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Wherever motion takes place in dies, molds or machinery, some type of springs will be found.

At Lamina, we have long believed that Raymond Die Springs give the best value. Made from chrome silicon alloys, Raymond Die Springs have long cycle lives in most applications. They are readily available from stock and are reasonably priced.

Mechanical die springs have long been the first choice for pressure control applications involving metal stamping dies. Die springs are widely used in general tooling, such as jigs and fixtures as well as components in the automotive, appliance, canning, electronic, and farm implement industries. We also see them used in plastics injection molds.

Also, from Associated Spring Raymond is a wide selection of compression and extension springs. Quality and reliability are important features in any product manufactured and/or distributed by Lamina Components. We are proud to offer these utility springs which complement our line of pressure control devices.

Urethane springs may be used for stripping metal from punches, tooling in press brakes, as die springs and assorted other applications such as pressure pads and forming.

Lamina offers urethane in 90A and 95A durometers in standard tubes, rods, sheets and slabs. Special sizes and durometers are available.

Schnorr Disc Springs are also important to the Lamina Components line of pressure control devices. Where a high degree of accuracy and short travel are required, disc springs offer the most predictable deflection rates of all pressure control devices.

Anchor Lamina Mission

To be the 'customer focused' world class supplier of choice to the metal working and plastics industry.

We will help our customers to compete globally by providing innovative and value added products and services.

Please check our website
www.anchorlamina.com for the
 latest technical information.



SELECTING DIE SPRINGS

Springs for strippers, pressure pads and other die components can be selected from the ratings (pounds per 1/10" deflection and at maximum deflection) given in the charts on pages 4 to 19.

The first decision to be made is the type of duty the springs will be called on to perform: Short run, normal, long run, high speed, or extra stress and use the appropriate chart (pages 4 to 19).

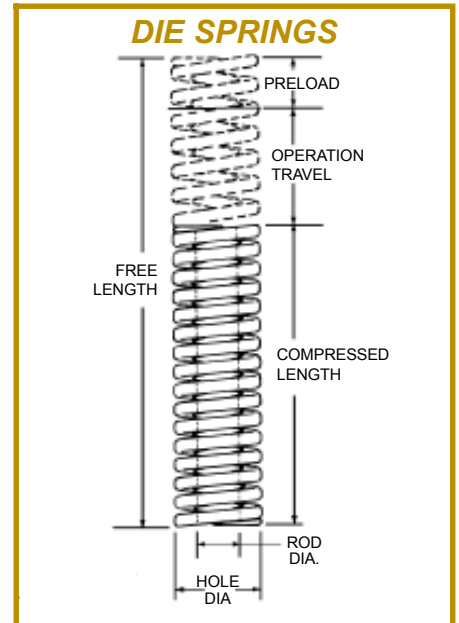
Another approach to spring selection is to work back from the amount of operating travel the springs will be subjected to as indicated on the die layout. Select springs in the correct duty range which will operate efficiently at the indicated travel. Calculate the number of springs needed by working with the pressure pounds for a single spring indicated on the chart.

A general rule to observe in spring selection is to always use as many springs as the die will accommodate that will produce the required load with the least amount of deflection. This will increase the useful life of the spring, reduce the chances of spring failure and the resulting downtime, loss of production and increased maintenance cost.

The more rapidly a spring works, the more attention must be paid to its fatigue limits. In slow moving dies or fixtures, it is possible to get good performance with springs operating near maximum deflection. As the working speed increases, the life expectancy of the spring at that deflection decreases.

Die spring costs are very small part of the total cost of the die. An effort to save a few cents on die springs is a misguided act that can cost many dollars in lost time and labor.

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CORRECT DIE SPRING USAGE

DO... perform preventive maintenance on die on a regularly scheduled basis. Records should be kept on the number of cycles performed by the die. Die Springs should be replaced at predetermined intervals to prevent expensive downtime.

DO... provide proper guidance on all springs to reduce buckling. All springs are designed to work within standard hole sizes and over standard rod sizes. Care should always be exercised in mounting springs.

DO... preload each spring in the assembled tool to prevent the possibility of shock loading which causes a stress surge

in the vibration frequency and results in spring failure.

DO... provide spring safeguards from adverse external elements such as heat, corrosive atmosphere, metal chips and other obstructions.

DO... deepen the spring pockets proportionately when the die is sharpened in order to maintain the same spring travel and load level.

DO... consult your Lamina Die Spring distributor or directly with Lamina Customer Service on Die Spring problems you may encounter.

INCORRECT DIE SPRING USAGE

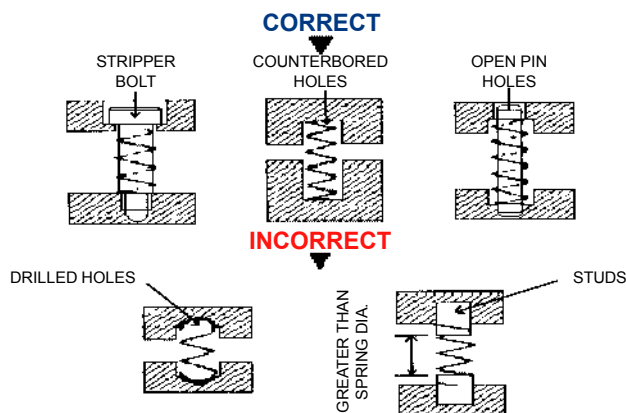
DON'T... wait until the die is built to determine which springs and how many are needed for the job. Make spring selection a part of the design function and work within the spring's practical limits.

DON'T... expect the maximum performance life from a spring that is producing the maximum load.

DON'T... replace only one spring in a die. Replace all of the springs to redistribute the loads evenly over each spring instead of over an unbalanced assembly of some new and some old springs. The small extra investment will pay handsome dividends.

