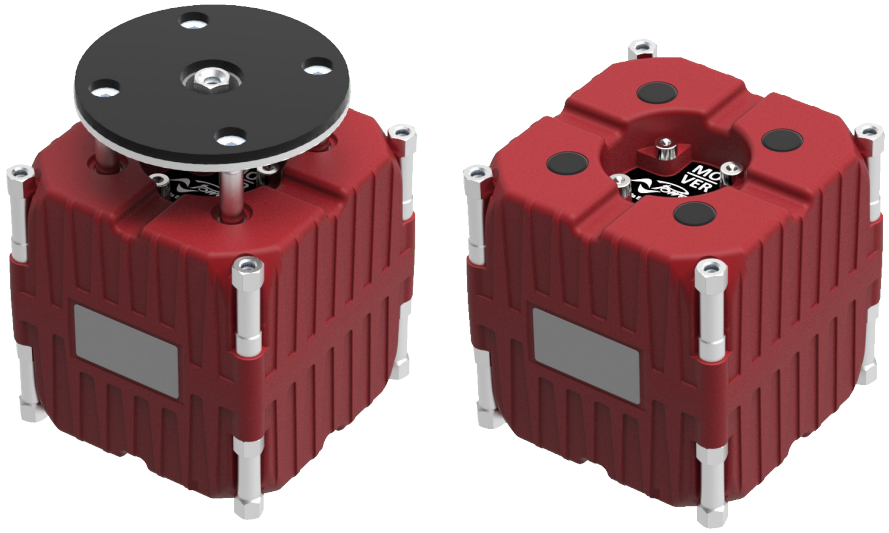
MOVER



USER GUIDE

DO000269.00 Rev. 00

Keep this manual
for future reference

DO000269.00_powersoft_MOVER_UG

Table of contents

Important safety instructions

1

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 INDICATING THAT THE EQUIPMENT IS FOR INDOOR USE ONLY.

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

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.

DO NOT SPILL WATER OR OTHER LIQUIDS INTO OR ON THE TRANSDUCER.

NO NAKED FLAME SOURCES SUCH AS LIGHTED CANDLES SHOULD BE PLACED ON THE TRANSDUCER.

WARNING TO PREVENT INJURY, THIS APPARATUS MUST BE SECURELY ATTACHED TO THE FLOOR/WALL IN ACCORDANCE WITH THE INSTALLATION INSTRUCTIONS.

DISCONNECT THE DC SOURCE BEFORE ATTEMPTING TO CLEAN ANY PART OF THE AMPLIFIER

IT IS HIGHLY RECOMMENDED TO UNPLUG THE OUTPUT CONNECTORS BEFORE PROCEEDING WITH THE SELF CHECK PROCEDURE

TAKE CARE TO LOCK THE TERMINAL BEFORE SWITCHING THE DEVICE ON.

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.
- Keep these instructions.
- Heed all warnings.
- Follow all instructions.
- Do not use this equipment near water.
- Clean only with a dry cloth.
- Do not block any ventilation openings. Install in accordance with the manufacturer’s instructions.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus that produce heat.
- Only use attachments/accessories specified by the manufacturer.
- Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.

- Unplug this apparatus during lightning storms or when unused for long periods of time.
- 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.

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.

Consignes de sécurité importantes

2

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.

LA MARQUE CE INDIQUE LA CONFORMITÉ DU PRODUIT À TOUTES LES DIRECTIVES EUROPÉENNES EN VIGUEUR

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).

NE PAS UTILISER PAS L'APPAREIL À DES ALTITUDES AU-DESSUS DE 2 000 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.

NE PAS RENVERSER D'EAU OU D'AUTRES LIQUIDES DANS OU SUR LE TRANSDUCTEUR.

AUCUNE SOURCE DE FLAMME NUE COMME DES BOUGIES ALLUMÉES NE DOIT ÊTRE PLACÉE SUR LE TRANSDUCTEUR.

AVERTISSEMENT POUR PRÉVENIR LES BLESSURES, CET APPAREIL DOIT ÊTRE SOLIDEMENT FIXÉ AU SOL / MUR EN CONFORMITÉ AVEC LES INSTRUCTIONS D'INSTALLATION.

CET APPAREIL DOIT ÊTRE ALIMENTÉ EXCLUSIVEMENT PAR RACCORDS DE SECTEUR CONNECTÉS À LA TERRE DANS DES RÉSEAUX ÉLECTRIQUES CONFORMES AUX NORMES CEI 364 OU AUX RÈGLES SIMILAIRES

DÉCONNECTER LA SOURCE DC AVANT DE TENTER TOUT NETTOYAGE DE L'AMPLIFICATEUR

VEILLER À VERROUILLER LA BORNE AVANT D'ALLUMER L'APPAREIL.

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.

- Lire ces instructions.
- Conserver ces instructions.
- Tenir compte de tous les avertissements.
- Suivre toutes les instructions.
- Ne pas utiliser cet équipement près de l'eau.
- Nettoyer uniquement à l'aide d'un chiffon sec.
- Ne bloquer aucune bouche d'aération. Installer conformément aux instructions du fabricant.
- Ne pas installer à proximité de sources de chaleur telles que radiateurs, bouches de chaleur, poêles ou autres appareils produisant de la chaleur.
- Utiliser uniquement les fixations/accessoires spécifiés par le fabricant.
- Utiliser uniquement avec le chariot, le support, le trépied, l'étrier ou la table spécifiée par le fabricant ou vendus avec l'appareil. Lorsqu'un chariot est utilisé, faire attention pendant le déplacement du bloc chariot/appareil pour éviter les blessures causées par un renversement.

- Débrancher cet appareil pendant les orages ou lorsqu'il n'est pas utilisé pendant de longues périodes.
- Confier toute réparation à un technicien qualifié. Un entretien est requis lorsque l'appareil a été endommagé de quelque façon que ce soit, par exemple un cordon d'alimentation ou une prise endommagée, du liquide qui a été renversé ou des objets qui sont tombés dans l'appareil, si l'appareil a été exposé à la pluie ou à l'humidité ou s'il est tombé.

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

CONTACTER LE CENTRE DE SERVICE AUTORISE 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.

Importantes Instrucciones de Seguridad

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.

LA MARCA CE INDICA LA CONFORMIDAD DEL PRODUCTO CON TODAS LAS DIRECTIVAS EUROPEAS APLICABLES

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).

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.

NO DERRAME AGUA U OTROS LÍQUIDOS DENTRO O SOBRE EL TRANSDUCTOR.

NO DEBEN COLOCARSE FUENTES DE LLAMAS DESCUBIERTAS TALES COMO VELAS ENCENDIDAS SOBRE EL TRANSDUCTOR.

ADVERTENCIA: PARA EVITAR DAÑOS, ESTE APARATO DEBE ESTAR ADHERIDO DE FORMA SEGURA AL SUELO/PARED CONFORME A LAS INSTRUCCIONES PARA SU INSTALACIÓN.

DESCONECTE LA FUENTE DC ANTES DE INTENTAR LIMPIAR CUALQUIER PARTE DEL AMPLIFICADOR

SE RECOMIENDA ALTAMENTE DESENCHUFAR LOS CONECTORES DE SALIDA ANTES DE CONTINUAR CON EL PROCEDIMIENTO DE AUTO CHEQUEO

ASEGÚRESE DE CERRAR EL TERMINAL ANTES DE ENCENDER EL DISPOSITIVO.

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.

- Lea estas instrucciones.
- Mantenga estas instrucciones.
- Tenga en cuenta todas las advertencias.
- Siga todas las instrucciones.
- No use este equipo cerca del agua.
- Limpie solamente con un paño seco.
- No bloquee las aberturas de ventilación. Instale en conformidad con las instrucciones del fabricante.
- No instale cerca de ninguna fuente de calor tales como radiadores, registradores de calor, cocinas u otros aparatos que produzcan calor.
- Use solo complementos/accesorios especificados por el fabricante.
- Use solo con el carrito, estante, trípode, anaquel o mesa especificados por el fabricante o vendidos con el aparato. Cuando se usa un carrito, tenga cuidado al MOVER la combinación de carrito/aparato y así evitar daños en caso de que se caiga.

- Desenchufe este aparato durante una tormenta eléctrica o cuando no se use por largos períodos de tiempo.
- Refiera todo el mantenimiento a personal calificado. Se requiere de servicio cuando el aparato ha sido dañado en cualquier forma, tales como enchufes o cables de suministro de energía eléctrica dañados, que se haya derramado líquido u objetos hayan caído dentro del aparato, que el aparato haya sido expuesto a la lluvia o humedad, que no funcione normalmente o que este se haya caído.

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

4

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.

IL MARCHIO CE INDICA CHE IL PRODOTTO È CONFORME A TUTTE LE DIRETTIVE EUROPEE APPLICABILI

SIMBOLO PER IL COLLEGAMENTO DELLA MESSA A TERRA.

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

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

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.

NON VERSARE ACQUA NE' ALTRI LIQUIDI ALL'INTERNO O SOPRA AL TRANSDUTTORE.

NON SI DEVONO POSIZIONARE FIAMME LIBERE QUALI CANDELE ACCESE SUL TRANSDUTTORE.

ATTENZIONE PER EVITARE LESIONI IL DISPOSITIVO DEVE ESSERE FISSATO IN MODO SICURO AL PAVIMENTO/ALLA PARETE ATTENENDOSI ALLE ISTRUZIONI DI INSTALLAZIONE.

SCOLLEGARE L'ALIMENTAZIONE DC PRIMA DI PULIRE QUALSIASI PARTE DEL TRANSDUTTORE

SI CONSIGLIA VIVAMENTE DI SCOLLEGARE I CONNETTORI DI USCITA PRIMA DI PROCEDER CON LA PROCEDURA DI AUTOCONTROLLO

FARE ATTENZIONE A BLOCCARE IL MORSETTO DI USCITA PRIMA DI ACCENDERE IL DISPOSITIVO.

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.

- Leggere queste istruzioni.
- Conservare queste istruzioni.
- Prestare attenzione a tutti gli avvertimenti.
- Seguire tutte le istruzioni.
- Non utilizzare il dispositivo vicino all'acqua.
- Pulire esclusivamente con un panno asciutto.
- Non ostruire le aperture per la ventilazione. Installare il dispositivo attenendosi alle istruzioni del produttore.
- Non installare vicino a fonti di calore quali radiatori, termoregolatori, stufe o altri apparecchi che producono calore.
- Utilizzare esclusivamente gli attacchi/accessori specificati dal produttore.
- Utilizzare solo il carrello, il supporto, il cavalletto, la staffa o il tavolino specificati dal produttore, o venduti con il dispositivo. Se si utilizza un carrello, prestare attenzione quando si sposta la combinazione carrello/apparecchio per evitare danni alle persone causati dal ribaltamento.

