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SpotSee® Impact Indicator Technical Data

SpotSee® impact indicators are innovative solutions for detecting mishandling of sensitive products. Simply mount the indicator on the outside of your package to being monitoring. When the indicators turn red, you know if your product may have been damaged as a result of mishandling. The ShockDot and ShockWatch® Label are both live indicators while the ShockWatch 2 is a field armable indicator.







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Key Specifications - ShockDot and ShockWatch Label

Indication Type	Visual, irreversible white to red color change
Activation Method	Live
Operating Temperature Range	-25°C to 60°C /-13°F to 140°F
Storage Conditions	20°C / 68°F, 1 ATM, 0 - 99% RH Non-Condensing
Impact Sensitivities	25G, 37G, 50G, 75G, 100G
Impact Duration	0.5 to 50 msec
Accuracy	+15% at 20°C / 68°F, 1 ATM
Responsiveness	Responds to single impact
Product Life	2 years from date of manufacture when stored at 20°C / 68°F, 1 ATM
Dimensions	3.8 in x 3.8 in (96.52 mm x 96.52 mm)

Key Specifications - ShockWatch 2

Indication Type	Visual, irreversible white to red color change
Activation Method	Armable
Operating Temperature Range	-25°C to 80°C /-13°F to 176°F
Storage Conditions	20°C / 68°F, 1 ATM, 0 - 99% RH Non-Condensing
Impact Sensitivities	5G, 10G, 15G, 25G, 37G, 50G, 75G
Impact Duration	0.5 to 50 msec
Accuracy	+15% at 20°C / 68°F, 1 ATM
Responsiveness	Responds to single impact
Product Life	2 years from date of manufacture when stored at 20°C / 68°F, 1 ATM
Dimensions	1.69 in x 1.69 in x 0.25 in (42.93 mm x 42.93 mm x 6.35 mm)

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Product Selection

SpotSee impact indicators should be used when monitoring products that are sensitive and must be handled with care. There are two things you need to know to select an impact indicator sensitivity: shipment size and weight. The selection guide should always be used as a starting point only. The indicator that will be best suited to your application will also consider product fragility and packaging.

ShockWatch Label	0 - 1 ft^3 0 - .03 m^3	1 - 5 ft^3 .03 - .14 m^3	5 - 15 ft^3 .14 - .42 m^3	15 - 50 ft^3 .42 - 1.42 m^3	50+ ft^3 1.42+ m^3
0-10 lbs 0-4.56 kg	L-30	L-30	L-35	L-35	L-47
10-25 lbs 4.56-11.34 kg	L-30	L-35	L-35	L-47	L-47
25-50 lbs 11.34-22.68 kg	L-35	L-35	L-47	L-47	L-55
50-100 lbs 22.68-45.36 kg	L-35	L-47	L-47	L-55	L-55
100-250lbs 45.36-113.40 kg	L-47	L-47	L-55	L-55	L-65
250-1,000 lbs 113.40-453.59 kg	L-47	L-47	L-55	L-65	L-65
1000+ lbs 453.59+ kg	-----	L-55	L-65	L-65	L-65

ShockDot	0 - 1 ft^3 0 - .03 m^3	1 - 5 ft^3 .03 - .14 m^3	5 - 15 ft^3 .14 - .42 m^3	15 - 50 ft^3 .42 - 1.42 m^3	50+ ft^3 1.42+ m^3
0-10 lbs 0-4.56 kg	L-30	L-30	L-35	L-35	L-47
10-25 lbs 4.56-11.34 kg	L-30	L-35	L-35	L-47	L-47
25-50 lbs 11.34-22.68 kg	L-35	L-35	L-47	L-47	L-55
50-100 lbs 22.68-45.36 kg	L-35	L-47	L-47	L-55	L-55
100-250lbs 45.36-113.40 kg	L-47	L-47	L-55	L-55	L-65
250-1,000 lbs 113.40-453.59 kg	L-47	L-47	L-55	L-65	L-65
1000+ lbs 453.59+ kg	-----	L-55	L-65	L-65	L-65

