

## Wire Rope Isolators

## WR Series

## Overview

## Materials and Finishes:

**Standard:** Wire Rope: 302/304 Stainless Steel  
 Mount Bars: 6061-T6 Aluminum, Chemical Conversion Coated per MIL-C-5541, Class 1A (RoHS Compliant)  
 Hardware: Alloy Steel per ASTM F835, Zinc Plated (WR12–WR40 Series)  
 Thread: Stainless Self Clinching Insert (WR2–WR8 Series), Threaded bar (WR12–WR40 Series)

**Optional:** Wire Rope: Galvanized or Nylon Coated Stainless  
 Mount Bars: 6061-T6 Aluminum, Anodized per MIL-A-8625, Type II, Class 1 (RoHS Compliant)  
 302/304 Stainless Steel per ASTM A276, Passivated  
 Hardware: 302/304 Stainless Steel (when stainless steel bars are specified) (WR12 – WR40)  
 Threads: Stainless Steel Helical Inserts, Free Running or Self Locking (WR3 – WR40)  
 Threaded Aluminum (WR2 – WR8)

**Special:** Consult ITT Enidine

## Isolator Options:

**Mounting:** ITT Enidine offers a full range of mounting combinations of thru-hole, countersunk, and threaded bars. All configurations are available in either Imperial or Metric styles. Add an "M" after the mounting option for Metric. Some models have reduced mounting options available due to limited fastener installation space. Consult ITT Enidine if a preferred mounting configuration is not listed.

**Loops:** ITT Enidine's wire rope isolators can be purchased with the full number of loops, or as few as 2-Loops. The number of loops is indicated in the isolator part number. Performance is provided for full loop isolators. Performance for reduced loop isolators can be obtained by a simple ratio.

**Bellmouth:** ITT Enidine's wire rope isolators are available with a "bellmouth" option. The bellmouth feature includes mount bars with radii manufactured into the wire rope hole edges. This option is recommended for high fatigue applications. Add an "R" to the end of the part number.

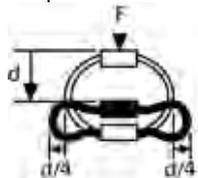
## Performance:

## Stiffness (Kv or Ks):

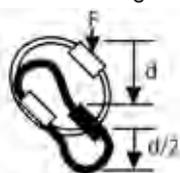
Wire rope isolators exhibit non-linear stiffness behavior. Small deflections, usually associated with vibration isolation, will have a different spring rate than larger shock deflections. ITT Enidine publishes typical vibration stiffness values (Kv), and average shock stiffness values (Ks) within the catalog. These values can be used with the provided equations listed on Page 108 to predict system performance. The stiffness values listed in the catalog are for full-loop versions. For reduced loop versions, ratio the stiffness by dividing the number of desired loops by the number of full loops.

## Isolator Axes:

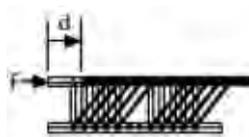
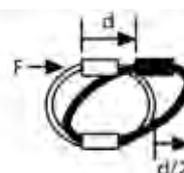
Wire rope isolators are multi-axis isolators. The diagram below includes load axis definitions and deflection considerations.



COMPRESSION



45° COMPRESSION/ROLL

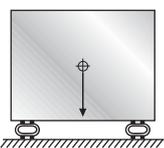
FIXED SHEAR  
(for Wire Rope Isolators)

FIXED ROLL

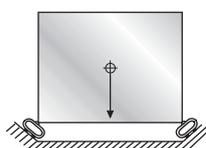
**Damping:** Typically 5-15%, depending on size and input level. For specific damping considerations, please consult ITT Enidine.

## Mounting Orientation:

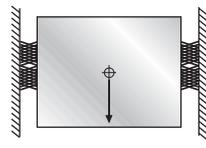
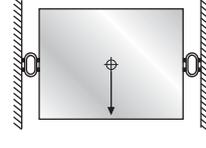
The diagrams below illustrate typical mounting orientations.



COMPRESSION



45° COMPRESSION/ROLL

FIXED SHEAR  
(for Wire Rope Isolators)

FIXED ROLL

## Stabilizers:

Stabilizers are used to control deflections of tall supported masses. Stabilizers are typically recommended when the height equals 2-times the width or depth dimension. In most applications, the quantity of stabilizers required are half as many as the base isolators, and selected one size softer than the base isolators.

