Introduction

This document provides an overview of information related to the activation of ShockWatch impact indicators. Activation graphs/response curves and other auxiliary information are included.

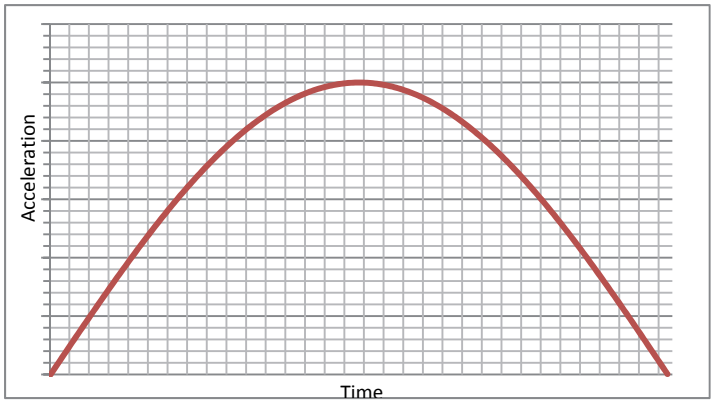
ShockWatch Impact Indicator Activation

Contents

ShockWatch Impact Indicator Activation Overview 2
ShockWatch 2 3
ShockWatch 2 Activation Graphs - Response Curves 3
ShockWatch 2 Response Equations 5
ShockWatch 2 Label Placement 6
ShockWatch 2 Specification 7

ShockWatch Impact Indicator Activation Overview

Two components comprise an impact – amplitude of acceleration (G) and duration of impact (msec). These components are illustrated in the graph below. The area under the curve represents the change in velocity (Δv).



ShockWatch impact indicator shock response curves are based on a half-sine shock pulse (shown above). A time, acceleration point on the half-sine curve can be correlated to the same point on the ShockWatch activation response curves.

The vertical axis of each ShockWatch impact indicator activation curve shows a linear scale and is titled "G" or "G-level." This value is the acceleration scale. A "G" is a multiple of the acceleration due to gravity ($32.2 ft/s^2$ or $9.8 m/s^2$).

The horizontal axis of the graph shows a linear scale titled "t" and represents the time duration. The unit of measure for this scale is milliseconds.

The most critical thing to observe from the curve is that as duration decreases, acceleration increases. Each ShockWatch impact indicator has a minimum G-threshold that must be exceeded before it will activate. The minimum G-level for each ShockWatch impact indicator is the leftmost G-value on the curve (the G-value where the shock curve intersects the left acceleration scale). If this minimum G-value is not exceeded, regardless of the duration or the Δv, the device will not activate.

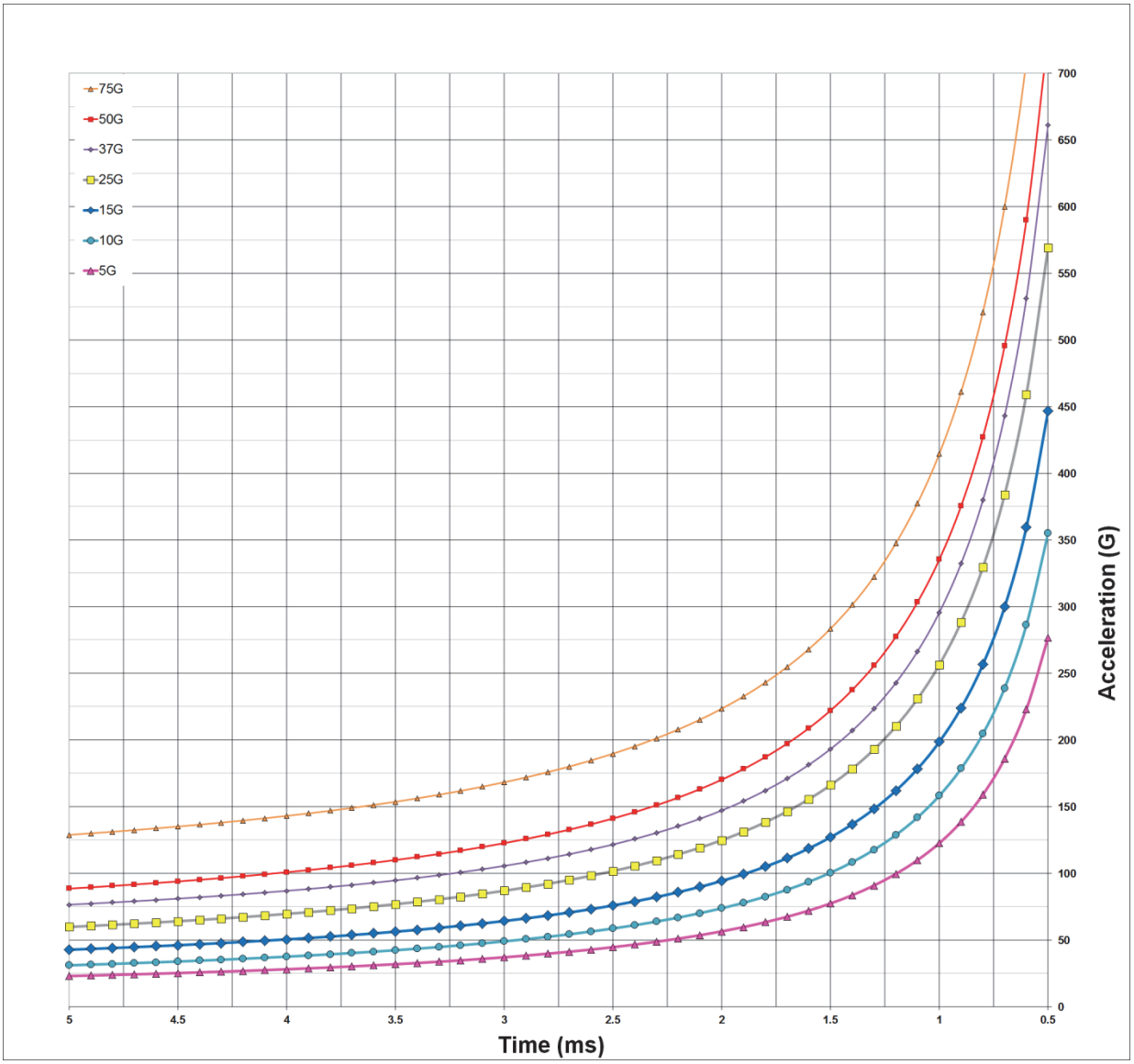
Response curves are measured with a drop system filtering at 3 kHz. Use of a different frequency filter will change the response curve.