- Scollegare il dispositivo durante i temporali o quando rimane inutilizzato per lunghi periodi del tempo.
- Per la manutenzione e l'assistenza rivolgersi a personale tecnico qualificato. Gli interventi di manutenzione e di riparazione sono necessari quando il dispositivo è stato danneggiato in qualsiasi modo, come ad esempio se il cavo di alimentazione o la spina sono stati danneggiati, se è stato versato del liquido o sono caduti oggetti sul dispositivo, se il dispositivo è stato esposto a pioggia o a umidità, se non funziona in modo normale o se caduto.

IL PRODUTTORE DECLINA OGNI RESPONSABILITA' 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.

Electrostatic Discharge (ESD)

5

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.

Introduction

6

6 : 3.Welcome

Thank you for purchasing the Powersoft Mover, the most efficient tactile transducer in the world!

The MOVER is a patented low-frequency direct drive/tactile transducer.

Through haptic perception, the human body can pick up the most minute vibrations, and bone conduction stimulates the inner ear which translates these into perceivable frequencies, thus allowing for deeper, richer sound experiences.

Despite its compact design, the MOVER packs a serious punch, allowing for scalability in larger projects, as well as miniaturization in more circumscribed setups.

Its uses are not confined to the audio realm: vibrating floors and warning systems are examples of other possible applications.

The MOVER is extraordinarily efficient, meaning that it can be easily coupled with a surface, to work its magic. Low signals are not a problem for us!

For more efficiency and more dramatic effects, it can also be used in direct drive applications. Here it is anchored to an immovable surface, and the moving magnet is connected to a movable surface, such as a floating floor or a chair.

As an example; 4 motors in parallel can drive a big platform with 16 people using a total power of 100 W at 5 Hz to simulate riding a bus!

6 : 4.MOVER in a nutshell:

- ▷ Very high-power tactile transducer.
- ▷ High efficiency.
- ▷ High mechanical power.
- ▷ High-quality neodymium magnet
- ▷ Very high ratio between moving mass and total mass.
- ▷ Compact design.
- ▷ Ultra-Low frequency extension.
- ▷ No mounting plane limitations.
- ▷ Adaptable for various purposes.
- ▷ Two versions available with different impedances, depending on usage conditions.
- ▷ External coupler allows to connect the transducer's moving mass to the receiving surface.
- ▷ Thermal protection: internal thermal switch.

Extremely versatile, just some examples of application:

- ▷ 4D cinemas
- ▷ High end home cinemas
- ▷ Vibrating acoustic floors
- ▷ Theme parks
- ▷ Gaming
- ▷ Industrial applications

Visit our website: www.powersoft.com

6 : 1.Disposal of the packing material

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

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

6 : 2.Unpacking and checking for shipping damage

Your Powersoft Mover has been completely tested and inspected before leaving the factory. Carefully inspect the shipping package before opening it, and the immediately inspect internal foams and the products. If you find any damage notify the shipping company immediately.

Important safety precautions

7

7 : 1.General Precaution

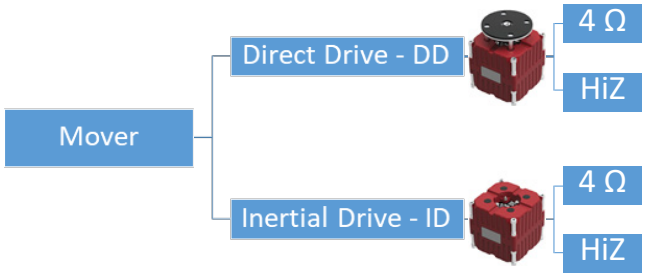
PACKAGING	
DO NOT DROP MOVER	Impacts can damage MOVER: Warranty will be void if signs of impacts will be detected.
PERMANENT MAGNETIC FIELD	External magnetic field: 0.1 T @ 10 mm from the shell. Do not use electronic devices and magnetic cards close to the Mover. Do not place the Mover in proximity to tube TV/Video monitors. Be careful when using tools around the Mover. Be careful when handling more than one Mover at a time outside boxes: take Movers at least 80 mm far one from each other.
USE MOVER IN CLEAN ENVIRONMENT	Do not expose MOVER to serious presence of dust and particles. Do not use MOVER in presence of ferromagnetic particles.
USE MOVER IN DRY ENVIRONMENT	Do not expose MOVER to liquid spry. Do not immerge MOVER in liquids.
DO NOT OPEN MOVER	Do not try to open MOVER for any reason! Risk of serious injury. Risk to damaging the unit. Warranty void if open or altered.
STORAGE	When not in use, keep MOVER adequately protected, in a dry place. If possible use its original package to store MOVER.
CONNECT WIRE WITH RIGHT POLARITY	Rating label attached to one side of MOVER, shows the direction of the moving mass if a DC current is applied.
USE INDICATED TORQUES FOR SCREWS	Use only torques indicated in this manual to fix the Mover to your devices.
DO NOT INSTALL MOVERS TOO CLOSE ONE FROM EACH OTHER	Install MOVERs at least 100 mm far one from each other
DO NOT OVERLOAD TOP PLATE	Do not pile Movers one over another. Do not load the top plate more than 15 N without an appropriate external suspension system.
USE EXTERNAL SPRING SYSTEM (2)	If you are using a Mover DD, always consider an external suspension system (not provided), adequate to the external static load.
AVOID EXCESSIVE HEAT	Do not expose Movers to excessive heat, over than 60 °C (140 F) environmental temperature. Durability and performances of the units can diminish if they are used in an excessively warm environment.

Technical Data

8

7 : 2. Versions

The Mover is available in the market in 4 versions:



- Direct Drive MOVER
  With Direct Drive Mover (DD) the object to be moved is connected to the mover through its top plate.

- Inertial Drive MOVER
  With Inertial Drive Mover (ID) the mover is connected to the surface to be mover and transmits its vibrations directly through the unit's body.

- 4 Ω MOVER
  It is suggested to connect no more than one single Mover 4 Ω to one amplified channel

- HiZ MOVER
  It allows you to connect in parallel up to 4 Movers, driven by one amplified channel.

8 : 1.Technical Datasheet[1,2]

			Direct Drive MOVER		Inertial Drive MOVER	
						
Parameter	**Symbol**	**Unit**	**4 Ω - DD**	**HiZ - DD**	**4 Ω - ID**	**HiZ - ID**
Total Mass	M_{tot}	g	2570		2460	
		lbs	5.67		5.42	
Moving Mass	M_{ms}	g	1385		1275	
		lbs	3.05		2.81	
Mms/Mtot	--	--	0.54		0.52	
Nominal Impedance	$\|Z\|_{nom}$	Ω	4	12	4	12
Resonance frequency	F_s	Hz	≈ 40[3]			
Max Impedance at Fs	$\|Z\|_{max}$	Ω	≈ 18	≈ 50	≈ 18	≈ 50
Suspension Compliance	C_{ms}	mm/N	± 0.017			
		in/N	± 0.001			
Linear Mass Displacement	X_{max}	mm	± 6			
		in	± 0.24 (1/4)			
Peak Mass Displacement	X_{mech}	mm	± 10			
		in	± 0.39 (3/8)			
DC Resistance	R_e	Ω	3.5	8.9	3.5	8.9
Coil Inductance @ 100 Hz	L_e	mH	9	26	9	26
Nominal Bl	Bl	Tm	32	52	32	52
Motor Strength Factor	$(Bl)^2/R_e$	$(Tm)^2/W$	≈ 290			
Frequency Response		Hz	0 - 500			
Program Power	$Pe_{\_AVG}$	W	5 - 150			
Peak Power	$Pe_{\_Peak}$	W	625			

(1) Technical data are subject to change without notice. Typical values are reported.
(2) Technical data must be interpreted as typical.
(3) Fs differences between DD and ID, due to different masses, is negligible (< 2 Hz).
(4) AES2-2012 Power Rating: pink noise, 12 dB crest factor. Moving mass free, unloaded.

Data subject to change without notice.

8 : 2.Glossary

Name	Symbol	Description
Total Mass	M_{tot}	
Moving Mass	M_{ms}	It is the weight of the moving apparatus inside MOVER. It is very important in MOVER ID, compared with the total weight.
Mms/Mtot		The higher it is the more efficient is MOVER ID
Resonance frequency	$\|Z\|_{nom}$	It is the frequency where the maximum absolute impedance is detected. It is measured without loads on the moving mass of MOVER.
Nominal Impedance	$\|Z\|_{nom}$	
Max Impedance at Fs	F_s	It is the value of the absolute impedance at resonance frequency
Suspension Compliance (1)	C_{ms}	It is the reciprocal value of the spring stiffness. Suspensions in MOVER are magnetic and then strongly non-linear, displacement-dependant
Linear Mass Displacement	X_{max}	It is the displacement within the behaviour of MOVER is linear
Peak Mass Displacement	X_{mech}	It is the maximum allowed displacement before mechanical damages can occur
DC Resistance	R_e	Electric resistance in W measured at the terminal connectors of MOVER
Coil Inductance @ 100 Hz	L_e	It is the inductance of the coil, measured without the moving mass at 100 Hz.
Nominal Bl	Bl	It is the magnetic flux generated from an infinitesimal section of the electric wire with 1A current passing in it, multiplied per the wire length. Its unit is the Wb*m, but an equivalent unit is the N/A: force conversion factor.
Motor Strength Factor	$(Bl)^2/R_e$	It is directly proportional to the efficiency of the motor
Frequency Response	Hz	Suggested frequency range for MOVER. It can go further but with lower efficiency.
Program Power	$Pe_{\_AVG}$	Declared.
Peak Power	$Pe_{\_Peak}$	Standard AES2-2012
Fixed support (DD MOVER only)	n/a	It is the unmovable surface where MOVER is installed.
Moving object (DD MOVER only)	n/a	It is the part of your system to be moved by MOVER.
Connection plate (DD MOVER only)	n/a	It is the external connection disk present only in MOVER DD versions.
Suspension system (DD MOVER only)	n/a	It is a system of springs flanking your MOVERs DD, required to allow them to do their job.
Stiffness (DD MOVER only)	k	Stiffness or spring constant it is the ratio between force vs displacement of a spring. Measurement unit N/mm (force/displacement). It is in general considered linear and bidirectional (equal in compression and extension).
Total Stiffness (DD MOVER only)	k_{tot}	It is the total stiffnesses generated by all the springs present in your external suspension system.
Connection plate (DD MOVER only)	n/a	It is the external connection disk present only in MOVER DD versions.