APPLICATION WORKSHEET - INPUTS METRIC		METRIC
<b>PART I: SYSTEM DATA:</b>		
1. Total Supported Load ( W <sub>T</sub> ):	$W_T = \text{_____ Kg} \times 9,81 = \text{_____ N}$	
2. Number of Isolators (n):	$n = \text{_____}$	
3. Static Load per Isolator (W): <small>* Assumes a central CG</small>	$W = \frac{W_T}{n}$	$W = \text{_____ N}^*$
4. Load Axis: Compression Shear or Roll 45° Compression/Roll		Load Axis _____
<b>PART II: VIBRATION SIZING:</b>		
1. Input Excitation Frequency	$f_i = \text{_____ Hz} \left( = \frac{\text{rpm}}{60} \right)$	
2. System Response Natural Frequency for 80% isolation:	$f_n = \frac{f_i}{3,0} = \text{_____ Hz}$	
3. Maximum Isolator Vibration Stiffness: (K <sub>v</sub> )	$K_v = \frac{W (2\pi f_n)^2}{g}$ $g = 9,81 \text{ m/s}^2$	$K_v = \text{_____ N/m}$
4. Select an isolator by comparing calculated values with technical data for the desired load axis provided in tables for each isolator. a.) Calculated "W" must be less than the isolator's max static load and b.) Isolator's vibration stiffness must be less than the calculated maximum K <sub>v</sub>		
<b>PART III: SHOCK SIZING:</b>		
1. Maximum Allowable Transmitted Acceleration:	$A_T = \text{_____ G's}$	
2. Shock Input Velocity:	$V = \text{_____ m/s}$	
Free Fall Impact:	$V = \sqrt{2gh}$ $g = 9,81 \text{ m/s}^2$ $h = \text{Drop Height (m)}$	
3. Min. Isolator Response Deflection:	$D_{\min} = \frac{V^2}{g(A_T)}$	$D_{\min} = \text{_____ m}$
4. Maximum Isolator Shock Stiffness:	$K_s = \frac{W(V/D_{\min})^2}{g}$	$K_s = \text{_____ N/m}$
5. Select an isolator by comparing calculated values with technical data for the desired load axis provided in tables for each isolator. a.) Calculated "W" must be less than the isolator's max static load and b.) Calculated D <sub>min</sub> must be less than the isolator's max deflection Note: Metric deflections are calculated in meters (m) and technical data is in millimeters (mm). and c.) Isolator's shock stiffness must be less than calculated maximum "K <sub>s</sub> "		
6. Check actual deflection using "K <sub>s</sub> " from technical data to ensure that the isolator's max deflection is not exceeded.	$D_{\text{actual}} = \sqrt{\frac{V}{K_s(\text{Isolator})g}}$	$D_{\text{actual}} = \text{_____ m}$
7. If isolator's max deflection is exceeded, select another isolator and repeat steps 5 and 6.		

**Compact Wire Rope Isolators**

## CR Series

**Overview****Materials and Finishes:**

**Standard:** Wire Rope: 302/304 Stainless Steel  
Mount Bars: 6061-T6 Aluminum, Chemical Conversion Coated per MIL-C-5541, Class 1A (RoHS Compliant)  
Threads: Tapped

**Optional:** Mount Bars: 6061-T6 Aluminum, Anodized per MIL-A-8625, Type II, Class 1 (RoHS Compliant)  
302/304 Stainless Steel per ASTM A276, Passivated

**Special:** Consult ITT Enidine

**Isolator Options:**

**Mounting:** ITT Enidine offers a full range of mounting combinations of thru-hole, countersunk, and threaded bars. All configurations are available in either Imperial or Metric styles. Add an "M" after the mounting option for Metric. Some models have reduced mounting options available due to limited fastener installation space. Consult ITT Enidine if a preferred mounting configuration is not listed.

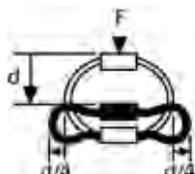
**Bellmouth:** The bellmouth feature includes mount bars with radii manufactured into the wire rope hole edges. This option is recommended for high fatigue applications. Compact rope models (CR1 – CR6) include this feature as the standard.

**Performance:****Stiffness (Kv or Ks):**

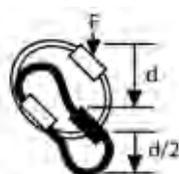
Compact wire rope isolators exhibit non-linear stiffness behavior. Small deflections, usually associated with vibration isolation, will have a different spring rate than larger shock deflections. ITT Enidine publishes typical vibration stiffness values (Kv), and average shock stiffness values (Ks) within the catalog. These values can be used with the provided equations listed on Page 140 to predict system performance.