If you have any questions or are unsure of how to interpret ShockWatch products, please contact ShockWatch or your local distributor for assistance.

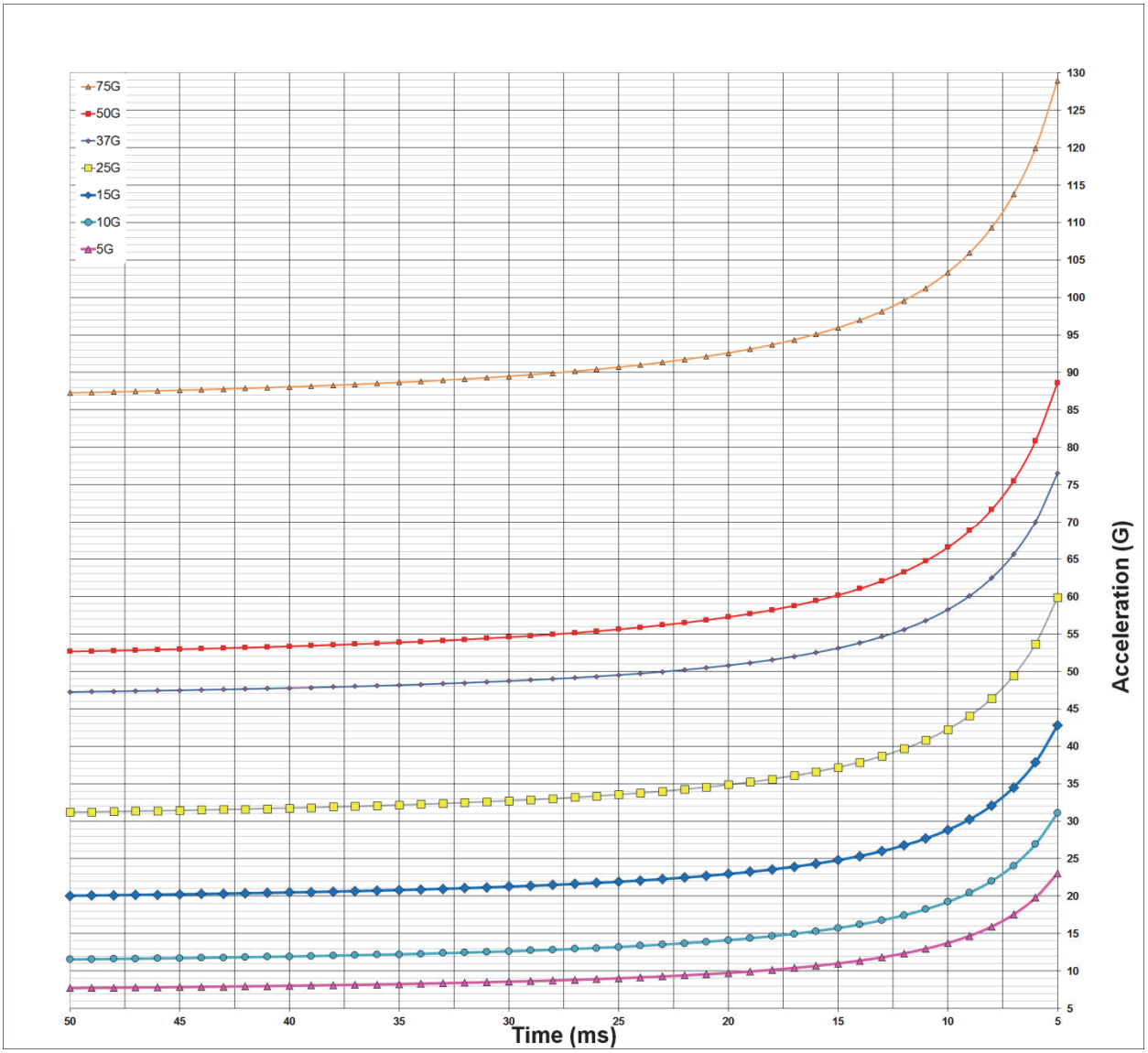
ShockWatch 2

ShockWatch 2 Activation Graphs - Response Curves

ShockWatch 2 G-Level vs. Duration (ms)
0.5 to 5ms
Activation Occurs +/- 15% of the Nominal Activation Value



ShockWatch 2 G-Level vs. Duration (ms)
5 to 50ms
Activation Occurs +/- 15% of the Nominal Activation Value



ShockWatch 2 Response Equations

All ShockWatch 2 impact indicator curves are based on the indicator being subjected to a flat drop. The ShockWatch 2's response generally follows the equations below:

Product	Equation
ShockWatch 2 – 5G	$G=(116/t^{-1.22}) + 6.75$
ShockWatch 2 – 10G	$G=(148/t^{-1.22}) + 10.3$
ShockWatch 2 – 15G	$G=(180/t^{-1.25}) + 18.7$
ShockWatch 2 – 25G	$G=(227/t^{-1.25}) + 29.5$
ShockWatch 2 – 37G	$G=(250/t^{-1.3}) + 45.7$
ShockWatch 2 – 50G	$G=(285/t^{-1.25}) + 50.5$
ShockWatch 2 – 75G	$G=(330/t^{-1.25}) + 84.8$

ShockWatch 2 Label Placement

The correct placement of a ShockWatch label is paramount to achieve proper device operation. A ShockWatch label placed in the wrong position on a package can alter that device's response characteristics and cause erratic results.

Whenever possible, the ShockWatch label should be placed on as rigid an area as possible. The reason for this is that if the surface to which the label is affixed is flexible, or can flex, it will dissipate an indeterminate amount of shock. The selection guide for ShockWatch devices is based on the assumption that the label is placed on a package at a position that has minimal flex. If a ShockWatch label is placed in a non-rigid position, its activation response will not correlate with the selection guide.