8 : 3.How many MOVERs do I need?

There is no specific rule to calculate how many Movers you will need, because this number is strongly dependant on the desired effect, on loads acting on the Movers and other factors.
It is usually suggested to use at least one Mover DD/ID each 350 kg (770 lbs) if a strong vibration/movement effect is required.

Wiring and Amplification

9

9 : 1.Wiring

1. USE 2 poles WIRES.

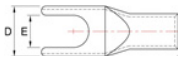
a. Suggested section: from 1.00 mm^2 to 1.5 mm^2;

b. AWG Rating: 16 or 18.

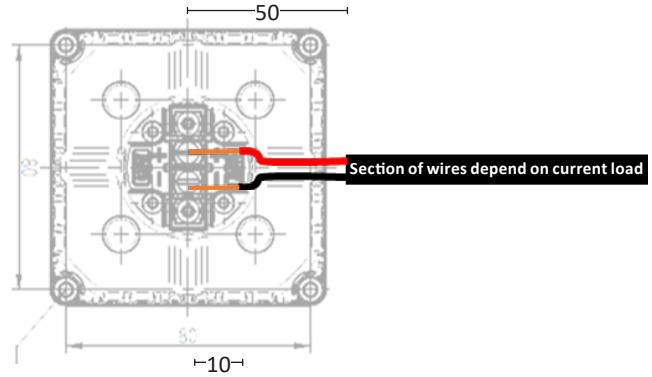
2. REMOVE MAIN WIRE'S SHEATH: 50 mm (2.0 in).

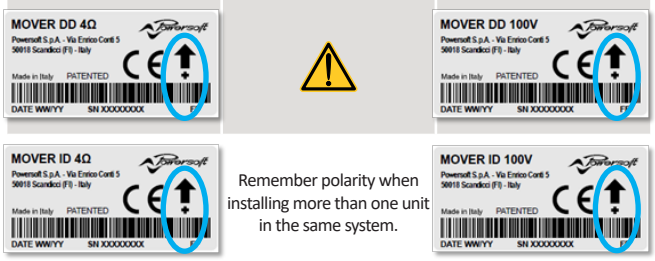
3. REMOVE SINGLE WIRES' SHEATHS: 10 mm (0.4 in – 3/8 in).

4. Use of crimp fork type terminal is recommended.



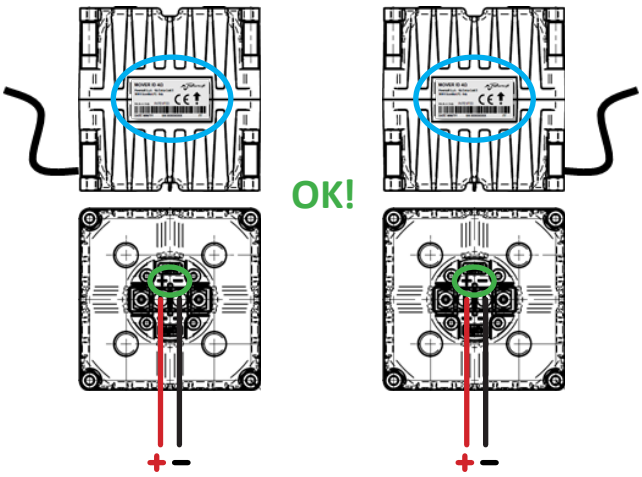
a: min 4 mm (0.16 in – 3/16 in)
b: max 8 mm (0.32 in – 5/16 in)



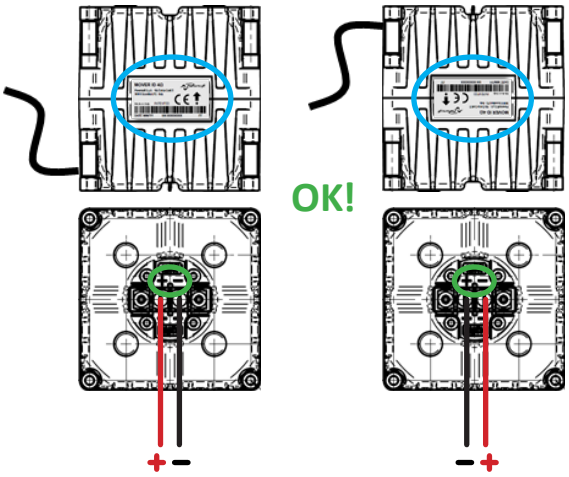


Remember polarity when installing more than one unit in the same system.

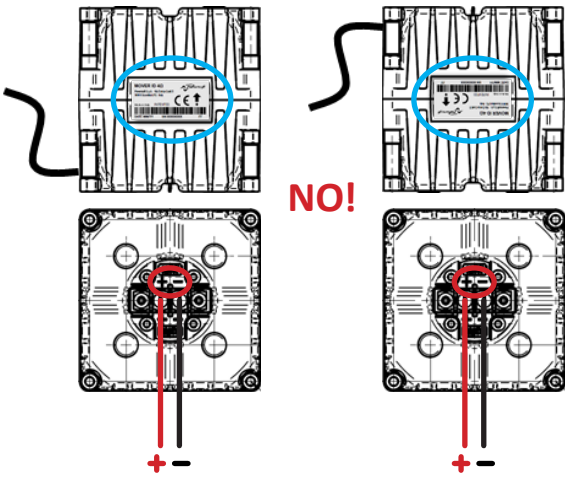
Example 1 - In phase Movers



Example 2 - In phase Movers



Example 3 - Error! Mover's phase is 180° one from the other



Amplification and Power Handling

10

10 : 1.Amplification

Powersoft CANALI DSP series amplifiers are strongly recommended to amplify the Mover.

Powersoft DSP amplifiers allow to handle the sub-harmonic generation, as explained in following dedicated paragraph.

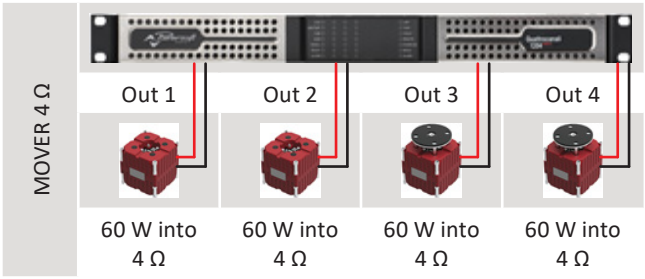
Power rating: 625 W (AES2-2012: pink noise signal, 12 dB crest factor).

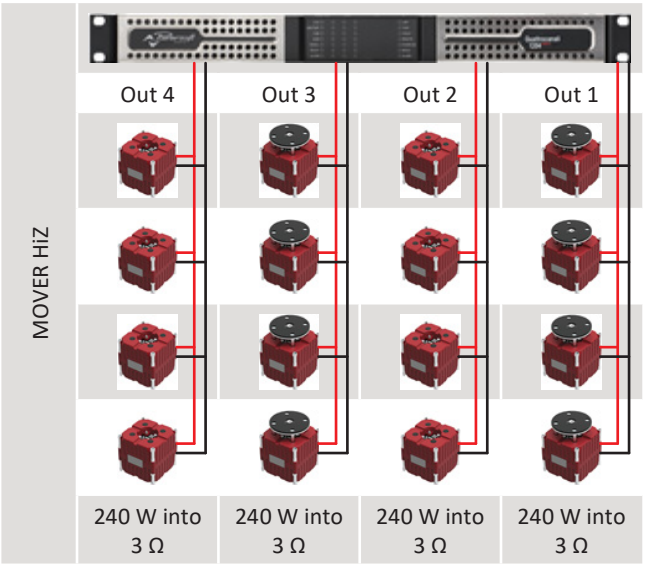
4 Ω and HiZ Movers have same power rating.

Movers 4 Ω is designed to be connected one to one to amplifier outputs.

Movers HiZ impedance allow to use one to four units in connected in parallel to one single amplifier outputs.

Following schemes show possible configurations of Movers linked to one Powersoft QUATTROCANALI amplifier.





10 : 2.Power Handling

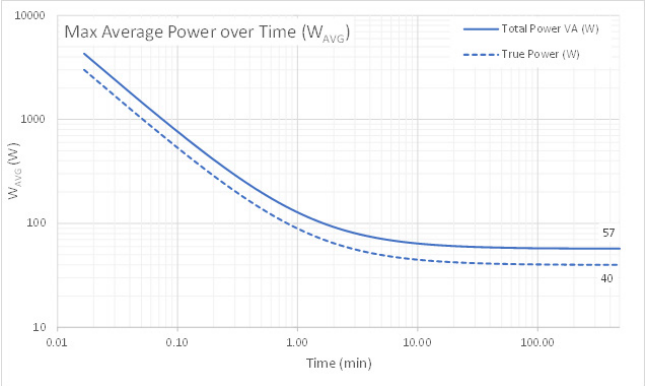
Both 4Ω and HiZ are rated for 625 W (AES2-2012). The

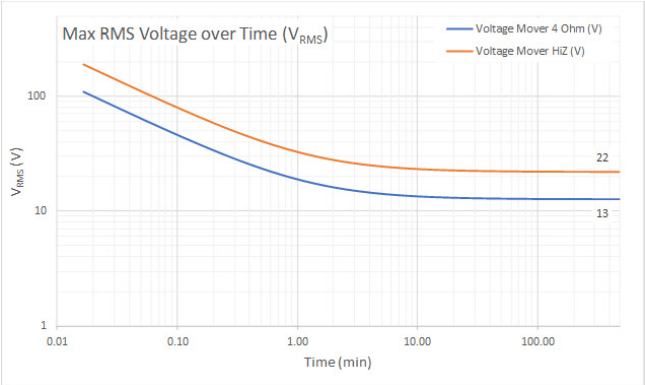
Following figures shows applicable max average power and max RMS voltage to one Mover.

Graphs are expressed function of time (minutes): do not exceed specified values in order to avoid sudden stop (thermal protection) or serious damages of the Mover.

Shown values must be scaled in case of using more than one unit connected in parallel from each other.

