



Power Innovation GmbH

Rehland 2 28832 Achim 04202 5117-0 www.powerinnovation.de

Facilities: Power Innovation 28832 Achim

Rehland 2

Im Finigen 5



- **102 employers permanent stuff**
- **ISO 9001:2008 Quality Management**
- **4000 m² Floor with space to grow**
- **Own EMC Laboratory**
- **100% Test of all produced articles**



- **Our main competencies**
 - Research & Development
 - Production
 - Sales

Mile-stones of Company-history

- | | |
|-------------|---|
| 1987 | Foundation of Company with Support of „Wirtschaftsförderung Bremen“ |
| 1988 | Integrated UPS for PC's / UPS for Fire Protection systems / Inverter |
| 1991 | Power Supplies for Telecom applications (e.g. FONTAS / ASLMX / Hytas) |
| 1995 | EFORE Group (Finnland) buys shares of WFG Bremen (25%) |
| 1996 | Battery-Management , charge of NiMH-batteries for Russian –space-mission (MIR97) |
| 2000 | —L—a—v—a—L—I—N—E © Inverter-systems up to 48 kVA |
| 2002 | Moving from Bremen to new Company-building in Achim |
| 2003 | DC/DC converter for railroad rolling stock / Diesel-start by Super-Caps |
| 2004 | 22kW bidirectional DC/DC Converter for military Application (PUMA) |
| 2005 | Modular Power Supply concept for VDSL sites (MultiFunctionCabinets) |
| 2006 | short-time DC-UPS based on Double-layer -capacitors (Super-Caps) |
| 2007 | DC/DC Wandler für Brennstoffzellen Systeme |
| 2009 | Infrastructur -Management -System for Outdoor Sites |
| 2010 | Launch of Lithium-Cerion Batteries for Telecom Applications |
| 2011 | Rebuying of Efore shares by Power Innovation |
| 2012 | onboard-charger for e-mobile application (automotive standard) |
| 2013 | Frame contract with German Telecom for Power Innovation being official exclusive single source supplier of V-DSL-outdoor power supplies. |
| 2014 | Power Innovation launches first stationary high-capacity-battery-system with Daimler Lithium-Ion cells. |

References



NOOKIA
CONNECTING PEOPLE

ED PN Technologies

EFORE

Scanpocon
part of Coromatic Group

DHB TECHNOLOGY

dimac

et

Radiotechnika
marketing spol.s.r.o.

minimax

T

ALSTOM

REXXON
TECHNIS
L3
communications
EUROATLAS

BOMBARDIER

ERICSSON

EATON | Powerware

PINTSCH BAMAG

KRAFT
POWERCON

JENOPTIK

e

Exista
POWER SUPPLIES

EVONIK
INDUSTRIES

Product groups overview

Inverter / Inverter-system



DC/DC converter



AC/DC converter charger



Lithium-ion-based battery-applications



Inverter / Inverter-systems overview

-L-a-v-a-L-I-N-E[©]

