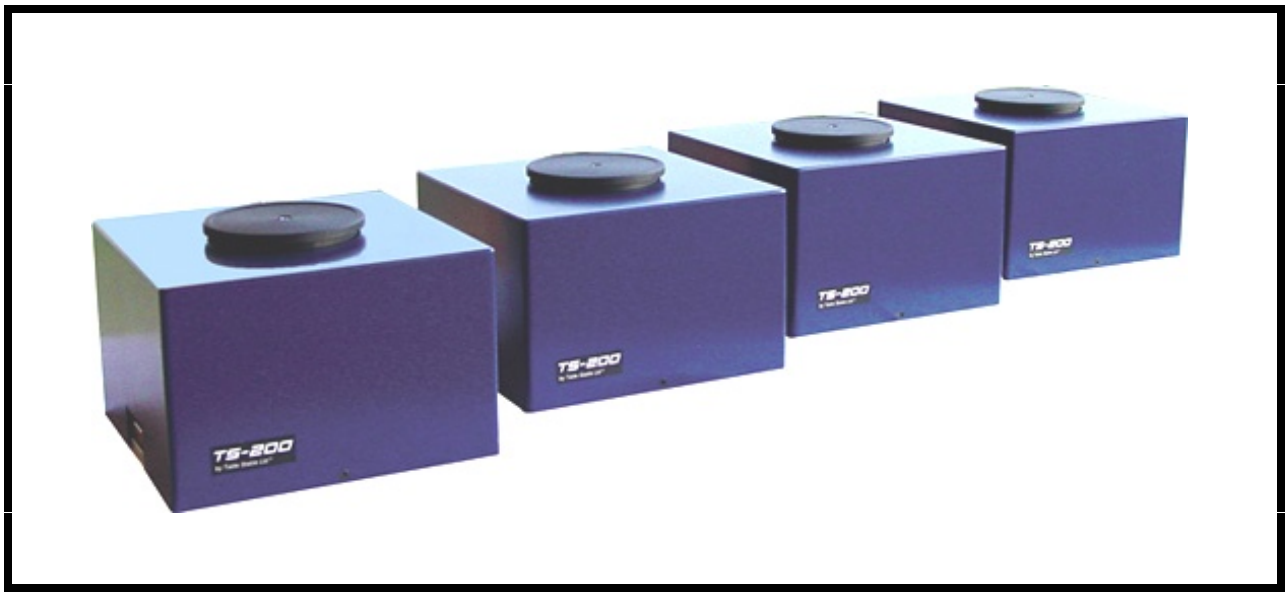
ACTIVE VIBRATION ISOLATION

System TS-200

Instruction manual



Address:
Fabrik am Weiher
CH-8909 Zwillikon
Switzerland

Phone: +41 44 776 33 66
Fax: +41 44 776 33 65
E-Mail: info@tablestable.biz
Internet: www.tablestable.biz

Fabrik am Weiher
CH-8909 Zwillikon
Switzerland

Phone : *+41 44 776 33 66*
Fax: *+41 44 776 33 65*
E-Mail: *info@tablestable.biz*

Table of Contents

Safety Instructions 3
Accessories 3
General 4
Optimum Support Surface 5
Test of Support Surface 5
First Time Installation 6
Operation 8
Functions 9
Additional Functions and Messages 9
Remote Output 10
BNC Output Jack 10
Specifications TS-200 11
Transmissibility 12

Sales Offices

Geographical Europe, near and middle East, Africa, India:	**Americas, Australia, New Zealand:**	**Asia:**
HWL Scientific Instruments GmbH	HERZAN	HERZ
Georgstrasse 11, 72119 Ammerbuch, **Germany** Phone: +49-7073-916-796 Fax: +49-7073-916-798 e-mail: hwl@hwlscientific.com Internet: www.hwlscientific.com	P.O. Box 30012-238, Laguna Niguel, Ca 92607 **USA** Phone: 949-363-2905 Fax: 949-363-2906 e-mail: sales@herzan.com Internet: www.herzan.com	18/F., Yokohama Creation Square Bldg.,5-1, Sakaecho, Kanagawa-Ku Yokohama Kanagawa 221-0052 **Japan** Phone: +81-45-450-2211 Fax: +81-45-450-2221 e-mail: sales@herz-f.co.jp Internet: www.herz-f.co.jp