NB: following values must be considered at room temperature, 20 °C (68 F).





10 : 3.ArmoníaPlus | Harmonics

Introduction

The Harmonics feature extents the lo-freq content of your signal: it shifts down to one octave the original signal. The process is true real time

This feature is present in all DSP amplifiers and it is easily controlled through Armonia Plus. The processed signal is added and mixed to the original one, through a specific control panel.

Following instructions refer to ArmoniaPlus 1.3.1 Rev 242.

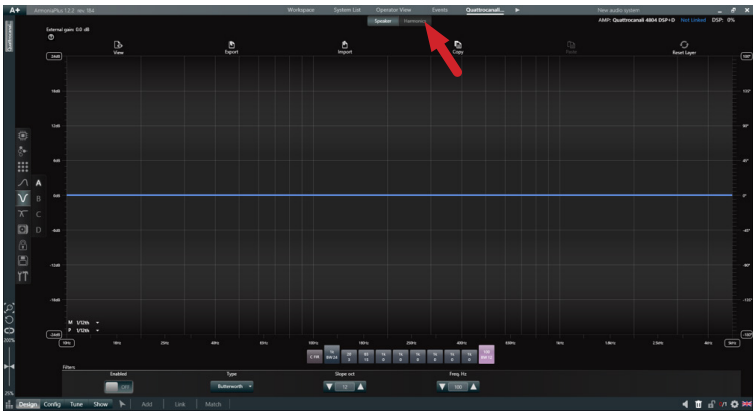
Signal

All signals are suitable to be processed by the Harmonics.

If you do not have sound below 100 Hz, no worries, we generate it for you! Just be sure to use our amplifiers and ArmoníaPlus!

How to enable Harmonics

The Harmonics feature is only active when a speaker type Mover is selected. The corresponding menu will appear in the Speaker Eq section, flanking the Speaker menu, as shown in following figure.



How Harmonics works

Following figure shows the Harmonics menu structure.

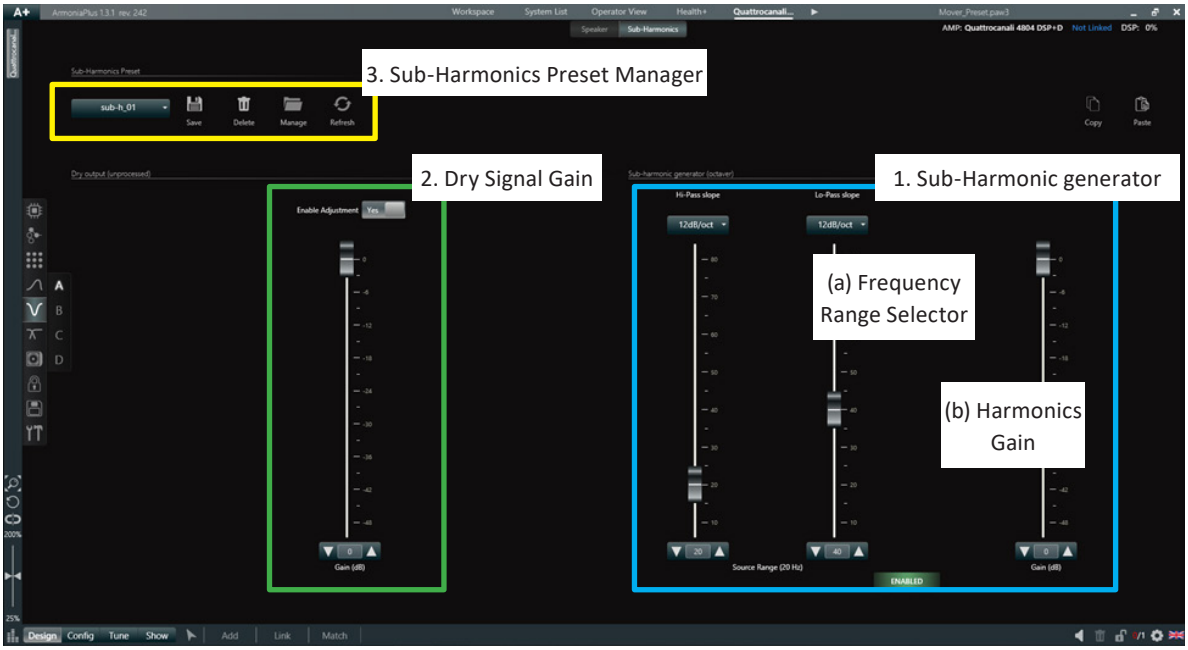
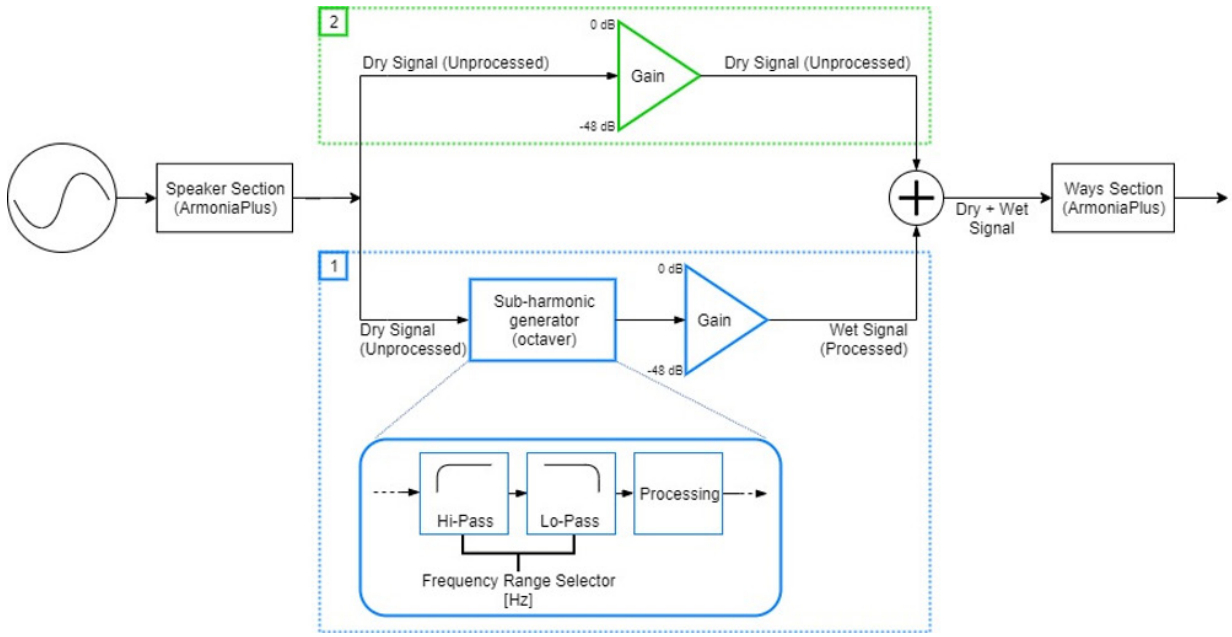


Figure below is a schematic representation of the “Sub-Harmonics” workflow in ArmoniaPlus.



1. Sub-Harmonic generator (octaver)

ENABLED Switches the sub-harmonics generator on.

DISABLED Switches the sub-harmonics generator off (Default).

a. Frequency Range Selector:

Using proper sliders, hi-pass and lo-pass filters can be set: resulting frequency band-width is processed with sub-harmonics.

hi/lo-pass slopes are adjustable.

A minimum bandwidth of 20 Hz is required.

b. Harmonics Gain:

Only works on the wet signal. It can be Use it together with the Dry Signal Gain in order to obtain the desired effect.

2. Dry Signal Gain

Only works on dry signal. It can be enabled or disabled using specific button.

Use it together with the Harmonics Gain in order to obtain the desired effect.

3. Harmonics Preset

Sub-Harmonics pre-sets can be managed from here.

1. Harmonics Preset: you can handle your preset from here

sub-h_02 List of saved presets.

Save button. Save your active configuration into a preset.

Delete button: delete active preset

Manage button: open the folder containing your saved presets

Refresh button: it only refreshes the list of presets

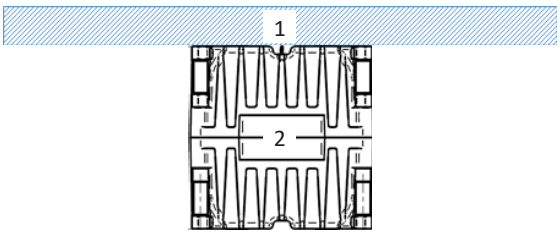
Mover ID - Integration instructions

11

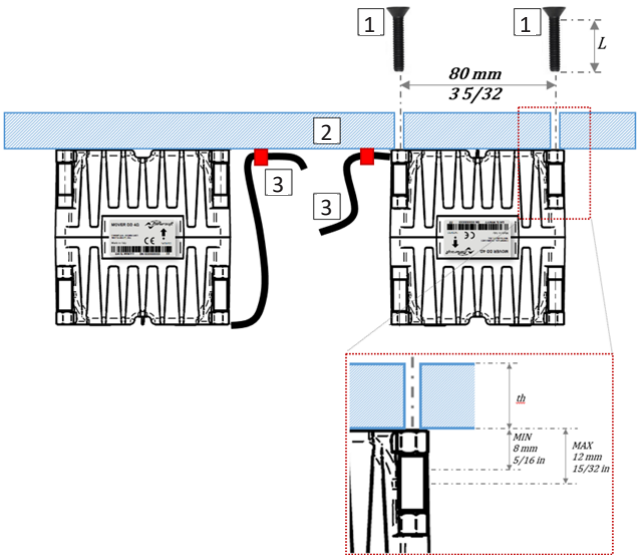
11 : 1.How to integrate your MOVER ID

The following figure shows a schematic representation of a possible integration design for the MOVER ID.

1. Moving Object
2. Mover ID



11 : 1.1. Practical instructions and precautions



1. **SCREWS**

Metric M5

Nominal length:

$$L = th + \begin{cases} 8 \text{ mm } (5/16 \text{ in}), & min \\ 12 \text{ mm } (15/32 \text{ in}), & max \end{cases}$$

where th=Thickness of the connection plate

2. **HOLES**

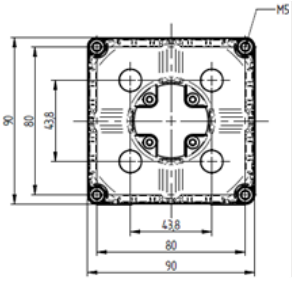
Diameter must be suitable for metric M5 screws

Centre-to-centre distance: 80 mm or 3 5/32 in (see Mechanical Drawings for more details)

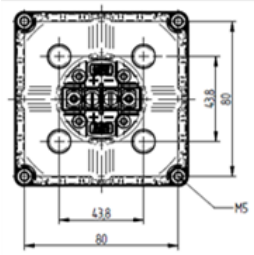
3. **WIRING**

Fix wires to the structure where the Mover ID. This is to avoid damages on wires due to vibrations. Keep in mind what explained in previous section Polarity.

