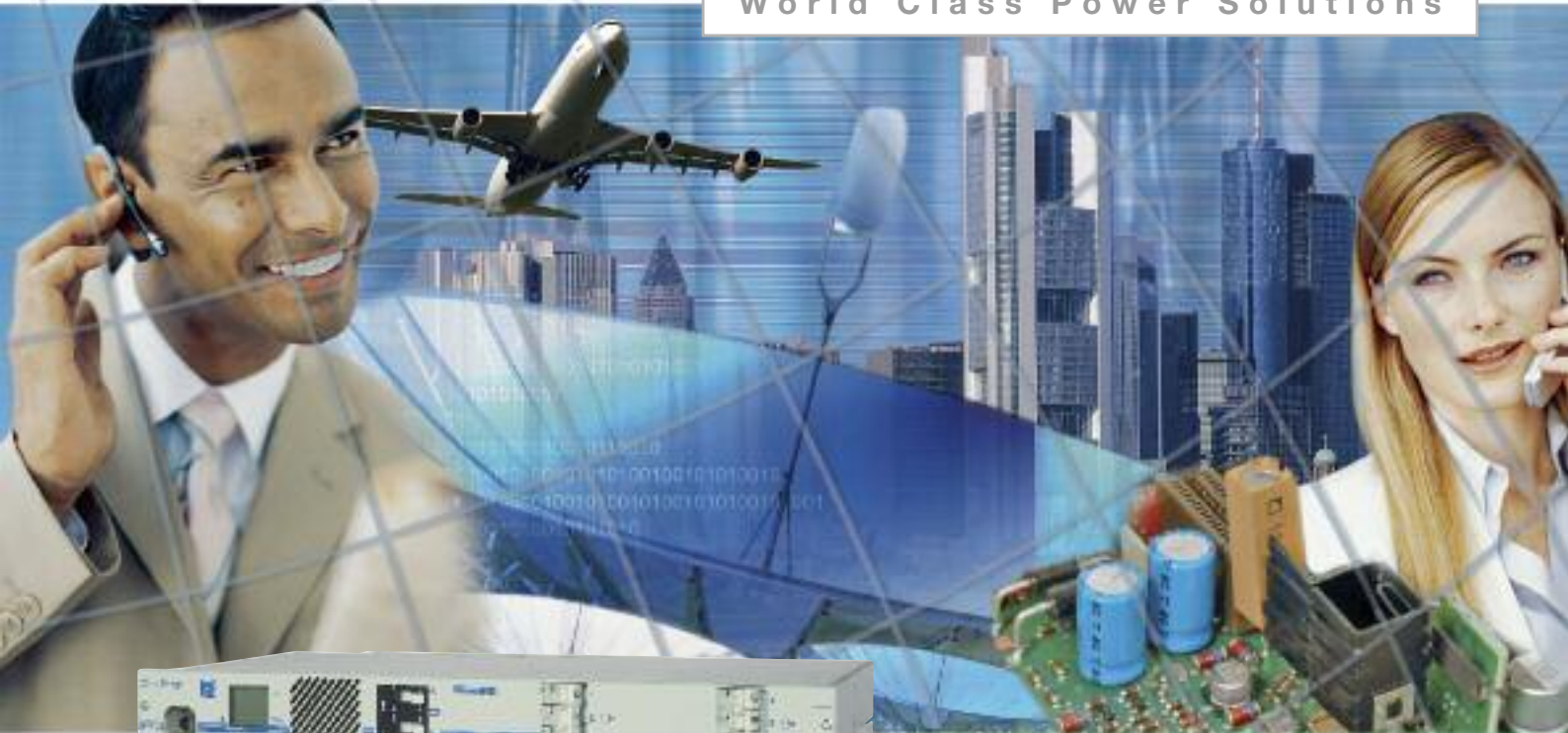


# BENNING

World Class Power Solutions



## Telecom

DC Power Systems  
SLIMLINE 500, 1500  
TEBECHOP 3000 HD, 12000



# SLIMLINE and TEBECHOP

## A new generation of cost effective power solutions

### DC Power Systems

Global communications demand cost efficient and compact DC power systems.

