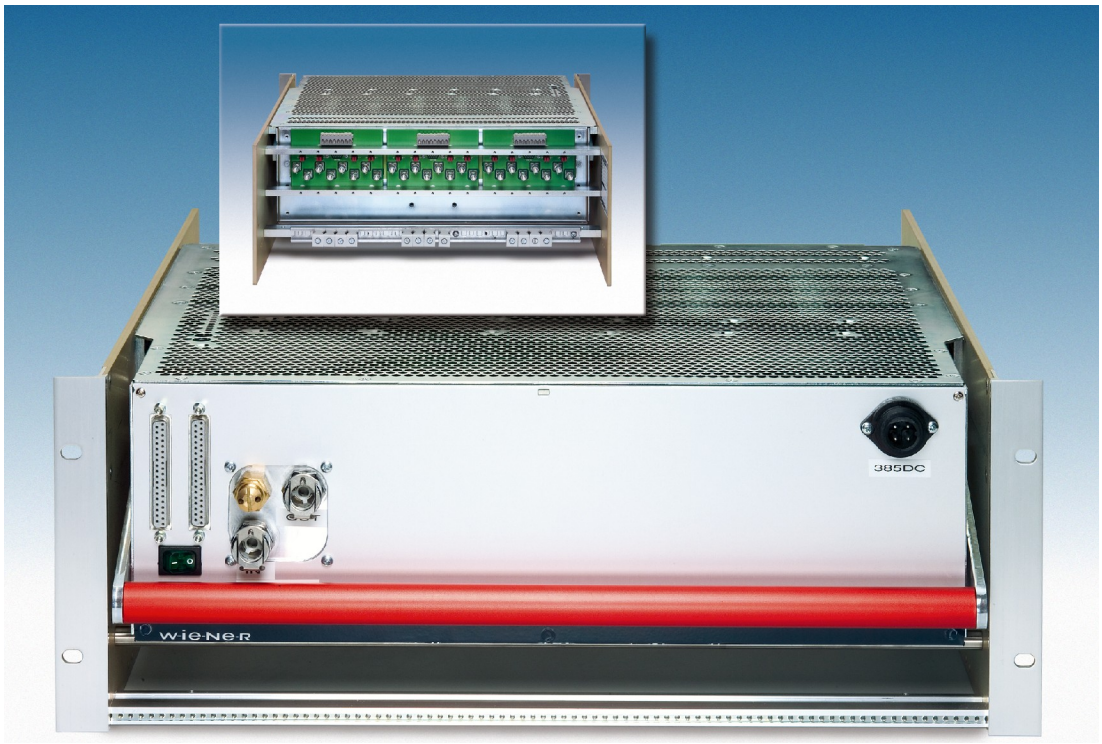

MARATON

Power Supply System

Technical Manual

General Remarks

The only purpose of this manual is a description of the product. It must not be interpreted as a declaration of conformity for this product including the product and software.

W-Ie-Ne-R revises this product and manual without notice. Differences of the description in manual and product are possible.

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Control Cabinet

In the context of this user manual, the control cabinet must fulfill the requirements on fire-protective enclosures according to EN 60950 / IEC 60950 / UL 60950.

All devices are intended for operation in control cabinets or in closed areas. The LAN connection and all wire connections between the different system parts must be done via shielded cable with conductive connector shells, which are fixed with screws.

Furthermore, an additional fire-protective enclosure is required which must not affect proper air circulation.

Mains Voltage and Connection

The Power supplies are equipped with a “World”- mains input (rated voltage range: 100-240 VAC, frequency: 50-60 Hz, rated current: 16 A). Before connecting to the mains please double-check correspondence.

This is a permanently connected equipment. Mains input connection at the power supply primary rectifier is done with screw terminals. A combined circuit breaker / main switch (16A at maximum operating temperature) is included.

Before working at the terminals, the power mains to which the device shall be connected must be absolutely reliable switched off or disconnected.

The DC output terminals are connected to hazardous voltage. After disconnecting the mains the capacitors connected to the DC-outputs must be discharged by a well isolated resistor 22 Ohm, 10 Watt.

Terminal Label	Description	Color of the Wire
+	Positive DC Output	
-	Negative DC Output	
PE	Protective Earth	green/yellow
L	Phase	black or brown
N	Return, Neutral	blue

Connection to Earth

Safety

After connecting the Power box to the mains, the mains input module is powered permanently. Filter and storage capacitors of the power factor correction module are charged with about **400VDC**. Any DC-On-Signal as well as a power switch at control board (if any installed) operates as a low voltage DC on/off switch only and not as a mains breaker. **Therefore it becomes dangerous if the box cover is open. In this case a lot of components on high voltage potential get touchable!**

Before starting any kind of work inside the power box remove the unit from mains and wait a couple of minutes with your activities! Discharge the primary DC Filter-capacitors by use of a well isolated 22 ohm 10W resistor.

We recommend in case of any malfunction to send the power box to Wiener or to one of our representative for service

Declaration of Conformity

Low Voltage Directive 73/23/EEC and EMC Directive Art. 10.1 of 89/336/EEC

W-IE-NE-R

Plein & Baus GmbH

---

declare under our own responsibility that the product

MARATON Power Supply System

Items: 0M12; 0M14; 0M22; 0M24; 0PFC; 0R00; 0B07

is in accordance with the following standards or standardized documents:

1.	**EN 60 950-1:2001** + Corr:2004-09	Niederspannungsrichtlinie [low voltage directive]
2.	**EN 61 000-6-3:2001**	Störaussendung EMA [RF emission]
	EN 55 022:1998 + Corr:2001 + A1:2000 Kl. B	Störspannung [conducted noise]
	EN 55 022:1998 + Corr:2001 + A1:2000 Kl. B	Störfeldstärke [radiated noise]
	EN 61 000-3-2:2001	Oberschwingungen [harmonics]
	EN 61 000-3-3:1995 +Corr:1997 +A1:2001	Spannungsschwankungen [flicker]
3.	**EN 61 000-6-2:2001**	**Störfestigkeit EMB [immunity]**
	EN 61 000-4-6:1996 + A1:2001	HF-Einströmung [injected HF currents]
	EN 61 000-4-3:1996 + A1:1998 + A2:2001	HF-Felder [radiated HF fields] incl. ”900MHz”
	EN 61 000-4-4:1995 + A1:2001	Burst
	EN 61 000-4-5:1995 + A1:2001	Surge
	EN 61 000-4-11:1994 + A1:2000	Spannungs-Variationen [voltage variations]
	EN 61 000-4-2:1995 + A1:1998 + A2:2001	ESD

Conditions:

This unit is not a final product and is foreseen for use inside a closed cabinet. The supplying of loads over long distances (>3m) needs possibly additional RF rejection hardware to get in conformity of the definition.

This confirmation is based on testreport

21124330_001 TÜV Rheinland Product Safety GmbH, 51101 Köln, Allemagne

---

Name and signature of authorized person — Place and Date

Juergen Baus

CERTIFICATE

TÜV

of Conformity
Low Voltage Directive 73/23/EEC
as last amended by EEC Directive 93/68/EEC

Registration No.: AN 60015546 0001

Report No.: 21124330 001

Holder:
Plein & Baus GmbH
Wiener Elektronik
Müllersbaum 20
51399 Burscheid
Deutschland

Product:
Schaltnetzteil
(Switching Power Supply)

Identification:

Type designation	: MAgnetic RAdiation TOlerant New Power Supply
Input voltage	: 100-240V AC; 16A; 50-60 Hz
Output voltages	: 6 x 2 channels with 1...8V DC
Output current	: 50A max. per channel; 300W max. in all
Protection class	: I
Serial No.	: 1494106, 1194077 and 1494118

This certificate of conformity is based on an evaluation of a sample of the above mentioned product. Technical Report and documentation are at the Licence Holder's disposal. This is to certify that the tested sample is in conformity with all revision of Annex I of Council Directive 73/23/EEC, in its latest amended version, referred to as the Low Voltage Directive. This certificate does not imply assessment of the series-production of the product and does not permit the use of a TÜV Rheinland mark of conformity. The holder of the certificate is authorized to use this certificate in connection with the EC declaration of conformity according to Annex III of the Directive.

Certification Body

TÜV Rheinland Product Safety GmbH Zertifizierungsstelle TÜV Rheinland

Cologne, 11.08.2006

Dipl.-Ing. H.-P. Pape

TÜV Rheinland Product Safety GmbH - Am Grauen Stein - D-51105 Köln

CE The CE marking may be used if all relevant and effective EC Directives are complied with. CE

10/020 7.95Q

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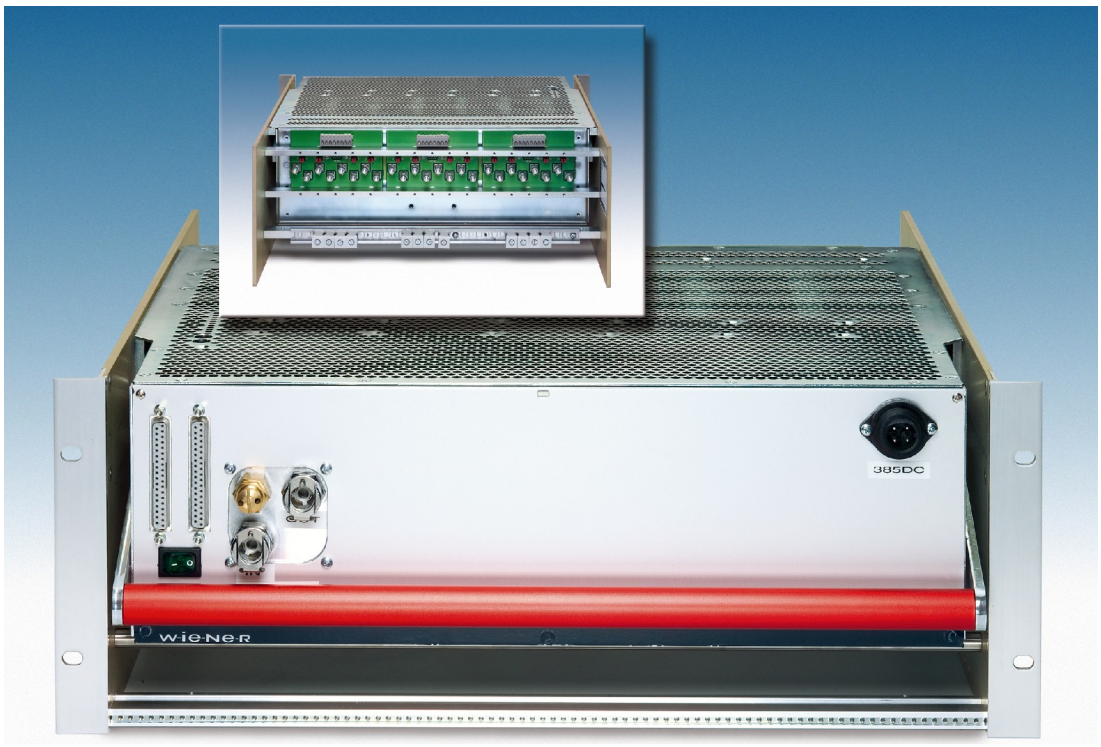
1 General Information



Features

- **up to 12 independent, potential free outputs, ≥3 kW DC output power (385VDC input), 3.6 kW water cooled**
- **Fully controlled, adjustable trip levels**
- **Adjustable voltages, current limits and OVP-trip levels**
- **Extremely low noise and ripple**
- **CE conform EN 50 081/82 part 2 or 1, safety in accordance with EN 60 950**
- **385V DC input for low cross section cabling**
- **VME form factor remote monitoring and control module for 12 channels with Ethernet (TCP/IP) interface (for Standard Environment)**
- **Water cooled (recommended) or by forced air**

A MARATON (***Ma***gnetism ***Ra***diation ***To***lerant ***N***ew power supply system) is a distributed power supply designed to provide up to 12 low voltage / high current channels at a magnetic or radiated environment.