Parallel- and bypass-
function available



inverters working
in parallel



inverters with
integrated
static bypass

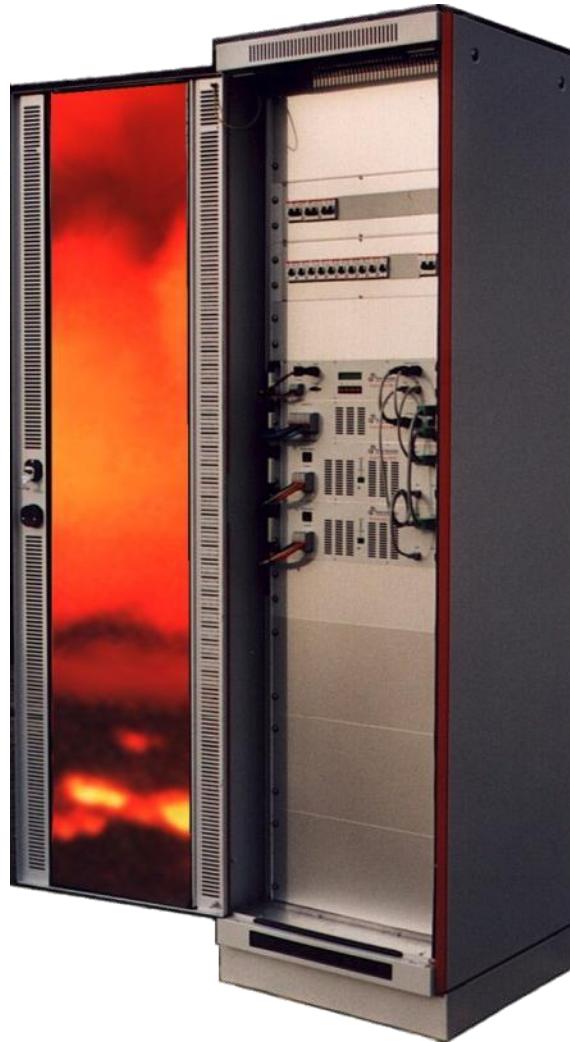


Standalone inverters



Integrated Inverter System

-L-a-v-a-L-I-N-E ©



- 19"/2U – System Controller



- 19"/3U – bypass 120A version



- 19"/4U – bypass 200A version



- 19"- 2 KVA inverter-module



- 19"- 4 KVA inverter module