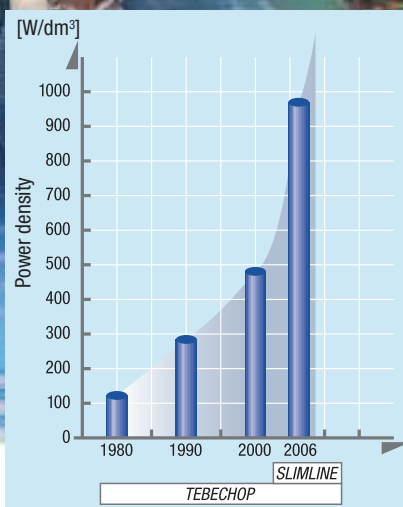
As one of the leading global power supply companies, BENNING offers a new range of rectifier modules and DC power systems with high power density (see graph 1) high efficiency and excellent reliability.

With the rectifier modules SLIMLINE 500 and 1500, the TEBECHOP 3000 HD and TEBECHOP 12000, BENNING covers the entire range of application areas within the telecommunications industry.

### Advantages of SLIMLINE and TEBECHOP Power Systems:

- Extremely high power density reducing space demands.
- High efficiency >90 % between 30 % and 100 % (see graph 3, 5, 7).
- Wide range of input voltage (85 V – 275 V) allows operation in nearly all countries in the world. \*
- Power constant DC output with temperature compensation.
- Real hot-plug connection.
- Automatic set-up of additional rectifiers.
- Ease of installation, operation and expansion.
- Tolerant of harsh environmental conditions- operational from -33 °C up to +75 °C ambient temperature. \*
- Systems status and alarm information with microprocessor controlled monitoring system MCU 2500.
- Remote control with modem, HTML or SNMP (option).

\* not TEBECHOP 12000



Graph 1: Power density of single phase 48 V telecom rectifiers over the last decades.



SMS 1500



TEBECHOP 3000 HD



SMS 4500



TEBECHOP 12000



# SLIMLINE

Wide range of input voltage and operating temperature

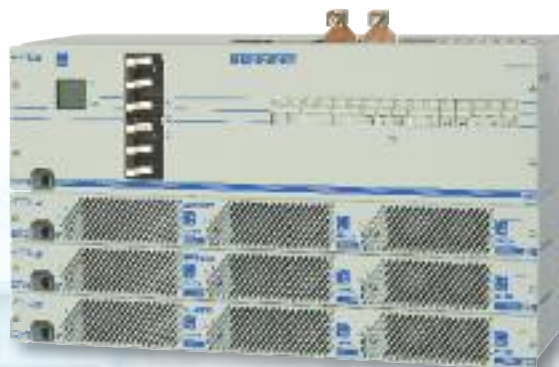
## SLIMLINE

The new SLIMLINE 500 watt and SLIMLINE 1500 watt rectifier modules are extremely compact and fit into a specially designed 19" 1 U sub-rack.

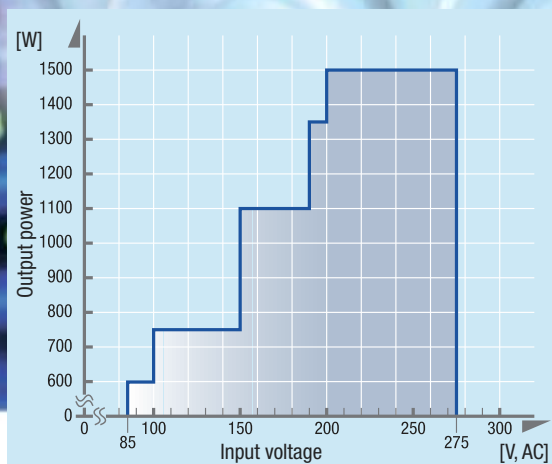
Together with 1 U and 3 U battery and load distribution modules the realisation of compact, flexible and expandable DC power systems with ratings between **500 watts and 13500 watts** for any indoor or outdoor solution is possible.