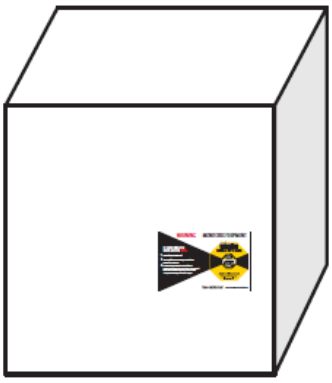
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ShockWatch 2	5 - 15 ft^3 .14 - .42 m^3	15 - 50 ft^3 .42 - 1.42 m^3	50 - 100 ft^3 1.42 - 2.83 m^3	100 - 250 ft^3 2.83 - 7.08 m^3	250 - 500 ft^3 7.08 - 14.16 m^3	500 - 1,000 ft^3 14.16 - 304.8 m^3	1,000+ ft^3 304.8+ m^3
0 - 10 lbs 0 - 5 kg	75G	75G	50G	37G	N/A	N/A	N/A
10 - 25 lbs 5 - 11 kg	75G	50G	50G	37G	25G	N/A	N/A
25 - 50 lbs 11 - 23 kg	50G	50G	37G	25G	25G	15G	N/A
50 - 100 lbs 23 - 45 kg	50G	37G	37G	25G	15G	15G	10G
100 - 250 lbs 45 - 113 kg	37G	37G	25G	25G	15G	15G	10G
250 - 1,000 lbs 113 - 454 kg	37G	25G	25G	15G	15G	10G	10G
1,000 - 2,000 lbs 454 - 907 kg	25G	25G	25G	15G	15G	10G	5G
2,000 - 5,000 lbs 907 - 2,268 kg	25G	25G	15G	15G	10G	10G	5G
5,000 - 10,000 lbs 2,268 - 4,536 kg	25G	15G	15G	15G	10G	10G	5G
10,000 - 15,000 lbs 4,536 - 6,804 kg	N/A	15G	15G	10G	10G	5G	5G
15,000 - 20,000 lbs 6,804 - 9,072 kg	N/A	N/A	10G	10G	5G	5G	5G
20,000 - 30,000 lbs 9,702 - 13,608 kg	N/A	N/A	N/A	5G	5G	5G	5G
30,000+ lbs 13,608+ kg	N/A	N/A	N/A	N/A	5G	5G	5G

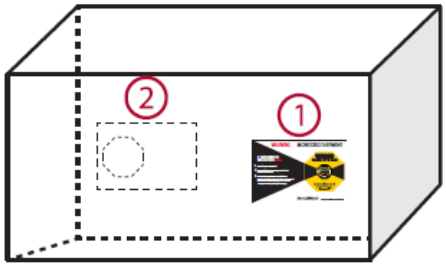
Mounting Best Practices

Mount Impact Indicators in the lower third of the package/pallet as close to the edge as possible. Avoid the center of the package because the mounting locations should be structurally sound.



If the package is twice as long as it is wide, use two impact indicators. Place a second indicator in the same position on the opposite side of the package.

While these instructions are considered best practices, each situation may be different. Contact SpotSee if you have any questions.

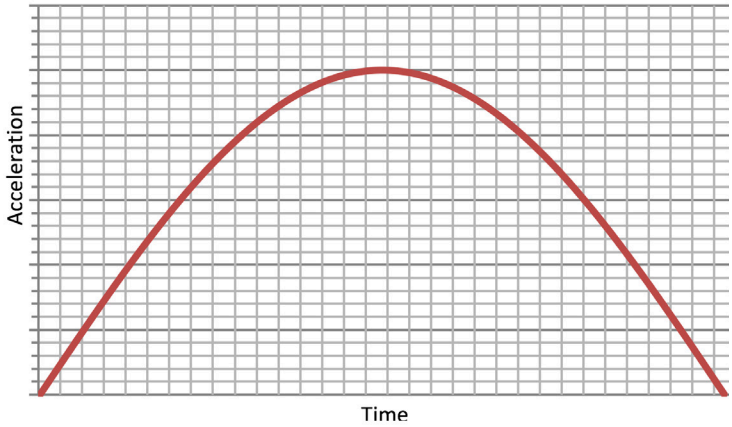


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Impact Indicator Activation Basics

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 impact indicator 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 (32.2ft/s2 or 9.8m/s2). 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 SpotSee impact indicator has a minimum G-threshold that must be exceeded before it will activate. The minimum G-level for each 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 SpotSee products, please contact SpotSee or your local distributor for assistance.

