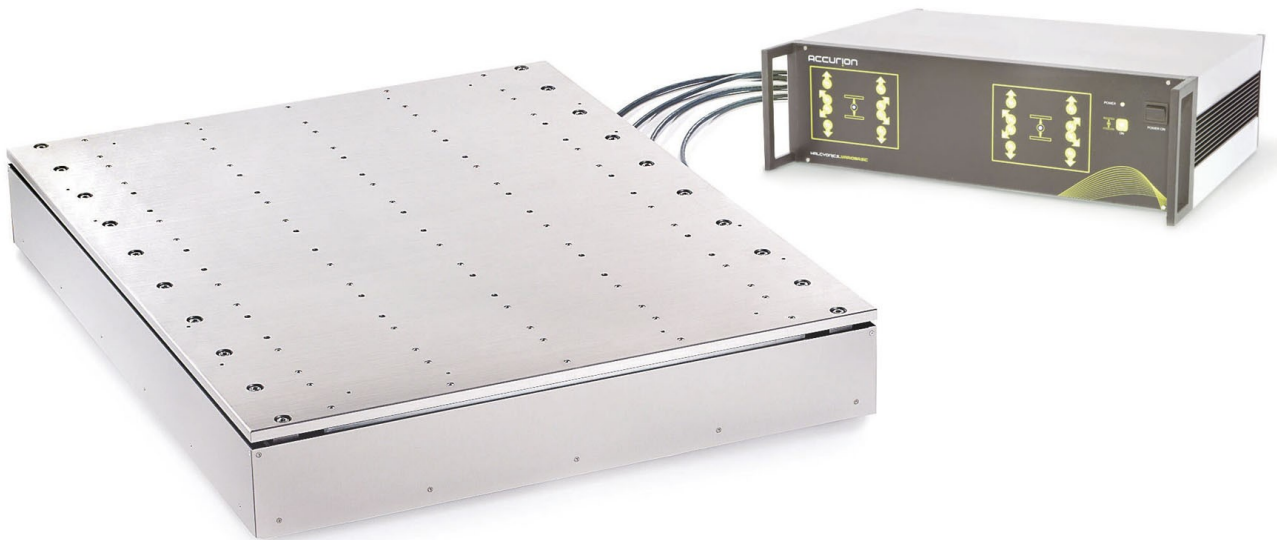


Operating Instructions:

Active vibration isolation for heavy loads
Sandwich



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1. Introduction

Thank you for purchasing the sandwich system. By selecting the sandwich platform, you have acquired top-of-the-line active vibration isolation equipment. We feel confident that our system will meet your expectations and provide the best possible performance for your specific application.

Please read the operating instructions carefully to setup the Sandwich system correctly.

We hope you enjoy working with your sandwich platform!

2. Unpacking the Sandwich System

After unpacking the equipment, please check whether you have received all components listed below:

Equipment supplied for the sandwich platform SW800-4.0, SW1000-4.0, SW1100x900-4.0:

- 1 sandwich isolation platform
- 1 4-port control unit
- 1 power cord
- 4 cables sub-D 15 pin (male/female)
- 1 set of instructions
- 1 torx screwdriver TX 10
- 1 spanner 10 mm

Equipment supplied for the sandwich SW1000-6.0, SW1100x900-6.0:

- 1 sandwich isolation platform
- 1 4-port control unit
- 1 2-port control unit
- 2 power cords
- 6 cables sub-D 15 pin (male/female)
- 1 set of instructions
- 1 torx screwdriver TX 10
- 1 spanner 10 mm

Equipment supplied for the sandwich SW1000-8.0, SW1100x900-8.0:

- 1 sandwich isolation platform
- 2 4-port control units
- 2 power cords
- 8 cables sub-D 15 pin (male/female)
- 1 set of instructions
- 1 torx screwdriver TX 10
- 1 spanner 10 mm

3. Symbols used in these instructions



Warning symbol



Important note



Action that the user is required to take

4. Safety Instructions and Warnings

Please read through the following safety instructions and warnings carefully before using this equipment.