11 : 1.2. Max Torque on mounting screws



- **4 x M5** metric screws required to fix the Mover to an immovable object from too connection points
- **MAX TORQUE**: **4 Nm** (35 lbf·in)



- **4 x M5** metric screws required to fix the Mover to an immovable object from bottom connection points
- **MAX TORQUE**: **4 Nm** (35 lbf·in)

Dimensions expressed in mm.

Mover DD - Integration instructions

12

12 : 1.Introduction and general rules

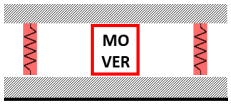
Mover DD it is unique, not as any other shaker in the market, because it physically pushes and pulls objects, generating a real punch sensation and force perception, when needed. Its external connection plate is joined to the Mover's moving mass, transforming it into a hybrid transducer, between a shaker and an actuator. Using the Mover DD brings you great advantages in terms of perceived vibrations:

- The object to be moved is directly connected to the moving apparatus of the Mover, that allows real punch when needed.
- The natural delay (at least half wavelength) given by traditional inertial shakers is eliminated.
- The efficiency of the Mover is fully used.

A special design is required to maximize the performance of your system with the Mover DD.

Carefully follow instructions below to properly install your Mover: a correct installation assure you the maximum performances of the transducer, avoiding the possibility of damages.

The integration of MOVER DD into your project can be schematized as shown in following figure.

OBJECT TO BE MOVED	It can be a chair, a floor tile, an armchair, etc...
	MOVER SYSTEM
FIXED SURFACE	An architectural surface, such as a floor or a wall: it must be unmovable.

The MOVER DD integration have almost same characteristics for all the project where you are going to install our transducer.

- **OBJECT TO BE MOVED**:
  - o Cinema chair
  - o Roller coaster seat
  - o Floating floor element
  - o Free your fantasy!

- **MOVER DD SYSTEM**
  - o Mover DD
  - o Flanking suspension system
  - o Eventual end-of-stroke system

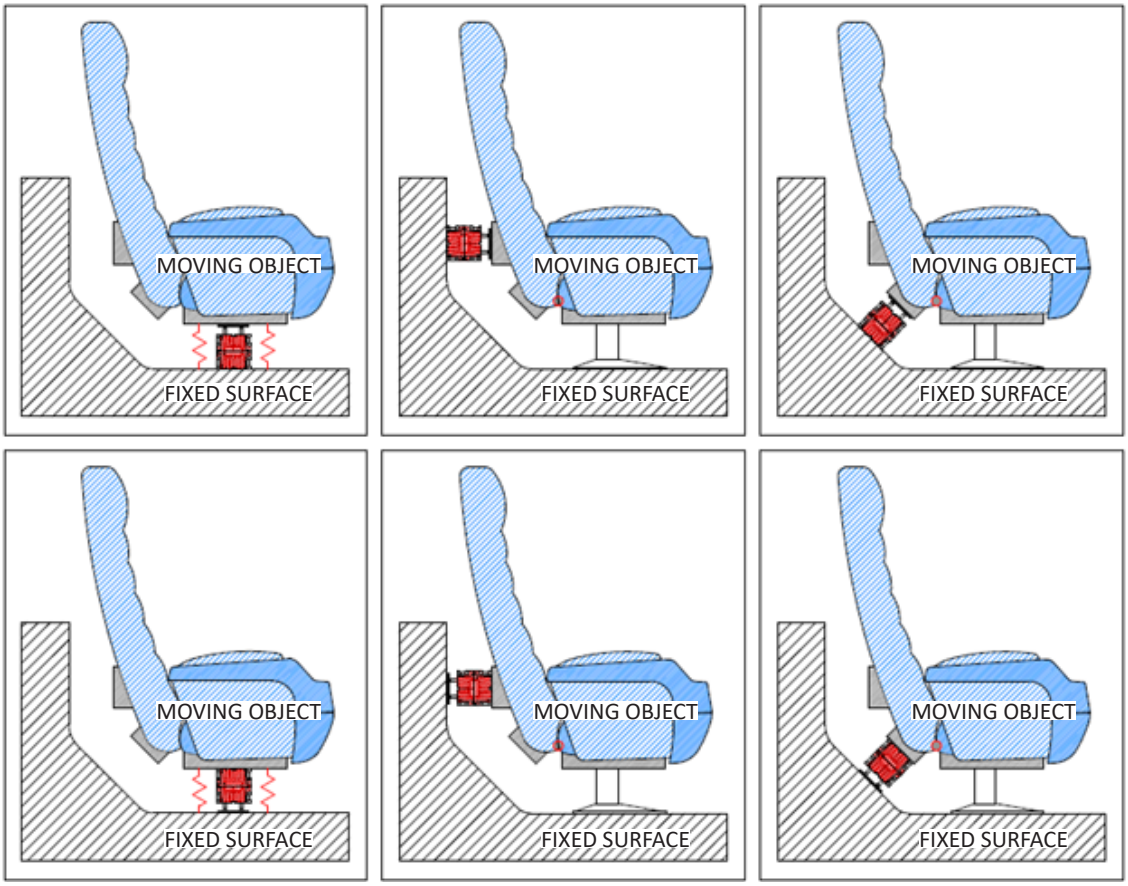
- **FIXED SURFACE**
  - o Concrete cinema balconies/floor
  - o Roller coaster chassis
  - o Concrete floor
  - o Be creative

Thanks to its mechanical solutions, the Mover presents wide range of possible integrations, without orientation limits.

The figure below shows some samples of integration for the Mover DD: only a cinema application is shown, but same integration principles further explained are valid for all kind of application you are thinking about:

- Cinema seats
- Moving Floors
- Roller Coasters seats
- Theme parks rides

Consider the following figures just as schematic samples

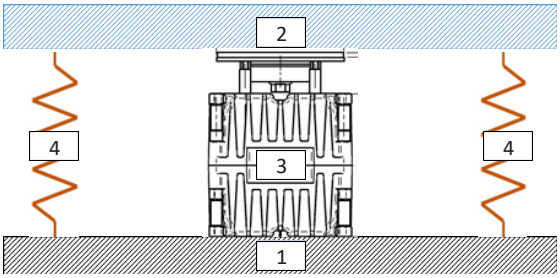


Vertical Axis Mount	Horizontal Axis Mount	Oblique Axis Mount
Best punch effect can be achieved installing MOVER under the seat itself. An external suspension system is mandatory. MOVER can be installed upside down also, but consider the polarity.	Punch effect arrives from your back, but legs and body are less influenced. Effect increases if MOVER is closer to the head position of the spectator. A hinge between seat and seatback can enhance the shaking effect. An external suspension system is not needed if the chair has its own support. MOVER can be installed upside down also, but consider the polarity.	Special applications can require an oblique positioning of MOVER. Effect increases if MOVER is closer to the head position of the spectator. An external suspension system is not needed if the chair has its own support. MOVER can be installed upside down also, but consider the polarity.

12 : 2.How to integrate your MOVER DD

Following figure show a schematic representation of a possible integration design for MOVER DD.

1. Fixed part
2. Moving object
3. MOVER DD
4. Suspension system



12 : 1.1. Fixed part

A fixed part is mandatory to use the Mover DD, it is part of your project and it can be whatever you want, but it must be immovable (e.g. a concrete floor or concrete steps, the chassis of a roller coaster). This part must be relatively fixed with respect of the connection plate of the Mover DD itself, that in fact moves.

It is not influenced by the Mover, nor influences the Mover itself.

Be sure to use appropriate fixing system for the Mover .

12 : 1.2. Moving Object

It is the object to be moved by the MOVER DD. Its weight strongly influences the Mover system, especially following parts:

a) Total stiffness of the suspension stiffness.

b) Resonance frequency of the Movers

c) Possible need of end-of-stroke bumpers (i.e. a floor with dancing/jumping people)

12 : 1.3. MOVER DD

It is the motor of your system.

12 : 1.4. Suspension system

It is mandatory using the Mover DD.

You can easily find the right solution for your system following instructions in Annexes 1 and 2.

Two design steps are requested:

1. Define external loads:

Structural: a chair, a floor tile… they constitute the constant loads in your design.

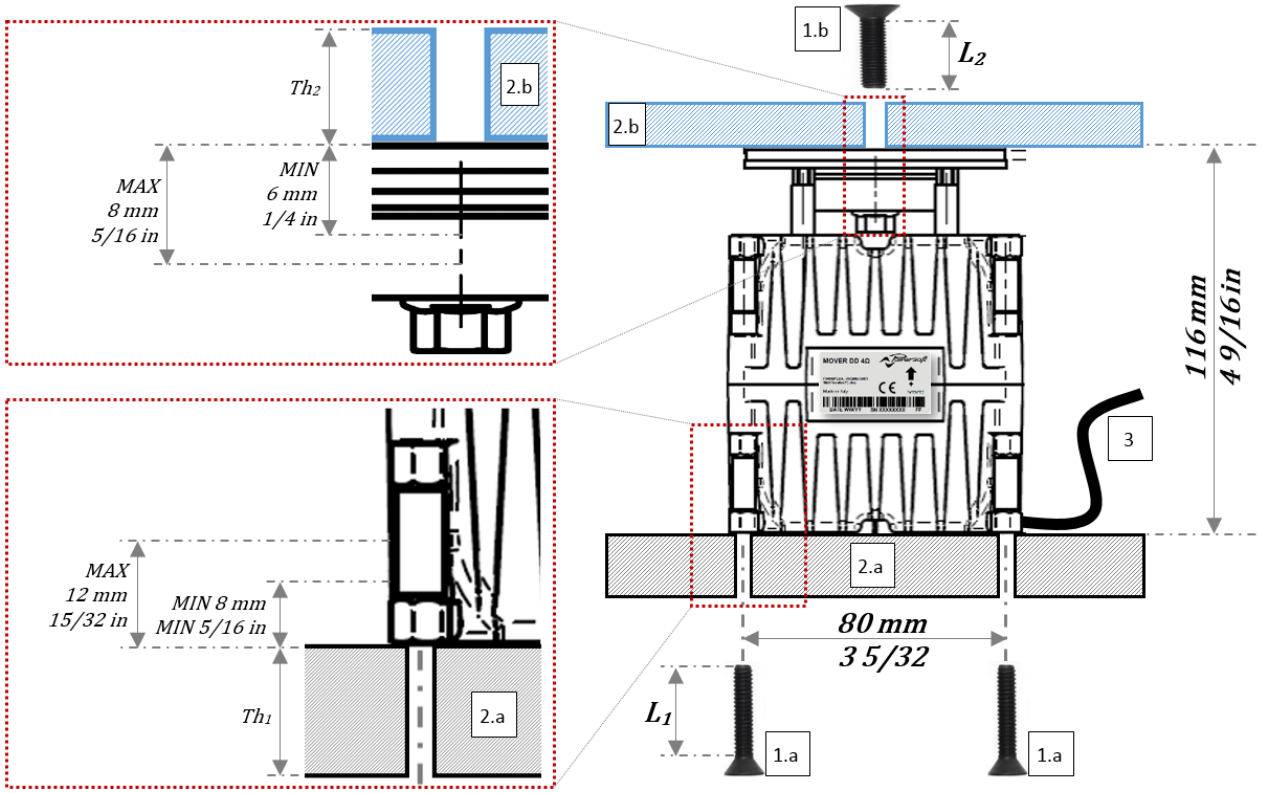
Variable loads: people! Calculate how many people can be moved by a single MOVER.