Fabrik am Weiher
CH-8909 Zwillikon
Switzerland
Phone : *+41 44 776 33 66*
Fax: *+41 44 776 33 65*
E-Mail: *info@tablestable.biz*

Notes on Equipment Safety

The vibration isolation system **TS-200** has been designed, manufactured and tested to conform to the safety regulations for measurement and control equipment DIN EN 61010-1 (IEC 61010-1 second edition 2001-02) and satisfies the relevant requirements of EEC Directive 73/23. The system conforms to EEC Directive 89/336 (electro-magnetic compatibility). The operator should read this manual which contains important warnings and information.

Safety Instructions

- The system may only be plugged into a socket with separate ground. Do not disconnect this ground, either at the socket, or by using an ungrounded extension cable.
- Before switching on this apparatus make sure that it is connected to the correct mains voltage.
- Do not remove any cover or allow any metal objects to enter any openings in the units.
- Disconnect from mains before removing any covers. Refer servicing to qualified personnel.
- Do not use in potentially explosive surroundings.
- Do not attempt to change a fuse without first unplugging the power cable. Only replace a fuse with the correct type. Never try to bypass a fuse.

Accessories

1 Instruction Manual
1 Power Cable
4 D-Sub Cables 15 M/F

Fabrik am Weiher
CH-8909 Zwillikon
Switzerland
Phone : *+41 44 776 33 66*
Fax: *+41 44 776 33 65*
E-Mail: *info@tablestable.biz*

General

The **TS-200** is a compact dynamic antivibration system, which offers isolation against all six translational and rotational vibration modes.

This moderately priced dynamic vibration isolation system achieves in a very small volume better isolation than is possible with the biggest and most expensive passive systems. Inertial feedback is used via electromagnetic transducers to provide not only isolation from building vibrations, but also isolation from vibration sources placed on the system itself. This means, for example, that a delicate microscope isolated by the system will remain at rest despite forces being applied via the operator's hands.

The inherent stiffness of the system, typically 25-100 times greater than that of a 1 Hz resonance passive isolator, imparts excellent directional and positional stability.

The characteristics of an active isolation system are typified by the virtual lack of any low frequency resonance, a resonance which plagues all passive isolation systems.

The **TS-200** consists of three or more elements each measuring 210 x 210 x 145mm together with an external control unit. The system isolates against all six possible translational and rotational vibration modes and has been designed to offer excellent isolation even at frequencies as low as 2-3Hz, where many buildings show large horizontal amplitudes due to oscillation about the vertical axis. Each element can support 200kg and many elements may be combined in one system.

This system is extremely convenient to use. Load compensation (auto-levelling) is performed automatically on switching on the power. If the load is changed whilst the system is isolating, it automatically readjusts and then returns to the isolation mode. Furthermore, at the push of a button the system locks itself for shipping.

Typically power consumption for a system consisting of four elements is less than 10 W, rising to 40 W in extreme environments. The control unit has a universal input which may be connected to any AC power point between 115 and 230 V ±10%.

The system is intended for supporting heavy loads. The design has been optimized to achieve best possible isolation for delicate instruments such as the Scanning Probe Microscopes (AFM, STM), Scanning Electron Microscopes, Interferometers and other high resolution instruments, allowing the ultimate performance to be achieved from these instruments. The tables have also proved to be extremely successful for supporting sensitive experiments, such as patch clamp, micro injection or the troughs for liquids used in measurements on Langmuir-Blodgett films.
Isolation of the **TS-200** system begins at about 1 Hz, increasing rapidly to at least 40dB beyond 10 Hz. This system offers excellent isolation in the typical laboratory environment.