General Warnings

Do not operate the system in a potentially explosive or humid environment. Do not switch on the system if there is any visible damage or if you think it might be damaged. In this case, turn off the power immediately and notify our distributor in your area or contact W.A.V.E's headquarters in Germany directly.

Electrical Safety

This system may be operated only on AC power that has a protective grounding conductor ("protective earth"). Do not interrupt the protective grounding conductor under any circumstances. If you plan to use a power cable other than the standard power cord supplied with this equipment, first check that the protective grounding conductor is connected.

Before starting to operate this equipment, check the voltage rating to be sure that it matches your local line voltage (mains). For further information, please refer to the specifications on page 12.

Completely set up and install the equipment before attempting to plug it into an electrical outlet (mains). Never open the equipment housing. Only authorized and qualified personnel may service or repair the equipment.

Mechanical Safety

Be sure that the equipment rests on a stable surface that can safely support the weight of this instrument.



Please note that you need to lock the system before you transport or move the equipment! For further instructions, please refer to the section on “Static Load Adjustment and Transportation Lock” on page 6.

DIN and European Standards, European Council Directives

sandwich_platform systems conform to the requirements currently valid for electrical safety according to EC Directive 2014/35/EU and for electromagnetic compatibility according to EC Directive 2014/30/EU. This equipment has been tested and found to comply with the following standards EN 61010-1:2010.

5. Getting Started

Basic Requirements

The performance of every vibration isolation solution depends on the ambient conditions. The sandwich_platform needs to be placed on a floor screed ground or on a concrete pad. Best isolation performance can be achieved with a rigid connection between the base plate of the Sandwich and the floor. Elastic layers, e.g. linoleum or carpet, will reduce the isolation performance! Any smooth layer between platform and floor ground would hinder the actuators to transmit compensation forces to the floor ground. (PVC floor covering is allowed). Furthermore a very plane support surface is required. For optimal isolation results the planarity should be within the limit of +/- 0.5 mm. Often the floor is to be prepared in order to fulfill these conditions.

To set up your vibration isolation equipment, select a place with a vibration level that is as low as possible. Vibration generated in this place should not exceed velocities of 350 $\mu\text{m/s}$. Read also page 10, section “Overmodulation of the System”.



Operating the system at low temperatures (below 10° C) may cause malfunctioning. If the equipment is brought from a cold environment into a relatively warmer one, we recommend that you wait approx. 2 - 3 hours before plugging it into AC power (mains) and switching on the power.

Mechanical Setup Overview



- Place the application (e.g. SEM) on the prepared surface.
- Lift the application by using an appropriate device, e.g. laboratory crane
- Place the Sandwich platform on the prepared surface underneath the application
- Slowly lower the application and place it on the center of the platform
- Remove the two side panels (see fig. 1) of the Sandwich by using the Torx-screwdriver TX 10 provided, to perform the load adjustment
- Perform the static load adjustment (see page 6 - 7, section “Static Load Adjustment and Transportation Lock”)
- Use the control cables provided to connect control unit and platform
- Use the power cord supplied to connect the system into the “power socket” to your local power outlet.

Static Load Adjustment

The Sandwich platform has to be adjusted to carry the required loads. A standard version either contains 4, 6 or 8 isolation elements. They are mounted parallel inside the platform. These internal isolation elements are supported by steel springs, which carry the static load, placed on top. For the initial installation or after load changes these springs have to be prestressed according to the application weight. This procedure is called „static load adjustment“. The objective of the load adjustment is that the top parts of the elements can slightly be moved in any direction, which is the precondition for the functionality of the system.

The static load adjustment has to be done as follows:

Uncover the internal isolation elements with adjustment nuts. Therefore remove the side panels by using the Torx-screwdriver provided (Fig. 1).



