

4-quadrant magnet power supply

CUTE [± 12.5 A; ± 15 V] – HCRPAFM

CUTE is an isolated switched mode power supply working in four-quadrant operation mode. It can provide positive or negative current to the magnet with cycling operation and recovering magnet energy. Its compactness enables to install up to 3 units in a 19-inch module of a height of 4U, and up to 21 units in a 19-inch rack, including control distribution (figure 2). CUTE includes an FGC3 control board, to ensure a high precision current control with two DCCTs, in the range of 50 ppm of stability.



Principle Schematics

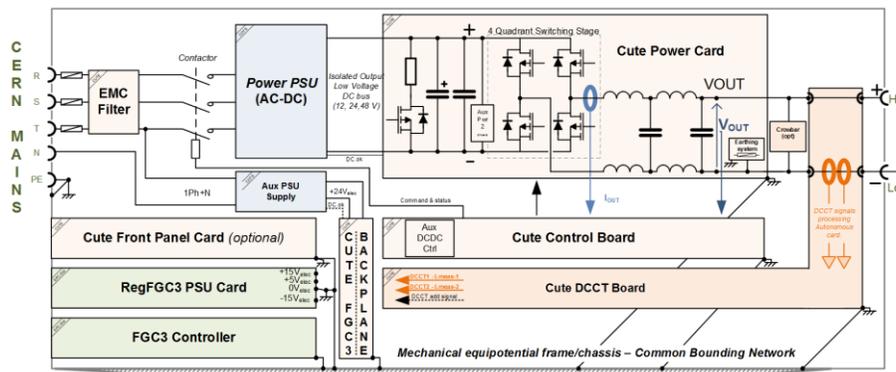


Figure 1: Schematic

Power Ratings

Rating		Value	Unit
Output current	cycling or DC operation	± 12.5	A
Output voltage	cycling or DC operation	± 15	V
Number of phase	3P+N+PE AC connection	3	
Input voltage		400	V_{RMS}
Input current		< 0.5	A
Isolation class	Isolation level to ground	3	kVAC
Power factor		> 0.9	
Efficiency	Power part only	$> 90\%$	
Efficiency	Including control	$> 70\%$	
Switching frequency		100	kHz
Load resistance		0.0001...1.2	Ω
Load inductance		0...1000	mH

Table 1: Power Ratings

Mechanical Characteristics

Characteristics		
Size	Height x Width x Depth	170 x 140 x 650 mm
Weight		7 kg
IP	Electrical enclosure protection	IP21
Cooling		Forced-air cooling

Table 2: Mechanical Characteristics

Cute Current Control

CUTE includes a FGC3 control board in the front panel. CUTE can be controlled locally with a computer through FGC3 USB interface or more generally through a front-end computer connected by FGC ETHER interface (ETHERNET cable).

Parameter		Value	Unit
Output current acquisition frequency		10	kHz
Current reference sampling frequency		10	kHz
Current control algorithm	CCLibs included in FGC3 software		
Output Voltage ripple	f=50Hz-150kHz	≤8.0	mVrms
Current precision performance	Short term stability (20 min)	10	ppm
	stability (12h)	50	ppm
	Long term stability (1 year)	200	ppm
	Noise (500Hz bandwidth)	50	rms ppm

Table 3: Current control performance

CUTE magnet protection

CUTE includes a magnet protection with three key rules, ensure external protection system to stop the power supply, stop the power supply in a safe way through a crowbar system and monitor earth current. The earth system, placed at the negative output, will stop the power supply if the linkage current is above 50mA.