DON'T... mix springs of assorted lengths or springs with different deflection ranges on the same die section.

DON'T... alter a die spring by cutting off coils or grinding the inside or outside diameters. These practices cause early spring failure and potential die damage.

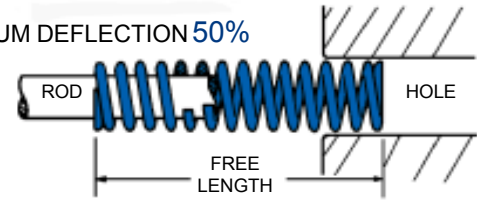


MEDIUM-DUTY DIE SPRINGS - INCH



IN STOCK

MAXIMUM DEFLECTION 50%



INCHES X 25.4 = MM
LBS. X .454 = KG

MEDIUM DUTY DIE SPRINGS • INCH												BLUE		
Hole Dia.	Rod Dia.	Free Length		PART NUMBER	Pounds at 1/10" Deflection	Deflection for Long Life 25% of Free Length		Deflection for Average Life 40% of Free Length		*Maximum Deflection 50% of Free Length		No. Per Box		
		Inch	mm			Pressure Pounds	Length of Deflection	Pressure Pounds	Length of Deflection	Pressure Pounds	Length of Deflection			
3/8 10mm Wire .039 x .070	3/16 4.5mm	1.00	25	M-100	6.00	15.00	0.25	24.00	0.40	30.00	0.50	200		
		1.25	32	M-100A	5.40	16.90	0.31	27.00	0.50	33.80	0.63	200		
		1.50	38	M-101	4.00	15.00	0.38	24.00	0.60	30.00	0.75	100		
		1.75	44	M-101A	3.40	14.90	0.44	23.80	0.70	29.80	0.88	100		
		2.00	51	M-102	2.80	14.00	0.50	22.40	0.80	28.00	1.00	100		
		2.50	64	M-103	2.40	15.00	0.63	24.00	1.00	30.00	1.25	100		
		3.00	76	M-104	2.10	15.80	0.75	25.20	1.20	31.50	1.50	100		
		12.00	305	M-105	0.60	18.00	3.00	28.80	4.80	36.00	6.00	50		
		1/2 13mm Wire .052 x .093	9/32 7mm	1.00	25	M-110	11.00	27.50	0.25	44.00	0.40	55.00	0.50	100
				1.25	32	M-110A	8.20	25.60	0.31	41.00	0.50	51.30	0.63	100
1.50	38			M-111	6.80	25.50	0.38	40.80	0.60	51.00	0.75	100		
1.75	44			M-111A	6.00	26.30	0.44	42.00	0.70	52.50	0.88	100		
2.00	51			M-112	5.50	27.50	0.50	44.00	0.80	55.00	1.00	100		
2.50	64			M-113	4.50	28.10	0.63	45.00	1.00	56.30	1.25	50		
3.00	76			M-114	3.50	26.30	0.75	42.00	1.20	52.50	1.50	50		
3.50	89			M-115	3.00	26.30	0.88	42.00	1.40	52.50	1.75	50		
4.50	114			M-115A	2.50	28.10	1.13	45.00	1.80	56.30	2.25	50		
5.50	140			M-115B	2.10	28.90	1.38	46.20	2.20	57.80	2.75	50		
6.50	165			M-115C	1.40	22.80	1.63	36.40	2.60	45.50	3.25	50		
12.00	305			M-115D	1.20	22.50	1.88	36.00	3.00	45.00	3.75	50		
5/8 16mm Wire .069 x .109	11/32 8.5mm	1.00	25	M-120	16.40	41.00	0.25	65.60	0.40	82.00	0.50	50		
		1.25	32	M-120A	12.80	40.00	0.31	64.00	0.50	80.00	0.63	50		
		1.50	38	M-121	10.80	40.50	0.38	64.80	0.60	81.00	0.75	50		
		1.75	44	M-121A	9.60	42.00	0.44	67.20	0.70	84.00	0.88	50		
		2.00	51	M-122	8.80	44.00	0.50	70.40	0.80	88.00	1.00	50		
		2.50	64	M-123	6.00	37.50	0.63	60.00	1.00	75.00	1.25	50		
		3.00	76	M-124	5.60	42.00	0.75	67.20	1.20	84.00	1.50	50		
		3.50	89	M-125	4.80	42.00	0.88	67.20	1.40	84.00	1.75	50		
		4.00	102	M-126	4.40	44.00	1.00	70.40	1.60	88.00	2.00	50		
		12.00	305	M-127	1.60	48.00	3.00	76.80	4.80	96.00	6.00	50		
3/4 19mm Wire .075 x .165	3/8 9.5mm	1.00	25	M-1	31.20	78.00	0.25	124.80	0.40	156.00	0.50	50		
		1.25	32	M-1A	25.60	80.00	0.31	128.00	0.50	160.00	0.63	50		
		1.50	38	M-2	20.00	75.00	0.38	120.00	0.60	150.00	0.75	50		
		1.75	44	M-2A	17.60	77.00	0.44	123.20	0.70	154.00	0.88	50		
		2.00	51	M-3	14.40	72.00	0.50	115.20	0.80	144.00	1.00	50		
		2.50	64	M-4	12.00	75.00	0.63	120.00	1.00	150.00	1.25	50		
		3.00	76	M-5	9.60	72.00	0.75	115.20	1.20	144.00	1.50	50		
		3.50	89	M-6	8.00	70.00	0.88	112.00	1.40	140.00	1.75	50		
		4.00	102	M-7	7.20	72.00	1.00	115.20	1.60	144.00	2.00	50		
		4.50	114	M-8	6.40	72.00	1.13	115.20	1.80	144.00	2.25	50		
		5.00	127	M-9	6.00	75.00	1.25	120.00	2.00	150.00	2.50	50		
		5.50	140	M-10	5.50	75.60	1.38	121.00	2.20	151.30	2.75	50		
		6.00	152	M-11	5.00	75.00	1.50	120.00	2.40	150.00	3.00	50		
		6.50	165	M-11B	4.50	73.10	1.63	117.00	2.60	146.30	3.25	50		
		7.50	191	M-11C	3.80	71.30	1.88	114.00	3.00	142.50	3.75	50		
12.00	305	M-11A	2.40	72.00	3.00	115.20	4.80	144.00	6.00	50				

*Deflection values shown represent compressed lengths near solid and are for design information only. The color blue is a registered trademark of Barnes Group Inc.