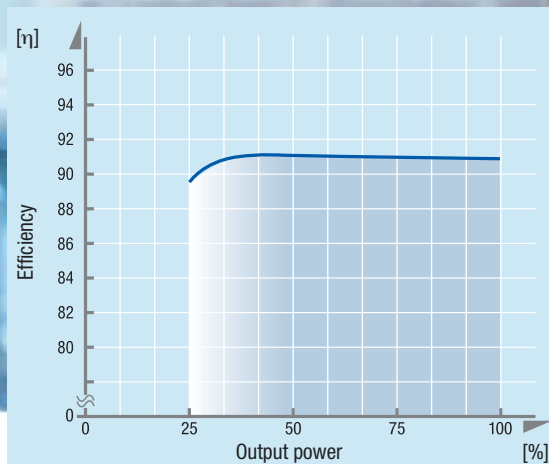
Power system  
48 V – 3 kW  
with Distribution



Power system  
48 V – 13,5 kW  
Distribution 13,5 kW



Graph 2: Output power as a function of input voltage



Graph 3: Efficiency as a function of output power

## Rectifier modules 48 V

- **SLIMLINE 500**  
output power 500 W
- **SLIMLINE 1500**  
output power 1500 W

The 500 W or 1500 W rectifier modules fit into a specially designed 19" 1 U sub-rack.

Max. 6 modules 500 W or 9 modules 1500 W can be used as one power block. With this arrangement the total DC power will be 1500 W – 13500 W.

The rectifier modules can supply the max. output power between mains voltages of 200 V and 275 V.

Between 200 V and 85 V the output power will be reduced in steps (see graph 2). To allow the operation of SLIMLINE systems in outdoor stations, the operation temperature ranges between -33 °C and +75 °C.

Starting from +55 °C the output power will derate down to 50 %.

## Distribution modules

- **Distribution SMS 4500**  
output power 4500 W
- **Distribution SMS 13500**  
output power 13500 W

Following the ultra compact design of the SLIMLINE rectifier modules, BENNING also offers 1 U and 3 U high battery and load distribution modules. These modules include battery fuses or breakers, load fuses or breakers and battery and/or load disconnect units.

The LC display in the front plate indicates current, voltage and temperature.

For the control and monitoring of the system the SLIMLINE-MCU can be used (optional).



## SLIMLINE and TEBECHOP 3000 HD

### Compact, variable, for global application

#### SLIMLINE

SLIMLINE module systems are made up with 1 U sub-racks for the necessary number of plug-in rectifier modules needed, and BENNING wall or floor system cabinets with monitoring and control unit MCU 2500. This unit allows local monitoring via frontpanel keypad and LCD.

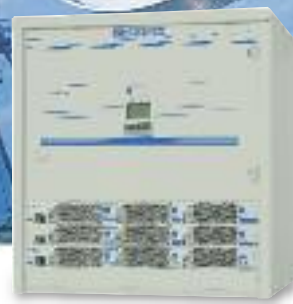
Remote monitoring and control can be done via modem, HTML or SNMP (option). Software packages are available. (see page 7)



Monitoring and control unit MCU 2500



Wall cabinet with batteries  
48 V – 270 A (13,5 kW)



Wall cabinet 19"  
48 V – 270 A (13,5 kW)

#### TEBECHOP 3000 HD

With the TEBECHOP 3000 HD rectifier modules, redundant 48 V DC power systems with system ratings between **6,0 kW and 70 kW** can be realised.

Versions for 24 V and 60 V output voltages are also available. The ultra compact dimensions of the 3000 HD rectifier with a power density of appr. 1 kW/dm<sup>3</sup> is the result of intensive research and development to optimise components and air-flow inside the high power section of the rectifier.