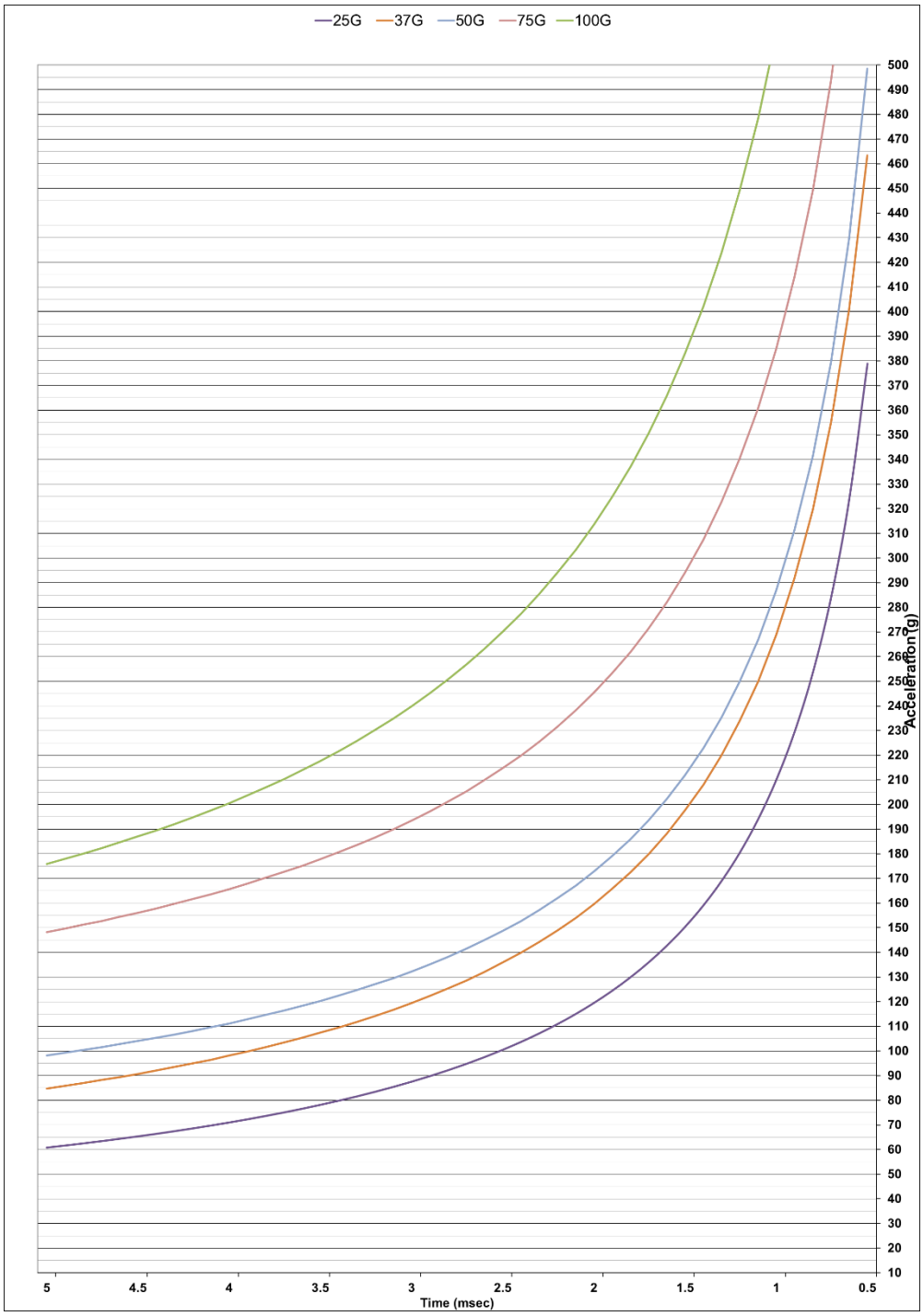
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ShockDot Response Curves