See page 3 for Die Springs "Do's and Don'ts".

MEDIUM DUTY DIE SPRINGS • INCH												BLUE
Hole Dia.	Rod Dia.	Free Length		PART NUMBER	Pounds at 1/10" Deflection	Deflection for Long Life 25% of Free Length		Deflection for Average Life 40% of Free Length		*Maximum Deflection 50% of Free Length		No. Per Box
		Inch	mm			Pressure Pounds	Length of Deflection	Pressure Pounds	Length of Deflection	Pressure Pounds	Length of Deflection	
1 26mm Wire .100 x .215	1/2 12.5mm	1.00	25	M-12	55.00	137.50	0.25	220.00	0.40	275.00	0.50	50
		1.25	32	M-12A	45.00	140.60	0.31	225.00	0.50	281.30	0.63	50
		1.50	38	M-13	35.00	131.30	0.38	210.00	0.60	262.50	0.75	50
		1.75	44	M-13A	30.00	131.30	0.44	210.00	0.70	262.50	0.88	50
		2.00	51	M-14	26.00	130.00	0.50	208.00	0.80	260.00	1.00	50
		2.50	64	M-15	20.00	125.00	0.63	200.00	1.00	250.00	1.25	50
		3.00	76	M-16	16.50	123.80	0.75	198.00	1.20	247.50	1.50	25
		3.50	89	M-17	15.00	131.80	0.88	210.00	1.40	262.50	1.75	25
		4.00	102	M-18	12.00	120.00	1.00	192.00	1.60	240.00	2.00	25
		4.50	114	M-19	10.40	117.00	1.13	187.60	1.80	234.00	2.25	25
		5.00	127	M-20	9.60	120.00	1.25	192.00	2.00	240.00	2.50	25
		5.50	140	M-21	8.80	121.00	1.38	193.60	2.20	242.00	2.75	25
		6.00	152	M-22	8.00	120.00	1.50	192.00	2.40	240.00	3.00	25
		7.00	178	M-23	7.20	126.00	1.75	201.60	2.80	252.00	3.50	25
8.00	203	M-24	6.00	120.00	2.00	192.00	3.20	240.00	4.00	25		
12.00	305	M-24A	4.00	120.00	3.00	192.00	4.80	240.00	6.00	25		
1-1/4 32mm Wire .155 x .285	5/8 15.5mm	1.50	38	M-36	49.60	186.00	0.38	297.60	0.60	372.00	0.75	50
		1.75	44	M-36A	42.40	185.50	0.44	296.80	0.70	371.00	0.88	50
		2.00	51	M-37	35.20	176.00	0.50	281.60	0.80	352.00	1.00	25
		2.50	64	M-38	28.80	180.00	0.63	288.00	1.00	360.00	1.25	25
		3.00	76	M-39	24.00	180.00	0.75	288.00	1.20	360.00	1.50	25
		3.50	89	M-40	20.00	175.00	0.88	280.00	1.40	350.00	1.75	25
		4.00	102	M-41	17.60	176.00	1.00	281.60	1.60	352.00	2.00	25
		4.50	114	M-42	16.00	180.00	1.13	288.00	1.80	360.00	2.25	25
		5.00	127	M-43	13.60	170.00	1.25	272.00	2.00	340.00	2.50	25
		5.50	140	M-44	12.80	176.00	1.38	281.60	2.20	352.00	2.75	25
		6.00	152	M-45	12.00	180.00	1.50	288.00	2.40	360.00	3.00	25
		7.00	178	M-46	10.40	182.00	1.75	291.20	2.80	364.00	3.50	25
		8.00	203	M-47	8.80	176.00	2.00	281.60	3.20	352.00	4.00	25
		10.00	254	M-48	7.20	180.00	2.50	288.00	4.00	360.00	5.00	25
12.00	305	M-48A	6.00	180.00	3.00	288.00	4.80	360.00	6.00	25		
1-1/2 38mm Wire .135 x .345	3/4 19mm	2.00	51	M-49	53.00	265.00	0.50	424.00	0.80	530.00	1.00	25
		2.50	64	M-50	45.00	281.30	0.63	450.00	1.00	562.50	1.25	25
		3.00	76	M-51	36.00	270.00	0.75	432.00	1.20	540.00	1.50	25
		3.50	89	M-52	30.00	262.50	0.88	420.00	1.40	525.00	1.75	25
		4.00	102	M-53	27.00	270.00	1.00	432.00	1.60	540.00	2.00	25
		4.50	114	M-54	23.00	258.80	1.13	414.00	1.80	517.50	2.25	25
		5.00	127	M-55	21.00	262.50	1.25	420.00	2.00	525.00	2.50	25
		5.50	140	M-55A	18.50	254.40	1.38	407.00	2.20	508.80	2.75	25
		6.00	152	M-56	17.00	255.00	1.50	408.00	2.40	510.00	3.00	25
		7.00	178	M-56A	14.50	253.80	1.75	406.00	2.80	507.00	3.50	25
		8.00	203	M-57	12.80	256.00	2.00	409.60	3.20	512.00	4.00	25
		10.00	254	M-58	10.00	250.00	2.50	400.00	4.00	500.00	5.00	25
		12.00	305	M-58A	8.00	240.00	3.00	384.00	4.80	480.00	6.00	25
		2 51mm Wire .195 x .468	1 25mm	2.50	64	M-70	100.00	625.00	0.63	1000.00	1.00	1250.00
3.00	76			M-71	83.00	622.50	0.75	996.00	1.20	1245.00	1.50	25
3.50	89			M-72	64.80	567.00	0.88	907.20	1.40	1134.00	1.75	25
4.00	102			M-73	60.00	600.00	1.00	960.00	1.60	1200.00	2.00	25
4.50	114			M-74	53.00	596.30	1.13	954.00	1.80	1192.00	2.25	25
5.00	127			M-75	47.00	587.50	1.25	940.00	2.00	1175.00	2.50	25
5.50	140			M-76	39.20	539.00	1.38	862.40	2.20	1178.00	2.75	25
6.00	152			M-77	39.00	585.00	1.50	936.00	2.40	1170.00	3.00	25
7.00	178			M-79	31.20	546.00	1.75	873.60	2.80	1092.00	3.50	25
8.00	203			M-80	28.50	570.00	2.00	912.00	3.20	1140.00	4.00	10
10.00	254			M-82	20.80	520.00	2.50	832.00	4.00	1040.00	5.00	10
12.00	305			M-83	17.50	525.00	3.00	840.00	4.80	1050.00	6.00	10

