VD 400
Vibration Detector

TECHNICAL MANUAL

Rev 2, 2002 GB

FEATURES

* SOLID STATE SELECTIVE VIBRATION DETECTOR

* DETECTS ATTACKS AGAINST LAMINATED GLASS

* EASY TO INSTALL AND CAN BE MOUNTED IN ANY POSITION

* ANALYSER AND SENSOR IN ONE UNIT

* FULL CUSTOM MICRO CONTROLLER

* RELAY ALARM OUTPUT

* AUTOMATIC RESET OR LATCH OUT

* DAY/NIGHT CONTROL OF LED INDICATION WHICH MEET BS4737:PART 3:SECTION 3.10

* THREE CHANNELS TO ANALYSE THE VIBRATION SIGNAL

* COUNTING CHANNEL 4 KNOCKS PROGRAMMABLE

* GROSS ATTACK CHANNEL

* INTEGRATION CHANNEL

* FIRST TO DETECT INDICATION

* PREALARM INDICATION OF EACH CHANNEL FOR EASY ADJUSTMENT

* TAMPER PROTECTIONS
  1. Opening protection
  2. Low voltage protection
  3. Outside magnet field can't hold the relay
  4. watch dog function

* AVAILABLE WITH COVER IN GREY METAL COVER

INTRODUCTION

The AlarmtechVD 400 is a selective vibration detector. It is primary designed to detect attacks against laminated glass on which it is glued on to. It is sensing the VIBRATION pattern created when an intruder forces his way through a structure. When a material is subject to this type of stress the shock pattern created have an element of acceleration. High frequency signals are generated when the structure starts to break down. TheVD 400 sensor converts these signals into electrical signals and its analyser distinguishes these signals from normal disturbances in the surrounding.

The AlarmtechVD 400 has a microprocessor capable of providing great processing power to minimise the incidence of false alarms. In addition to the improvement of detecting unlawful attack, the microcircuit can provide a variety of options of great use for the alarm installer.

The AlarmtechVD 400 has a Piezo electric sensor within the module that is designed to respond only to high frequency vibrations and shocks. The detector is immune to low frequency vibrations and incorporates an individual sensitivity control to enable the installer to selectively adjust each detector to suit the area to be protected. The point at which the detector triggers at the selected level is only dependent upon the magnitude of the shock and the nature of the vibration.

Also in the design of the program to the microprocessor we have used our deep knowledge in processing vibration signals and we have introduced in the AlarmtechVD 400 the same "Seismic Philosophy" which have proven to be so reliable.

VD 400 ALARMTECH has 3 detection channels

1. Explosion channel gross attack channel
2. Counting channels with up to 4 knocks programmable
3. Integrating channel

The explosion channel overrules the 2 other channels in case of a gross attack.

The counting channel counts the number of shock pulses caused by the attack against the protected structure and the number 4 knocks.

The integrating channel allows detection of those attacks that creates low signals but requires longer time to carry out. That allows us to reduce the sensitivity of the counting channel, as we don't need to detect those low signals so fast. In this integrating channel we also have even more taken away the low frequency to reduce the influence of common noise sources in the surrounding. We have with the integrating channel designed a very safe and efficient detector.

Function control

Use the tester GVT 5000. The tester will give out bursts of vibration signals. Counting the number of bursts to alarm is a measurement of the sensitivity setting. Function control of Alarmtech VD 400 is simplified with the TEST function that when Jumper 4 is incerted or when wired in on terminal 3 it can be controlled remotely (jumper 4 must then be removed). The LED will now indicate when the unit goes into alarm and the LED lit up and reset after 2s if the D/N line on terminal 4 is in DAY-position or not connected. The LED will prealarm with a short flash for each count. When the integrator works there are very short flashes. It is therefore very easy to see the reaction of the detector.

The alarm relay will follow the programming AUTO RESET or LATCHING by jumper 3. The installer does not need to return to the control panel for resetting the unit

Setting up

The cover will need to be removed for the following operations, and tamper circuit disarmed at the control panel.

