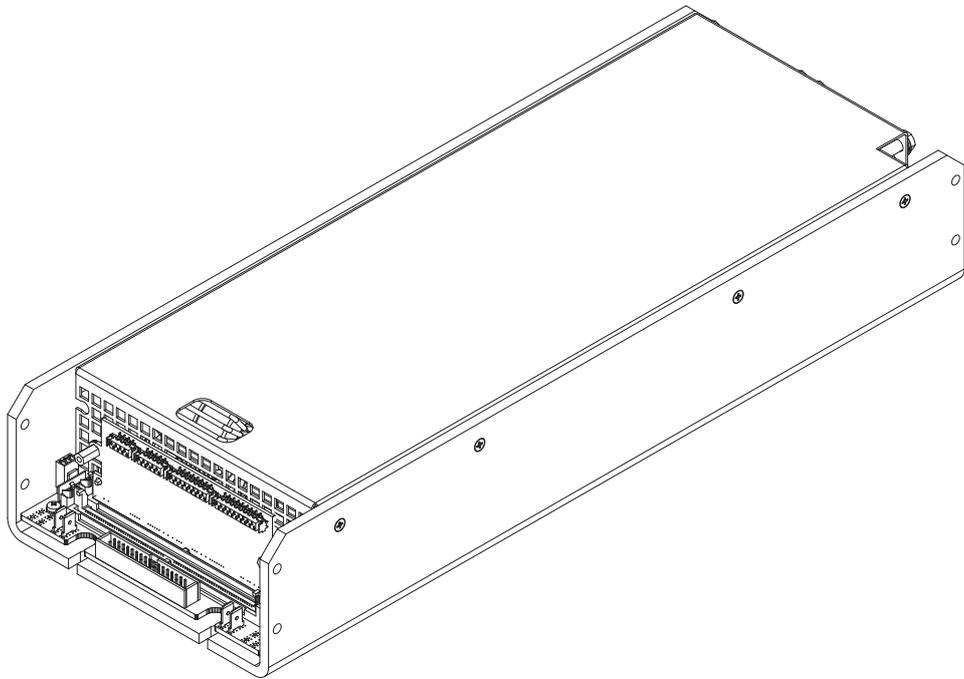




# M-Drive



## USER GUIDE

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Data are subject to change without notice.  
For latest update please refer to the  
online version available on [www.powersoft-audio.com](http://www.powersoft-audio.com).

# M-Drive | User Guide

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# Important safety instructions

**This amplifier module is intended to be installed inside other devices and must be checked in the final product.**



THE TRIANGLE WITH THE LIGHTNING BOLT IS USED TO ALERT THE USER TO THE RISK OF ELECTRIC SHOCK.



THE TRIANGLE WITH THE EXCLAMATION POINT IS USED TO ALERT THE USER TO IMPORTANT OPERATING OR MAINTENANCE INSTRUCTIONS.



THE CE-MARK INDICATES THE COMPLIANCE OF THE PRODUCT TO ALL THE APPLICABLE EUROPEAN DIRECTIVES



SYMBOL FOR EARTH/GROUND CONNECTION.



SYMBOL FOR CONFORMITY WITH DIRECTIVE 2012/19/EC OF THE EUROPEAN PARLIAMENT ON WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE).



0°C TO +35°C  
DERATING ABOVE 35°C.



10% TO 90% HUMIDITY (NON CONDENSING).



DO NOT USE THE UNIT AT ALTITUDES ABOVE 2000 M.



DO NOT USE THE UNIT IN TROPICAL ENVIRONMENT.



WARNING: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT ATTEMPT TO OPEN ANY PART OF THE UNIT. NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.



CONNECTION TO THE MAINS SHALL BE DONE ONLY BY A ELECTROTECHNICAL SKILLED PERSON ACCORDING THE NATIONAL REQUIREMENTS OF THE COUNTRIES WHERE THE UNIT IS SOLD.



VERIFY THAT YOUR MAINS CONNECTION IS CAPABLE OF SATISFYING THE POWER RATINGS OF THE DEVICE.



**CAUTION**

**RISK OF ELECTRIC SHOCK  
DO NOT OPEN**



This unit has been engineered and manufactured to ensure your personal safety. But IMPROPER USE CAN RESULT IN POTENTIAL ELECTRICAL SHOCK OR FIRE HAZARD.

In order not to defeat the safeguards incorporated into this product, observe the following basic rules for its installation, use and service. Please read these "Important Safeguards" carefully before use. Read these instructions.

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this equipment near water.
6. Do not block any ventilation openings. Install in accordance with Powersoft's instructions.
7. Do not install near any heat sources such as radiators, heat registers, stoves or other apparatus that produce heat.
8. Do not defeat the safety purpose of the polarized or grounding-type plug.
9. Only use attachments/accessories specified by Powersoft.
10. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
11. The apparatus shall be connected to a MAINS socket outlet with a protective earthing connection.



DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE, DRIPPING OR SPLASHING LIQUIDS. OBJECTS FILLED WITH LIQUIDS, SUCH AS VASES, SHOULD NOT BE PLACED ON THIS APPARATUS.



SPEAKER TERMINALS COULD BE HAZARDOUS LIVE IF SPEAKER BRIDGE MODE CONNECTION IS USED.



PROPER CONNECTIONS AND INSULATIONS TECHNIQUES MUST BE ADOPTED WHEN SPEAKER BRIDGE MODE CONNECTION IS USED.

THE MANUFACTURER CANNOT BE HELD RESPONSIBLE FOR DAMAGES CAUSED TO PERSONS, THINGS OR DATA DUE TO AN IMPROPER OR MISSING GROUND CONNECTION.

CONTACT THE AUTHORIZED SERVICE CENTER FOR ORDINARY AND EXTRAORDINARY MAINTENANCE.

IT IS ABSOLUTELY NECESSARY TO VERIFY THESE FUNDAMENTAL REQUIREMENTS OF SAFETY AND, IN CASE OF DOUBT, REQUIRE AN ACCURATE CHECK BY QUALIFIED PERSONNEL.

## Importantes instructions de sécurité

**Ce module d'amplification est destiné à être installé à l'intérieur d'autres dispositifs et doit donc être contrôlé sur le produit fini.**



LE TRIANGLE AVEC LE SYMBOLE D'UN ÉCLAIR EST UTILISÉ POUR ALERTER L'UTILISATEUR DU RISQUE DE CHOC ÉLECTRIQUE.



LE TRIANGLE AVEC LE POINT D'EXCLAMATION EST UTILISÉ POUR ALERTER L'UTILISATEUR SUR DES INSTRUCTIONS DE FONCTIONNEMENT OU D'ENTRETIEN IMPORTANTES.



LE SIGNE CE INDIQUE LA CONFORMITÉ DU PRODUIT À TOUTES LES DIRECTIVES EUROPÉENNES APPLICABLES



SYMBOLE POUR LA CONNEXION TERRE / MASSE.



SYMBOLE INDIQUANT QUE L'ÉQUIPEMENT EST DESTINÉ À UN USAGE INTÉRIEUR UNIQUEMENT.



SYMBOLE DE CONFORMITÉ AVEC LA DIRECTIVE 2012/19/CE DU PARLEMENT EUROPÉEN RELATIVE AUX DÉCHETS D'ÉQUIPEMENTS ÉLECTRIQUES ET ÉLECTRONIQUES (DEEE).



DE 0°C À +35°C

DÉCLASSEMENT AU DESSUS DE 35°C.



DE 10 % À 85 % D'HUMIDITÉ (SANS CONDENSATION).



NE PAS UTILISER PAS L'APPAREIL À DES ALTITUDES AU-DESSUS DE 2000 M.



NE PAS UTILISER L'APPAREIL DANS UN ENVIRONNEMENT TROPICAL.



AVERTISSEMENT : POUR RÉDUIRE LE RISQUE DE CHOC ÉLECTRIQUE, NE PAS ESSAYER D'OUVRIR TOUTE PARTIE DE L'APPAREIL. AUCUNE PIÈCE RÉPARABLE PAR L'UTILISATEUR À L'INTÉRIEUR. RENVOYER L'ENTRETIEN AU PERSONNEL DE SERVICE QUALIFIÉ.



LE BRANCHEMENT AU SECTEUR NE SERA EFFECTUÉ QUE PAR UNE PERSONNE QUALIFIÉE DANS LE DOMAINE ÉLECTROTECHNIQUE SELON LES EXIGENCES NATIONALES DES PAYS OU L'APPAREIL EST VENDU.



VÉRIFIER QUE VOTRE CONNEXION SECTEUR EST CAPABLE DE SATISFAIRE LES VALEURS DE PUISSANCE DE L'APPAREIL.



**AVIS**

**RISQUES D'ÉLECTROCUTION  
NE PAS OUVRIR**



Cet appareil a été conçu et fabriqué pour assurer votre sécurité personnelle. Mais UNE UTILISATION INCORRECTE PEUT ENTRAÎNER UN RISQUE D'ÉLECTROCUTION OU D'INCENDIE.

Respecter les règles de base suivantes pour son installation, utilisation et entretien, afin de ne pas compromettre les mesures de sécurité incorporées dans ce produit. Veuillez lire attentivement ces «Consignes de sécurité importantes» avant utilisation.

1. Lisez ces instructions.
2. Gardez ces instructions.
3. Tenez compte de toutes les mises en garde.
4. Suivez toutes les instructions.
5. N'utilisez pas cet amplificateur à proximité de l'eau.
6. Assurez-vous d'une bonne ventilation de l'appareil. Installez en accord avec les instructions préconisées par Powersoft.
7. N'installez pas l'appareil à proximité de sources de chaleur ou d'autres appareils produisant de la chaleur.
8. Respectez le dispositif de mise à la terre de la prise secteur.
9. Utilisez uniquement les accroches et accessoires spécifiés par Powersoft.
10. Confiez toute réparation à un technicien qualifié. L'intervention d'un technicien est nécessaire dans les cas suivants : le cordon d'alimentation ou la prise secteur sont endommagés, des corps étrangers ou du liquide se sont introduits dans l'appareil, l'appareil a été exposé à la pluie ou à l'humidité, l'appareil montre des signes de dysfonctionnement ou est tombé.
11. L'appareil doit être connecté à une prise SECTEUR dotée d'une mise à la terre de protection.



NE PAS EXPOSER CET APPAREIL A LA PLUIE OU A L'HUMIDITÉ, AUX GOUTTES OU AUX ÉCLABOUSSURES. LES OBJETS REMPLIS DE LIQUIDE, TELS QUE LES VASES, NE DOIVENT PAS ÊTRE PLACÉS SUR CET APPAREIL.



LES BORNES D'ENCEINTES POURRAIENT ÊTRE DANGEREUX SI LA CONNEXION DE MODE PONT DU HAUT-PARLEUR EST UTILISÉ.



ADOPTER DES TECHNIQUES CORRECTES DE CONNEXION ET D'ISOLEMENT LORSQUE LA CONNEXION EN MODE BRIDGE HAUT-PARLEUR EST UTILISÉ.

LE FABRICANT NE PEUT ÊTRE TENU RESPONSABLE DES DOMMAGES CAUSÉS AUX PERSONNES, AUX CHOSSES OU AUX DONNÉES EN RAISON D'UNE CONNEXION À LA TERRE INCORRECTE OU MANQUANTE.

CONTACTER LE CENTRE DE SERVICE AUTORISÉ POUR UN ENTRETIEN ORDINAIRE ET EXTRAORDINAIRE.

IL EST ABSOLUMENT NÉCESSAIRE DE VÉRIFIER CES CONDITIONS FONDAMENTALES DE SÉCURITÉ ET, EN CAS DE DOUTE, D'OBTENIR UNE VÉRIFICATION PRÉCISE PAR DU PERSONNEL QUALIFIÉ.

## Instrucciones de seguridad importantes

**Este módulo amplificador está diseñado para ser instalado dentro de otros dispositivos y debe verificarse en el producto final.**



EL TRIÁNGULO CON EL RAYO ES USADO PARA ALERTAR AL USUARIO DEL RIESGO DE DESCARGA ELÉCTRICA.



EL TRIÁNGULO CON EL SIGNO DE EXCLAMACIÓN ES USADO PARA ALERTAR AL USUARIO DE INSTRUCCIONES DE OPERACIÓN Y MANTENIMIENTO IMPORTANTES.



EL MARCADO CE INDICA QUE EL PRODUCTO CUMPLE TODAS LAS DIRECTIVAS EUROPEAS VIGENTES



SÍMBOLO PARA TIERRA/CONEXIÓN A TIERRA.



SÍMBOLO INDICANDO QUE EL EQUIPO ES SOLO PARA USO INTERIOR.



SÍMBOLO PARA LA CONFORMIDAD CON LA DIRECTIVA 2012/19/EC DEL PARLAMENTO EUROPEO SOBRE EL DESECHO DE EQUIPOS ELÉCTRICOS Y ELECTRÓNICOS (WEEE por sus siglas en Inglés).



ENTRE 0°C Y +35°C  
DEGRADACIÓN POR ENCIMA DE 35°C.



ENTRE 10% Y 90% DE HUMEDAD (SIN CONDENSADO).



NO USE LA UNIDAD EN ALTITUDES SOBRE LOS 2000 METROS.



NO USE LA UNIDAD EN AMBIENTES TROPICALES.



ADVERTENCIA: PARA REDUCIR EL RIESGO DE DESCARGA ELÉCTRICA, NO INTENTE ABRIR NINGUNA PARTE DE LA UNIDAD. NO EXISTEN PARTES INTERNAS REPARABLES PARA EL USUARIO. REFIERA LA REVISIÓN A PERSONAL DE MANTENIMIENTO CALIFICADO.



LA CONEXIÓN A LA RED ELÉCTRICA DEBERÁ SER EFECTUADA SOLAMENTE POR UNA PERSONA QUE ESTÉ CAPACITADA EN EL ÁREA DE ELECTROTÉCNICA DE ACUERDO A LOS REQUERIMIENTOS NACIONALES DE LOS PAÍSES DONDE LA UNIDAD SEA VENDIDA.



