BENNING
World Class Power Solutions

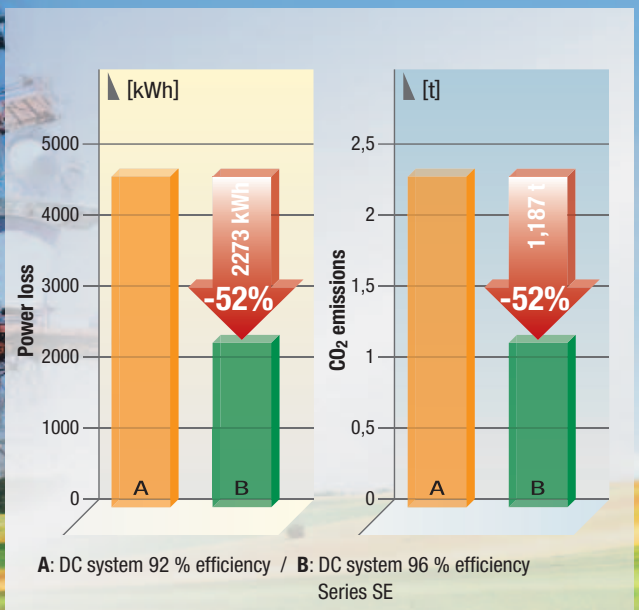
Excellent Technology, Efficiency and Quality

Telecom power supplies

Rectifier series SE

- Highly efficient
- Reliable
- Flexible

Telecom power supplies
Rectifier series SE



A: DC system 92 % efficiency / **B**: DC system 96 % efficiency Series SE

Fig. 1: Comparison of the annual values (power loss and CO_2) of 6.0 kW DC power supplies

Flexible, efficient and reliable

Established more than 70 years ago, today BENNING is a leading supplier of power supplies in support of the information, telecommunications and industrial technology sectors.

As the world has become more aware of how finite our energy resources are BENNING has invested significantly in the development of ever more efficient power supply systems.

Increased efficiency when converting AC to DC using rectifiers, DC to AC using inverters or AC to AC in UPS systems has the potential to create significant energy savings.

Advanced manufacturing techniques, improved circuit design and the use of state of the art semiconductor components all lead to greater equipment efficiencies.

As an example BENNING has achieved a 52% reduction in power losses when converting AC to DC using our new high-efficiency rectifier series SLIMLINE SE and TEBECHOP 13500SE.

Additionally the weight and volume of the rectifiers and distribution units was also reduced during development leading to further practical benefits and reduced resource use.

The highly efficient and innovative SE series contributes to a reduction in electrical energy consumption lessening your environmental impact. Using less energy means there is less heat to dissipate which in turn results in a reduced need for cooling providing another consequential saving.

As an example, using the new SE series rectifier reduces the environmental impact of a DC supply rated at 6kW by 2373kWh and 1.19t of CO_2 on an annual basis.

Telecom Power Supplies
Rectifier Series SE

Special features

- **Extremely high power density reduces 'footprint' on site**
- **High efficiency >96% under partial load**
- **DC output with consistent power and temperature characteristics**
- **Reliable hot plug technology**
- **Automatic synchronization of the DC rectifier modules when replacing and upgrading**
- **Commissioning, expansion and replacement is a simple process**
- **Operating temperature range -33°C to +75°C (for outdoor use)**
- **Remote monitoring via TCP/IP or modem**

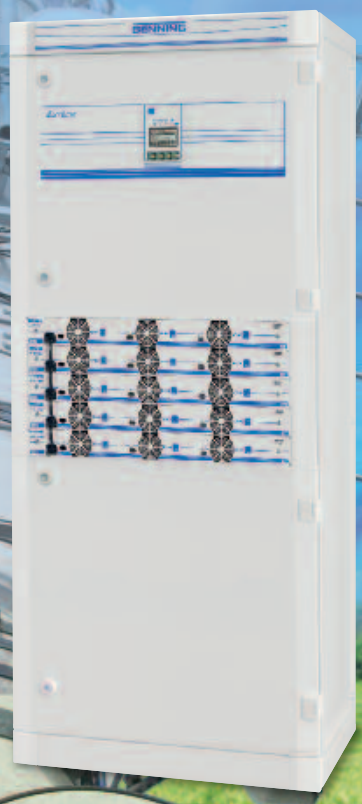


Fig. 2:
Power supply system
DC output:
48 V / 28 kW (n+1)

SLIMLINE modular
DC power supply systems

SLIMLINE SE power supply systems are built from individual modules with capacities of 800W (SLIMLINE 800 SE) and 2000W (SLIMLINE 2000 SE). The SLIMLINE SE rectifier modules are installed in 19" 1U carriers. Each carrier can accommodate up to five 48V- 800 SE modules or three 48V-2000 SE modules.