Fabrik am Weiher
CH-8909 Zwillikon
Switzerland
Phone : *+41 44 776 33 66*
Fax: *+41 44 776 33 65*
E-Mail: *info@tablestable.biz*

Optimum Support Surface

To obtain the optimum performance from the system it must be supported on a surface which is as rigid as possible. The best possible performance is obtained with the **TS-200** sitting directly on the floor. However for most applications this will not be practical, and some support structure will be required to bring the system to a convenient operating height. Most simple table structures will be rigid enough vertically, but will leave much to be desired horizontally. The addition of diagonal struts between the table legs can improve the situation dramatically.

It is good to bear in mind that any support structure will follow the building vibrations exactly up to some certain cut off frequency at which point the structure goes into resonance and amplifies the vibration amplitudes. A typical structure may have its lowest horizontal resonance frequencies around 40-60 Hz.

It is an unfortunate fact of life that the amplitudes of the vertical vibrations of the building (dominantly bending modes of the floor) are largest in the centre of the floor, where for convenience most experiments are situated! If possible locate the system near to a supporting wall.

Test of Support Surface

The best location for the system is directly on the floor. This is generally rather inconvenient and a support structure is used to bring the system to a suitable working height. Although the **TS-200** will operate on any support surface, a soft support structure resonantly amplifies certain building vibration frequencies and these will therefore be less effectively isolated.

If the elements are not placed directly on the floor, you can obtain an idea for the suitability of your support structure by observing the diagnostic signal while pushing on the support structure. The isolation should be disabled for this test. If the support is rigid the signals should hardly respond to a push on the support in any direction. Now try tapping the support to excite its internal resonances. Generally the support will react more strongly to a horizontal tap than to a vertical one. A very resonant support will show long lived resonances and the isolation will be seriously affected at these frequencies. A better support will show well damped resonances.

Fabrik am Weiher
CH-8909 Zwillikon
Switzerland
Phone : *+41 44 776 33 66*
Fax: *+41 44 776 33 65*
E-Mail: *info@tablestable.biz*