Special MCU 2500 modul





## TEBECHOP 3000 HD

*High power density, good efficiency characteristic*

### TEBECHOP 3000 HD

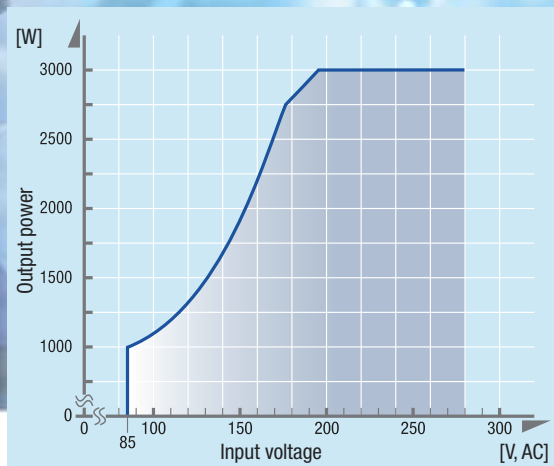
Similar to the SLIMLINE rectifier modules, the TEBECHOP 3000 HD accepts wide input voltage variations from 85 V up to 265 V.

Between 200 V and 265 V the 3000 HD supplies 3000 W output power. Below 200 V the output power is limited (see graph 4).

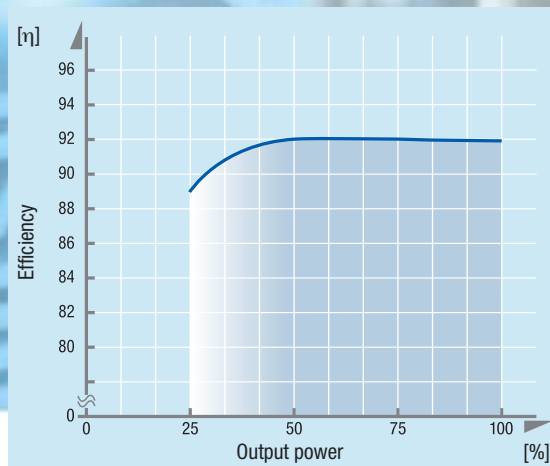
Graph 7 shows the constant power output characteristics of the 3000 HD between 1,8 V/C and 2,4 V/C.



TEBECHOP 3000 HD  
5 x 48 V – 56 A



Graph 4: Output power as a function of input voltage



Graph 5: Efficiency as a function of output power

PSJ or TC type 2066 floor cabinet (height 2000 mm, depth 600 mm, width 600 mm) can be fitted with max 4 sub-racks to carry 20 pieces of 3000 HD rectifiers.

Five 3000 HD rectifiers can be fitted across a 19" shelf. Instead of one rectifier a specially designed MCU 2500 modul can be integrated.

Power system  
48 V – 1120 A (60 kW)



Power system with batteries  
48 V – 280 A (15 kW)

# TEBECHOP 12000

## Energy saving high efficiency

### TEBECHOP 12000

For larger power needs, (> 70 kW) the TEBECHOP 12000 three phase rectifier is optimised for a wide range of system sizes.

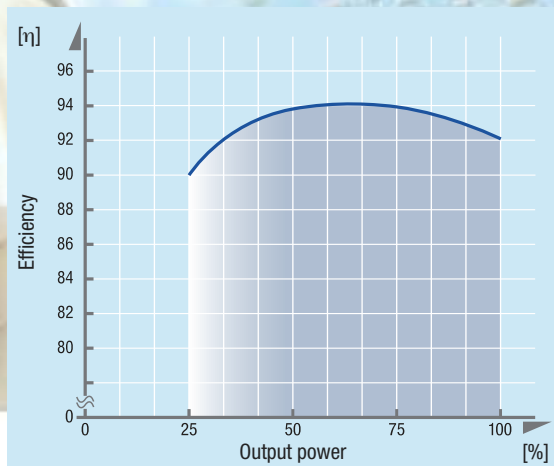
The output power of 12000 W, (200 A) the reliable design and the very high efficiency makes the TEBECHOP 12000 the best cost reduction solution for medium and large central office power plants.