VERIFIQUE QUE SU CONEXIÓN A LA RED ELÉCTRICA ES CAPAZ DE SATISFACER LOS ÍNDICES DE ENERGÍA DE ESTE DISPOSITIVO.



**PRECAUCIÓN**

RIESGO DE CHOQUE ELÉCTRICO  
NO ABRA LA UNIDAD



Esta unidad ha sido diseñada y fabricada para garantizar su seguridad personal. Pero SU USO INADECUADO PUEDE RESULTAR EN UNA POTENCIAL DESCARGA ELÉCTRICA O RIESGO DE FUEGO.

Con el fin de no anular las garantías incorporadas en este producto, siga las siguientes reglas básicas para su instalación, uso y servicio. Por favor lea cuidadosamente estas "Garantías Importantes" antes de su uso.

1. Lea estas instrucciones.
2. Guarde estas instrucciones.
3. Preste atención a todas las advertencias.
4. Siga todas las instrucciones.
5. No use este aparato cerca del agua.
6. No bloquee las aberturas de ventilación. Realice la instalación de acuerdo con las indicaciones de Powersoft.
7. No instale cerca ninguna fuente de calor como, por ejemplo, radiadores, rejillas de calefacción, hornos u otros aparatos que produzcan calor.
8. No elimine el diseño de seguridad del enchufe, ya sea del tipo polarizado o con conexión a tierra.
9. Use exclusivamente los dispositivos/accesorios indicados por Powersoft.
10. El servicio técnico debe realizarlo siempre personal cualificado. Se requerirá servicio de asistencia técnica cuando el aparato sufra algún tipo de daño como, por ejemplo, que el cable de alimentación o el enchufe estén dañados, que se haya derramado líquido o hayan caído objetos dentro del aparato, que éste se haya expuesto a la lluvia o humedad, que no funcione normalmente o que se haya caído.
11. Este aparato deberá ser conectado a un enchufe de salida de red eléctrica con una protectora conexión a tierra.



NO EXPONGA ESTE UNIDAD A LA LLUVIA O LA HUMEDAD, GOTE O SALPICADURAS. NO COLOQUE OBJETOS LLENOS DE LÍQUIDOS, TALES COMO VASIJAS, SOBRE EL APARATO.



TERMINALES DE LOS ALTAVOCES PODRÍA SER PELIGROSO, SI SU CONEXIÓN SE UTILIZA EL ALTAVOZ MODO PUENTE.



ADOPTAR TÉCNICAS CORRECTAS DE CONEXIÓN Y AISLAMIENTO CUANDO SE USA CONEXIÓN DE ALTAVOZ MODO PUENTE.

EL FABRICANTE NO SE HACE RESPONSABLE POR DAÑOS CAUSADOS A PERSONAS, OBJETOS O DATOS DEBIDO A UNA CONEXIÓN A TIERRA INAPROPIADA O FALTANTE.

CONTACTE AL CENTRO DE SERVICIO AUTORIZADO PARA MANTENIMIENTO DE RUTINA O EXTRAORDINARIO.

ES ABSOLUTAMENTE NECESARIO VERIFICAR ESTOS REQUERIMIENTOS FUNDAMENTALES DE SEGURIDAD Y, EN CASO DE DUDA, EXIJA UN CORRECTO CHEQUEO POR PARTE DE UN PERSONAL CALIFICADO.

# Importanti istruzioni di sicurezza

**Questo modulo amplificatore è destinato ad essere installato dentro altri dispositivi e deve quindi essere controllato nel prodotto finito.**



IL TRIANGOLO CON IL SIMBOLO DEL FULMINE VIENE UTILIZZATO PER AVVISARE L'UTENTE SUL RISCHIO DI SCOSSE ELETTRICHE.



IL TRIANGOLO CON IL PUNTO ESCLAMATIVO VIENE UTILIZZATO PER AVVISARE L'UTENTE SU IMPORTANTI ISTRUZIONI DI FUNZIONAMENTO O DI MANUTENZIONE.



LA MARCATURA CE INDICA LA CONFORMITÀ DEL PRODOTTO A TUTTE LE DIRETTIVE EUROPEE IN VIGORE



SIMBOLO PER IL COLLEGAMENTO DELLA MESSA A TERRA.



SIMBOLO CHE INDICA CHE IL DISPOSITIVO PUO' ESSERE UTILIZZATO SOLO ALL'INTERNO.



SIMBOLO INDICANTE LA CONFORMITÀ ALLA DIRETTIVA 2012/19/CE DEL PARLAMENTO EUROPEO SUI RIFIUTI DI APPARECCHIATURE ELETTRICHE ED ELETTRONICHE (RAEE).



DA 0°C A +35°C  
DERATING OLTRE I 35°C.



DAL 10% AL 90% DI UMIDITÀ (NON CONDENSANTE).



NON UTILIZZARE IL DISPOSITIVO AD ALTITUDINI SUPERIORI A 2000 M.



NON UTILIZZARE IL DISPOSITIVO IN UN AMBIENTE TROPICALE.



ATTENZIONE: PER RIDURRE IL RISCHIO DI SCOSSE ELETTRICHE NON TENTARE DI APRIRE ALCUNA PARTE DEL DISPOSITIVO. ALL'INTERNO NON E' PRESENTE ALCUN COMPONENTE RIPARABILE DALL'UTENTE. PER L'ASSISTENZA RIVOLGERSI A PERSONALE TECNICO QUALIFICATO.



IL COLLEGAMENTO ALLA RETE ELETTRICA DEVE ESSERE ESEGUITO DA UN ELETTROTECNICO QUALIFICATO ATTENENDOSI AI REQUISITI DEL PAESE IN CUI IL DISPOSITIVO VIENE VENDUTO.



CONTROLLARE CHE LA CONNESSIONE DI RETE SIA IN GRADO DI SODDISFARE LA POTENZA NOMINALE DEL DISPOSITIVO.



**ATTENZIONE**

**RISCHIO DI SCOSSE  
ELETTRICHE, NON APRIRE**



Il dispositivo è stato progettato e fabbricato per garantire la vostra sicurezza personale. TUTTAVIA UN UTILIZZO NON CORRETTO PUO' PROVOCARE RISCHI DI SCOSSE ELETTRICHE E DI INCENDI.

Per non compromettere le protezioni incorporate nel prodotto, rispettare le seguenti regole di base relative all'installazione, all'utilizzo e alla manutenzione. Si prega di leggere queste "Istruzioni sulla sicurezza" accuratamente prima dell'utilizzo.

1. Leggere queste istruzioni.
2. Conservare le istruzioni.
3. Tenere conto di tutti gli avvisi.
4. Seguire tutte le istruzioni.
5. Non usare l'apparecchio in prossimità di acqua.
6. Non ostruire le prese di ventilazione. Installare secondo le indicazioni del produttore.
7. Non installare vicino a fonti di calore quali radiatori, bocchette dell'aria calda, stufe o altri apparecchi (compresi gli amplificatori) che producono calore.
8. Non compromettere la sicurezza delle spine polarizzate o con messa a terra.
9. Usare solo accessori specificati dal produttore.
10. Ricorrere a personale qualificato per qualsiasi intervento. Tali interventi sono necessari in caso di guasti dell'apparecchio quali danneggiamento del cavo di alimentazione o della spina, versamento di liquidi o caduta di oggetti nell'apparecchio, esposizione a pioggia o umidità o se l'apparecchio non funziona normalmente o è caduto.
11. Il dispositivo deve essere collegato a una presa di corrente con collegamento protetto da messa a terra.



NON ESPORRE QUESTO APPARECCHIO ALLA PIOGGIA, UMIDITÀ O SOSTANZE LIQUIDE. OGGETTI PIENI DI LIQUIDI, COME VASI, NON DEVONO ESSERE COLLOCATI SU QUESTO APPARATO.



I TERMINALI DEI DIFFUSORI POTREBBERO ESSERE PERICOLOSI, SE VIENE UTILIZZATA LA CONNESSIONE IN MODALITÀ BRIDGE DEGLI ALTOPARLANTI.



ADOPTARE LE CORRETTE TECNICHE DI CONNESSIONE E ISOLAMENTO QUANDO VIENE UTILIZZATA LA CONNESSIONE IN MODALITÀ BRIDGE DEGLI ALTOPARLANTI.

IL PRODUTTORE DECLINA OGNI RESPONSABILITÀ PER DANNI PROVOCATI A PERSONE, COSE O DATI A CAUSA DI UN COLLEGAMENTO NON CORRETTO O MANCANTE DELLA MESSA A TERRA.

CONTATTARE IL CENTRO DI ASSISTENZA AUTORIZZATO PER ESEGUIRE LA MANUTENZIONE ORDINARIA E STRAORDINARIA.

E' ASSOLUTAMENTE NECESSARIO CONTROLLARE QUESTI REQUISITI FONDAMENTALI SULLA SICUREZZA E, IN CASO DI DUBBI, RICHIEDERE UN CONTROLLO ACCURATO DA PERSONALE QUALIFICATO.

## Regulatory information

### FCC COMPLIANCE NOTICE

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

**CAUTION:** Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

**NOTE:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- ▶ Reorient or relocate the receiving antenna.
- ▶ Increase the separation between the equipment and receiver.
- ▶ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- ▶ Consult the dealer or an experienced radio/TV technician for help.

### WEEE DIRECTIVE

If the time arises to throw away your product, please recycle all the components possible.



This symbol indicates that when the end-user wishes to discard this product, it must be sent to separate collection facilities for recovery and recycling. By separating this product from other household-type waste, the volume of waste sent to incinerators or land-fills will be reduced and natural resources will thus be conserved.

The Waste Electrical and Electronic Equipment Directive (WEEE Directive) aims to minimise the impact of electrical and electronic goods on the environment. Powesoft S.p.A. comply with the Directive 2002/96/EC and 2003/108/EC of the European Parliament on waste electrical and electronic equipment (WEEE) in order to reduce the amount of WEEE that is being disposed of in land-fill site. All of our products are marked with the WEEE symbol; this indicates that this product must NOT be disposed of with other waste. Instead it is the user's responsibility to dispose of their waste electrical and electronic equipment by handing it over to an approved reprocessor, or by returning it to Powesoft S.p.A. for reprocessing. For more information about where you can send your waste equipment for recycling, please contact Powesoft S.p.a. or one of your local distributors.

### EC DECLARATION OF CONFORMITY

**Manufacturer:**  
Powesoft S.p.A.  
via E. Conti 5  
50018 Scandicci (Fi)  
Italy



**We declare that under our sole responsibility the products:**

**Model Name:** M-Drive IK  
M-Drive IK

**Intended use:** Professional Audio Amplifier Module

Are in conformity with the provisions of the following EC Directives, including all amendments, and with national legislation implementing these directives:

2014/35/EU	Low Voltage Directive
2014/30/EU	Electromagnetic Compatibility Directive
2011/65/EU	RoHS Directive

The following harmonized standards are applied:

EN 55103-1:2009,  
EN 55103-1:2009/A1:2012  
EN 55103-2:2009  
EN 61000-3-2:2014  
EN 61000-3-3:2013  
EN 61000-3-11:2000  
EN 60065:2014  
EN 60065:2014/AC:2016

Scandicci,  
August 2020

Marco Cati  
Quality & Process Manager

For compliance questions only: [compliance@powesoft.it](mailto:compliance@powesoft.it)

## Electrostatic Discharge (ESD)

Electrostatic discharge (ESD) is one of the most significant factors leading to damage and failure of a wide variety of electronic components.

Poor handling can cause internal damage, which is invisible. This internal damage can then cause electrical failure or reliability problems.



It is recommended that all workstations where Electrostatic Discharge Sensitive devices (ESDS) and assemblies are handled outside of full static protection packaging (i.e. within static control areas) should be provided with some form of ground conductive or dissipative flooring.

## 7:1.Welcome

Congratulations on your purchase of the Powersoft M-Drive module.

We know you are eager to use the M-Drive module, but please take a moment to read this user's manual and safety instructions. In case you have any questions, please do not hesitate to contact your dealer or Powersoft.

The M-Drive is a one channel amplifier modules specifically designed to fully exploit the potential of the M-Force transducer. M-Drive shows amazing figures in terms of both output voltage ( $310 V_{peak}$ ) and current capabilities ( $200 A_{peak}$ ).

The new design of the power supply equipped with PFC, reduces power consumption while enhancing reliability and consistency in all operating conditions.

M-Drive can be equipped with any Powersoft or third-party DSP solution, and integrates the Powersoft's patented Differential Pressure Control technology that optimizes sonic performances of the amplifier+transducer+cabinet+environment system.

A custom heat sink designed to best fit the M-Drive is available: please refer to the M-Drive IK solution for more info on this subject.

## 7:2.Unpacking & checking for shipping damage

Your Powersoft product has been completely tested and inspected before leaving the factory. Carefully inspect the shipping package before opening it, and then immediately inspect your new product. If you find any damage notify the shipping company immediately.

## 7:3.Disposal of the packing material

The transport and protective packing has been selected from materials which are environmentally friendly for disposal and can normally be recycled.

Rather than just throwing these materials away, please ensure they are offered for recycling.

## 7:4.Differential Pressure Control

The Differential Pressure Control – DPC – is the core technology of the Integrated Powered Adaptive Loudspeaker system, also known as IPAL.



DPC makes M-Drive efficient and reactive to the environment condition, overcoming the physical limitation of traditional sound reinforcement systems.

The differential pressure measurement, senses the difference of pressure between the front and the rear sides of the radiating diaphragm and uses this information to alter the behaviour of the transducer, according to the real boundary conditions. Thanks to this innovative approach to full boundary conditions feedback processing, the DPC dramatically improves the electroacoustic efficiency in terms of high SPL and sonic performance of the sound reinforcement system.

The DPC system combines a high-efficient transducer with a high-power switching mode amplifier that embed a fast and effective ZeroLatency™ DSP. The DSP performs the double operation of both managing the loudspeaker processing and taking care of the differential pressure control signal. M-Drive establishes a global feedback between the electrical and the acoustic domains.

Thanks to the rich graphic user interface – GUI – it is possible to weight and customize the feedback between the electrical and the acoustic domains.

