SMi200FE ULTRA HIGH EFFICIENCY RECTIFIER

DC output rating 2000 W, 48 VDC



In a highly competitive business environment and with concerns on global warming, telecom OEMs and Communications Service Providers are looking ever closer at their operating costs.

To help CSPs to remain competitive, AEG PS introduces class-leading power conversion efficiency. With a typical flat efficiency feature higher than 96% achieved within 30 – 70% of load and higher than 95.5% achieved within 25 – 90% of load, OPEX is reduced. The ability to operate at high temperature, without de-rating, reduces or eliminates the need for expensive air conditioning with its heavy $\rm CO_2$ burden and high OPEX.

Finally, our all-digital DSP architecture achieves very high levels of circuit integration attaining the very best in reliability. The result? – less frequent need for service calls and maintenance trips, reducing ${\rm CO}_2$ (up to 80% in some cases) throughout the product's life time and lowering OPEX even further.

Key features

- >> Plug & Play, fully compatible with previous installed systems
- "> High efficiency: 96 % typical over large load bandwidth / 96.5 % peak
- >> Standby power consumption: <2 W
- » Wide temperature range: -40 °C to 75 °C
- » Robust; wide input range: 85 300 VAC
- >> Embedded neutral opening protection
- » Designed for high reliability
- Engineered for low environmental impact with massive reduction in CO₂ emissions

Description

The SMi2000FE, using the new Full Efficiency platform, is a ultra-high efficiency 48 VDC rectifier, fully plug & play with backwards compatibility with installed systems using rectifiers from the previous generation (SMi2000HD).

This offers the ability to achieve immediate savings on energy consumption by enhancing the efficiency of deployed MPi-Series & MPTi systems, replacing the SMi2000HD with SMi2000FE. This allows the protection of your original capital investment while reducing operating expense by means of higher efficiency. SMi2000FE is optimized for a wide range of system sizes. Digital communication over CAN bus with our controller ACMi1000HD (as well as ACMi1000e) simplifies system design and enhances flexibility.

Applications

Data centers and telecommunications networks, for wireless, fiber and fixed line communication. With world class efficiency, excellent reliability, and its sleep mode for power management during periods of low traffic, the SMi2000FE really delivers low OPEX.

Increasing network speed demands flexible and expandable DC power solutions. SMi2000FE is the key building block for your future needs.



