Excellent Technology, Efficiency and Quality

• smart, flexible, modular
• highly efficient and reliable
• cost-effective
It has become normal within our modern society to use a wide variety of electronic media for instantaneous contactability, communication, process control and transactions. In order to always be in touch, permanently available network access is required whose backbone is formed by the nationwide roll-out of high-speed wireless data networks such as LTE and, in future, 5G. The requisite telecommunications technology requires there to be a reliable power supply which is operational at all times.

BENNING has delivered battery-powered AC and DC power supplies to many mobile phone and landline operators around the world for decades and has made particular investments in the development of high-efficiency power supplies for energy-saving, reliable operation. Nowadays, BENNING ranks as one of the leading suppliers of high-efficiency power supplies for the secure operation of information, telecommunications and industrial technology systems.

Fig. 1: In this series, the power density is more than 33% improved on the previous model
The SLIMLINE system simply scalable and can grow in line with customer requirements—from 2 to 400 kW. Due to the high degree of modularisation, it is possible to plan, configure and deliver customised systems at very short notice.

Hot plug
All modules can be replaced during ongoing operation (hot plug). The SLIMLINE carrier with the appropriate quantity of rectifier modules and the assigned battery and consumer distribution creates a complete, modular SLIMLINE power supply system (see Figs. 4, 5, 6).

Flexible scalability up to 400 kW
The SLIMLINE system is simply scalable and can grow in line with customer requirements—from 2 to 400 kW. Due to the high degree of modularisation, it is possible to plan, configure and deliver customised systems at very short notice.

The most cost-effective solution for every requirement
The new SLIMLINE series covers the entire array of mobile radio applications, from the mobile switching center (MSC) to the base station controller (BSC) to individual base transceiver stations (BTS). Consequently, the power supply systems safeguard the entire transmission technology (LTE, 4G, VoIP, TV, servers, etc.) against power failures.

Low power ratings of up to 4000 W
The smallest rated low-power telecommunications power supply system, SLIMLINE PSU 4000, has a maximum of two rectifier modules 48 V / 2000 W, a controller, as well as the battery and consumer distribution integrated into a 19” 1H SLIMLINE carrier (see Fig. 4).

Medium power ratings of up to 32 kW
System power ratings of 10 kW (with a controller module) or 12 kW in only one module height can be achieved with a rack which is fully configured with rectifiers for the medium output range, which includes mobile radio stations for example (see Fig. 6).

High power ratings of up to 400 kW
Larger power ratings, such as those required in nodes and distribution stations, can be achieved by connecting multiple SLIMLINE carriers in parallel. This enables power ratings of up to 400 kW to be achieved. The systems are integrated into 19” cabinet systems which can also house batteries and distribution units (see Fig. 7).

The power rating can be increased to up to 22 kW by connecting a second SLIMLINE carrier in parallel (see Fig. 5) and up to 32 kW by connecting a third SLIMLINE carrier, including a controller module. Battery and consumer distribution units of different outputs are available for all power ranges, guaranteeing a compact, space-saving system. The distribution units are also structured in 19” plug-in units and each comprise one or three height units, depending on the output power (see Figs. 4 and 6).

Modular component concept
The modular concept significantly lowers the cost and time expenditure in the installation and maintenance of the new SLIMLINE telecommunications power supplies at wireless sites which are being newly built or converted.
SLIMLINE controller – remote monitoring and reliability in a very compact space

The SLIMLINE controller is available for extensive control and monitoring functions. This is generally inserted into the SLIMLINE carrier as a module (see Fig. 8) in the case of low power ratings. The 19” 1H carrier can accommodate either five 48 V / 2000 W rectifier modules combined with a controller module or six rectifier modules. In the case of power supplies with a greater power rating, the monitoring and control unit can be integrated into the cabinet door of the power supply system (see Fig. 9).

The controller monitors the entire power supply system and controls the power management for example. The system is structured to ensure that the power supply remains operational in the event of controller failure. The rectifiers continue to supply the system and the batteries, which is why the power remains at 100%. Therefore, failure is not critical to the process, and there is no need for controller redundancy. This lessens the space required and reduces investment and operating costs. Needless to say, a message appears in the event of a controller failure so that prompt steps can be taken to have the controller module replaced by a service technician at short notice.

It is easy to operate by computer, tablet or smartphone

In the case of the SLIMLINE controller modules which are inserted in the racks, five methods of connectivity are integrated into only one sixth of the 19” width, for example an SNMP adapter and the modbus which is addressable via the RS-485 port or the network. It also includes a modem connection which is supplied via an RS-232 port and the 12 V feed (see Fig. 10).