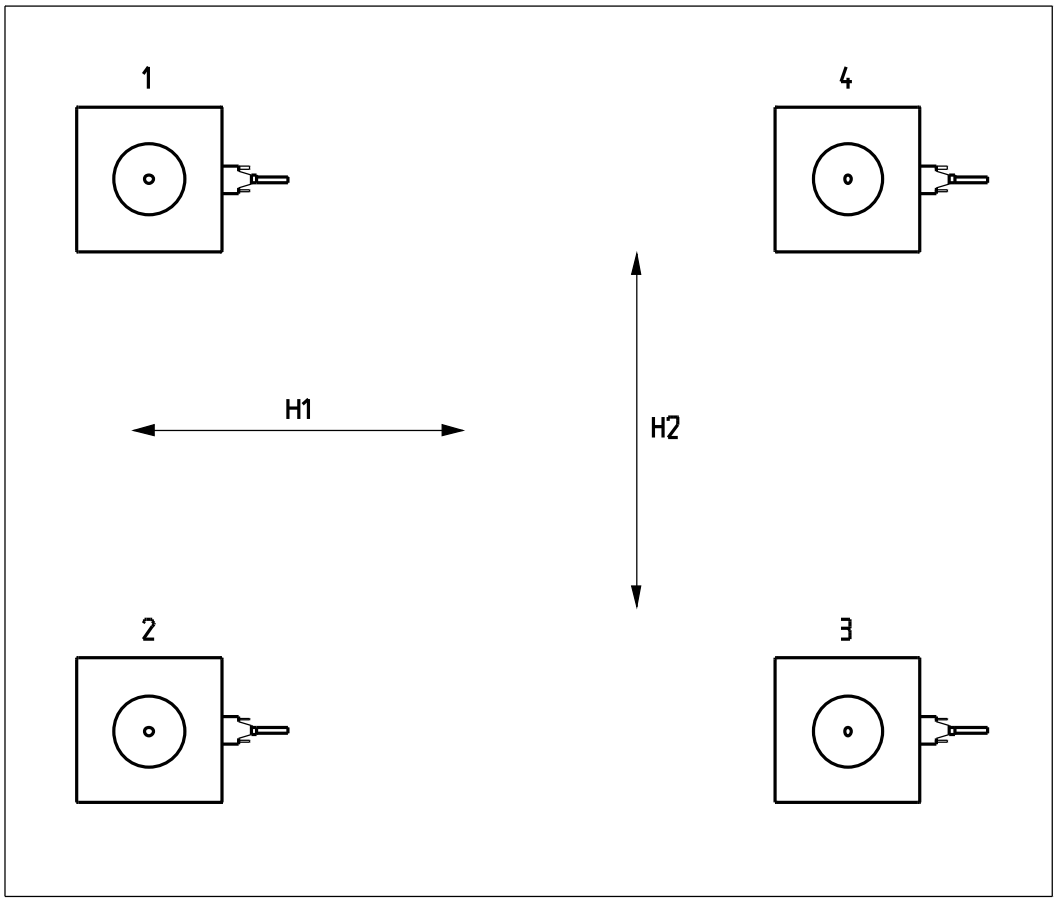
First Time Installation

Note: *For shipping the system has been locked to prevent damage. It will automatically be unlocked when power is applied to the system.*

Sometimes equipment can get very cold during shipping. We recommend that if the system is cold you allow 2-3 hours for it to reach room temperature before connecting the power, otherwise a malfunction may arise due to condensation.

Place the four units under the load and connect the units via the D-Sub 15p cables to the control unit. The sockets on the control unit are numbered 1-4 and should be connected to the units in clockwise or anti-clockwise order. We suggest the order shown in figure 1. It does not matter in which direction the units are oriented, but all units **must have the same orientation**. On the display showing the vibration levels the horizontal axis H1 is parallel to the cable (see below).

fig.1



Fabrik am Weiher *Phone :* *+41 44 776 33 66*
CH-8909 Zwillikon *Fax:* *+41 44 776 33 65*
Switzerland *E-Mail:* *info@tablestable.biz*

- Switch on the control unit (6)

fig 2

1 Scroll up
2 Scroll down
3 Enter
4 Enable/disable Isolation
5 Isolation Indicator
6 Power Switch



Auto-Levelling

If the system has been locked for transport the motors will run rapidly for a few seconds until the system is floating. If any unit is near to overload that corner of the load will start to float. If the load pushes the unit fully down the unit is definitely overloaded and you should not proceed with the installation.

The display will show *height adjustment* and the motors will now run and adjust the units to the load. After some time the motors will stop.

```
******   TS-200   ******
HEIGHT ADJUSTMENT
```

Check carefully by pushing vertically and horizontally on each unit that the load is indeed floating. If a unit is near the limit of its horizontal movement the message *horiz. pos. unit x* will appear in the display. Try raising the load above that unit and lowering again - the message should then disappear.

```
******   TS-200   ******
ISOLATION DISABLED
Horiz. Pos. Unit x
```

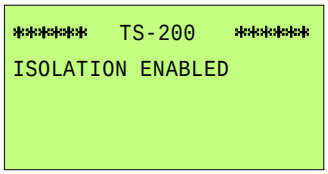
The system should now be floating
and the display shows *isolation disabled*

```
******   TS-200   ******
ISOLATION DISABLED
```

Fabrik am Weiher *Phone :* *+41 44 776 33 66*
CH-8909 Zwillikon *Fax:* *+41 44 776 33 65*
Switzerland *E-Mail:* *info@tablestable.biz*

Operation

Push the enable button (E) to switch on the isolation.
The Isolation Indicator (5) will light up and the display shows *isolation enabled*
The system is now ready and is isolating.

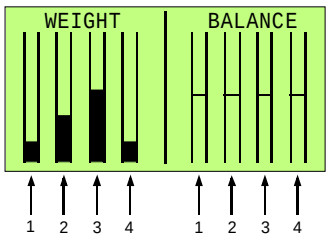


By using the up (↑) and down (↓) arrows on the front panel various pages in the menu will be found.