### 7:4.1.Pressure mode

The Pressure mode relies on the DPC making it possible to match a specific target pressure response. Being the SPL output of any acoustic signal derived from the relationship between the pressure and the acoustical impedance, it's straightforward to use a direct measurement of such a pressure signal to make the system track a reference target pressure model. Benefits in terms of predictability of the system response and reduction of sensitivity from disturbing effects could be substantially appreciated.

# Thermal constrains

This device must be correctly heatsinked for proper and reliable operation.

The built-in fans and an appropriate external passive heat sink guarantee by design thermal efficiency and reliability.

Proper heat sink planarity is strongly suggested to allow thermal transfer from the module's bottom plate to the heatsink; a thermal compound may be used, but it is not strictly necessary.

In order to ensure proper ventilation of the module, reasonable spacing of at least 100 mm must be left between the frame of the unit and any side component or surface of the enclosure.

The module has been designed to fit into a loudspeaker cabinet: please refer to [FIGURE 1](#) for proper module placing.

IN [FIGURE 1](#) HEATSINK FINS ARE SET HORIZONTALLY (WRONG!) ONLY FOR DESCRIPTIVE PURPOSE.

We suggest to position the module vertically with respect the ground in order to take advantage of the chimney effect for ventilation and heat dissipation.

A custom heat sink designed to best fit the M-Drive is available: please refer to the M-Drive IK solution for more info on this subject.

## 8:1.Heatsink performance

Here we suggest a rule of thumb to calculate the thermal resistance of the heatsink.

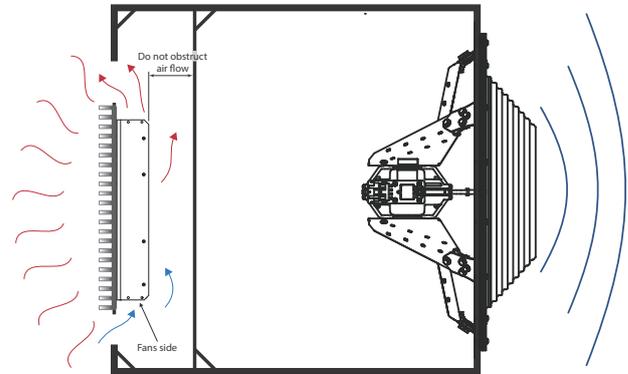
The absolute thermal resistance of the heatsink is the temperature difference (kelvin or celsius) across its structure when a unit of heat energy flows through it in unit time (watt). For seek of simplicity, a heatsink with low thermal resistance offers high heat dissipation, as well as a low electric resistance allows high current flow through a conductive wire.

In order to define the maximum allowed thermal resistance for the heatsink let assume the following:

- ▶  $e$  as the amp module efficiency
- ▶  $cf$  as the crest factor of the audio signal
- ▶  $W_{max}$  as the peak power delivered by the module
- ▶  $T_{amb}$  as the highest ambient temperature
- ▶  $T_{mod}$  as the highest operating temperature

The thermal resistance of the heatsink derives from the fol-

$$R_{th} = \frac{T_{mod} - T_{amb}}{Dissipated\ power}$$



*FIGURE 1: Cooling solutions (for descriptive purpose the heatsink fins are set in wrong direction): module in a separate vented chamber.*

lowing formula:

$$Dissipated\ power = \frac{W_{max} (1 - e)}{cf}$$

The maximum dissipated power can be calculated as:  
For example, stating an efficiency of 80%, 6 dB crest factor

$$\frac{3400 (1 - 0.8)}{4} = 170\ W$$

and 3400 W peak power, the dissipated heat is:

Considering that thermal protection of the module ( $T_{mod}$ ) is set at 75°C (167°F) on the bottom aluminium plate and stating an ambient temperature of 45 °C (113°F), the previous

$$\frac{75 - 45}{170} = 0.14^{\circ}C/W$$

example gives:

meaning that the temperature of the bottom plate is always lower than 75°C if the heatsink has a thermal resistance better than 0.14°C/W (or 0.14 K/W) with ambient temperature up to 45 °C.

## 8:2.Suggested heatsink

Powersoft provides a M-Drive compatible heat sink, specifically designed to house the amp module, an input/output interface and the AC mains connection: please refer to the M-Drive IK solution for more info on this subject.

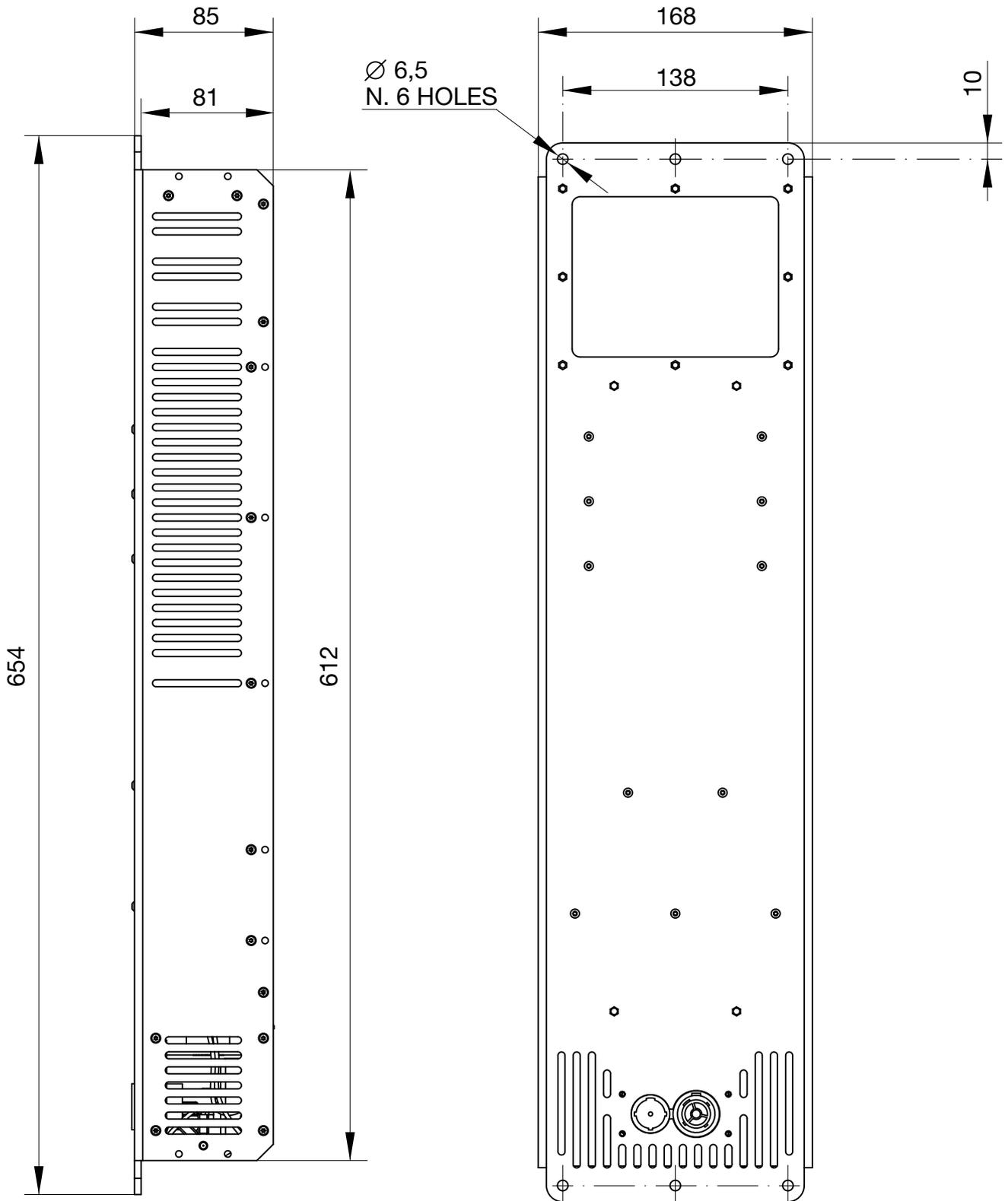


FIGURE 2: M-Drive IK heat sink with powerCON and AC Mains filter.

## Electromagnetic Compatibility (EMC) & Safety

### 9:1.AC MAINS filter

 In order to improve the electromagnetic compatibility an EMC filter must be inserted before the AC MAINS plugs on the power supply. Powersoft suggests: Schaffner FN2030-10-06 model.

### 9:2.Cabling

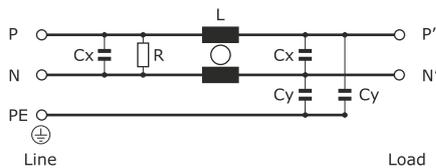


FIGURE 3: Typical electrical schematic of the EMI Filter.

Wiring between the amp module and the load may lead to radio frequency noise. The following guide lines should be observed:

- ▶ reduced cabling length is advisable;
- ▶ keep cable pairs as close as possible to each other in order to minimize the antenna effect;
- ▶ design the cabling path far from RF noise source;
- ▶ set the cabling for RF noise rejection: shielded or twisted cables are advisable configuration (ref. FIGURE 4);
- ▶ place ferrites as close to the module as possible

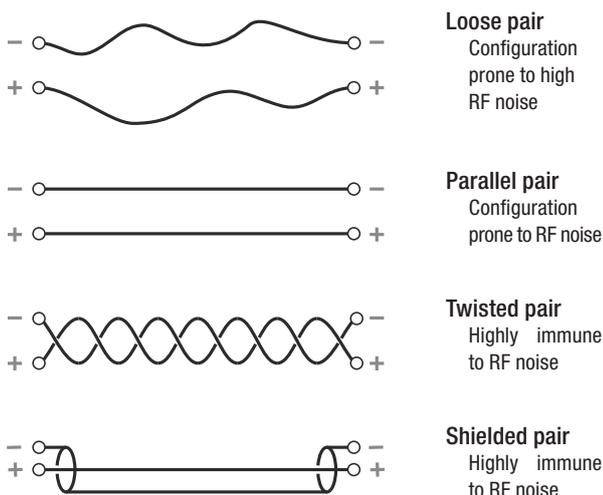


FIGURE 5: Cabling configuration.

### 9:3.Ferrite cores

Reject RF noise from input and output cabling by installing ferrite shields. Powersoft suggests the KITAGAWA

RFC-H13 ferrite core, or equivalent.

Wrap both cables around one side of each ferrite so that it pass through each ferrite twice (ref. FIGURE 3). Install the ferrite shield as close as possible to where the cable plugs into the amplifier. Placing the ferrite elsewhere on the cable noticeably reduces its effectiveness.

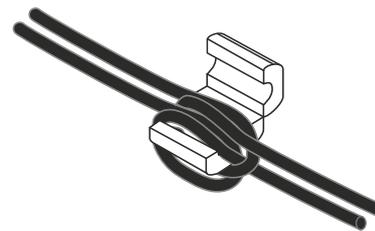


FIGURE 4: Ferrite core installation on I/O wirings.

### 9:4.Chassis shielding

If not already present on the product, a full body metal chassis or a shielding cage will provide best shielding of RF emission. In order to achieve the highest shielding, minimize the amount and size of holes or opening in the chassis.

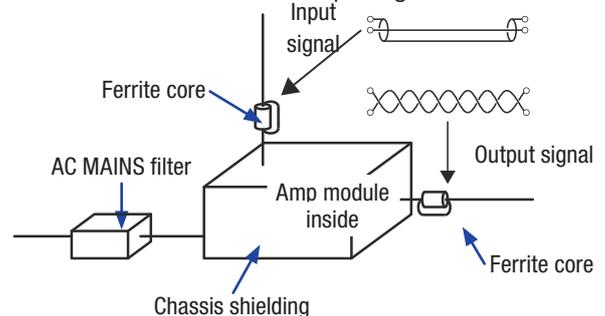


FIGURE 6: Tools and best practice for improving the electromagnetic compatibility.

### 9:5.Mains Fuse

Replace the fuses with the same type and rating: time delay fuse of 10A rating (2x Littelfuse series 215).

### 9:6.Earth connection

 This device must be powered exclusively by earth connected mains sockets in electrical networks compliant to the IEC 364 or similar rules. Is absolutely necessary to verify this fundamental requirement of safety and, in case of doubt, require an accurate check by a qualified personal.

Is absolutely necessary to ground this device using the proper earth connection on the metal frame of the chassis; use M4 nut and bolt with proper split washer – grover washer – to secure the earth terminal lug.

