VANDERBILT

GM7xx

Seismic Detectors and Accessories

Application Guide

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1 General information

The Vanderbilt GM7xx range of seismic detectors has been the market leader in seismic detection for more than 20 years. Vanderbilt detectors are designed to detect and report any attempt to compromise the integrity of any type of high value storage unit.

Vanderbilt's patented detection technology covers a wide spectrum of attack types. The flexibility in the design and local environmental compensation enables normal activities to continue without creating unwanted alarms.

The GM7xx range of detectors are capable of detecting attacks using many different methods:

- Tamper protection
- Temperature surveillance (for thermal attacks)
- Shock detection (impacts on the detector or monitored surface)
- Access times (automatic or manual access without creating an alarm, controlled via the intruder panel)
- Integration alarms (low level frequencies detected over a longer period of time).

The critical component of all GM7xx seismic detectors is a patented bimorph sensor that provides unrivalled detection, unwanted alarm immunity and reliability. GM7xx detectors are compatible with most intruder systems but peak performance is achieved when the detectors are connected to the Vanderbilt SPC panel. See Section 9 Interface to SPC Panel/System for more information.

Detection of an attack is primarily achieved by monitoring the surfaces of the protective enclosure and detecting any vibrations that are carried through the structure. Vibration signals are evaluated based on amplitude (signal strength), frequency, and duration to differentiate between an attack and general background signals. This patented technology enables swift and reliable detection of any attempt to gain unauthorised entry to the protected space. With several different detector options, an unrivalled range of accessories, and an extensive range of programming options, the Vanderbilt GM7xx range of seismic detectors offers reliable detection and the highest immunity to unwanted alarms.

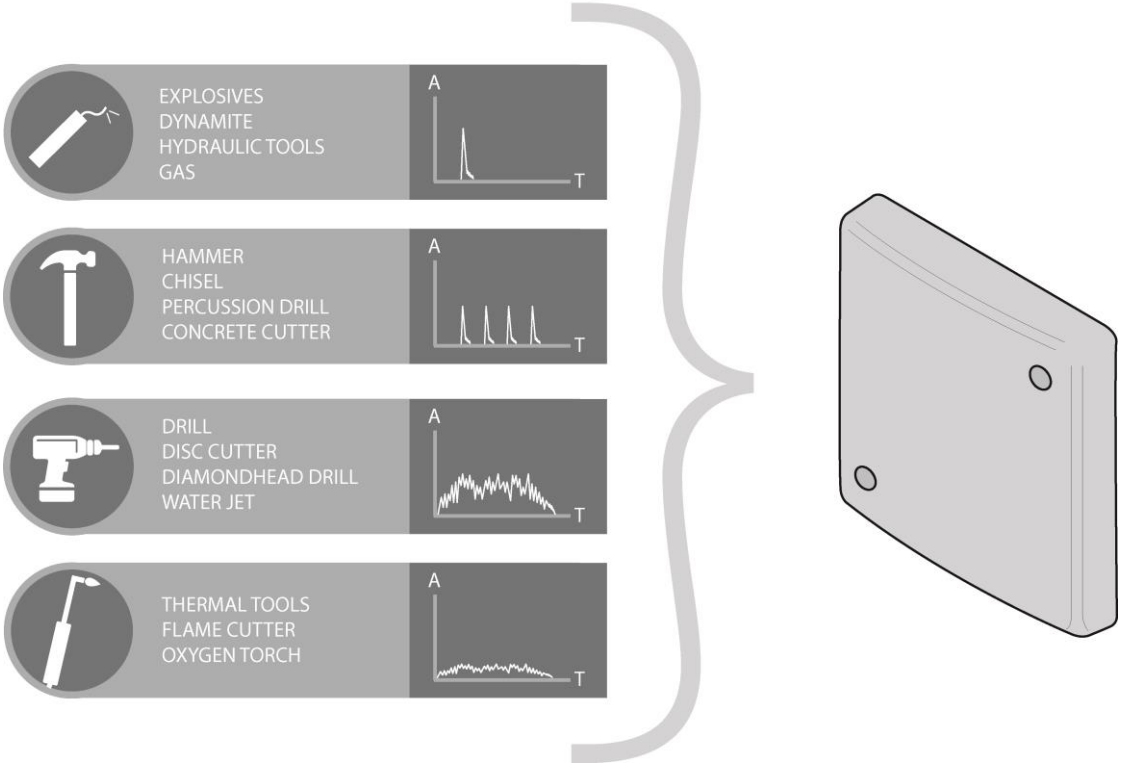


Figure 1-1: GM7xx Seismic detectors – Attack types

	The GM7xx range of seismic detectors operate at maximum efficiency on steel or concrete surfaces. Correct operation and performance of the detectors on other surfaces cannot be guaranteed.

1.1 Detector and accessory overview

Additional information relating to the Vanderbilt Seismic range of detectors and accessories is available on www.spiap.com.

Figure 1-2: Detector and accessory overview

2 Applications

The Vanderbilt GM7xx range of seismic detectors offers detection solutions with a wide range of applications.

2.1 Detector applications and attack profiles

The following table shows some of the more common applications for the detectors:

Applications	Attack Types grouped by amplitude profile
Financial – Vaults, safes, ATM's, night deposit boxes, coin cabinets	**Explosions** – Gas, dynamite, hydraulic tools **Electric tools** – Disc cutter, diamond head drill, high pressure water **Mechanical attacks** – Hammer, chisel, percussion drill, concrete cutter **Thermal Tools**- Oxygen lance, flame cutter **Unauthorised opening** – Doors & gates
Commercial – Vending machines, file storage, ATM's, fuel dispensaries, ticket machines, show cases, bonded warehouses, jewellery showcases	
Military – Armouries, medical stores, file storage, intelligence storage, gates, barriers	
Heritage – Vaults, store rooms, statues, show cases	
Transportation – Ticket machines, ATM's, vaults, access hatches	
Medical – Drug storage, vaults, personal records, instrument stores, ATM's	
Anti-terror – Water treatment works, nuclear plants, power generation	
Residential – Safes and gun cabinets	

Table 2-1: Detector applications and attack profiles

2.2 Detector selection

The following table shows some of the applications for the detectors together with a suggestion for which detector from the range would provide the best detection solution for the application.

Applications	GM710	GM730	GM760	GM775
Ticket Machines	Yes			
Vending Machines	Yes			
Document/Filing Cabinets	Yes	Yes	Yes	
Gun Cabinets	Yes	Yes	Yes	
Chests	Yes			
Night Deposit Boxes	Yes	Yes	Yes	
Safes	Yes	Yes	Yes	Yes
LWS (Light Weight Safes) [1]			Yes	Yes
Lobby ATMs	Yes	Yes	Yes	Yes
ATMs		Yes	Yes	Yes
Modular Vaults			Yes	Yes
Strong Room Vaults			Yes	Yes
Containers			Yes	
Bonded Warehouses			Yes	Yes

Table 2-2: Applications and recommended detectors

[1] LWS Light Weight Safes can be constructed from a range of different composite materials. Vanderbilt recommend that on-site tests are performed to ascertain the correct number of detectors required for each LWS application.

Please note that Country specific approvals may exclude the use of certain detectors. See Section 10.1 Cross-reference chart for country-specific approvals for more information.

To compliment the excellent detection capabilities of the GM7xx detectors Vanderbilt offer a comprehensive range of accessories to provide additional security in the most challenging of environments and applications. See Section 4 Installation - Accessories for more information.

2.3 Steel applications and accessory options

Steel Application		Options	Accessory
Installation	On flat steel	Direct fix	N/A
	On uneven steel	Mounting plate[1]	GMXP0[1]
Test Method		Internal	GMXS1
		External	GMXS5
Lock Protection		Safes	GMAS6
		Vaults	GMXP3/Z
Additional Protection		Anti-drill foil	GMXD7

Table 2-3: Steel applications and accessories

[1] The GMXP0 Mounting plate is a mandatory accessory when installing a detector on uneven steel.

2.4 Concrete applications and accessory options

Concrete Application		Options	Accessory
Installation	Recess Mount	Wall/Ceiling	GMXW0
		Floor	GMXB0
	Surface Mount	Mounting plate[1]	GMXP0[1]
Test Method		Internal	GMXS1
		External	GMXS5
Additional Protection		Anti-drill foil	GMXD7
Cable Access		Plastic/Metal Conduit	GMXC2

Table 2-4: Concrete applications and accessories

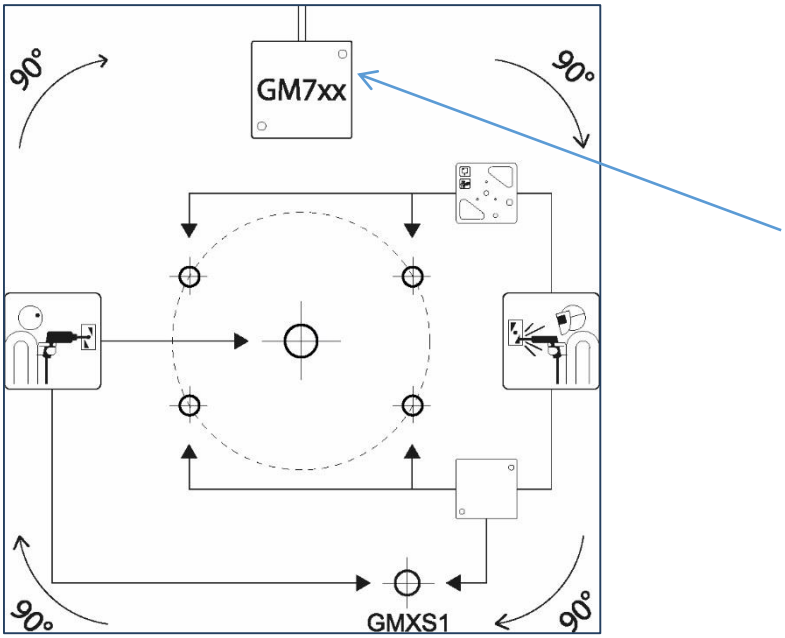
[1] The GMXP0 Mounting plate is a mandatory accessory when surface mounting a detector on concrete.

3 Installation - Detectors

It is essential that the GM7xx detectors are installed correctly to provide the optimum performance from the detector and to ensure that the required signals from the protected surface are transmitted to the detector.

3.1 Drill template

A drill template is provided with each detector to assist with the correct method of securing the detector to the protected surface.



a) Cable access indicator

Figure 3-1: GM7xx drill template

a) The cable access point for the detector is depicted by the symbol , which shows the cable access at the top of the detector. The drill template can be turned through 90, 180 & 270^0 to have the cable access from the top, right, bottom or left side.

There is a 1:1 scale copy of the drill template located in Appendix 1: Drill template GM7xx.

The drill templates are also available as a download from the Vanderbilt Seismic microsite on SPIAP. www.spiap.com

	Before installing a detector, Vanderbilt recommend that you consult the guidelines for installation in this document. For more information, see Section 5.4 Installation guidelines.

3.2 Installation methods

This section contains useful information on the three main methods of detector installation.

- Direct installation on steel
- Indirect installation on steel
- Installation on concrete

3.3 Detector installation onto flat steel surface

Use this method to install a detector on a flat and even steel surface.

Remove all paint or grease from the steel surface to ensure that the detector has the optimum metal to metal contact between the rear of the detector and the protected surface.

To mount the detector directly onto the steel surface, drill two holes to secure the detector, and one hole to secure the GMXS1 test transmitter, if required.

Use the GM7xx drill template (supplied with the detector) to correctly locate the drill holes for the GM7xx detector and for the GMXS1 test transmitter.

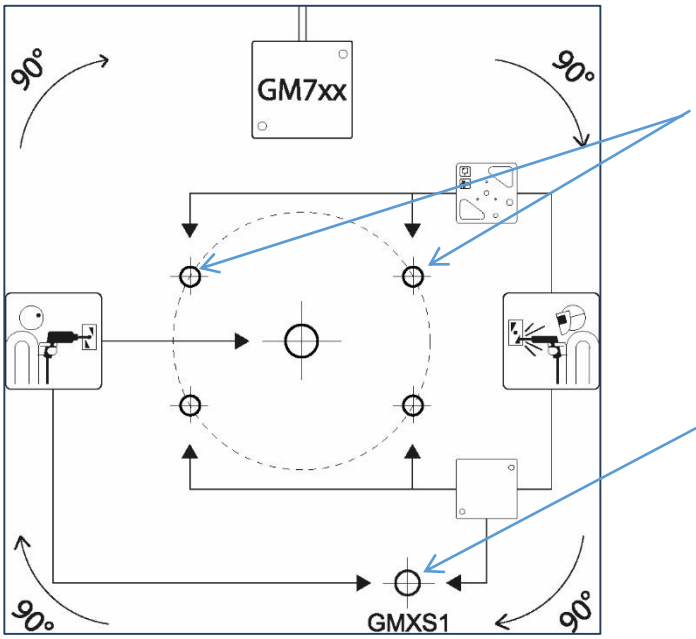
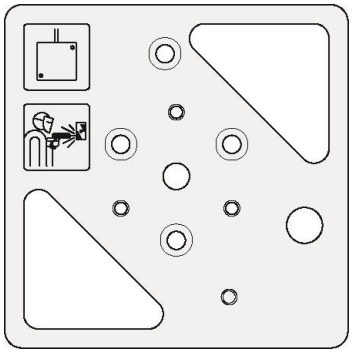


Figure 3-2: Gm7xx drill template on flat steel

3.4 Detector installation on steel using the GMXP0 mounting plate

The GMXP0 mounting plate must be used if the steel surface is uneven or the steel is reinforced. The mounting plate can be welded or screwed to the protected surface. It is important to ensure that the correct side is selected for the installation of the detector on to a steel surface.



GMXP0 mounting plate (weld side)

Figure 3-3: GMXP0 mounting plate

	The weld symbol should be visible when weld fixing the GMXP0 mounting plate to a steel surface.

	Remove all paint or grease from the steel surface to ensure that the rear of the GMXP0 has the optimum metal to metal contact between the mounting plate and the protected surface.

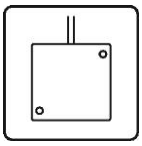
3.4.1 Weld fixing

Vanderbilt recommend weld fixing the GMXP0 mounting plate directly on to the clean, paint-free area of the protected surface. This option provides the best acoustic coupling for the detection of vibration signals.

Ensure that the correct side of the mounting plate is selected for the type of fixing to the protected surface.

	The weld symbol should be visible when weld fixing the GMXP0 mounting plate to a steel surface.

Before fixing the mounting plate to the protected surface, it is important to consider cable access to the detector. If necessary, rotate the mounting plate to the correct orientation to give cable access to the detector. When the mounting plate is welded to the protected surface it becomes a permanent fixture on that surface.

	The cable access symbol indicates the direction of the cable access to the detector when the detector is secured to the mounting plate. In the orientation shown here, cable access to the detector is at the top of the installation.

Use two fillet welds, applied to the long side of the two cut-outs, to secure the mounting plate to the protected surface.

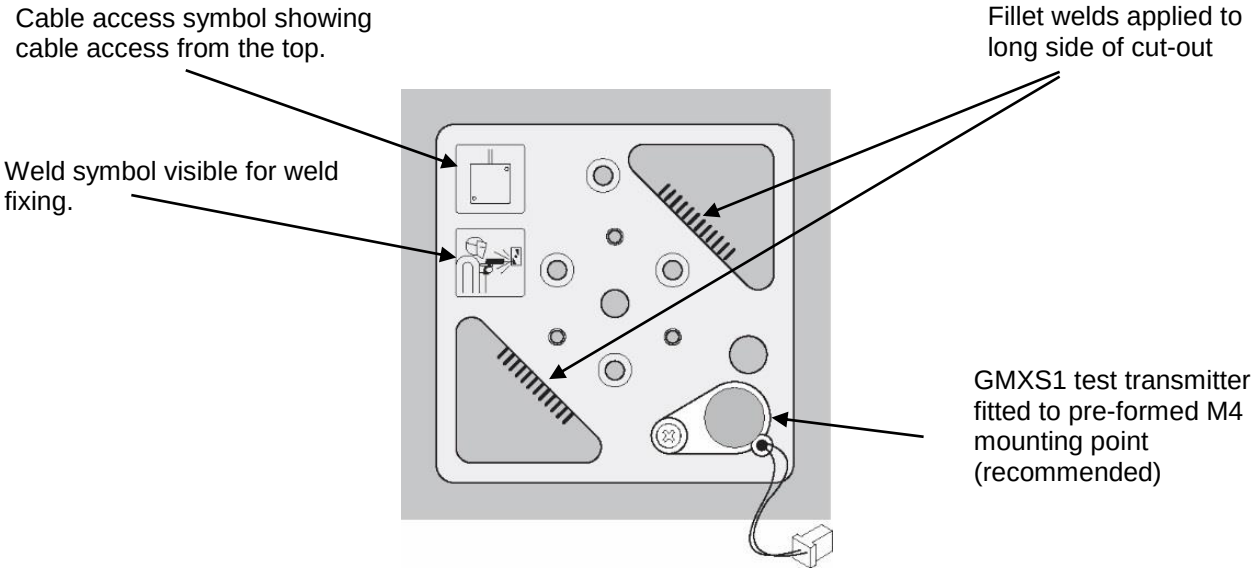


Figure 3-4: GMXP0 mounting plate - weld fixing

3.4.2 Screw fixing

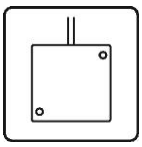
If weld fixing to the protected surface is not an option, the GMXP0 mounting plate can be secured by screw fixing to a clean, paint-free area of the protected surface.

	Use the weld side of the GMXP0 when screw fixing the GMXP0 mounting plate to a steel surface.

Ensure that the correct side of the mounting plate is selected for the type of fixing to the protected surface.

	The weld symbol should be visible when screw fixing the GMXP0 mounting plate to a steel surface.

Before fixing the mounting plate to the protected surface, it is important to consider cable access to the detector. If necessary, rotate the mounting plate to the correct orientation to give cable access to the detector.

	The cable access symbol indicates the direction of the cable access to the detector when the detector is secured to the mounting plate. In the orientation shown here, cable access to the detector is at the top of the installation.

Use the GM7xx drill template to mark the location of the required drill holes.

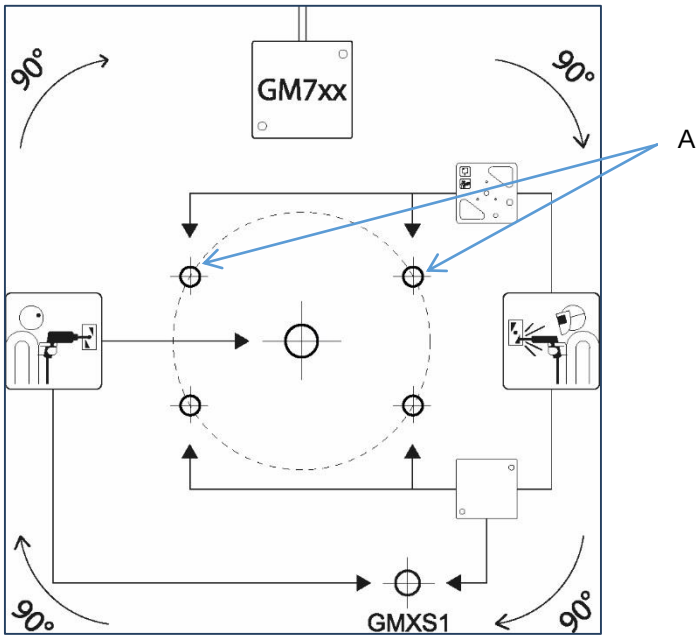


Figure 3-5: GM7xx drill template for GMXP0 on steel

1. Use the GM7xx drill template to mark the correct location of the fixing holes (A), and drill two 3.2mm Ø holes at least 6mm deep.
2. Tap each hole to M4.
3. Remove the drill template from the protected surface before fixing the GMXP0.