Systems with different battery capacities and load configurations can be created. Distribution modules are designed to fit 19" racks and are 1U or 3U high depending upon the number of output feeds required. The rectifier carrier, rectifier modules, battery protection devices and output distribution equipment forms a complete modular SLIMLINE SE power supply system (SLIMLINE Modular System = SMS).

BENNING's smallest capacity power supply system (SMS 2400 SE) accommodates up to three rectifier modules (48V-800 SE) in a 1U 19" carrier together with a battery protection and load distribution unit (4000 SE) in a second 1U 19" enclosure.

The SMS 4000 SE increases the maximum power to 4000W. This system consists of a 1U carrier with up to five rectifier modules (48V-800 SE) plus the battery protection and load distribution unit 4000 SE .

Larger capacities up to 6000W (SMS 6000 SE) are possible using the 48V-2000 SE modules. A 1U 19" carrier can accommodate up to three of these rectifiers and can be combined with the battery protection and load distribution unit 6000 SE (fig. 4).

A capacity of up to 18000W (SMS 18000 SE) can be achieved by connecting in parallel three 6000 SE rectifier carriers. These can then be combined with the 3U 19" battery protection and load distribution unit 18000 SE. Even greater capacities can be realized by the parallel connection of further carriers (fig.2).

A SLIMLINE control board is provided for rectifier control and monitoring purposes. A SLIMLINE MCU is available as an option for additional monitoring functionality. In the case of the SMS 2400 SE the SLIMLINE MCU is mounted in the rectifier carrier. In power supplies with greater capacity the SLIMLINE MCU is mounted in the battery protection and load distribution enclosure.

For more comprehensive control and monitoring functions, the remote mounted monitoring system MCU 2500 is available. A description of this device can be found on page 7 (fig.9).

Fig. 3: 3 x SLIMLINE rectifier 800 SE
with distribution 2400 SE
DC output 48 V / 2400 W

Fig. 4: 3 x SLIMLINE rectifier 2000 SE
with distribution 6000 SE
DC output 48 V / 6000 W

Fig. 5: 9 x SLIMLINE rectifier 2000 SE
with distribution 18000 SE
DC output 48 V / 18000 W

	SMS 2400 SE	SMS 4000 SE	SMS 6000 SE	SMS 18000 SE	SMS 18000 SE
Battery connections	1	1	1	1	2
LVD	●	●	●	●	●
N-PLD	○	○	○	○	○
LC display (display of U, I, T)	●	●	●	●	●
Battery fuse monitored (1 battery)	1 x LSS 60 A	1 x LSS 150 A	1 x LSS 150 A	1 x LSS 350 A	–
Battery fuse monitored (2 batteries)	–	–	–	–	2 x LSS 350 A
Load fuse monitored (diodes)	5 x LSS 6 A – 15 A	6 x LSS 2 A – 60 A	6 x LSS 2 A – 60 A	15 x LSS 2 A – 125 A	15 x LSS 2 A – 125 A
Load fuse* monitored (auxiliary switch)	–	–	–	9 x LSS 6 A – 50 A	9 x LSS 6 A – 50 A
Battery current measurement	●	●	●	●	●
Connection for external distribution	1 x 60 A	1 x 150 A	1 x 150 A	–	–
SLIMLINE MCU	○	○	○	○	○

(● = is included / ○ = optionally available / – = not included), * alternatively
LVD ≙ battery deep discharge protection
N-PLD ≙ Non-essential load disconnect

Important components of the SLIMLINE SE battery and load distributions

Fig. 6: Power supply system
DC output: 48 V / 121.5 kW (n+1)

TEBECHOP 13500SE
Modular power supply systems

The new 48V rectifier TEBECHOP 13500 SE is ideally suited to power supply systems with a load requirement greater than 50kW.

The 3U high 19" mounting unit has a three-phase mains connection, active power factor correction (power factor 0.99) and supplies a constant output power of 13500W. The output current is 250A at 2.25V /c (float voltage) (fig. 7).

The TEBECHOP 13500 SE is very energy efficient particularly within the 25% to 90% load range (fig.8). For larger capacity systems proportionately more energy can be saved when using this rectifier series. Higher energy efficiency results in reduced heat output. In most cases this leads to a reduced demand for cooling or ventilation, saving even more energy.