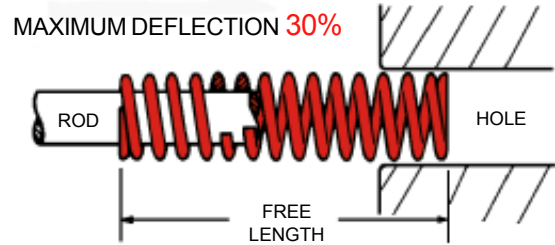
*Deflection values shown represent compressed lengths near solid and are for design information only. The color blue is a registered trademark of Barnes Group Inc.

Let us quote your specials!

MEDIUM-HEAVY DUTY DIE SPRINGS - INCH



IN STOCK



INCHES X 25.4 = MM
LBS. X .454 = KG

MEDIUM HEAVY-DUTY DIE SPRINGS • INCH												RED
Hole Dia.	Rod Dia.	Free Length		Part Number	Pounds at 1/10" Deflection	Deflection for Optimum Life 20% of Free Length		Deflection for Long Life 25% of Free Length		*Maximum Deflection 30% of Free Length		No. per Box
		Inch	mm			Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	
3/8 10mm WIRE .046 x .067	3/16 4.5mm	1.00	25	MHC-100	9.00	18.00	0.20	22.50	0.25	33.30	0.37	200
		1.25	32	MHC-100A	7.30	18.30	0.25	22.80	0.31	33.80	0.46	100
		1.50	38	MHC-101	6.70	20.10	0.30	25.10	0.38	37.20	0.56	100
		1.75	44	MHC-101A	5.80	20.30	0.35	25.40	0.44	37.60	0.65	100
		2.00	51	MHC-102	5.00	20.00	0.40	25.00	0.50	37.00	0.74	100
		2.50	64	MHC-103	4.20	21.00	0.50	26.30	0.63	38.90	0.93	100
		3.00	76	MHC-104	3.00	18.00	0.60	22.50	0.75	33.30	1.11	100
12.00	305	MHC-106	0.90	21.60	2.40	27.00	3.00	40.00	4.44	100		
1/2 13mm WIRE .061 x .156	9/32 7mm	1.00	25	MHC-110	16.80	33.60	0.20	42.00	0.25	62.20	0.37	100
		1.25	32	MHC-110A	13.00	32.50	0.25	40.60	0.31	60.10	0.46	100
		1.50	38	MHC-111	9.50	28.50	0.30	35.60	0.38	52.70	0.56	100
		1.75	44	MHC-111A	8.50	29.80	0.35	37.20	0.44	55.00	0.65	100
		2.00	51	MHC-112	7.50	30.00	0.40	37.50	0.50	55.50	0.74	50
		2.50	64	MHC-113	6.00	30.00	0.50	37.50	0.63	55.50	0.93	50
		3.00	76	MHC-114	5.70	34.20	0.60	42.80	0.75	63.30	1.11	50
3.50	89	MHC-115	4.00	28.00	0.70	35.00	0.88	51.80	1.30	50		
12.00	305	MHC-117	1.20	28.80	2.40	36.00	3.00	53.30	4.44	50		
5/8 16mm WIRE .081 x .117	11/32 8.5mm	1.00	25	MHC-120	30.00	60.00	0.20	75.00	0.25	111.00	0.37	100
		1.25	32	MHC-120A	21.50	53.80	0.25	67.20	0.31	99.40	0.46	50
		1.50	38	MHC-121	19.00	57.00	0.30	71.30	0.38	105.50	0.56	50
		1.75	44	MHC-121A	16.80	58.80	0.35	73.50	0.44	108.80	0.65	50
		2.00	51	MHC-122	14.80	59.20	0.40	74.00	0.50	109.50	0.74	50
		2.50	64	MHC-123	11.50	57.50	0.50	71.90	0.63	106.40	0.93	50
		3.00	76	MHC-124	10.00	60.00	0.60	75.00	0.75	111.00	1.11	50
3.50	89	MHC-125	8.50	59.50	0.70	74.40	0.88	110.10	1.30	50		
4.00	102	MHC-126	7.60	60.80	0.80	76.00	1.00	112.50	1.48	50		
12.00	305	MHC-127	2.70	64.80	2.40	81.00	3.00	119.90	4.44	50		
3/4 19mm WIRE .093 x .156	3/8 9.5mm	1.00	25	MHC-1	50.00	100.00	0.20	125.00	0.25	185.00	0.37	50
		1.25	32	MHC-1A	38.00	95.00	0.25	118.80	0.31	175.80	0.46	50
		1.50	38	MHC-2	32.00	96.00	0.30	120.00	0.38	177.60	0.56	50
		1.75	44	MHC-2A	28.00	100.80	0.35	126.00	0.44	186.50	0.65	50
		2.00	51	MHC-3	24.80	99.20	0.40	124.00	0.50	183.50	0.74	50
		2.50	64	MHC-4	19.20	96.00	0.50	120.00	0.63	177.60	0.93	50
		3.00	76	MHC-5	14.40	86.40	0.60	108.00	0.75	159.00	1.11	50
		3.50	89	MHC-6	12.80	89.60	0.70	112.00	0.88	165.80	1.30	50
		4.00	102	MHC-7	12.00	96.00	0.80	120.00	1.00	177.60	1.48	50
		4.50	114	MHC-8	11.20	100.80	0.90	126.00	1.13	186.50	1.67	50
		5.00	127	MHC-9	9.00	90.00	1.00	112.50	1.25	166.50	1.85	50
5.50	140	MHC-10	8.00	88.00	1.10	110.00	1.38	162.80	2.04	50		
6.00	152	MHC-11	7.50	90.00	1.20	112.50	1.50	166.50	2.22	50		
12.00	305	MHC-11A	3.60	86.40	2.40	108.00	3.00	159.80	4.44	50		