1. Program the VD 400 for TEST with jumper 4 inserted and Relay in AUTO RESET with jumper 3 inserted.

2. Rotate the sensitivity control fully clockwise and apply 12 volts DC to the VD 400 .

3. Check its operation by gently tapping the adjacent surface and note that the LED illuminates.

4. Rotate the sensitivity control fully anti-clockwise and reset the detector by momentary disconnection of the 12-volt supply.

5. Operate the GVT 500 TESTER at the furthest distance from the device and progressively increase sensitivity by rotating the control clockwise until the LED is iflashing when the GVT is operated. Count the number of vibration bursts to alarm. It is a good measurement of the sensitivity. A sensitivity setting of 5-6 bursts to alarm is normal.

6. Repeat at other locations around the perimeter of the zone.

7. After setting the sensitivity, connect the wires into the terminal block and mount the cover. Check operation of the alarm and tamper circuits at control panel.

High sensitivity levels should not be attempted over large areas unless the installer is confident that false vibration signals cannot arise from objects in the surrounding like machinery, loose surfaces and other.

Alarmtech VD 400 has been designed to give a long reliable life, however it is recommended that each device be checked regularly. As VD 400 has the capability of analysing both the signal magnitude and duration the installer should consider the potential methods of attack and adjust the sensitivity accordingly. The device will either respond to one large blow or several small

ones or to an attack method with low signal amplitude but with long duration you get with tools like diamond discs, drilling or welding tourch.

Planning instruction

Area of protection

The Alarmtech VD 400 is designed to detect intrusion through laminated glass on which it is glued on. It can also be used on other materials The area of protection cannot be simply defined since there are many factors that influence the overall sensitivity.

1. The area of protection.

2. Construction and fabric of the surface to which the sensor is attached.

3. Physical location of the sensor relative to beams, hinges, cross members and discontinuities such as opening frames etc.

Since the device can be mounted in any position the installer has greater attitude to select the optimum position to mount the device. On laminated glass it is recommended to mount it close to one of the upper corners to avoid that cleaning solvent penetrate the detector. Materials used in the construction industry all have differing abilities to transmit mechanical vibration and further irregularities, cracks and voids etc. will impair the performance and hence affect the area that can be safely protected.

Detection range

Surface	Laminated Glass	Steel sheet	Concrete (on MP 400)	Brickwork	Wood
Radius	5 m	5 m	5 m	4 m	3 m

* All values quoted are typical and are subject to practical testing which must be made for each installation. In some environments attenuation may be very high. On brickwork, and concrete the mounting plate with the expander boalt must be used.

Applications

The Alarmtech VD 400 may be fitted to laminated glass by using the same glue kit as for the Glass Break Detectors GB 500-series or to any solid structure directly by using the enclosed screw or the metal mounting plate MP 400. The sensor works effectively on all solid materials such as metal, glass, wood, concrete, brickwork, etc. In general the more dense the material is the greater its ability to transfer high frequency shock signals.

On metal frames or grills a range of 5 metres is easily achieved. This type of security grill is normally fitted inside windows, skylights etc. When an VD 400 is fitted secure, the security level is high, as soon as an intruder attack the grill with any metal object the integration channel of the detector immediately detects the small high frequency signals. The type of grill referred to here is of rigid construction not to be confused with roller type shutter grills.

On brickwork a 4-metre range from the sensor is possible and on concrete that is denser, a range of 5 metres or more is easily obtained if mechanical tools is used in the attack.

On weaker structures such as asbestos roofs etc. sensor spacing of between 2.5 and 3 metres has been found to be adequate. In this situation each sensor should cover an area of approximately 30 square metres.

Care should be taken with less dense materials such as studded walls where plasterboard is used. In this situation, Alarmtech VD 400 should be fitted closer together, however fitting them in metal conduit boxes may increase sensitivity.

A combination of Alarmtech VD 400 with Alarmtech magnetic contacts provides the best form of protection to a door structure, for example a safe door or steel entrance door. Alarmtech has designed a broad range of recessed and flush mounted high security contacts. If the door is left unlocked then the Alarmtech VD 400 is unable to see the low frequency movement as the door opens. It is for that reason that the magnetic contact is required.