The compact installation height (3U) of the TEBECHOP 13500 SE together with the low power loss and improved efficiency allows up to 10 rectifier modules to be installed in a single cabinet 2000mm high x 600mm wide x 600mm deep.

To complete the system, battery protection and load distribution cabinets are available. These cabinets can also accommodate assemblies such as the MCU2500 (fig.6).

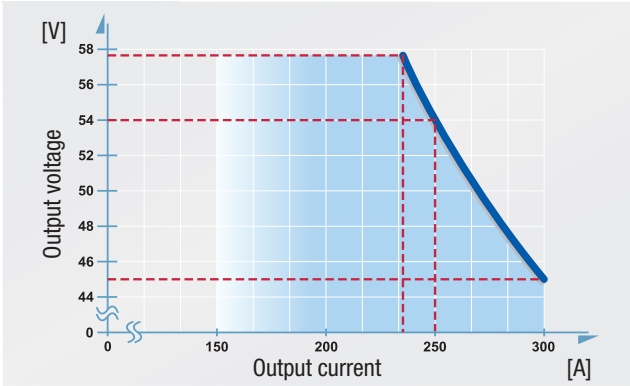


Fig. 7: Output currents vs. output voltages, rectifier shelf TEBECHOP 13500 SE

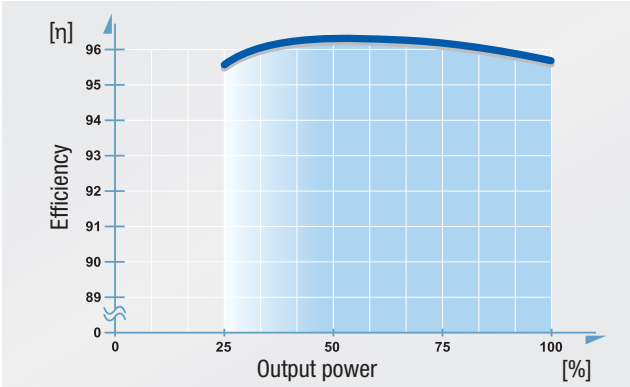
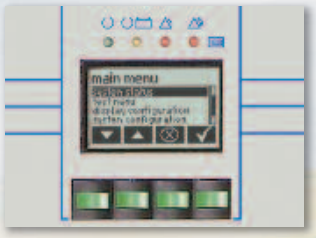


Fig. 8: Efficiency vs. output power, rectifier shelf TEBECHOP 13500 SE

Telecom power supplies
Rectifier series SE

MCU 2500

The MCU 2500 is a door mounted, microprocessor controlled, monitoring and control device. The embedded software makes comprehensive monitoring and control of the power supply system possible both locally and remotely.



Connection to the MCU 2500 can be made via a PC, modem or TCP/IP adapter. The MCU 2500 encourages more efficient use of maintenance and service personnel.

Web browser: System values and configuration

TCP/IP protocol: complete data are transmitted

Graphical user interface for all Windows operating systems

RS 232 serial communication

Fig. 9: MCU 2500 remote monitoring system

Technical data

Rectifier		**SLIMLINE SE**		**TEBECHOP SE**
Output power	[W]	800	2000	13500
Max. number per 19” carrier		5	3	1
Input voltage range	[V]	140 - 275	140 - 275	3 x 340 - 440 (o. N)
Input current [A]		3.7	9.3	21
Frequency	[Hz]	45 - 63		
Power factor		0.99		
Output current				
48 V	[A]	15	40	250
60 V	[A]	-	30	-
Output voltage		programmable		
Boost charge	[V/C]	2.4		2.4
Float charge	[V/C]	2.25		2.25
Direct feed	[V/C]	2.0		2.0
Battery test	[V/C]	1.95		1.95
Voltage stability (U_A)				
static	[%]	+/- 1		
dynamic load (10/100/10) (di/dt > 200 µs)		+/- 5		+/- 4
Settling time	[ms]	< 5		< 1
Efficiency		96		96
Characteristic		IPU power constant		
Interference voltage	[mV]	< 2		
Electromagnetic compatibility		EN 61000-6-2 / EN 61000-6-4		
Safety		EN 60950 / IEC 950 / UL 1950		
Protection degree		IP 20		
Cooling		temperature controlled fan		
Temperature range	[C°]	-33 to +75*		
Installation height	[m]	up to 2000 m above NN		
Humidity class		F DIN 40040		
Weight (without tool carrier)	[kg]	1.0	1.9	22

* > 55°C derating with 2.5 % / K

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