SMi2000FE TECHNICAL DATA

AC INPUT

Voltage range 85 to 300 VAC Power 184 to 290 VAC P₂ = 2000 W Power factor 90 to 140 VAC P₂ = 1000 W Perguency range 45 to 66 Hz Power factor >0.98 typical P₂ = 1000 W to 2000 W Maximum input current 12 A PROTECTION Input voltage Auto shutdown; auto restart when input voltage is within valid range >290 VAC shutdown (with galwaric auto-disconnect by relay) shut shutdown; autor restart when input voltage is within valid range >290 VAC shutdown (with galwaric auto-disconnect by relay) shut shut shut shut shut shut shut of ward in put voltage is within valid range >290 VAC shutdown (with galwaric auto-disconnect by relay) shut shut shut shut shut shut shut shut	Nominal voltage	220 / 230 / 240 VAC		
\$90 to 140 VAC	Voltage range	85 to 300 VAC		
Prequency range	Power	184 to 290 VAC	P _o = 2000 W	
Power factor >0.98 typical P _e = 1000 W to 2000 W Maximum input current 12 A PROTECTION 12 A Imput voltage Auto shutdown; auto restart when input voltage is within valid range >290 VAC shutdown (with galvanic auto-disconnect by relay) Both Typical (Property) 80 to 990 VAC shutdown (with galvanic auto-disconnect by relay) Input current Electronic current limiting HRC fuses in-line and neutral conductors inrush current Efficiency 96 % typical / 96.5 % peak OUIDESCENT POWER CONSUMPTION 2 W P _e = 0 W, V _e = 0 V Output OFF <2 W P _e = 0 W, V _e = 52.5 V GALVANIC ISOLATION 1500 VAC 1500 VAC Input to output 3000 VAC 3000 VAC Input to chassis (ground) 1500 VAC 400 VAC DC OUTPUT Voltage range 42 to 58 VDC Voltage range 42 to 58 VDC 2000 VAC ±140 VAC Automatic linear de-rating from 184 VAC to 90 VAC 2000 VAC ±140 VAC Automatic linear de-rating from 184 VAC to 90 VAC 41.7 A at 48 VDC Output current rating 41.7 A at 48 VDC Constant power characteristic from 58 VDC to 48 VDC		90 to 140 VAC	P _o = 1000 W	
Maximum input current 12 A PROTECTION Auto shutdown; auto restart when input voltage is within valid range >270 VAC shutdown (with palvanic auto-disconnect by relay) Input current Electronic current limiting HRC fuses in-line and neutral conductors Inrush current <40 A at 230 VAC Efficiency 96 % typical / 96.5 % peak QUIESCENT POWER CONSUMPTION Output OFF QUIESCENT POWER CONSUMPTION 2 W P₂ = 0 W, V₂ = 0 V Output ON 15 W typical P₂ = 0 W, V₂ = 52.5 V GALVANIC ISOLATION 1500 VAC DO VAC Input to chassis (ground) 1500 VAC DC OUTPUT Voltage (ground) 1500 VAC DC OUTPUT Nominal voltage 48 VDC Voltage range 42 to 58 VDC Output power rating 2000 W input ≥184 VAC ≤290 VAC Automatic linear de-rating from 184 VAC to 90 VAC Automatic linear de-rating from 184 VAC to 90 VAC Hold up time >1000 W input ≥90 VAC ≤140 VAC Hold up time >10 ms P₂ = 2000 W TURN ON Start up delay 3 s Rise time <500 ms	Frequency range	45 to 66 Hz		
PROTECTION	Power factor	>0.98 typical	P _o = 1000 W to 2000 W	
Input voltage	Maximum input current			
Septiment	PROTECTION			
Inrush current	Input voltage	>290 VAC shutdown (with galvanic auto-disconnect by relay)		
Efficiency 96 % typical / 96.5 % peak QUIESCENT POWER CONSUMPTION C2W P₀ = 0 W, V₀ = 0 V Output OFF < 2W	Input current	Electronic current limiting HRC fuses in-line and neutral conductors		
Output OFF <2 W	Inrush current	<40 A at 230 VAC		
Output OFF <2 W	Efficiency	96 % typical / 96.5 % peak		
Output ON 15 W typical P = 0 W, V = 52.5 V GALVANIC ISOLATION Input to output 3000 VAC Input to chassis (ground) 1500 VAC Output to chassis (ground) 500 VAC DC OUTPUT Nominal voltage 48 VDC Voltage range 42 to 58 VDC Output power rating 2000 W input ≥90 VAC ≤140 VAC Automatic linear de-rating from 184 VAC to 90 VAC Automatic linear de-rating from 58 VDC to 48 VDC Hold up time >10 ms P = 20000 W TURN ON Start up delay <3 s	QUIESCENT POWER CONSUMPTION	ON		
Input to output 3000 VAC Input to chassis (ground) 1500 VAC Input to chassis (ground) 500 VAC Input Input to chassis (ground) 1000 Vac 1000 Vac Input to chassis (ground) 1000 Vac Input to severe the chass	Output OFF	<2 W	$P_{o} = 0 \text{ W, V}_{o} = 0 \text{ V}$	
Input to output 3000 VAC Input to chassis (ground) 1500 VAC Output to chassis (ground) 500 VAC DC OUTPUT SOUTPUT Nominal voltage 48 VDC Voltage range 42 to 58 VDC Output power rating 2000 W input ≥184 VAC ≤290 VAC 1000 W input ≥90 VAC ≤140 VAC Automatic linear de-rating from 184 VAC to 90 VAC Automatic linear de-rating from 184 VAC to 90 VAC Output current rating 41.7 A at 48 VDC Constant power characteristic from 58 VDC to 48 VDC Constant power characteristic from 58 VDC to 48 VDC Hold up time >10 ms P _o = 2000 W TURN ON Start up delay <3 s Rise time <500 ms Walk in 5 to 10 s VOLTAGE REGULATION Set point accuracy <1 % Total regulation <2 % (line, load & temperature) RIPPLE AND NOISE Seponemetric <2.0 mV weighted PROTECTION Power limit 2000 W @ 48 V to 58 V Current limit 42 A typical, with automatic recovery, programmable Hot plugging	Output ON	15 W typical	$P_{\circ} = 0 \text{ W}, V_{\circ} = 52.5 \text{ V}$	