TECHNICAL DESCRIPTION

Integrating Channel

The integrating channel in ALARMTECH VD 400 is sensing very low signals and need to have duration of minimum 2s up to 30s before it triggers an alarm. The sensitivity is set by the potentiometer that also controls the counting channel sensitivity such that the sensitivity distance always is constant and preset by the factory.

The integrating channel has a much higher cut off frequency than the counting channel to increase the immunity to common noise sources with low signal output.

Counting Channel

The Alarmtech VD 400 is factory preset to 4 knocks to minimise the possibility of false alarm.

This channel opens up the possibility to decrease the sensitivity of the integrating channel and yet to minimise the possibility of false alarms and thereby increase the detection probability and range. In this situation, small shocks are counted by the electronics; these pulses are stored in a digital memory. For each pulse the reset timer of 8s restart. If the attack is sustained the maximum monitoring time is 4 * 8s = 32s if during this time the programmed pulse count number is reached the alarm is given.

Auto Reset/Latching

Alarmtech VD 400 has, when delivered, jumper 3 inserted and is therefore configured for automatic reset of the relay. In the event of an alarm situation the relay contacts will remain open for approximately 2s before resetting.

When removing the jumper 3 the device is configured for latching of the relay. The relay now remains open until resetted. To reset relay two possibilities are available.

1. Interruption of the power
2. Remotely by using the D/N function on terminal 3 if it is wired in.

D/N Terminal 3.
This function meet the objective of British Standard BS 4737 part 3, section 3.10, to provide indication only during setting, unsetting and testing procedures.

Remote control of the LED is achieved by daisy chain connection of all terminal 4 back to the control panel and switching the line high or low as desired.

Note: To function properly the jumper 4 must be removed.

Terminal 4 high
This is the Night position. When the device triggers an alarm there will be no indication. The alarm relay will open for 2s or latch in alarm depending on jumper 3. This alarm is now stored in a memory.

Terminal 4 Low
When switching from High to Low all devices with an alarm will now lit. Switching momentarily the line high does reset of both the relay and LED.

When the line is low no alarm indication is possible if the unit

TEST

With jumper 4 the Alarmtech VD 400 can be programmed to indicate with the LED the reaction of the detector. This is a very useful and convenient feature at set up and calibration procedures. Use the GVT 5000 tester when testing the unit.

In TEST position there will be a short prealarm. The LED give a very short flash for each integration or the LED give a little longer flash for each count the detector memorise. The Alarm is indicated with a 2 s long LED flash or is permanently lit until resetted depending on the setting of jumper 3. This prealarm indication is very useful at set up and is designed to support the installer to make a fast and reliable job.

The **TEST** programming can also be achieved remotely by the AIS input on terminal 3. (Do not forget to remove jumper 4 for this function.)

SABOTAGE PROTECTION

The Alarmtech VD 400 is very well protected. It has the following protections:

1. Opening protection with a mechanical switch giving TAMPER Alarm

On terminal 8 and 9.

2. Watchdog function to supervise the program

3. Low input voltage protection giving Alarm on output 5 and 6 when the voltage is below 7 volt.

4. The relay is insensitive for outside coming magnetic field.

AIS Terminal 3

The Alarmtech Alarm Information System AIS provides a simple method to determine which detector first went into alarm provided the D/N input is high on terminal 4. To determine the first detector to achieve the alarm state, you just wire all inputs on VD 400 detectors terminal in a Daisy chain. Indication is as follows:

1. First to Alarm; LED will pulse
2. Subsequent to Alarm; LED's will remain steady

Each unit has the capability both receiving and transmitting information over the wire.

When a VD 400 is activated the microcircuit will monitor the voltage on terminal 3. Should the voltage appear low the VD 400 will conclude that it is the first detector to achieve the alarm state and it will pulse its LED to signal first to alarm. The microcircuit will now drive the line high. Subsequent activation of other VD 400 detectors will cause electronics to interrogate the high voltage present on terminal 3 it will deduce that it is not the first to alarm and switch its LED to the steady state.