## Mechanical drawings

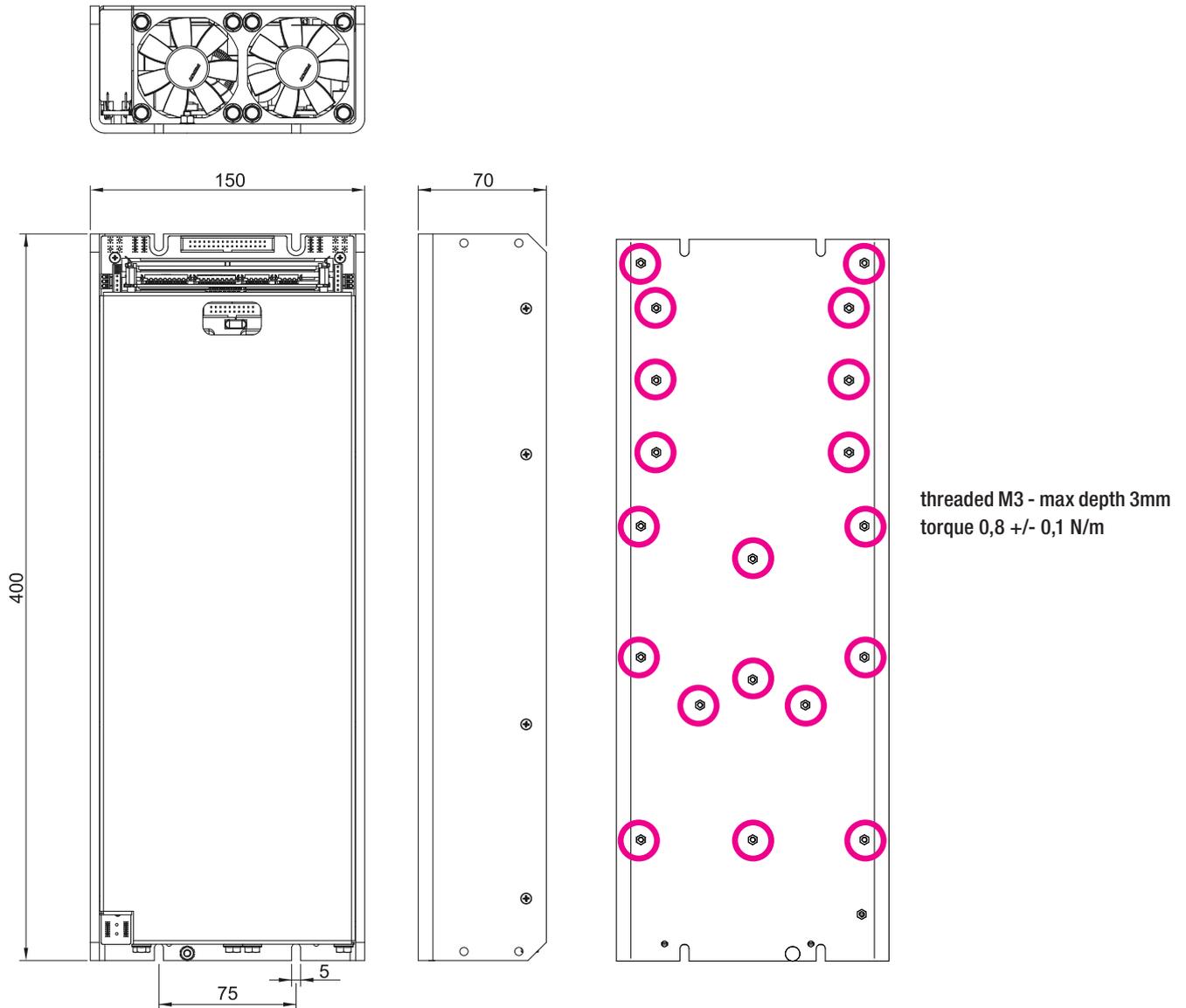


FIGURE 7: M-Drive mechanical drawing (all dimensions in millimetres).

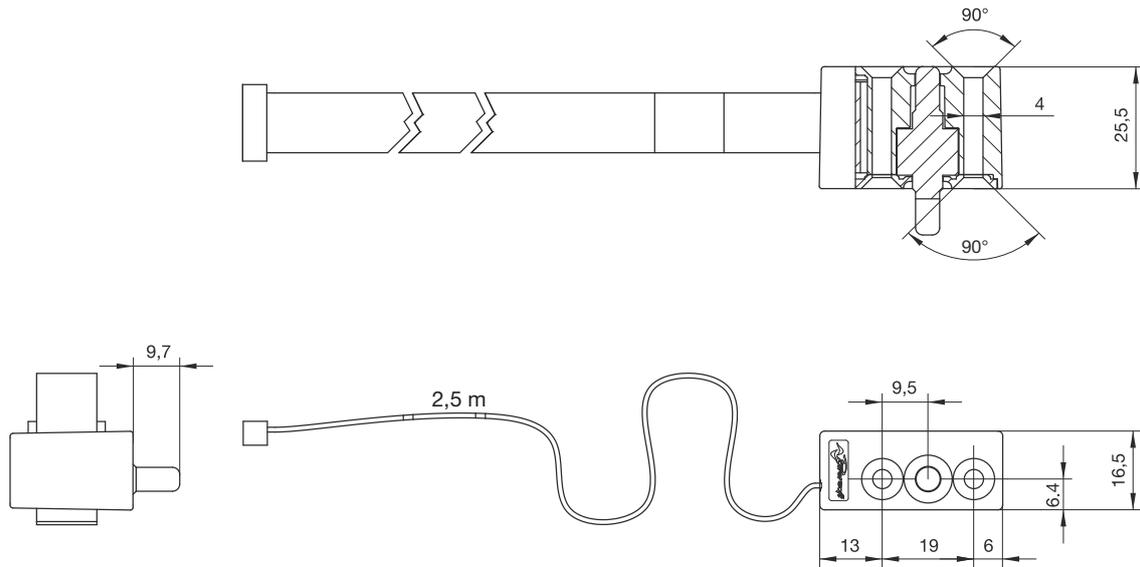


FIGURE 8: Pressure sensor (all dimensions in millimetres unless otherwise stated)

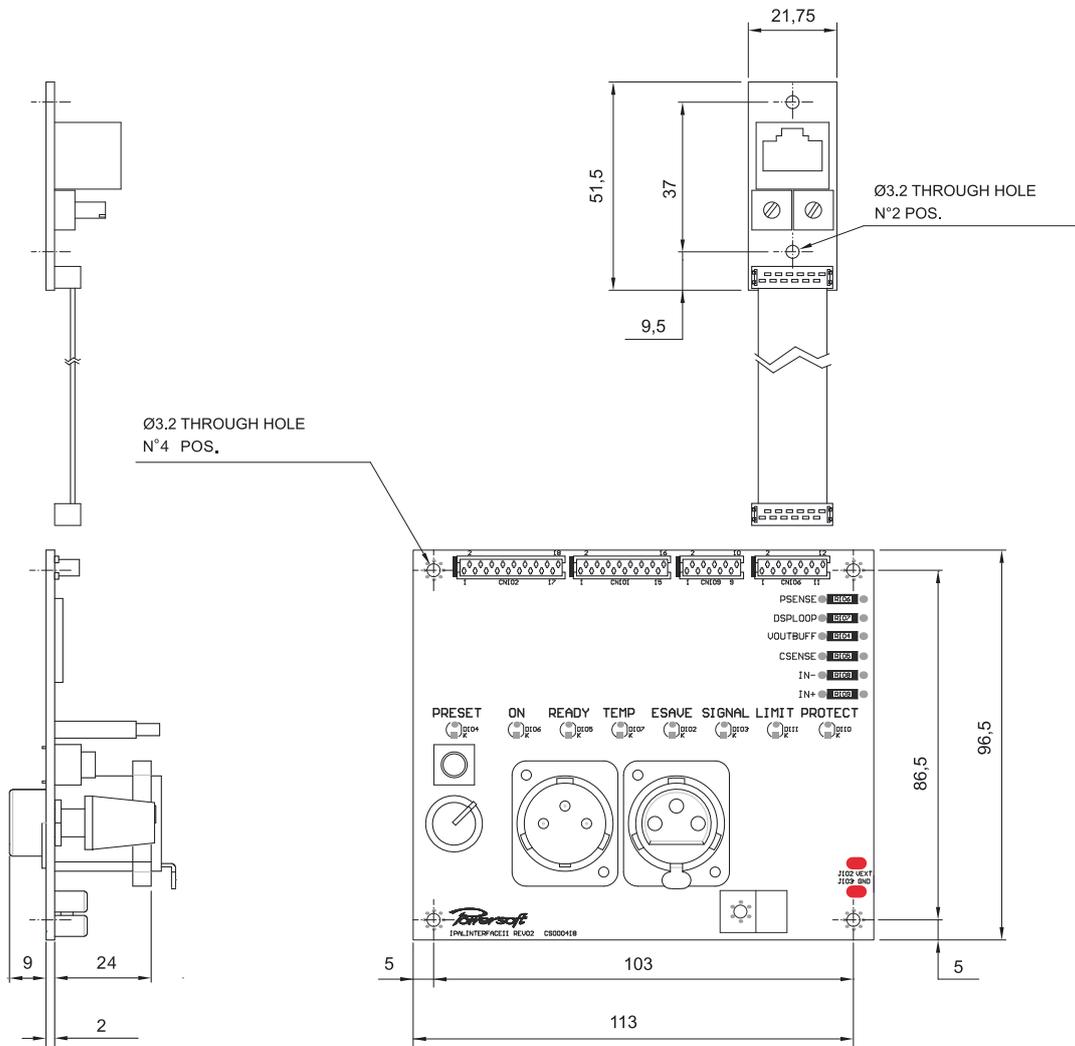


FIGURE 9: DPC interface board (all dimension in millimetres).

## Connections

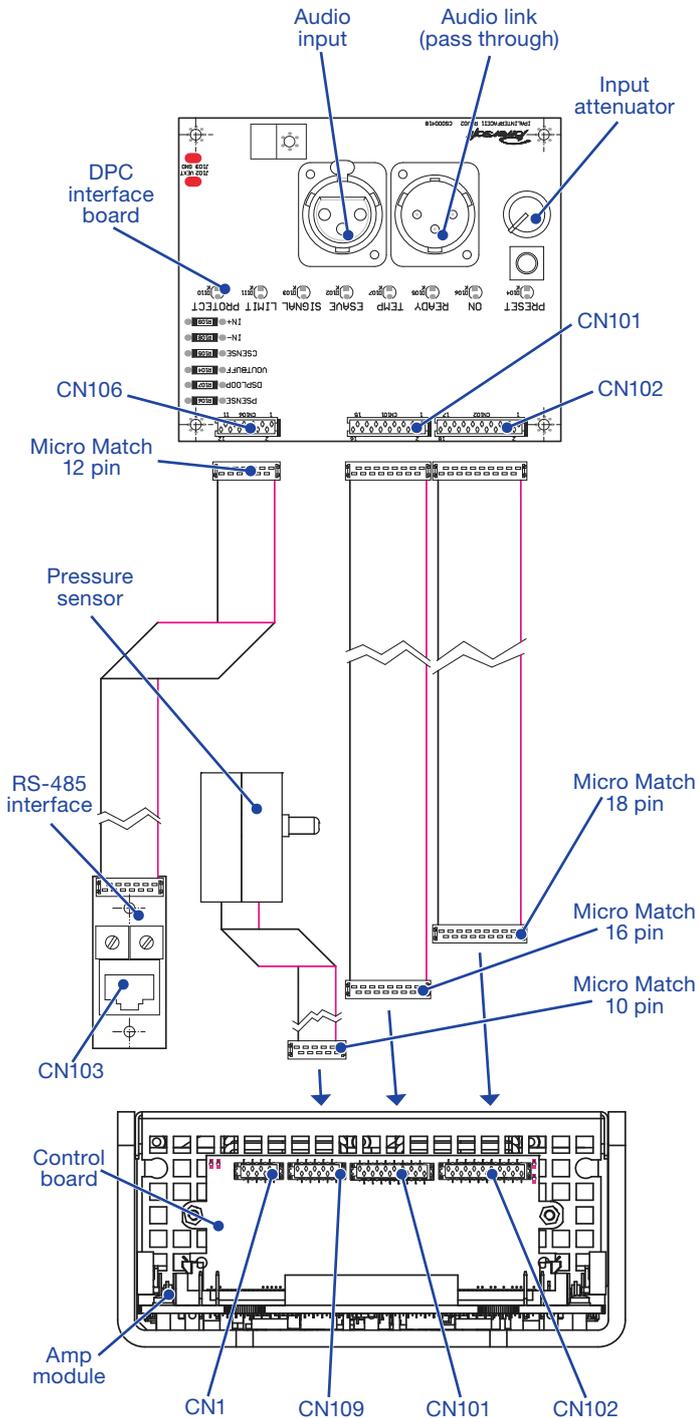


FIGURE 10: DPC interface to control board connections.

### 11:1. Interface board: bill of connectors

CODE	FUNCTION	TYPE
CN107	Audio link (pass through) balanced	XLR-M
CN108	Audio input balanced	XLR-F

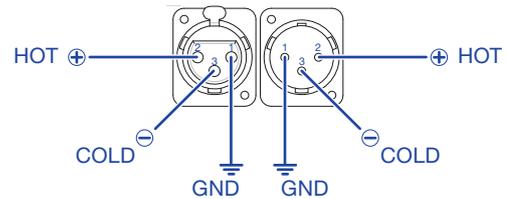


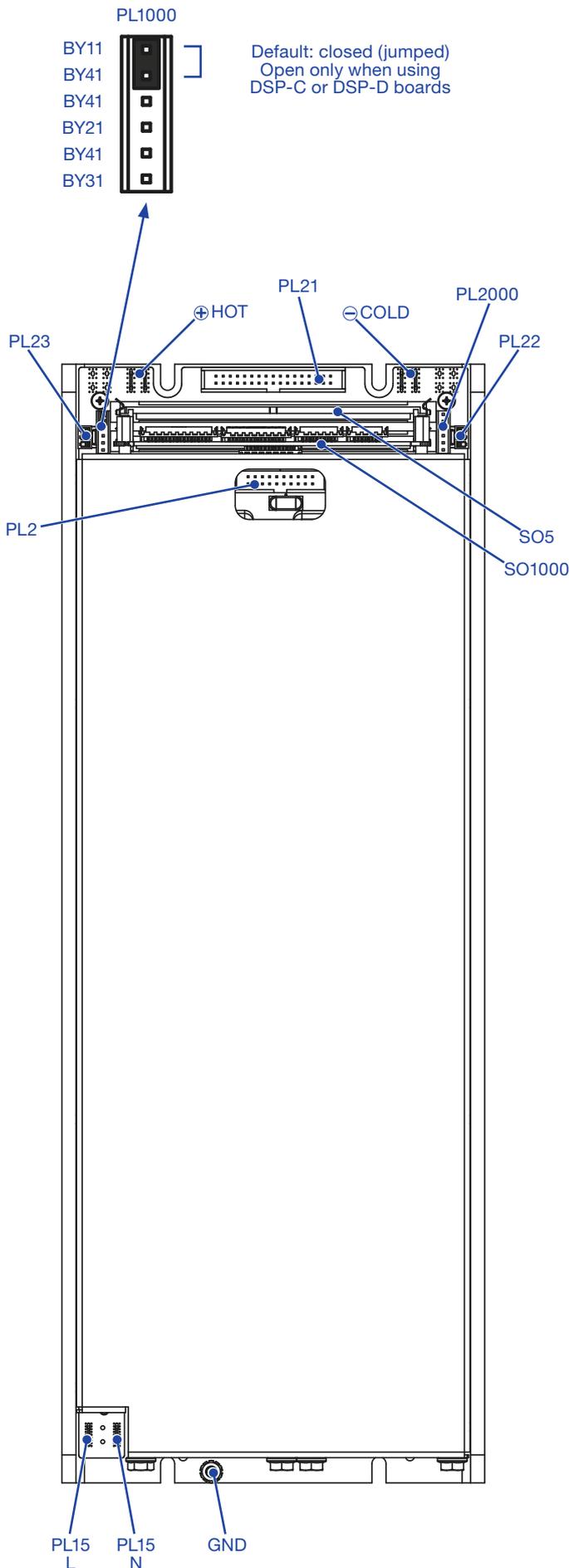
FIGURE 11: XLR pinout.

