

Hacousto Holland bv Industrieweg 87 2651BC Berkel & Rodenrijs		
4EVAC i-DCA2.500 user and installation manual	Author:	NR



SUMMARY

This document is the user manual of the I-DCA2.500 'D-Class Direct-Drive' power amplifier (IP- Based) with integrated power supply and battery charger, dedicated to the 4EVAC IMPACT MM voice evacuation system.


REVISION AND APPROVAL

Rev.	Date	Nature of Changes	Approved By
01	21-03-2023	Original Draft	NR

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Thank you for choosing 4EVAC as your Voice Evacuation System solution.

4EVAC IMPACT MM is a flexible Voice Evacuation System capable of both standalone and network operation. 4EVAC IMPACT MM is certified in accordance with EN54-16 and EN54-4, which are harmonized standards under the Products Regulation, mandatory in the European Union.

1. What's in the box?

Inside the package you will find:

-  I-DCA2.500 amplifier
-  Set of connector plugs
-  Temperature sensor (enabling charger)

2. General information

The 4EVAC I-DCA2.500 is a highly efficient and robust 2x500W power amplifier, specially designed for use in voice evacuation systems, public address installations, and commercial audio applications. This device is fully compliant with EN54-4 and EN54-16 standards, and comes equipped with an integrated power supply and 24V battery charger. It can work seamlessly as a native component of the 4EVAC IMPACT MM voice evacuation system and commercial audio application system, and its dual ethernet ports enable it to daisy-chain and broadcast digital audio streams, offering a complete solution to your audio needs. Additionally, the I-DCA2.500 can function as a standalone power amplifier or battery charger without the need for external control devices.



The I-DCA Amplifiers allow you to handle 2 audio streams simultaneously for both input and output, providing access to all 250 audio streams in the maze network. Each output channel of the I-DCA can handle any audio stream available in the maze network. With a maximum of 16 I-DCA Amplifiers connected to a single I-controller, you can simultaneously use up to 32 audio sources in standalone mode.


One notable feature of the I-DCA 2.500 is its Aux output, which is parallel to the 2 maze channels available in the respective I-DCA 2.500. The I-DCA 2.500 is user-friendly and easy to operate, making it a perfect choice for users looking for a comprehensive and convenient audio solution in combination with PAVA application.

3. Front indicators



NOTE: Where bi-colour LED indication is defined, in case of multiple states driving that LED are simultaneously active, two colours cannot be displayed simultaneously. Fault indication (YELLOW) always has priority, priority among fault indications is defined in tables below.

	POWER
	LINK
	BATTERY
	CHARGER
	AMPLIFIER FAULT
	CH A SIG / CLIP
	CH B SIG / CLIP

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3.1. POWER

Indicates if the unit is being powered and from which source (mains / battery). Indicates loss of mains supply.

OFF	Not powered
GREEN continuous	This device is powered from AC (mains) input
GREEN blinking	This device is powered from DC (battery) input
YELLOW continuous	Mains fault

3.2. LINK

Indicates the status of the data link with other devices over IP LINK (link heartbeat)

OFF	Not connected (standalone unit)
GREEN continuous	Active link with IMPACT MM ICONTROLLER *
GREEN flash single	No IMPACT MM ICONTROLLER, active link with another I-DCA2.500
YELLOW	IMPACT MM iCONTROLLER connection lost

3.3. BATTERY

Indicates status of the battery

OFF	Battery disconnected, no battery configured (see chapter "battery and charger").
GREEN continuous	Battery connected, OK ($V_{batt} > 20V$ DC) *
YELLOW continuous	Battery loss
YELLOW blinking	Excessive internal resistance of the battery

3.4. CHARGER

Indicates status of the charger

OFF	No charging possible (no mains / no battery)
GREEN flashing double	Boost charging (high current stage, battery empty) *
GREEN continuous	Normal charging *
GREEN flashing single	Trickle charging (battery full) *
YELLOW continuous	Charger fault: insufficient charging voltage (mains fault) / temperature fault