ShockDot G-Level vs. Duration (ms)
0.5 to 50 msec range

Activation Occurs +/- 15% of the Nominal Activation Value

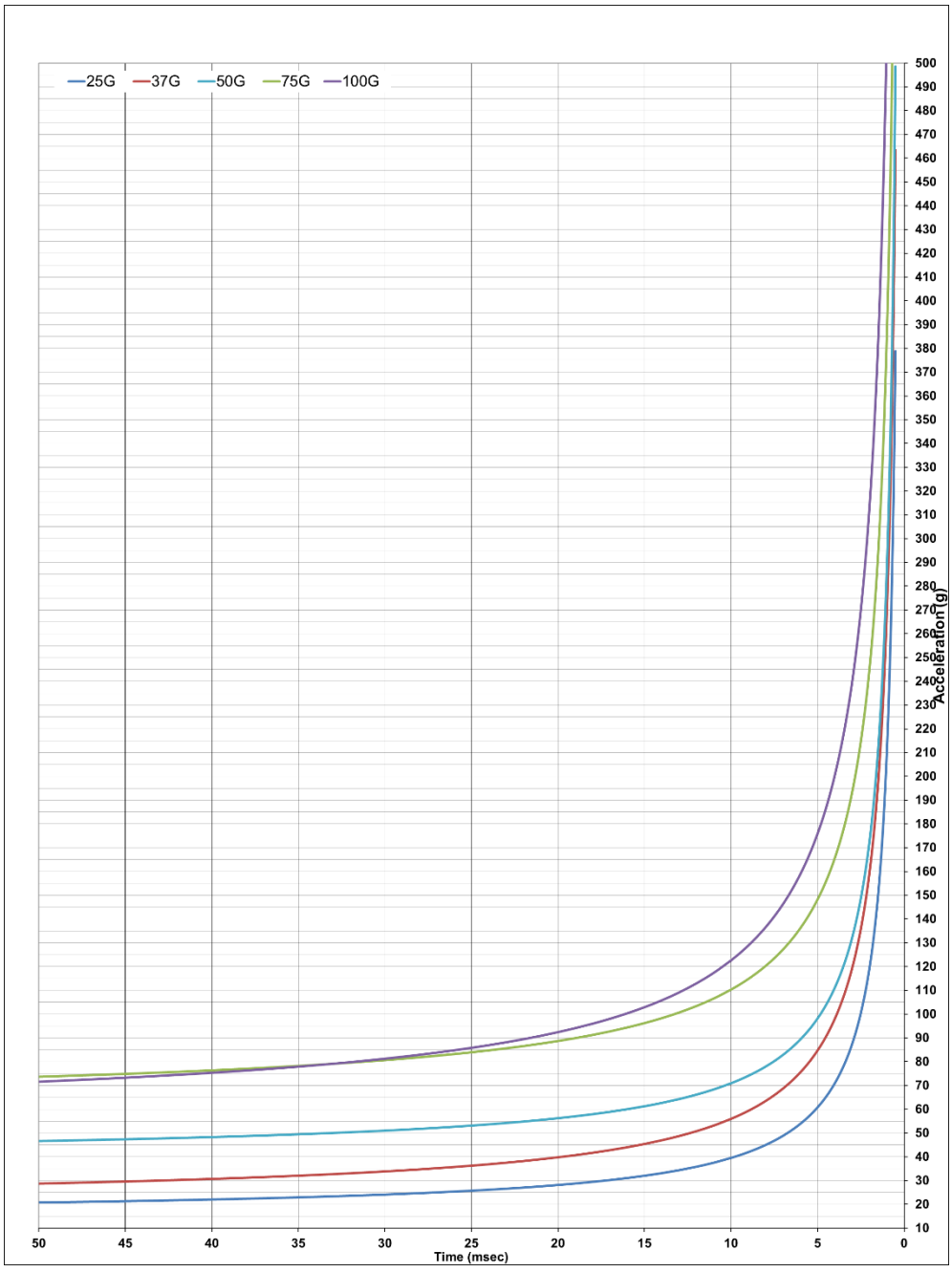


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ShockDot G-Level vs. Duration (ms)
0.5 to 5 msec range

Activation Occurs +/- 15% of the Nominal Activation Value



Note: The ShockDot is not affected by mounting orientation. The device is not responsive to impacts directly to the face of the product.