### 11:2. RS-485 interface

CODE	FUNCTION	TYPE
CN103	RS-485	RJ45
SW101	ID selector: units	rotative knob
SW101	ID selector: tens	rotative knob

### 11:3. Control board: bill of connectors

CODE	FUNCTION	TYPE
CN1	Not Used (future development)	8 pin Micro Match Socket
CN109	Pressure sensor input	10 pin Micro Match Socket
CN101	RS-485/ FL0IS315 Interface	16 pin Micro Match Socket
CN102	FL0IS315 Interface	18 pin Micro Match Socket



## 11:4.Amp module: bill of connectors

ID	Connector Model	Connector Model
PL15 – L	FASTON 6.3x0.8mm	AC mains input (Line)
PL15 – N		AC mains input (Neutral)
GND	M4 bolt	Earth
PL21	IDC 34p Header	For DSP/ Custom interface board connection
S05	72p SIMM Socket	
OUT1+ (HOT)	2x FASTON 6.3x0.8mm	Amplifier output to M-Force-motor Positive input*
OUT2- (COLD)	2x FASTON 6.3x0.8mm	Amplifier output to M-Force-motor Negative input*
PL22	Molex 22-27-2031	Output to external FAN(s). 24Vdc, 100mA MAX current (total)
PL23		

\*the polarity is directly dependant on the positioning and configuration of the pressure sensor and motor.

Check [Chapter 14](#) for more detailed information.

## 11:5.PL1000 pinout

Pin#	Name	IN	OUT	Impedance	Description
1	BY31	●		2.7 k $\Omega$ + 47 $\Omega$	Unbalanced Input
2-4-5	BY41		●	2.7 k $\Omega$ + 47 $\Omega$	Unbalanced Output
3	BY21				RESERVED
6	BY11				RESERVED

## 11:6.PL22 / PL23 pinout

Pin#	Bias	Description	Maximum available current: 100 mA
1	-	- 12 V <sub>DC</sub> OUT	
2	+	+ 12 V <sub>DC</sub> OUT	
3	-	- 12 V <sub>DC</sub> OUT	

## 11:7.PL21 pinout

PIN#	NAME	TYPE	DESCRIPTION	RANGE	IMPEDANCE/NOTES
1	SDPWS	IN	PSU shutdown. Active HI	$3,3V_{DC} < V_{IH} < 12V_{DC}$	1K $\Omega$
2	READY 1	OUT	High when PWM is ON	$3,3V_{DC} < V_{OH} < 5V_{DC} \mid 0V_{DC} < V_{OL} < 1V_{DC}$	47K $\Omega$ - external cap. needed (1nF min)
3	RESERVED				
4	RESERVED		DO NOT CONNECT		
5	GND	PWR			
6	IN 1+	IN	Bal. IN (non-inverting)	5,5V <sub>RMS</sub> input for full output Absolute MAX input= 8V <sub>RMS</sub>	DIFF= 20K $\Omega$ / CMODE= 20K $\Omega$ (bal)
			Unbal. IN ( non-inv. p7 to GND)		20K $\Omega$ (unbal)
7	IN 1-	IN	Bal. IN (inverting)		DIFF= 20K $\Omega$ / CMODE= 20K $\Omega$ K $\Omega$ (bal)
			Unbal. IN (inv. p6 to GND)		10K $\Omega$ (unbal)
8	GND	PWR			
9	VOUTMON	OUT	Output voltage monitor	0-8V <sub>AC</sub> (Scale factor= 20V/V)	4,5K $\Omega$
10	PROTECT	OUT	Low when output is in protect	$2V_{DC} < V_{OH} < 10V_{DC} \mid 0V_{DC} < V_{OL} < 1V_{DC}$	100K $\Omega$
11	IOUTMON	OUT	Output current monitor	0,17V <sub>DC</sub> min - 1V <sub>DC</sub> max (Scale Factor = 40A/V)	4,5K $\Omega$
12	TEMPMON	OUT	Output temperature monitor	0-5V <sub>DC</sub> (Scale factor)*	Temperature dependant (~7K $\Omega$ @25°C)
13	+12V <sub>DC</sub>	PWR	Regulated +12V <sub>DC</sub> supply	(+/-5%) MAX current (tot)= 0,5A	Protected with series Polyswitch
14	-12V <sub>DC</sub>	PWR	Regulated -12V <sub>DC</sub> supply	(+/-5%) MAX current (tot)= 0,5A	Protected with series Polyswitch
15	MUTE	IN	HW mute (PWM off). Active LO	$V_{IL(max)}=0,2V_{DC} \mid I_{sink}=20mA_{(min)}$	
16	+VCCMON	OUT	Positive rail bus monitor	Scale factor= 20V/V	4,5K $\Omega$
17	-VCCMON	OUT	Negative rail bus monitor	Scale factor= 20V/V	4,5K $\Omega$
18	-VCCMON	OUT	Negative rail bus monitor	Scale factor= 20V/V	4,5K $\Omega$
19	+VCCMON	OUT	Positive rail bus monitor	Scale factor= 20V/V	4,5K $\Omega$
20	MUTE	IN	HW mute (PWM off). Active LO	Shorted to pin 15	
21	-12V <sub>DC</sub>	PWR	Regulated -12V <sub>DC</sub> supply	see pin 14	
22	+12V <sub>DC</sub>	PWR	Regulated +12V <sub>DC</sub> supply	see pin 13	
23-33			RESERVED		
34	SDPWS	IN	PSU shutdown. Active HI	see pin 1	

\*[TEMPMON table](#)

## 11:8.S05 pinout

PIN#	NAME	TYPE	DESCRIPTION	RANGE	IMPEDANCE/NOTES
1	OUT+	OUT	Output Voltage monitor. Positive terminals	160V	1k $\Omega$
2	GND	PWR	Ground	0V	
3	GND	PWR	Ground	0V	
4	IN+	IN	Bal. IN (non-inverting) Unbal. IN ( non-inv. p7 to GND)	5,5V <sub>RMS</sub> input for full output Absolute MAX input= 8VRMS	DIFF= 20K $\Omega$ / CMODE= 20K $\Omega$ (bal) 20K $\Omega$ (unbal)
5	IN-	IN	Bal. IN (inverting) Unbal. IN (inv. p6 to GND)		DIFF= 20K $\Omega$ / CMODE= 20K $\Omega$ (bal) 10K $\Omega$ (unbal)
6	BY11				
7	BY21				
8	BY41				
9	NC				
10	IOUTMON	OUT	Output current monitor	0,17V <sub>DC</sub> min - 1V <sub>DC</sub> max (Scale Factor = 40A/V)	4,5K $\Omega$
11	PROTECT	OUT	Low when output is in protect	2V <sub>DC</sub> <V <sub>OH</sub> <10V <sub>DC</sub>   0V <sub>DC</sub> <V <sub>OL</sub> <1V <sub>DC</sub>	100K $\Omega$
12 13	RESERVED				
14 15	NC				
16	GPIO34	OUT	Hardware overcurrent protection	OPEN: normal operation Shorted to GND: OVC Prot status active	Apply 4,7k $\Omega$ external resistor.
17	GPIO18	OUT	Hardware overcurrent protection	OPEN: normal operation Shorted to GND: OVC Prot status active	Apply 4,7k $\Omega$ external resistor.
18-21	RESERVED				
22	GND	PWR	Ground	0V	
23-27	NC				
28	TEMPMON	OUT	Output temperature monitor	0-3,3V <sub>DC</sub> (Scale factor)	See TEMPMON table
29	GND	PWR	Ground	0V	
30	+VCCMON		Positive rail bus monitor	Scale factor= 20V/V	4,5K $\Omega$
31	GND	PWR	Ground	0V	
32	-VCCMON		Negative rail bus monitor	Scale factor= 20V/V	4,5K $\Omega$
33	GND	PWR	Ground	0V	
34	-12V <sub>DC</sub>	PWR	Regulated -12V <sub>DC</sub> supply	(+/-5%) MAX current (tot)= 0,5A	Protected with series Polyswitch
35	+12V <sub>DC</sub>	PWR	Regulated +12V <sub>DC</sub> supply	(+/-5%) MAX current (tot)= 0,5A	Protected with series Polyswitch
36 37	RESERVED				
38	+12V <sub>DC</sub>	PWR	Regulated +12V <sub>DC</sub> supply	(+/-5%) MAX current (tot)= 0,5A	Protected with series Polyswitch
39	-12V <sub>DC</sub>	PWR	Regulated -12V <sub>DC</sub> supply	(+/-5%) MAX current (tot)= 0,5A	Protected with series Polyswitch
40	GND	PWR			
41	-VCCMON	OUT	Negative rail bus monitor	Scale factor= 20V/V	4,5K $\Omega$
42	NC				
43	+VCCMON	OUT	Positive rail bus monitor	Scale factor= 20V/V	4,5K $\Omega$
44	GND	PWR	Ground	0V	
45	TEMPMON	OUT	Output temperature monitor	0-3,3V <sub>DC</sub> (Scale factor)	See TEMPMON table
46-49	RESERVED				
50	NC				
51	GND	PWR	Ground	0V	

PIN#	NAME	TYPE	DESCRIPTION	RANGE	IMPEDANCE/NOTES
52	SDPWS	IN	PSU shutdown. Active HI	$3,3V_{DC} < V_{IH} < 12V_{DC}$	
53~57	NC				
58	MUTE	IN	HW mute (PWM off). Active LO	$V_{L(max)}=0,2V_{DC} \mid I_{sink}=20mA_{(min)}$	
59~62	NC				
63	IOUTMON	OUT	Output current monitor	0,17Vdc min - 1Vdc max (Scale Factor = 40A/V)	4,5K $\Omega$
64	NC				
65~69				RESERVED	
70 71	GND	PWR	Ground	0V	
72	VOUT-	OUT	Output Voltage monitor. Positive terminals	160V	1k $\Omega$

## 11:9. Installing an optional DSP SIMM board

The M-Drive amplifier module can host an optional DSP board such as the Powersoft DSP-Lite and DSP-4 interfaces, as well as any other custom interface. Refer to [FIGURE 12](#) for proper SIMM board dimensions and connectivity.

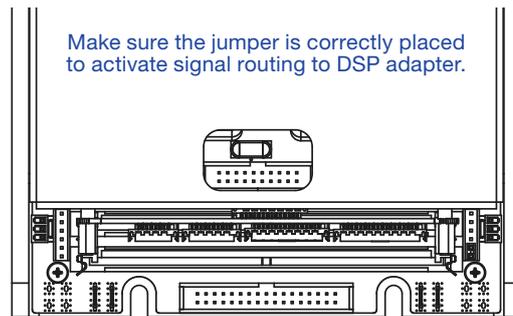


FIGURE 12: Jumper settings for DSP-Lite and DSP-4 adapter

## Hardware protections

The architecture of Powersoft's amplifiers encompass several protection mechanisms triggered by harmful signal and temperature. Protection systems and triggers are independently implemented in the power supply section (power supply protection) and the amplifier section (amplifier protections). (ref. [Chapter 15:3.Advanced parameters](#)).

### 12:1.Thermal Protections and Fan Control

Fan starts to run as soon as the amp module measures a temperature greater than 35°, the fan control keeps fan at maximum speed for the first 2s, then its speed will be controlled according to operating temperature.

When the amp module reaches 45°, or when the module reaches the 500 W threshold, the fan starts to run at maximum speed.

At 60° the temperature Led will turn solid on, at 80° the unit will shutdown.

The temperature of the Amplifier section is monitored and replicated on the 34 poles interface connector according to the TEMPON table:

TEMP (°C)	TEMPMON (V)
0	2.69
5	2.57
10	2.44
15	2.30
20	2.16
25	2.00
30	1.85
35°	1.70
40	1.55
45°*	1.41
50	1.28
55	1.15
60	1.04
65	0.93
70	0.84
75	0.76
80	0.68
85	0.61
90	0.55
95	0.50
100	0.46

### 12:2.Power supply protections

Power supply protections aim to isolate a faulty section in electrical power system from the rest of the device in order to prevent the propagation of the fault and limit device damages.

#### 12:2.1.Primary AC mains overcurrent protection

AC main overcurrent are filtered by two 10 A time-lag fuses (also known as time-delay or low blow-fuse). The purpose of the time lag fuses is to allow the supply in electricity for a short time before the fuses actually blow. If the time-lag fuses blow out, the amplifier switch off; replace the fuses with proper 10 A time-lag fuses in order to restore the full functionality of the amplifier.

#### 12:2.2.Primary AC mains overvoltage protection

AC mains overvoltage threshold is set to 295  $V_{rms}$ . If the AC mains voltage exceeds 295  $V_{rms}$  the power supply stop working; the device does not turn completely off but falls in a "sleeping" mode: the power supply turns on again when the AC mains voltage drops under 290  $V_{rms}$ .

AC mains overvoltage are well tolerated by the power supply: no damages can be caused to the system even in case of severe overvoltage up to 400  $V_{peak}$ .

#### 12:2.3.Primary thermal protection

The temperature is detected at power supply and triggers the heat dissipated by the device: if the temperature rises exceeding components tolerances, the primary hardware thermal protection starts lowering the rails voltage in order to lower the heat wasted and keep the overall efficiency high.