Load distribution and balance

Weight shows the load on each corner. A flashing bar means an overload or bad load distribution: the system will not isolate.

Balance shows the heights of the individual units. Under normal circumstances the bars should be approximately in the middle.
A flashing bar means the system is not balanced and will not isolate.

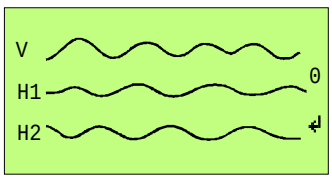


An uneven floor will cause an out-of-balance situation in which case the balance indicators will show two diagonally opposite units high and the other two units low (for example 1 and 3 high, 2 and 4 low). One or both of the units indicating high should be raised. Those units may be raised by placing cardboard or similar under the unit. It is also acceptable to place packing between the load and the top of the unit. The balance indicators show approximately +/-0.4mm full scale.

Example: suppose that units 1 and 3 indicate high, about mid-range. The units 2 and 4 should indicate low by the same amount. Units 1 and 3 are therefore about 0.2mm too high, and units 2 and 4 about 0.2mm too low. Correct by placing packing shims of thickness 0.4mm under both units 1 and 3, or 0.8mm under either unit 1 or unit 3.

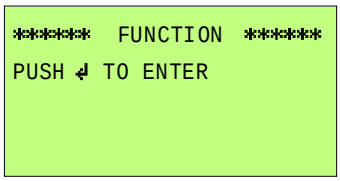
Vibration Levels

The traces show velocity, but are not calibrated – the top trace is vertical and the lower 2 traces show the horizontal vibrations. H1 is parallel to the cables attached to the units, and H2 perpendicular to this axis. The time axis can be changed by pushing the Enter button – a higher index number N gives a slower display.
The approximate time per scan is 160 x 2^N milliseconds.



Fabrik am Weiher
CH-8909 Zwillikon
Switzerland
Phone : *+41 44 776 33 66*
Fax: *+41 44 776 33 65*
E-Mail: *info@tablestable.biz*

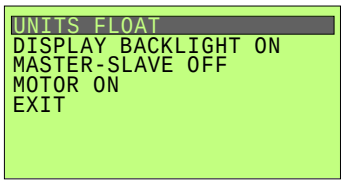
Functions



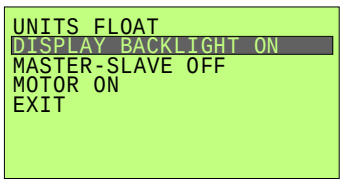
Under FUNCTION you will find several possibilities to operate and set up the system. Push ↵ to get into the submenus.

Push ⊕ or ⊖ to scroll the cursor between the functions.

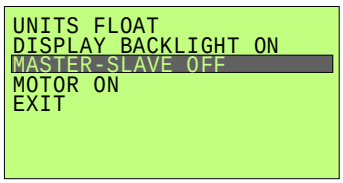
UNITS FLOAT
Place the cursor on the line for running the units UP or DOWN or FLOAT. Toggle between the 3 possibilities using the ↵ button.



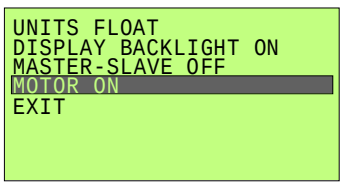
DISPLAY BACKLIGHT
The Backlight may turned off if desired. Place the cursor on the line und push ↵ to toggle between backlight on and off



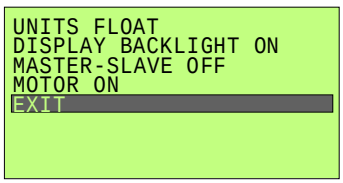
MASTER-SLAVE OFF
The master-slave function allows you to operate the system with additional units for higher load. The master-slave function is only active for systems with more than 4 units.



MOTOR ON
Push the ↵ button to switch the height adjustment motors on and off.