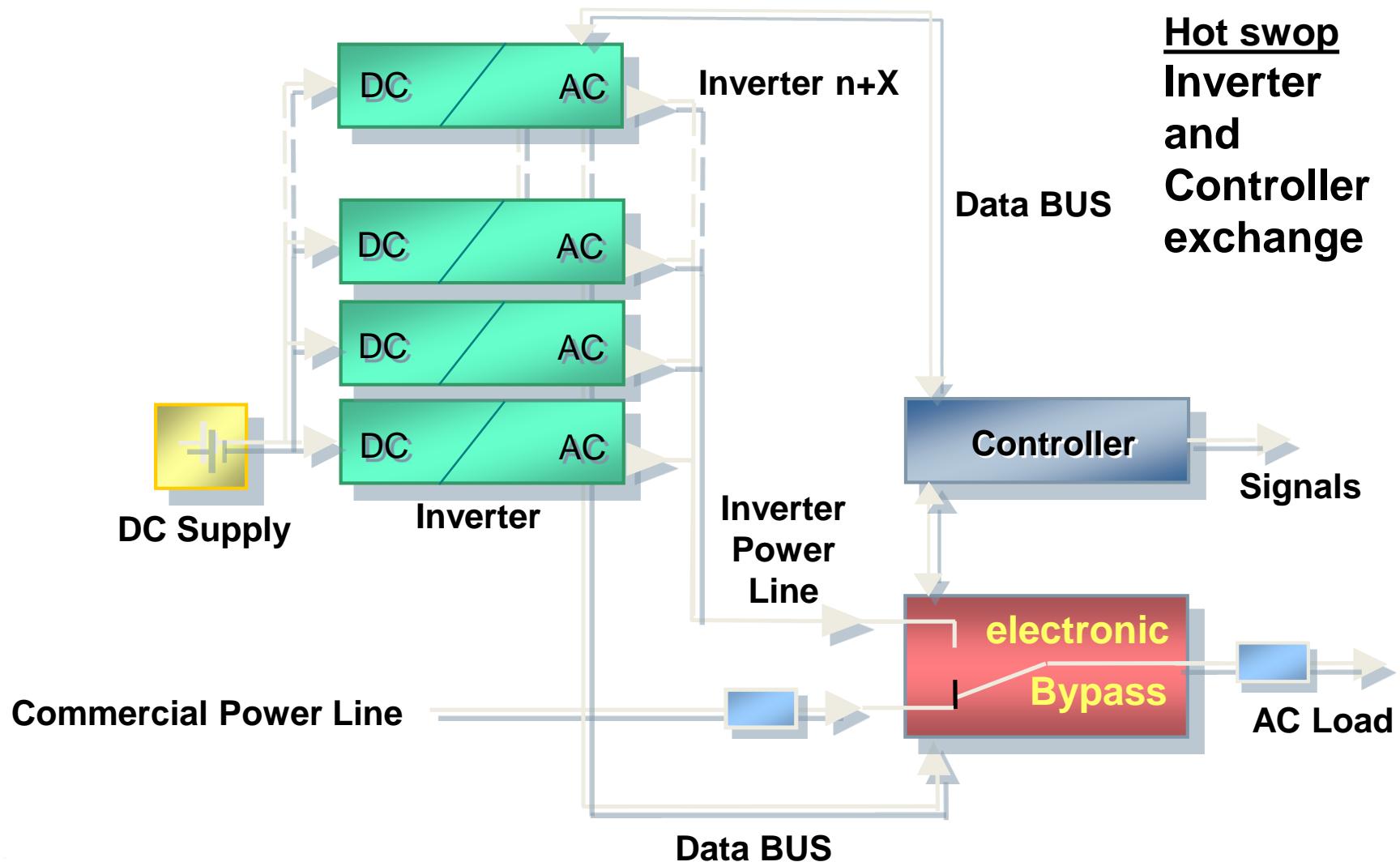


Features

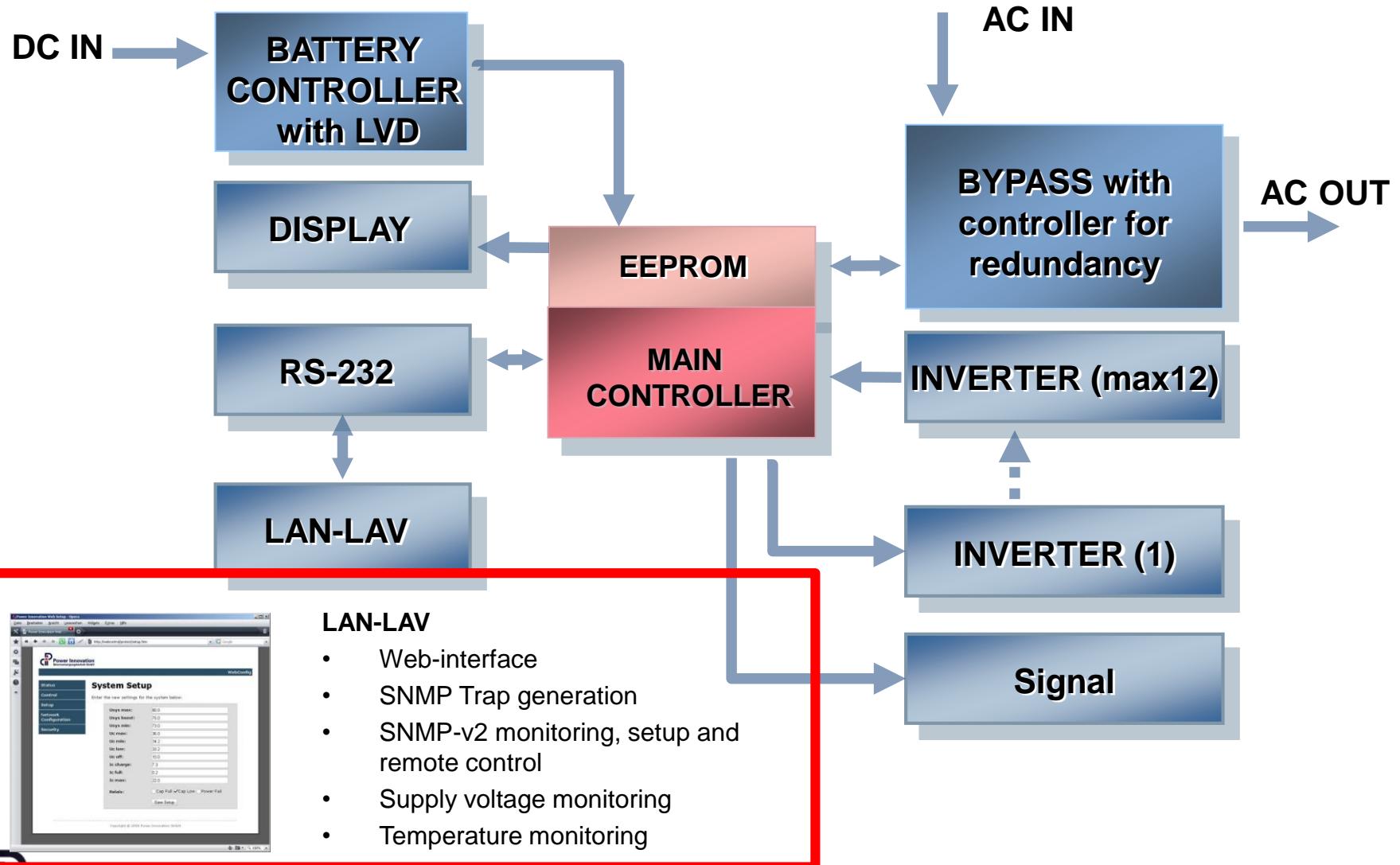
- Up to 12 inverters and static bypass connectable
- Storage of up to 256 system events, i.e. alarms
- Automatic or timer controlled release of alarm messages via modem, cellular phone module or LAN-module
- Programmable Event- & Alarm functions
- Configurable via push buttons on the front panel or terminal program