The process is driven by the DSP section of the Control Board and is auto-adaptive, aiming to maintain the system up even in heavy thermal condition.

### 12:3.Amplifier protections

The amplifier section protections are managed by the DSP section on the Control Board and can be customized by means of the ArmoníaPlus software.

#### 12:3.1.Auxiliary power protections

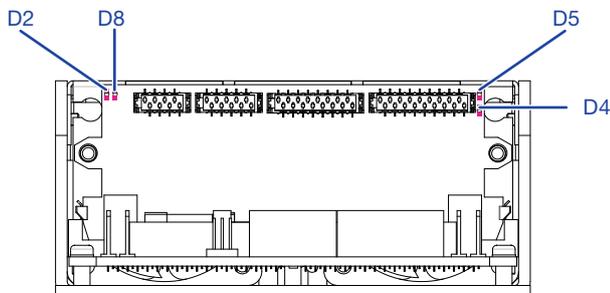
Auxiliary plugs are protected against short circuit: a poliswitch opens the auxiliary circuits when the current drawn exceeds 1 A.

#### 12:3.2.Secondary overcurrent protection

A secondary protection on the load shuts down the amplifier section when an output current greater than 200  $A_{peak}$  is detected.

## LED chart

### 13:2.SIMM board LED chart



Color	Code	Signal	Lighting
GREEN	D2	+5V <sub>DC</sub>	SOLID ON
RED	D4	signal clip	ON
GREEN	D5	ready	SOLID ON
RED	D8	protection active	ON

### 13:1.Interface board LED chart

For a comprehensive control on system status refer to the ArmoniaPlus metering interface (ref. [Chapter 15:5. Metering](#)).

Color	Label	Signal	Lighting
RED	PROTECT	Signal protection active	SOLID ON
		No pressure sensor connected	BLINKING
RED	LIMIT	Limiter active	SOLID ON
GREEN	SIGNAL	Input signal present	SOLID ON
GREEN	E.SAVE	Energy save mode active	SOLID ON
YELLOW	TEMP	Thermal protection active	SOLID ON
GREEN	READY	No faults, system fully operating	SOLID ON
GREEN	ON	System on	SOLID ON

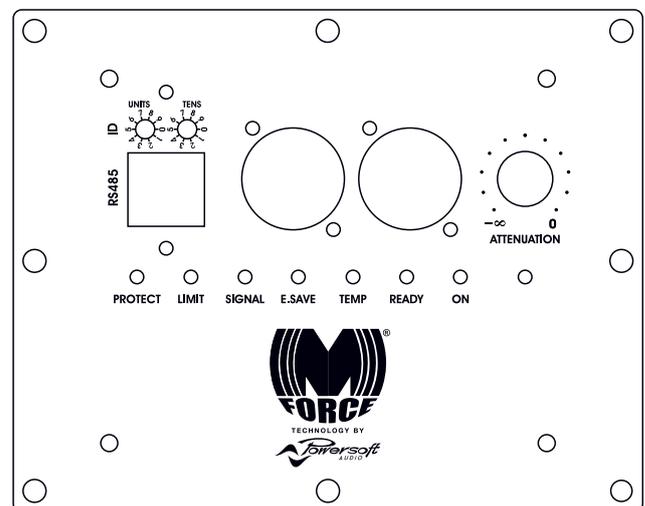


FIGURE 13: M-Drive interface plate.

## Pressure sensor

In order to guarantee high system performance, the proper placement of the pressure sensor on the loudspeaker cabinet and the correct connection of the transducer to the M-Drive are paramount.

### WARNING!

**Inadequate or wrong positioning of the pressure sensor can easily damage the amp module and the loudspeaker permanently.**

The pressure sensor must be mounted on the front side of the loudspeaker cabinet as close to the diaphragm as possible.

The protruding black cylinder must be inserted in a 10 mm hole.

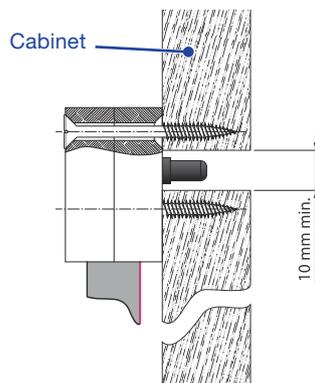
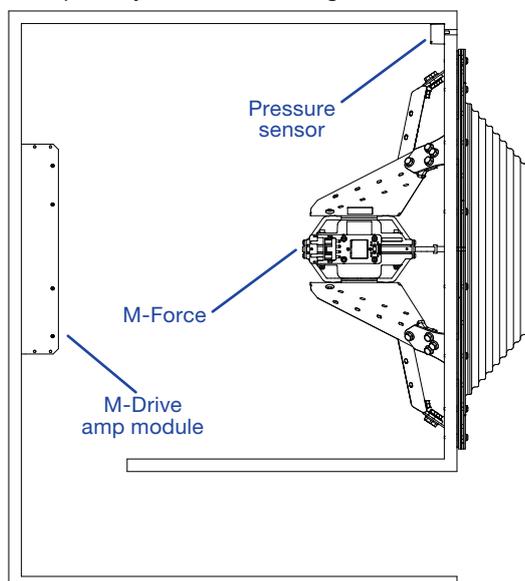


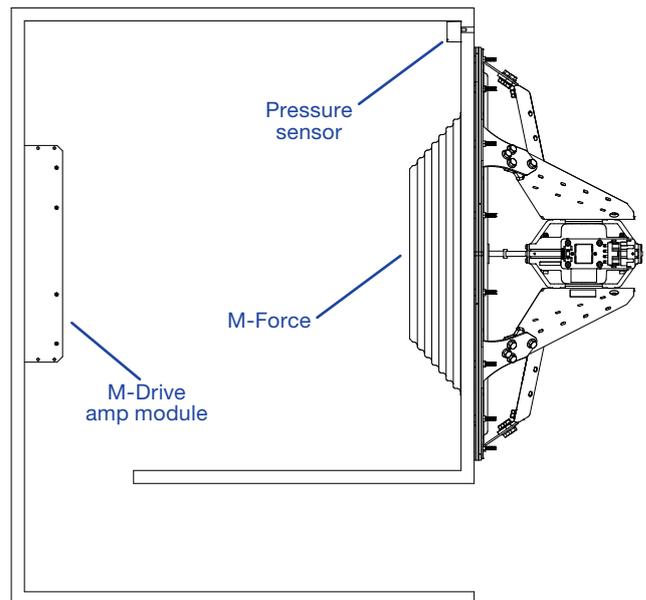
FIGURE 14: Pressure sensor placement

Note the polarity in the 3 possible configurations:

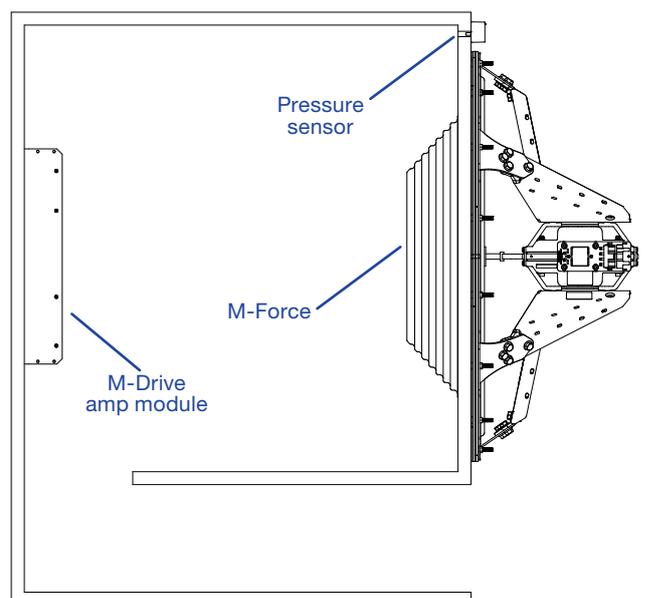
1. If both the motor and the pressure sensor are mounted inside the cabinet, pointing outwards, follow the specified polarity when connecting the M-Force.



2. If the motor is mounted outside the cabinet and pointing inwards, and the pressure sensor is mounted inside the cabinet, pointing outwards, reverse the specified polarity when connecting the M-Force.



3. If both the motor and the pressure sensor are mounted outside the cabinet, pointing inwards, follow the specified polarity when connecting the M-Force.



## Initialization

### 15:1.DPC Programming System

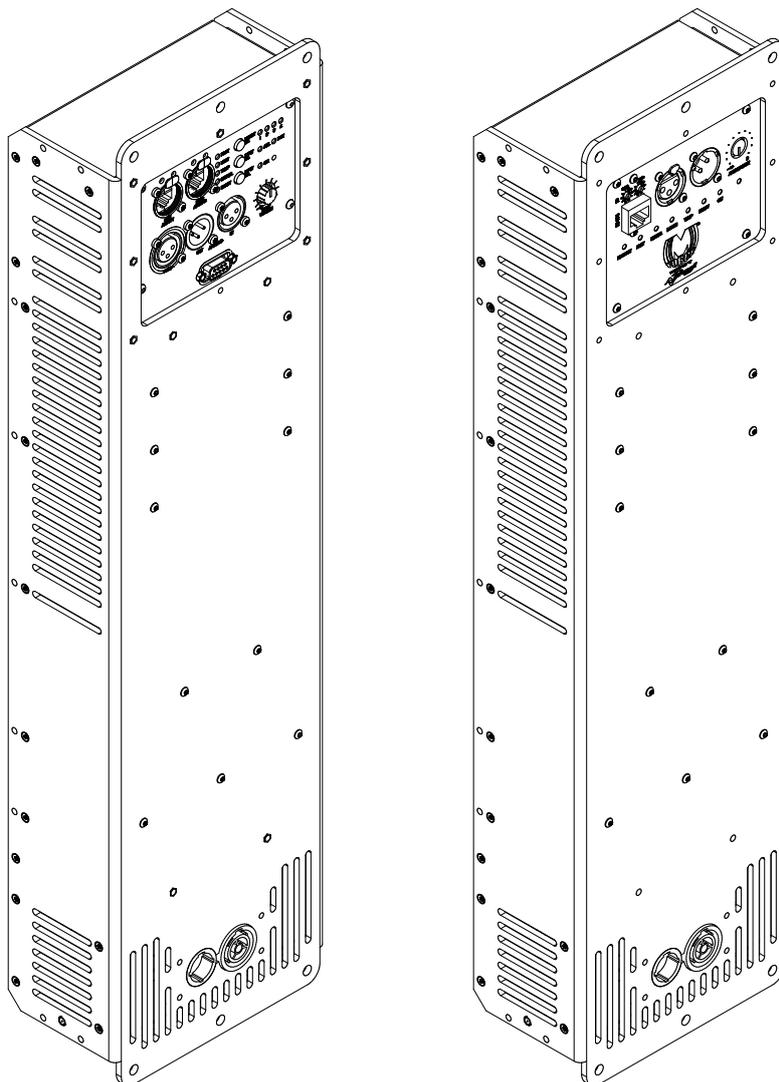
The DPC technology represents the most effective tool available for the acoustic designer to achieve unprecedented results in terms of control over the transducer displacement and system performance in low frequencies. Thanks to the differential pressure control, the behavior of subwoofer and low frequency applications can be modeled in order to modify the systems response, increase sound pressure level capabilities and enhance the overall efficiency.

A DPC system is composed by:

- ▶ Class-D amp module;
- ▶ differential pressure sensor;
- ▶ Zero-latency DSP board;
- ▶ low impedance transducer

The DPC system performs a real time feedback between the actual acoustic emission of the loudspeaker and the instantaneous displacement of the transducer. By knowing the pressure field generated by the loudspeaker, the Zero Latency DSP controls the transducer displacement and adaptively modify the system emission. The system is capable to overcome transducers non linearities, offering a complete control over sonic performance. In addition, DSP provides the needed algorithms for a complete loudspeaker tuning.

Using ProManager Plus™ is possible creating a custom model based on Zero Latency DSP (included on M-Drive) or based on an additional Powersoft DSP-4. Once you have created and exported the custom Armonía Plugin, the loudspeaker equipped with M-Drive can be recognized and managed via ArmoníaPlus™ software.



## 15:2.Making custom preset

At this stage you should have already initialized your DSP board as a Powersoft model. This includes also some default presets' schemes designed by Powersoft, which are intended to represent a good starting point for your evaluation of the amplifier, for a proper tuning of your speaker and for desired signal processing that you want to apply on your finished product. The final steps of this chapter will also guide through the process of exporting the presets that you have designed as .pam files. The exportation of these presets is an essential action if you desire to create a custom model for ArmoniaPlus™. In fact, you will be asked to import them on following steps.

### 15:2.1.Automatic Discovery

1. Connect the amp module to the computer via the RS485 connection on the interface board.

2. Set a unique ID number on the interface board by means of the two rotary knobs: allowed values range from 01 to 99; 00 is reserved.

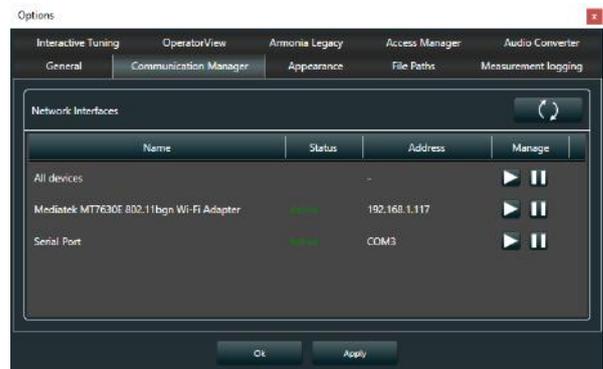
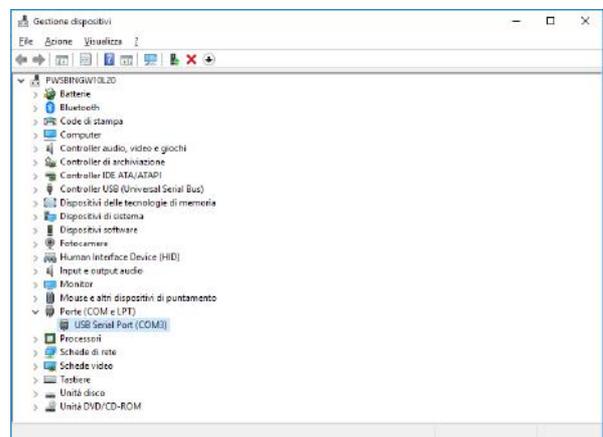
3. Turn the amplifier module on.