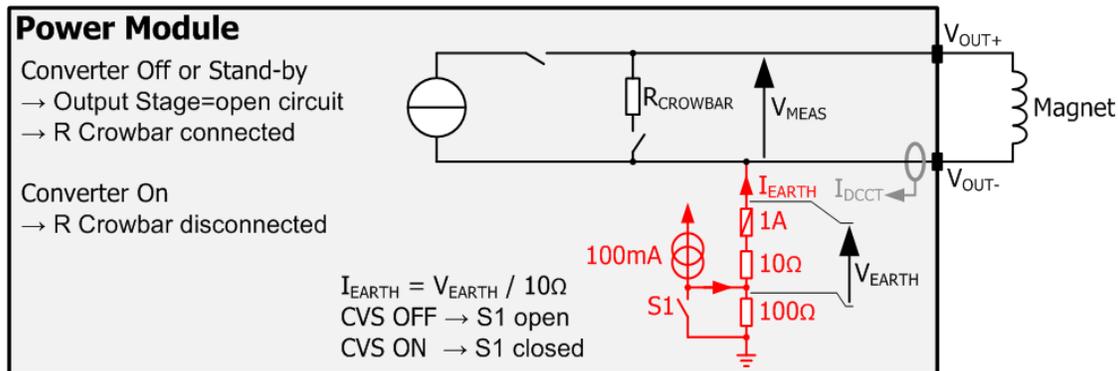


Figure 2: Magnet protection

Cute interface

External interlocks can stop the power supply. Hardwire status are available for external systems.

Parameter	Value	Description
MAGNET INTLK	Burdy UTO-014-12S-21T	1: Powering failure+ (output, dry contact) 2: Powering failure- (output, dry contact) 5: PC connect+ (output, bridge) 6: PC connect- (output, bridge) 7: PC fast abort+ (input) 8: PC fast abort- (input) 11: PC permit+ (input) 12: PC permit- (input)

Table 4: rear connector interface

Cute panel views



Picture 1: front view



Picture 2: rear view

CUTE rack integration

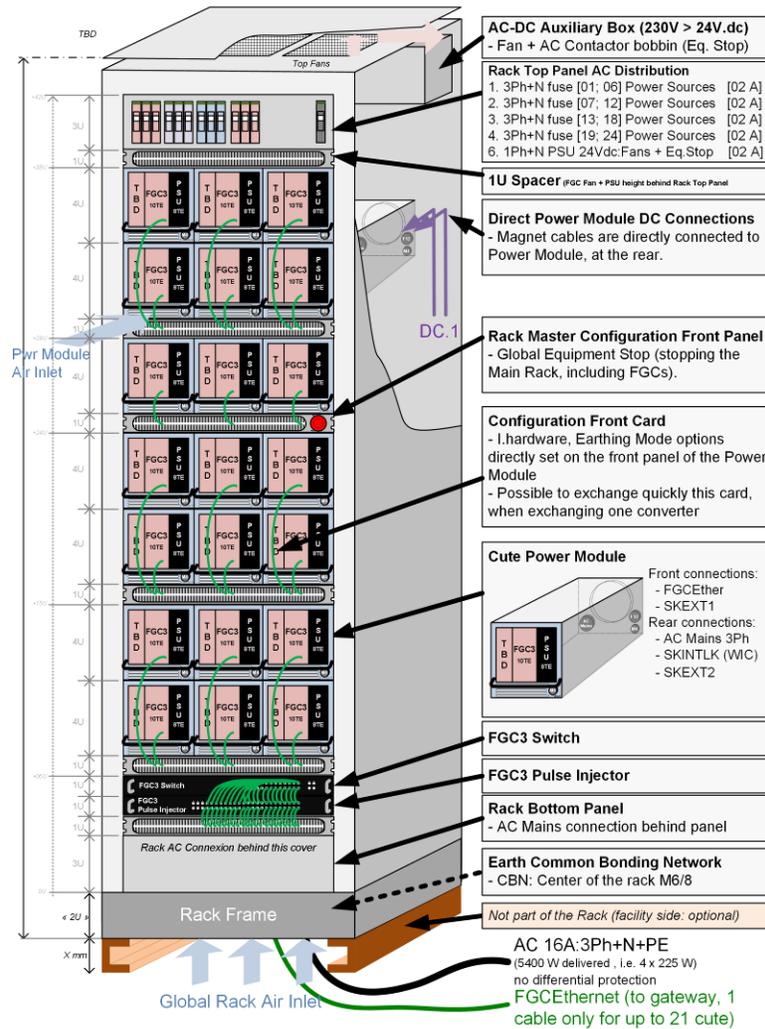


Figure 3: Cute rack with 21 units