Fig. 1: Side panels Sandwich platform

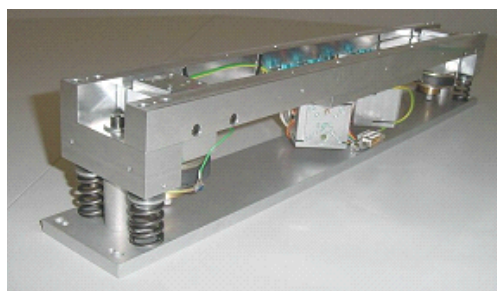


Fig. 2: Internal isolation element of the Sandwich

The steel spring system supports the upper block which is mounted to the upside part of the platform. If a heavy load is placed on the platform, the complete system is pressed down, so that there might be not any gap between pillar and upper block. For correct load adjustment this gap shall be approximately 1.5 - 2 mm. This gap shall be nearly equal at all isolation elements, on both sides of the platform.

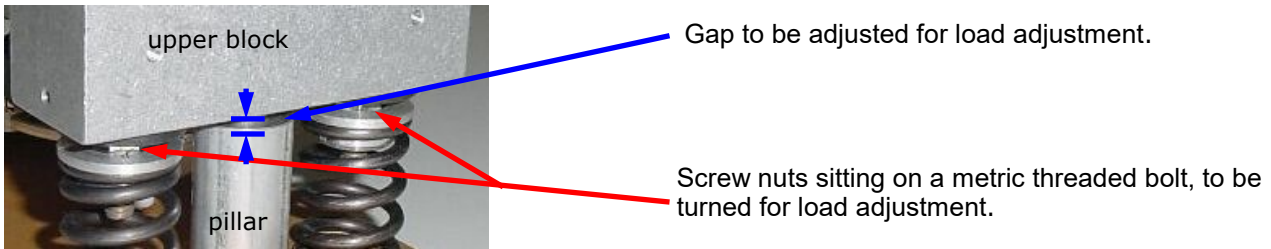


Fig. 3: Load Adjustment

If the gap is not existing or smaller than recommended, turn both screw nuts to the left. If the gap should be bigger than recommended, turn the screw nuts to the right. It sometimes happens that an equal gap at all elements could not be achieved (due to bending of the platform bottom). This is not a problem at all. The major focus is to get the complete platform floating free on the spring system.

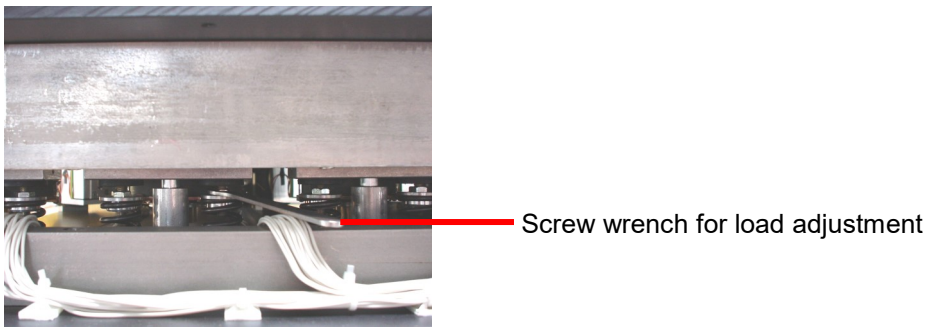


Fig. 4: View to load adjustment, several isolation elements inside a platform.

The above picture shows how to use a screw wrench to turn the screw-nut. After finishing the load adjustment, the side panels of the platform shall be closed and the platform can be connected to the external controller.



*Please notice: Do not turn the screw nuts too far down or you may damage the units. Under no circumstances should the indicated space in fig. 3 be greater than **10 mm**.*

Transportation Lock

For transportation the system has to be locked by turning all M6 nuts to the left till the upper stop position is reached. In the lock mode a rigid mechanical contact between the top and the bottom of the element prevents the sensitive components to get damaged.

Check the lock mode by pushing gently the top of the element. There should be no relative displacement between the base and the top part of the unit since the base and the top part of the unit are mechanically connected and the internal voice coil actuators are protected against impacts.



During transportation the system always has to be locked!

Electrical Installation

sandwich_platform are supplied with external control unit which contains the control electronics. Depending on the amount of internal isolation elements, either a 4-port control unit, a 4-port and a 2-port control unit or two 4-port control units are provided.

The isolation elements inside of the platform need to be connected to the external control unit(s) via control cables. Please notice, other cables than original sandwich_platform cables are not permitted. Also, any kind of adapters or similar may not meet the requirements of the active isolation system and cannot be used. If you should require any of those (e. g. longer cables) please contact W.A.V.E first.