Input to chassis (ground)	GALVANIC ISOLATION			
Output to chassis (ground) 500 VAC DC OUTPUT Nomial voltage 48 VDC Voltage range 42 to 58 VDC Output power rating 2000 W input ≥184 VAC ≤290 VAC 1000 W input ≥90 VAC ≤140 VAC Automatic linear de-rating from 184 VAC to 90 VAC Automatic linear de-rating from 184 VAC to 90 VAC Output current rating 41.7 A at 48 VDC Constant power characteristic from 58 VDC to 48 VDC At 10 ms Hold up time >10 ms P₀ = 2000 W TURN ON Start up delay <3 s Rise time <500 ms Walk in 5 to 10 s VOLTAGE REGULATION Set point accuracy <1 % Total regulation <2 % (line, load & temperature) RIPPLE AND NOISE Psophometric <2.0 mV weighted PROTECTION Power limit 2000 W @ 48 V to 58 V Current limit 42 A typical, with automatic recovery, programmable Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2 nd fault	Input to output	3000 VAC		
DC OUTPUT Nominal voltage 48 VDC Voltage range 42 to 58 VDC Output power rating 2000 W input ≥184 VAC ≤290 VAC 1000 W input ≥90 VAC ≤140 VAC Automatic linear de-rating from 184 VAC to 90 VAC Output current rating 41.7 A at 48 VDC Constant power characteristic from 58 VDC to 48 VDC Hold up time >10 ms P _e = 2000 W TURN ON Start up delay <3 s Rise time <500 ms Walk in 5 to 10 s VOLTAGE REGULATION Set point accuracy <1 % Total regulation <2 % (line, load & temperature) RIPPLE AND NOISE Psophometric <2.0 mV weighted PROTECTION Power limit 2000 W @ 48 V to 58 V Current limit 42 A typical, with automatic recovery, programmable Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2 nd fault	Input to chassis (ground)	1500 VAC		
Nominal voltage 48 VDC Voltage range 42 to 58 VDC Output power rating 2000 W input ≥184 VAC ≤290 VAC 1000 W input ≥90 VAC ≤140 VAC Automatic linear de-rating from 184 VAC to 90 VAC Output current rating 41.7 A at 48 VDC Constant power characteristic from 58 VDC to 48 VDC Hold up time >10 ms P₀ = 2000 W TURN ON TURN ON \$3 s Rise time <500 ms	Output to chassis (ground)	500 VAC		
Voltage range 42 to 58 VDC Output power rating 2000 W input ≥184 VAC ≤290 VAC 1000 W input ≥90 VAC ≤140 VAC Automatic linear de-rating from 184 VAC to 90 VAC Output current rating 41.7 A at 48 VDC Constant power characteristic from 58 VDC to 48 VDC Hold up time >10 ms P₀ = 2000 W TURN ON Start up delay <3 s Rise time <500 ms Walk in 5 to 10 s VOLTAGE REGULATION Set point accuracy <1 % Total regulation <2 % (line, load & temperature) RIPPLE AND NOISE Psophometric Psophometric <2.0 mV weighted PROTECTION 2000 W @ 48 V to 58 V Current limit 42 A typical, with automatic recovery, programmable Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2 nd fault	DC OUTPUT			
Output power rating 2000 W input ≥184 VAC ≤290 VAC 1000 W input ≥90 VAC ≤140 VAC Automatic linear de-rating from 184 VAC to 90 VAC Output current rating 41.7 A at 48 VDC Constant power characteristic from 58 VDC to 48 VDC Hold up time >10 ms TURN ON Start up delay <3 s Rise time <500 ms Walk in 5 to 10 s VOLTAGE REGULATION Set point accuracy <1 % Total regulation <2 % (line, load & temperature) RIPPLE AND NOISE Psophometric <2.0 mV weighted PROTECTION Power limit 2000 W @ 48 V to 58 V Current limit 42 A typical, with automatic recovery, programmable Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2nd fault	Nominal voltage	48 VDC		
1000 W input ≥90 VAC ≤140 VAC	Voltage range	42 to 58 VDC		
Automatic linear de-rating from 184 VAC to 90 VAC Output current rating 41.7 A at 48 VDC Constant power characteristic from 58 VDC to 48 VDC Hold up time >10 ms P _o = 2000 W TURN ON Start up delay 3 s Rise time < 500 ms Walk in 5 to 10 s VOLTAGE REGULATION Set point accuracy 7 total regulation RIPPLE AND NOISE Psophometric PROTECTION Power limit 42 A typical, with automatic recovery, programmable Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2 nd fault	Output power rating	2000 W input	≥184 VAC ≤290 VAC	
Output current rating 41.7 A at 48 VDC Constant power characteristic from 58 VDC to 48 VDC Hold up time >10 ms P = 2000 W TURN ON Start up delay <3 s Rise time <500 ms Walk in 5 to 10 s VOLTAGE REGULATION Set point accuracy <1 % Total regulation <2 % (line, load & temperature) RIPPLE AND NOISE Psophometric <2.0 mV weighted PROTECTION Power limit 2000 W @ 48 V to 58 V Current limit 42 A typical, with automatic recovery, programmable Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2nd fault		1000 W input	≥90 VAC ≤140 VAC	