It offers 12 independent channels of 300W each in a 3U high box. In parallel operation the output power per channel can be boosted to 600W / 900W /1200W... with 6 / 4 / 3... channel utilization.

Dynamic behavior adjustable by internal jumper (long or short sensed distances to loads).

The power supply system is consisting of three main components

- Primary Rectifier
- Remote Controller
- Power Box

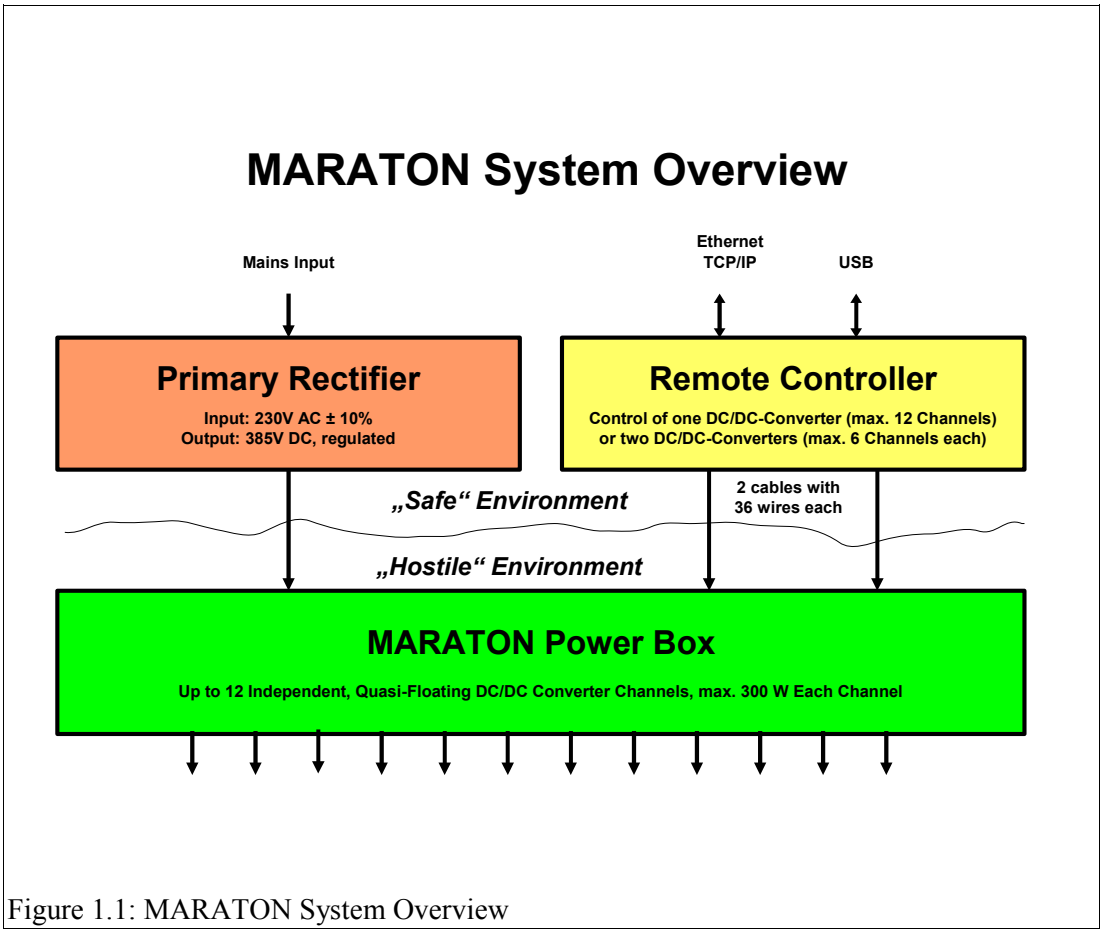


Figure 1.1: MARATON System Overview

The *Primary Rectifier* and *Remote Controller* are operating at locations with standard industrial conditions (Safe Environment).

The *Power Box* is located near to the electronics which shall be supplied, and is capable to operate in a "Hostile Environment" (strong magnetic field and / or radioactive radiation).

The distance between the DC/DC-Converter and the other components may be up to 120 m.

2 Primary Rectifier

This module converts the standard mains voltage (100 V ... 230 V AC, 16 A) to a regulated DC voltage (nominal 385 V). There is no galvanic isolation.

Up to 6 *Primary Rectifiers* can be plugged into one *Primary Rectifier Bin*.

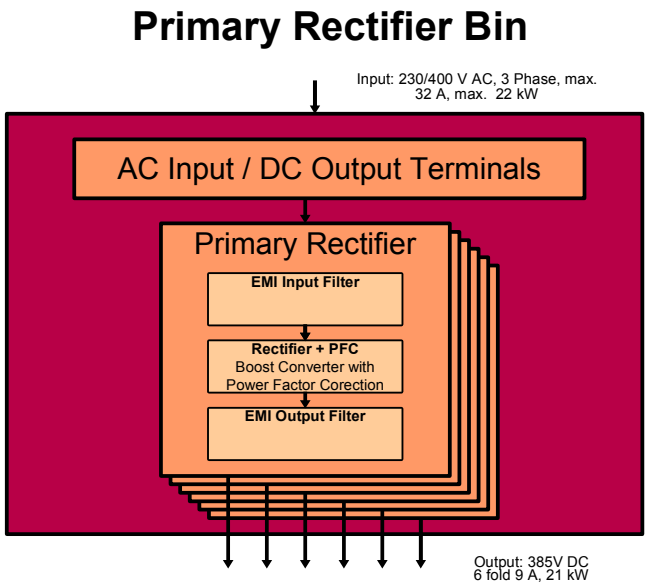


Figure 2.1: Primary Rectifier

The screw terminal connections to the mains are separate for each *Primary Rectifier*. So it is possible to connect all 6 inputs in parallel to a 230V/96A mains connection. Another solution is to connect each two modules in parallel, and connect the three groups in a star connection to a 400V/230V mains (The central point conductor must be provided!).

The screw terminal connections of the high voltage DC outputs may not be connected in parallel. Each output shall be routed to one (or max. two in a low power configuration) *Power Box*.

Before working at the terminals, the power mains to which the device is connected must be absolutely reliable switched off or disconnected.

The DC output terminals are connected to hazardous voltage. After disconnecting the mains the capacitors connected to the DC-outputs must be discharged by a well isolated resistor 22 Ohm, 10 Watt.

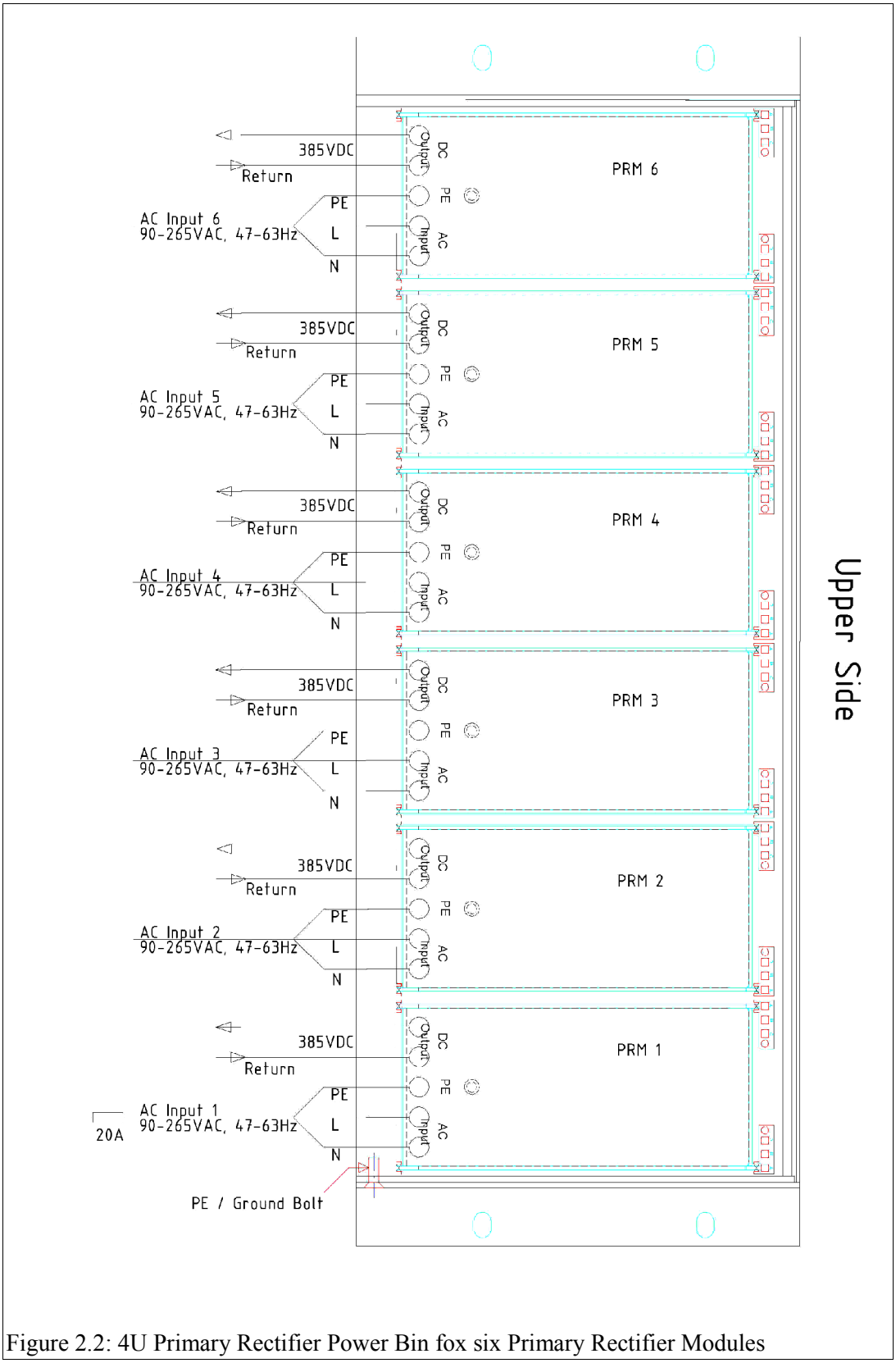


Figure 2.2: 4U Primary Rectifier Power Bin fox six Primary Rectifier Modules

The conductor cross section is max. 2.5 mm²,
PR-Modules are plugged to a six-fold rear plug/screw terminal combination. The terminals are foreseen for wire cross section of max. 2.5mm².
For different paralleled DC outputs the version 0PFC0.000P without integrated circuit breaker is available. In that case the AC inputs of the paralleled PR-Modules have to be the same phasing. Otherwise a short circuit occurs.