*Deflection values shown represent compressed lengths near solid and are for design information only. The color red is a registered trademark of Barnes Group Inc.

See page 3 for Die Springs
"Do's and "Don'ts".

MEDIUM HEAVY-DUTY DIE SPRINGS • INCH												RED
Hole Dia.	Rod Dia.	Free Length		Part Number	Pounds at 1/10" Deflection	Deflection for Optimum Life 20% of Free Length		Deflection for Long Life 25% of Free Length		*Maximum Deflection 30% of Free Length		No. per Box
		Inch	mm			Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	
1 26mm WIRE .115 x .218	1/2 12.5mm	1.00	25	MHC-12	76.00	152.00	0.20	190.00	0.25	281.20	0.37	50
		1.25	32	MHC-12A	62.40	156.00	0.25	195.00	0.31	288.60	0.46	50
		1.50	38	MHC-13	49.60	148.80	0.30	186.50	0.38	275.30	0.56	50
		1.75	44	MHC-13A	44.00	154.00	0.35	192.50	0.44	284.90	0.65	50
		2.00	51	MHC-14	40.00	160.00	0.40	200.00	0.50	296.00	0.74	50
		2.50	64	MHC-15	31.00	155.00	0.50	193.80	0.63	286.80	0.93	25
		3.00	76	MHC-16	25.00	150.00	0.60	187.50	0.75	277.50	1.11	25
		3.50	89	MHC-17	21.60	151.20	0.70	189.00	0.88	279.70	1.30	25
		4.00	102	MHC-18	18.40	147.20	0.80	184.00	1.00	272.30	1.48	25
		4.50	114	MHC-19	17.00	153.00	0.90	191.30	1.13	283.10	1.67	25
		5.00	127	MHC-20	14.40	144.00	1.00	180.00	1.25	266.40	1.85	25
		5.50	140	MHC-21	12.80	140.80	1.10	176.00	1.38	260.50	2.04	25
		6.00	152	MHC-22	12.00	144.00	1.20	180.00	1.50	266.40	2.22	25
		7.00	178	MHC-23	10.00	140.00	1.40	175.00	1.75	259.00	2.59	25
8.00	203	MHC-24	8.80	140.80	1.60	176.00	2.00	260.50	2.96	25		
12.00	305	MHC-24A	6.20	148.80	2.40	186.00	3.00	275.30	4.44	25		
1-1/4 32mm WIRE .156 x .281	5/8 15.5mm	1.50	38	MHC-36	114.40	343.20	0.30	429.00	0.38	634.90	0.56	25
		1.75	44	MHC-36A	100.80	352.80	0.35	441.00	0.44	652.70	0.65	25
		2.00	51	MHC-37	86.40	345.60	0.40	432.00	0.50	639.40	0.74	25
		2.50	64	MHC-38	62.40	312.00	0.50	390.00	0.63	577.20	0.93	25
		3.00	76	MHC-39	51.20	307.20	0.60	384.00	0.75	568.30	1.11	25
		3.50	89	MHC-40	44.00	308.00	0.70	385.00	0.88	569.80	1.30	25
		4.00	102	MHC-41	36.80	294.40	0.80	368.00	1.00	544.60	1.48	25
		4.50	114	MHC-42	32.00	288.00	0.90	360.00	1.13	532.80	1.67	25
		5.00	127	MHC-43	29.00	290.00	1.00	362.50	1.25	536.50	1.85	25
		5.50	140	MHC-44	26.40	290.40	1.10	363.00	1.38	537.20	2.04	25
		6.00	152	MHC-45	25.00	300.00	1.20	375.00	1.50	555.00	2.22	25
		7.00	178	MHC-46	20.00	280.00	1.40	350.00	1.75	518.00	2.59	25
		8.00	203	MHC-47	18.40	294.40	1.60	368.00	2.00	544.60	2.96	25
		10.00	254	MHC-48	14.50	290.00	2.00	362.50	2.50	536.50	3.70	25
12.00	305	MHC-48A	12.40	297.60	2.40	372.00	3.00	550.60	4.44	25		
1-1/2 38mm WIRE .187 x .312	3/4 19mm	2.00	51	MHC-49	108.00	432.00	0.40	540.00	0.50	799.20	0.74	25
		2.50	64	MHC-50	85.60	428.00	0.50	535.00	0.63	791.80	0.93	25
		3.00	76	MHC-51	62.40	374.40	0.60	468.00	0.75	692.60	1.11	25
		3.50	89	MHC-52	52.80	369.60	0.70	462.00	0.88	683.80	1.30	25
		4.00	102	MHC-53	48.00	384.00	0.80	480.00	1.00	710.40	1.48	25
		4.50	114	MHC-54	43.20	388.80	0.90	486.00	1.13	719.30	1.67	25
		5.00	127	MHC-55	36.80	368.00	1.00	460.00	1.25	680.80	1.85	25
		5.50	140	MHC-55A	34.40	378.40	1.10	473.00	1.38	700.00	2.04	25
		6.00	152	MHC-56	30.40	364.80	1.20	456.00	1.50	674.90	2.22	25
		7.00	178	MHC-56A	26.40	369.60	1.40	462.00	1.75	683.80	2.59	25
		8.00	203	MHC-57	22.00	352.00	1.60	440.00	2.00	651.20	2.96	25
		10.00	254	MHC-58	17.60	352.00	2.00	440.00	2.50	651.20	3.70	25
		12.00	305	MHC-58A	14.40	345.60	2.40	432.00	3.00	639.40	4.44	25
		2 51mm WIRE .225 x .437	1 25mm	2.50	64	MHC-70	118.40	592.00	0.50	740.00	0.63	1095.20
3.00	76			MHC-71	96.00	576.00	0.60	720.00	0.75	1065.60	1.11	25
3.50	89			MHC-72	80.00	560.00	0.70	700.00	0.88	1036.00	1.30	25
4.00	102			MHC-73	66.40	531.20	0.80	664.00	1.00	982.70	1.48	25
4.50	114			MHC-74	60.00	540.00	0.90	674.00	1.13	999.00	1.67	25
5.00	127			MHC-75	56.00	560.00	1.00	700.00	1.25	1036.00	1.85	25
5.50	140			MHC-76	50.40	554.00	1.10	693.00	1.38	1025.60	2.04	25
6.00	152			MHC-77	47.20	566.40	1.20	708.00	1.50	1047.80	2.22	25
7.00	178			MHC-79	40.00	560.00	1.40	700.00	1.75	1036.00	2.59	25
8.00	203			MHC-80	35.20	563.20	1.60	704.00	2.00	1041.90	2.96	10
10.00	254			MHC-82	26.00	520.00	2.00	650.00	2.50	962.00	3.70	10
12.00	305			MHC-83	22.40	537.60	2.40	672.00	3.00	994.60	4.44	10