Constant power characteristic from 58 VDC to 48 VDC Hold up time >10 ms P _o = 2000 W TURN ON Start up delay <3 s Rise time <500 ms Walk in 5 to 10 s VOLTAGE REGULATION Set point accuracy <1 % Total regulation <2 % (line, load & temperature) RIPPLE AND NOISE Psophometric <2.0 mV weighted PROTECTION Power limit 2000 W @ 48 V to 58 V Current limit 42 A typical, with automatic recovery, programmable Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2 nd fault		Automatic linear de-rating from 184 VAC to 90 VAC		
Hold up time >10 ms P = 2000 W TURN ON Start up delay <3 s Rise time <500 ms Walk in 5 to 10 s VOLTAGE REGULATION Set point accuracy <1 % Total regulation <2 % (line, load & temperature) RIPPLE AND NOISE Psophometric <2.0 mV weighted PROTECTION Power limit 2000 W @ 48 V to 58 V Current limit 42 A typical, with automatic recovery, programmable Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2nd fault	Output current rating	41.7 A at 48 VDC		
TURN ON Start up delay Start up delay Rise time \$ 500 ms Walk in \$ 5 to 10 s VOLTAGE REGULATION Set point accuracy \$ 1 % Total regulation \$ 2 % (line, load & temperature) RIPPLE AND NOISE Psophometric \$ 2.0 mV weighted PROTECTION Power limit \$ 2000 W @ 48 V to 58 V Current limit \$ 42 A typical, with automatic recovery, programmable Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2nd fault		Constant power characteristic from 58 VDC to 48 VDC		
Start up delay Rise time Stooms Walk in Stooms VOLTAGE REGULATION Set point accuracy Total regulation Set point Accuracy Total regulation Set Posphometric Psophometric PROTECTION Power limit 2000 W @ 48 V to 58 V Current limit 42 A typical, with automatic recovery, programmable Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2nd fault	Hold up time	>10 ms	P _o = 2000 W	
Rise time < 500 ms Walk in 5 to 10 s VOLTAGE REGULATION Set point accuracy < 1 % Total regulation < 2 % (line, load & temperature) RIPPLE AND NOISE Psophometric < 2.0 mV weighted PROTECTION Power limit	TURN ON			
Walk in 5 to 10 s VOLTAGE REGULATION Set point accuracy < 1 % Total regulation <2 % (line, load & temperature) RIPPLE AND NOISE Psophometric <2.0 mV weighted PROTECTION Power limit 2000 W @ 48 V to 58 V Current limit 42 A typical, with automatic recovery, programmable Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2 nd fault	Start up delay			
VOLTAGE REGULATION Set point accuracy Cotal regulation C2 % (line, load & temperature) RIPPLE AND NOISE Psophometric PROTECTION Power limit Current limit A2 A typical, with automatic recovery, programmable Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2 nd fault	Rise time	<500 ms		
Set point accuracy Total regulation RIPPLE AND NOISE Psophometric PROTECTION Power limit 2000 W @ 48 V to 58 V Current limit 42 A typical, with automatic recovery, programmable Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2nd fault	Walk in	5 to 10 s		
Total regulation <2 % (line, load & temperature) RIPPLE AND NOISE Psophometric <2.0 mV weighted PROTECTION Power limit 2000 W @ 48 V to 58 V Current limit 42 A typical, with automatic recovery, programmable Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2nd fault	VOLTAGE REGULATION			
RIPPLE AND NOISE Psophometric <2.0 mV weighted PROTECTION Power limit 2000 W @ 48 V to 58 V Current limit 42 A typical, with automatic recovery, programmable Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2nd fault	Set point accuracy	<1 %		
Psophometric <2.0 mV weighted PROTECTION Power limit 2000 W @ 48 V to 58 V Current limit 42 A typical, with automatic recovery, programmable Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2 nd fault	Total regulation	<2 % (line, load & temperature)		
PROTECTION Power limit 2000 W @ 48 V to 58 V Current limit 42 A typical, with automatic recovery, programmable Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2 nd fault	RIPPLE AND NOISE			
Power limit 2000 W @ 48 V to 58 V Current limit 42 A typical, with automatic recovery, programmable Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2nd fault	·	<2.0 mV weighted		
Current limit 42 A typical, with automatic recovery, programmable Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2 nd fault	PROTECTION			
Hot plugging Automatic current surge limiting Over voltage Shutdown, with auto-restart, programmable, latched after 2 nd fault	Power limit	2000 W @ 48 V to 58 V		
Over voltage Shutdown, with auto-restart, programmable, latched after 2 nd fault	Current limit	42 A typical, with automatic recovery, programmable		
	Hot plugging	<u> </u>		
Over temperature Automatic power de-rating and excessive temperature shutdown	Over voltage	· •		
	Over temperature	Automatic power de-rating and	d excessive temperature shutdown	