3 MARATON Power Box

The MARATON Power Box uses the 385 VDC of the Primary Rectifier and generates up to 12 independent low voltage floating output voltages.

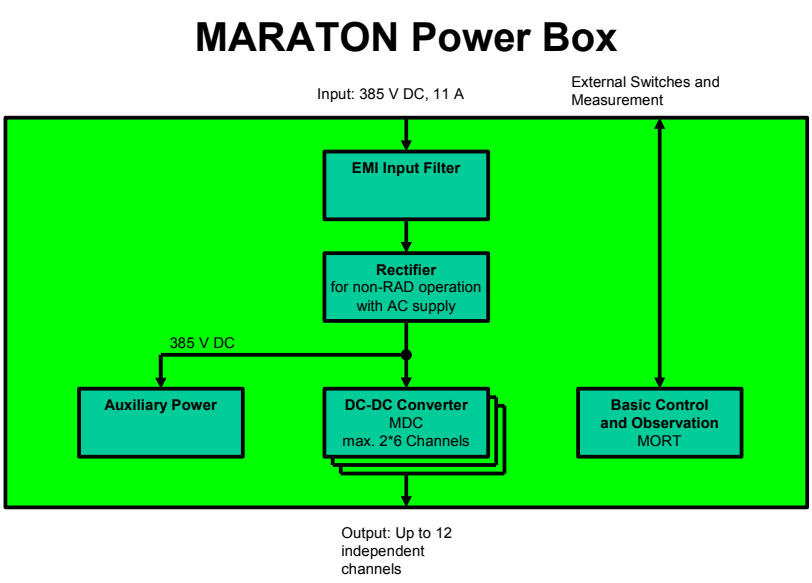


Figure 3.1: MARATON Power Box

Each channel can be independently switched on or off. The output voltage, current limit and dedicated over voltage protection level can be adjusted at the read of the power box.

For remote control of the outputs, special signals to measure the sense voltage, output current and channel status and one signal to switch a channel on or off are routed to two 37-pin D-SUB connectors.

A global reset input allows to disable all outputs with just one signal (closed contact).

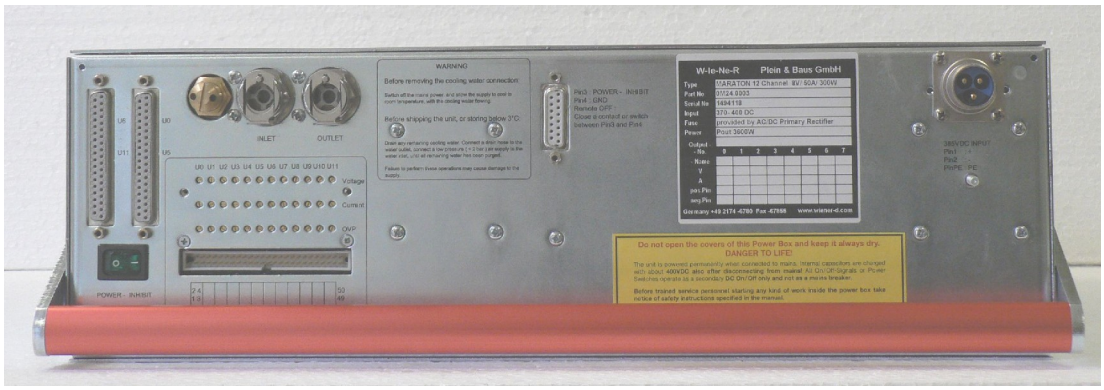


Figure 3.2: Power Box Front

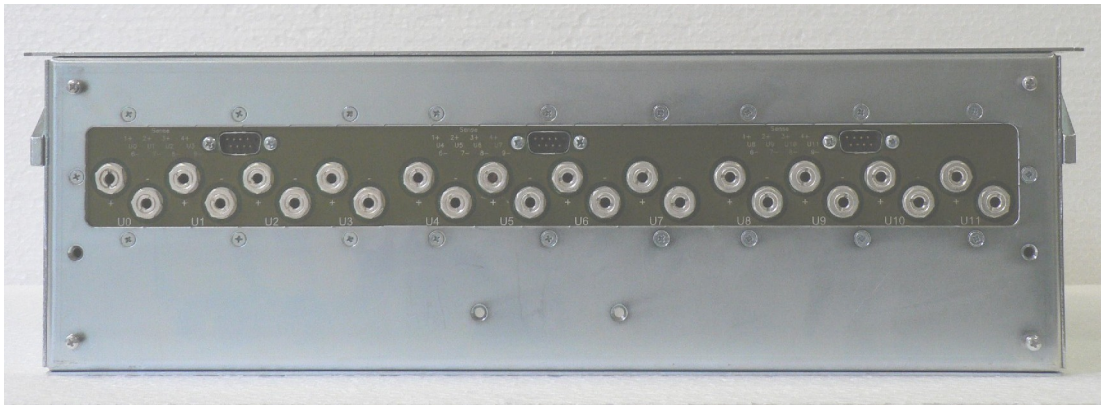


Figure 3.3: Power Box Rear Side (Power Output Connections)

3.1 High Voltage DC Input

The DC input connections are made with the *Amphenol* circular connector series ECTA 133 (standard polarization: 0° rotation between insert and shell).

We recommend the mating plug 1331-M-303-FS with the backshell 1330-3-PES1.

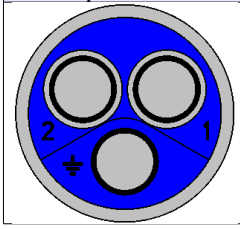
DC Input	Pin	Signal	Comment
	1	+ 385 V	DC Power Input. There is a bridge rectifier inside, so exchange of the polarity does not harm.
	2	+ 385 V Return	
	PE	Protective Earth	Safety Ground

Table 1: High Voltage DC Input Connector Pin Assignment

3.2 Water Cooling Connection

The water connections are made with quick couplings series LC 6.4 mm from *Colder Products Company* (CPC). We recommend an elbow mating plug with shutoff, e.g. LCD230-04.

Consider that water inlet and water outlet are **not** exchangeable.

The safety valve may not be readjusted by the customer.

3.3 Main Switch

The green illuminated switch works as a global inhibit input.

- 0 Power outputs disabled
- I Switch is lighting, power outputs may be enabled by the remote control.

3.4 Global Reset Input

The global reset input (POWER_INHIBIT) is provided to force all outputs to be switched off.

- connected to GND Power outputs disabled
- floating Power outputs may be enabled by the remote control

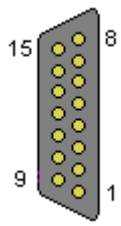
DSUB15 female	Pin	Signal	Comment
	8	NC	reserved
	15	NC	reserved
	7	NC	reserved
	14	NC	reserved
	6	NC	reserved
	13	NC	reserved
	5	NC	reserved
	12	NC	reserved
	4	GND	Ground of the aux. supply, connected to U0 output sense return
	11	NC	reserved
	3	POWER_INHIBIT	Inhibit input
	10	NC	reserved
	2	NC	reserved
	9	NC	reserved
	1	NC	reserved

Table 2: Global Reset Connector Pin Assignment

The signals shall be connected by an isolated contact (e.g. relays), and must not be connected to other potentials.

3.5 Adjustments

It is possible to adjust the

- Output Voltage at the Load (Sense Point)
- Maximum Output Voltage at the Terminals of the Power Box (OVP)
- Current Limit

for each channel with a screwdriver potentiometer.

You can turn the potentiometers and measure the change of the trimmed item, e.g. output voltage. But for the current limit and OVP this is difficult. So a 40-pin connector is provided, which gives access to the relative voltage values of the settings.

Connect a voltmeter between the GND pin and the OVP, I-Set or U-Set pin of the channel of interest.

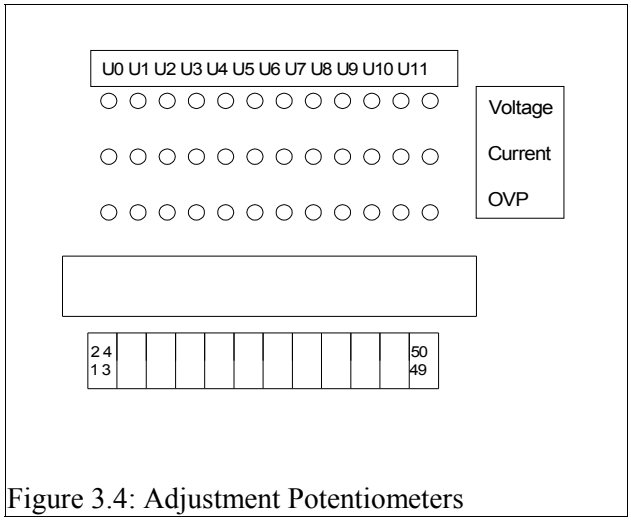


Figure 3.4: Adjustment Potentiometers

The real value can be calculated by multiplying a scale factor with the measured relative value.

For I-Set and U-Set, the channel which is adjusted must be switched on!

The scale factor is different for the different MDC module types.

