions of the models, but not assured features according to German § 459 BGB, if they are not especially called as such.

Changes
Technical improvements or adaptions to modified standards are reserved.

Photos
in this catalogue are design examples, but not binding upon the supplied design.

Warranty
For all our power supplies we provide a 2 years warranty, according to our General Conditions of Delivery.

Delivery conditions
according to our General Conditions of Delivery and Payment, see price list.

Our sales partners worldwide:

You can find our sales partners also in the internet.
From www.fug-elektronik.de you will be led by links to all companies beneath.

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