When doing the cable connections, it generally does not matter which cable belongs to which connector, neither at the platform nor at the controllers. All control circuits are working completely independent. But it makes sense to sort the connections to avoid confusion when analyzing the analog signal output.

For this reason the platform gets connected according to the following procedure:

When looking at the platform connector board, start from the inside two connectors. The left connector (A1) shall be connected to channel A at the first controller. The right connector B1 belongs to the first controller at channel B. Now start with the second pair of connectors, again the left connector (C1) connects to the first controller on channel C, the right connector (D1) goes to the first controller on channel D. Now start with the third pair of isolation elements; the left connector (A2) to the second controller on channel A and so on. Please see figure 5 as a reference.

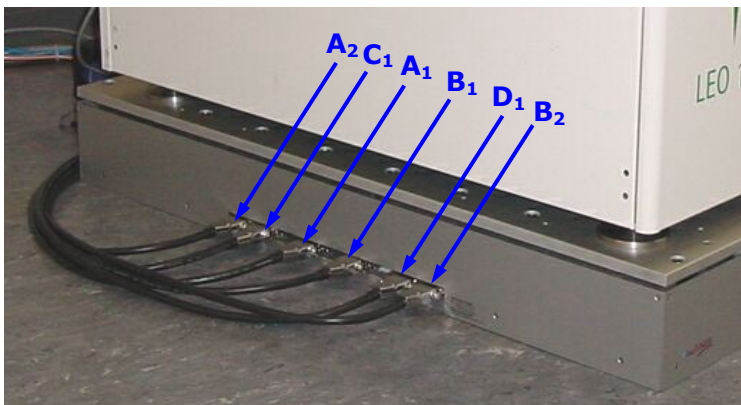


Fig. 5: Connection of controller cables

After these connections have been done, the platform is ready for operation. Connect the controllers to electrical power and switch them on.



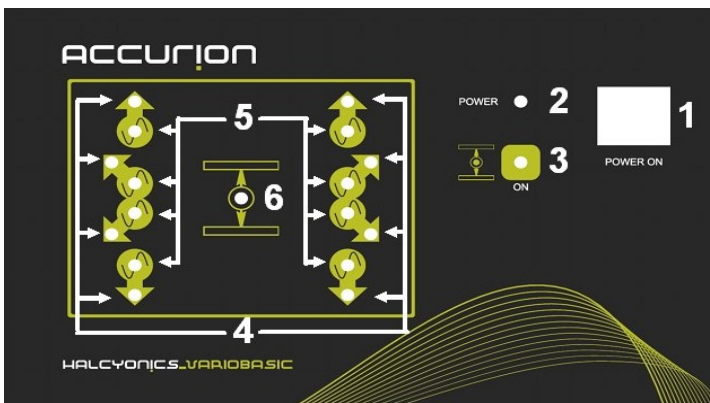
Use the „power switch“ in front of the control unit to turn on the power.

Operation and Control Units

sandwich_platform systems are supplied with external control unit(s). Depending on the amount of internal isolation elements, either a 4-port control unit, a 4-port and a 2-port control unit or two 4-port control units are provided.

Controller Front Display (2-port)

The controller front display of the Sandwich system is equipped with a main power switch, an on/off switch for the active isolation mode and several LEDs. All switches and LEDs are depicted in Fig. 6.



Description:

- 1 Power Switch
- 2 Power On/Off Indicator
- 3 Isolation On/Off Switch
- 4 Output (Actuator) LEDs for Isolation Elements 1 & 2
- 5 Input (Detector) LEDs for Isolation Elements 1 & 2
- 6 Isolation On/Off Indicator

Fig. 6: Front view Sandwich/Vario Basic 2-port control unit

Controller Front Display (4-port)

The controller front display of the 4-port controller with two displays is depicted in Fig. 7. The operation is similar to the 2-Port Controller depicted on this page.