	U0	U1	U2	U3	U4	U5	U6	U7	U8	U9	U10	U11
OVP	1	5	9	13	17	21	25	29	33	37	41	45
I-Set	2	6	10	14	18	22	26	30	34	38	42	46
GND	3	7	11	15	19	23	27	31	35	39	43	47
U-Set	4	8	12	16	20	24	28	32	36	40	44	48

Table 3: Adjustment Control Connector Pin Assignment

Module	Voltage	OVP	Current
MDC 7 V / 50 A	0.872 V/V	1.745 V/V	6.0 A/V
MDC 8 V / 50 A	0.940 V/V	1.881 V/V	6.0 A/V
MDC 8V / 100 A	0.940 V/V	1.881 V/V	12 A/V
MDC 8V / 150 A	0.940 V/V	1.881 V/V	18 A/V
MDC 9V / 30 A	1,068 V/V	2.136 V/V	6.0 A/V
MDC 9V / 60 A	1,068 V/V	2.136 V/V	12.0 A/V
MDC 15V / 20 A	1.989 V/V	3.978 V/V	3.0 A/V
MDC 25 V / 6 A	2.809 V/V	5.618 V/V	0.75 A/V
MDC 48 V / 6 A	5.660 V/V	11.32 V/V	0.75 A/V

Table 4: Adjustment Scaling Factors

3.6 Connection to the Remote Control

For remote control and monitoring 6 signals are available for each channel: Two differential pairs for voltage and current monitoring, and one differential pair for a combined inhibit / status signal.

To simplify the design of the remote control, the monitoring signals are scaled depending on the maximum MDC module output voltage and the maximum output current.

Module Voltage	Voltage Scaling
7 V	1.2 V/V
8 V	1.2 V/V
15 V	2 V/V
25 V	3 V/V
48 V	7 V/V

Table 5: Voltage Scaling Factors

Module Current	Current Scaling
6	1.5 A/V
12	3 A/V
25	6 A/V
50 A	12 A/V
100 A	24 A/V
150 A	36 A/V

Table 6: Current Scaling Factors

The generation of the combined inhibit/status signal is a bit complicated.

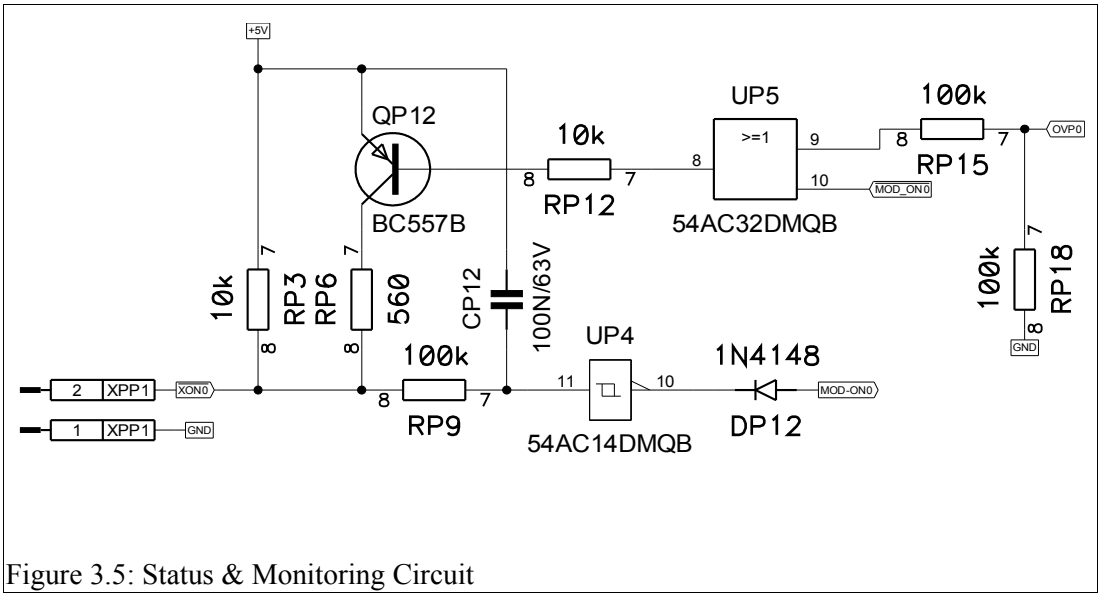


Figure 3.5: Status & Monitoring Circuit

The remote on/off signal is a current-controlled signal. If XON and XON-RET are not connected, the „MOD-ON“ signal disables the module.

If the pins are connected, the module is enabled (and will be switched on if there is no failure).

The remote on/off signal is qualified by a low pass filter (RP9+CP12) with a cut-off frequency of 16 Hz and a schmitt-trigger.

The XON/XON-RET lines are additionally used as status output: If the module is really on (No over-voltage-switch off (OVP), PF and TEMPFAIL both OK), the current in the remote control wire is about 10 mA (QP12 is conducting). If the status is bad, the current is reduced to 0.5 mA.

To support this functionality in the controller, a relay (to switch on/off) and a circuit which measures the current (e.g. 10 Ohm shunt resistor with following instrumentation amplifier) must be provided.

The common mode of this circuit should not be less than the voltage & current common modes.

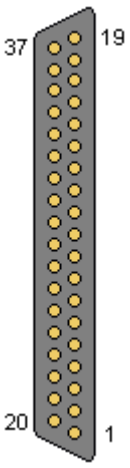
DSUB37 female	Pin	Left (U6..U11)	Right (U0..U5)	Comment
	19	NC	NC	reserved
	37	IMON+6	IMON+0	Current monitoring signal
	18	IMON-6	IMON-0	Current monitoring signal return
	36	UMON+6	UMON+0	Connected to the positive sense lines
	17	UMON-6	UMON-0	Connected to the negative sense lines
	35	XON6	XON0	Combined ON/Status line
	16	XON-RET6	XON-RET0	ON/Status line return
	34	IMON+7	IMON+1	Current monitoring signal
	15	IMON-7	IMON-1	Current monitoring signal return
	33	UMON+7	UMON+1	Connected to the positive sense lines
	14	UMON-7	UMON-1	Connected to the negative sense lines
	32	XON7	XON1	Combined ON/Status line
	13	XON-RET7	XON-RET1	ON/Status line return
	31	IMON+8	IMON+2	Current monitoring signal
	12	IMON-8	IMON-2	Current monitoring signal return
	30	UMON+8	UMON+2	Connected to the positive sense lines
	11	UMON-8	UMON-2	Connected to the negative sense lines
	29	XON8	XON2	Combined ON/Status line
	10	XON-RET8	XON-RET2	ON/Status line return
	28	IMON+9	IMON+3	Current monitoring signal
	9	IMON-9	IMON-3	Current monitoring signal return
	27	UMON+9	UMON+3	Connected to the positive sense lines
	8	UMON-9	UMON-3	Connected to the negative sense lines
	26	XON9	XON3	Combined ON/Status line
	7	XON-RET9	XON-RET3	ON/Status line return
	25	IMON+10	IMON+4	Current monitoring signal
	6	IMON-10	IMON-4	Current monitoring signal return
	24	UMON+10	UMON+4	Connected to the positive sense lines
	5	UMON-10	UMON-4	Connected to the negative sense lines
	23	XON10	XON4	Combined ON/Status line
	4	XON-RET10	XON-RET4	ON/Status line return
	22	MON+11	MON+5	Current monitoring signal
	3	IMON-11	IMON-5	Current monitoring signal return
	21	UMON+11	UMON+5	Connected to the positive sense lines
	2	UMON-11	UMON-5	Connected to the negative sense lines
	20	XON11	XON5	Combined ON/Status line
	1	XON-RET11	XON-RET5	ON/Status line return

Table 7: Remote Control Connector Pin Assignment

3.7 Power Output and Sense Connections

The low voltage DC output at the rear side of the power supply is provided by 4 mm sockets (Figure 3.3: Power Box Rear Side). The channels are arranged from left to right starting with U0. Positive output is up and negative output is down.

The sense lines are routed to three DSUB connectors (four channels each).

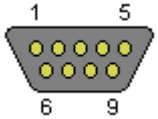
DSUB9 male	Pin	Left Connector (U0..U3)	Middle Connector (U4..U7)	Right Connector (U8..U11)
	1	U0 Sense +	U4 Sense +	U8 Sense +
	6	U0 Sense -	U4 Sense -	U8 Sense -
	2	U1 Sense +	U5 Sense +	U9 Sense +
	7	U1 Sense -	U5 Sense -	U9 Sense -
	3	U2 Sense +	U6 Sense +	U10 Sense +
	8	U2 Sense -	U6 Sense -	U10 Sense -
	4	U3 Sense +	U7 Sense +	U11 Sense +
	9	U3 Sense -	U7 Sense -	U11 Sense -
	5	not connected	not connected	not connected

Table 8: Sense Connector Pin Assignment

4 The MARA Power Bin

For easy exchange of the MARATON Power Box the special bin (MARA) is provided: The low voltage/high current cabling is connected to M5 threaded bolts (MULTICONTACT). The arrangement is the same as at the power box: Starting from left with U0, and positive outputs up – negative outputs down.

Each sense lines of four output channels are connected to an eightfold pluggable terminal row.

If remote sensing is not used, the sense lines can be connected to the power outputs with jumpers.

