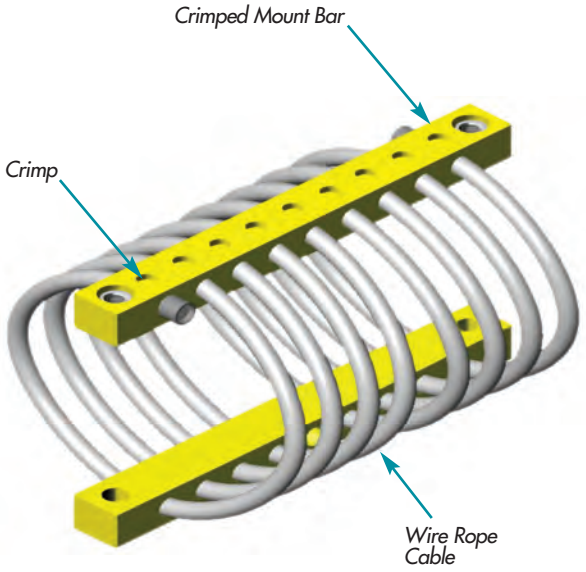
U.S. Patents 5,549,285

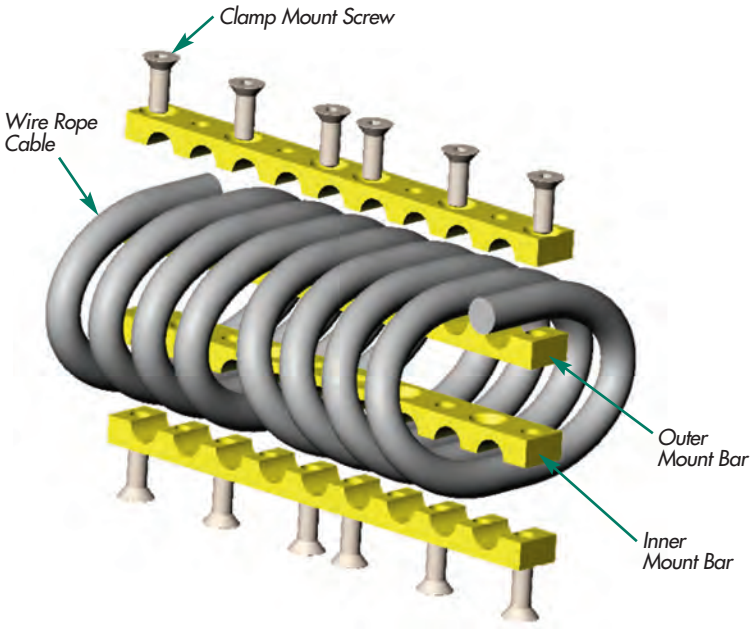
Wire Rope Isolators

Standard **Wire Rope Isolators** are comprised of stainless steel stranded cable threaded through aluminum alloy retaining bars that are mounted for effective shock and vibration isolation. With their corrosion resistant, all-metal construction, ITT Enidine Wire Rope Isolators are environmentally stable, high-performance shock and vibration isolators that are unaffected by temperature extremes, chemicals, oils, ozone and abrasives.

Featuring a patented crimping pattern, versatile mounting options and a variety of sizes, these helical isolator products can help ensure that your systems can effectively meet performance requirements in Commercial, Industrial, and Defense industries, including MIL-STD-810, MIL-STD-167, MIL-S-901D, MIL-E-5400, STANAG-042, BV43-44 and DEF-STND 0755. For more information, please refer to our "Wire Rope Isolator Overview and Application Worksheet" on pages 107-108 to assist you in selecting a model for your application.