3.5. AMPLIFIER FAULT

Indicates status of the amplifier fault

OFF	Both channels OK
YELLOW continuous	Channel 1 and 2 fault
YELLOW flashing single	Channel 1 fault
YELLOW flashing double	Channel 2 fault

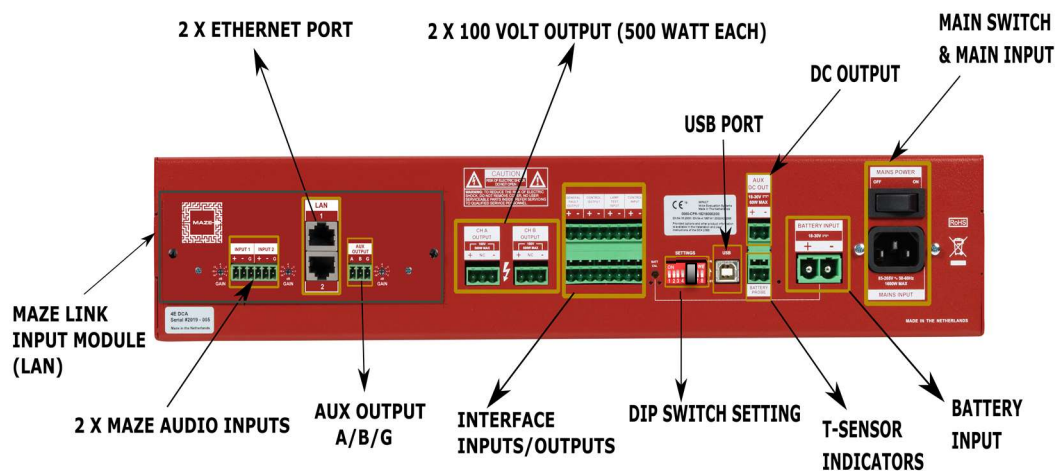
3.6. CHA (CHB) SIG / CLIP

Indicates when an audio signal is clipping at the end stage of the amplifier.

OFF	signal OK
YELLOW	Signal clipping

* NOTE: In order to ensure EN54-16 compliance with indication requirements, some of the indications are disabled while local settings dipswitch #3 is set.