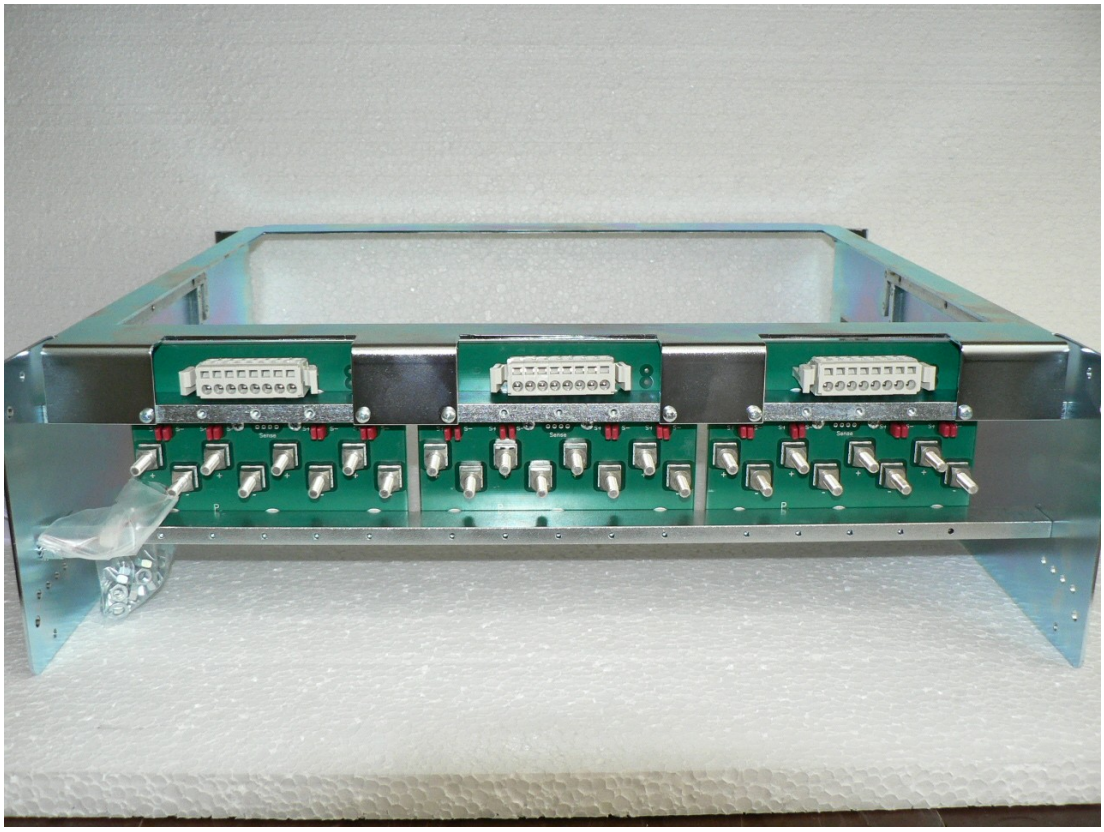
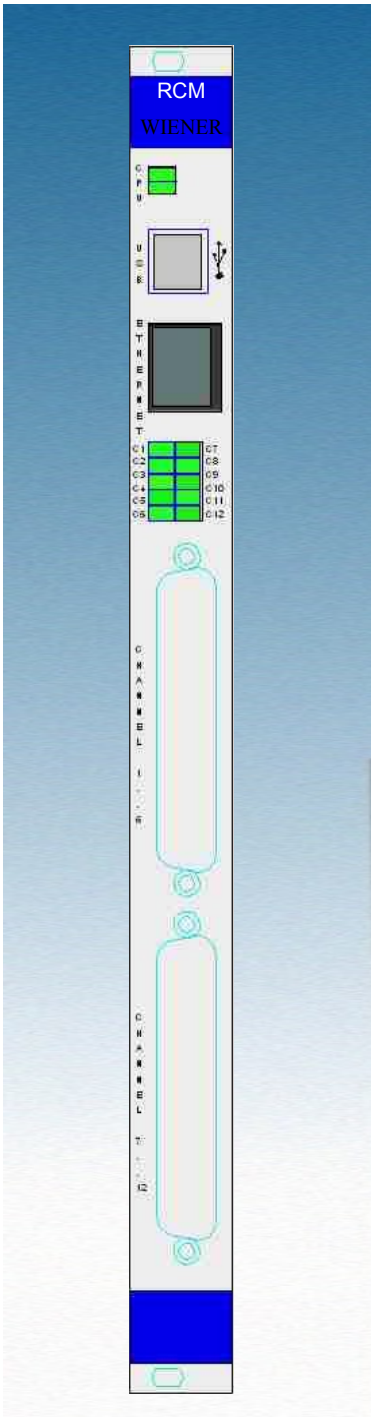


Figure 4.1: MARA Power Bin

5 MARATON Remote Controller Module

Features



- Measurement of Voltage & Current Monitor Outputs
- 12 Channels (1x12 or 2 x <6), groups freely definable
- Individual Channel Switch On & Off
- Detection of the Status per channel
- Trip behavior: channel wise, group wise or all
- CPU busy LED and USB active LED (2x)
- Channel-Status LED (12x)
  LEDs lit: outputs within limits, dark: channel off,
  flashing: channel failure
- TCP/IP connection for remote control (10/100M)
- SNMP protocol
- USB -Port
- Connection to MARATON power supplies via DSUB37 front panel connectors, alternative connection via J2 “User Defined“ and “Reserved“ Pins
- 6U VME Board Form Factor, 160 mm, 4 TE

The remote controller for MARATON (RCM) is capable to control two groups of 6 MARATON Power Box output channels each. The standard configuration is to connect one RCM to one power box.

All control signals (voltage, current and status) are formed as differential signals. The high input impedance of the controller avoids ground loops between this controller and the MARATON Power Box.

The voltage measurement outputs of the power supply are connected to the sense inputs via protection resistors (and an optional voltage divider).

It is a 6U VME form-factor processor board. Only the +5V supply voltage of the VME backplane is used, there is no data connection to the VME bus.

At the front panel is one global power LED, one USB LED and 12 status LED's. After power-on all leds flash once (self test). Then the upper CPU led is continuously lighting. The lower CPU led signals that the USB bus has successfully connected to a computer.
The status LED's provide a quick overview about the connected MARATON:

- LED off Channel is off
- LED on Channel is working properly
- LED blinking Channel has switched off because of any failure

After configuration of the RCM by a Windows XP computer connected to the USB port, the RCM provides access to many power supply parameters via Ethernet SNMP.

5.1 RCM capabilities

The following direct control functions are possible:

- Measurement of each MARATON output sense voltage
- Measurement of each MARATON output current
- Read the status of each MARATON channel
- Switch a MARATON channel on or off

The on-board microcontroller extends this functionality by comparing these values with additional limits, which can be modified via the network:

- Minimum sense voltage
- Maximum sense voltage
- Maximum current
- Maximum power

Each channel can assigned to one output group. The reaction at any failure can be selected independently:

- Ignore the failure (not possible in case the power supply might get damaged)
- Switch the channel of
- Switch all channels with the same group number off
- Switch all channels of the MARATON Power Box off

A detailed description of the SNMP functionality can be found in the corresponding MIB file (WIENER-CRATE-MIB.txt)

5.2 OPC Server

A server according to OPC Data Access V2.05 is optional available.

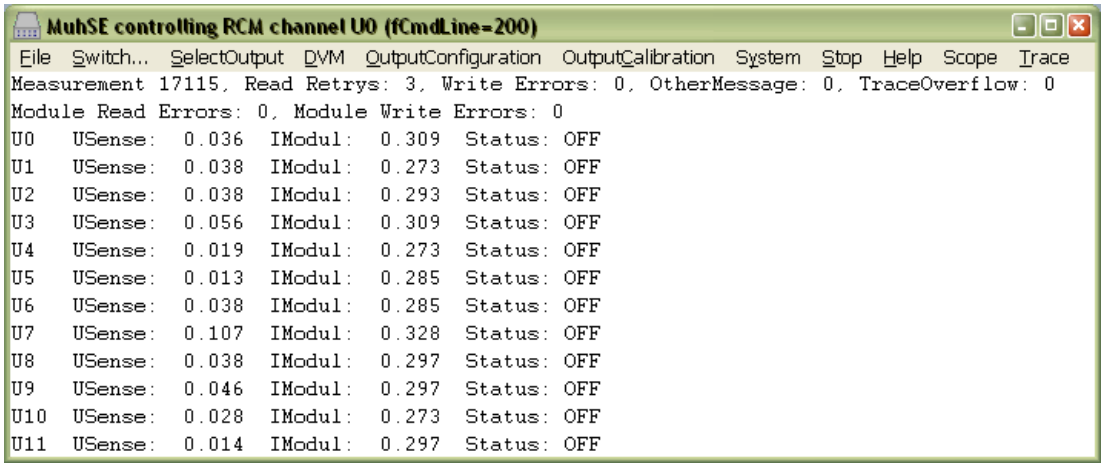
OPC (**O**LE for **P**rocess **C**ontrol) allows fast and secure access to data and information under Windows operating systems. As an industry-spanning, multi-vendor software interface, OPC minimizes connection and maintenance overheads.
This server, running on a Computer with the Microsoft Windows XP operating system, enables access to all controllers which are connected to the network (TCP/IP). It is possible to

- access from any OPC Client application to the data of one or more servers
- encapsulating the properties specific to the server and type of communication
- commissioning support due to automatic scanning of the network and registration of communication stations
- restricting access rights by the underlying Microsoft DCOM.

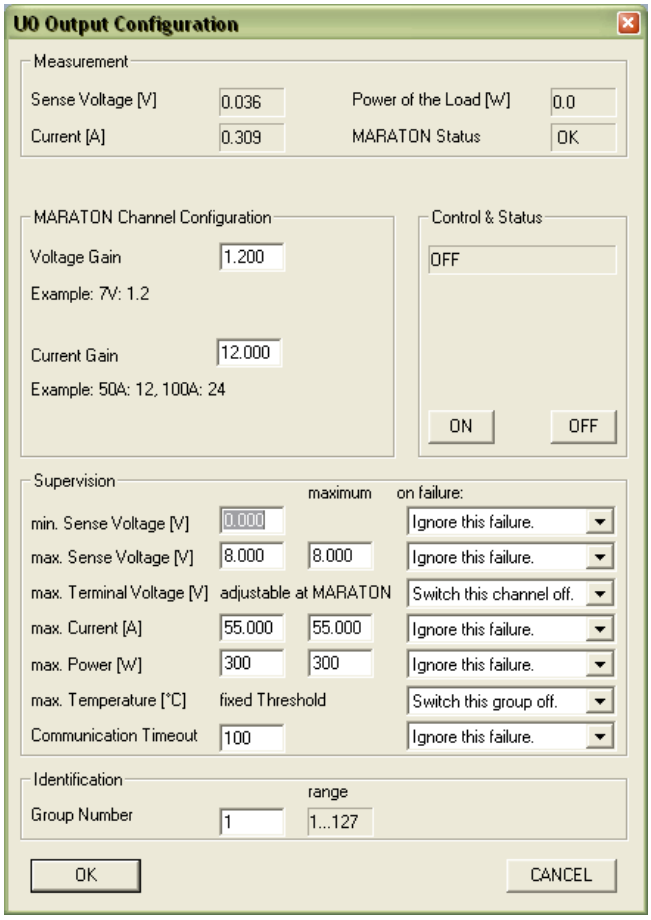
The details of the OPC server can be found in the manual delivered with the OPC server software.

5.3 Software Setup

Before the RCM can be used, the controller has to be configured according to the connected environment.
This is done by the MUSEcontrol utility, which allows access to the USB-port of the RCM with a computer running Windows XP. The software is free available at the download area of our website.
After installing the software, connecting the USB cable and starting the program, the main window gives a quick overview of the RCM and its connected MARATON Power Box:



You can switch on or off any channel by clicking at the line of the channel. If you click with the right mouse button, the “OutputConfiguration” dialog is entered:
The dialog is divided into five main sections:



- Measurement

  Shows the actual measured sense voltage, current and status and the calculated power at the load.