*Deflection values shown represent compressed lengths near solid and are for design information only. The color red is a registered trademark of Barnes Group Inc.

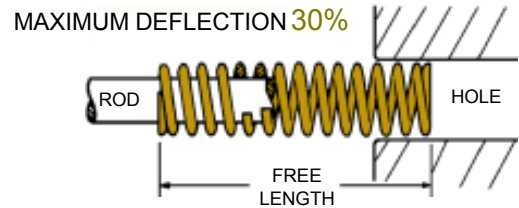
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HEAVY DUTY DIE SPRINGS - INCH



INCHES X 25.4 = MM
LBS. X .454 = KG

IN STOCK



HEAVY-DUTY DIE SPRINGS • INCH												GOLD
Hole Dia.	Rod Dia.	Free Length		Part Number	Pounds at 1/10" Deflection	Deflection for Optimum Life 15% of Free Length		Deflection for Long Life 20% of Free Length		*Maximum Deflection 30% of Free Length		No. per Box
		Inch	mm			Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	
3/8 10mm WIRE .054 x .072	3/16 4.5mm	1.00	25	H-100	11.00	16.50	0.15	22.00	0.20	33.00	0.30	200
		1.25	32	H-100A	9.80	18.40	0.19	24.50	0.25	36.80	0.38	100
		1.50	38	H-101	8.00	18.00	0.23	24.00	0.30	36.00	0.45	100
		1.75	44	H-101A	8.40	22.10	0.26	29.40	0.35	44.10	0.53	100
		2.00	51	H-102	7.20	21.60	0.30	28.80	0.40	43.20	0.60	100
		2.50	64	H-103	5.50	20.60	0.38	27.50	0.50	41.30	0.75	100
		3.00	76	H-104	4.20	18.90	0.45	25.20	0.60	37.80	0.90	100
		12.00	305	H-105	1.20	21.60	1.80	28.80	2.40	43.20	3.60	50
1/2 13mm WIRE .070 x 093	9/32 7mm	1.00	25	H-110	23.60	35.40	0.15	47.20	0.20	70.80	0.30	100
		1.25	32	H-110A	18.60	34.90	0.19	46.50	0.25	69.80	0.38	100
		1.50	38	H-111	15.50	34.90	0.23	46.50	0.30	69.80	0.45	100
		1.75	44	H-111A	13.80	36.20	0.26	48.30	0.35	72.50	0.53	100
		2.00	51	H-112	11.00	33.00	0.30	44.00	0.40	66.00	0.60	100
		2.50	64	H-113	8.40	31.50	0.38	42.00	0.50	63.00	0.75	50
		3.00	76	H-114	7.40	33.30	0.45	44.40	0.60	66.60	0.90	50
		3.50	89	H-115	6.00	31.50	0.53	42.00	0.70	63.00	1.05	50
12.00	305	H-117	1.60	28.80	1.80	38.40	2.40	57.60	3.60	50		
5/8 16mm WIRE .093 x .125	11/32 8.5mm	1.00	25	H-120	42.40	63.60	0.15	84.80	0.20	127.20	0.30	100
		1.25	32	H-120A	29.60	55.50	0.19	74.00	0.25	111.00	0.38	50
		1.50	38	H-121	27.20	61.20	0.23	81.60	0.30	122.40	0.45	50
		1.75	44	H-121A	24.00	63.00	0.26	84.00	0.35	126.00	0.53	50
		2.00	51	H-122	20.80	62.40	0.30	83.20	0.40	124.80	0.60	50
		2.50	64	H-123	17.00	63.80	0.38	85.00	0.50	127.50	0.75	50
		3.00	76	H-124	14.40	64.80	0.45	86.40	0.60	129.60	0.90	50
		3.50	89	H-125	12.20	64.10	0.53	85.40	0.70	128.10	1.05	50
4.00	102	H-126	10.80	64.80	0.60	86.40	0.80	129.60	1.20	50		
12.00	305	H-127	3.00	54.00	1.80	72.00	2.40	108.00	3.60	50		
3/4 19mm WIRE .125 x .165	3/8 9.5mm	1.00	25	H-1	108.00	162.00	0.15	216.00	0.20	324.00	0.30	50
		1.25	32	H-1A	88.00	165.00	0.19	220.00	0.25	330.00	0.38	50
		1.50	38	H-2	65.50	147.60	0.23	196.80	0.30	295.20	0.45	50
		1.75	44	H-2A	60.00	157.50	0.26	210.00	0.35	315.00	0.53	50
		2.00	51	H-3	49.60	148.80	0.30	198.40	0.40	297.60	0.60	50
		2.50	64	H-4	40.00	150.00	0.38	200.00	0.50	300.00	0.75	50
		3.00	76	H-5	34.00	153.00	0.45	204.00	0.60	306.00	0.90	50
		3.50	89	H-6	28.00	147.00	0.53	196.00	0.70	294.00	1.05	50
		4.00	102	H-7	25.00	150.00	0.60	200.00	0.80	300.00	1.20	50
		4.50	114	H-8	22.00	148.50	0.68	198.00	0.90	297.00	1.35	50
		5.00	127	H-9	19.50	146.30	0.75	195.00	1.00	292.50	1.50	50
		5.50	140	H-10	17.00	140.30	0.83	187.00	1.10	280.50	1.65	50
6.00	152	H-11	16.00	144.00	0.90	192.00	1.20	288.00	1.80	50		
12.00	305	H-11A	8.00	144.00	1.80	192.00	2.40	288.00	3.60	50		

*Deflection values shown represent compressed lengths near solid and are for design information only. The color gold is a registered trademark of Barnes Group Inc.

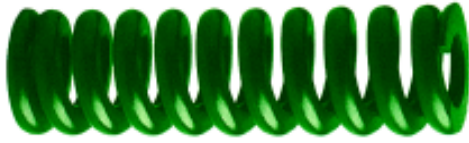
See page 3 for Die Springs
"Do's and "Don'ts".