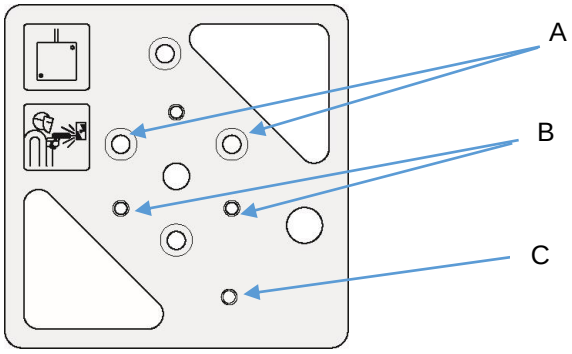


Figure 3-6: GMXP0 screw fixing

4. Secure the GMXP0 through the holes (A) using 2 x M4 countersunk screws (provided with GMXP0).
5. Mount the detector on the GMXP0 using the mounting holes provided (B).
6. Mount the GMXS1 internal test transmitter on the designated location on the GMXP0 (C) and connect to the detector.

3.4.3 Glue Fixing

If weld or screw fixing to the steel surface is not an option, the GMXP0 mounting plate can be secured by glue fixing to a clean area of the protected surface. For improved adhesion results the surface of the protected surface should be scratched with a form of abrasive material or tool. The recommended option for installation is to drill or weld the GMXP0 to the protected surface and to follow the installation guides throughout this document and the associated installation sheets.

Tests have been completed using UniBond Repair Power Expoxy Permanent Adhesive – Metal. Material Reference 2000912. Other forms of adhesive exist and local tests should be performed if any other type of adhesive is used.

⚠	A GMXP0 mounting plate must be used when this installation option is selected. Apply the adhesive to the drill side of the GMXP0 when glue fixing the GMXP0 mounting plate to a steel surface. DO NOT apply the adhesive to the rear of the detector**.**

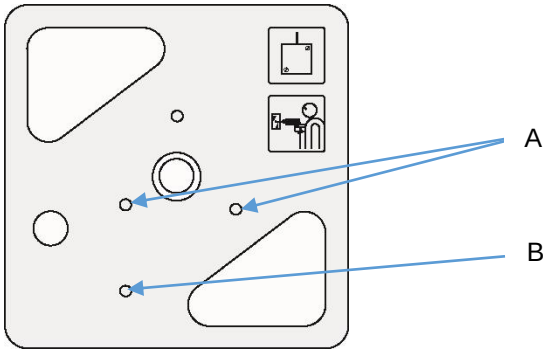
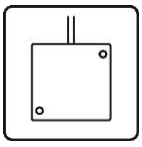


Figure 3-7: GMXP0 mounting plate (drill side)

Before fixing the mounting plate to the protected surface, it is important to consider cable access to the detector. If necessary, rotate the mounting plate to the correct orientation to give cable access to the detector. When the mounting plate is glued to the protected surface it becomes a permanent fixture on that surface.

	The cable access symbol indicates the direction of the cable access to the detector when the detector is secured to the mounting plate. In the orientation shown here, cable access to the detector is at the top of the installation.

1. Protect the detector mounting holes (A) and the GMXS1 mounting hole (B) by placing tape over the holes on the drill side to prevent ingress of the adhesive.
2. Apply adhesive to the drill side of the GMXP0. Do not place excessive amounts of adhesive on the plate as it will overspill onto the protected surface when the plate is applied.
3. Use clamps or tape to secure the mounting plate in position for the initial setting time. Under normal environmental conditions, the UniBond Repair Power Expoxy Permanent Adhesive – Metal. Material Reference 2000912 takes approximately 10 minutes to set for normal handling and 2 hours for rough handling.

Notes

1. Carefully follow the instructions supplied with the adhesive for securing products and all health & safety advice.
2. When using the adhesive, it is not imperative that the paint is removed prior to the adhesive being applied but the surface should be clean.
3. Securing the GMXP0 with a GM775 detector using adhesive will have a slight performance issue when the detector is set for low shock sensitivity. This reduction in sensitivity should be considered as part of the design criteria. All other detectors and their associated settings remain unaffected by this installation method.
4. As part of any routine inspection, the mounting plates should receive special attention to ensure that there has not been a deterioration of the adhesive material.

3.5 Indirect installation on concrete

The GMXP0 mounting plate must be used to secure a GM7xx seismic detector to a concrete surface.

Use the GM7xx drill template (supplied with the detector) to correctly locate the cable access for the detector and to locate the drill holes for the GMXP0 mounting plate detector and for the GMXS1 test transmitter (if required).

⚠	Use the drill side of the GMXP0 when fixing the GMXP0 mounting plate to a concrete surface.

Ensure that the correct side of the mounting plate is selected for the type of fixing to the protected surface.

	The drill symbol should be visible when fixing the GMXP0 mounting plate to a concrete surface.

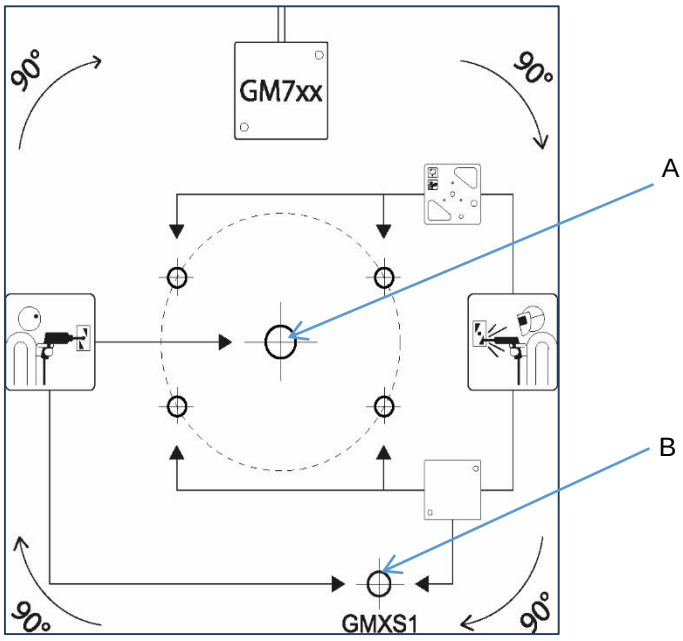


Figure 3-8: GM7xx drill template for GMXP0 on concrete

1. Drill a 10mm Ø x 60mm hole (A) and insert the steel expansion plug, supplied with the GMXP0.
2. If the GMXS1 test transmitter is required, drill a 5mm Ø x >22mm hole (B) and insert the GMXS1 brass expansion plug.

⚠	Do not use any other screw or expansion plug for either of these fixings.
ℹ	It is essential that the GMXS1 test transmitter is secured directly to the concrete and that it does not make contact with the GMXP0 or the detector. This is to ensure that the correct test signal is applied to the protected surface when the GMXS1 is activated.

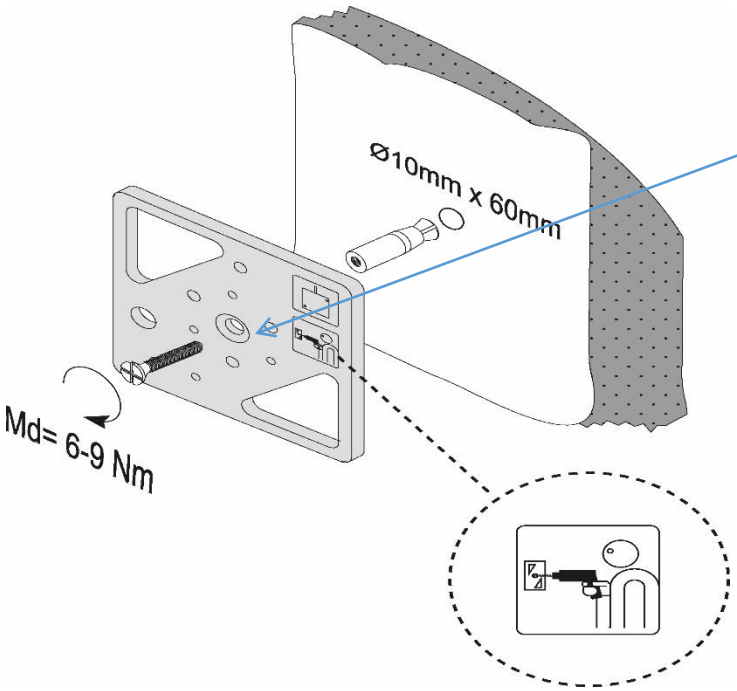


Figure 3-9: GMXP0 on concrete

3. Use the M6 x 47mm screw to secure the GMXP0 to the steel expansion plug.
4. Use the M4 x 21mm screw to secure the GMXS1 to the brass expansion plug.
5. Mount the GM7xx detector on to the GMXP0.

4 Installation - Accessories

4.1 GMXP0 mounting plate

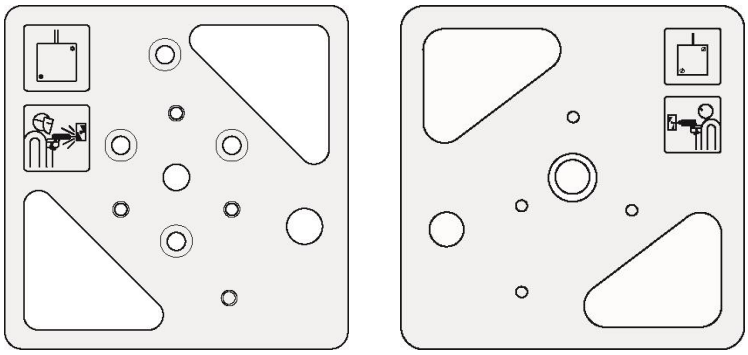


Figure 4-1:GMXP0 mounting plate

The GMXP0 is used to provide a secure connection between the detector and the protected surface.

The GMXP0 is a double-sided metal plate suitable for welding, screwing or gluing to the protected surface.

The GMXP0 is mandatory for installations on uneven steel, reinforced steel and concrete surfaces.

4.2 GMXS1 internal test transmitter

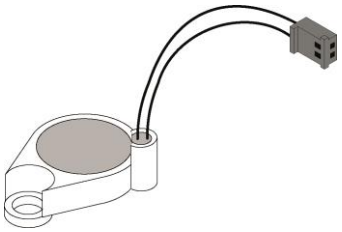


Figure 4-2: GMXS1 internal test transmitter

The GMXS1 internal test transmitter is installed with a detector. The GMXS1 enables a user to test the detector from an external source, via a switched input. Testing is usually performed from the intruder panel but it may also be performed from another source.

Activation of the GMXS1 is interpreted by the detector as a thermal lance attack as this form of attack is the most difficult to detect.

The GMXS1 must be installed in the recommended location in close proximity to the seismic detector to enable a good acoustic connection between the test transmitter and the detector. The location of the GMXS1 is determined by the drill template or the mounting plate. In both cases, the GMXS1 is located under the cover of the GM7xx detector.

The GMXS1 may be used for both steel and concrete applications.

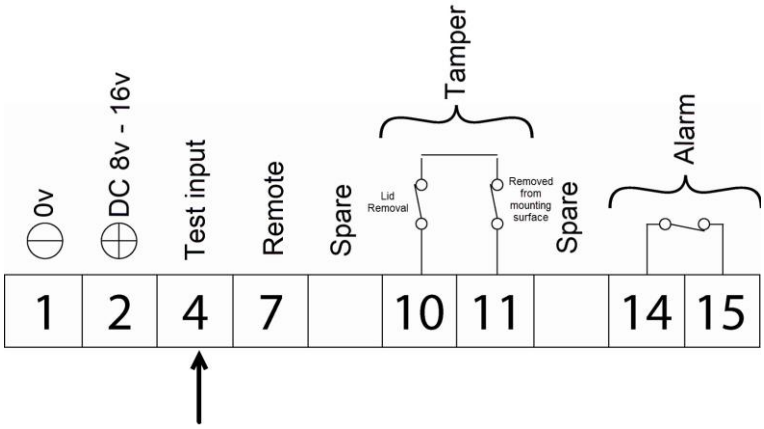


Figure 4-3: Detector input for GMXS1 testing

Apply the required input to terminal 4, which is selectable as part of the detector programing options.

	Active low = 0v applied to activate. Active high = 0v removed to activate.

When selecting the Active high option, it is essential to connect a permanent 0v to avoid unwanted alarms. To activate, remove the 0v.

Selection of the test input is only possible through the GMSW7 SensTool software.

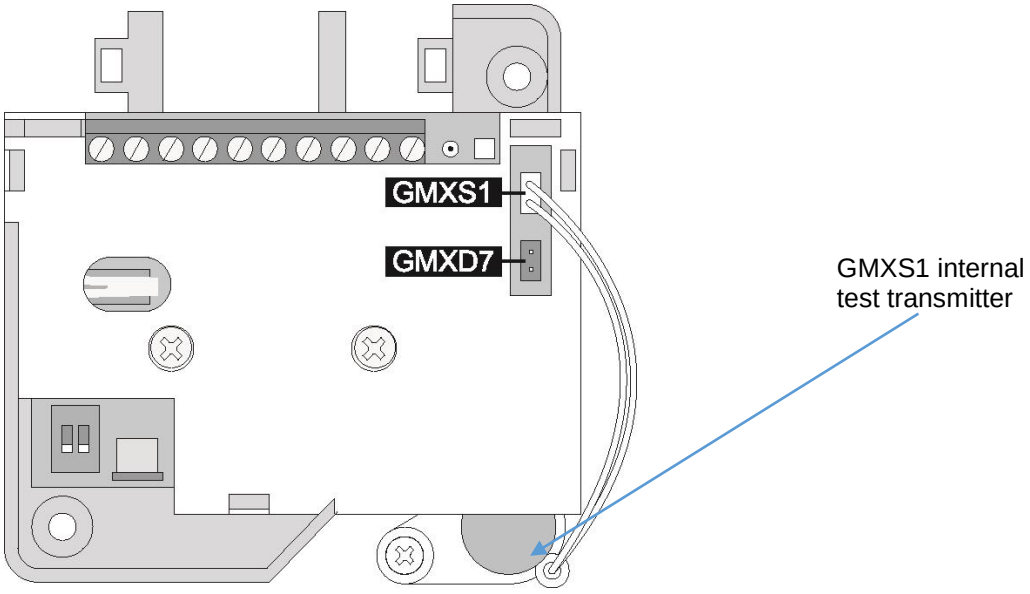


Figure 4-4: GM7xx detector with GMXS1

4.3 GMXS5 – External test transmitter

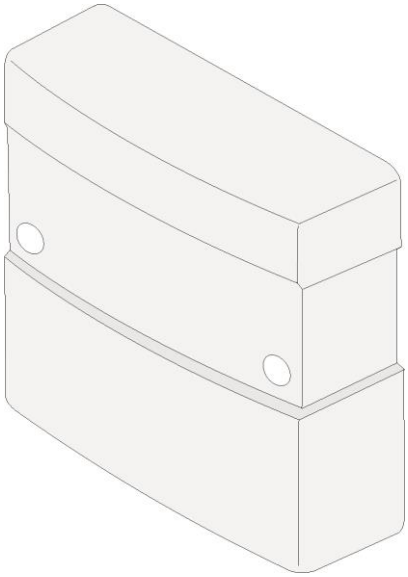


Figure 4-5: GMXS5 external test transmitter

The GMXS5 external test transmitter is mounted on the exterior of the protected area to enable a functional check of the seismic detection system by simulating an external attack. During the test period the GMXS5 creates a series of mechanical oscillations which are transmitted to the seismic detector(s) as structure-borne sound. If the seismic detectors are correctly spaced and configured, then the test is detected and an alarm is triggered.

The GMXS5 has an operating radius that is directly linked with the operating radius of the detector that is being tested. The GMXS5 is capable of testing multiple devices.

See Figure 4-8: Activate 4 detectors from a single GMXS5 for more information.

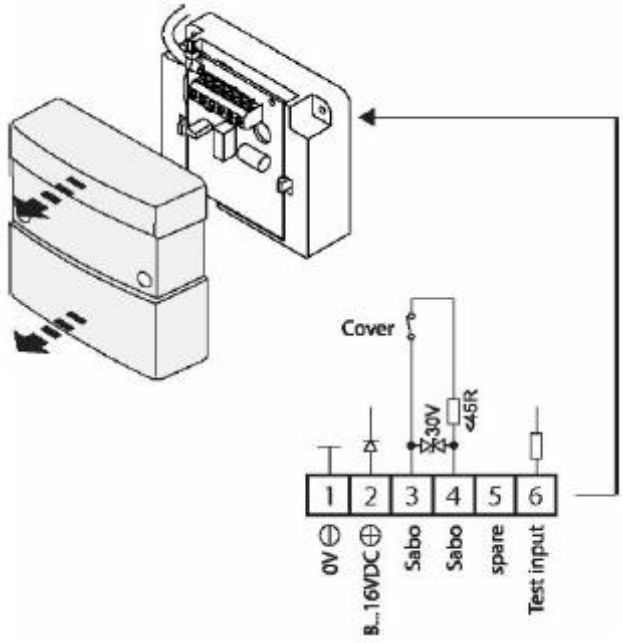


Figure 4-6: GMXS5 Electrical connections

Figure 4-6 shows the electrical connection for the device, 12 VDC, tamper (Sabo) contacts and a selectable switched input are the available connections.

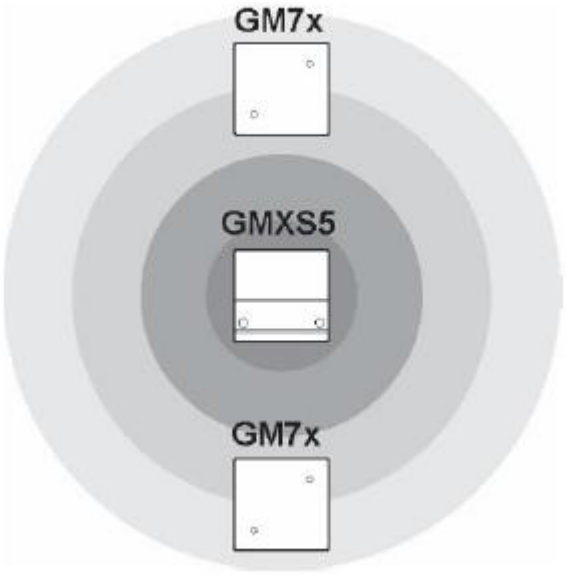


Figure 4-7: GMXS5 transmission signals

Figure 4-7: GMXS5 transmission signals shows the transmission signals from the GMXS5, which are strongest closest to the device but still detectable by GM7xx detectors if the signals are within the operating radius of the detectors.

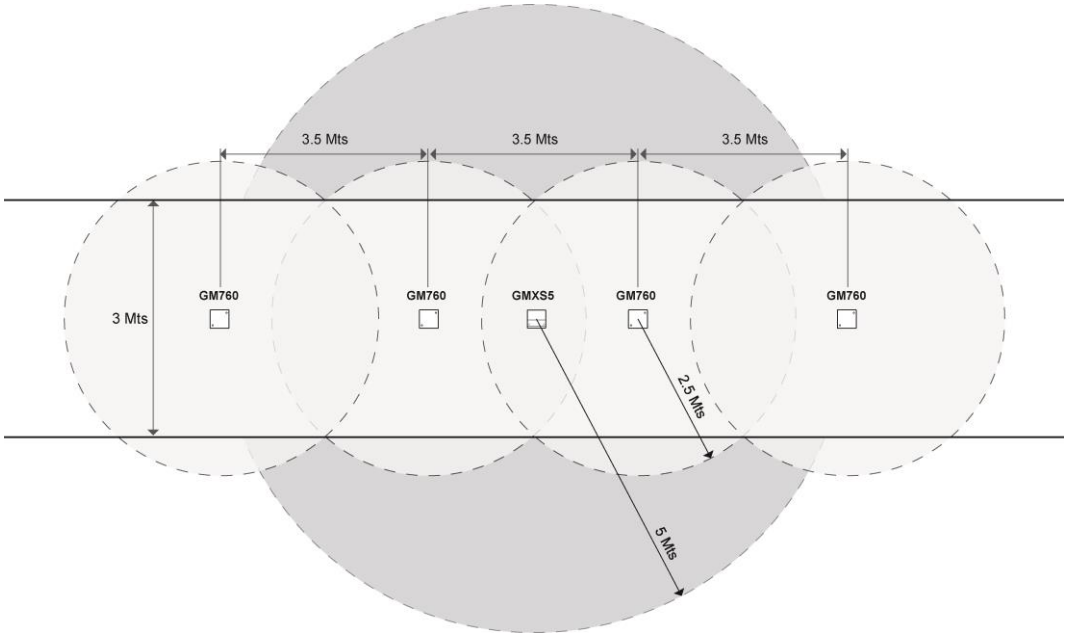


Figure 4-8: Activate 4 detectors from a single GMXS5

Figure 4-8: Activate 4 detectors from a single GMXS5 is a typical example of how to activate multiple detectors from a single GMXS5.

