

# MARATON hazardous HE

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**MARATON is a family of MAGnetic field and RAdiation TOLeraNt power supplies developed for CERN LHC. MARATON HHE is the 12 channel version for use in a hazardous hostile environment.**

**Magnetic field tolerance is achieved by water cooling (up to 300G) and shielded components (up to 1200G). For radiation hardness (<30Gy) a quasi-redundant principle of power conversion is combined with special components. Further radiation sensible components are placed at remote locations.**

The modular construction with a 19" rack mountable power bin and a plug-in power supply box allows to swap the power supply without any tools and within shortest time.

## Main Features

- Up to 12 independent, potential free outputs, total up to 3 kW(air cooled) or 3.6kW (water cooled) DC power
- Radiation and magnetic field tolerant, tested with protons: up to 140 Gy and neutrons up to 722 Gy.
- Remote VME RCM controller, programmable warning and trip levels
- Extremely low noise and ripple
- 94V – 265VAC world-wide auto-range AC input, with power factor correction, CE

## MARATON HHE Features

- Up to 12 independent, potential free outputs, total up to 3 kW DC output power (at nominal 385VDC input), 3.6kW power water cooled
- Fully controlled, adjustable trip levels
- Adjustable voltages, current limits, temperature 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
- VME compatible remote monitoring and control module for 12 channels with Ethernet (TCP/IP) interface (for Standard Environment)
- 385VDC input from PFC module (with standard mains input) placed on remote bin
- Water cooled (recommended) or by forced air

## MARATON Remote Controller (RCM) Features

- 6U VME Board Form Factor, 160 mm, 4 TE
- Measurement of MARATON Voltage & Current Monitor Outputs
- 12 Channels (1x12 or 2 x <6), groups free 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)
- LED's 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

## MARATON consists of:

=> **Power Bin:** 19" bin for rack mounting hosting a power box

Type	Dimensions	Features
<i>PBNMARA – 3U RASO</i>	3U x 19" x 445mm	Folded metal frame
<i>PBNMARA – 4U</i>	4U x 19" x 445mm	Aluminum side panels

=> **Power Box** containing a PFC mains input module, a control card and slots for up to 6 modules (MDM / MDC types, dual channel, 250W) for a maximum of 12 channels. The power box includes the CAN-bus interface and can be outfitted with an individual channel interlock feature (**I option**)

Type	Dimensions	Features
<i>PBXMARA</i>	3U x 19" x 445mm	Ethernet, USB, "Easy Lever" extraction mechanism

=> **Power Modules** integrated into Power Box for a maximum of 6 modules / 12 channels

Type AL (up to 300G)	Voltage range	Channels	Peak output / Power
<i>MDC – 02/07</i>	2V ... 7V/8V	2	2 x 55A or 1 x 110A / 330W (660W total)

<i>MDC – 07/16</i>	5/7V ... 15/16V	2	2 x 22A or 1 x 44A / 330W (660W total)
<i>MDC – 07/24</i>	7V ... 24V	2	2 x 11,5A or 1 x 23A / 275W (550W total)
<i>MDC – 30/60</i>	30V ... 60V	2	2 x 6,6A or 1 x 13,2A / 330W (660W total)
<b>Type FE (up to 1200G)</b>	<b>Voltage range</b>	<b>Channels</b>	<b>Peak output / Power</b>
<i>MDM – 02/07</i>	2V ... 7V/8V	2	2 x 55A or 1 x 110A / 330W (660W total)
<i>MDM – 07/16</i>	5/7V ... 15/16V	2	2 x 22A or 1 x 44A / 330W (660W total)
<i>MDM – 07/24</i>	7V ... 24V	2	2 x 11,5A or 1 x 23A / 275W (550W total)
<i>MDM – 30/60</i>	30V ... 60V	2	2 x 6,6A or 1 x 13,2A / 330W (660W total)

=> The RCM control card is placed on a remote VME crate

=> The mains input module with PFC is placed in a remote bin

### Specs:

<b>Rated Input Voltage:</b>	385 V DC +/- 10 V
<b>Rated Input Current:</b>	11:00 AM
<b>Output Isolation :</b>	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):

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

### Regulation slow remote sense circuit (long sensed distance):

<b>Static:</b>	MDC/M 2-8V/ 30-60V	< 15 mV	(+/-100% load, +/- full mains range)
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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, Udrop < 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 mVPP (0.5 m wire, 0–20 MHz)

Voltage > 8 V < 15 mVPP

< 3 mVPP (10 m wire, 0-300 MHz)

< 1.5 mVRMS

Conditions at the load: Parallel (X) 330µF and 1µF ceramic, 100nF HF- conducting to case (Y) each line

### Other

**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** Fast protection programmable to lower than peak values via trim-pots (constant current mode)

<b>limiting:</b>	Via Remote Controller channel wise I <sub>max</sub> trip off set point programmable independently
<b>Status control / DC Off (trip off):</b>	Processed in external Remote Controller. Tripping global, group- or channel wise programmable (after overload, overheat , overvoltage, undervoltage)
<b>Interlock input:</b>	optional
<b>Efficiency (pro Module):</b>	65% 2V/ -81% >5V/ -85% >7V -87% >12V/ -90% >48V at nominal input voltage
<b>M T B F, cooled by:</b>	Conditions: 3kW DC output with 80% efficiency (600W internal power dissipation: WORST CASE)
<b>Water, 30°C inflow:</b>	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
<b>Forced Air, 30°C entrance:</b>	ca. 90,000 h , put through > 153m <sup>3</sup> /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:

<b>3 U box with extraction lever:</b>	max. 6 modules, up to 3 kW / 3,6kW output power
<b>Connections / plugs:</b>	24 female pins 80A, parallel used for higher currents, 3 x 9pin Sub D for sensing (each for 4 channels)
<b>Dimensions (w, h, d)</b>	434 mm x 132 mm x 325 mm
<b>Weight:</b>	31,5 kg
<b>Accessories:</b>	19" Power Bin for plug in MARATON power supplies. 24 power contacts with M5 threaded 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

#### Product Data Sheet

MARATON hazardous HE: [Print Product Data Sheet](#)

#### Documentation

Manual and Tech-Notes :

[Manual MARATON](#)

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Introduction:

[WIENER Power Supplies intro](#)

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