4. Back Panel



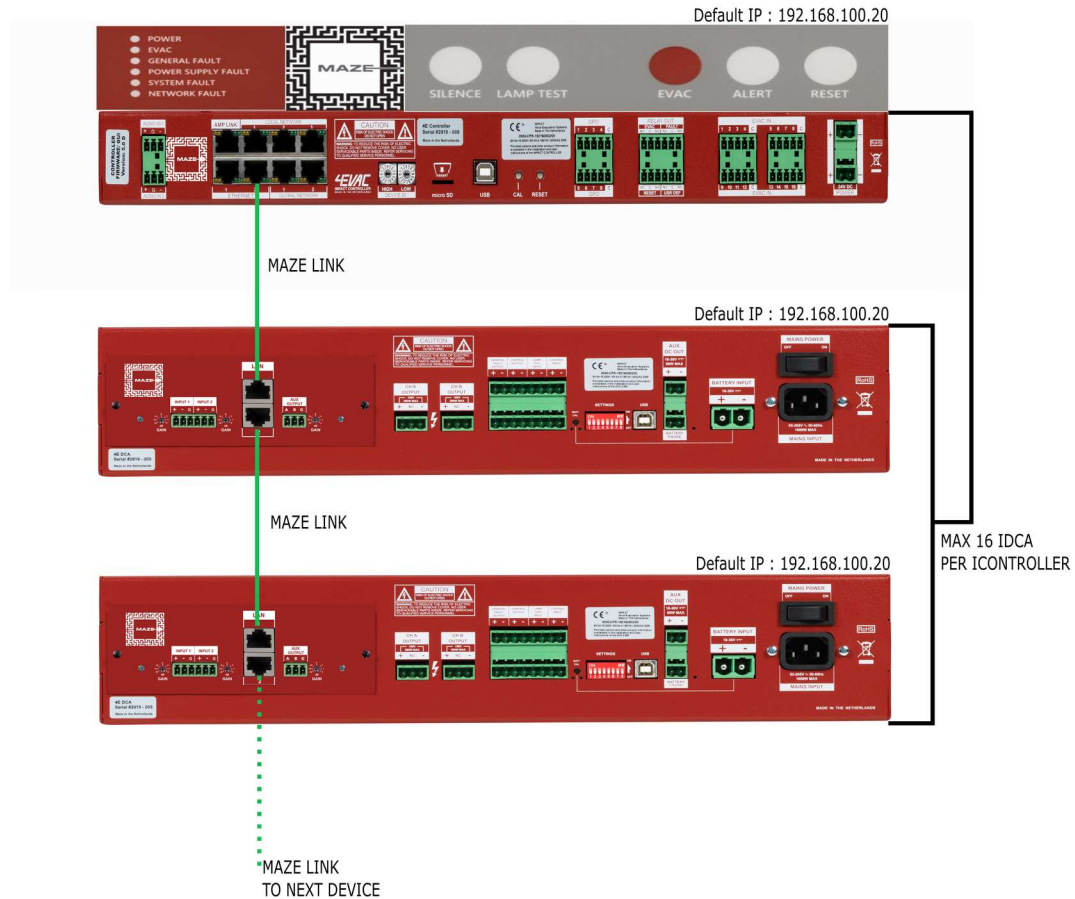
4.1. Maze Link Input module (LAN)

In the left section, the I-DCA2.500 amplifier provides space for a removable input module (Maze) dedicated to broadcast and receive audio signal and perform control and diagnostics data.

4.1.1. Input module – Maze Link

- DUAL RJ45 PORTS

The I-DCA 2.500 amplifier comes with dual RJ45 ports that can be used as IP link with any Maze device interface (daisy chainable). This allows the amplifier to connect seamlessly with I-controllers and other Maze powered modules. With the capacity to connect up to 16 I-DCA amplifiers to a single I-controller, this feature offers increased flexibility and scalability in your audio system. Each device comes with a default IP address 192.168.100.20. The amplifiers can be identified in the maze manager with a specific Maze S/N (available in rear side of I-DCA).




Example of MAZE link between I-DCA amplifiers and other Maze devices

- AUDIO INPUTS– MAZE BROADCAST CHANNELS**

The I-DCA 2.500 amplifier features two balanced line-level (0dBV) analog audio inputs, labelled INPUT 1 and INPUT 2, which can be used as maze broadcast channels. These inputs come equipped with an input level adjustment potentiometer that can be adjusted between -24dB and +12dB, offering greater control over your audio inputs. The audio inputs are dynamic, meaning they can be routed to the A/B 100 volt outputs or to the B/A 100 volt outputs as required.

- AUX OUTPUT**

The I-DCA 2.500 amplifier comes with an Aux output, which is a dual-channel single-ended output that can be adjusted using the output level adjustment potentiometer (-24 ... 9dB). This output can be used to connect with a record player, allowing you to listen to the maze receive streams.

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4.2. 100V audio output (loudspeaker out)- *Maze Listen channels*

The I-DCA 2.500 amplifier includes CH A and CH B output terminals for connecting to 100V loudspeaker lines. Each output is capable of delivering a maximum output power of 500WRMS (5A @ 20Ω), and both outputs are electrically floating against earth potential. It's important to note that these 100V outputs are not bridgeable, and should never be connected with each other. These outputs are electrically floating against earth potential.

Each output channel can be individually controlled, even if multiple I-DCA amplifiers are daisy-chained together. This allows for separate volume control (output) and flexible stream selection from the 250 simultaneous streams available in the maze network. When priority channels are available, the EVAC/ALERT/PAGING signals override the maze BGM channels.