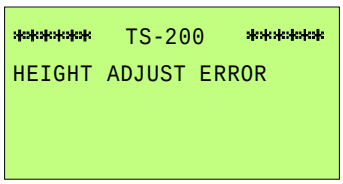
EXIT
Push the ↵ button to exit from the function mode and return to the higher level display pages.



Additional Functions and Messages

HEIGHT ADJUST ERROR
This message appears if one or more unit is over- or under-loaded.

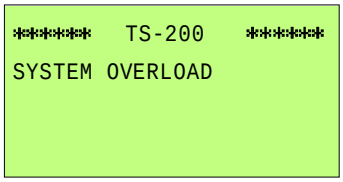
Note: *each unit must have a minimum load of approximately 25kg.*



Fabrik am Weiher
CH-8909 Zwillikon
Switzerland
Phone : *+41 44 776 33 66*
Fax: *+41 44 776 33 65*
E-Mail: *info@tablestable.biz*

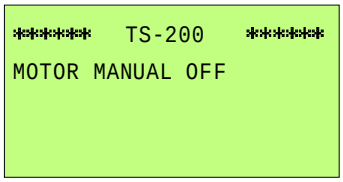
SYSTEM OVERLOAD

If you apply to much force to the system, the isolation indicator lamp (5) will flash for a few seconds, indicating that the system is temporarily no longer isolating until the overload is removed (standby mode).



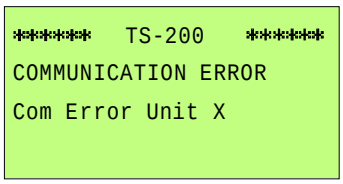
MOTOR MANUAL OFF

This message will appear if the height adjustment motors have been switched off manually.



COMMUNICATION ERROR UNIT X

This message will appear if one or more unit is not connected to the control unit. The cause can be a damaged cable or a socket is not sitting properly.



Remote Output

A remote control box (optional) can be connected to the D-Sub 15 socket and allows you to switch the Isolation on and off externally.



BNC Output Jack

The rear panel BNC socket gives a multiplexed output showing a mixed signal from all accelerometers.
To view this signal on an oscilloscope, set the time base to **20msec** and the sensitivity to **1V**.
On using the system for the first time it is strongly recommended that you observe this signal, with the isolation both enabled and off - it gives a good impression of how well the system is operating.
Note: *The arrangement of the traces is the same as the vibration levels on the display*
The signals are for diagnostic purposes only.

Fabrik am Weiher
CH-8909 Zwillikon
Switzerland
Phone : *+41 44 776 33 66*
Fax: *+41 44 776 33 65*
E-Mail: *info@tablestable.biz*

Specifications TS-200

Isolation:	dynamic 1Hz to 1kHz, purely passive beyond 1kHz.
Transmissibility:	see attached curve. Above 10 Hz transmissibility <0.01 (-40dB)
Correction Forces:	Maximum ±4N in any direction.
System Noise:	less than 20nG/√Hz from 0.1-200Hz in any direction
Minimum Load:	approx. 25 kg / unit
Maximum Load:	200 kg / unit
Static Compliance:	approx. 12µm/N vertical approx. 30-40µm/N horizontal
Size of unit:	210 x 210 x 145 mm (L x W x H)
Weight of one unit:	9.5 kg