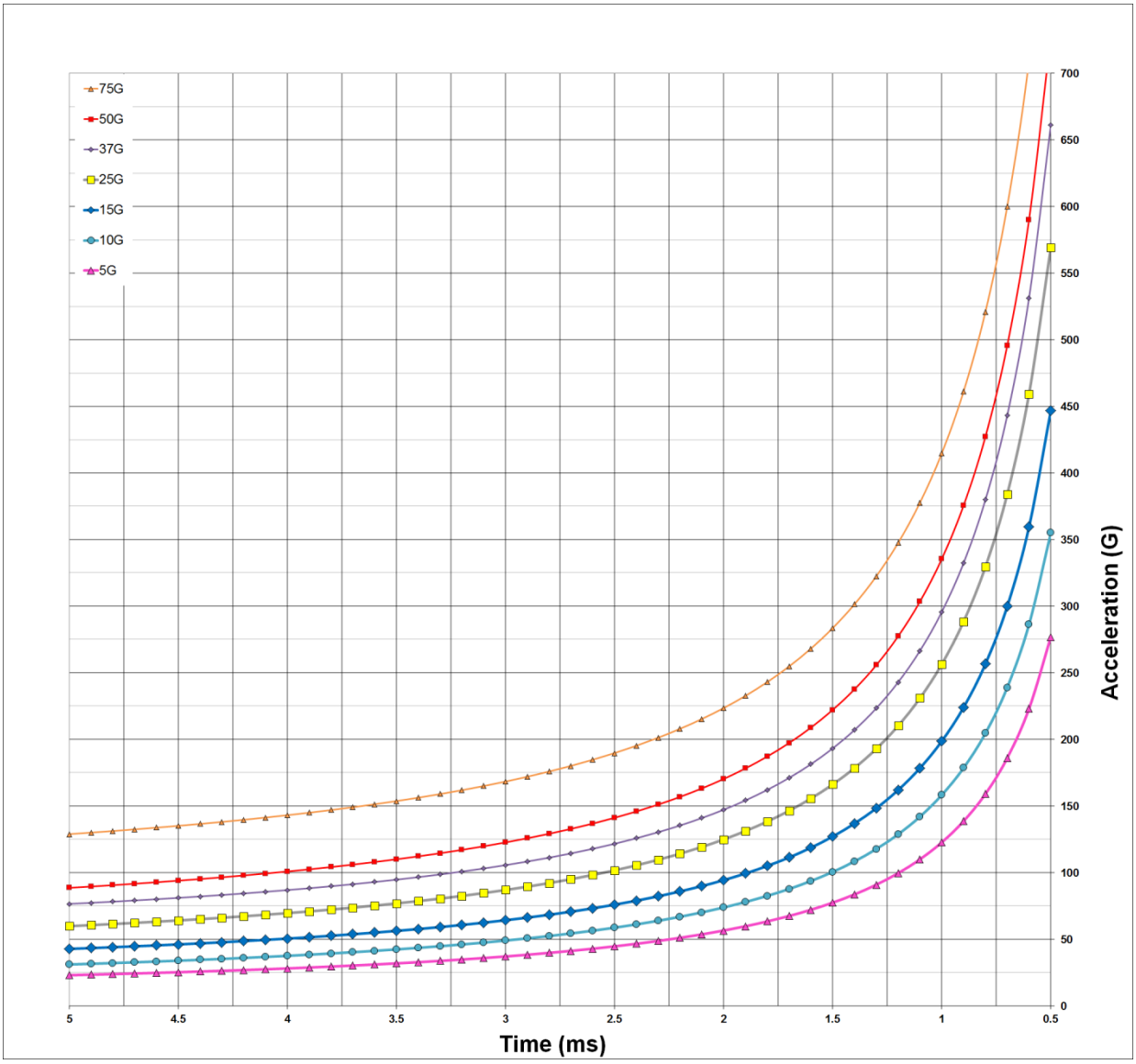
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ShockWatch 2 – Response Curves