Graph 6 shows the high efficiency level of 94 % between 50 % and 74 % of the output load, which contributes to lower energy costs.

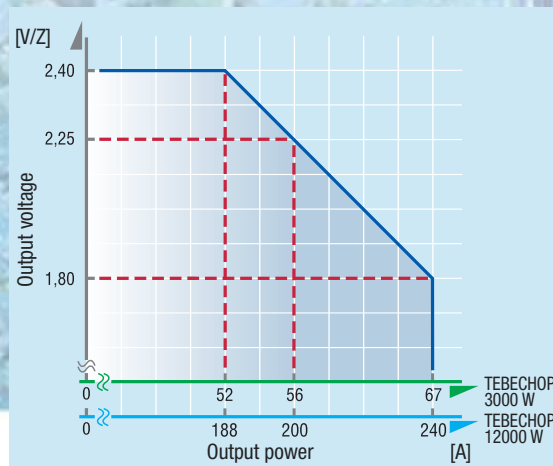
State-of-the-art switch-mode technology was used to minimise volume and weight of the TEBECHOP 12000. With a weight of 23 kg, the rectifier can be handled by one person.



TEBECHOP 12000  
48 V – 200 A



Graph 6: Efficiency as a function of output power



Graph 7: Relationship between output power and output voltage

The floor cabinet PSJ 2066 (height 2000 mm, width 600 mm, depth 600 mm) allows the integration of 10 pieces TEBECHOP 12000 with the total output current of 2000 amps. PSJ 2066 cabinet solutions are also available for battery and load distribution.

The front door mounted remote monitoring system MCU 2500, collects and monitors system information, providing operational controls and local/remote reporting functions of the power system.



Power system  
48 V – 2000 A (120 kW)



## Technical data

### MCU 2500 Remote monitoring

|                                                |        | SLIMLINE                     |           | TEBECHOP         |                  |
|------------------------------------------------|--------|------------------------------|-----------|------------------|------------------|
| Output power                                   | [W]    | 500                          | 1500      | 3000 HD          | 12000            |
| max. quantity per 19" carrier                  |        | 3                            | 3         | 5                | 1                |
| Input voltage                                  | [V]    | 85 - 275*                    | 85 - 275* | 85 - 264*        | 360 - 460        |
| Input current                                  | [A]    | 2,5                          | 6,3       | 15               | 17               |
| Frequency                                      | [Hz]   | 47 - 63                      |           |                  |                  |
| Power factor                                   |        | 0,99                         | 0,99      | 0,99             | 0,94             |
| Output current                                 |        |                              |           |                  |                  |
| 24 V                                           | [A]    | -                            | -         | 80               | -                |
| 48 V                                           | [A]    | 10                           | 30        | 56               | 200              |
| 60 V                                           | [A]    | -                            | -         | 44               | 160              |
| Output voltage                                 |        | programmable                 |           |                  |                  |
| Boost                                          | [V/C]  | 2,4                          |           | 2,4              |                  |
| Float                                          | [V/C]  | 2,23                         |           | 2,23             |                  |
| Direct                                         | [V/C]  | -                            |           | 2,05             |                  |
| Battery availability test                      | [V/C]  | -                            |           | 1,8              |                  |
| Stability of output voltage                    |        |                              |           |                  |                  |
| Static                                         | [%]    | +/- 1                        |           |                  |                  |
| Dynamic load step<br>(10/100/10) (di/dt>200µs) | [%]    | +/- 5                        |           | +/- 4            |                  |
| Response time                                  | [ms]   | < 5                          |           | < 2              | < 1              |
| Efficiency                                     |        | 91                           |           | 92               | 94               |
| Characteristic                                 |        | IPU Power constant           |           |                  |                  |
| Noise voltage                                  | [mV]   | 2                            |           |                  |                  |
| Radio interference                             |        | EN 55022 class B             |           |                  |                  |
| Protection class                               |        | 1-EN 60950                   |           |                  |                  |
| Safety                                         |        | EN 60950 / IEC 950 / UL 1950 |           |                  |                  |
| Protection                                     |        | IP 20                        |           |                  |                  |
| Ventilation method                             |        | forced-ventilation           |           |                  |                  |
| Ambient temperature                            | [C°]   | -33 up to +70                |           | 0 up to 50       |                  |
| Operating altitude                             | [m]    | up to 2000 m above sea level |           |                  |                  |
| Moisture class                                 |        | F DIN 40040                  |           |                  |                  |
| Current measurement                            |        | -                            | -         | measuring socket |                  |
| Voltage measurement                            |        | -                            | -         | -                | measuring socket |
| Frontpanel indications                         |        |                              |           |                  |                  |
| Mains                                          | yellow |                              | -         | •                | •                |
| DC overvoltage                                 | red    |                              | -         | • **             | •                |
| Normal operation                               | green  | •                            | •         | •                | •                |
| Fault                                          | red    | •                            | •         | •                | •                |
| Fan failure                                    | red    |                              | -         | •                | •                |
| Fuse alarm                                     | red    |                              | -         | • **             | •                |
| LCD - Display                                  |        |                              |           |                  | •                |
| Dimensions                                     |        |                              |           |                  |                  |
| Hight (front panel)                            | [mm]   | 44,3                         |           | 133              | 133              |
| Width                                          | [mm]   | 81                           | 162       | 68,6             | 485              |
| Depth                                          | [mm]   | 250                          | 275       | 300              | 430              |
| Weight                                         | [kg]   | 1,0                          | 1,7       | 2,9              | 22,0             |