$S_{[out]}$ [VA]	$V_{[in]}$ [V]DC
2.000 -	24
48.000	48/60
	110
	220

System Block Schematic



Monitoring and Functions



Inverter / Inverter-systems overview

-L-a-v-a-L-I-N-E ©

Parallel- and bypass-
function available



inverters working
in parallel



inverters with
integrated
static bypass



Standalone inverters



19" Standalone & Parallel

● 19"- 500 / 1000 / 2000 VA

Pout [W]	Vin [VDC]	Vout [VAC]
400,	24	115 / 230
800	48/60	115 / 230
or	110	115 / 230
1600	220	115 / 230



Efficiency > 88%
at nominal load!

Integrated parallel mode module, up to five inverters in parallel

● 19"- 4000 VA

Pout [W]	Vin [VDC]	Vout [VAC]
3200	48/60	230
	110	230
	220	230



Max. Power 20kVA

MTBF 31,97 years
acc. SN29500, INVP2000-48-230, 50°C

● 19"- 4000 VA with Ethernet interface

Pout [W]	Vin [VDC]	Vout [VAC]
3200	48/60	230
	110	230
	540	230



Individual synchronization of each inverter



- INPL2000/4000**
- Web-interface
 - SNMP Trap generation
 - SNMP-v2 monitoring, setup and remote control
 - Supply voltage monitoring

Inverter / Inverter-systems overview

-L-a-v-a-L-I-N-E ©

Parallel- and bypass-
function available



inverters working
in parallel



inverters with
integrated
static bypass



Standalone inverters



● 19"- 500 / 1000 / 2000 VA

Pout [W]	Vin [VDC]	Vout [VAC]
400	24	115 / 230
800	48/60	115 / 230
or	110	115 / 230
1600	220	115 / 230

19" Inverter & integrated Bypass



Efficiency > 88%

at nominal load!



Integrated static bypass switch, double source technology

● 19"- 4000 VA

Pout [W]	Vin [VDC]	Vout [VAC]
3200	48/60	115 / 230
	110	115 / 230
	220	115 / 230

● 19"- 2000 VA with Ethernet interface

Pout [W]	Vin [VDC]	Vout [VAC]
1600	48/60	230
	110	230
	220	230



Switch time < 10ms

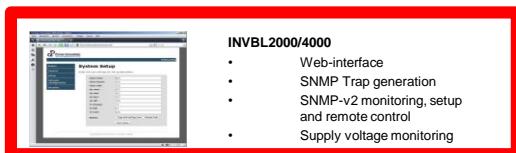
< 5ms for INVBL2000/4000, INVBL2000/48-230, 50°C

● 19"- 4000 VA with Ethernet interface

Pout [W]	Vin [VDC]	Vout [VAC]
3200	48/60	230
	110	230
	540	230



Sine-wave output
THD < 2%



INVBL2000/4000

- Web-interface
- SNMP Trap generation
- SNMP-v2 monitoring, setup and remote control
- Supply voltage monitoring

Inverter / Inverter-systems overview

-L-a-v-a-L-I-N-E ©

Parallel- and bypass-
function available



inverters working
in parallel



inverters with
integrated
static bypass



Standalone inverters



Stand alone Inverter

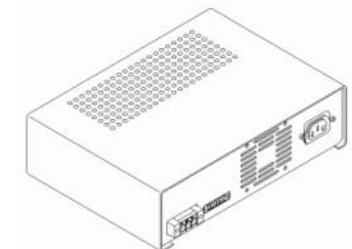
- **125 VA Cassette**

Pout [W]	Vin [VDC]	Vout [VAC]
100	24	230
	48/60	230
	110	230



- **125 / 250 VA Bench Case**

Pout [W]	Vin [VDC]	Vout [VAC]
200	24	230 or 115
	48/60	230 or 115
	110	230 or 115
	220	230 or 115



- **125 / 250 VA Wall mounting Case**

Pout [W]	Vin [VDC]	Vout [VAC]
200	24	230 or 115
	48/60	230 or 115
	110	230 or 115
	220	230 or 115



Heavy duty railway-Inverter

● 400 VA

Pout [W]	Vin [VDC]	Vout [VAC]
320	24	230



Efficiency > 87%
at nominal load!