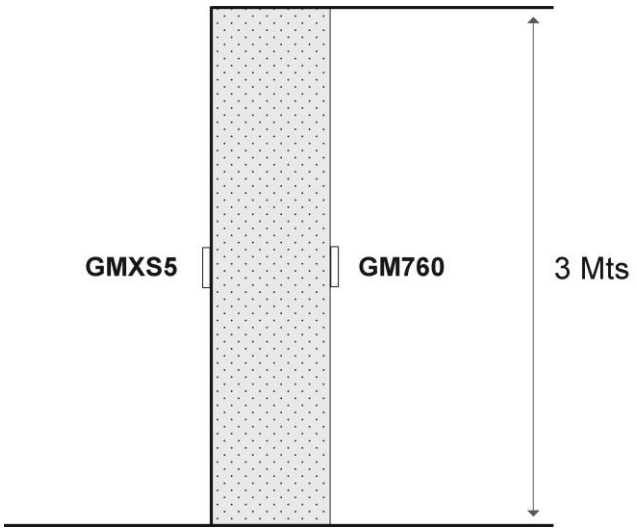


Figure 4-9: External GMXS5 and internal GM760

Figure 4-9 shows the detectors mounted internal to the protected space and the GMXS5 mounted external to the protected space. This location provides a stringent test for the detectors as the test signals from the GMXS5 have to travel through the wall.

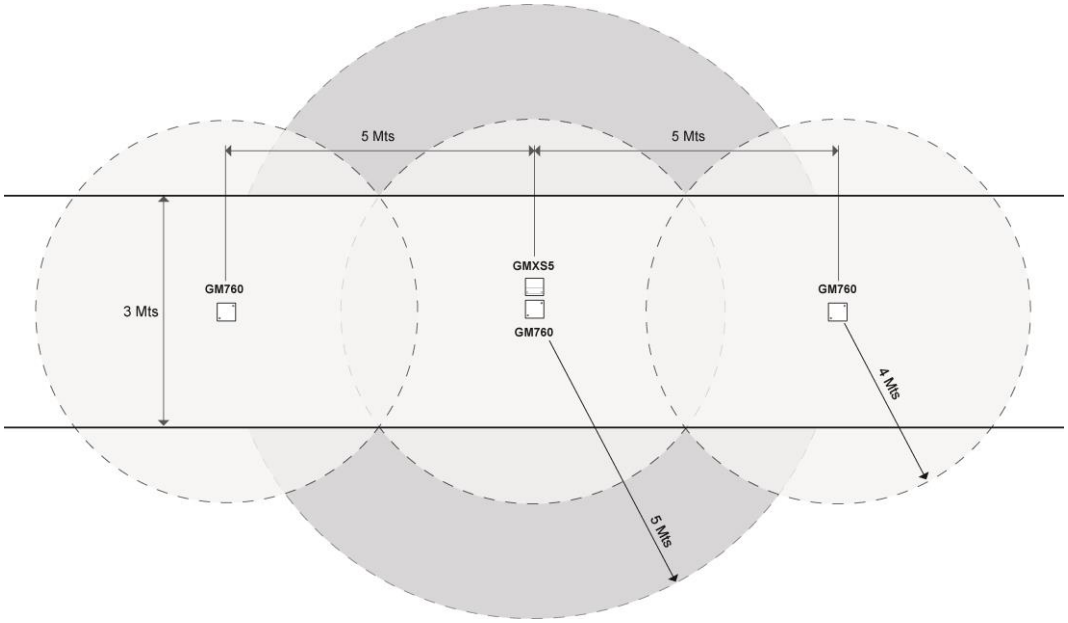


Figure 4-10: Activate 3 detectors from a single GMXS5

Figure 4-10 is an example of how to activate multiple detectors from a single GMXS5.

Material	Detector	Effective Transmission Diameter of the GMXS5
Concrete	GM775	5m
Steel	GM775	2m
Concrete	GM760	5m
Steel	GM760	2m
Concrete	GM730	4m
Steel	GM730	2m
Steel	GM710	2m

Table 4-1: GMXS5 transmission diameters

4.4 GMXW0 wall mounting kit

The GMXW0 wall mounting kit is a recess box for flush-mounting seismic detectors in concrete walls and ceilings.

The mounting kit contains a polystyrene mould mounted on a stainless steel back plate. The GMXW0 is installed in the wall/ceiling prior to the concrete being poured, and the polystyrene is then removed leaving a space for the detector.

It is important to consider cable access within the concrete walls or ceiling. Two holes are provided for conduit access for the connection cables.

For the best detection results from the seismic detector, connect the steel plate of the GMXW0 to the steel supports within the structure of the wall or ceiling.

The GMXW0 is secured to the front of the temporary wooden shuttering via the large bolt and associated wing nut.

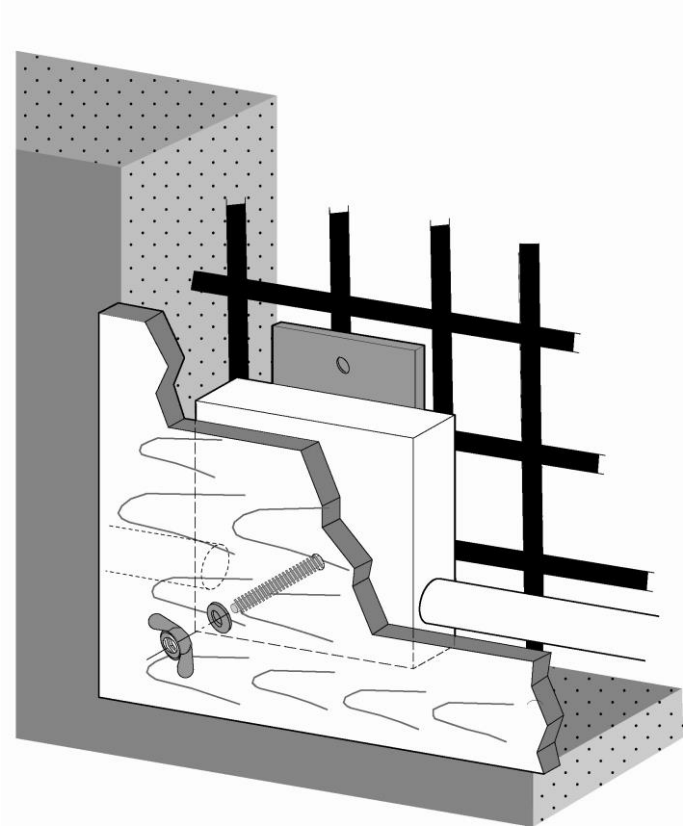


Figure 4-11: GMXW0 during installation

	Connect the back plate of the GMXW0 to the steel supports within the structure for the best acoustic coupling.

When the concrete has set, the wooden shuttering can be removed to reveal the polystyrene mould.

The mould must be fully removed to reveal the mounting plate and the conduit access points to the left and right hand sides. The mounting plate contains pre-drilled and tapped M4 mounting holes for the detector and for the GMXS1 test transmitter.

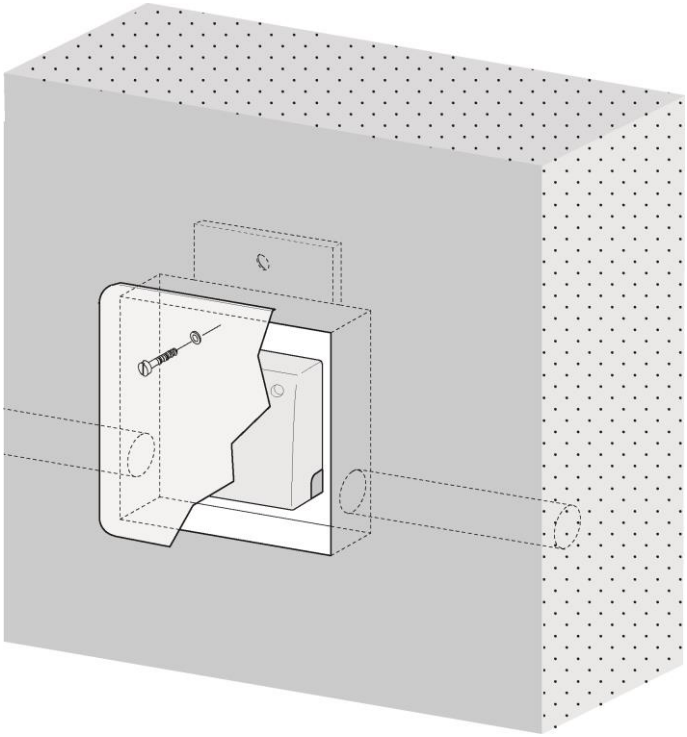


Figure 4-12: GMXW0 installed

When installation and commissioning is complete, the lid can be fixed via the appropriate mounting screw.

4.5 GMXB0 floor box

The GMXB0 is a stainless steel recess box for flush mounting seismic detectors in concrete floors.

The GMXB0 is located in the floor prior to the concrete being poured to reserve a space for the detector to be mounted in. It is important to consider cable access within the concrete surface. Two holes are provided for conduit access for the connection cables.

For the best detection results from the seismic detector, connect the steel plate of the GMXB0 to the steel supports within the structure of the floor.

The GMXB0 floor box provides a robust housing, which can withstand weights of up to 1 tonne, to protect a GM7xx seismic detector when installed within the floor of a protected space.

There are pre-drilled and tapped M4 mounting holes for the detector and the GMXS1 test transmitter. The GMXB0 has pre-formed conduit access holes to enable the cables to be securely offered to the device through the concrete.

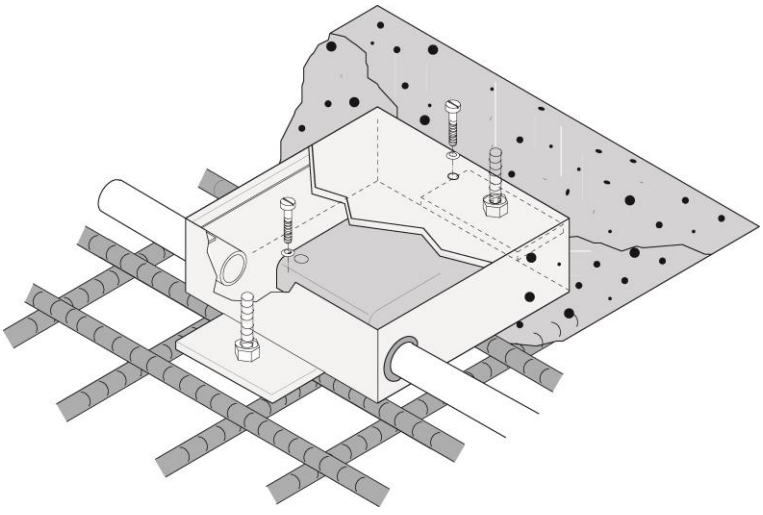


Figure 4-13: GMXB0 installed

	Connect the back plate of the GMXB0 to the steel supports within the structure for the best acoustic coupling.

4.6 GMXP3 & GMXP3Z lock protection system

Combine the GMXP3 and GMXP3Z lock protection systems with a GM7xx seismic detector to monitor safe and strong room doors with protruding key holes.

When used with the lock protection system, the detector reports any unauthorised movement of the lock protection plate and detects any break-in attempts on the door of the vault or safe.

The swivel plate, which covers the keyhole when the door is locked, is linked to a micro-switch. This switch opens when the swivel plate is moved from protecting the keyhole and generates an alarm signal.

There are a number of accessories for the lock protection system to cater for the different clearance distances required between the swivel plate and the protruding key hole.

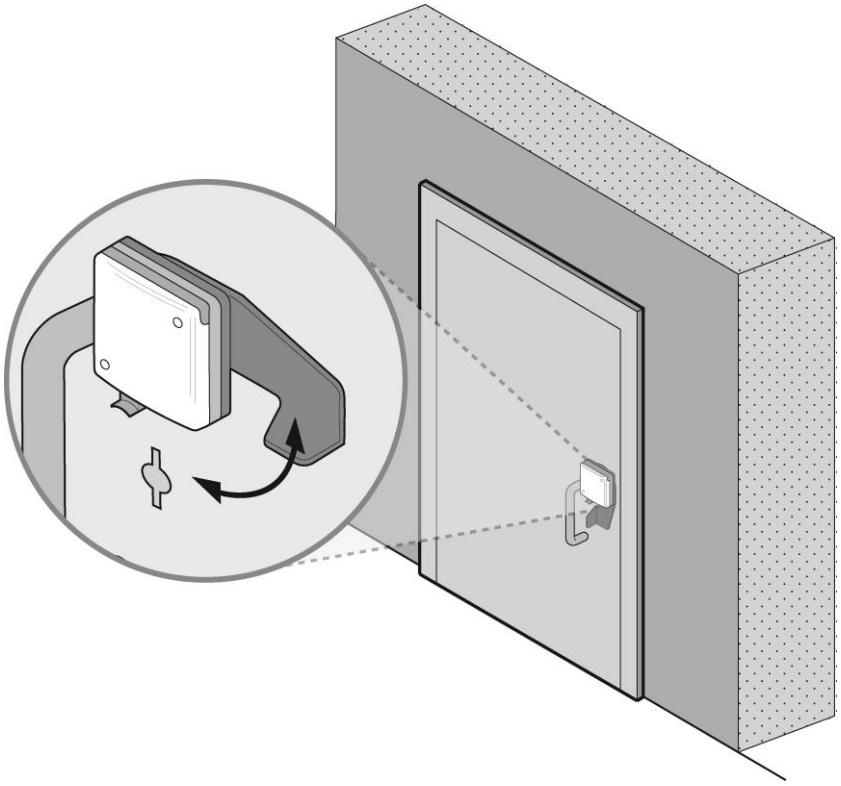


Figure 4-14: GMXP3 monitoring position

Figure 4-14 shows the door in the locked state with the system armed. The GMXP3 is covering the keyhole.

The expanded section in Figure 4-14 shows the system in the unarmed state with the swivel arm of the GMXP3 moved to provide access to the keyhole.

	The swivel arm of the GMXP3 is not electrically restricted and therefore is moveable irrespective of the armed status of the system. Take required precautions to prevent unwanted activations.
	Refer to installation sheet for the GMXP3 for details of the accessories required for the swivel arm clearance distance.

4.7 GMAS6 movable mounting kit

The GMAS6 movable mounting kit is used in conjunction with seismic detectors on safe and strong room doors with flush-fitting keyholes.

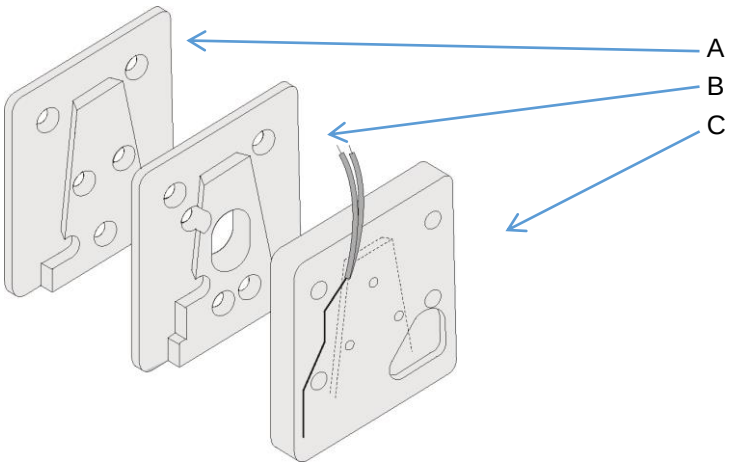


Figure 4-15: GMAS6 movable mounting kit

The GMAS-6 consists of 3 component parts:

(A) Detector rest plate

(B) Door plate

(C) Detector plate

The seismic detector is mounted on the detector plate to enable the combination to be easily moved between the detector rest plate and the door plate. The detector rest plate and the door plate are designed to securely accommodate the detector. The detector can easily be relocated from one location to the other by sliding the detector upwards to free it from the current plate.

	The GMAS6 movable mounting kit must always be mounted on the opening side of the door and not the hinged side.

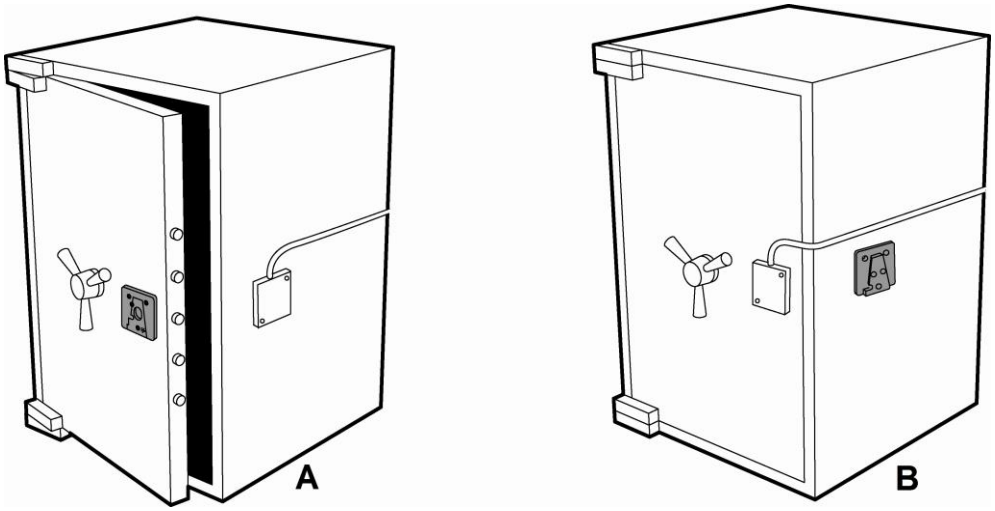


Figure 4-16: GMAS6 installed

Figure 4-16 (A) shows the system disarmed while access to the protected area is required. The detector plate is located on the rest plate to the opening side of the door.

Figure 4-16 (B) shows the system armed with the detector and detector plate mounted on the door plate. If the detector is moved from the door plate, then the two contacts (micro-switch and reed) that are located inside the detector plate open and signal an alarm condition.

When the system is armed, the seismic detector also detects unauthorized opening, thermal attacks, and mechanical attacks.

As the cable for the detector is exposed and will be subject to constant movement, then a form of mechanical cable protection should be considered.

4.8 GMXD7

The GMXD7 anti-drilling foil is a self-adhesive foil that is used to detect external mechanical attacks on the cover of the GM7xx seismic detectors. The GMXD7 is fitted inside the cover of the detector and plugs into the detector. This device should be used in all applications where the device is accessible during normal working hours. The foil is simple to install and plugs directly into the seismic detector. As shown in Figure 4-17: GMXD7 anti-drilling foil, the foil must be pre-formed into the shape of the detector lid. Removal of the back section of the foil reveals the self-adhesive side of the foil.

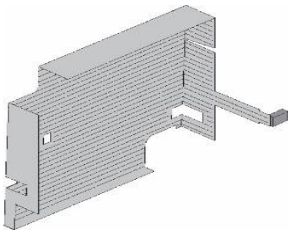


Figure 4-17: GMXD7 anti-drilling foil

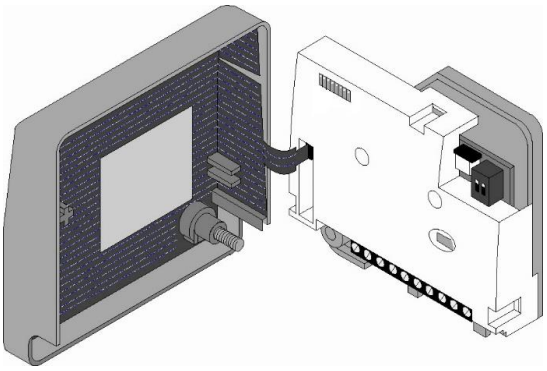


Figure 4-18:GMXD7 fitted to detector cover

⚠	Always remove the detector type label from the detector lid and replace on the foil when it is installed. Never support the weight of the lid by the detection foil as this may damage the foil and create an unwanted alarm.