- Control & Status

  Here the channel can be switched on and off. If the channel has switched off because of any failure, the reason is displayed here, too.

- MARATON Channel Configuration

  Here the scaling factors of the connected MARATON Power box must be entered. (See chapter 3.6)

- Supervision

  Here the threshold values of the minimum sense voltage, the maximum sense voltage, the maximum current, the maximum power and the communication timeout can be entered. The right column “maximum” can only be changed by this utility and is the maximum allowed value of the left column. The left column may be changed here or via the TCP/IP network. The most right column “on failure” defines the action if the associated threshold is exceeded.

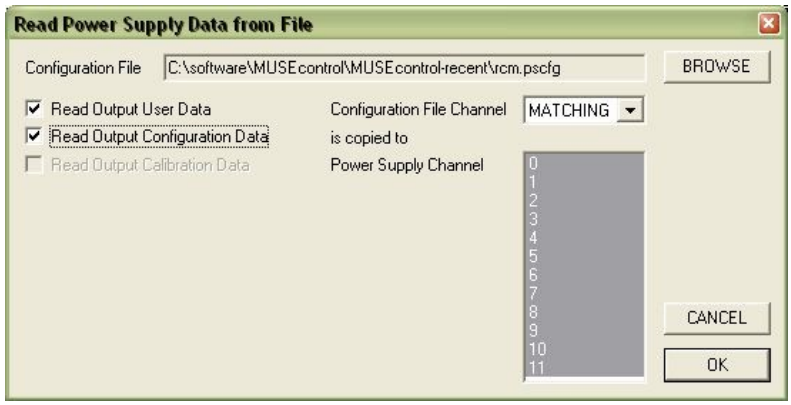
  The “communication timeout” at the last low is an internal timeout of the communication between different processors. If the processor responsible for a specific output has no data from it's master processor for longer than this time (in milliseconds), the output channel will be switched off.

- Identification

  Here the group number of this channel can be entered.

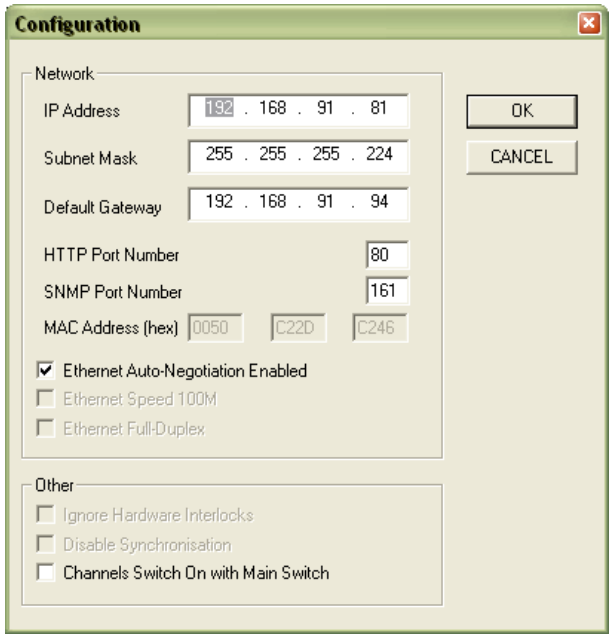
Other main menu items associated with this dialog are “Start/Stop” (stop and restart the communication with the RCM) and “SelectOutput”, which simple increments the channel number which is displayed by the other dialogs.

The “File → Read” and “File → Save” menu items can be used to save this data to disc and to copy a configuration from disk to a RCM module. The configuration file is in XML format and may be edited manually. WIENER supplies specific configuration files for each MARATON power box. This configuration must be read into the connected RCM module. This is necessary because the RCMs are delivered with a generic configuration (12 MARATON channels, each 8V/50A).



Be sure to check the “Read Output User Data” (output voltage, ...) and “Read Output Configuration Data” (module types of the power box) check boxes like the example above.
Another essential menu item is the “System” branch. System → FirmwareUpdate starts the firmware update procedure, and System → Configuration starts the network configuration dialog.

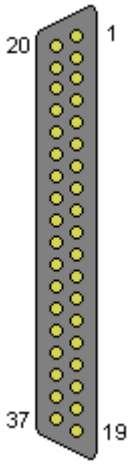
Here you enter the TCP/IP network settings (IP address, subnet mask and default gateway). You have to use the parameters of your local network here. Please contact your network administrator for details.
HTTP and SNMP port numbers should only modified if you know what you do. Setting any ports to 0 disables the server.

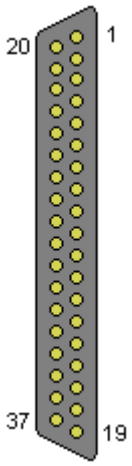


The other main menu items are used for test and maintenance and should not used by the customer.

5.4 Connection to the Power Box

To connect the RCM with the MARATON Power Box the 37-pin DSUB connectors at the RCM front panel may be used. The signals are also routed to the rows A+C of the VME-type J2 connector, so it is possible to connect from the backside.

Upper DSUB37 male (Channel 0..5)	Pin	Signal	Comment	96pol / J2
	19	NC	reserved	
	37	IMON+0	Current monitoring signal	C16
	18	IMON-0	Current monitoring signal return	A16
	36	UMON+0	Connected to the positive sense lines	C15
	17	UMON-0	Connected to the negative sense lines	A15
	35	XON0	Combined ON/Status line	C12
	16	XON-RET0	ON/Status line return	A9
	34	IMON+1	Current monitoring signal	C14
	15	IMON-1	Current monitoring signal return	A14
	33	UMON+1	Connected to the positive sense lines	C13
	14	UMON-1	Connected to the negative sense lines	A13
	32	XON1	Combined ON/Status line	A12
	13	XON-RET1	ON/Status line return	A9
	31	IMON+2	Current monitoring signal	C11
	12	IMON-2	Current monitoring signal return	A11
	30	UMON+2	Connected to the positive sense lines	C10
	11	UMON-2	Connected to the negative sense lines	A10
	29	XON2	Combined ON/Status line	C9
	10	XON-RET2	ON/Status line return	A9
	28	IMON+3	Current monitoring signal	C8
	9	IMON-3	Current monitoring signal return	A8
	27	UMON+3	Connected to the positive sense lines	C7
	8	UMON-3	Connected to the negative sense lines	A7
	26	XON3	Combined ON/Status line	C4
	7	XON-RET3	ON/Status line return	A1
	25	IMON+4	Current monitoring signal	C6
	6	IMON-4	Current monitoring signal return	A6
	24	UMON+4	Connected to the positive sense lines	C5
	5	UMON-4	Connected to the negative sense lines	A5
	23	XON4	Combined ON/Status line	A4
	4	XON-RET4	ON/Status line return	A1
	22	IMON+5	Current monitoring signal	C3
	3	IMON-5	Current monitoring signal return	A3
	21	UMON+5	Connected to the positive sense lines	C2
	2	UMON-5	Connected to the negative sense lines	A2
	20	XON5	Combined ON/Status line	C1
	1	XON-RET5	ON/Status line return	A1

Lower DSUB37 male (Channel 6..11)	Pin	Signal	Comment	96pol
	19	NC	reserved	
	37	IMON+6	Current monitoring signal	C32
	18	IMON-6	Current monitoring signal return	A32
	36	UMON+6	Connected to the positive sense lines	C31
	17	UMON-6	Connected to the negative sense lines	A31
	35	XON6	Combined ON/Status line	C28
	16	XON-RET6	ON/Status line return	A25
	34	IMON+7	Current monitoring signal	C30
	15	IMON-7	Current monitoring signal return	A30
	33	UMON+7	Connected to the positive sense lines	C29
	14	UMON-7	Connected to the negative sense lines	A31
	32	XON7	Combined ON/Status line	A28
	13	XON-RET7	ON/Status line return	A25
	31	IMON+8	Current monitoring signal	C27
	12	IMON-8	Current monitoring signal return	A27
	30	UMON+8	Connected to the positive sense lines	C26
	11	UMON-8	Connected to the negative sense lines	A26
	29	XON8	Combined ON/Status line	C25
	10	XON-RET8	ON/Status line return	A25
	28	IMON+9	Current monitoring signal	C24
	9	IMON-9	Current monitoring signal return	A24
	27	UMON+9	Connected to the positive sense lines	C23
	8	UMON-9	Connected to the negative sense lines	A23
	26	XON9	Combined ON/Status line	C20
	7	XON-RET9	ON/Status line return	A17
	25	IMON+10	Current monitoring signal	C22
	6	IMON-10	Current monitoring signal return	A22
	24	UMON+10	Connected to the positive sense lines	C21
	5	UMON-10	Connected to the negative sense lines	A21
	23	XON10	Combined ON/Status line	A20
	4	XON-RET10	ON/Status line return	A17
	22	IMON+11	Current monitoring signal	C19
	3	IMON-11	Current monitoring signal return	A19
	21	UMON+11	Connected to the positive sense lines	C18
	2	UMON-11	Connected to the negative sense lines	A18
	20	XON11	Combined ON/Status line	C17
	1	XON-RET11	ON/Status line return	A17

6 Power Box Data Sheet

3U box with max. 6 power modules.