IP 54

Convection cooled

MTBF 29,12 years
acc. SN29500, INWR500-220-230, 50°C

Options:

- Remote on / off
- alarm contacts
- 115V_{AC} / 60Hz

● 2000 VA

Pout [W]	Vin [VDC]	Vout [VAC]
2000	24	230
	110	230



● 6000 VA

Pout [W]	Vin [VDC]	Vout [VAC]
6000	110	230



EN 50155 / EN 50121-3-2

Product groups overview

Inverter / Inverter-system



DC/DC converter



AC/DC converter charger



Lithium-ion-based battery-applications



- 19"-Cassette version

Pout [W]	Vin [VDC]	Vout [VDC]
300	110	110
150	110	48
	24	110
	24	48
50	110	24
	110	5
	24	5

DC-DC Converter



- Wall mounting version

Pout [W]	Vin [VDC]	Vout [VDC]
360	110	110
300	110	48
	110	24
	48/60	24
	48/60	60
	48/60	48



Application ■ Emergency Door Control / Valve Control

■ ICE 3 High Speed Train / Front illumination

■ On board conversion for additional control electronic

EN 50155 /
EN 50121-3-2 /
EN 61373

Ultra Cap Charger

● Wall mounting version

Pout [W]	Vin [VDC]	Vout [VDC]
900	24	28
900	110	28



● Features

- Remote Control
- 30 A charging current
- IP 54
- Reliable against Shock & Vibration



● Applications

- Diesel engine start-up in combination with a Ultra Cap
- Replacing of starter batteries on board of trains and for power generators

DC-DC Converter DCDC1800-85-62 operation of 60V devices in 72V battery supply systems

DC-DC Converter DCDC1600-85-54 operation of 48V devices in 60V or 72V battery supply systems

Input

voltage range

-40 to -85 VDC

Output

Nominal voltage

-60 VDC (DCDC1800-85-62)

-62 VDC for U_{IN} -64V to -85V
 U_{IN} -1,5V for U_{IN} -40V to -64V

Nominal voltage

-48 VDC (DCDC1600-85-54)

-54 VDC for U_{IN} -56V to -85V
 U_{IN} -1,5V for U_{IN} -40V to -56V

Nominal voltage

-48 VDC (DCDC1400-85-48)

-48 VDC for U_{IN} -50V to -85V
 U_{IN} -1,5V for U_{IN} -40V

Current

30A (15A each module)

Warranty

24 month

Advantages:

- Modular concept
- Optional output distribution
- Electronic over-voltage protection
- Potential-free alarm contact each module



Product groups overview

Inverter / Inverter-system



DC/DC converter



AC/DC converter charger



Lithium-ion-based battery-applications



Rectifier Products

● Modular Rectifier-System

Pout [W]	Vin [VAC]	Vout [VDC]
250	230	48
500		



- Redundant- and/or Parallel-mode

Features

- integrated 3-way electronic distribution
- all connectors at front, AC-in cable at rear side
- For 48V-DC system a 24V or 12V battery can be used as a bidirectional DCDC-converter in the battery-module adapts the voltage to 48Vdc
- temperature-controlled charging
- Hot plug-in, for controller and rectifier-modules
- LCT Ethernet-interfaces for monitoring and remote control

Operation

- DC-Back-up
- Telecom Appliances

Rectifier Products

● Modular Rectifier-System

Pout [W]	Vin [VAC]	Vout [VDC]
600 up to 1600	230	48



- Features**
- Redundant- and/or Parallel-mode
 - all connectors at front, AC-in cable at rear side
 - Two independent AC-Supplies (L1-N1 and L2-N2), electronic supervised Fused DC-battery connection + DC-bulk output
 - temperature-controlled charging
 - Hot plug-in, for controller and rectifier-modules
 - WEB-SNMP-LCT Ethernet-interfaces for monitoring and remote control
- Operation**
- DC-Back-up
 - Telecom Appliances