4. Verify the name assigned to the RS485 communication port on your PC operating system (this can be done through Microsoft Windows® Device Manager): the name should be something like COM5, COM6 or so on, depending on the number of the system built-in COM ports.

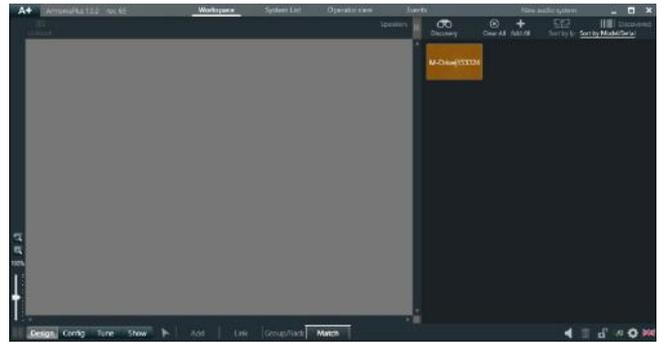
5. Open ArmoniaPlus, press the cogwheel in the lower right-hand corner select the tab “Communication Manager” on the option menu.

6. Make sure that the shown serial port number corresponds to the USB-to-RS485 converter and press Play for activating it, then press Apply.

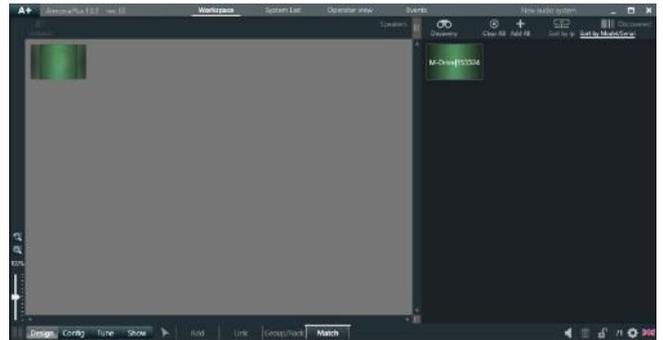
7. Close the Option menu by clicking on OK.



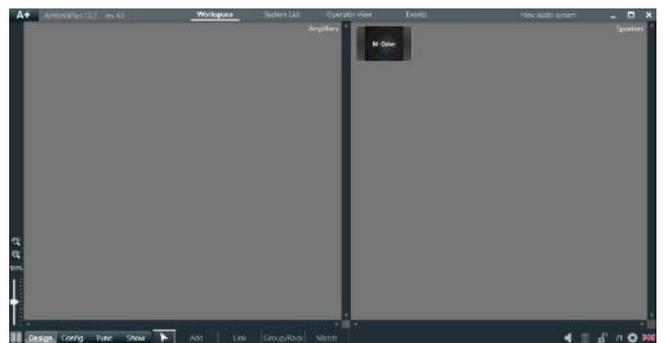
8. In the ArmoníaPlus™, go in the Match view and click on Discovery button . All connected amp modules will be detected and automatically shown on the amp list in the Status section.



9. Drag the discovered model onto the workspace and wait it becomes green (device is on-line)



10. Go in the Select view , double click on the model



11. M-Drive as should appear at first opening



M-Drive DSP has two access levels based on kind of user:  
1) Monitor view – for end user  
2) Advanced view – for manufacturer

### 15:2.2. Monitor View

By clicking on the amplifier module, at first opening you enter the Monitor view of the module, designed for the end user. In fact, all accessible settings do not permit to change internal DSP processing except delay, mute state and reverse polarity. The gain fader behaves as an attenuator; the max level is provided than the gain amount set inside the DSP.



Clicking on Advanced view, is possible entering deep inside in DSP processing, of course this is permitted only for a manufacturer with a pre-registered M-Drive license, Advanced view button does not show in case of missed license. When you pass in Advanced view first time after the initialization as Powersoft Model, no password will be requested.

### 15:2.3. Advanced View

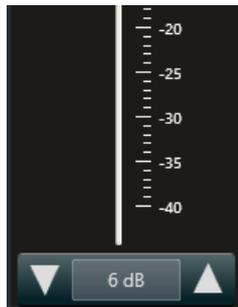
The advanced view provides a set of algorithms for tuning loudspeaker, including the DPC and impedance control.



### 15:2.3.1.Global Settings

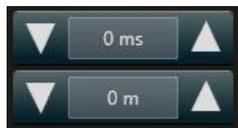
#### 15:2.3.2.Input gain

Set the maximum volume of the input signal. The attenuator knob on the interface board modifies the signal volume in series with the internal settings, it is possible disabling the external gain in the internal settings. In the Monitor view, input gain behaves as attenuator with a max value set than the gain value. So, end user has the possibility just to attenuate the signal.



#### 15:2.3.4.Delay

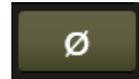
The input signal can be delayed by user definable amounts via the delay processing block. Parameters can be accessed



and set both from Advanced view and Monitor view. Delay values can be entered in the time domain (us) or as physical linear distances (in mm or in inches).

#### 15:2.3.3.Polarity

The input signal can be phase reversed by clicking on this button. Polarity button is available for the end user in the monitor view.

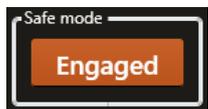


The Mute button is provided as well to mute audio playback.



#### 15:2.3.5.Safe mode and Mute

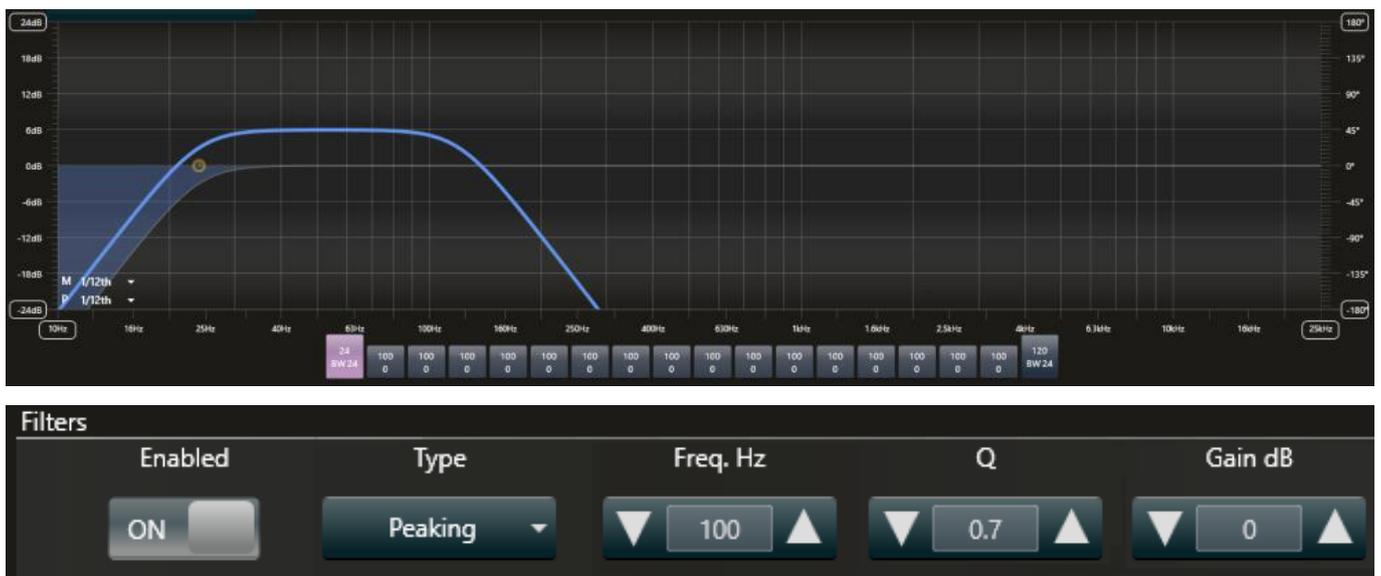
Some settings may bring to system instability and critical operating condition. The Safe Mode button provides a protection against critical settings: when activated, this function will not allow the output power to exceed a set limit (about 20W set on Power Limiter).



#### 15:2.3.6.Parametric equalizer

A fully parametric equalizer processing blocks are available to fine tune the system's sound.

Each individual selected filter can however be enabled switching on the on/off switch. A list of parameter presets of commonly used equalization schemes is available under Type combo box. For each kind of equalization, you can set Frequency, Q, Gain (when available) using the sliding box. A log scale diagram of each filter's effect is presented, the slider on filters allows real time variations of filter parameters such as the filter's central frequency, gain, Q.



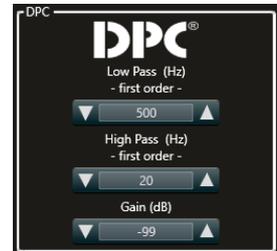
## 15:2.4. Pressure Model Operating Mode

The amplifier's output signal is modified in real time as a result of the combination of the input audio signal and the feedback loop. The alteration is applied to the input stage so to minimize the difference between the desired output and that measured and reported by interpolating two the feedback loops.

### 15:2.4.1. Pressure Control (pressure feedback loop)

This loop brings the pressure level measured at the radiating sound field, back to the input stage. This is achieved by feeding the pressure sensor measurement through a first order low pass filter (LPF) and a linear amplifier. The parameters that can be set by the user for this feedback-loop therefore are:

- ▶ The loop gain, expressed in dB and limited by the system's stability, defining the strength of the feedback effect;
- ▶ The LPF bandwidth, defining the top frequency of the band at which this feedback loop is active;
- ▶ The HPF bandwidth, defining the bottom frequency of the band at which this feedback loop is active.

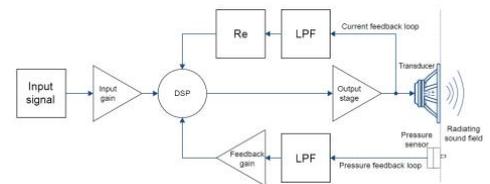


It is important to set the loop gain carefully, as too high a value will bring the system to instability. This results in a loud "ship's horn" sound which can potentially damage the system if not silenced after a short time. This can be done by lowering the feedback loop gain until the sound stops. The entire pressure feedback loop can be bypassed by entering

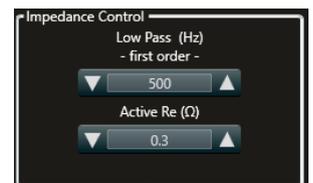
### 15:2.4.2. Impedance Control (current feedback loop)

This loop brings back a voltage signal proportional to the current present at the output stage to the system's input. The signal taken from the output is first filtered by a first order low pass filter. Following this step, the current/voltage translation is carried out by a virtual resistor named "Re". The importance of this series resistor relies in the difference between traditional transducers and M-Force.

M-Force has an extremely low impedance. This means that they manifest a violent, extremely high Q resonant peak which can result in an unnatural sound reproduction. By adding a virtual series resistor  $R_e$ , the entire system's resonant peak will be slightly flattened and widened in a way that mimics a traditional speaker's lower Q resonance. This resistor will however not affect the power transfer from input to output as this is not a "real" physical resistor subject to ohmic heating. The parameters the user can set for this feedback loop therefore are:

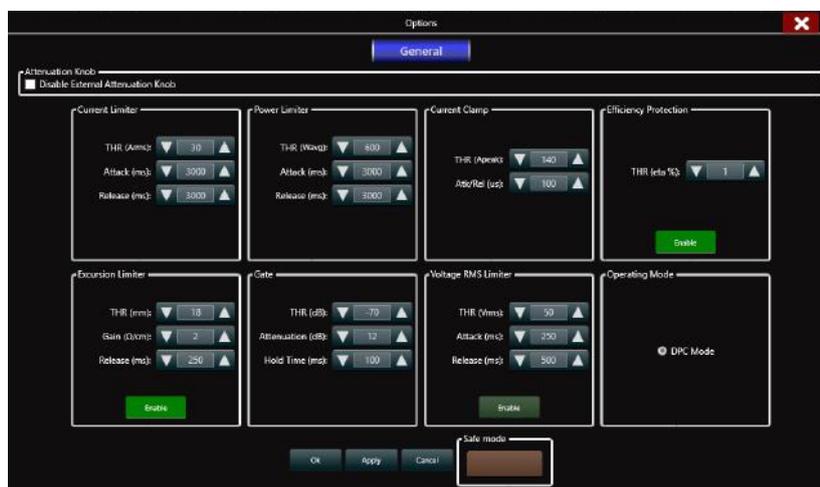


- ▶ The "added  $R_e$ " value, defining the additional series resistor inserted to simulate a traditional speaker behavior. This is usually a small number, which aims to return the apparent loudspeaker resistance to a traditional 2-4 Ohm value;
- ▶ The LPF bandwidth, defining the range of frequency at which this feedback loop is active.



## 15:2.5. Internal parameters

Click on the cogwheels button to access the Internal parameters window.



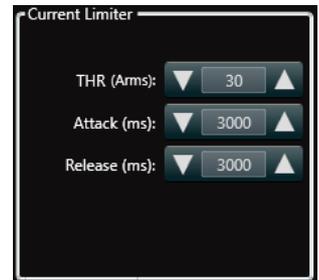
### 15:2.5.1.Disable External Knob

By clicking on this box is possible disabling the external attenuation knob, this must be done in case of external processor like DSP-4 connected to M-Drive.



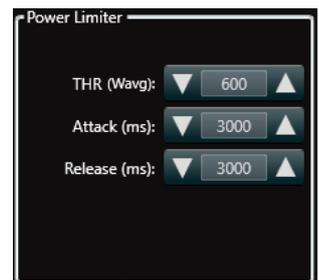
### 15:2.5.2.Current Limiter

Set a threshold limit and the attack/release time for the average (rms) output current.