2. Stiffness of the suspension system:

It depends on external loads and you can calculate how much stiff must be the suspension system using a bit of theory in ANNEX 1 and charts in ANNEX 2.

The suspension system will shift down the resonance frequency from nominal 39 Hz to 15±3 Hz.

12 : 3.Practical instructions and precautions



1. SCREWS

a. Metric M5 x L_1

b. Metric M6 x L_2

$$L_1 = th_1 + \begin{cases} 8\text{ mm (5/16 in)}, & min \\ 12\text{ mm (15/32 in)}, & max \end{cases}$$

$$L_2 = th_2 + \begin{cases} 6\text{ mm (1/4 in)}, & min \\ 8\text{ mm (5/16 in)}, & max \end{cases}$$

$$where \begin{cases} th_1\ Thickness\ of\ the\ fixed\ plate\ or\ floor \\ th_2\ Thickness\ of\ the\ connection\ plate \end{cases}$$

2. HOLES

a. Diameter must be suitable for metric M5 screws

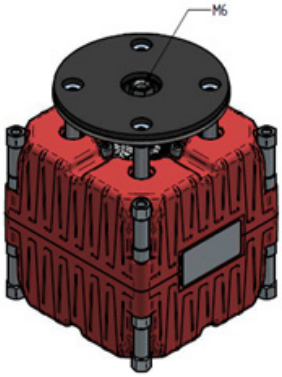
b. Diameter must be suitable for metric M6 screws

Centre-to-centre distance (2.a): 80 mm or 3 5/32 in (see Mechanical Drawings in ANNEX 3 and 4 for more details)

3. WIRING

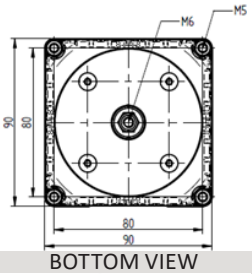
Keep in mind what explained in previous section Polarity.

▶ MAX TORQUE on mounting screws



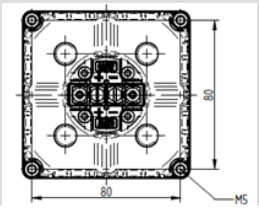
TOP VIEW

•**1 x M6** metric screw required to fix an object to be shaker by the Mover
•**MAX TORQUE: 8 Nm** (70 lbf·in)



BOTTOM VIEW

• **4 x M5** metric screws required to fix the Mover to an immovable object from too connection points
• **MAX TORQUE**: **4 Nm** (35 lbf·in)



• **4 x M5** metric screws required to fix the Mover to an immovable object from bottom connection points
• **MAX TORQUE**: **4 Nm** (35 lbf·in)

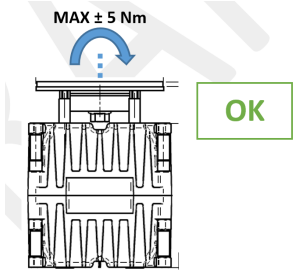
Dimensions expressed in mm.

▶ MAX TORQUE on connection nut: horizontal axis

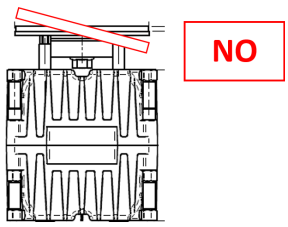
The connection plate was designed to allow small movements (rotations) on its connection nut, during play.

Your design must be that max torque on connection nut is ± 5 Nm

▶ AVOID TILTS of the connection plate



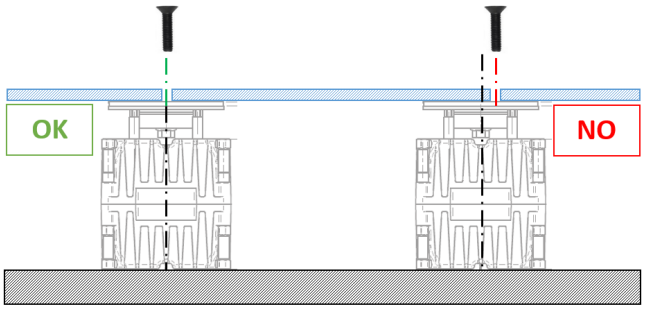
Do not connect the connection plate in tilted position. Fixed and moving surfaces must be parallel from each other.



▶ AVOID PERMANENT LATERAL SHIFTS

Be sure of the alignment between holes in your plate and the Mover's connection plate.

Do not force screws on wrong positions.



Annex 1 - Spring constant calculator

13

13 : 3.Spring constant

Assuming that the springs in your project have linear behaviour, they must follow the classical Hooke's law.

$$F = kx \quad [N]$$

Where:

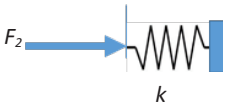
F = external force applied to the spring in Newton [N];

k = spring constant [N/mm];

x = displacement from equilibrium point [mm].

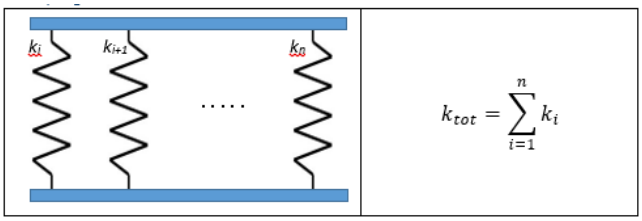
It is easy to find the spring constant k: same spring with different loading condition => k is CONSTANT.

$$k = F/x \quad [N/mm]$$

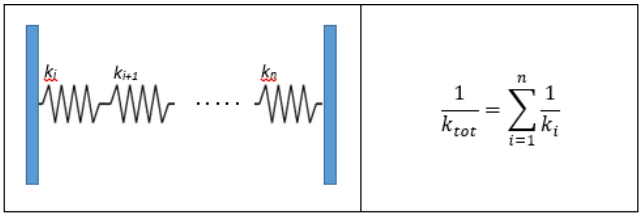


$$k = F_1/x_1 = F_2/x_2 \quad [N/mm]$$

13 : 2.Parallel Springs



13 : 1.Series of Spring



Annex 2 - Suspension system calculator

14

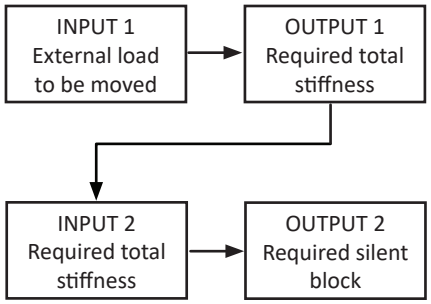
14 : 1.Introduction

Following figure shows how to read following charts, with a scheme and a sample.

This method is only a suggestion: each project presents its peculiarity and appropriate evaluations must be done by designers.

First graph refers to the required total stiffness of your suspension system and it is a good starting point for calculating your project. Second graph only refers to silent-block type suspension, but you can choose different suspension system also (hydraulic, pneumatic, etc.) according to your project.

Data used to prepare graphs refer to specific tested silent-block type suspensions. Mechanical properties can vary according to manufacturers.



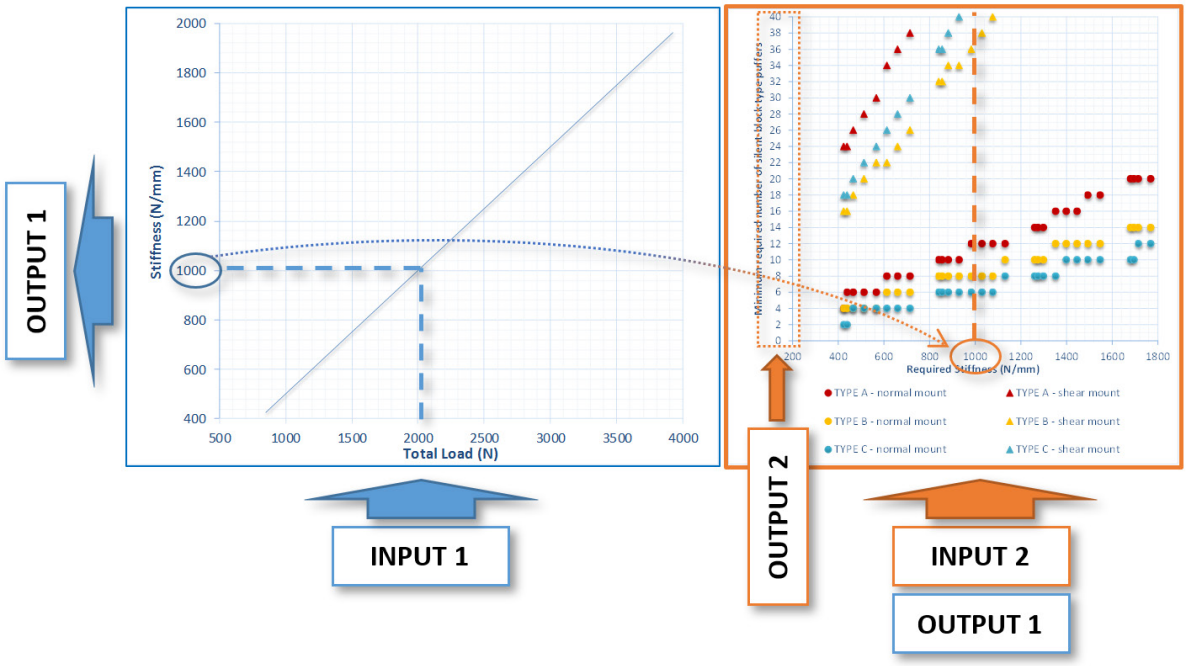
INPUT 1. Use the load of the structure to be moved as input of first graph.