Rectifier Products

● Modular Rectifier-System -K20

Pout [W]	Vin [VAC]	Vout [VDC]
600	230	24
up to		48
3200		60
2400(24V)		



Features

- Redundant- and/or Parallel-mode
- all connectors at front
- Three (3) independent AC-Supplies (L1, L2 and L3),
thus 1-3 phase Supply, electronic supervised
- DOUBLE Battery-Management, temperature-controlled charging
- Hot plug-in, for controller and rectifier-modules
- WEB-SNMP-LCT Ethernet-interfaces for monitoring and remote control

Operation

- DC-Back-up
- Telecom Appliances

Rectifier Products

● Modular Rectifier-System -K21

Pout [W]	Vin [VAC]	Vout [VDC]
600	230	24
up to		48
3200		
2400(24V)		



Features

- Redundant- and/or Parallel-mode
- all connectors at front, AC-in cable at rear side
- Three (3) independent AC-Supplies (L1, L2 and L3),
thus 1-3 phase Supply, electronic supervised
- Electronic distribution integrated, temperature-controlled charging
- Hot plug-in, for controller and rectifier-modules
- WEB-SNMP-LCT Ethernet-interfaces for monitoring and remote control

Operation

- DC-Back-up
- Telecom Appliances

Management System

- Available for new generation rectifier-systems

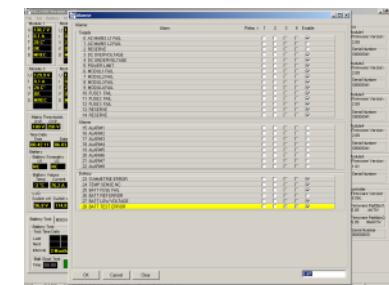
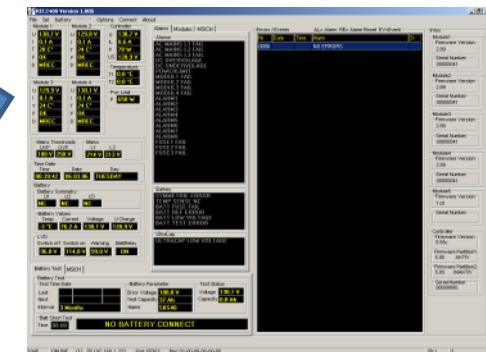
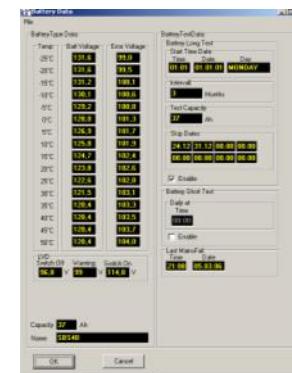
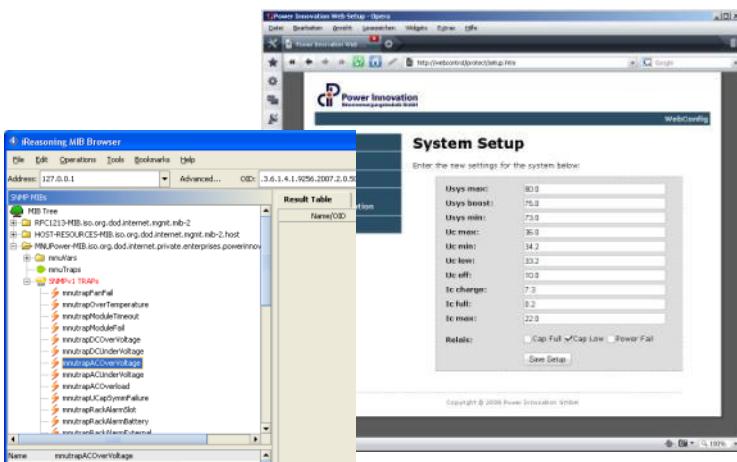
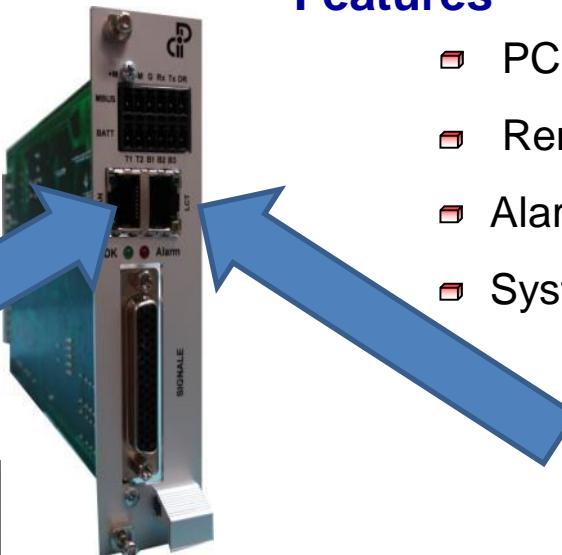
Features