ShockWatch 2 G-Level vs. Duration (ms)
0.5 to 5ms

Activation Occurs +/- 15% of the Nominal Activation Value

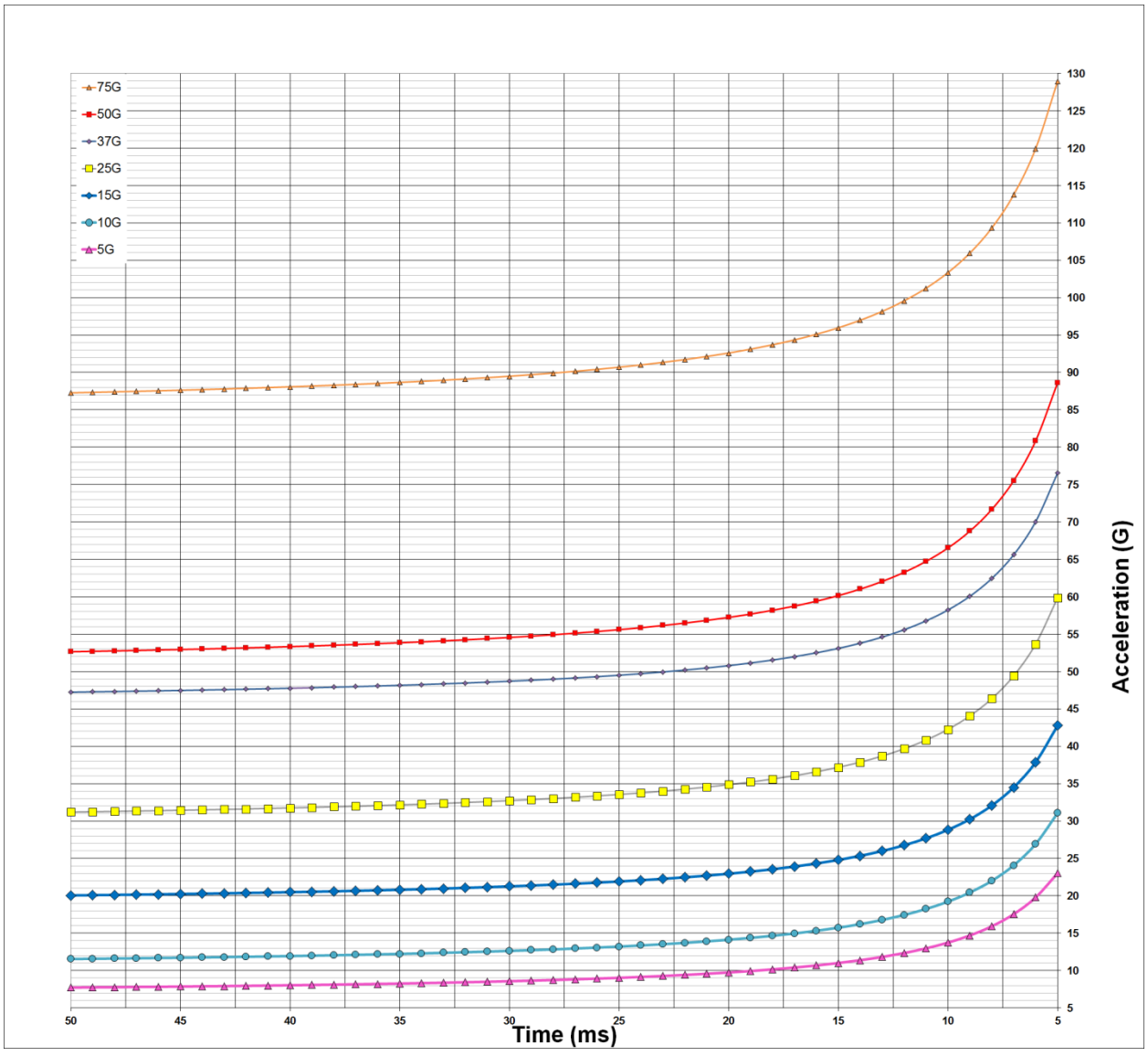


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ShockWatch 2 G-Level vs. Duration (ms)
0.5 to 50 msec range

Activation Occurs +/- 15% of the Nominal Activation Value



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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	$G=(116/t^{-1.22}) + 6.26$
ShockWatch 2 – 10G	$G=(145/t^{-1.25}) + 9.37$
ShockWatch 2 – 15G	$G=(190/t^{-1.25}) + 15.12$
ShockWatch 2 – 25G	$G=(245/t^{-1.25}) + 23$
ShockWatch 2 – 37G	$G=(250/t)-1.3 + 45.7$
ShockWatch 2 – 50G	$G=(285/t)-1.25 + 50.5$
ShockWatch 2 – 75G	$G=(330/t)-1.25 + 84.8$