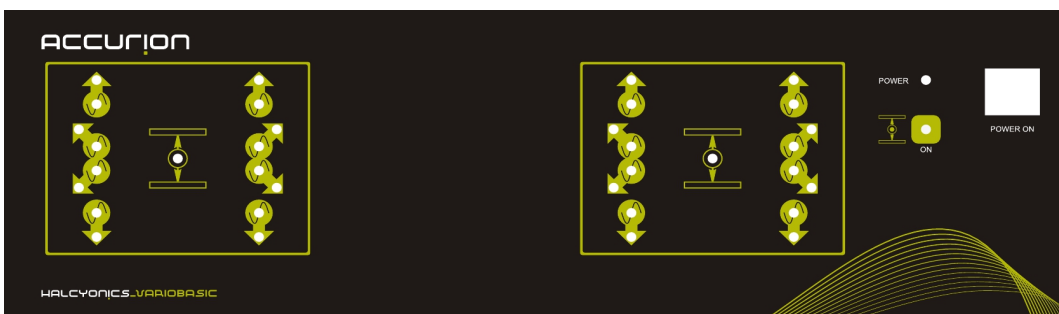


Fig. 7: Front view Sandwich/Vario Basic 4-port control unit



- Use the „power switch“ in front of the control unit to turn on the Sandwich/Vario Basic power.
- Press the on/off button to activate/deactivate the active vibration isolation.

After the controller has been switched on, the green „POWER“ LED lights up and the blue LED starts blinking. The blue LED indicates the isolation mode. Blinking of this LED means that the system is in the initialization or stand-by mode. After approximately 30 to 60 seconds, the blue LED shines continuous and the system is then running in the active isolation mode. This mode can be changed by pressing the on/off button for the active isolation mode. The factory setting of the active isolation mode is “on”.



Fig. 8: Front view Sandwich/Vario Basic controller

At least sixteen sensor-actuator units are integrated in the Sandwich Platform. Each sensor and each actuator is represented by a pictogram consisting of a circle with a sine symbol and an arrow printed on the front panel. The sensor signals are displayed by the yellow LEDs and actuator outputs are indicated by red LEDs, as shown in Fig. 8. These LEDs flicker if extreme vibrations are present, or if there is a direct excitation of the table top.

The LED pairs numbered from 1 to 4 correspond to isolation element B and 5 to 8 to isolation element A inside the Sandwich system. The arrows of the pictograms display the direction of the actuator force. The actuators 1, 4, 5 and 8 have a vertical orientation whereas the other actuators 2, 3, 6 and 7 are placed in a horizontal direction.

Overmodulation of the System

The Sandwich platform has been designed to compensate vibration amplitudes up to 350 $\mu\text{m/s}$. If vibrations significantly exceed this level the system changes to the stand-by mode, indicated by a flashing blue LED. After the overload excitation is stopped, the isolation mode will automatically be turned on again. Some of the sensor and actuator LEDs may come on and persist for a few seconds. After a severe overload the system may take up to 30 seconds to reach full active isolation performance, but normally only a few seconds are required.



The active vibration isolation will be automatically switched off during overmodulation of the system. Once this interference has subsided, the system will re-initialize and, after a few seconds, automatically resume to the active isolation mode. This procedure does not require any action from the user.

BNC Output Socket

The BNC socket at the rear side of the control unit(s) offers a multiplexed output showing the signals from the sensors. To display this signal on an oscilloscope, set the time base to 20 msec and the sensitivity to 1V. Do not use BNC cable longer than 2 meters.

The Signal on your oscilloscope should look like this:

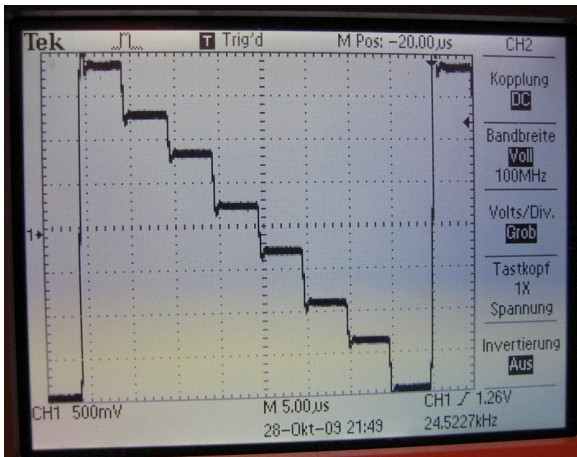


Fig. 9: good oscilloscope signal

Something is wrong if it looks like this:

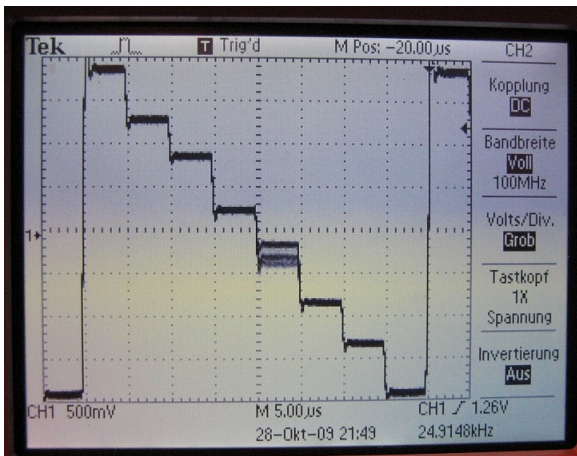


Fig. 10: bad oscilloscope signal

6. Appendix

Care and Maintenance

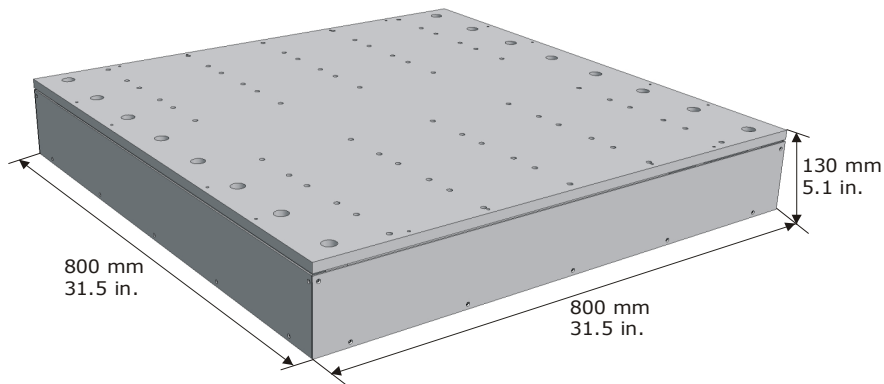
To maintain this equipment and the validity of your warranty, you should observe the following recommendations:

- Store the system in a dry place. Never expose it to rain, liquids or dampness. The minerals contained in these liquids may lead to short-circuits or corrosion of the electronic circuits.
- Where possible, avoid operating and storing the system in dirty or dusty environments as this may otherwise damage the electronic or mechanical components.
- Do not store the system in hot environments. Operating the system at high temperatures may compromise its performance and reduce its lifetime.
- Do not store the system in cold environments. When the temperature rises to normal room temperature, moisture condenses inside the system and causes a circuit failure. If you need to transport the system from a cold environment to a warmer one, wait approx. 2 – 3 hours before plugging it into AC power and switching on the power.
- Do not drop the system or shake it, and never expose it to impact or blows. Improper handling can damage the integrated electronics and mechanical components in the system.
- To clean, wipe off dust from the exterior surfaces of the system using a lint-free cloth. For cleaning, do not use any aggressive cleaning agents.