**Isolator Axes:**

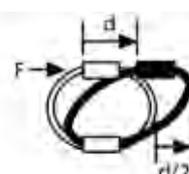
Compact wire rope isolators are multi-axis isolators. The diagram below includes load axis definitions and deflection considerations.



COMPRESSION



45° COMPRESSION/ROLL

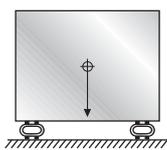


FIXED ROLL/SHEAR

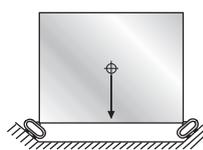
**Damping:** Typically 5-15%, depending on size and input level. For specific damping considerations, please consult ITT Enidine.

**Mounting Orientation:**

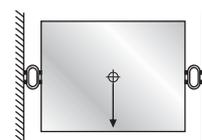
The diagrams below illustrate typical mounting orientations.



COMPRESSION



45° COMPRESSION/ROLL



FIXED ROLL/SHEAR

**Stabilizers:**

Stabilizers are used to control deflections of tall supported masses. Stabilizers are typically recommended when the height equals 2-times the width or depth dimension. In most applications, the quantity of stabilizers required are half as many as the base isolators, and selected one size softer than the base isolators.

**Compact Wire Rope Isolators**  
CR Series

CR

**Application Worksheet**

Compact Wire Rope Isolators

APPLICATION WORKSHEET - INPUTS METRIC		METRIC
<b>PART I: SYSTEM DATA:</b>		
1. Total Supported Load ( W <sub>T</sub> ):	$W_T = \text{_____ Kg} \times 9,81 = \text{_____ N}$	
2. Number of Isolators (n):	$n = \text{_____}$	
3. Static Load per Isolator (W): <small>* Assumes a central CG</small>	$W = \frac{W_T}{n}$	W = _____ N*
4. Load Axis: Compression Shear or Roll 45° Compression/Roll		Load Axis _____
<b>PART II: VIBRATION SIZING:</b>		
1. Input Excitation Frequency	$f_i = \text{_____ Hz} \left( = \frac{\text{rpm}}{60} \right)$	
2. System Response Natural Frequency for 80% isolation:	$f_n = \frac{f_i}{3,0} = \text{_____ Hz}$	
3. Maximum Isolator Vibration Stiffness: (K <sub>v</sub> )	$K_v = \frac{W (2\pi f_n)^2}{g}$ $g = 9,81 \text{ m/s}^2$	K <sub>v</sub> = _____ N/m
4. Select an isolator by comparing calculated values with technical data for the desired load axis provided in tables for each isolator. a.) Calculated "W" must be less than the isolator's max static load and b.) Isolator's vibration stiffness must be less than the calculated maximum K <sub>v</sub>		
<b>PART III: SHOCK SIZING:</b>		
1. Maximum Allowable Transmitted Acceleration:	$A_T = \text{_____ G's}$	
2. Shock Input Velocity:  Free Fall Impact:	$V = \text{_____ m/s}$ $V = \sqrt{2gh}$ $g = 9,81 \text{ m/s}^2$ $h = \text{Drop Height (m)}$	
3. Min. Isolator Response Deflection:	$D_{min} = \frac{V^2}{g(A_T)}$	D <sub>min</sub> = _____ m
4. Maximum Isolator Shock Stiffness:	$K_s = \frac{W(V/D_{min})^2}{g}$	K <sub>s</sub> = _____ N/m
5. Select an isolator by comparing calculated values with technical data for the desired load axis provided in tables for each isolator. a.) Calculated "W" must be less than the isolator's max static load and b.) Calculated D <sub>min</sub> must be less than the isolator's max deflection Note: Metric deflections are calculated in meters (m) and technical data is in millimeters (mm). and c.) Isolator's shock stiffness must be less than calculated maximum "K <sub>s</sub> "		
6. Check actual deflection using "K <sub>s</sub> " from technical data to ensure that the isolator's max deflection is not exceeded.	$D_{actual} = \sqrt{\frac{V}{K_s(\text{Isolator})g}}$	D <sub>actual</sub> = _____ m
7. If isolator's max deflection is exceeded, select another isolator and repeat steps 5 and 6.		