Input:

Rated Input Voltage:	385 V DC +/- 10 V	
Rated Input Current:	11 A	
Output Insulation (SELF)	CE	EN 60950 , ISO 380, VDE 0805, UL 1950, C22.2.950

Regulation fast remote sense circuit (short sensed distance, sense connected to output at the MARA power bin):

Static:	MDC/M 2-8 V / 30–60 V	< 15 mV	(+/-100% load, +/- full mains range)
	MDC/M other voltages	< 0.05 %	(+/-100% load, +/- full DC input range)
Dynamic (0.5 m wire):	MDC/M 2-8 V	< 100 mV	(50 % - 75 % load change)
	other	< 0.7 %	(50 % - 75 % load change)
Recovery Time:	MDC/M 2-8V	1%: 0.2 ms 0.1%: 0.5 ms	(50 % - 75 % load change)
	MDC/M 5-16V, 7-24V	1%: 0.0 ms 0.1%: 1.0 ms	(50 % - 75 % load change)
	MDC/M 30-60V	1%: 0.5 ms 0.1%: 1.0 ms	(50 % - 75 % load change)
Conditions	Current slope <1000A/ms, 20mF per 100A parallel to load		

Regulation slow remote sense circuit (long sensed distance):

Static:	MDC/M 2-8V/ 30-60V	< 15 mV	(+/-100% load, +/- full mains range)
	Other	< 0.05 %	(+/-100% load, +/- full mains range)
Dynamic:	Dynamic deviation depends on current slope resp. filter capacitors at load side only 30m cable to load, 0,3mF capacitance at load side, 1V drop at nominal load, 10% - 90 % load change with 3ms slope (50A output= 13,33A/ms) leads to less than 10% temporary output voltage deviation		
Recovery Time (40m wire, 5V at load side, U_{drop} < 2 V:	MDC 2-7V, 2-8V	10%: <15 ms 1%: <25 ms	(50 % - 75 % load change)
	Other	10%: <15 ms 1%: < 33 ms	(50 % - 75 % load change)

DC Output Characteristics:

Sense compensation range:	Limited to < 10V or nominal voltage (whichever is lower).		
Regulation mode:	The voltage at the sense connection point is regulated.		
Floating range:	> nominal output voltage for MEH, min. +/-10V for voltage ranges <10V MEH, MDH, MDM and MDC		
Noise and ripple:	Voltage < 8 V	< 10 mV_{PP}	(0.5 m wire, 0–20 MHz)
	Voltage > 8 V	< 15 mV_{PP}	
		< 3 mV_{PP}	(10 m wire, 0-300 MHz)
		< 1.5 mV_{RMS}	
Conditions at the load:	Parallel (X) 330µF and 1µF ceramic, 100nF HF- conducting to case (Y) each line		

Emission:	CE EN 50081-1 (EN 55 022-B)
Immunity:	CE EN 50082-1 or 2
Operating temperature:	10 °C – 40 °C
Storage Temperature:	- 30 °C - + 85 °C (cooling water must be completely removed, else +3 °C - +85 °C)
Temp.- Coefficient:	< 0.2% / 10K
Stability (constant conditions)	<5mV or 0.1% within 24 h, <25mV or 0.3% within 6 months
Current limiting:	Fast protection programmable to lower than peak values via trim-pots (constant current mode) Via Remote Controller channel wise Imax trip off set point programmable independently
Status control / DC Off (trip off):	Processed in external Remote Controller. Tripping global, group- or channel wise programmable (after overload, overheat , overvoltage, undervoltage)
Interlock input:	optional
Efficiency (pro Module):	65% 2V/ -81% >5V/ -85% >7V -87% >12V/ -90% >48V at nominal input voltage
M T B F, cooled by:	Conditions: 3kW DC output with 80% efficiency (600W internal power dissipation: WORST CASE)
Water, 30°C inflow:	
Forced Air, 30°C entrance:	ca. 120,000 h , put through > 50l/h for <10°C DT of cooling water. Minimum differential pressure >0.5 bar, abs. max. pressure <15bar ca. 90,000 h , put through > 153m3/h for <15°C DT of cooling air, ambient air pressure 1 bar. Adequate airflow is roughly 1,4m/s. Values for air cooled units are valid for new ones. Abrasive dust, corrosion, etc. can limiting the heat transfer to the cooling air

during lifetime. Higher operating temperature is the consequence.

Increasing of internal temperater at the most critical points of 10°C will reduce the MTBF by 50% Lower operating temperatures will increase the MTBF accordingly, independent of cooling medium.

Construction features, Accessories:	**3 U box with extraction lever:**	max. 6 modules, up to 3 kW / 3,6kW output power
	Connections / plugs:	24 female pins 80A, parallel used for higher currents, 3 x 9pin Sub D for sensing (each for 4 channels)
	Dimensions (w, h, d)	434 mm x 132 mm x 325 mm
	Weight:	31,5 kg
Accessories:	19" Power Bin for plug in MARATON power supplies. 24 power contacts with M5 threated bolts and sense terminals at rear side.	
	Type 44 :	4U x 450mm mounting depth, 1 U air baffle, strain relief, cooling air entry front- or bottom side, for 3U – Box
	Special power bins / 19" assembly with 3U and 6U (for two MARATON boxes) available. 450mm mounting depth	

7 Primary Rectifier Data Sheet

Mains Input

AC Input: power fact. >0,98	**CE**	100- 240VAC / 16A +/-10% (20A peak), 47-63Hz,
Inrush current: (cold unit)		limited by soft start-circuit to 110% of nominal current
Input protection:		Circuit breaker with 20A thermal overload protection (16 A at maximum operating temperature) included.
Power Output: converter		385 V DC +/- 5V, matched for MARATON DC/DC
230VAC input		continuously 9A, 3500W nominal (4,4kW peak) @
Regulation:		Load (10-90%) 1% deviation Mains (10-90%) 1% deviation
Output ripple: frequency)		Load (10-90%) 1-10V_{ss} 94-126Hz (double mains
RF rejection:		EN 55 022 Class B, Input and Output
Output protection overload:		current limiting for booster circuits, 90°C cut off temperature
Dimensions:		4U x 14 PU width acc. to IEC 60297, 450 mm deep
Weight:		4,7 kg
Module connectors:		2mm pin / socket diameter. max. ratings: 25A up to 50°C, 500V. 2,2kV test
voltage 50Hz		PE / Ground pins outfitted as leading pin

EMC Compatibility /RFI Rejection **Separate Input and Output**

EMC Filter

EMA	**EN 61 000-6-3:2001**	**[RF emission]**
	EN 55 022:1998 + Corr:2001 + A1:2000 Class B	conducted noise
	EN 55 022:1998+ Corr:2001 + A1:2000 Class B	radiated noise
	EN 61 000-3-2:2001	harmonics
	EN 61 000-3-3:1995 +Corr:1997 +A1:2001	flicker
EMB	**EN 61 000-6-2:2001**	**[immunity]**
	EN 61 000-4-6:1996 + A1:2001	injected HF currents
	EN 61 000-4-3:1996 + A1:1998 + A2:2001	radiated HF fields incl. 900MHz
	EN 61 000-4-4:1995 + A1:2001	Burst
	EN 61 000-4-5:1995 + A1:2001	Surge
	EN 61 000-4-11:1994 + A1:2000	voltage variations
	EN 61 000-4-2:1995 + A1:1998 + A2:2001	ESD

Operation temperature:		0....50°C without derating, storage: -30°C … + 85°C
Efficiency:		better than 95 %
M T B F	electronics:	40°C ambient: ca. 100 000 h
	integrated fan:	40°C ambient: ca. 65 000 h, 25° ambient >85000h

8 RCM Remote Controller Data Sheet

Power requirement: 5V +/- 5 %, max. 1,5 A

Operation temperature: 0....50°C without derating, storage -30°C ... +85°C

Controllable Items of the MARATON DC/DC Converter:

Current trip: remotely programmable. Trip of individual channel or channel groups.

Voltage trip: discharge of output capacitors after tripping and DC off.

Over Voltage trip: Fix point adjustment in MARATON (not changeable remotely)

Temperature trip: Fix point setting in MARATON (not changeable remotely)

Control outputs: Reaction delay < 5ms

Monitor inputs: **Analog: Voltage** per channel

Input Common Mode Range	± 60 V
Differential input voltage range	min. 50 V
Input resistance	min. 400 kOhm
Measurement rate	min. 500/s
Typical full scale accuracy, including power box and cabling	± 0.5 %

Analog: Current per channel

Differential input voltage range	min. 5 V
Input resistance	min. 100 kOhm
Measurement rate	min. 500/s
Typical full scale accuracy, including power box and cabling	± 3 %

Digital: Status information per channel

Tripping: within 5ms if programmed or fixed limits (overload, overheat, over voltage) exceed. Channel wise, group wise or

	global programmable.
M T B F:	at 40°C ambient /cooling air >120 000 h
Input /output connection	1. Via front panel access through 37 pin Sub D (each per 6 channels) 2. By use of J2 connector
Communication:	Ethernet 10/100M, USB 2
Dimensions (w, h, d)	20 mm (4 BE) x 262 mm (6U) x 185 mm
Weight:	0,3 kg

9 Appendix A: Ordering Information

9.1 Power Box

The power boxes can be classified into four categories, which define the most significant part of the ordering number:

	Magnetic Field < 30 mT (300 G)	Magnetic Field < 120 mT (1200 G)
Water Cooled	**0M22.**xxxx	**0M24.**xxxx
Air Cooled	**0M12.**xxxx	**0M14.**xxxx

The left side of the ordering number is not descriptive, it is randomly assigned to the requested module & options configuration. Up to six power modules may be used inside of one power box.

The following modules are possible:

Module Type	Channels per Module	Optimal Voltage Range	Peak Output Current	Continuous Output Power
MDC	2	2V ... 7V/8V	2*55A	2*300W
MDC	2	5/7V ... 15/16V	2*22A	2*300W
MDC	2	9V	2*30A	2*270W
MDC	2	7V ... 24 V	2*11.5A	2*250W
MDC	2	30V ... 60V	2*6.6A	2*300W

The MDC 7V and MDC 9V are available with the special “maximum voltage ensured” option.
With this option the modules are designed in a way that even in the worst case (All electronic regulation and protection fails and the PWM generates it's maximum duty cycle) the output voltage does not rise. Please contact WIENER for more details.