HEAVY-DUTY DIE SPRINGS • INCH											GOLD	
Hole Dia.	Rod Dia.	Free Length		Part Number	Pounds at 1/10" Deflection	Deflection for Optimum Life 15% of Free Length		Deflection for Long Life 20% of Free Length		*Maximum Deflection 30% of Free Length		No. per Box
		Inch	mm			Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	
1 26mm WIRE .158 x .225	1/2 12.5mm	1.00	25	H-12	208.00	312.00	0.15	416.00	0.20	624.00	0.30	50
		1.25	32	H-12A	171.20	321.00	0.19	428.00	0.25	642.00	0.38	50
		1.50	38	H-13	118.40	266.40	0.23	355.20	0.30	532.00	0.45	50
		1.75	44	H-13A	104.00	273.00	0.26	364.00	0.35	546.00	0.53	50
		2.00	51	H-14	90.00	270.00	0.30	360.00	0.40	540.00	0.60	50
		2.50	64	H-15	68.00	255.00	0.38	340.00	0.50	510.00	0.75	50
		3.00	76	H-16	54.40	244.80	0.45	326.40	0.60	489.60	0.90	25
		3.50	89	H-17	45.60	239.40	0.53	319.20	0.70	478.80	1.05	25
		4.00	102	H-18	40.00	240.00	0.60	320.00	0.80	480.00	1.20	25
		4.50	114	H-19	35.20	237.60	0.68	316.80	0.90	475.20	1.35	25
		5.00	127	H-20	31.20	234.00	0.75	312.00	1.00	468.00	1.50	25
		5.50	140	H-20A	28.80	237.60	0.83	316.80	1.10	475.20	1.65	25
		6.00	152	H-21	25.60	230.40	0.90	307.20	1.20	460.80	1.80	25
		7.00	178	H-21A	22.40	235.20	1.05	313.60	1.40	470.40	2.10	25
8.00	203	H-22	19.20	230.40	1.20	307.20	1.60	460.80	2.40	25		
12.00	305	H-22A	12.00	216.00	1.80	288.00	2.40	432.00	3.60	25		
1-1/4 32mm WIRE .200 x .295	5/8 15.5mm	1.50	38	H-36	212.00	477.00	0.23	636.00	0.30	954.00	0.45	25
		1.75	44	H-36A	181.60	476.70	0.26	635.60	0.35	953.40	0.53	25
		2.00	51	H-37	149.60	448.80	0.30	598.40	0.40	897.60	0.60	25
		2.50	64	H-38	117.60	441.00	0.38	588.00	0.50	882.00	0.75	25
		3.00	76	H-39	95.20	428.40	0.45	571.20	0.60	856.80	0.90	25
		3.50	89	H-40	75.20	394.80	0.53	526.40	0.70	789.60	1.05	25
		4.00	102	H-41	66.40	398.40	0.60	531.20	0.80	796.80	1.20	25
		4.50	114	H-42	58.40	394.20	0.68	525.60	0.90	788.40	1.35	25
		5.00	127	H-43	53.00	397.50	0.75	530.00	1.00	795.00	1.50	25
		5.50	140	H-44	47.20	389.40	0.83	519.20	1.10	778.80	1.65	25
		6.00	152	H-45	42.40	381.60	0.90	508.80	1.20	763.20	1.80	25
		7.00	178	H-46	36.80	386.40	1.05	515.20	1.40	772.80	2.10	25
		8.00	203	H-47	32.80	393.60	1.20	524.80	1.60	787.20	2.40	25
		10.00	254	H-48	25.60	384.00	1.50	512.00	2.00	768.00	3.00	25
12.00	305	H-48A	20.80	374.40	1.80	499.20	2.40	748.80	3.60	25		
1-1/2 38mm WIRE .225 x .350	3/4 19mm	2.00	51	H-49	190.40	571.20	0.30	761.60	0.40	1142.40	0.60	25
		2.50	64	H-50	155.00	581.30	0.38	775.00	0.50	1162.50	0.75	25
		3.00	76	H-51	130.00	585.00	0.45	780.00	0.60	1170.00	0.90	25