Electrical

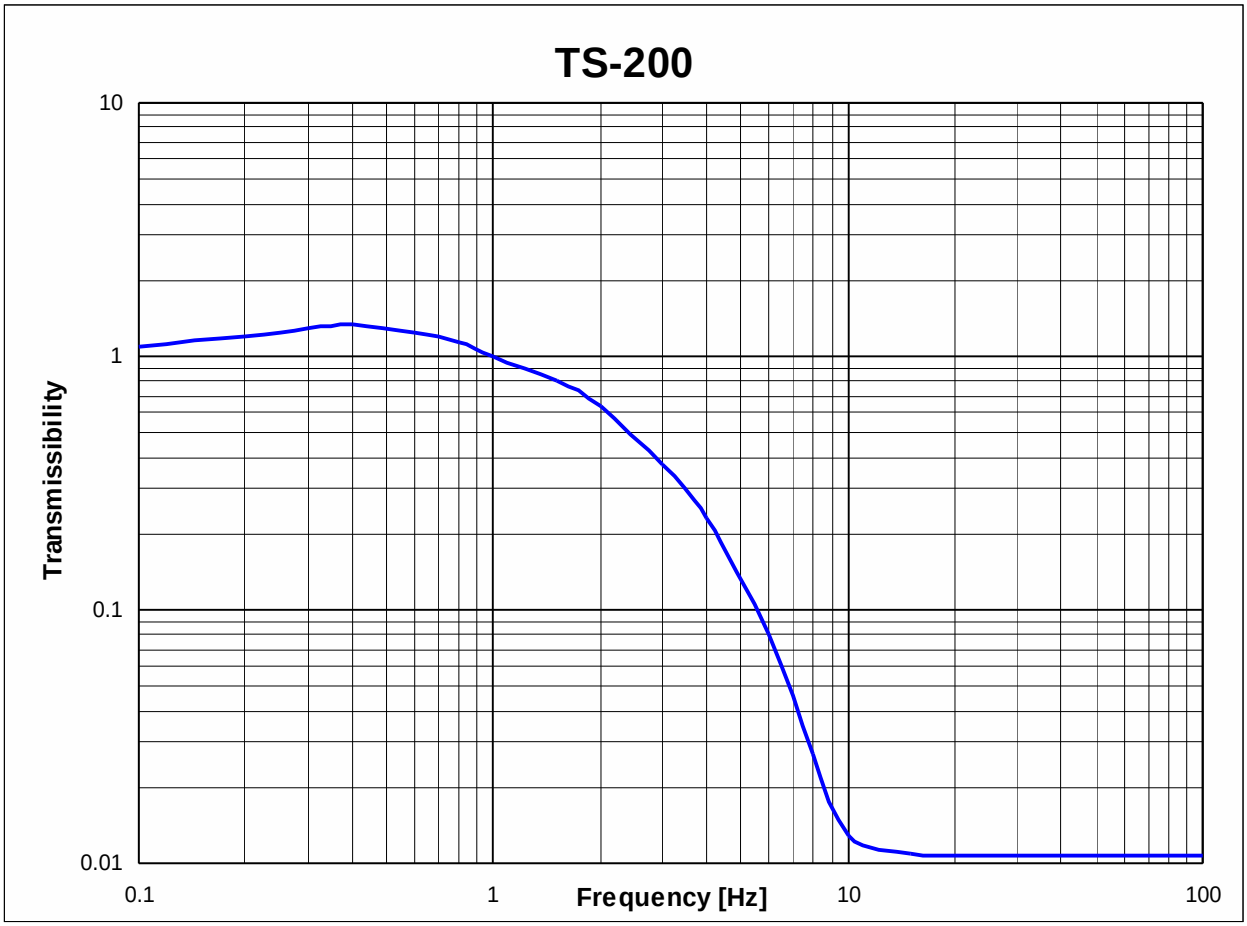
Safety class:	1
Power Consumption:	typically 10 W, maximum 50 W (70 VA)
Input Voltage:	115 – 230 V AC ±10%, 50 – 60 Hz
Fuses:	2 x 1.6A/250V slow, located in the power socket on the rear side of the unit.

Normal Environmental Conditions

Protection class:	IP 20
Temperature range:	5°C - 40°C
Relative humidity:	10 – 90% (5 – 30°C) 10 – 60% (30 – 40°C)
Application:	Indoor
Altitude:	up to 2000m (6500ft)

Fabrik am Weiher
CH-8909 Zwillikon
Switzerland
Phone : *+41 44 776 33 66*
Fax: *+41 44 776 33 65*
E-Mail: *info@tablestable.biz*

Transmissibility



The system TS-200 is still under development. The above curve is a provisional measurement of the vertical transmissibility.