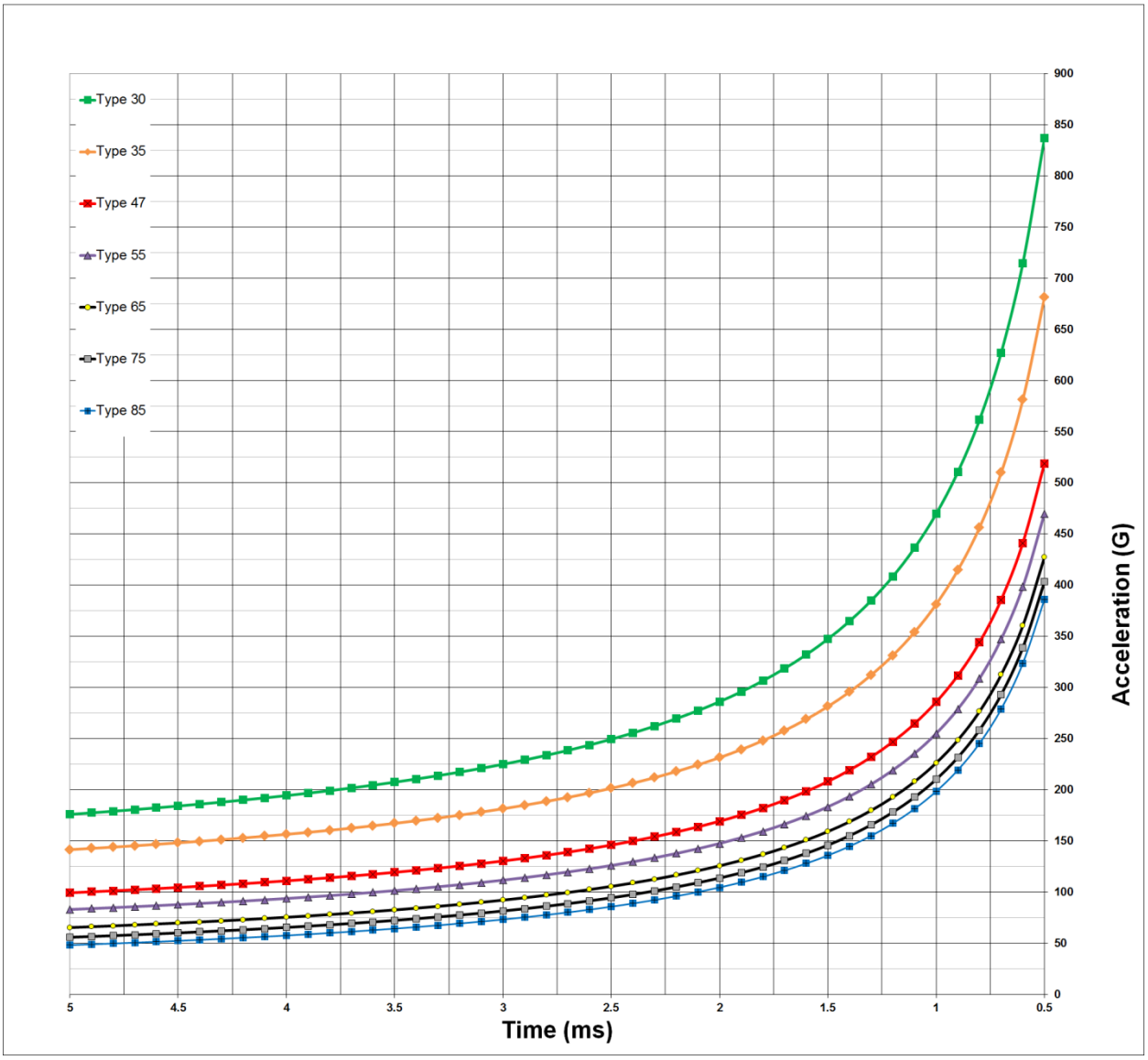
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ShockWatch Label Response Curves