Typically, the most rigid area of a container (box) is at or near a corner. The most flexible area of a container is the center of a side. To prove this to yourself, press against the center of one side of a corrugated container. You will see that it easily gives way and flexes. Now, press against that same side but at a point near the junction of that side with one of the other sides (corner). You will see that there is considerably less flex.

In conclusion, if a ShockWatch customer reports erratic results in using the ShockWatch labels, the first item to check is the placement of the label.

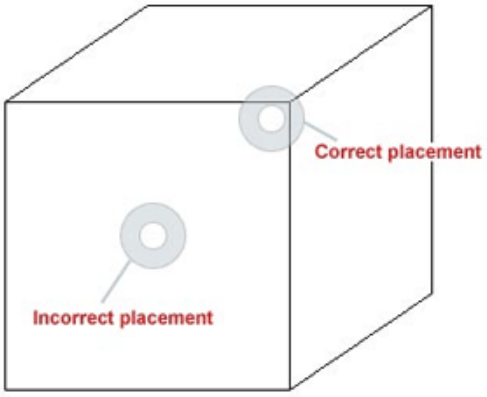


Figure 2

Specification

The quality specification used in the manufacturing process of the ShockWatch tube is as follows:

U.S. Military Specification (Mil Spec)
Mil Spec 105D
2.5% Cumulative AQL
This specification is a recognized means of statistically sampling manufactured goods and is acceptable to ISO 9001.

Operating Temperature	-13°F / -25°C to 176°F / 80°C
Size	3.8″/96.52mm x 3.8″/96.52mm
Sensitivity	Available from 10 to 100G and sensitive to impacts on 360° axis
Responsiveness	Responds to single impact, omni-directional
Duration	Ranges 1 to 50ms
Adhesive	Acrylic
Shelf Life	Scotch 468 Adhesive – 2 years from date of sale, when stored at standard temperature and pressure (20°, 1ATM)