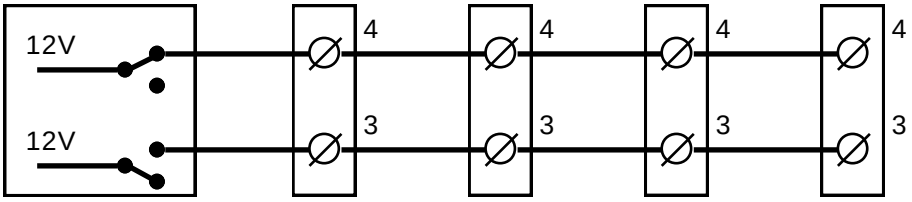
When the **D/N** on terminal 4 is low or not connected, day position, the terminal 3 can be used for remote control of the TEST function.

The AIS features may be used in conjunction with **AUTO** and **LATCH** functions. The Alarmtech VD 400 has a new form of alarm memory; we call it the Alarm Information System AIS. This is the most versatile and sophisticated form of alarm memory available, but at the same time it is easy to use and compatible with most control panels, without any modifications.

The alarm memory operates with two wires for complete functionality, although a simpler operation can be obtained over one wire. Up to 20 detectors can be wired together in this way.

Full functionality - two wire operation
- First up alarm memory
- Remote TEST enables

Terminal 3 and 4 are connected as shown in Figure 1.



Complete operation: two extra wires needed.
This hookup supports four functions
1. Alarm memory for the first detector to alarm and subsequent alarms
2. Control TEST function
3. DAY/NIGHT control of alarm indication
4. Remote control for resetting

FIG 1. Full functionality

1. On arming the system +12V is applied to terminal 4 of the detector. Any alarm now occurring is stored in the detector's memory but not indicated by the LED.

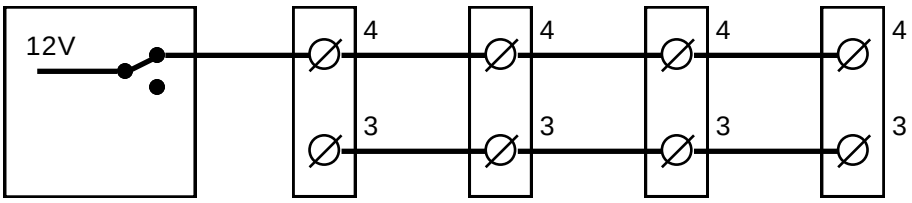
2. On disarming the system those detectors, which were in alarm when the system was armed, are indicated by the LEDs. The first detector to alarm is distinguished by the fact that its LED flashes, while all others light steady.

3. If so desired, the TEST signal (+12V) can be applied to terminal 3. The detectors' LEDs will stop being permanently lit and they can be tested in the normal way. When the test signal is removed, the alarm memory indications will return as before.

4. When the system is next armed all memories and counters are cleared and LEDs reset.

Note: For system-wide first alarm indication, terminal 3 of all detectors in the system are connected together regardless of what zone they are in.

Partial operation - NO remote TEST enable
See Figure 2. Here there is no need to connect terminal 3 of the detectors to the control panel - only to each other.



Partial operation: one wire extra from control panel and detectors interconnect
This hookup supports three functions
1. Alarm memory for the first detector to alarm and subsequent alarms
2. DAY/NIGHT control of alarm indication
3. Remote control for resetting

FIG 2. AIS in partial operation

1. On arming the system +12V is applied to terminal 4 of the detector. Any alarm now occurring is stored in the detector's memory but not indicated by the LED.

2. On disarming the system those detectors that were in alarm when the system was armed are indicated by the LEDs. The first detector to alarm is distinguished by the fact that its LED flashes, while all others light steady.

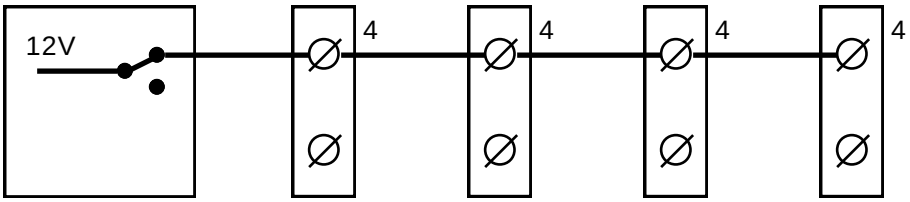
3. When the system is next armed all memories are cleared and LEDs resetted.