OUTPUT 1. You will obtain the total required stiffness for the auxiliary suspension system.

OUTPUT 1 = INPUT 2

INPUT 2. Take the output obtained from previous graph as INPUT.

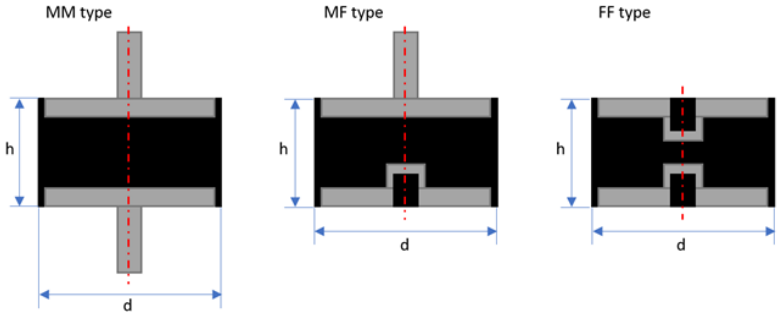
OUTPUT 2. You will obtain the number of rubber silent block, divided by type.



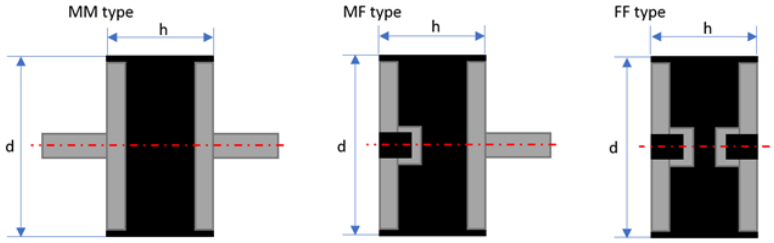
INPUT 1.	The total load consists in your structure weight in addition with an estimate load of person/people. *In present sample a total load of 2000 N is considered.*
OUTPUT 1.	Required total stiffness for the auxiliary suspension system. You can obtain the required stiffness in many ways: second chart is optional, if you want to use rubber cylindrical silent-block type puffers. *In present sample the total required stiffness is 1000 N/mm.*
INPUT 2.	= OUTPUT 1
OUTPUT 2.	It helps you to chose type and number of rubber silent-blocks, if you want to use this solution for your suspension system.

TYPE	Base diameter		Height	
A	30.0 mm	1.2 in	30.0 mm	1.2 in
B	40.0 mm	1.6 in	40.0 mm	1.6 in
C	50.0 mm	2.0 in	50.0 mm	2.0 in