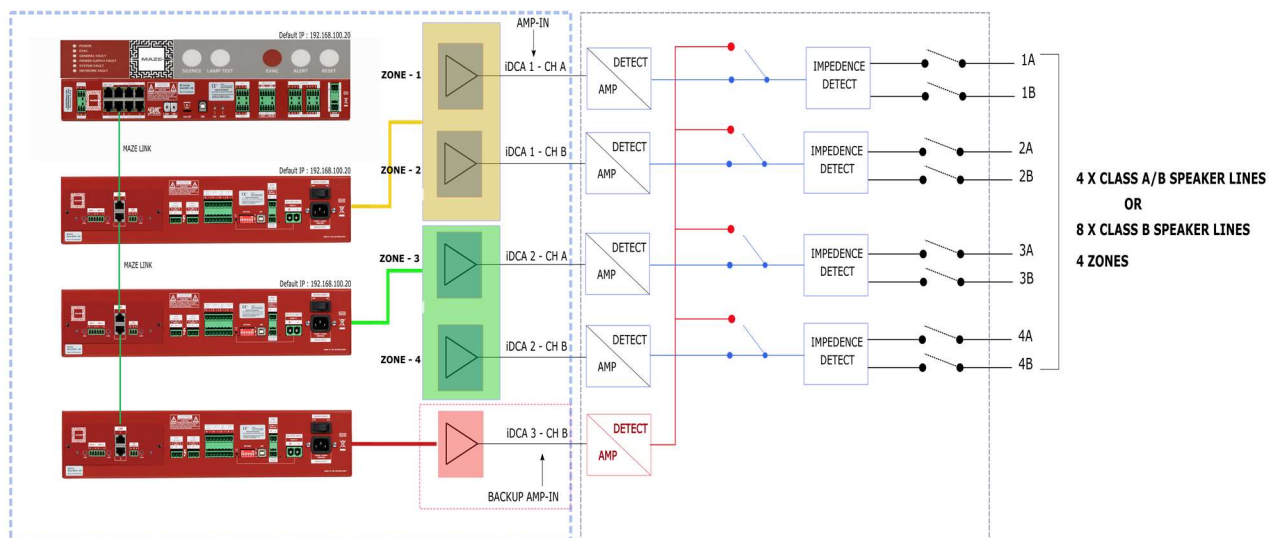
CAUTION! Danger of electric shock! High voltages between pins of the terminal! De-power the unit prior to any intervention.

NOTE: 100V outputs CH A / CH B are not bridgeable, do not connect outputs with each other.


4.2.1. Line surveillance and Backup

Each output of the I-DCA amplifier is considered an individual zone. The volume of each channels can be regulated indivugally with line monitoring enabled.