Overview





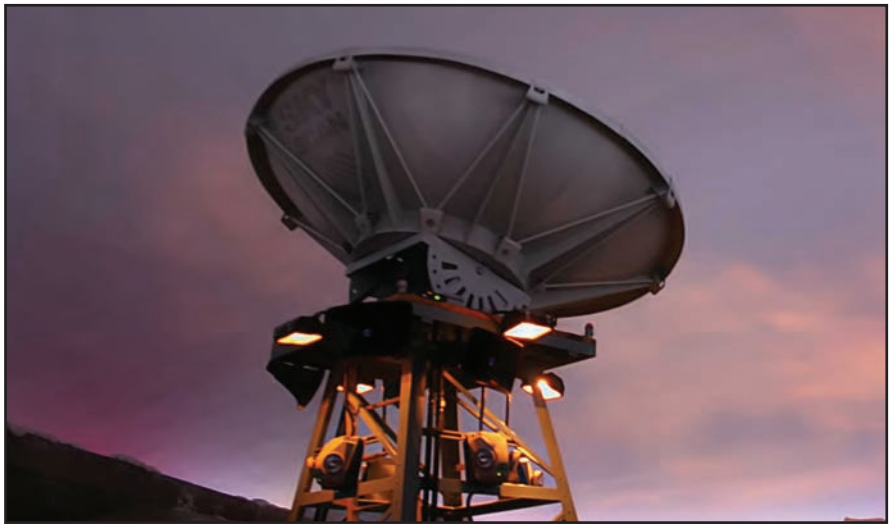
Crimp Models (WR2 – WR8):
ITT Enidine's patented crimp design lowers cost by using fewer mount bars when compared to the clamp design, no assembly hardware, and reduced assembly time.

Clamp Models (WR12 – WR40):
ITT Enidine's clamp bar models are constructed by clamping the wire rope between two fastened mount bars.

Typical Applications

Piping Systems

Cabinet Applications



Sensitive Electronics Isolation

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.

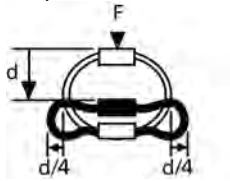
Bellmouth: ITT Enidine's wire rope isolators are available with a "bellmouth" option. The bellmouth feature includes mount bars with radii manufactured into the wire rope hole edges. This option is recommended for high fatigue applications. Add an "R" to the end of the part number.

Performance:

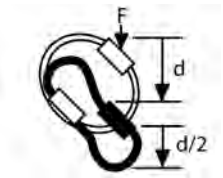
Stiffness (Kv or Ks):
Wire rope isolators exhibit non-linear stiffness behavior. Small deflections, usually associated with vibration isolation, will have a different spring rate than larger shock deflections. ITT Enidine publishes typical vibration stiffness values (Kv), and average shock stiffness 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:

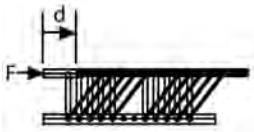
Wire rope isolators are multi-axis isolators. The diagram below includes load axis definitions and deflection considerations.



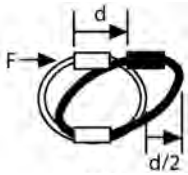
COMPRESSION



45° COMPRESSION/ROLL



FIXED SHEAR
(for Wire Rope Isolators)

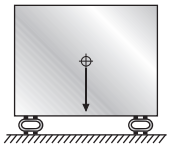


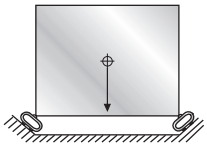
FIXED ROLL

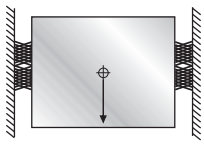
Damping: Typically 5-15%, depending on size and input level. For specific damping considerations, please consult ITT Enidine.

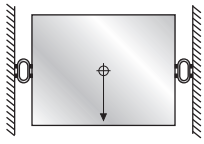
Mounting Orientation:

The diagrams below illustrate typical mounting orientations.