Label/Clip/Tube G-Level vs. Duration (ms)
0.5 to 5ms

Activation Occurs +/- 15% of the Nominal Activation Value

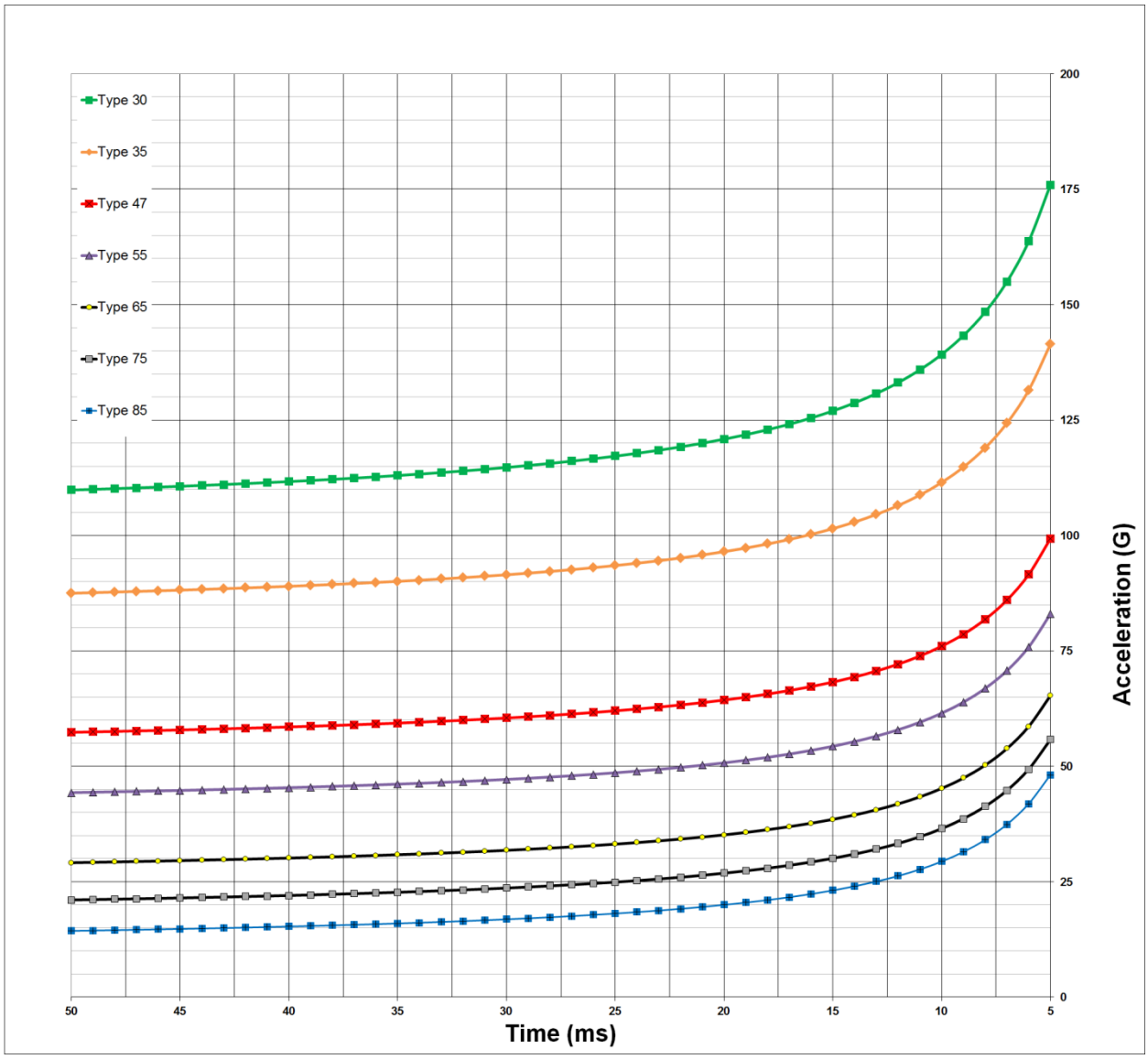


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Label/Clip/Tube G-Level vs. Duration (ms)
0.5 to 5 msec range

Activation Occurs +/- 15% of the Nominal Activation Value



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ShockWatch Label Response Equations

Activation curves for the ShockWatch Label, Clip, and Tube are based on the indicator receiving an impact at a 45° angle. The response curves generally follow the equations below.

Product	Equation
Type 30 Label/Clip/Tube	G=367.2/t + 102.5
Type 35 Label/Clip/Tube	G=299.8/t + 81.5
Type 47 Label/Clip/Tube	G=233.1/t + 52.7
Type 55 Label/Clip/Tube	G=215.0/t + 40
Type 65 Label/Clip/Tube	G=201.1/t + 25.1
Type 75 Label/Clip/Tube	G=193.0/t + 17.2
Type 80 Label/Clip/Tube	G=187.8/t + 10.6

The ShockWatch Label is most sensitive to impacts at a 45° angle; however, there is a slight deviation in the response of a ShockWatch Label to an impact at an angle of 90°. In most applications, this deviation is not relevant. However, there are some applications where precise impact values at specific angles are required.

The deviation in a ShockWatch indicator's response due to the change in angle generally follows this equation:
90° acceleration (G) value = 45° acceleration (G) value ÷ 0.7071

Accessories & Related Products

Companion labels, alert stickers, and alert tape can be incorporated into an overall program for reducing product mishandling. Contact your SpotSee Regional Manager or Local Distributor for more information.

Quality

SpotSee is an ISO 9001-2015 company, and as the global leader in supply chain damage prevention programs, SpotSee's testing and inspection equipment is calibrated by an ISO/IEC accredited organization, traceable to NIST standards.

Technical Support

If you are unsure of how to use or interpret the SpotSee Impact Indicators, please contact SpotSee Technical Support by visiting www.spotsee.io/contact-us for the latest contact information.