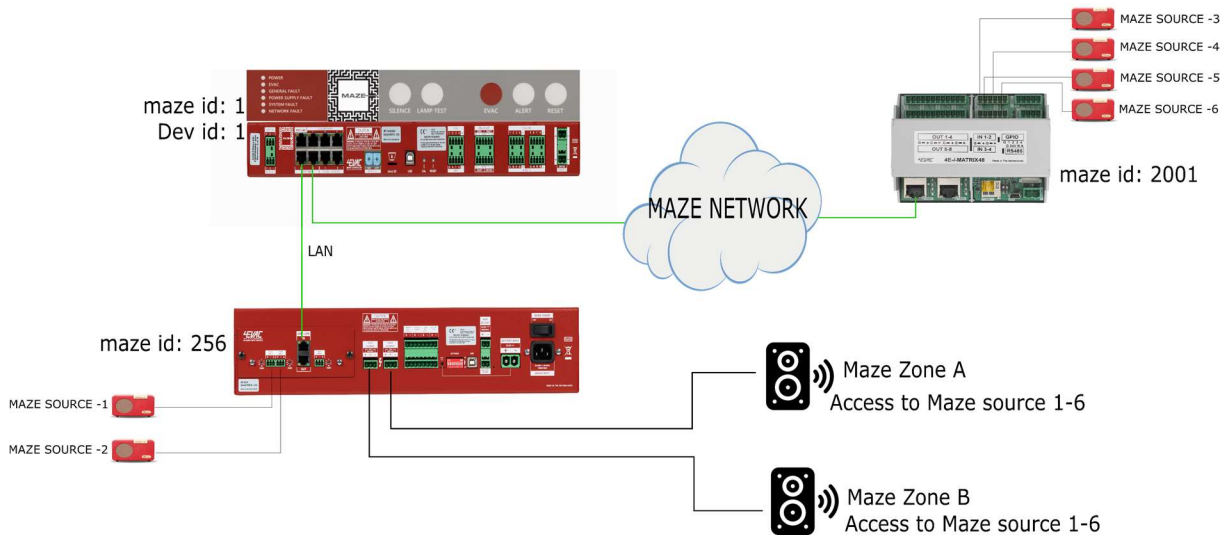
Line surveillance and class A/B circuits can be achieved by using the AM448 module. (Refer to the AM448 user manual for more information).



Example of I-DCA amplifiers with AM448 (line surveillance/ A.B Lines) +Backup

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If there is no need for Line surveillance, then the AM448 module can be omitted and the audio outputs can be directly connected to the speakers. The amplifier's input channels or any compatible devices, such as the IMatrix (for additional details, please consult the IMatrix user manual), can be used to provide additional broadcast channels.



Example of I-DCA amplifiers without Line surveillance (additional inputs using i-matrix module)

4.3. Local settings DIP switch

1. No battery


When this setting is on, the charger is shut down. The device does not expect a battery to be connected and will work with any 24V DC power source connected to the battery input. Battery faults and charger faults are not detected or reported, the temperature sensor is ignored since it is not necessary for operation. On a mains loss, the device will report a mains fault and automatically switch over to receive power from a battery input, and will recover automatically when mains power is available.

2. No mains

When this setting is on, the device ignores mains fault and runs fault-less when powered solely through battery input.

NOTE: when DIP switches 1&2 are both ON, the amplifier is capable to run solely on an external 24V DC power supply connected to the battery input and will not report any power supply faults, i.e. mains fault, any battery-related faults or charger status/faults. This makes the I-DCA2500 capable of integrating with third-party power supply systems using their native 24V DC power equipment.

NOTE: regardless of DIP switches 1&2's settings, the I-DCA2.500 will always run when either of the power sources (mains input or battery input) is available, with mains priority (as long as mains supply is available, it is the only source which the I-DCA2.500 will use).

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3. 54-16 indication mode

OFF: all indications are displayed

ON: only EN54-16 mandatory indicators are displayed.

According to EN54-16:

- Green indicators may be used only for power indications
- Yellow indicators may be used only for fault indications
- Red indicators may be used only for voice alarm indications

4. Battery save mode DISABLE

OFF –the amplifier has battery save mode enabled and follows IMPACT MM system battery save mode command.

- a) If connected to the I-Controller, the amplifier runs in a sleep/wake cycle during mains fault, in order to minimize idle power consumption while powered from battery.
- b) Regardless this setting, in case of audio transmission during battery operation, the amplifier will turn on automatically and return to sleep/wake cycle as soon as audio is stopped.

ON – keeps amp continuously on during battery operation, resulting in increased idle power consumption.

This setting is provided for service works, to manually ‘force’ the amplifier awake from sleep mode, without interfering with the I-Controller.

5 & 6 – Not used

7 & 8. battery capacity

Battery capacity

The battery capacity setting defines the maximum charging current delivered by charger to the battery. Current limiting helps to protect the battery from overcharging and excessive temperatures. It also limits power loss across the battery cable.