In theory, the system can be configured via the integrated colour display on the front. If there is a mobile device or computer available, the configuration can take place conveniently via a network connection and Internet browser (see figure above). There is no further software required. By consistently matching operation to the requirements of the user delivers all the most beneficial measurements and settings with clarity, precision and simplicity.

The high contrast, bright display of the SLIMLINE controller also functions as a visual alert. If a fault occurs, it is fully illuminated in red and is clearly visible from a distance.
Technical data

<table>
<thead>
<tr>
<th>Systems</th>
<th>SLIMLINE PSU 4 kW</th>
<th>SLIMLINE PSU 8 kW</th>
<th>SLIMLINE PSU 16 kW</th>
<th>SLIMLINE PSU 32 kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery outputs</td>
<td>1+1 (optional)</td>
<td>1+1 (optional)</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>LVD</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
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<tr>
<td>N-PLD</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Battery fuse monitored</td>
<td>1 x LSS 60 A</td>
<td>1 x LSS 200 A</td>
<td>2 x LSS 200 A</td>
<td>4 x LSS 200 A</td>
</tr>
<tr>
<td>Consumer fuse monitored (diodes)</td>
<td>6 x LSS 2 A – 30 A*</td>
<td>14 x LSS 2 A – 63 A</td>
<td>14 x LSS 2 A – 63 A</td>
<td>14 x LSS 2 A – 63 A</td>
</tr>
<tr>
<td>Shunt for battery current</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Connection for an external distribution unit</td>
<td>•</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

(* = is included / • = optional / – = not included)

SLIMLINE rectifier module

| Output power [W] | 2000 |
| max. quantity per 19” SLIMLINE carrier | 6 |
| max. quantity per system | 200 |
| Input voltage range [V] | 195 – 264 |
| Input current [A] | 9.7 – 8.6 |
| Frequency [Hz] | 47 – 63 |
| Power factor | 0.99 |
| Output current [A] | 41.7 |

Output voltages

| Output voltage range [V] | 43.2 – 57.6 |
| Floating charge (factory setting) [V] | 54 |
| Main charge (factory setting) [V] | 57.6 |
| Voltage stability (Uₖ) static [%] | ± 1 |
| Voltage stability (Uₖ) dynamic (< 50 ms, 90-10-90%) [%] | ± 8 |
| Recovery time [ms] | 50 ms |
| Efficiency [%] | 97 |
| Characteristic | IPU constant power |
| Interference voltage [mV] | < 2 |
| Radio interference level | EN61000-6-2 / E 61000-6-4 |
| Safety | EN 60950 / IEC 950 |
| Degree of protection | IP20 |
| Ventilation | Fans |
| Ambient temperature [°C] | -33 to 75* |
| Installation altitude [m] | up to 2000 m above sea level |
| Humidity class | EN60721-3-3 class 3K3 |
| Weight [kg] | 1.3 |

* > 55 °C derating with 2.5% / K

Subject to technical changes.
SLIMLINE – modular, smart, flexible and extremely efficient

Fig. 2: Efficiency in relation to the output power

Fig. 3: The 19” 1H carrier can accommodate either five 48 V and 2000 W rectifier modules combined with a controller or six rectifier modules.

Maximum operational reliability, minimum operating costs

The newly developed SLIMLINE power supply solutions are precisely tailored to the requirements of the telecommunications network operator.

- optimum operational reliability
- maximum energy efficiency
- optimum user space
- flexibility (pay as you grow)
- modularity

They not only contribute significantly to the low total cost of ownership (TCO), they are also the basis for a clear reduction in installation and assembly times, as well as for simpler and more efficient maintenance possibilities in later operation.

Only one type of rectifier is required for systems within a power range of 2 kW to 400 kW. This simplifies stock management and logistics for the benefit of the owner as it is only required to keep one type of module in stock for all systems.

Optimum energy efficiency in the minimum user space

Individual rectifier modules with an output of 2000 W are available for creating complete power supply systems. The 19” 1H carrier can accommodate either five 48 V / 2000 W rectifier modules combined with a monitoring and control unit (SLIMLINE controller) or six rectifier modules. This gives a power rating of 10 kW or 12 kW per rack (see Fig. 3).

In this series of high-efficiency rectifiers, the power loss which occurs in the transformation of energy from alternating current to direct current has been reduced by up to 30% compared to the previous model. At the same time, the overall physical footprint of the rectifiers has been reduced by more than 33% (see Fig. 1).

A particularly impressive fact is that the SLIMLINE series works at efficiency in excess of 97% across a load range of between 50% and 90% (see Fig. 2). This creates substantial savings for telecommunications service providers which operate a number of systems in the field. Optionally, active power management can be enabled which determines the load required and automatically connects or disconnects the rectifier modules accordingly.
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