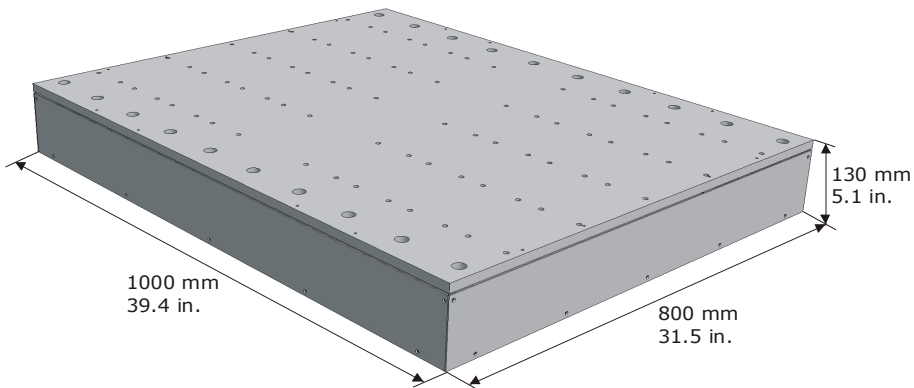
Specification

Available Standard Versions		
SW800-4.0	SW1000-4.0	SW1100x900-4.0
	SW1000-6.0	SW1100x900-6.0
	SW1000-8.0	SW1100x900-8.0
Performance Specifications		
Isolation technology:	The active vibration isolation technology is based on piezoelectric type acceleration pickup, fast signal processing and electro-dynamic force transducers.	
Force directions:	Active compensation in all six degrees of freedom	
Isolation performance:	> 5 Hz = 25 dB (94.4%); >10 Hz = 35 dB (98.2%)	
Active bandwidth:	1.0 – 200 Hz*	
Settling time:	300 ms	
Max. correction forces:	All SW-4.0 platforms: vertical ± 16 N; horizontal ± 8 N All SW-6.0 platforms: vertical ± 24 N; horizontal ± 12 N All SW-8.0 platforms: vertical ± 32 N; horizontal ± 16 N	
Load capacity:	All SW-4.0 platforms: 0—600 kg (0—1,320 lbs) All SW-6.0 platforms: 0—900 kg (0—1,980 lbs) All SW-8.0 platforms: 0—1.200 kg (0—2,650 lbs)	
Other Specifications		
Dimensions:	See figure 11	
Weight:	Sandwich 800-4.0: 105 kg (230 lbs) Sandwich 1000-4.0: 115 kg (250 lbs) Sandwich 1000-6.0: 135 kg (300 lbs) Sandwich 1000-8.0: 155 kg (340 lbs) Sandwich 1100-900-4.0: 140 kg (290 lbs) Sandwich 1100-900-8.0: 160 kg (330 lbs) Sandwich 1100-900-8.0: 170 kg (370 lbs)	
Maximum compensation level:	350 μ m/s at 9 Hz and 300 kg (661 lbs)**	
Interface:	BNC analog diagnostic output – 50 Ohms	
Environmental and Operational Requirements		
Electrical voltage:	100 - 250 V/47 – 63 Hz	
Power consumption:	all SW-4.0 platforms: 20 - max.70 W all SW-6.0 platforms: 30 - max. 140 W all SW-8.0 platforms: 40 - max. 210 W	
Operating temperature:	10 - 40°C (50 – 104 F)	
Relative humidity:	0 - 60%	
Operating altitude:	< 2500 m (8100 ft)	
Certification		
Electrical Safety:	CE certificated according to directive 2014/35/EU	
EMC:	CE certificated according to directive 2014/30/EU	
* Floating table top is supported by steel springs; low-pass characteristics of spring-mass combination		
** The maximum compensation level depends on several conditions, such as payload, frequency, load distribution and height of the payload as well as the distance between the isolation elements. For that reason this value should be considered as an estimation		