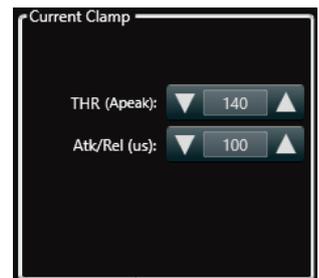
### 15:2.5.3.Power Limiter

Ensures that the real part of the average output power does not exceeds the limits set by the user.



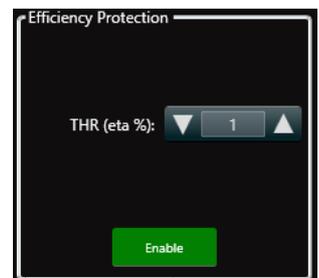
### 15:2.5.4.Current Clamp

The Current Clamp is a faster acting current limiter. Current Clamp is meant to limit spikes of current, effectively protecting the output stage and the connected loudspeaker from dangerous high peak current: this is different respect the short circuit protection that works by sensing decreasing rails values. The current threshold value does not indicate the maximum output current, but the current level at which the limiter will start sensing spikes of current. Output current level can exceed the clamp threshold considerably due to the internal limiter design.



### 15:2.5.5.Efficiency Protection

Set the minimum threshold limit of the measured efficiency that triggers the protections on the amp module. The pressure sensor continuously measures the acoustical output power developed by the diaphragm: when the acoustical output power falls under the expected output power, the efficiency of the system lower accordingly. This can be occasionally caused by a fault either in the amp module or in the transducer motor. Powersoft recommends to set the efficiency protection at least to 1/3 of the value of the reference loudspeaker efficiency (Ref eff. no%, see below). The value 0 (zero) switches off the efficiency protection. If the pressure sensor is not used, set the efficiency protection to 0 (zero).



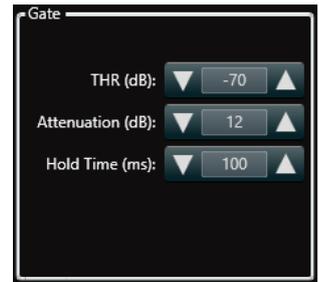
### 15:2.5.6.Excursion Limiter

The excursion limiter keeps the loudspeaker cone displacement within a user defined range. The threshold cone excursion is set in mm. The excursion limiter works through a current loop, dynamically changing the value of a resistance proportionally to the displacement of the cone with respect to its resting position. It is important to note that this position is estimated; its accuracy depends on the precision of the connected speaker physical parameters entered in the Physical Speaker Parameters section in the advanced parameters window (see below). The Gain (ohm/cm) parameter sets the displacement/resistance conversion factor, so as to regulate the intensity of the limiting effect. For a given cone displacement, a higher gain value yields a more severe limiting action. The release time determines the time needed for the limiter to release the cone. Please note that the maximum cone excursion set in this window only determines the cone displacement value that activates the effect of the limiter; it does not represent the maximum excursion the cone will display. The limiter's internal design allows for a certain margin between maximum displacement threshold value and effective cone displacement, the latter being potentially higher.



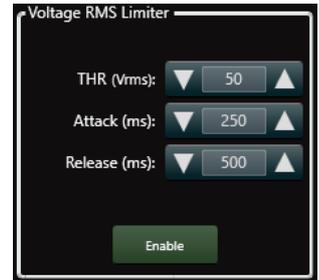
### 15:2.5.7.Gate

The system is equipped with a gate output block intended to improve the overall signal-to-noise ratio. The gate reduces the output gain for small signals interpreted as noise. The hold time indicates how long the gain reduction occurs after the output signal falls below the threshold. The attenuation parameter indicates the amount by which then output gain is decreased with respect to no attenuation. Note that the system gain changes slowly and not abruptly so the effect is unnoticeable.



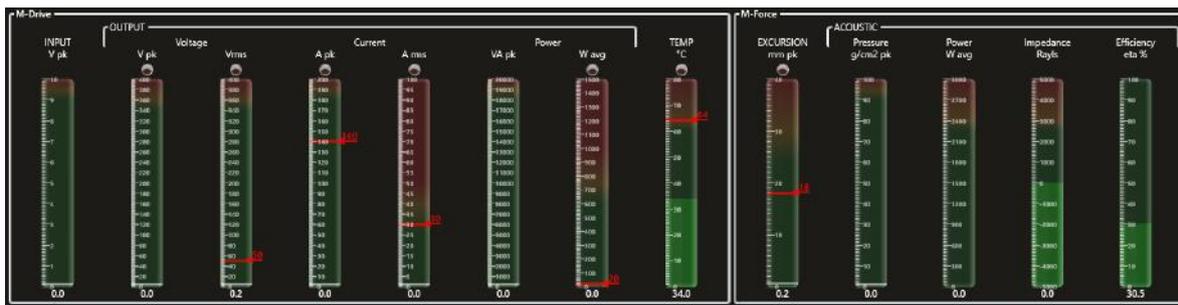
### 15:2.5.8. Voltage RMS Limiter

Set a threshold limit and the attack/release time for the average (rms) output voltage.



## 15:2.6.Metering

Metering are divided in two parts, one regarding M-Drive amplifier and one regarding the M-Force and loudspeaker volume. Where is present, the red line indicates the threshold level in according with respective limiter.



### 15:2.6.1.M-Drive metering

**Input ( $V_{pk}$ )** – Input peak voltage measured before input gain/attenuation processing: the meter therefore represents the signal level entering the system before any processing is performed.

**Output Voltage ( $V_{pk}$ )** – Output voltage peak level. The Limit red LED underneath the meter strip lights when the measured output voltage is being clipped to the system’s maximum possible voltage level.

**Output Voltage ( $V_{rms}$ )** – Output voltage rms level. The Limit red LED underneath the meter strip lights when the measured output voltage is being clipped to the system’s maximum possible voltage level. Red line refers to Voltage RMS Limiter threshold.

**Output Current ( $A_{pk}$ )** – Peak output current. The Limit red LED underneath the meter strip lights when the measured output peak current rises above the limit set in the current clamp threshold. Red line refers to Current Clamp threshold.

**Output Current ( $A_{rms}$ )** – Root mean square current value. The Limit red LED underneath the meter strip lights when the measured output average current exceeds the limit set in the current limiter threshold. Red line refers to Current Limiter threshold.

**Output Peak Power ( $VA_{pk}$ )** – Peak output power.

**Output Avarange Power ( $W_{avg}$ )** – Average output power. The Limit red LED underneath the meter strip lights when the measured average power rises above the limit set in the power limiter threshold section. Red line refers to Power Limiter threshold, when Safe mode is engaged, threshold set to 20W.

### 15:2.6.2.M-Force metering

**Excursion ( $mm_{pk}$ )** – Peak estimated cone excursion with respect to the central resting position. The Limit red LED underneath the meter strip lights when the estimated cone excursion goes beyond the limit set in the excursion limiter threshold section. Red line refers to Excursion Limiter threshold.

**Acoustic Pressure ( $g/cm^2_{pk}$ )** – Peak pressure level as measured by the pressure sensor.

**Acoustic Power ( $W_{avg}$ )** – Estimated average acoustic power.

**Impedance (Rayls)** – Estimated average acoustic impedance.

**Acoustic Efficiency ( $\%_{\eta}$ )** – Estimated acoustic efficiency.

### 15:2.7.Locking

Normally the manufacturer take care for locking this view after he finished loudspeaker tuning, since DSP processing is part of his know-how. When you enter in the Advanced view first time, no password required, by pressing Lock button first time, a pop up, where you can set password, will appear; until you press Lock button, M-Drive and so pam files exported remain not locked by password.

Make attention: password is saved on board M-Drive and in the pam file when you export it, only pam files with a same password than M-drive will open.

Each time you press Lock button you will pass to monitor view directly; if you want to pass again to advanced view you need to type the password for opening. Use monitor view button for closing the advanced view and return to Monitor view maintaining the M-Drive not locked by password, in this case if you want to pass again to advanced view, no password will be requested.

	M-Drive	Export Pam files
Not Locked M-Drive	M-Drive accepts all pam file from M-Drive not locked	Pam files compatible with all not locked M-Drive
Locked M-Drive	M-Drive accepts all pam file with the same locking password	Pam files compatible with M-Drive has same password
Change Password	Password changed only for M-Drive	Pam files previously exported from M-Drive with old password become not compatible.

## Support and warranty

### 16:1.Service

There are no user-serviceable parts in your amplifier. Refer servicing to qualified technical personnel. In addition to having an in-house service department, Powersoft supports a network of authorized service centers. If your amplifier needs repair contact your Powersoft dealer (or distributor). You can also contact the Powersoft Technical Service department to obtain the location of the nearest authorized service center.

### 16:2.Warranty

POWERSOFT guarantees its manufactured products to be free from defective components and factory workmanship for a period of 12 (twelve) months, starting from the date printed in the invoice of purchase.

All warranty repairs and retrofits must be performed at Powersoft facilities or at an Authorized Service Center at no cost for the purchaser. Warranty exclusion: Powersoft's warranty does not cover product malfunctioning or failure caused by: misuse, abuse, repair work or alterations performed by non-authorized personnel, incorrect connections, exposure to harsh weather conditions, mechanical damages (including shipping accidents), and normal wear and tear.

Powersoft will perform warranty services provided that the product is not damaged during transportation.

#### 16:2.1.Return of Goods

Goods can be returned to Powersoft only after they have been granted a Return Merchandise Authorization – RMA – number to be attached to the external packaging. Powersoft (or its Authorized Service Center) has the right to refuse any returned good without a RMA number.

#### 16:2.2.Repair or replacement

Powersoft reserves the right to repair or replace any defective goods covered by product warranty at its sole discretion and as it deems best.

#### 16:2.3.Cost and responsibility of transport

The purchaser (or end user/customer) is solely responsible for all transportation costs and risks associated with sending warranty covered goods to Powersoft or its Authorized Service Center. Powersoft will assume full responsibility and cover all costs incurred to send the goods back to the purchaser (or end user/customer).

### 16:3.Assistance

Even though most product malfunctioning can be solved at your premises through Powersoft Customer Care or your direct knowledge, occasionally, due the nature of the failure, it might be necessary to return defective products to Powersoft for repair. In the latter case, before shipping, you are kindly asked to follow step by step the procedure described below:

- ▶ Obtain the “Defect Report Form” by contacting our Customer Care Department via email: [service@powersoft.it](mailto:service@powersoft.it) or download the “Defect Report Form”.
- ▶ Fill out one “Defect Report form” for each returned item (the form is an editable tab guided document) and save as your name, amp model and serial number (for example: distributorname-MDRIVE-17345.doc) providing all required information except the RMA code/s and send it to [service@powersoft.it](mailto:service@powersoft.it) for Powersoft approval.
- ▶ In case of defect reports approved by the Powersoft Customer Service Representative you will receive an RMA authorization code (one RMA code for each returning device). Upon receiving the RMA code you must package the unit and attach the RMA code outside the pack, protected in a waterproof transparent envelope so it is clearly visible.

All returning items must be shipped to the following address:

Powersoft S.p.A.  
Via Cadolingi, 13  
50018 Scandicci (FI) Italy

In case of shipment from countries NOT belonging to the European Community make sure you have also followed the instructions described in the document available for download at the TEMPORARY EXPORTATION / IMPORTATION PROCEDURE link at <http://www.powersoft-audio.com/en/support/service>.

Thank you for your understanding and cooperation and continued support as we work to improve our partnership.

# Specifications

# 17

## General

Number of channels	1 in / 1 out
Output power	
2 $\Omega$	14970 W
4 $\Omega$	9170 W
8 $\Omega$	4930 W
Max output voltage	310 V <sub>peak</sub>
Max output current	200 A <sub>peak</sub>

## Power Supply

Maximum Mains Continuous Power	@ 240 V <sub>ac</sub>	@ 120 V <sub>ac</sub>
	5500 W <sub>avg</sub>	4000 W <sub>avg</sub>
Stored Energy Available for Output Stages	520 J (26 kW in 20 ms)	
Maximum Long Term Power (thermal limit)	2000 W <sub>avg</sub>	

## Audio

Gain	32 dB
Frequency response	20 Hz - 250 Hz @ 1 W, 2 $\Omega$
S/N ratio (A weighted)	115 dB
Output Noise Floor (A weighted) @ 4 $\Omega$ (input terminated on 600 $\Omega$ )	2 mV <sub>rms</sub>
Input sensitivity @ 8 $\Omega$	3 V <sub>rms</sub> / 11.7 dBu
Input impedance	10 k $\Omega$ balanced

## AC Mains Power

Power supply	Universal, regulated switch mode with PFC	
Nominal power requirement	AC 100 V - 240 V, 50/60 Hz	
Operating voltage	AC 90 - 264 V	
Power factor	cos $\phi$ > 0.9 @ 4 $\Omega$ full power	
Fan plug (+12 V), max current draw	100 mA	
Consumption	@ 115 V	@ 230 V
Idle	23 W	27 W
1/8 of max output power @ 8 $\Omega$	745 W	760 W
1/8 of max output current @ 8 $\Omega$	6.6 A	3.9 A
Thermal Dissipation		
1/8 of max output power @ 8 $\Omega$	436 BTU	490 BTU

## Construction

Dimensions (L x W x H)	400 mm x 150 mm x 70 mm 15.75" x 5.90" x 2.75"
Weight	4.85 kg (10.67 lb)

## Reference Standard

Vibration	
EMC immunity	EN 55103-2:2009
EMC emissions	EN 55103-1:2009, EN 55103-1:2009/A1:2012
EMC other	EN 61000-3-2:2014 EN 61000-3-3:2013 EN 61000-3-11:2000
Safety standards	EN 60065:2014 EN 60065:2014/AC:2016



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Service & maintenance: [service@powersoft.com](mailto:service@powersoft.com)  
Compliance questions: [compliance@powersoft.com](mailto:compliance@powersoft.com)

[powersoft-audio.com](http://powersoft-audio.com)