The removal or opening of the foil from the detector will be detected as a drill alarm by the seismic detector.

ℹ	Retain the shorting link, supplied with the detector, as this may be required to inhibit a Drill Alarm signal when the lid is been removed.

4.9 GMSW7 SensTool software

Figure 4-19: GMSW7 SensTool software

The SensTool software is a PC based program that enables configuration of the detectors, monitoring the real time signals received by the detectors and storing and retrieving the event logs from the detectors.

SensTool is supplied as a CD and a serial port to special USB connection lead.

The software can also be used as a fault-finding guide. See **Section 8 SensTool** for more information.

GMSW7 SensTool software is an **essential** part of configuration, commissioning, diagnostics, and fault finding for the GM730, GM760 & GM775 detectors.

A laptop with a serial port or a serial to USB conversion interface will be required to use this program.

4.10 GMXC2 conduit connection cover

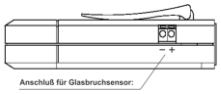
Figure 4-20: GMXC2 conduit connection cover

The GMXC2 is a plastic shroud, which provides a professional method of connecting cable conduit to a seismic detector. The cable access apron of the detector needs to have sections removed to enable the GMXC2 to slide into the apron.

Conduit external diameter = 16mm, proprietary reducers are available for larger diameter conduits.

4.11 GMXS4 seismic test tool

Table 4-2: GMXS4 seismic test tool



The GMXC4 (available October 2016) is a battery operated, hand held test tool for the verification of the seismic detectors. The GMXS4 is an essential part of the commissioning procedure, customer demonstrations, and handovers. The tool works on both steel and concrete surfaces.

Operation of the test button starts a series of signals that are detected as an integration alarm by the detector under test.

Place the test tool adjacent to the detector under test and press the test button. The detector should respond with an alarm condition within 10 seconds.

More information to follow.

5 Planning

5.1 General Application

It is essential to plan each installation correctly in order to ensure the best protection and the most reliable performance from the detectors. The following sections give some guidelines on the correct installation practices to follow and some tips on what conditions to avoid.

It is essential that only Vanderbilt accessories are used to compliment the system. See Chapter 4 Installation - Accessories.

5.2 General Planning Guidelines

- The GM7xx range of seismic detectors operate at maximum efficiency on steel or concrete surfaces. Correct operation and performance of the detectors on other surfaces cannot be guaranteed.
- Verify the layout drawing against the detection parameters of the detectors and accessories to ensure compliance.
- If drawings are not available, perform a physical measure and then verify the detection parameters of the detectors and accessories to ensure compliance.
- For new build concrete vaults, ensure coordination between with the builder to ensure the accessories are installed as per the instructions. Don't forget the cable access conduit prior to the concrete being poured.
- If the vault is existing or a new build, perform a visible inspection to identify any weaknesses in the construction that may impair the transmission of the acoustic signals.
- Ensure that all equipment planned to be used is compatible and that performance and/or approval are not compromised, (refer to section 4.4)
- Do not install the detectors on block type brickwork as the mortar joints will impair the acoustic signals. If in doubt, seek clarification of the structure.
- Do not install the detector on materials other than concrete or steel, as the correct operation and performance of the detectors cannot be guaranteed.
- Check that the GM7xx seismic detectors have a direct connection to the protected surface and that all section paint has been removed, drill template removed, mounting plate installed (if required).
- Determine the ambient noise levels for the protected areas prior to completing the installation. (Refer to sections 6 & 7 for additional information).
- Determine the storage height of the equipment within the protected space prior to final installation, this may avoid accidental alarms due to contact from shelving and can also assist with access for maintenance/service purposes.
- Determine the environmental conditions for the protected space and ensure that they are within allowed tolerances.
- For vaults, ensure that all fascia of the vault have at least one detector installed.
- Ensure that all doors have a detector installed and that any lock protection system is adequate for the purpose.
- Determine if any real attacks can be performed after the installation has been completed as this may assist with the handover of the system.
- Establish the ambient temperature of the protected space and the temperature levels should be set at +/-10° C above this level. GM730 has a fixed temperature surveillance and the GM760 & GM775 have selectable temperature surveillance levels.
- Refer to sections 4.3 & 4.4 for additional information.

5.3 Planning limitations

Although the Vanderbilt GM7xx series of seismic detectors are designed to provide a high level of immunity against unwanted alarm sources, it is essential that certain precautions are observed.

Listed below are some instances that should be avoided, which will result in a more stable and reliable detection system.

- Take additional precaution to avoid mounting the detectors in close proximity to the following: Electric motors, transformers, fans, air conditioners, and any electrical devices that may emit mechanical vibrations.
- If possible, avoid mechanical contact between such devices and the protected surface, or reduce the vibrations by using suitable insulating materials.
- The flow of water through pipes that are in mechanical contact with the protected surface can produce a strong interference signal. This signal may cause unwanted alarms.
  Insulation of the pipes will reduce the risk of unwanted alarms.
- Door bells or other types of bell signalling may cause unwanted alarms if they are in close proximity to a seismic detector. A solution may be to change the bell to an electronic audible warning device or to supress the tone generated by the bell dome. Suppression may be achieved by adjustment or insulation.
- One source of noise that may be difficult to avoid is human activities within the building. Noise can be generated by walking on hard floors, stairs and other activities. Noise that is generated by the occupants of the building can be reduced by adding carpet to the areas that are in close proximity to the protected space.

5.4 Installation guidelines

The tables in Section 5.4.1 Detector Requirements and Section 5.4.2 System Requirements show some suggested headings and some sample data to assist planners and designers of new systems and system upgrades.

Vanderbilt recommend that planners create their own version of these tables and insert the relevant information under the headings in these tables to assist with planning and as a means of recording all of the salient information.

The information in Table 5-1 is to assist with the detection requirements of the area to be protected and to ensure that the required inputs and outputs are available to complete the system requirements.

5.4.1 Detector Requirements

Table 5-1 gives examples of the number of zones and outputs required to complete the seismic application. The table also details the mounting surface and provides prompts for the accessories & test methods for the seismic installation.

Detector	Location / Ref	Surface*	Installation*	Testing*	Protection*	Monitoring*	Others - (specify)
# 1		Steel Concrete	Direct GMXP0 GMXB0 GMXW0 GMXC2	GMXS1 GMXS5	GMXD7	GMAS6 GMXP3 GMXP3Z	
# 2							
# 3							
# 4							
# 5							
# n							

Table 5-1: Detector requirements

*Delete as required

See Table 6-4 for an example of a completed form.

5.4.2 System Requirements

Table 5-2 gives examples of the components of the system, the locations of the components, and the power supply details. This will assist in routing cables to these locations or in deciding if an expander should be located closer to the risk to save on additional cabling.

This table can help to identify if an existing system has the capability to accommodate the required inputs and outputs for the seismic application.

Control Panel	Zones	Location	EOL value(s)	Power	Location
SPC Financial package	Panel Zones 1-8	Main Reception	Dual 4K7 (default)	Panel	N/A
	Expander # 1 (Zones 9-16)	Document store, 1st floor	Dual 4K7 (default)	PSU # 1	Document store, 1st floor
	Expander # 2 (Zones 17-24)	Electrical cup-board ground floor	Dual 4K7 (default)	PSU # 2	Electrical cupboard ground floor
	Expander # 3 (Zones 25 – 32)	Electrical riser, basement	Dual 4K7 (default)	PSU # 3	Electrical riser, base-ment

Table 5-2: System requirements

6 Design

Planning the detection layout requires the consideration of many factors in order to provide the highest security level.

- The type of detector.
- The operating radius of the detector.
- The spacing of the detectors.
- The detector accessories that will complement the design and assist with the detection properties of the detectors. For more information on detector accessories, see Chapter 4 Installation - Accessories.

6.1 General Principles

Always consider the spacing of detectors along with the operating radius to determine the correct number of detectors required to provide comprehensive detection coverage for the application. The coverage area is the maximum area monitored by a single detector. A detector's coverage area depends on the material type the detector is mounted on, in conjunction with the setting of the operating radius.

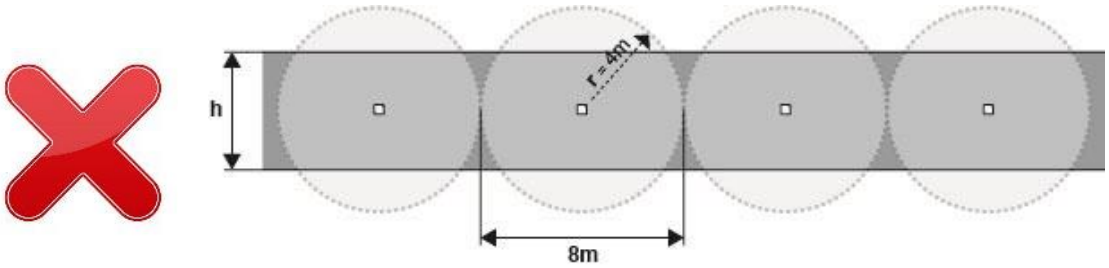


Figure 6-1: Insufficient seismic detector coverage

Figure 6-1 shows an example of the coverage area for a seismic detector with an operating radius (**r**) of 4m on a wall height (**h**) of 5m. As the coverage area of the detectors do not overlap, there are parts of the protected surface (the darker areas in Figure 6-1) where detector coverage is insufficient for optimum system performance. It is essential that the detectors are not installed as shown in Figure 6-1 as the system performance will be undermined.

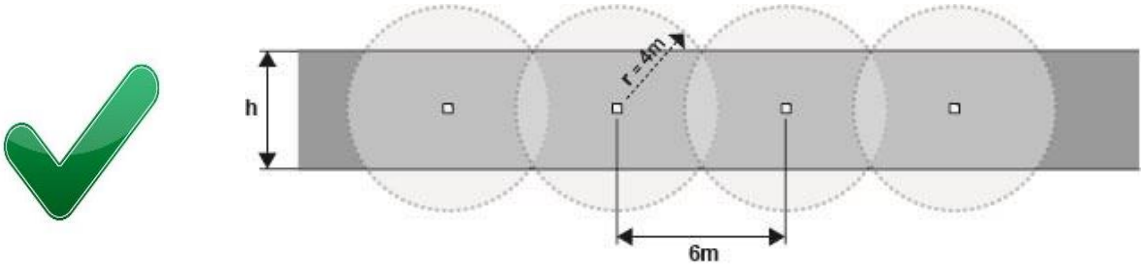


Figure 6-2: Revised seismic detector spacing

Figure 6-2 shows the spacing of the seismic detectors that is required in order to provide adequate coverage for the protected surface.

	The coverage area of seismic detectors should always overlap to provide 100% detection coverage. To ensure complete detection coverage the maximum spacing distance (**sd**) for the seismic detectors must be determined.

The installer requires the following information for each wall of the protected area:

- Optimum seismic detector spacing and location
- Optimum number of seismic detectors

The Vanderbilt Seismic Calculation Tool can quickly provide this information for the system designer. For more information on the Vanderbilt Seismic Calculation Tool, see Section 6.2 Seismic Calculation Tool.

6.2 Seismic Calculation Tool

Vanderbilt provides a Seismic Calculation Tool to assist in the design process. Enter the operating radius of the detector and the dimensions of the protected surface (wall, ceiling or floor). The Seismic Calculation Tool calculates the number of detectors required and the optimum spacing of the detectors to maximize the system performance.

The calculation tool is available on line at: http://vanderbiltindustries.com. Choose your country from the list of global websites and select ***Products-> Intrusion-> Seismic Detectors***.

	Click on the **DOWNLOAD** button and save the file to your PC or laptop prior to running the application.

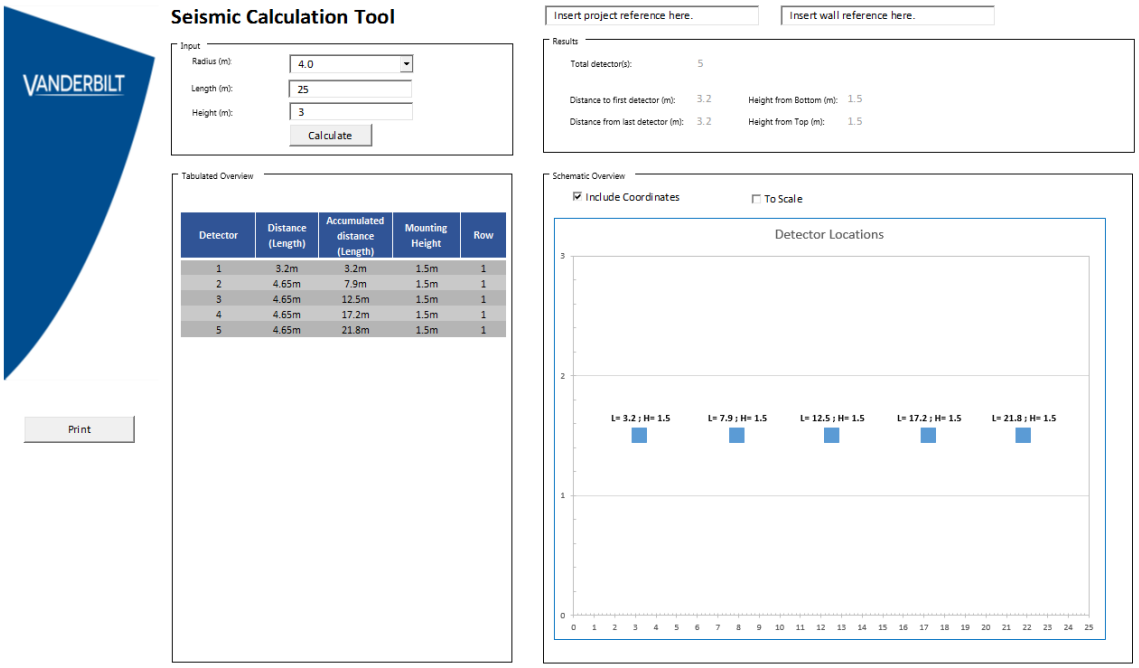


Figure 6-3: Seismic Calculation Tool

6.3 Manual calculation

System designers and installers can use the information in the following sections to manually calculate the spacing distances and the number of detectors required. Any manual adjustment or calculations should be verified against the optimum results generated by the Seismic Calculation Tool.

	System designers and installers must ensure that an alternative layout does not compromise security or system performance.

6.3.1 Calculating the number and location of the detectors

This section outlines the process of calculating the location and spacing of the detectors, and then using this information to calculate the optimum number of detectors for a protected surface.

1. Determine the length (**l**) and height (**h**) of the protected surface. The height (**h**), which will assist in identifying the operating radius (**r**). The detectors should be mounted on the horizontal centre line of the wall to provide a balanced coverage.

	Table 6-4 details the maximum wall height for the different operating radius of the detectors. If the wall height/radius is exceeded, another row of detectors would be required.

2. Calculate the maximum distance between the corner of the protected wall and the first detector (**d1**). The figure for **d1** is also used for the distance between the last detector and the far corner of the wall (**d2**).
   The formula to determine **d1** (and **d2**) is:
   d1 = r x 0.8
3. Calculate maximum spacing distance between two detectors (**sd_{max}**). The formula to determine the maximum allowable spacing distance **sd_{max}** between two detectors is:
   sd_{max} = r x (2 x 0.75)
4. Determine the required number of detectors (**n**).

$$\boldsymbol{n} = \frac{\boldsymbol{l} - (\boldsymbol{d1} + \boldsymbol{d2})}{\boldsymbol{sd_{max}}} + 1$$

	If **n** is greater than a whole number, then roundup to the nearest whole number. For example, if **n** = 4.1, roundup to 5. Therefore, **n** = 5.

For example:

Calculate the location and spacing of the detectors for a wall that is **25m long** and **3m high**. Operating **radius** of the detector is set to **4m**. In this example, the height of the wall is less than twice the operating radius of the detector, so all detectors can be located on the horizontal centre-line of the wall.

a) Determine the length (**l**) and height (**h**) of the protected surface alongside the operating radius (**r**).
   l= 25m
   h= 3m
   r= 4m

b) Calculate distance from corner to first detector **d1**.
   d1 = **r** x 0.8
   d1 = 4 x 0.8
   d1 = 3.2m
   Note: The figure for **d1** is also used for the distance between the last detector and the far corner of the wall (**d2** = 3.2m).

c) Calculate the spacing distance **sd_{max}**
   sd_{max} = r x (2 x 0.75)
   sd_{max} = 4 x (2 x 0.75)
   sd_{max} = 6m

d) Determine the required number of detectors (**n**).

$$\boldsymbol{n} = \frac{\boldsymbol{l} - (\boldsymbol{d1} + \boldsymbol{d2})}{\boldsymbol{sd_{max}}} + 1$$

$$\boldsymbol{n} = \frac{25 - (3.2 + 3.2)}{6} + 1$$

   n = 3.1 + 1
   n = 4.1
   n = 5
   This calculation determines that 5 detectors are required for this protected surface.

	If **n** is greater than a whole number, then roundup to the nearest whole number. For example, if **n** = 4.1, roundup to 5. Therefore, **n** = 5.

6.3.2 Manually adjusting the detector locations

Under certain conditions the sum of the manually calculated **d1**, **sd_{max}**, and **d2** distances may exceed the length of the protected surface for the number of detectors **n** (see Table 6-1: Manually calculated detector locations).

Distance to detector	Calculated distance (m)	Accumulated distance (m)
Detector 1 (**d1**)	3.2 (**d1**)	3.2
Detector 2	6.0 (**sd_{max}**)	9.2
Detector 3	6.0 (**sd_{max}**)	15.2
Detector 4	6.0 (**sd_{max}**)	21.2
Detector 5	6.0 (**sd_{max}**)	27.2
(**d2**)	3.2 (**d2**)	30.4
Total	**30.4m**	**30.4**

Table 6-1: Manually calculated detector locations

Table 6-1 is using the same dimensions and radius as per previous example (**l**= 25m; **h**= 3m; **r**= 4m). The calculated number of 5 detectors is the minimum number of detectors required to provide 100% coverage of the protected surface. The sum of the calculated distances **d1** and **sd_{max}** already exceeds the length of the wall (highlighted in yellow). However, using four detectors would only cover 24.4m of the protected surface and therefore would leave 0.6m exposed to potential intruder attacks. Adding a fifth detector is required to ensure 100% detection coverage.

For maximum performance and efficient coverage, the calculated number of detectors **n** can never be reduced.

Distance to detector	Calculated distance (m)	Accumulated distance (m)	Balanced distance (m)	Accumulated distance (m)
Detector 1 (**d1**)	3.2 (**d1**)	3.2	2.5	2.5
Detector 2	6.0 (**sd**)	9.2	5.0	7.5
Detector 3	6.0 (**sd**)	15.2	5.0	12.5
Detector 4	6.0 (**sd**)	21.2	5.0	17.5
Detector 5	6.0 (**sd**)	27.2	5.0	22.5
(**d2**)	3.2 (**d2**)	**30.4**	2.5	**25.0**
Total	**30.4m**		**25m**	

Table 6-2: Manually balanced detector locations

In Table 6-2 the balanced detection layout uses the same number of detectors **n.** The calculated distances **d1, sd** and **d2** are reduced to fit within the length of the protected space (highlighted in yellow). A schematic layout of the manually balanced system design is shown in Figure 6-4.

To balance a system design, the distances **d1**, **d2**, and **sd** may be reduced but never increased.

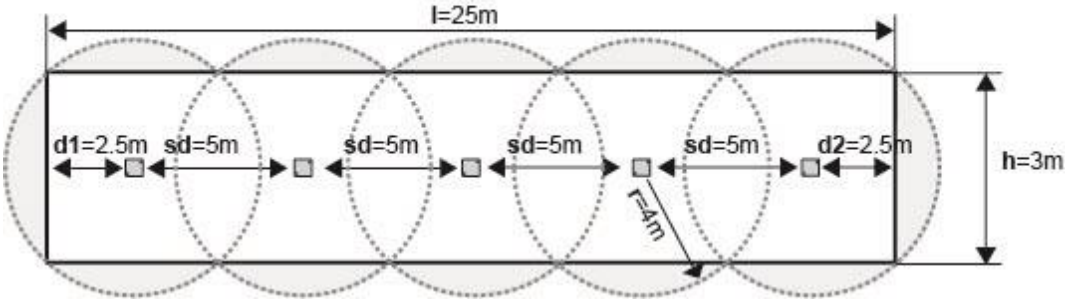


Figure 6-4: Manually balanced detector locations with 5 detectors

Figure 6-4 shows the manually balanced system layout as per Table 6-2.