This setting also defines a maximum allowed resistance of the battery circuit (total: batteries+ battery cable + connection terminals), above which a battery fault will be detected.



NOTE: The battery capacity setting must be properly defined on every I-DCA2.500 connected to a battery.

DIP switch setting		Maximum series resistance of battery circuit	Maximum charging current	Battery capacity range
7	8			
0	0	200 mΩ	0.5 A	10 – 19.5 Ah
0	1	160 mΩ	1.5 A	20 – 34,5 Ah
1	0	120 mΩ	2 A	35 – 49,5 Ah
1	1	80 mΩ	4 A	50 – 100 Ah

4.4. I/O contact interface

NOTE: Outputs (General Fault, Control output) potential-free, opto-isolated with max. rating 60V / 100mA.

1. General Fault output
Normally closed, activated while any fault status of I-DCA2.500 is being detected.
2. Control output
(not used)
3. Lamp test input
open: inactive – all LEDs work normally;
shorted: active – all LEDs are performing lamp test sequence.
4. Control input
(not used)



Corresponding pins in the upper and lower connectors are internally connected, (i.e. the lower connector has the same function as the upper connector), so that connections between multiple amplifiers can be easily paralleled.

4.5. USB port

The USB port is used for Access Level 3 operations, including service and maintenance, e.g. firmware upgrades. For more information please contact the manufacturer.

4.6. AUX DC OUT


This output is the general power supply for all DC powered devices in the system (I-CONTROLLER, 4E-AM448, as well as the power source for auxiliary equipment). It delivers guaranteed power from battery in case of mains failure, according to EN54-4.

Output voltage:

- b) Mains powered: 30 V DC
- c) Battery powered: 24 V DC nominal, 20~27 V DC (identical to battery voltage),

Maximum continuous output current:

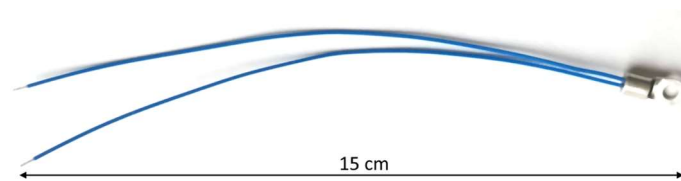
- d) 2 A, fused (resettable fuse)

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NOTE: If the total current consumption of equipment connected to this output exceeds 2A, an additional I-DCA2.500 unit should be used.

4.7. BATTERY PROBE

Connect here the battery probe (included in the package) by means of an DIY extension cable. Polarity is irrelevant. Diameter or length of extension cable is not critical.



Battery thermal probe for I-DCA2.500

The battery probe has a built-in NTC thermal sensor element of variable resistance. Its resistance at normal ambient room temperature 25°C equals 10kΩ.

Battery probe is necessary for safe battery charging. Connecting the battery probe enables the charger of the I-DCA2.500 as a **master charger**, which is active at all times. When the battery probe is removed, the I-DCA2.500 turns into a **slave charger**, which has its charging function disabled, unless it belongs to a **charging cluster**. (More info about cluster charging, master and slave chargers chapter “**Cluster charging**”).

The presence of the battery probe is indicated by a LED indicator next to the battery probe connector.

Put the probe directly on the top surface of the battery, preferably in direct contact with one of the battery terminals, inside the terminal insulating cap.

NOTE: The battery thermal probe is glued into a metal crimp with a ring, provided for an easy way of fastening without affecting thermal conductivity between the sensor and monitored surface. This metal crimp is galvanically isolated from the sensor and electrical contact with the battery terminal or any other potential will not affect measurement or cause any damage.

4.8. BATTERY INPUT


Connect 24V battery here.

The battery connector can accept a maximum cable gauge of 16mm².

Battery leads must be shortest possible, with the greatest possible conductor gauge and properly crimped terminal lugs. A greater conductor gauge and shorter cable run prevent excessive voltage drops and power loss at high current flow.