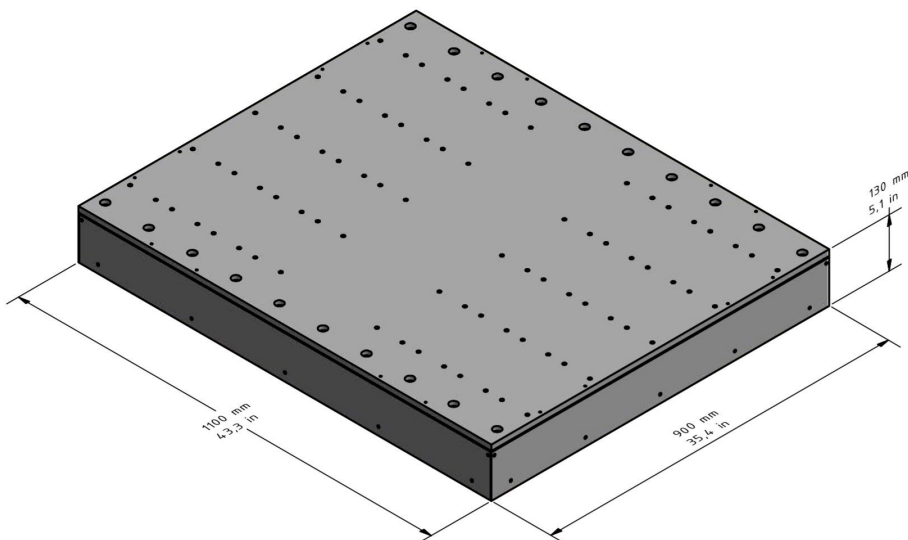
Dimensions of the Sandwich System



Sandwich 800

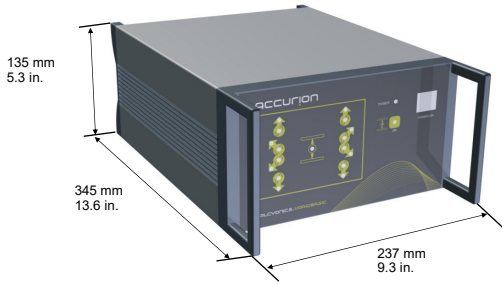


Sandwich 1000



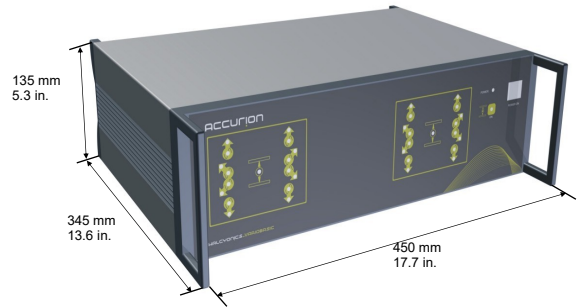
Sandwich 1100x900

Fig. 11: Sandwich dimensions



2-port control unit

Fig. 12: 2-port control unit



4-port control unit

Fig. 13: 4-port control unit

Transmissibility of the Sandwich

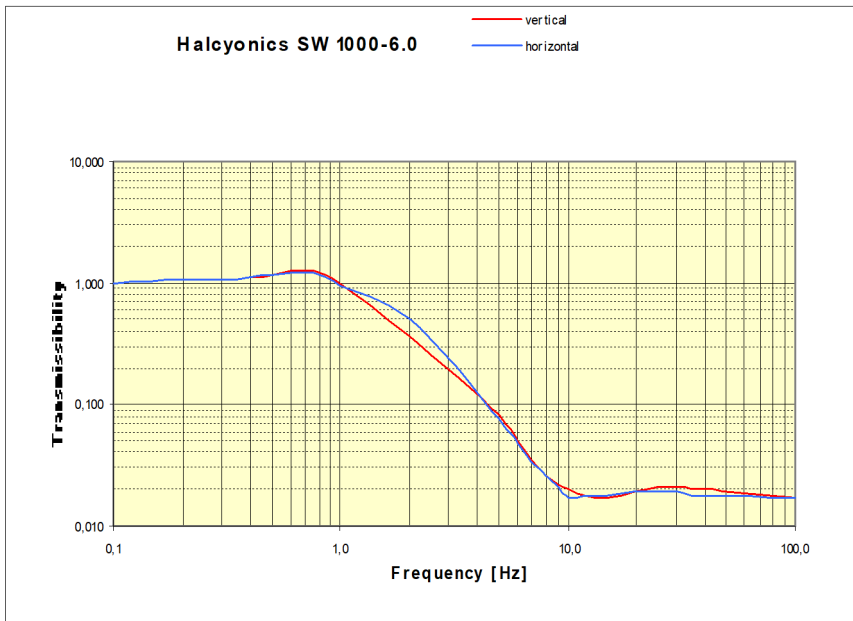


Fig. 14: Transmission Graph of a Sandwich 1000-6.0 - measured at a velocity of 100 $\mu\text{m/s}$, with a payload of 60 kg (132 lbs)

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