The system-wide first alarm indication is achieved by simply wiring terminal 3 of all the detectors together.

The system also allows display of which detector in a selected group was the first to alarm by wiring groups of detectors together.

With a little more complex wiring, these sub-groups can be made to include detectors on different zones.

Simplest operation - No first alarm indication and no remote TEST enable
See Figure 3. Only terminal 4 is connected



DAY/NIGHT control of alarm indication. One wire extra needed.
This hookup supports two functions
1. DAY/NIGHT control of the LED. DAY = 0V. NIGHT = 12V.
   The LED glows if in alarm when changeover from NIGHT to DAY occur
   No other indication is obtained in the event of an alarm.
2. Remote reset in connection with changeover from DAY to NIGHT.

FIG 3. AIS in the simplest operation

1. On arming the system +12V is applied to terminal 4 of the detector. Any alarm now occurring is stored in the detector's memory but not indicated by the LED.

2. On disarming the system those detectors that were in alarm when the system was armed are indicated by a steady LED.

3. When the system is next armed all memories are cleared and the LEDs reset.

D/N Terminal 4

On terminal 4 it is possible to remote control the LED indication and the reset of the unit. When this input is going high the LED is inhibiting to light up at alarm. The unit is put in NIGHT position. When switching the input low The LED lit up if there has been an alarm during night. When again switching the input high the unit is completely resetted.

DAY	= LOW VOLTAGE
NIGHT	= HIGH VOLTAGE
RESET	= LOW --> HIGH VOLTAGE

This function meets the objective of British Standard BS 4737, part 1, 1986 to provide indication during setting, unsetting and testing procedures.

Terminals

The detector has 11 screw terminals with wire guard. The illustration in fig.2 and the text presented below explain the functions of the different connections. A similar illustration is printed on the inside of the detectors cover.

1.	-	0 Volts DC
2.	+	12 Volts DC
3.	AIS	First alarm and remote TEST
4.	D/N	Day/Night control
5.	C	Alarm Relay
6.	NC	Alarm Relay
7.	Sp	Unused connection
8.	T	Sabotage contact (Tamper)
9.	T	Sabotage contact (Tamper)
10.	Sp	Unused connection
11.	LED	Output for external LED. Goes from 5V to 0 V at alarm. Max 10 mA

Jumpers

The VD 400 has 4 programming jumpers.

S1	Sensitivity	S3	LED mode
	Normal		**Monitor**
. .	**Reduced**	**. .**	**D/N**

S2	Relay	S4	Counting
	AUTO		**ON**
. .	**LATCH**	**. .**	**OFF**

FIG 5. Programming board

Technical data

INPUT POWER	8 - 15V DC
PEAK TO PEAK RIPPLE	2V max at 12V
CURRENT CONSUMPTION	
Normal operation	10 mA
In Alarm state	12 mA
ALARM OUTPUT	RELAY, 33 OHM IN SERIES
RATING	MAX 500 mA, 50V DC
TAMPER OUTPUT	MAX 50 mA, 50 V DC
TEMPERATURE LIMIT	-20 TO +50 deg C
RELATIVE HUMIDITY	MAX 90%
SIZE	L90xW30xH27 mm
WEIGHT	49 gram

Ordering information

Model	Description
VD400	Seismic Detector
VD 400-C	Seismic Detector with communication interface
VD 400-Z1	Set of one Seismic Detector with Junction metal box and metal conduit
VD 400-Z2	Set of two Seismic Detector with Junction metal box and metal conduit
MP 400	Metal mounting plate
MH 400	Metal housing
GVT 5000	Tester for VD 400 and GB 500-series Glass Break Detectors
JB 22	Junction box with 20 terminals and opening protection switch
USB-Link	Computer interface for VD400-C
VCD 400	Test program