Any manual adjustment or calculations should be verified against the results of the Seismic Calculation Tool (see Figure 6-5: Seismic Calculation Tool results).

Detector	Distance (Length)	Accumulated distance (Length)	Mounting Height	Row
1	3.2m (d1)	3.2m	1.5m	1
2	4.65m (sd)	7.9m	1.5m	1
3	4.65m (sd)	12.5m	1.5m	1
4	4.65m (sd)	17.2m	1.5m	1
5	4.65m (sd)	21.8m	1.5m	1

Figure 6-5: Seismic Calculation Tool results

Figure 6-5 The Seismic Calculation Tool automatically provides a balanced calculation in the Tabulated Overview section using the same dimensions and radius as per previous example (**l**= 25m; **h**= 3m; **r**= 4m).

In summary:

- The number of detectors in Table 6.2 and Table 6.3 should be identical.
- The calculated and balanced distances **d1** in Table 6.2 should be less than or equal to the value in Figure 6-5.
- The calculated and balanced distances **sd** in Table 6.2 should be greater than or equal to the values in Figure 6-5.

6.4 Wall height and operating radius

Table 6-3: Maximum wall height for each detector radius indicates the maximum wall height that can be covered by a single row of detectors for each operating radius setting.

Operating radius (r)	Surface Material	d1 (maximum)	sd_{max}	Maximum wall height
1.0	Steel	0.8m	1.50m	1.5m
1.5	Steel	1.2m	2.25m	2.0m
2.0	Steel	1.6m	3.00m	2.5m
2.5	Concrete	2.0m	3.75m	3.0m
4.0	Concrete	3.2m	6.00m	5.0m
5.0	Concrete	4.0m	7.50m	6.0m

Table 6-3: Maximum wall height for each detector radius

Table 6-3: Maximum wall height for each detector radius details the maximum wall height for the different operating radius of the detectors. If the wall height/radius is exceeded, another row of detectors is required to ensure the correct coverage, as detailed in figure 6-2.

6.5 Modular vaults

There are two main methods of constructing a concrete modular vault.

- Interlocking panels
- Panels with steel surrounds

	As construction methods of vaults may vary, the transfer of operating radius from one surface to an adjacent surface should not form part of any calculation.

For all types of modular vaults, it is strongly recommended that a survey is conducted to determine the exact number of detectors required to fully protect the vault. To perform such a survey, the following equipment would be required;

- a) A temporary power source, 12v dc, a battery would suffice
- b) A GMXS5 external test transmitter
- c) At least 2 x GM7xx detectors
- d) Interconnecting cable for power and/or signalling

The basic guidelines for seismic detection in concrete vaults, strong rooms and modular vaults using the GM730, GM760 & the GM775 seismic detectors are as follows:

A minimum of one detector should be provided in the following surfaces of the vault:

- Floor
- Ceiling
- Door
- Each of the four walls

The size of the vault, plus the coverage area will determine the exact number of detectors required.

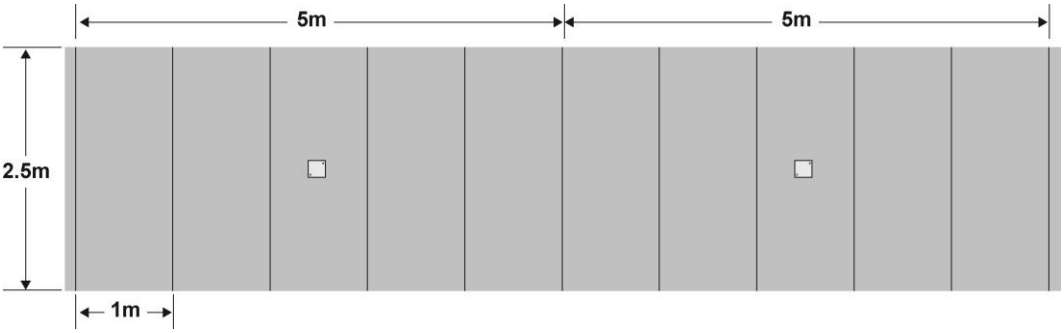


Figure 6-6: Modular vault - detector positioning

	Consider the size of the wall where the door is located. A larger wall and/or the construction and fitting of the door may indicate a requirement for additional detection on the wall.

For more information on installation method and on the mandatory and optional accessories, see Section 2 Applications.

6.5.1 Interlocking panels

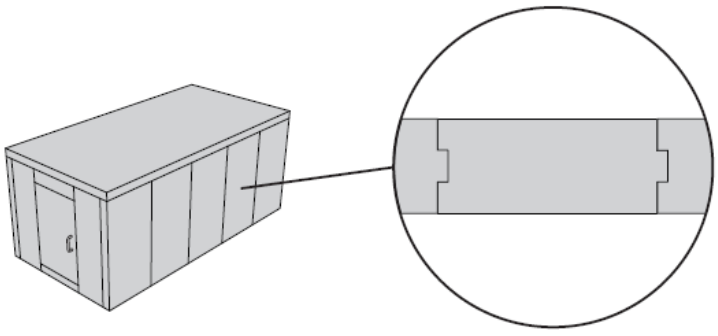


Figure 6-7: Modular vault - interlocking panel construction

Figure 6-7 shows a vault that is constructed using the interlocking panel construction method.

For signal detection purposes, the interconnection between the joints including the use of insulating/securing materials will determine the efficiency of the acoustic transfer. The width of the panels that are used will also have a direct bearing on the quantity of detectors that are required for adequate coverage of the protected area.

The expanded section of Figure 6-7 shows a plan view of the joints.

	As construction methods of vaults may vary, the transfer of operating radius from one surface to an adjacent surface should not form part of any calculation.

6.5.2 Panels with steel surrounds

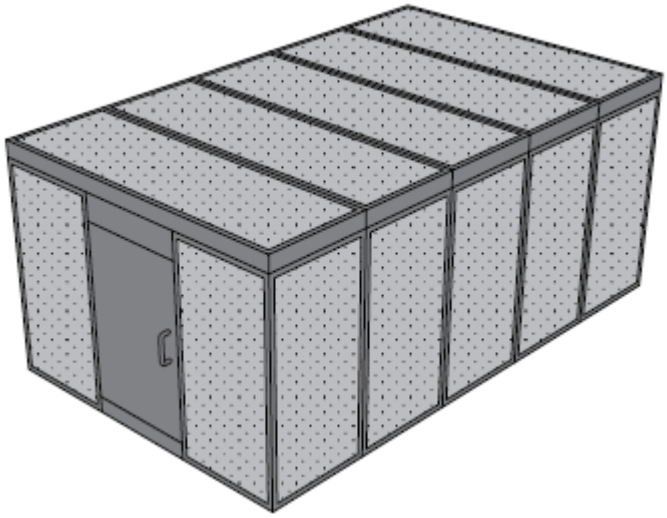


Figure 6-8: Modular vault - panels with steel surrounds

Figure 6-8: Modular vault - panels with steel surrounds shows a vault that is constructed using concrete panels with steel surrounds. The steel surrounds may be bolted or welded together to form the wall.

For signal detection purposes, the interconnection between the steel surrounds will determine the efficiency of the acoustic transfer. The frequency, size and quality of the joining bolts or welds will determine the transfer capabilities of the wall. There may be a vast difference in how the panels are connected together and this will have a direct bearing on the capability of the structure to transfer the signals that the seismic detectors detect.

In addition to being bolted together, all joints between modules must be welded every 400 − 500mm with a 30 − 40mm seam.

Corner joints between wall modules must be seamlessly welded.

When building vaults using modules of varying thickness, the butt joints must be seamlessly welded.

Modules which have a pay-in/withdrawal slot must be protected with a detector. This detector will also be able to monitor the adjacent modules.

	As construction methods of vaults may vary, the transfer of operating radius from one surface to an adjacent surface should not form part of any calculation.

6.6 Vault protection guidelines

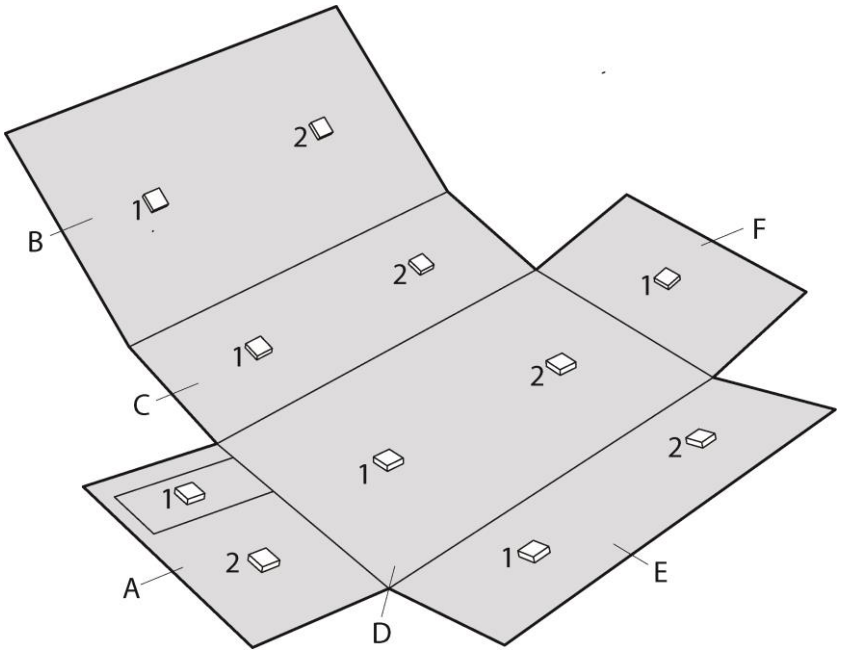


Figure 6-9: Vault protection system - example 1

Figure 6-9 shows a detection system for a vault with dimensions of 10m long, 5m wide and 2.5m high. In this example all of the detection devices are mounted internally to the vault.

Depending upon the construction of the vault there will be a degree of detection coverage that will transfer from the plane where the detector is installed to the adjacent plane of the vault. The joint between two adjacent planes of the vault will normally reduce the transferred operating radius by 25%, but as the construction of the vaults and the detail of the joints between the planes can vary, the transferred detection coverage should be ignored. Each plane should have detection coverage as if the plane is an autonomous surface.

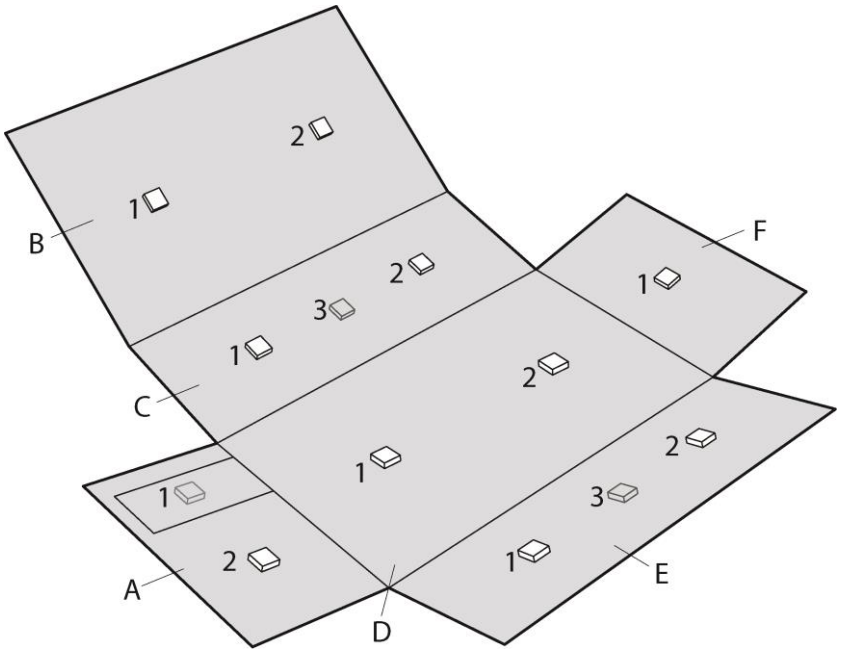


Figure 6-10: Vault protection system - example 2

Figure 6-10 is a similar design to the example in Figure 6-9.

Figure 6-10 shows the detectors that are mounted inside the vault in white (for example B1, B2, A2). The test transmitters, detector, and lock protection system that are mounted externally to the vault are shown in grey (for example A1, E3).

GMXS5 external test transmitters are installed externally on walls C and E in position 3 and 3. In this example, the floor, ceiling, and rear walls are not externally accessible and so the detectors in these areas are tested by using GMXS1 internal test transmitters.

	Practical sensitivity and noise checks should always be performed before the installation is completed. Exact detection range and capabilities can only be determined by practical tests on site.

In Figure 6-11 and Figure 6-12, the detector layout is shown for the same application.

Figure 6-11 shows the positioning of the internally installed detectors with the associated operating radius for each detector.

	Using a scale drawing of the room to be protected and adding the operating radius is a good method of verifying a system design.

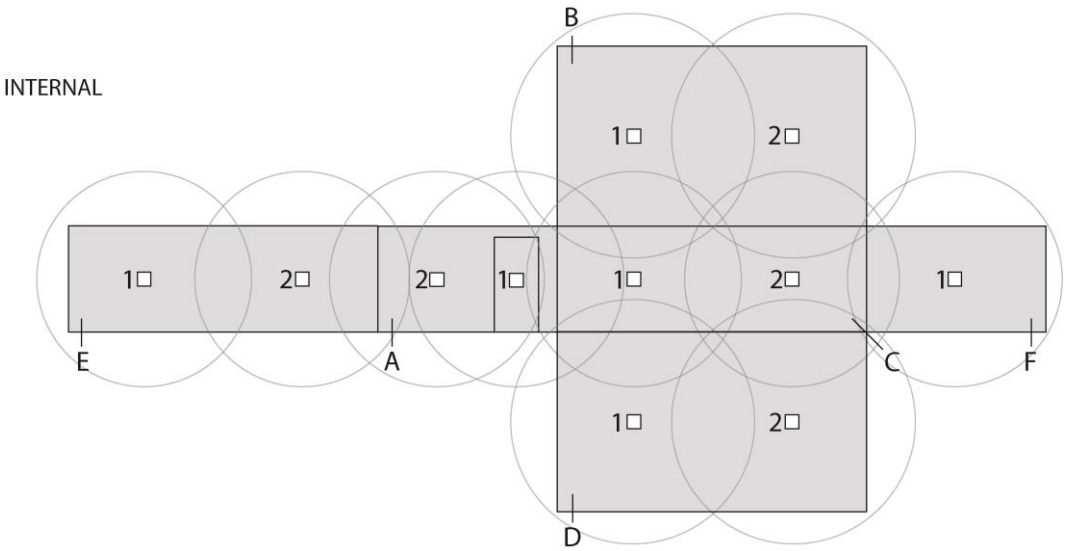


Figure 6-11: Example 2 - detectors inside vault

Figure 6-12 shows the GMXS5 external test transmitters mounted on the exterior of the vault at C3 & E3.

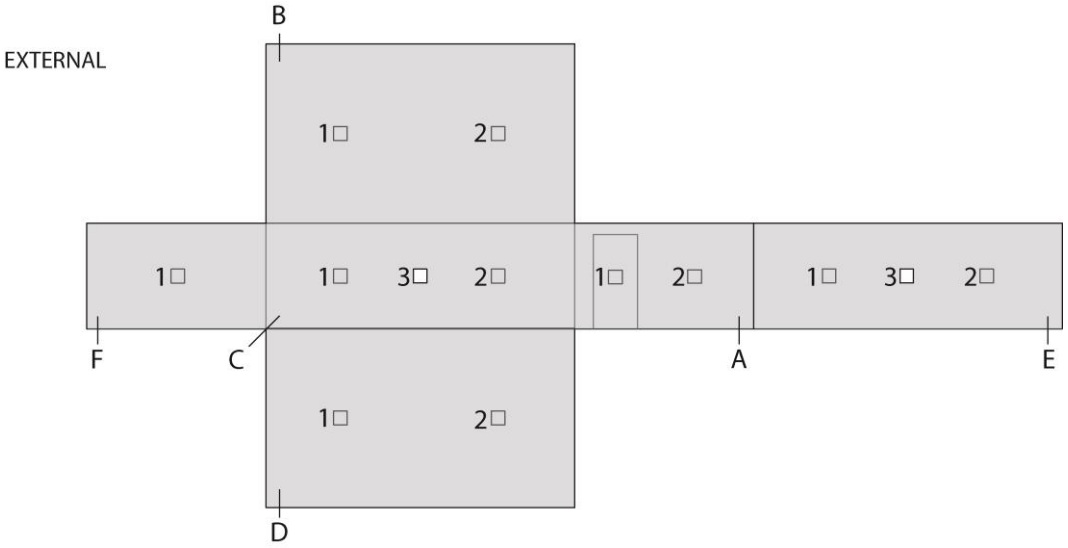


Figure 6-12: Example 2 - detector layout and external devices

Figure 6-13 shows the detector location and the operating radius for each detector. This is an example to demonstrate that each surface of the vault has comprehensive detection coverage. The

reduction in the transferred signals to adjoining surfaces such as coverage from a wall-mounted detector extending to the adjoining wall, ceiling or floor, is not depicted.

As construction methods of vaults may vary, the transfer of operating radius from one surface to an adjacent surface should not form part of any calculation.

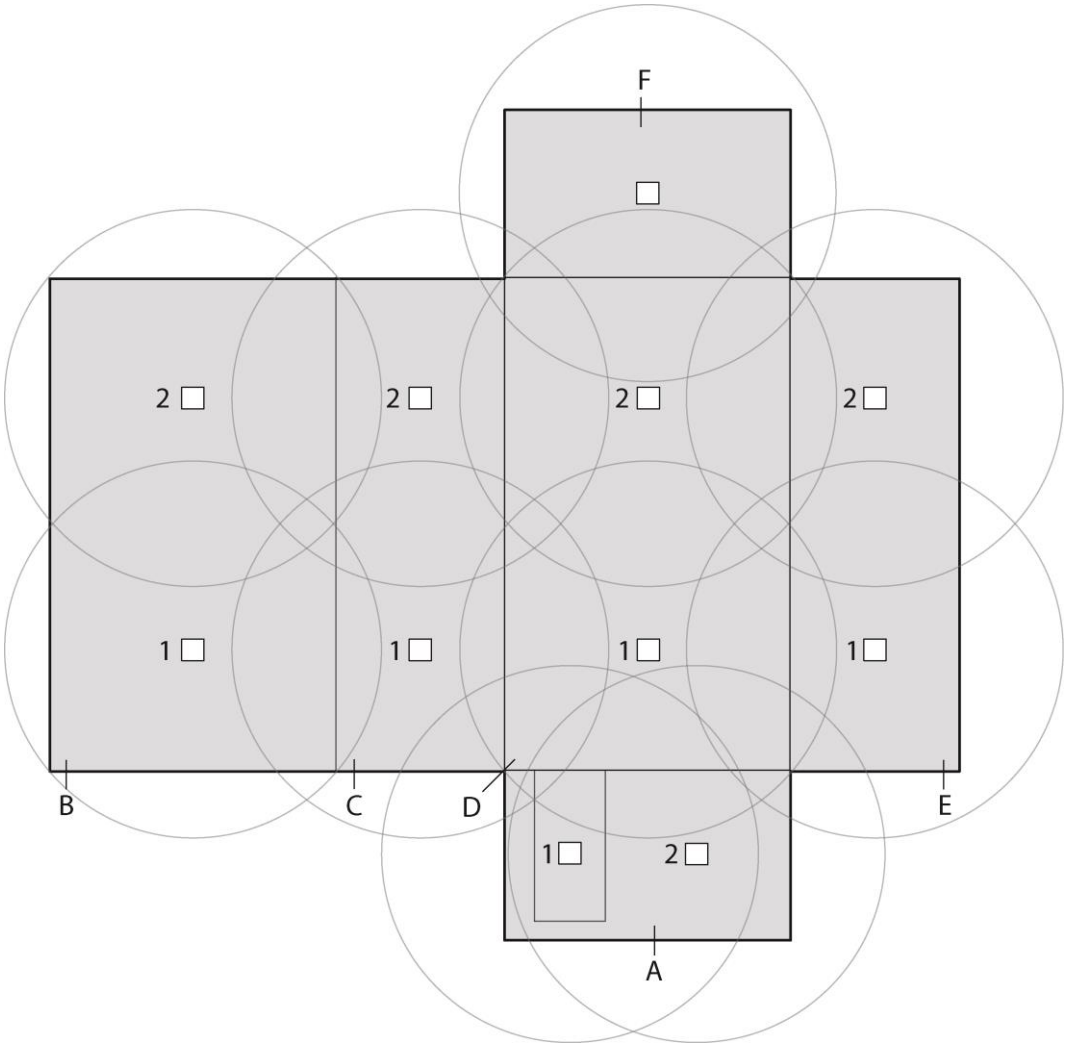


Figure 6-13: Example 2 - detector location and operating radius

Using a scale drawing of the room to be protected and adding the operating radius is a good method of verifying a system design.