- web-interface integrated
- SNMP-Remote control functions
- Alarm and event log file
- System configuration via SNMP

- Available for all Rectifier systems

Features

- PC-based software
- Remote control functions
- Alarm and event log file
- System configuration



Rectifier Products

● Modulare Rectifier-System

Pout [W]	Vin [VAC]	Vout [VDC]
2400	230	48/60/110
1800	230	48/60/110
1200	230	48/60/110
600	230	48/60/110



Features

- Redundant- and/or Parallel-mode
- Two (2) AC-Supplies (1+1 phase), electronic monitored
- Battery-Management, temperature-controlled charging
- Hot plug-in, for controller and rectifier-modules
- TCP/IP-based-interface for monitoring and remote control

Operation

- DC-Back-up
- Railway and Telecom Appliances

High Power Rectifier

- **With 3-phase input**

Pout [kW]	Vin [VAC]	Vout [VDC]
4,2/module	400	24V 20-30 V / 175A
		48V 40-60 V / 88A
		60V 50-75 V / 70A



Features

- Modular architecture
- Up to 16 modules in parallel, makes 67kW
- only 4U high, hot-plug rectifier modules
- internal CAN-Bus control, TCP/IP interface for monitoring and remote control

Application

- Applications, where High Power Density is the key
- Power Charger

Product groups overview

Inverter / Inverter-system



DC/DC converter



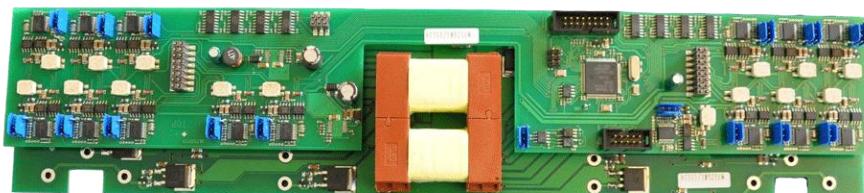
AC/DC converter charger



Lithium-ion-based battery-applications



The smart way of energy-storage



BMS with active Cell-balancing

48V /36Ah Li-Ion Batterie 1,8kWh

- 19“ housing 2HE (88mm)
- integrated DC/DC converter
- Integrated charge control
- CAN-BUS controlled/monitored
- Redundant parallel concept
- Comprehensive safety concept
- safety certificates (shock and vibration, EMC, fall tests)