The following modules can be used only at magnetic fields below 30 mT:

Module Type	Channels per Module	Optimal Voltage Range	Peak Output Current	Continuous Output Power
MDH	2	2V ... 7V/8V	2*30A	2*210W
MDH	2	5/7V ... 15/16V	2*20A	2*250W
MDH	2	7V...24V	11.5A	2*275W
MEH	1	2...7V	115A	550W

Module Type	Channels per Module	Optimal Voltage Range	Peak Output Current	Continuous Output Power
MEH	1	6...10V	80A	550W
MEH	1	7...16V	46A	550W
MEH	1	12...30V	23A	550W
MEH	1	30...60V	13.5A	550W

All power modules can be ordered with different sense regulation characteristics:

- Fast — Fastest regulation, but may be instable if connected to cables longer than 1 m.
- Moderate — This is the standard configuration for cable length up to 30 m
- Slow — This is used for much longer cables

Available Power Bins:

	Ordering Number
Power Bin (MARA) 3U	0B15.1200
Power Bin (MARA) 6U, for two power boxes	0B14.2400

9.2 Primary Rectifier

	Ordering Number
Primary Rectifier Module (PFC)	0PFC.0001
Power Bin for 6 PFC Modules	0B07.0001

9.3 RCM

	Ordering Number
Control and Monitoring Module (RCM)	0R00.0000
OPC Software for RCM	0S00.0000
RCM with OPC Software (bundle)	0R00.0001
Control crate with fan tray and power supply, special backplane only usable for RCM	0300.M921
Control bin with special backplane only usable for RCM, suits for 0P06 power supply and 0F00 fan tray families.	0B06.025M

10 Appendix B: Recommended Cable Specification

10.1 400V DC Cabling (Primary Rectifier ↔ MARATON)

The cable selections are based on max. 10V voltage drop at the cable, at max. current of 10A (total cable resistance ≤ 1 Ω)

maximum length	number of wires / cross section	LAPP part no.[1] not halogen-free	LAPP part no.[2] halogen-free
40 m	2 x 1.5 mm²	1135 902 2X1,5	0035 067 2X1,5
65 m	2 x 2.5 mm²	1135 402 2X2,5	
80 m	4 x 1.5 mm² (2 wires in parallel)	1135 904 4X2,5	0035 070 4G1,5 (standard cable only with gn/ye color)
105 m	2 x 4 mm²	1135 502 2X4,0	
130 m	4 x 2.5 mm² (2 wires in parallel)	1135 404 4G2,5 (standard cable only available with gn/ye color)	0035 090 4G2,5 (standard cable only available with gn/ye color)
160 m	2 x 6 mm²	1135 602 2X6,0	

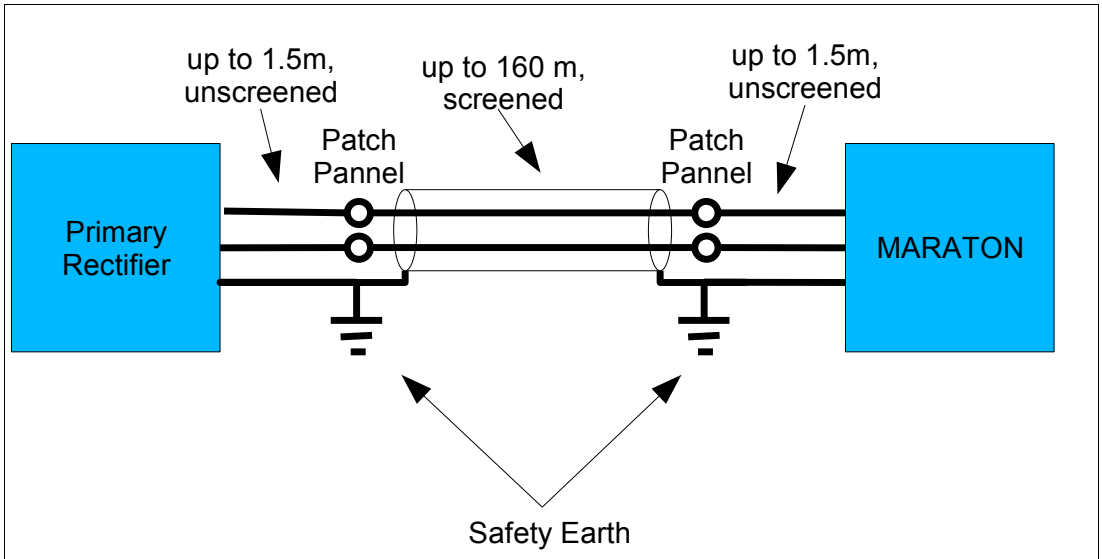


Figure 10.1: HV DC Wiring

1 ÖLFLEX® CLASSIC 110 CY, U0/U: 300/500 V, Datasheet:
http://www.lappkabel.de/webkatalog/katalog.cfm?cmd=show_produkt_details&produkt_id=10016

2 ÖLFLEX® CLASSIC 110 CH, U0/U: 300/500 V, Datasheet:
http://www.lappkabel.de/webkatalog/katalog.cfm?cmd=show_produkt_details&produkt_id=10035

10.2 Control Cabling (Remote Control Module ↔ MARATON)

maximum length	number of wires / cross section	LAPP part no.[3] not halogen-free	LAPP part no.[4] halogen-free
200m	3 x 2 x 0.28 mm² for each channel	J-Y(St)Y 20x2x0.6 for 6 channels (one SUB-D) 1591 311	J-H(St)H 20x2x0.6 for 6 channels (one SUB-D) 3022 224

3 J-Y(ST)Y...LG Cu-Conductor 0,6 mm, Datasheet: http://www.lappkabel.de/webkatalog/katalog.cfm?cmd=show_produkt_details&produkt_id=10309

4 UNITRONIC® J-H(ST)H-BD, Datasheet: http://www.lappkabel.de/webkatalog/katalog.cfm?cmd=show_produkt_details&produkt_id=10313

11 Appendix C: Parallel Connection of Output Channels

A set of six current bars (4-fold) will be delivered by each power bin in a companion-assembly-pack.

Parallel connection of power supply outputs require modifications inside of the power supply box, which may only be done by WIENER service personal and must be mentioned in your order.
This instructions apply only for such power supplies.
Connecting other channels may damage the power box! (If a channel is switched off, its output is short-circuited by a transistor. So if another channel is connected and is not switched on/off at exactly the same time, this transistor will burn)

How to use the current bars

If the power supply has channels with more than one contact pair, use the current bars to connect each option. For best operation it is necessary to connect the parallel outputs together as near as possible at the power supply site. For 200A (4-fold) the current bars can be used as they are, for 3-fold or dual paralleling they have to be cut accordingly.

4-fold : 200A (order number : 1480753.A1)

3-fold : 150A

2-fold : 100A

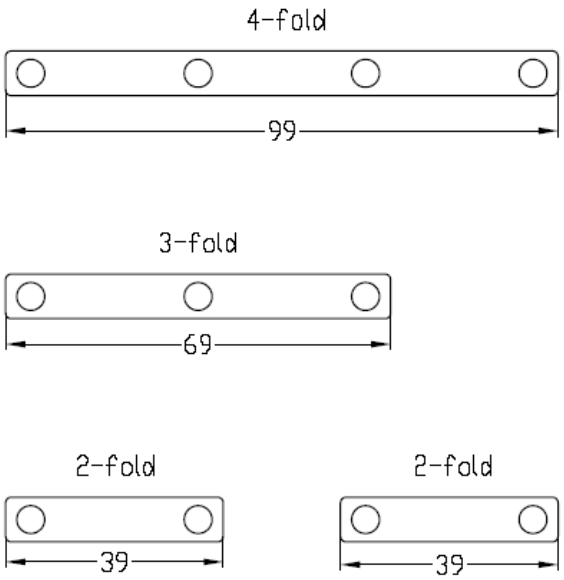


Figure 11.1: Current Bar Dimensions

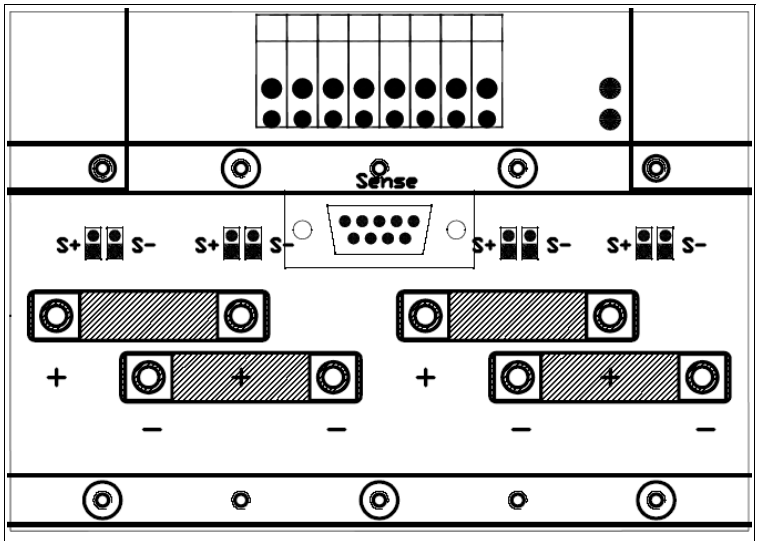


Figure 11.2: Two Channels Parallel

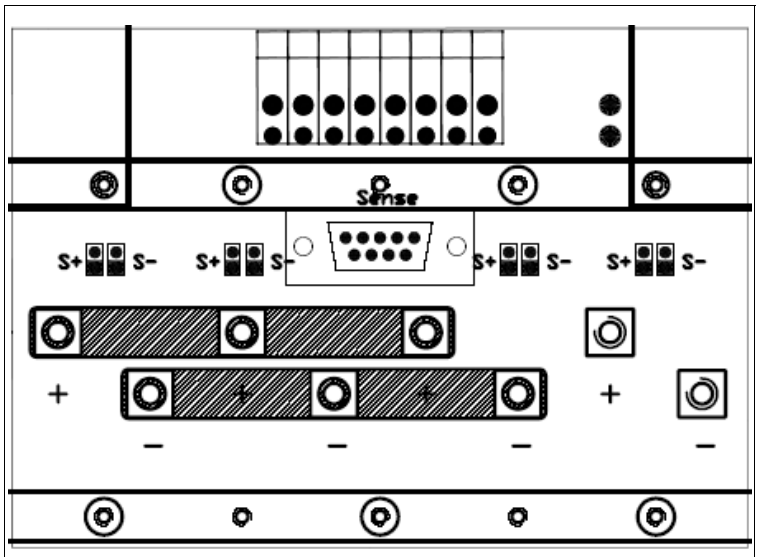


Figure 11.3: Three Channels Parallel

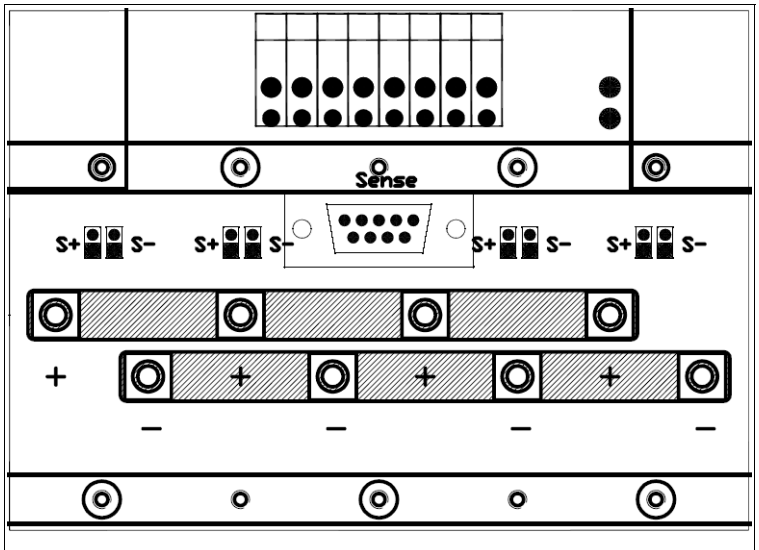


Figure 11.4: Four Channels Parallel