Surface & Reference	Detector-Reference	Detector Setting	Accessory for Mounting	Accessory for Testing
Left hand wall (C)	GM775 - 1	5m concrete	GMXW0	GMXS5
	GM775 -2	5m concrete	GMXW0	
Ceiling (B)	GM775 - 3	5m concrete	GMXP0	GMXS1
	GM775 - 4	5m concrete	GMXP0	GMXS1
Right hand wall (E)	GM775 - 5	5m concrete	GMXW0	GMXS5
	GM775 - 6	5m concrete	GMXW0	

Surface & Reference	Detector-Reference	Detector Setting	Accessory for Mounting	Accessory for Testing
Floor (D)	GM775 – 7	5m concrete	GMXB0	GMXS1
	GM775 – 8	5m concrete	GMXB0	GMXS1
Rear wall (F)	GM775 – 9	5m concrete	GMXW0	GMXS1
Door wall (A)	GM775 – 10	5m concrete	GMXW0	GMXS1
Door in wall (A)	GM710 - 11	2m steel	GMXP3	GMXS1

Table 6-4: Overview of complete vault installation

Not all of the operating radius options are available via the DIP switches. SensTool must be used to access of a full set of options.

6.7 Night Deposit Box and ATM Applications

When planning the detector layout for night deposit boxes or ATMs it is important to protect the most likely points of attack:

a) The body of the ATM/night deposit box near to the dispenser or opening.

b) The door for accessing the interior of the ATM or night deposit box.

To provide the highest security level consider the type of detector to use and the accessories that will complement the design & assist with the detection properties of the detector.

6.7.1 Night deposit boxes

Figure 6-14: Night deposit box shows a typical example of a night deposit box application, with the grey area being the public access side and the white area being the secure side. The wall provides a physical divide between the two areas.

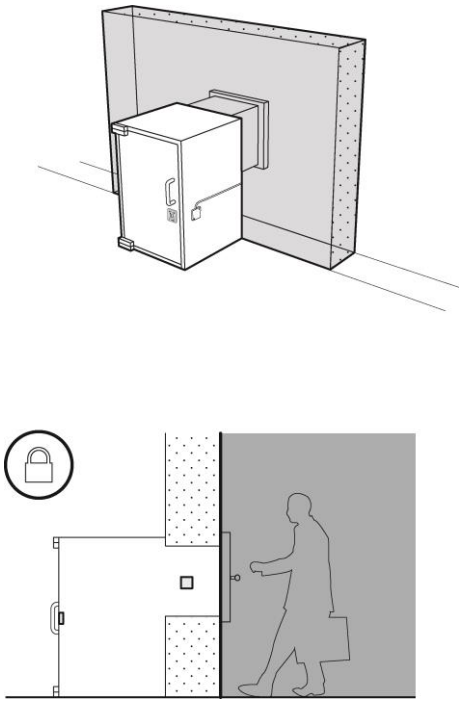


Figure 6-14: Night deposit box

Detectors should be mounted close to the potential attack points, but consideration should be given to the following environmental factors that can generate noise and vibration:

- Opening and closing the door
- Depositing of cash in the depository drawer
- Drop of deposits to the floor of the protected area

6.7.2 ATM's

Figure 6-15: ATM shows a typical example of a night an ATM application, with the grey area being the public access side and the white area being the secure side. The wall provides a physical divide between the two areas

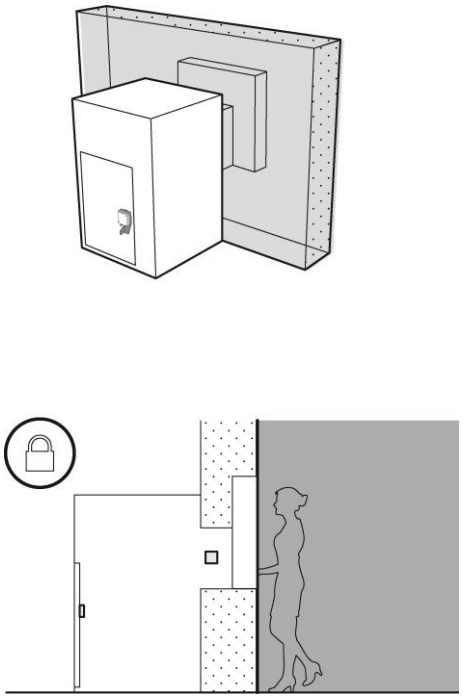


Figure 6-15: ATM

The top section of Figure 6-15 shows the detector mounted on the exterior of the door and a GMXP3 has been shown to add additional protection to the safe.

The lower section of Figure 6-15 shows a detector mounted internally, close to a potential attack point at the external user interface.

Detectors should be mounted close to the potential attack points. When locating the detectors, consider the noise of the user interface and the internal noise of the machine when it is counting and transferring money, as this may be a source of unwanted alarms.

6.7.3 General Design Guide for Night Safes & ATMs

Consider the following points as part of the design and location criteria:

Location	Consideration
Externally on the door of the unit	Secure or public area? If installed in a public area, Vanderbilt recommend the use of the GMXD7 anti-drill foil for increased protection. Consider the mounting height. Ideally, mount the detector above the normal hazards such as shopping trolleys, baby buggies, cleaning equipment, and any other hazard that may be site/location specific. Consider using lock protection accessories GMAS6 and/or GMXP3/Z.
Internally near the door	Detector should be mounted on the hinged side of the door for better transfer of acoustic signals.
Externally on the body of the unit	Secure or public area? If installed in a public area, Vanderbilt recommend the use of the GMXD7 anti-drill foil for increased protection. Consider the mounting height. Ideally, mount the detector above the normal hazards such as shopping trolleys, baby buggies, cleaning equipment, and any other hazard that may be site/location specific.

Location	Consideration
Internally on the body of the unit	Consider access to the detectors after the device has been commissioned and is fully functional.
General	Cable protection, flexible or fixed conduit to provide mechanical protection to the cables serving the units.

Table 6-5: Night deposit box and ATM design considerations

6.7.3.1 Detector sensitivity

Normal operation and servicing of night deposit boxes and ATMs can cause internal noise and vibration which may activate the seismic detectors.

For the GM730, GM760 & GM775 detectors, the sensitivity of the detector can be reduced by applying a remote input to terminal 7 on the detector as shown in Figure 6-16: Sensitivity reduction - remote input.

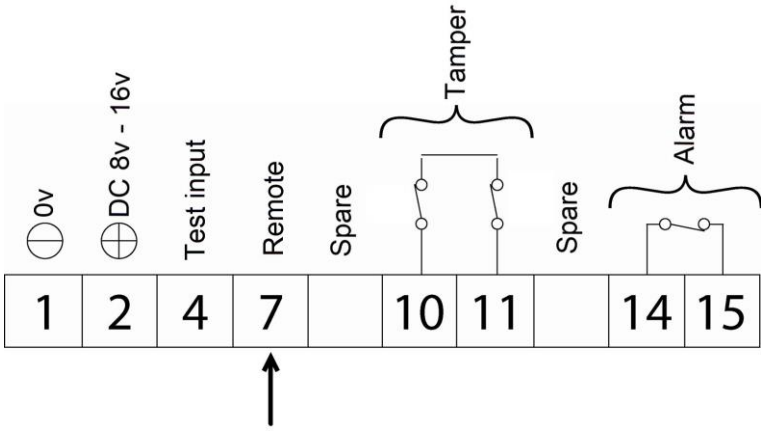


Figure 6-16: Sensitivity reduction - remote input

When this input is active, the sensitivity of the detector is reduced to 12.5% of the original setting. This input is used to overcome noise for short periods of time to avoid unwanted activations.

Any reduction in sensitivity must comply with applicable regulations such as VdS in Germany.

This input reduces the sensitivity of the integration detection. The reduction in sensitivity does not apply to the shock alarm part of the detection system.

The factory setting is Active low. Active high is selectable through the GMSW7 SensTool software.

Apply the required input to terminal 7, which is selectable as part of the detector programing options.

⚠	Use the drill side of the GMXP0 when fixing the GMXP0 mounting plate to a concrete surface.

ℹ	**Active low** = 0V applied to activate. **Active high** = 0V removed to activate. When selecting the option, **Active high**, it is essential to connect a permanent 0 volt to avoid unwanted alarms. To activate, remove the 0 volt.

The construction of ATM's and night safes can involve layers of different materials, which could be steel/concrete/steel. This adds additional protection from drill attacks but provides challenges to the installation of the seismic detectors & ancillary devices to the enclosure.

6.8 Cabinet Protection

The GM7xx range of seismic detectors are widely used to protect secure storage in cabinets including but not limited to the following applications:

- Document cabinets
- Filing cabinets
- Gun cabinets

Consider other forms of detection devices for these applications as part of a comprehensive design including:

- An anti-removal device.
- Magnetic contacts for the doors.
- Lock monitoring devices such as the GMXP3, GMXP3Z, and GMAS6

For all cabinet protection, conduct a risk assessment to ensure the correct levels of protection.

	Establish a library of use cases for different types of cabinets this may prevent duplicated site testing as the results would be available from a previous test.

6.9 Document cabinet

A single GM7xx detector mounted internally provides adequate coverage for most document cabinets. Figure 6-17: Document cabinet shows a suggested installation of a detector mounted internally to the top of the document cabinet.

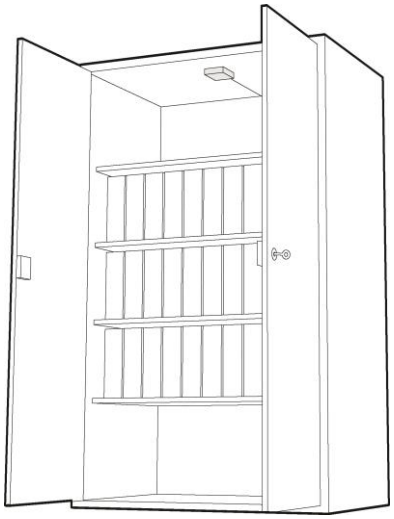


Figure 6-17: Document cabinet

6.10 Filing cabinet

A single GM7xx detector mounted externally provides adequate coverage for most filing cabinets. Figure 6-18: Filing cabinet shows a suggested installation of a detector mounted externally at the side of the document cabinet.

Figure 6-18: Filing cabinet

6.11 Gun cabinet

Depending on the construction and size of the gun cabinet, a single detector may be adequate for a protection. For cabinets of a robust construction a second detector mounted on the door of the cabinet may be required. Consider the accessories GMXP3, GMXP3Z & GMAS-6 for lock protection and additional security.

Figure 6-19: Gun cabinet shows a suggested installation of a detector mounted internally to the top of the gun cabinet.

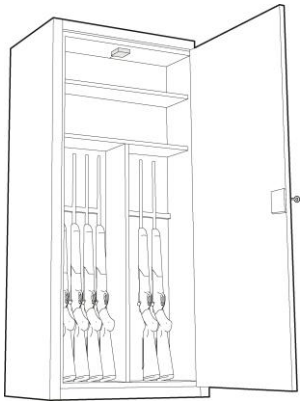


Figure 6-19: Gun cabinet

7 Commissioning

7.1 Pre-commissioning checklist

Item	Description	Complete/Comments
1	Check that the mounting surface for all detectors and/or GMXP0 plates are free from all debris, paint, drill templates, etc.	
2	Install all detectors and accessories in accordance with the guidelines in the installation sheets.	
3	Check all electrical connections for polarity and correct terminal designations.	
4	Check all end of line resistors for values and connection.	
5	Perform a visual inspection of the vault for any irregularities in the construction that may cause the impairment of the acoustic signals.	
6	Ensure that all of the component parts are compatible and that performance and approvals are not compromised.	
7	Record the ambient noise levels for the protected space to enable the detector settings to filter out this noise.	
8	Ensure that the environmental conditions for all components parts of the system are within the recommended parameters.	

Table 7-1: Pre-commissioning checklist

7.2 Commissioning & test options

Table 7-2 details the test method options and the resulting alarm type. Note that the alarm type is only visible in SensTool.

	Never strike the detector directly as this may cause irreparable damage to the detector.

Test method	Alarm Type
Apply power to the detectors and leave for at least 30 seconds to allow the detectors to stabilise.	N/A
If the detector has an internal test transmitter GMXS1 fitted, apply the required trigger signal and ensure that the detector activates.	Integration
If the system has the external test transmitter GMXS5 installed, apply the required trigger signal and ensure that all detectors within the signal radius activate.	Integration
Remove the lid of the detector and scratch the detector plate with a screw driver. After about 30 seconds the detector signals an alarm condition. The GM730, GM760 & GM775 confirm an alarm by opening the alarm contact and illuminating the internal LED. The GM710 will only open alarm contacts.	Integration
Using a small metal plate to protect the surface, repeatedly hit the metal plate, leaving 2 second intervals, with a small hammer. After about 6 blows, the detector signals an alarm condition.	Integration

Test method	Alarm Type
Using a small metal plate to protect the surface, hit the metal plate with a firm blow with a small/medium hammer. Do not strike the detector as this will cause damage to the device.	Shock
For the GM730, GM760 & GM775 detectors, remove the GMXD7 anti-drill foil, if fitted, or remove the hold off jumper.	Drill
The GM730 has a fixed temperature range lower -15° C to +85° C. The GM760 & GM775 have default settings the same as the GM730 but are adjustable by 1° C to lower and upper limits of -40°C and 85 °C. If these limits are exceeded then an alarm is indicated. (not practical to perform on site)	Temperature
For all detectors place the hand the hand held test tool adjacent to the detector and press the test button.	Integration

Table 7-2: Commissioning & test procedure

7.3 Staged commissioning

It is possible to commission seismic detectors using a power source and a multi-meter. This option may be useful for staged commissioning or when permanent supplies or commissioning tools are not yet available.

7.3.1 Staged commissioning procedure

1. Power up the device, observing the correct polarity and leave for 30 seconds.
   The internal LED will pulse for 10 seconds to confirm that the correct power is applied. The LED is not available on the GM710 version.
2. Verify that the correct operating radius and material type are selected via the DIP switches or use the SensTool, if available to select.
3. Use a multi-meter at terminal 1 (0 V) and at the test point, which is a gold coloured solder pad, just to the left hand side of the terminal strip.
   The following voltages will determine the status of the detector.
   - Quiescent level = circa 0 to 0.3v DC
   - Detection of the integration signal will increase the voltage to = 1v DC, this voltage will continue to increase, in direct proportion to the strength and/or duration of the integration signal. The integration alarm can be generated by use of the hand held test tool or by scratching the base plate of the detector with a screwdriver.
   - Activating the GMXS1 or GMXS5 will increase the voltage to around 2.7v DC.
     The LED beside the test point on the detector illuminates as visual confirmation for all detectors except the GM710.
   - Activating the shock alarm will increase the voltage to around 2.7v DC when the required impact is detected.
     The LED beside the test point on the detector illuminates as visual confirmation but recording the voltage and providing the required impact may be difficult to achieve.
   - Alarm threshold (w/o load) = 3v DC. Note that this 3v DC reading only reflects the integration alarm and does not depict a drill alarm, temperature alarm and/or a shock alarm.

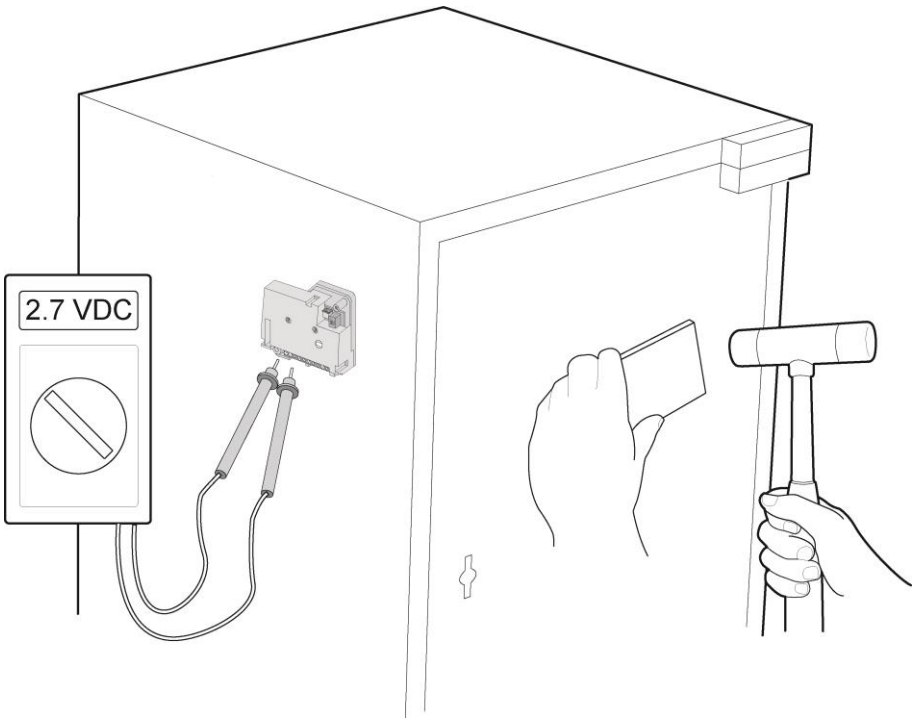


Figure 7-1: Staged commissioning - shock

In Figure 7-1: Staged commissioning - shock the shock test will illuminate the LED as confirmation of the alarm and the voltage will increase to circa 2.7v DC level as confirmation.

	Do not strike the detector as this may cause irreparable damage to the detector.

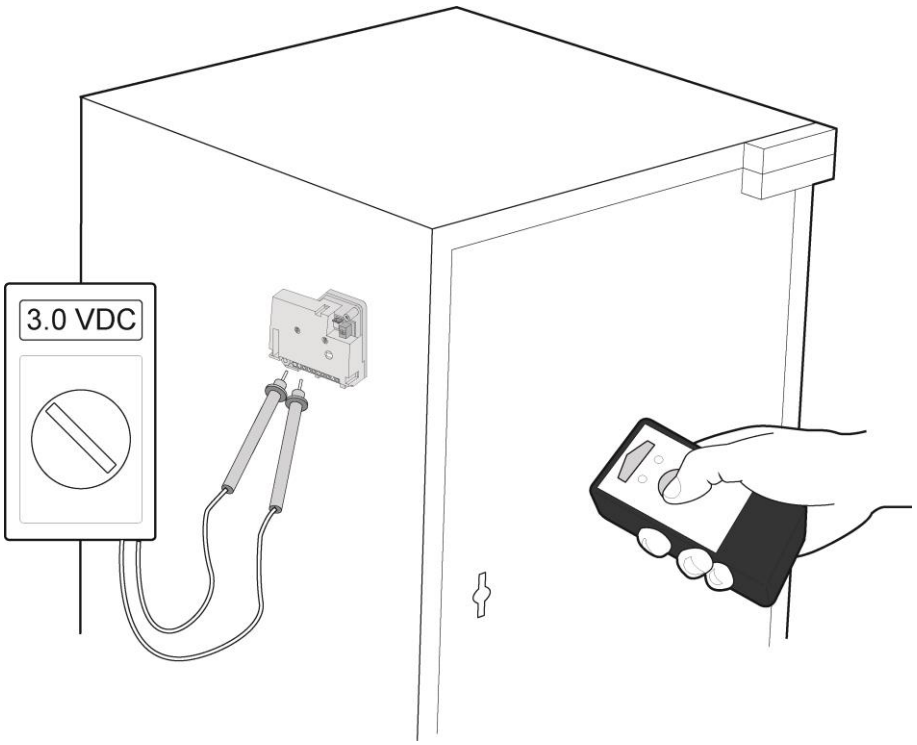


Figure 7-2: Staged commissioning - integration

In Figure 7-2: Staged commissioning - integration the integration test will illuminate the LED as confirmation of the alarm and the voltage will increase to circa 2.7v DC level as confirmation.