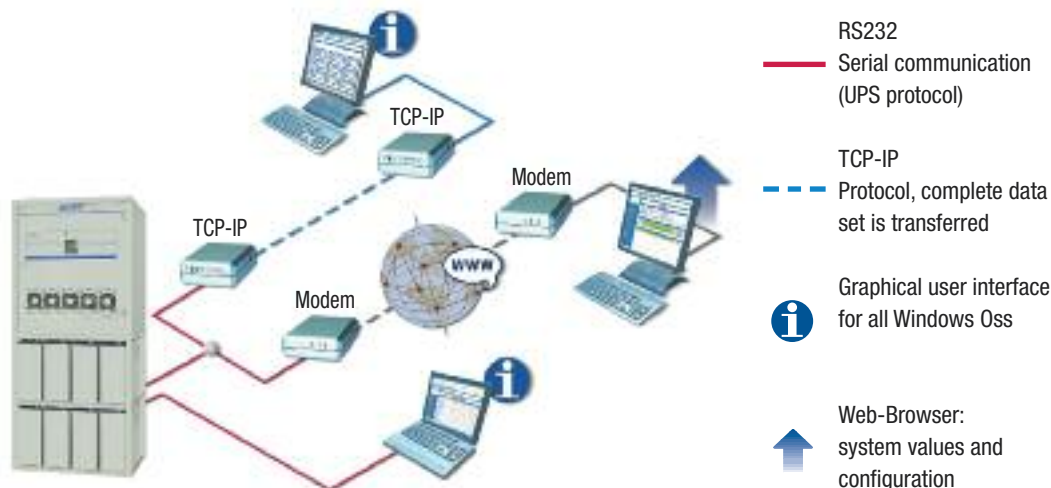
\* Power derating from 205 V input voltage

\*\* red - green flashing

#### MCU 2500

The microprocessor controlled MCU 2500 remote monitoring system, collects and monitors all necessary power system information. Service software is available for on site and remote operation.

Connection can be done with PC, modem or TCP/IP-Adapter. Remote operation reduces the system maintenance costs.




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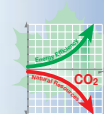
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