The battery must comply with the following specifications:

- Sealed lead acid (SLA) / valve regulated lead acid (VRLA);
- Maintenance-free, for stationary use;
- 10 ~100 Ah rated capacity;
- 24V

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5. Power supply and battery charging

The I-DCA2.500 is equipped with a fully standalone, dual source (110-230V AC/ 24V DC) power supply and a 4A battery charger, capable of charging max. 100Ah battery according to requirements of EN54-4. (100AH = 80% of rated capacity within 24h)

5.1. Cluster charging

Multiple I-DCA2.500 chargers may be connected in parallel to the same 24V battery. A set of I-DCA2.500 units that are connected to the same battery form a **cluster**.

In a cluster, the master charger (with battery thermal probe) controls slave chargers (without thermal probe) and enables or disables the charging function on slave chargers. Slave chargers are idle by default. When the battery is discharged, the master charger commands slave chargers to enable the charging function, so that all chargers in the cluster charge the battery in parallel.

When the battery voltage reaches a certain minimum level (approximately 80% of rated capacity), the master charger sends a command to disengage slave chargers. Furthermore, only a master charger is enabled during charging until the battery is fully charged, as well as in trickle mode, where battery is maintained in fully charged state.

The charging cluster must be created and configured following several guidelines:

- a) The cluster must be defined so that it is clear which chargers belong to the same cluster:
In the configuration settings of the ICONTROLLER you can assign each I-DCA2.500 amplifier to a charging cluster. Unassigned chargers will work as single master units. There may be a maximum of 16 clusters defined per ICONTROLLER.
- b) One cluster needs exactly one master charger. The master charger is determined simply by the thermal probe. It is irrelevant which charger in the cluster is the master, as long as there's only one. It is recommended however that the master charger is the one closest to the battery, as its battery leads are shortest, which improves the battery resistance measurement.



NOTE: Set master charger closest to battery. This will improve the accuracy of the battery resistance measurement, as the battery leads are shortest here.

The master charger is responsible for measurements of the battery, monitoring and control over the charging process and sending commands to slave chargers.

All chargers without a thermal probe, remain in slave charging mode. Slave chargers are, by default, idle and must receive the "enable" command from the master charger.



NOTE: One cluster needs exactly one master charger i.e. one thermal probe! More than one thermal probe connected to the same cluster will cause unstable charging behaviour and may lead to false battery fault indications and extend charging time. However, multiple masters in one cluster will not cause any damage to the battery.

- c) The charging capacity (i.e. max charging current) of a cluster is the sum of the charging capacities of all chargers in this cluster. A single I-DCA2.500 can handle a maximum capacity of 100Ah, a cluster of N chargers can handle a maximum of Nx100Ah.

The charging capacity can be adjusted by means of the setting of DIP switches 7/8. Each charger in the cluster can have an individual setting, independent from other chargers, which will determine the maximum charging current delivered by the charger.

NOTE: The charging capacity may be set differently on each particular charger in the cluster. It is recommended, however, to set all chargers in the cluster to the same setting, if possible.


DIP switch setting		Maximum series resistance of battery circuit	Maximum charging current	Battery capacity range
7	8			
0	0	200 mΩ	0.5 A	10 – 19.5 Ah
0	1	160 mΩ	1.5 A	20 – 34,5 Ah
1	0	120 mΩ	2 A	35 – 49,5 Ah
1	1	80 mΩ	4 A	50 - 100 Ah



NOTE: It is not possible to mix between cluster charging with DCA amplifiers and I-DCA amplifiers.