The recommended method of recording and verifying the tests is to use the GMXD7 SensTool. See Section 8 SensTool for additional information.

8 SensTool

8.1 SensTool GMXS7

Senstool is an essential part of the successful configuration of the GM7xx seismic detectors. Note that the GM710 does not have Senstool connectivity. It is strongly recommended that SensTool is used for the configuration and commissioning of the GM7xx seismic detectors. Certain configuration options are only available from SensTool, such as digital filters, temperature adjustment & monitoring, alarm contact options, test input options, remote input options, and shock sensitivity.

8.1.1 SensTool User Mode Settings (recommended)

The settings detailed below are with the digital filter set to **OFF**.

Construction	Impact sensitivity	Application
Steel 1.0m	Low	Ticket machine with loud function-related noises.
Steel 1.5m	Medium	ATM, day/night vaults, safes with loud function-related noises.
Steel 2.0m	Medium	Encased safe, vault doors with function-related noises.
Concrete 2.5m	High	Vault room, element vault with some interfering influences.
Concrete 4.0m	High	Vault room, element vault with low interfering influences.
Concrete 5.0m	High	Vault room, element vault with minimal interfering influences.
LWS 1.5m	High	ATM made of plastic plating system with function-related noises.
LWS 2.0m	High	Element vault made from plastic plating system with minimal noises.

Table 8-1: Recommended SensTool user mode settings

8.2 Setting up Senstool

The set up procedure is well documented in the SensTool manual and once communications have been established the testing and recording of the data can commence. There is support information available as part of the software package.

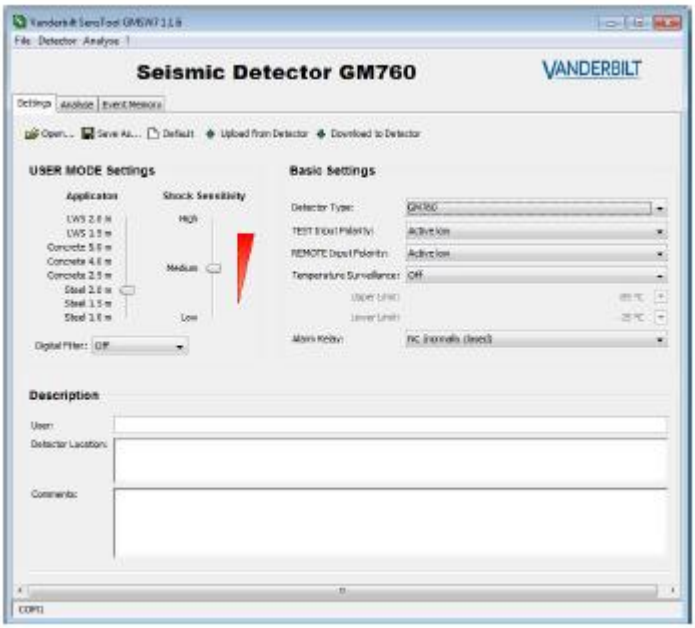


Figure 8-1: SensTool software

8.3 Recording ambient noise levels

SensTool via a GM7xx detector has the facility to monitor and record the background noise levels of parts of an installation. If there are concerns over high noise levels prior to installation or if post installation problems exist, then it is strongly recommended that the installation is monitored to assist with the removal of the problem.

The GM7xx via Senstool has the facility to monitor for 18 hours. A monitoring exercise should be established during the noisiest part of the day, when most activity/noise is present, this can be mechanical human or electrical.

For monitoring purposes, mount a detector as close to the final location as possible. Ensure that a suitable ac power source is available for the duration of the test to supply primary power to the laptop p.c. Select the duration of the monitoring period (up to 18 hours) and run the test. The test will automatically terminate. The results of the test will show the background noise levels in real time as the test results are linked to the p.c.'s clock. The recording shows the signal strength of any noise detected and also the details of the integration alarm as a %. The recording will also indicate any alarms, which with some local investigation should determine the activity that caused the alarm. It is preferable that the noise is reduced or stopped but if this cannot be achieved, then the digital filters and the sensitivity setting can be changed to remove the alarm. If the alarm is process related and the process is only for a short duration, then the application of the remote input signal will reduce the sensitivity of the detector to 12.5% of the original setting. Local regulations will determine if this is a permissible option.

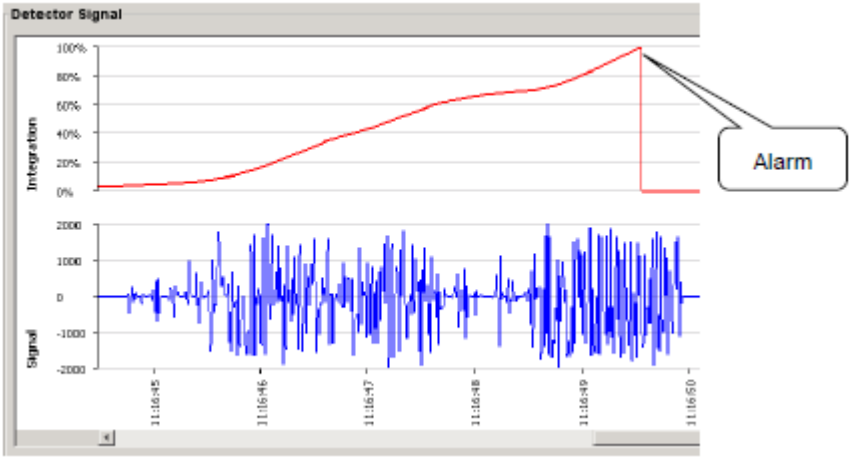


Figure 8-2: SensTool detector signal

8.4 Trouble Shooting

Problem	Diagnosis	Solution
PC cannot communicate with the detector.	Ensure that the COM port on the PC is free for use.	Check that the correct COM port is selected, usually COM1
	Close all open applications that could claim the port.	
	Ensure the connection cable is plugged into the serial port on the PC and into the detector.	
	Ensure the detector has power.	Check using a multi-meter, also check for polarity.
	Ensure that DIP switches 1 and 2 are in the ON position to establish comm's.	
	Ensure that a detector type has been selected and it is the correct type.	
	Ensure that the compatible version of SensTool is being used.	
	Ensure the correct driver software is installed on the PC, if a USB/Serial adapter is used.	
Detector is showing Drill Alarm	Ensure the GMXD7 anti-drilling foil is connected correctly.	Connected into header marked GMXD7, refer to detector Install sheet.
	Ensure that the GMXD7 is not open circuit.	Check using a multi-meter for continuity (around 300Ω resistance for GMXD7).
Integration Alarm present	Ensure that the GMXS1 test transmitter is not activated from an external source.	Check terminal 4 on the detector with a multi-meter. Refer to the Install sheet for the detector.
		Ensure that the 0v applied or removed is correct for the detector configuration.
	Check that the GMXS5 auxiliary test transmitter (usually located outside the protected space) is not activated.	Check terminal 6 on GMXS5 with a multi-meter. Refer to GMXS5 Install sheet for input options.
	Use the Analyse option to view and record the noise.	Use the digital filter options to remove the noise as required.
Shock Alarm present	View the shock alarm using the Analyse option in SensTool.	Change shock settings to reduce noise. Change the operating radius, if permissible, to remove the noise. Use the digital filter options to remove the noise. Identify the source and take appropriate action to prevent
Temperature Alarm present	Check the high and low settings of the detectors. Check ambient temperature of the local area.	Use SensTool and adjust if required.

Problem	Diagnosis	Solution
Detector slow to respond	Check if the remote input is active, which will reduce the sensitivity to 12.5%.	Check input 7 on the detector using a multi-meter. Refer to the Install sheet for the detector.
Unwanted activations	Check the settings of the detector. Repeat the processes above for the removal of the different types of alarm.	Verify against the original settings, if available.

Table 8-2: SensTool troubleshooting

For more information, see the GMSW7 SensTool Operating Instructions.

8.5 Using SensTool as a record of commissioning

The SensTool software can form part of the handover package for a system. All of the testing for each individual detector can be recorded complete with real time date & time stamps and the type of alarm that was detected.

This is easily achieved by clearing the event log for the detector being commissioned, performing the commissioning and then saving the event log file. The event log file will record the time and date of the commissioning, the type of test (integration, test integration, shock, drill or temperature).

The file is saved as a .txt file and could be used to demonstrate that each detector was tested and the method of testing applied.

Note that this event memory is only available in the GM760 and GM775 detectors.

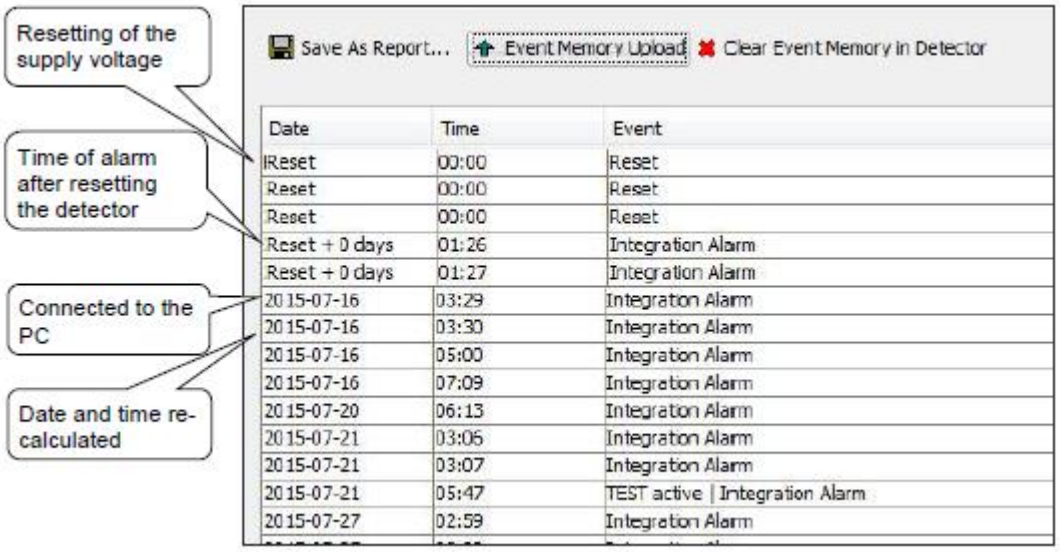


Figure 8-3: SensTool event memory

In addition to the record of testing and the configuration of the actual detector settings complete with any associated guidance notes.

9 Interface to SPC Panel/System

9.1 General Electrical Connections

There are a number of different connection options for the monitoring of the seismic detectors available from the SPC system. Vanderbilt recommend that the dual end of line options are selected, as they provide the most comprehensive coverage and reporting.

Optimum performance of the combined SPC/GM7xx system requires selection of the financial package in SPC. See Section 9.2 for more information on the additional benefits.

The list of available end of line monitoring is as follows and the default value is Dual 4K7/4K7 end of line resistor:

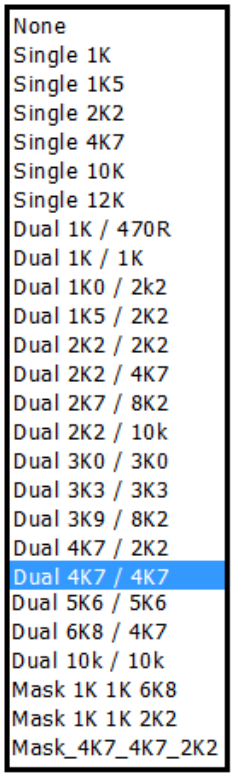


Figure 9-1: End of line monitoring options

Note that resistors are not supplied with GM7xx seismic detectors.

A quick comparison of the benefits between single and dual end of line monitoring follows:

Status	Dual end of line 4K7	Single end of line 4K7
Normal	4K7	4K7
Tamper	Infinity	Infinity
Alarm	9K4	Infinity
Short circuit	0 ohm	0 ohm
Open circuit	Infinity	Infinity

Table 9-1: End of line monitoring

Note: the SPC panel detects the different resistance values and reports the condition to the user of the SPC system as detailed in the status column.

The electrical connection for seismic detectors (GM710, GM730, GM760, GM775) is detailed in Figure 9-2.

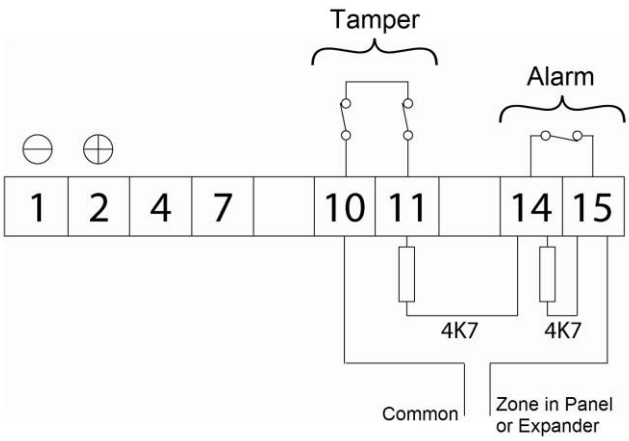


Figure 9-2: SPC seismic electrical connections

9.2 Testing the detectors

Relay 3 is a normally open configurable output, located in the main panel. This relay is a dry change over contact relay. Relay 3 can be configured as the seismic test output. The attributes assigned to relay 3 can be copied to one of the two available relays in each expander.

	The system outputs are volt free change over contacts rated at 30v DC and SPC panel outputs 1,2,4,5, and 6 open collector rated at 45mA.

When the output is assigned as a seismic output there are a number of different ways that the output can be used to test the seismic detectors:

- Manual test
- Automatic test
- Automatic test when setting

9.2.1 Manual Test

This is instigated by the user of the system and is a menu driven option.

Once the test has been selected, then the assigned outputs in the panel and the expanders will activate the associated GMXS1 and GMXS5 test transmitters. The options for this are from 3 -120 seconds, with the default being 30 seconds.

	The SPC system can accommodate up to 512 zones. Test duration should be extended in accordance with the number of seismic zones in the test.

Once completed all test results, pass/fail, will be posted to the system log and a failure of a seismic detector to activate will be displayed on the keypad as a failure. This does not determine the exact detector(s), which failed the test but a general notification. For the exact test failure(s), refer to the system log.

	The seismic input attribute must be enabled through the SPC system for this test.

9.2.2 Automatic Test

The SPC panel has the facility to determine the frequency of the seismic test in the Output Configuration screen. The options for this are from 12 – 240 hours, with the default being 168 hours = 1 week.

The SPC panel has the facility to determine the duration of the seismic test in the System Timers screen. The options for this are from 3 -120 seconds, with the default being 30 seconds.

	The SPC system can accommodate up to 512 zones. Test duration should be extended in accordance with the number of seismic zones in the test.

The time required for the actual test for 50 detectors would be 1-2 seconds and the lower time limits should be used in preference to the upper limits. The automatic seismic test is not dependent upon the set condition of the system but operates differently for either option.

	Automatic test is only available in the unrestricted mode of operation. See the SPC documentation for more information.

System status	Seismic test	Result	Reporting & Display
Set	Yes	Pass	Successful test result posted to system log
	Yes	Fail	A failure will be posted to the system log together with the zone(s) of the failed detector(s). When the system is unset, a seismic failure report will be displayed on the keypad. The system cannot be set until this fault is cleared
Unset	Yes	Pass	Successful test result posted to system log
	Yes	Fail	A failure will be posted to the system log together with the zone(s) of the failed detector(s). A seismic failure report will be displayed on the keypad. The system cannot be set until this fault is cleared

Table 9-2: Automatic seismic test

9.2.3 Automatic test when setting

In the configuration option page, there is an option to force a test on the seismic detectors each time the system is set. The normal exit time of the system is delayed by the duration of the seismic test.

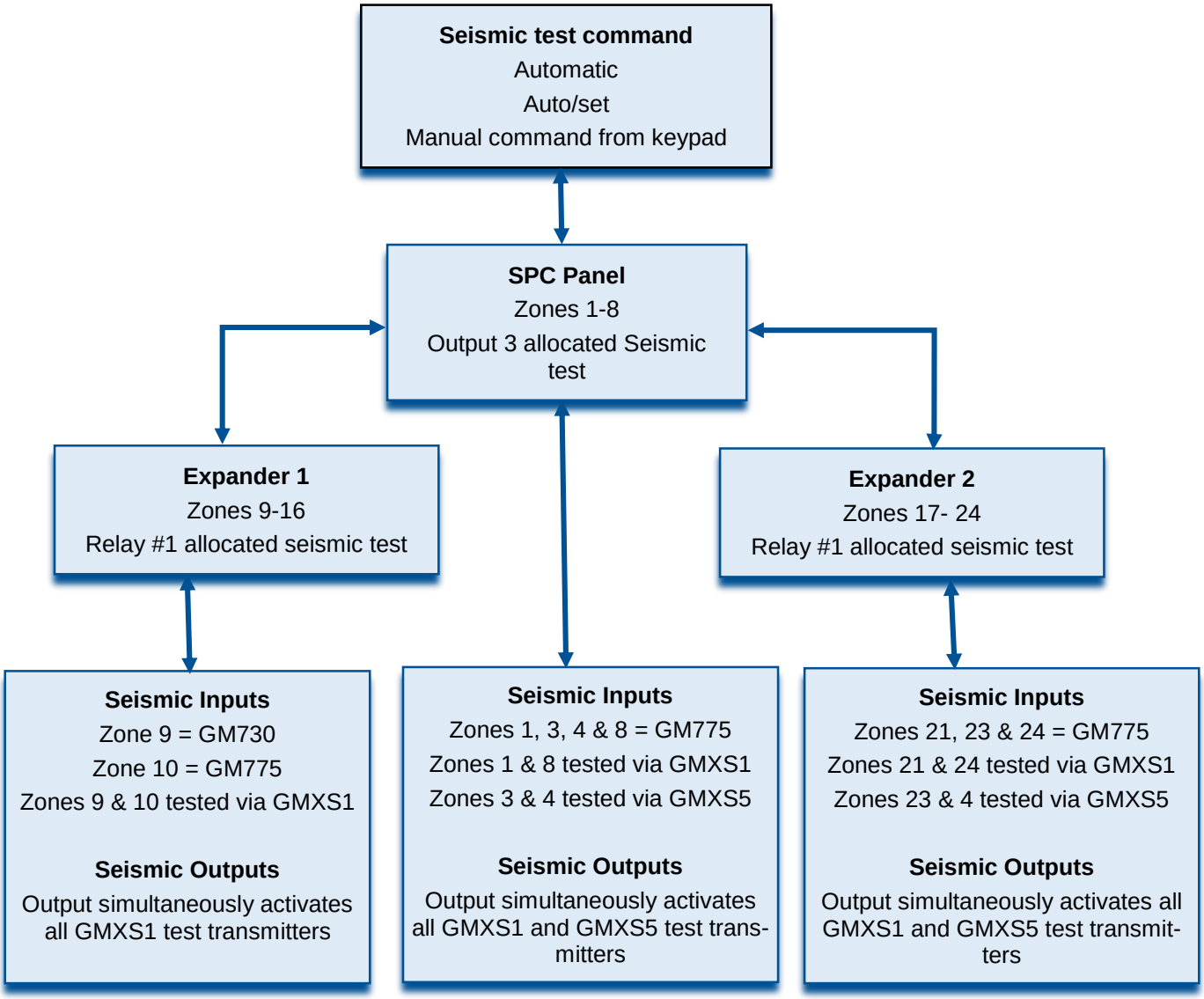
Setting time	System arming time
Seismic test time	30 seconds
Exit time	45 seconds (default)
Total setting time	75 seconds

As per the automatic seismic test, the results are logged and displayed in a similar manner;

Automatic test on set	Yes	Pass	Successful test result posted to system log
	Yes	Fail	A failure will be posted to the system log together with the zone(s) of the failed detector(s). A seismic failure report will be displayed on the keypad. The system cannot be set until this fault is cleared

	For all test options, if a seismic detector is not served by a form of test transmitter, internal GMXS1 or external GMXS5 or if the test device is defective or out of range, then a fail will be recorded for each test.
	With the unrestricted mode selected in the SPC panel, system testing can be a combination of automatic test and automatic test when setting. In this case, all seismic detectors are tested each time the system is set.