COMPRESSION


45° COMPRESSION/ROLL

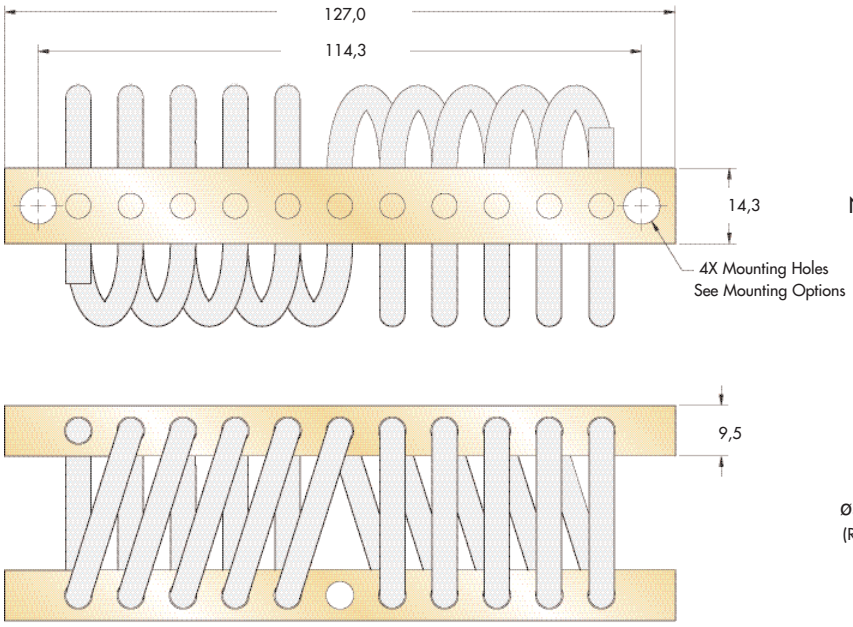

FIXED SHEAR
(for Wire Rope Isolators)


FIXED ROLL

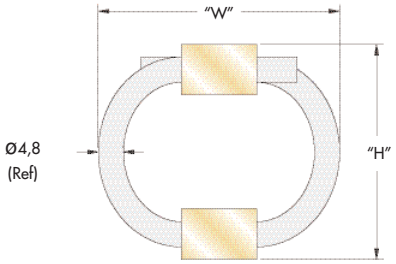
Stabilizers:
Stabilizers are used to control deflections of tall supported masses. Stabilizers are typically recommended when the height equals 2-times the width or depth dimension. In most applications, the quantity of stabilizers required are half as many as the base isolators, and selected one size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

APPLICATION WORKSHEET - INPUTS METRIC

		METRIC
PART I: SYSTEM DATA:		
1. Total Supported Load (W_T):	W_T = _____ Kg x 9,81 = _____ N	
2. Number of Isolators (n):	n = _____	
3. Static Load per Isolator (W):	$W = \frac{W_T}{n}$	W = _____ N*
* Assumes a central CG		
4. Load Axis: Compression Shear or Roll 45° Compression/Roll		Load Axis _____
PART II: VIBRATION SIZING:		
1. Input Excitation Frequency	f_i = _____ Hz $\left(= \frac{rpm}{60}\right)$	
2. System Response Natural Frequency for 80% isolation:	$f_n = \frac{f_i}{3,0}$ = _____Hz	
3. Maximum Isolator Vibration Stiffness: (K_V)	$K_v = \frac{W\,(2\pi\, f_n)^2}{g}$ $g = 9,81\ m/s^2$	K_v = _____ 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_v		
PART III: SHOCK SIZING:		
1. Maximum Allowable Transmitted Acceleration:	A_T = _____G's	
2. Shock Input Velocity:	V = _____ m/s	
Free Fall Impact:	$V = \sqrt{2gh}$ $g = 9,81\ m/s^2$ h = Drop Height (m)	
3. Min. Isolator Response Deflection:	$D_{min} = \frac{V^2}{g(A_T)}$	D_{min} = _____m
4. Maximum Isolator Shock Stiffness:	$K_s = \frac{W(V/D_{min})^2}{g}$	K_s = _____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_{min} 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_s"		
6. Check actual deflection using "K_s" from technical data to ensure that the isolator's max deflection is not exceeded.	$D_{actual} = \frac{V}{\sqrt{\frac{K_s(Isolator)g}{W}}}$	D_{actual} = _____m
7. If isolator's max deflection is exceeded, select another isolator and repeat steps 5 and 6.		