5.2. IDCA 2.500 Technical specifications

Amplifier	
Output power	2 x 500 W _{RMS} (continuous @1kHz, all channels driven @20 Ω)
Output voltage (Direct-drive output)	100 V _{rms} @ 0 dBu input
Output load	4 Ω minimum, 20 Ω @ rated power, max. 5 A continuous
Output impedance	< 50 mΩ
Input level	max. 775 mV _{rms} / 0 dBu (balanced) @100 V _{rms} output
Max number of i-DCA per i-Controller	16
Maze Link	IP network 10/100Mbps – All devices in same LAN
Audio	
Audio Inputs	Two balanced line-level (0dBV) analog audio inputs
Input gain control	-12dB to +12dB Hardware / -60 dB to +20dB software
Input impedance @ 1 kHz	20 kΩ (balanced)
S/N @ 1 kHz rated power (3 Hz – 48 kHz- ADC and DAC)	100 dBA
THD @ 1 kHz rated power-3 dB (20 Hz – 20 kHz) – DAC and ADC	< 0.1 %
Channel crosstalk (20 Hz – 20 kHz) @ rated load	-85 dB
Frequency response	20Hz – 20KHz, +/- 3 dB
Sampling Frequency	48 KHz
Dynamic Range	A->D (-93dB) / D->A (-97dB)
A->D Converter	24 bits
D->A Converter	24 bits
Analog input- output latency	< 10 ms (stand-alone system)
EQ/Filter	5-point parametric EQ with predefined IIR filters
Power supply	
Mains AC input	110 - 230 V AC, 50/60 Hz, selection by input fuse rating
Mains power consumption	max. 12 A @ 110 V AC / 6A @ 230 V AC
Inrush current	40A @110V AC, 20A @230V AC, 10ms
DC input voltage	18 – 30 V DC (nominal 24 V DC)
DC current consumption	max. 45 A @ 24 V
Idle AC power consumption	24 W / 1 W (all channels on / standby)
Idle DC current consumption	34 mA (0.9 W) (all channels standby)
Power efficiency @ rated load	89% @ 230V AC / 93% @ 24V DC
DC output	18 – 30 V DC (max. 60W / 2A @30 V DC nominal)
Battery charger	
Charging voltage	max. 27.9V DC, temperature compensated
Charging current max.	depending on battery capacity settings
Single charger	4 A
Cluster charger	N x 4 A (cluster of N chargers), max. 64 A
Battery requirements	rechargeable sealed lead-acid battery for stationary use
Capacity (54-4) single charger	max. 100 Ah (measured @ 80% of battery capacity after 24h of charging)
Capacity (54-4) cluster charger	N x 100Ah (cluster of N chargers), max. 1600Ah
Charging time (80% of max. capacity)	< 24 h
Rated voltage	24 V DC
Battery cut-off voltage	20 V DC

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Battery circuit max. internal resistance	Depending on battery capacity settings: 80/120/160/200 mΩ (total, incl. leads, connectors, fuses, etc.)
Connectivity / recommended cabling	
Mains	IEC - 3
DC input (battery input)	Phoenix PC 6-16/2-G1-10, 16
DC output	2 pin Phoenix 5.08 mm / 2 x 1.5mm ²
Audio input	3 pin Phoenix 3.81 mm, 2x, shielded microphone cable
100 V audio output	3 pin Phoenix 5.08 mm
I/O (Fault out, lamp test in, control in/out)	8 pin Phoenix 5.08 mm (2 x parallel)
MAZE-Link (IP LINK)	2 x RJ45 CAT6 straight UTP
Mechanical	
Dimensions (HxWxD)	88.5 x 442 x 350 mm
Front panel width (incl. brackets)	483 mm
Weight	8.2 kg
Dimensions / weight incl. package	150 x 600 x 460 mm / 9.5 kg
Housing material	Steel
IP rating	IP 30
Mounting	19" rack mounted, 2U
Temperature (Ambient)	-5 ~ 40°C
Max. Temperature (Device)	65°C
Relative humidity	max. 90% (non condensing)
Storage temperature	-40 ~ 70°C

All information provided in this document is subject to change without notice. 4EVAC may also make improvements and/or changes in the products described in this information at any time without notice



MADE IN THE NETHERLANDS

4EVAC is a trade name of:

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