application: Mobile Service-Box

Mobile, emission-free, 48VDC / 230VAC Power-Supply for Service



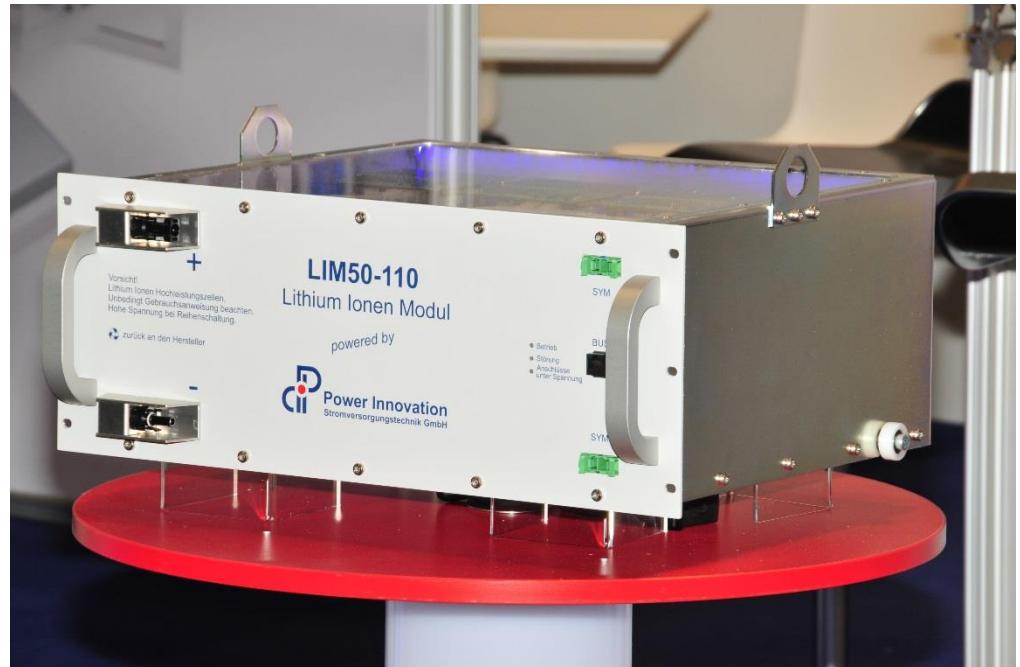
- Up to 1.2kW DC power available
- Up to 500VA AC power available
- Up to 2 x 1728kWh capacity
- AC-input for battery-charging,
standard charging 6A @ 48V, boost 20A @ 48V

application: stationary high efficiency storage

modular, scalable energy storage system, 750VDC (range 300Vdc-900Vdc)



30kWh storage capacity per cabinet,
capability for direct parallel connection,
due to Integrated high power dc/dc-converter



End of Power Innovation standard products



time for discussion
let's talk!

Power Innovation

future projects and products



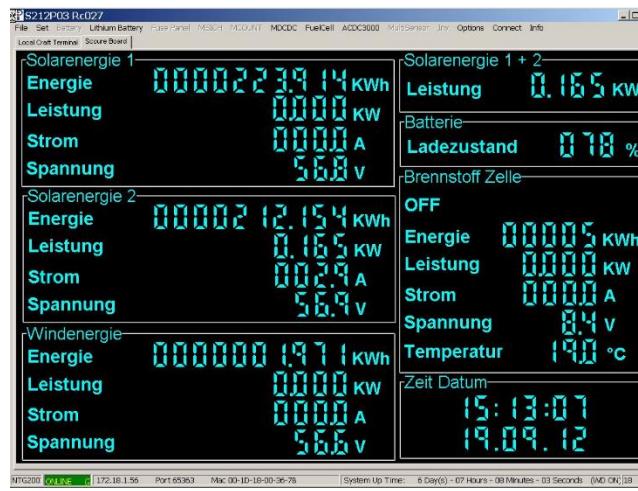
Let's talk!

Stand alone radio-relay-site project with **EURO POLES**



Power Innovation GmbH

- **Radio-relay-system Power 300W**
- **SOLAR:**
2,5 kW(peak) solar cells
- **WIND:**
2,5 kW Wind Generator
- **FUEL-CELL:**
800 W Methanol powered fuel cell
- **ENERGY-STORAGE:**
4 * Li-Ion Batteries 19“ 2HE approx. 7kWh = 24h backup
- **Monitoring by TCP/IP based system:**



Elektromobility

Quick charging station for electric vehicles (commercial vehicles fleet service)

- **Charging time 20 to 30 minutes**
- **Charge up to 800V DC**
- **Load capacity up to 60kW**
- **Low network load (continuous loading)**
- **Involvement in energy concepts (Vehicle to Grid)**
- **Easy storage of renewable energies.**
- **Car battery may possibly be reduced and thus the battery could be used more effectively.**



DC charging-stations project with

Vorstellung des Gesamtprojektes

Schnellladung von Elektrofahrzeugen

- Entwicklung geeigneter Ladeverfahren



- Temperaturfeldüberwachung



- Vollladung in unter 30 Minuten

**4 quick charging stations
between Goslar and
Wolfsburg**

Thank you for your attention



time for discussion
let's talk!