Note: Dimensions are in mm
Tolerances are ± 0,25mm



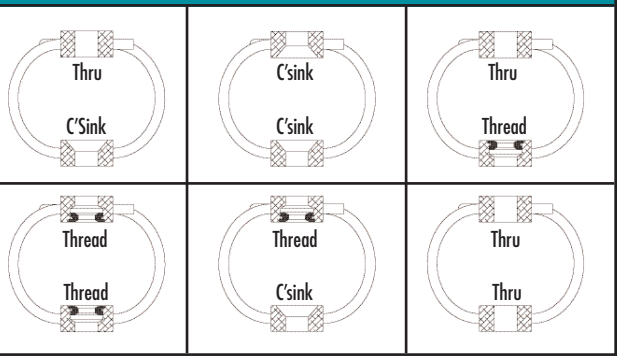
Size	Height "H" mm		Width Ref "W" mm	Unit Weight Kg	Mounting Options	Thru Hole mm	Thread mm	C'sink
WR6-200	30	± 1,52	36	0,19	D	Ø6,9 ± 0,13	M6 X 1,0	90°
WR6-300	33		38	0,20				
WR6-400	36		41	0,21	B, D, E			
WR6-500	38		43	0,21	A, B, C, D, E, S			
WR6-600	41		46	0,22				
WR6-700	43		48	0,25				
WR6-800	51		58	0,26				
WR6-850	54	± 3,30	75	0,27				
WR6-900	62		88	0,28				
WR6-950	81		107	0,29				

Model Number Ordering Code

WR6 - 400 - 10 D T M

Add "M" for Metric	For C'sink and Threaded Options
Threaded Hole Options:	[ ] - Flush Self Clinching Threaded Insert [T] - Tapped [H] - Helical Insert, Free Running [L] - Helical Insert, Self Locking
Mounting Options:	See Chart
Number of Loops:	10 (Reduced Number of Loops Available)
Isolator Size:	See Sizing Table

Mounting Options

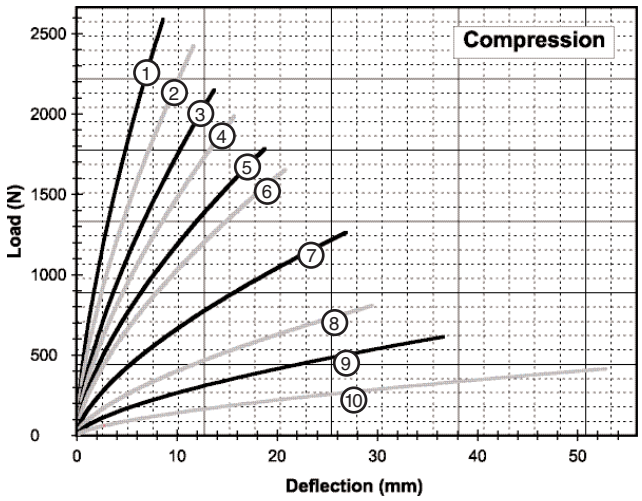


Wire Rope Special Options

Optional materials for the wire rope and mount bars are available upon request. Possibilities include galvanized rope, bell mouth mount bars or stainless steel rope and mount bars. Please contact ITT Enidine to discuss in more detail. Minimum purchase quantities may apply. See page 107.