9.3 Test and indication flow



9.4 User Interface

When using the compact keypad as the user interface the following menu options will be available for automatic and manual testing of all of the detectors on a system.

To perform a seismic test, enter the required passcode and follow the steps indicated below;

a) Scroll to TEST > SEISMIC TEST.

b) Press SELECT.

c) Select TEST ALL AREAS, or select an individual area to test.

d) If you select an individual area to test, you can select either TEST ALL ZONES or select a specific seismic zone to test.

⇨ The message ‘SEISMIC TEST’ is displayed on the keypad and flashes while the test is being performed,

⇨ If the test fails, the message ‘SEISMIC FAIL’ is displayed. If the “i” or VIEW key is pressed, a scrollable list of the failed zones is displayed.

⇨ If the test succeeds, ‘SEISMIC OK’ is displayed.

10 Useful information

10.1 Cross-reference chart for country-specific approvals

Product	Comment
GM710 Seismic detector	CCC, UL, RCM, PD6662, CE, EAC
GM730 Seismic detector	CE, CCC, UL, RCM, PD6662, CNPP, IMQ, IN-CERT, MABISZ, NBU, PIE, SBSC, VdS, VSÖ, F&P, REQ, EAC
GM760 Seismic detector	CE, CCC, UL, RCM, PD6662, CNPP, IMQ, IN-CERT, MABISZ, NBU, PIE, REQ, EAC
GM760B Seismic detector	CE
GM775 Seismic detector	CE, MABISZ, NBU, SBSC, VdS, VSÖ, F&P, FG, EAC
GM775LSNi Seismic detector	CE, VdS, VSÖ, EAC
GM780LSN Seismic detector watertight	CE, VdS, VSÖ
GMXW0 Wall recess box	X
XGMXB0 Floor box	X
GMXP0 Mounting plate	X
GMXP3 Swivel plate	X
GMXP3Z Swivel plate	X
GMXS1 Test transmitter for GM5xx/GM7xx	UL, EAC
GMAS6 Fixing device	X
GMXS5 Remote test transmitter	VdS, EAC
Spacer/2mm Plate 2mm for GMXP3	EAC
Spacer/4mm Plate 4mm for GMXP3	EAC
GMXC2 Connection sleeve. 16mm	X
GMXD7 Drilling protection (10pcs)	X
GMSW7 SensTool-SW	EAC
GMYA7-AS Remote test system for seismic	VdS, EAC
GMYA7-A Alarm indicator	VdS, EAC

Table 10-1: Country Specific Approvals

10.2 Cross reference chart for all related internal documentation

Product Reference	Description	Doc Ref
GM7xx Seismic detectors and accessories		
GM710	Install sheet	022_GM710_A6V10221656_d
	Data sheet	V54534-F106-A100_GM710_023_01_en
GM730	Install sheet	020_GM730_008321_o
	Data sheet	V54534-F107-A100_GM730_023_01_en
GM760	Install sheet	020_GM760_008320_p
	Data sheet	V54534-F108-A100_GM760_023_01_en
GM775	Install sheet	022_GM775_A6V10221658_c
	Data sheet	V54534-F109-A100_GM775_023_01_en
GM775LSNi	Install sheet	022_GM775LSNi_A6V10276498_b
	Data sheet	V54534-F114-A100_GM775LSNi_023_01_en
GM780LSN	Install sheet	022-GM780LSN_A6V10314908_d
	Data sheet	V54534-F116-A100_GM780LSN_023_01_en
GMXP0	Install sheet	N/A
	Data sheet	Vanderbilt - Seismic_Range_of_Accessories
GMXS1	Install sheet	020_GMXS1_686_g
	Data sheet	Vanderbilt - Seismic_Range_of_Accessories
GMXS5	Install sheet	020_GMXS5_004707_e
	Data sheet	Vanderbilt - Seismic_Range_of_Accessories
GMXW0	Install sheet	020_GMXW0_I-200103-1_a
	Data sheet	Vanderbilt - Seismic_Range_of_Accessories
GMXB0	Install sheet	020_GMXB0_I-200102-1_a
	Data sheet	Vanderbilt - Seismic_Range_of_Accessories
GMXP3	Install sheet	020_GMXP3--GMXP3Z_003996_e
	Data sheet	Vanderbilt - Seismic_Range_of_Accessories
GMXP3Z	Install sheet	020_GMXP3--GMXP3Z_003996_e
	Data sheet	Vanderbilt - Seismic_Range_of_Accessories
GMAS6	Install sheet	021_GMAS6_1438_d
	Data sheet	Vanderbilt - Seismic_Range_of_Accessories
GMXD7	Install sheet	020_GMXD7_008383_d
	Data sheet	Vanderbilt - Seismic_Range_of_Accessories
GMXC2	Install sheet	N/A
	Data sheet	Vanderbilt - Seismic_Range_of_Accessories
GMXS2	Install sheet	N/A
	Data sheet	Vanderbilt - Seismic_Range_of_Accessories
GMXS4	Install sheet	N/A
	Data sheet	Vanderbilt - Seismic_Range_of_Accessories

Product Reference	Description	Doc Ref
GMSW7	Operating instructions	022_SensTool_A6V10245824_c
	Data sheet	Vanderbilt - Seismic_Range_of_Accessories
GMYA7-AS	Installion instructions	052_GMYA7-AS_GMYA7-A_A6V10200077_e
	Data sheet	Vanderbilt - Seismic_Range_of_Accessories
SPC Documentation		
SPC Panel 4000 Series 5000 Series 6000 Series	Installation and configuration manual	SPC42xx_43xx_52xx_53xx_63xx_Installation_Configuration_Manual_en
SPCE450/452	Expander with 8 relay outputs	SPCE450_452_Expander_Installation_Instruction_in
SPCE651/652	Expander with 8 Inputs and 2 Outputs	SPCE650_651_652_Expander_Installation_Instruction_in
SPCK420/ SPCK421	LCD-Keypad	SPCK420_421_Keypad_Installation_Instruction_in
SPCK520/SPCK521	Compact Keypad, Compact Keypad with CR	SPCK520_SPCK521_Compact_Keypad_Installation_Instruction_in
SPCY520	Flush Mount Box for SPCK52x	SPCY520_Flush_Mount_Box_Installation_Instruction_in
SPCY521	Metal Back Box for SPCK52x	SPCY521_Metal_Back_Box_Installation_Instruction_in
SPCK620/ SPCK623	Comfort Keypad, Comfort Keypad with Audio/CR	SPCK620_623_Installation_Instruction_in
SPCP332/ SPCP333	Smart PSU (Power Supply Unit) with 8-In/2-Out-Expander	SPCP332_333_PSU_Expander_Installation_Instruction_in
SPCP355/	PSU with 8-In/2-Out-Expander	SPCP355_PSU_Expander_Installation_Instruction_in
SPCP432/ SPCP433	Smart PSU (Power Supply Unit) with 2-Door-Expander	SPCP432_433_PSU_Expander_DC_Installation_Instruction_in
SPCV340	Audio Expander with 4 Inputs / 1 Output	SPCV340_SPCV341_Audio_Expander_Installation_Instruction_in
SPCV440	Combi Audio Expander with 4 Inputs/1 Output	SPCV440_Combi_Audio_Expander_Installation_Instruction_in
SPCW130	SiWay RF-Expander for X-BUS	SPCW130_Wireless_Expander_Installation_Instruction_in

Table 10-2: Related documentation – internal

	All of the above documents are available from the public and/or restricted areas within SPIAP.

10.3 Cross reference chart for applicable, external related documents

Publishing Body	Description	Reference No.
VdS	Surveillance measures for safes & strong rooms	VdS 2264
VdS	VdS Guidelines for intruder systems / IAS Surveillance measures for safes and strongrooms	VdS 2477

Table 10-3: Related documentation - external

10.4 Cross reference list of all part numbers

Product code	Description	Article number
GM710	Seismic detector	V54534-F106-A100
GM730	Seismic detector	V54534-F107-A100
GM760	Seismic detector	V54534-F108-A100
GM775	Seismic detector	V54534-F109-A100
GM775LSNi	Seismic detector	V54534-F114-A100
GM780LSN	Seismic detector	V54534-F116-A100
GMXP0	Mounting plate – GM7xx	VBPZ:2772730001
GMXS1	Internal test transmitter – GM7xx	VBPZ:4202370001
GMXS5	External test transmitter – GM7xx	VBPZ:5627000001
GMXW0	Wall / Ceiling recess box – GM7xx	VBPZ:2771210001
GMXB0	Floor recess box – GM7xx	VBPZ:2772020001
GMXP3	Lock protection – GM7xx	VBPZ:3470190001
GMXP3Z	Lock protection – GM7xx	VBPZ:5712410001
GMAS6	Movable mounting kit – GM7xx	VBPZ:4886060001
GMXD7	Anti-drill foil (10x) – GM730/760/775	VA5Q00006245
GMSW7	SensTool-SW – GM730/760/775	VA5Q00006245
GMYA7-AS	Remote testing system	V54534-F101-A100
GMYA7-A	Alarm for indicator module	V54534-F102-A100
GMXC2	Connection sleeve (16mm) – GM7xx	VBPZ:5021840001
GMXS2	2mm spacer	VBPZ:3506110001
GMXS4	4mm spacer	VBPZ:3506240001
GMXC4	Test tool	TBD

Table 10-4: Part numbers

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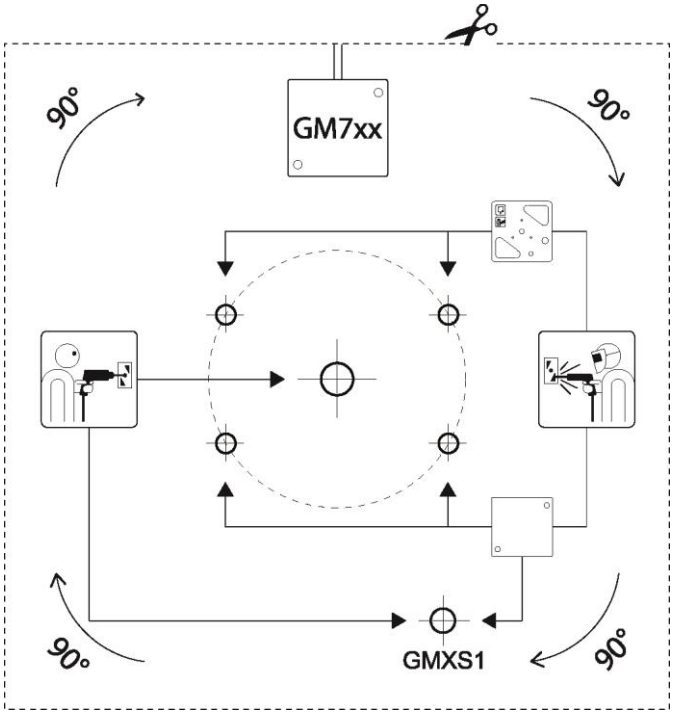
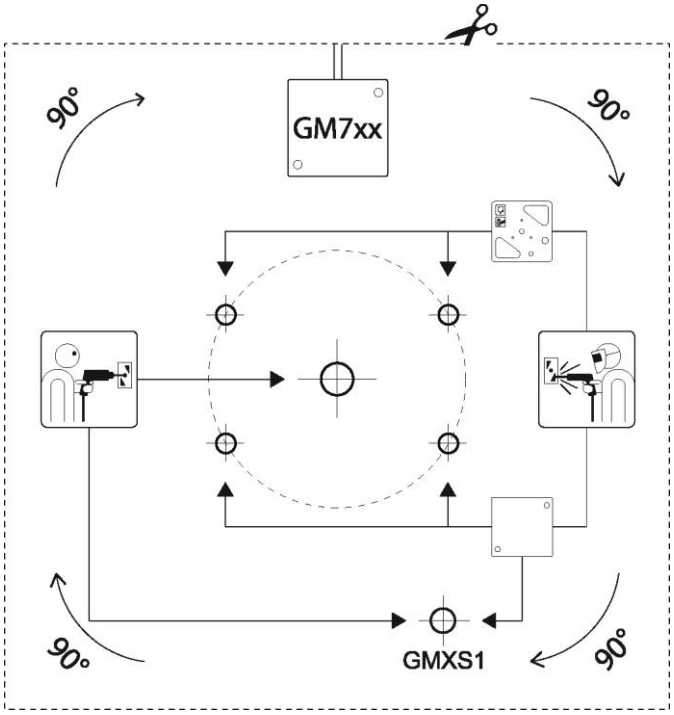
11 Appendix 1: Drill template GM7xx

Scale 1:1

Dimensions when printed:88mm x 88mm

⚠	Printer settings must be optimized to reproduce at actual size. While every effort has been made to ensure accurate sizing, the templates in this document must be checked before use to ensure that the dimensions are correct.





12 Appendix 2: Drill Template GMXP3/Z

Scale 1:1

Dimensions when printed 88mm x 88mm

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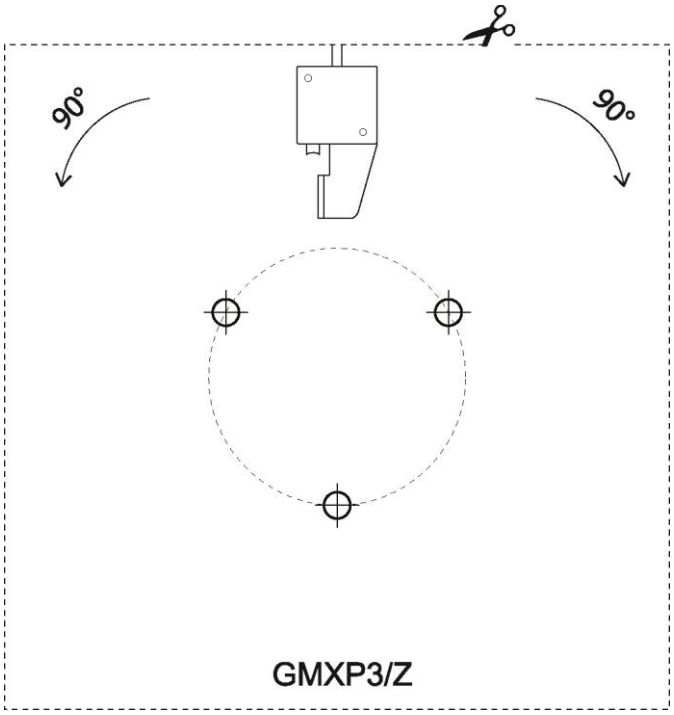
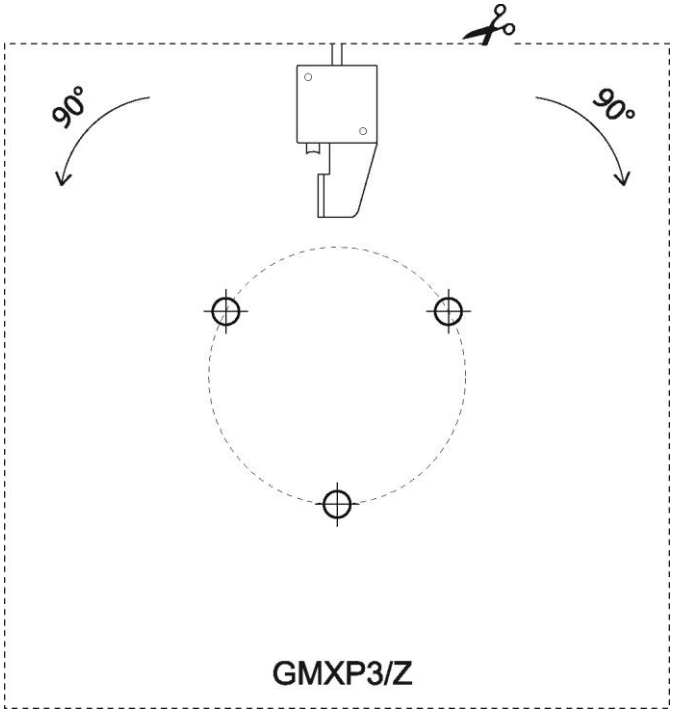


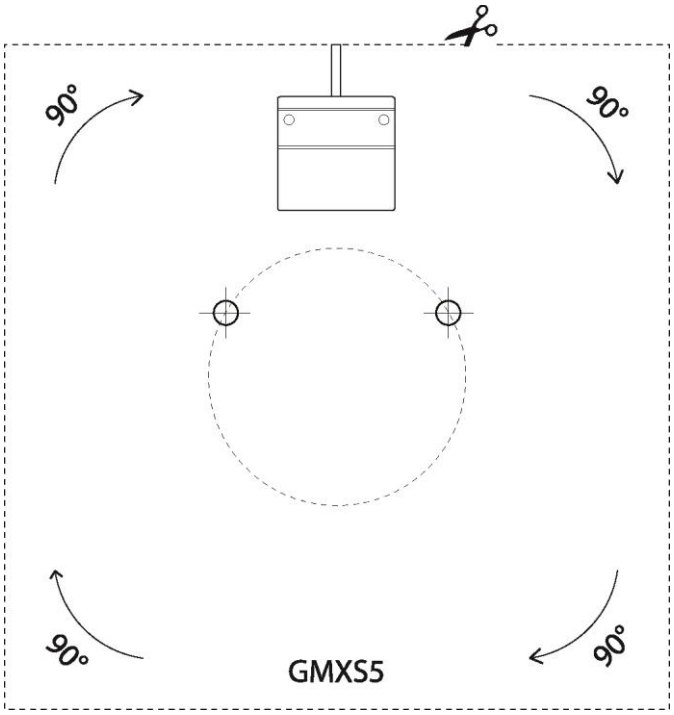


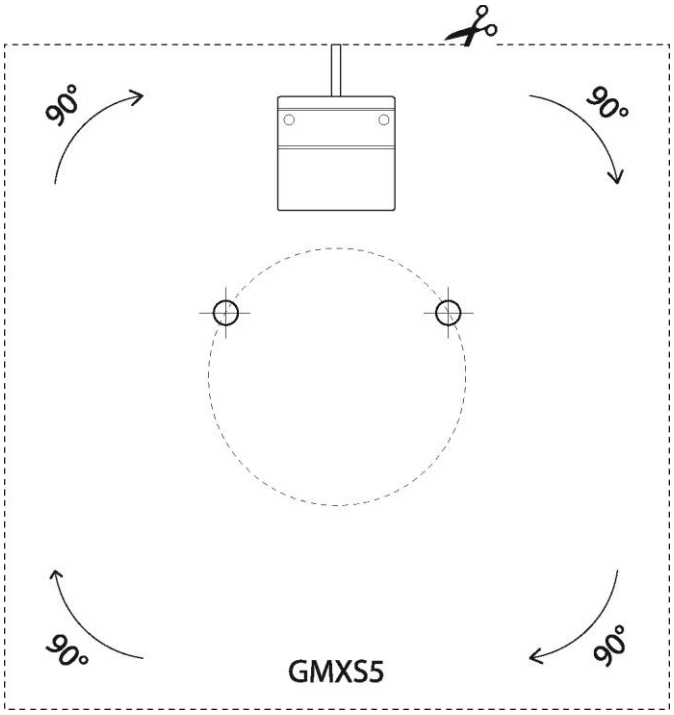
13 Appendix 3: Drill Template GMXS5

Scale 1:1

Dimensions 88mm x 88mm

⚠	Printer settings must be optimized to reproduce at actual size. While every effort has been made to ensure accurate sizing, the templates in this document must be checked before use to ensure that the dimensions are correct.





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