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TECHNICAL DATA

CONTROL AND MONITORING

CONTROL AND MONTORII			
Alarms and signaling	Reported via CAN-Bus to system controller		
Visual indicators	Green LED = normal operation, output voltage >42 VDC		
	Green LED "slow blinking" = rectifier in sleep mode		
	Yellow LED "blinking" = CAN bus communication failure		
	Yellow LED = minor alarms		
	Green LED "off" + red LED = major alarm, no power at output		
MECHANICAL			
Dimensions (H x W x D) (mm)	41.5 (1 U) x 109 x 325		
Weight (kg)	2		
Connections	Rear mounted		
ENVIRONMENTAL			
IP rating	IP20		
Operating temperature	-40 °C to +75 °C Automatic de-rating above 55 °C		
Storage temperature	-50 °C to +85 °C		
Humidity	5% to 95% (non-condensing)		
Acoustic noise	<55 dB(A) Full load		
RoHS	2002 / 95 / EC		
WEEE	2002 / 96 / EC, 2003 / 108 / EC		
Altitude	Up to 2500 m without de-rating		
RELIABILITY			
MTBF	>350,000 hours Telcordia SR-332		
REGULATORY STANDARDS			
SAFETY			
International	EN60950-1		
North America	UL / CSA 60950-1		
Safety approvals	CE / UL(*) / TÜV / cTUVus		
Electro-magnetic compatibility (EMC)	Installed in system		
Emissions, conducted	EN55022, Class B		
Emissions, radiated	EN55022, Class B		
IMMUNITY			
ESD	IEC/EN 61000-4-2		
Radiated "E" field	IEC/EN 61000-4-3		
Fast transient burst	IEC/EN 61000-4-4		
Surge	IEC/EN 61000-4-5		
Conducted RF	IEC/EN 61000-4-6		
Radiated "H" field	IEC/EN 61000-4-8		
Power line dips	IEC/EN 61000-4-11		
"ANSI" surge	IEEE C62.41		
Telecom networks	EN300-132-2, EN300-386-2		

(*) Pending

Services

With over 60 years of expertise in power systems and solutions, AEG Power Solutions is renowned for its unparalleled services and technical support in critical application environments. As a world class systems provider, you can rely on a global network of 20 services centers supported by over 150 field engineers and more than 100 certified service partners around the world. From the power solution selection to your process installation and commissioning, our certified experts go beyond your expectations by offering service excellence that will ensure the lowest operational cost for your

mission-critical equipment. The reliability of your installed power solution is supported by a global service team renowned for its short response time and trouble shooting efficiency. Choosing one of the Pro Care™ preventive maintenance options gives you the ultimate peace of mind reassuring complete cost control, security and uninterrupted power supply in utmost critical situations.

You can also benefit from a full range of professional services that will protect and ensure the durability of your investment and will take over when you need it most:

- » Pro Care™ preventive maintenance options
- >> Turnkey solutions
- Installation and commissioning
- Maintenance services
- » E-Service/remote monitoring
- » 24/7 hotline
- » Onsite training
- » Hot swapping
- Onsite battery replacement
- » Battery monitoring
- Facility and equipment management
- >> 24/7 global onsite contracts
- » Power quality assessment
- » Load bank and site capacity analysis
- Trouble shooting and repair

AEGPOWER SOLUTIONS