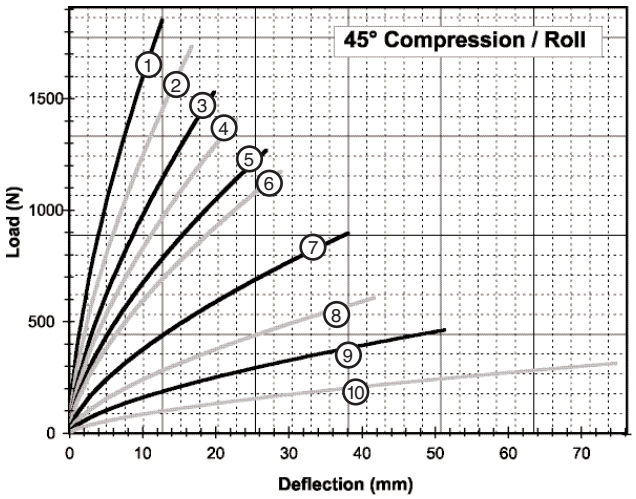
- Maximum recommended torque for standard threaded insert is 4,3 Nm
- Operating Temperature Range: -100°C to 260°C
- U.S. Patent 5,549,285

Static
Load vs. Deflection



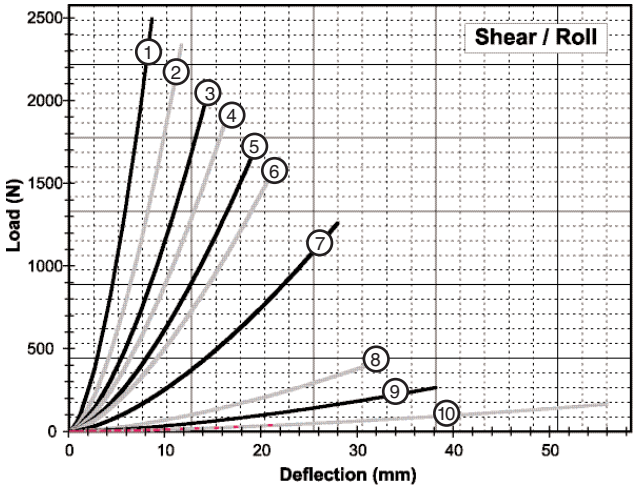
Compression

Curve	Model	Max Static Load N	Max Deflection mm	Kv (vibration) kN/m	Ks (shock) kN/m
1	WR6-200-10	734	8,6	578	363
2	WR6-300-10	712	11,7	455	252
3	WR6-400-10	601	13,7	347	189
4	WR6-500-10	578	15,7	301	152
5	WR6-600-10	512	18,8	244	117
6	WR6-700-10	489	20,8	212	96
7	WR6-800-10	365	26,9	136	58
8	WR6-850-10	236	29,5	82	33
9	WR6-900-10	178	36,6	54	21
10	WR6-950-10	120	52,8	29	10



45° Compression/Roll

Curve	Model	Max Static Load N	Max Deflection mm	Kv (vibration) kN/m	Ks (shock) kN/m
1	WR6-200-10	534	12,7	341	179
2	WR6-300-10	512	16,8	258	126
3	WR6-400-10	432	19,8	197	93
4	WR6-500-10	409	22,9	172	75
5	WR6-600-10	373	26,9	141	58
6	WR6-700-10	350	29,0	123	49
7	WR6-800-10	260	38,1	77	28
8	WR6-850-10	177	41,7	49	18
9	WR6-900-10	136	51,3	33	11
10	WR6-950-10	91	74,7	18	5,3



Shear/Roll

Curve	Model	Max Static Load N	Max Deflection mm	Kv (vibration) kN/m	Ks (shock) kN/m
1	WR6-200-10	356	8,6	224	224
2	WR6-300-10	356	11,7	156	156
3	WR6-400-10	334	14,7	112	112
4	WR6-500-10	311	16,8	93	93
5	WR6-600-10	289	19,8	70	70
6	WR6-700-10	267	21,8	60	60
7	WR6-800-10	200	27,9	35	35
8	WR6-850-10	58	31,0	11	11
9	WR6-900-10	40	38,1	5,3	5,3
10	WR6-950-10	22	55,9	2,3	2,3

Notes: Performance provided for full loop models with standard (302/304) stainless steel cable.
Consult ITT Enidine for other options. Do not extrapolate curves.