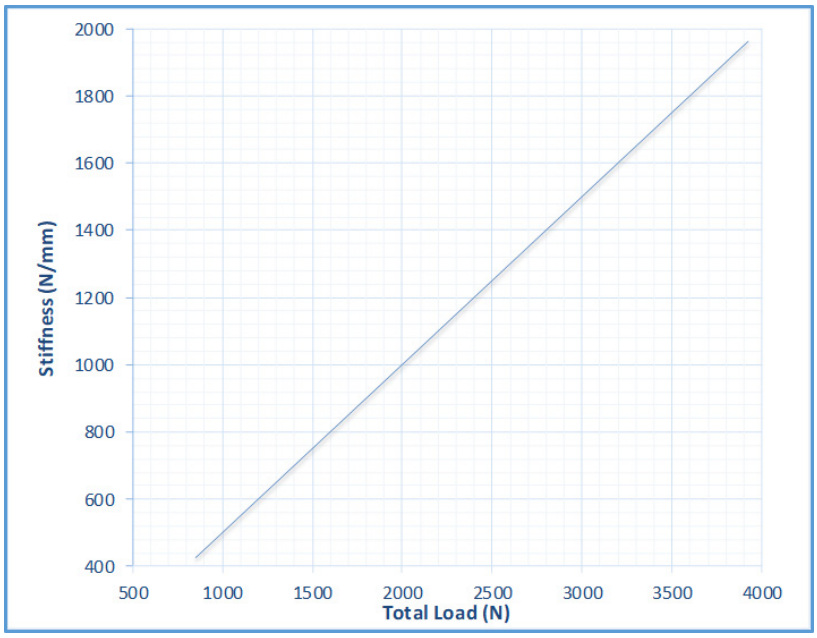
NORMAL MOUNT



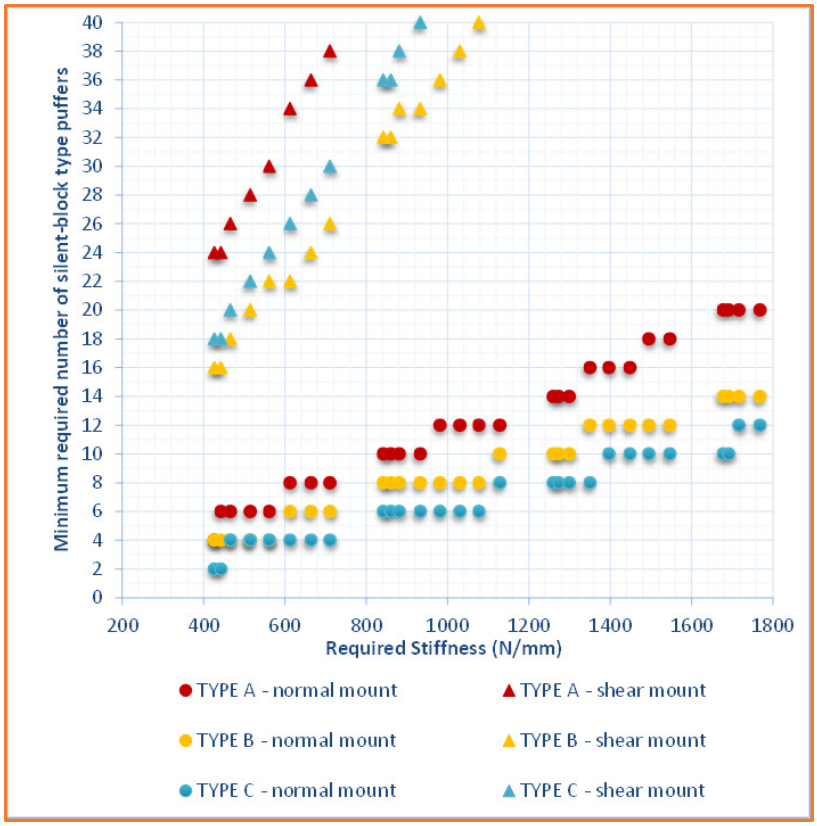
SHEAR MOUNT



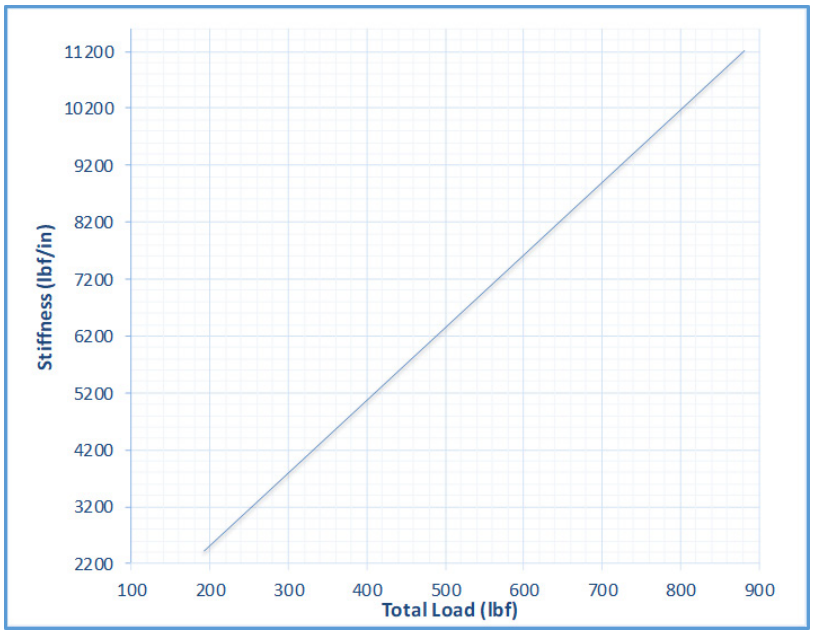
Metric Units



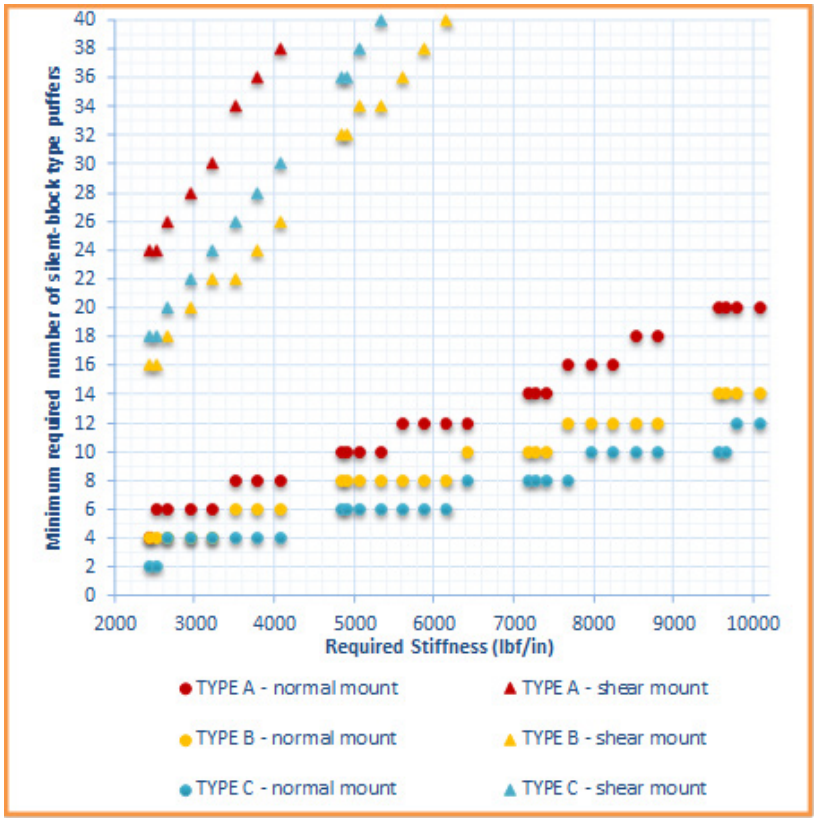
k = 0.5 load



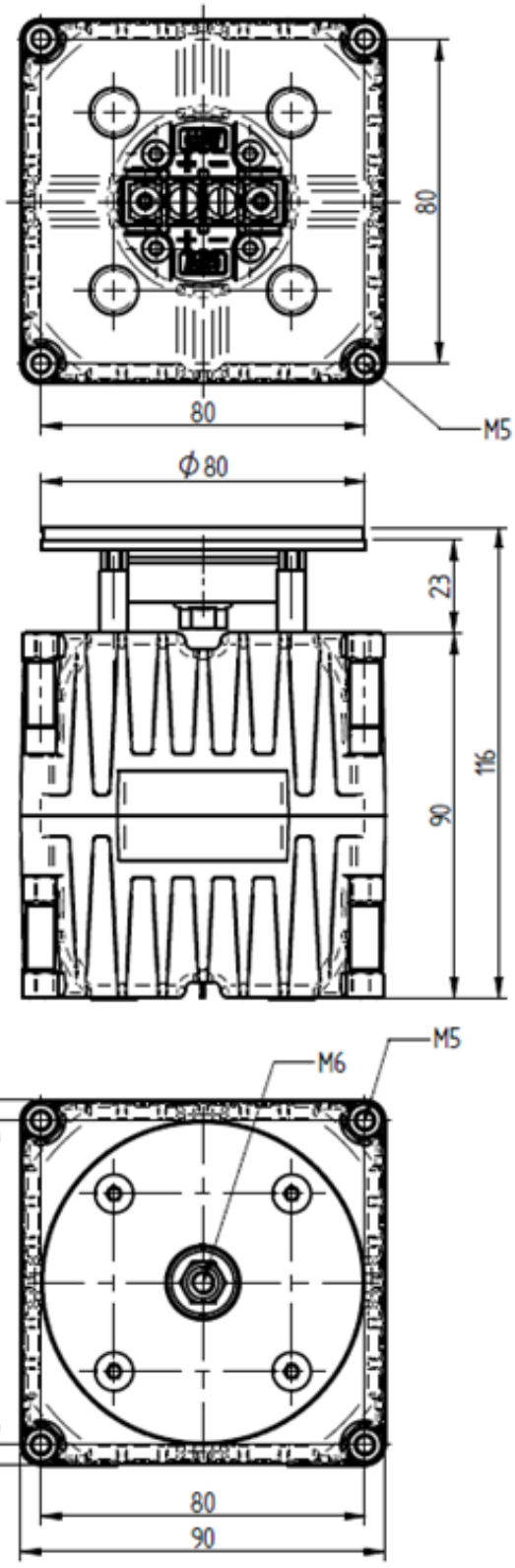
Imperial Units

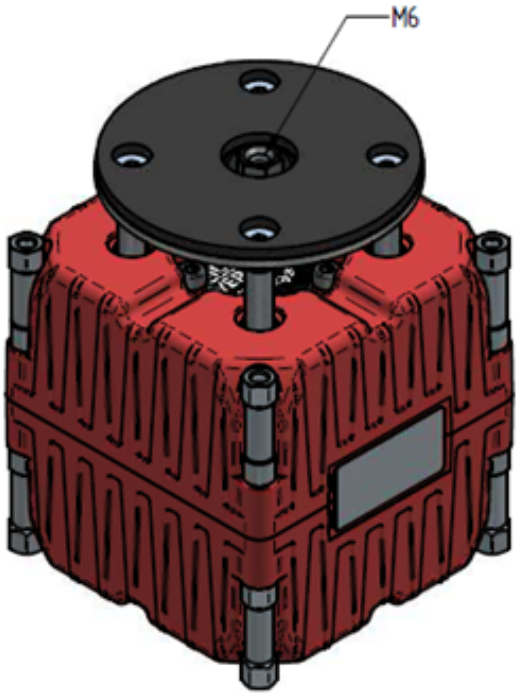


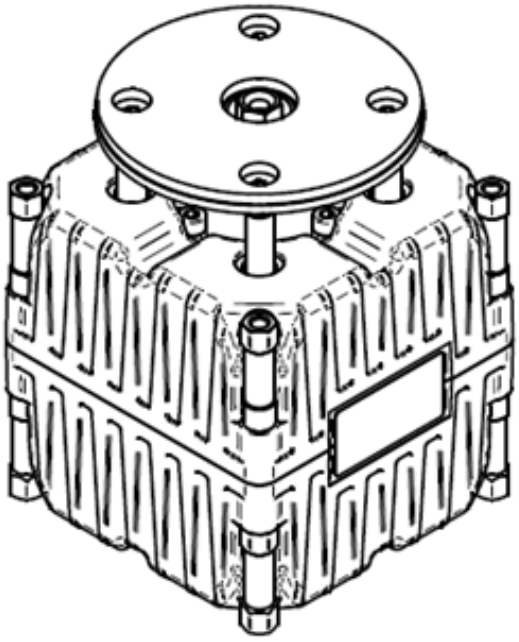
k = 12.7 load



Annex 3 - MOVER DD Mechanical drawings







Annex 4 - MOVER ID Mechanical drawings

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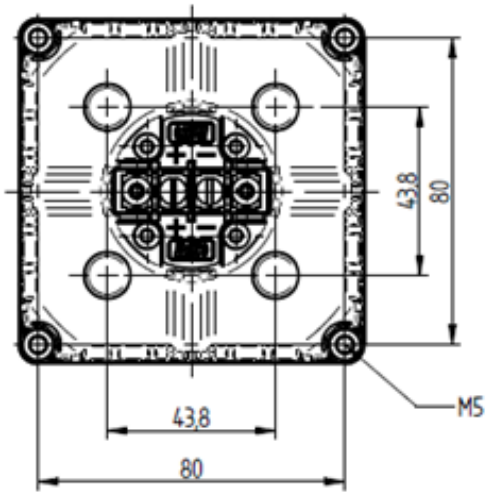

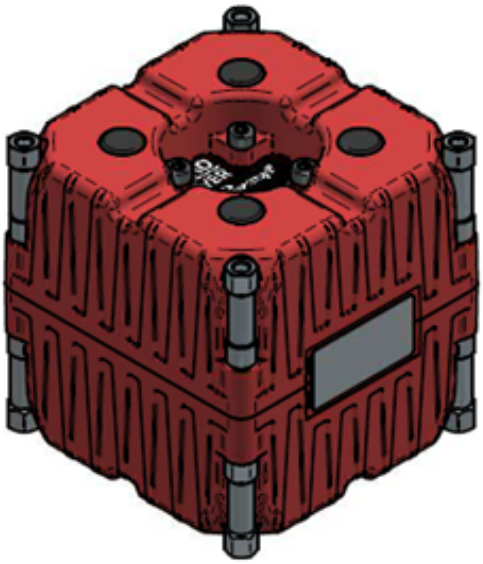

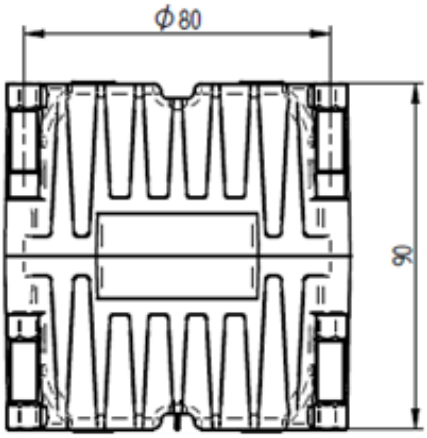

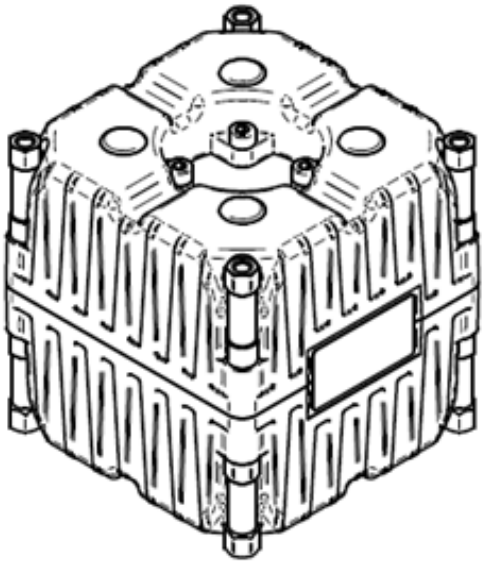

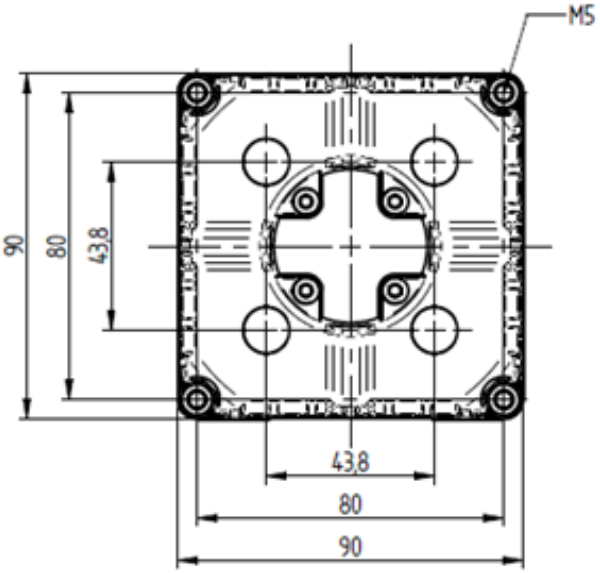

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DRIVING HUMAN AUDIO EXPERIENCE

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