		3.50	89	H-52	106.40	558.60	0.53	744.80	0.70	1117.20	1.05	25
		4.00	102	H-53	91.20	547.20	0.60	729.60	0.80	1094.40	1.20	25
		4.50	114	H-54	78.40	529.20	0.68	705.60	0.90	1058.40	1.35	25
		5.00	127	H-55	71.20	534.00	0.75	712.00	1.00	1068.00	1.50	25
		5.50	140	H-55A	64.00	528.00	0.83	704.00	1.10	1056.00	1.65	25
		6.00	152	H-56	58.40	525.60	0.90	700.80	1.20	1051.20	1.80	25
		7.00	178	H-56A	49.60	520.80	1.05	694.40	1.40	1041.60	2.10	25
		8.00	203	H-57	43.20	518.40	1.20	691.20	1.60	1036.80	2.40	25
		10.00	254	H-48	34.40	516.00	1.50	688.00	2.00	1032.00	3.00	25
		12.00	305	H-58A	28.80	518.40	1.80	691.20	2.40	1036.80	3.60	25
		2 51mm WIRE .280 x .470	1 25mm	2.50	64	H-70	260.00	975.00	0.38	1300.00	0.50	1950.00
3.00	76			H-71	200.00	900.00	0.45	1200.00	0.60	1800.00	0.90	25
3.50	89			H-72	170.00	892.50	0.53	1190.00	0.70	1785.00	1.05	25
4.00	102			H-73	150.00	900.00	0.60	1200.00	0.80	1800.00	1.20	25
4.50	114			H-74	120.00	810.00	0.68	1080.00	0.90	1620.00	1.35	25
5.00	127			H-75	110.00	825.00	0.75	1100.00	1.00	1650.00	1.50	25
5.50	140			H-76	100.00	825.00	0.83	1100.00	1.10	1650.00	1.65	25
6.00	152			H-77	94.00	846.00	0.90	1128.00	1.20	1692.00	1.80	25
7.00	178			H-79	82.00	861.00	1.05	1148.00	1.40	1722.00	2.10	25
8.00	203			H-80	73.00	876.00	1.20	1168.00	1.60	1752.00	2.40	10
10.00	254			H-82	55.00	825.00	1.50	1100.00	2.00	1650.00	3.00	10
12.00	305			H-83	42.00	756.00	1.80	1008.00	2.40	1512.00	3.60	10

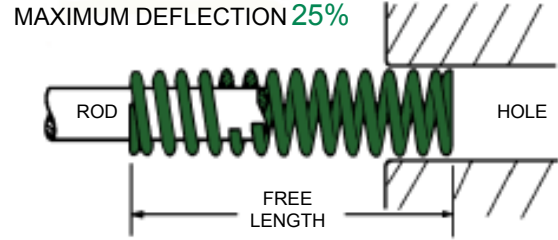
*Deflection values shown represent compressed lengths near solid and are for design information only. The color gold is a registered trademark of Barnes Group Inc.

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EXTRA HEAVY DUTY DIE SPRINGS • INCH



IN STOCK



INCHES X 25.4 = MM
LBS. X .454 = KG

Hole Dia.	Rod Dia.	Free Length		Part Number	Pounds at 1/10" Deflection	Deflection for Optimum Life 15% of Free Length		Deflection for Long Life 20% of Free Length		*Maximum Deflection 25% of Free Length		No. per Box	
		Inch	mm			Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)		
3/8 10mm	3/16 4.5mm	WIRE .059 x .080	1.00	25	XH-100	22.00	33.00	0.15	44.00	0.20	55.00	0.25	200
			1.25	32	XH-100A	16.80	30.00	0.19	40.00	0.25	50.00	0.31	200
			1.50	38	XH-101	12.50	28.10	0.23	37.50	0.30	46.90	0.38	100
			1.75	44	XH-101A	11.50	30.20	0.26	40.30	0.35	50.30	0.44	100
			2.00	51	XH-102	9.00	27.00	0.30	36.00	0.40	45.00	0.50	100
			2.50	64	XH-103	7.00	26.30	0.38	35.00	0.50	43.80	0.63	100
			3.00	76	XH-104	6.50	29.30	0.45	39.00	0.60	48.80	0.75	100
			12.00	305	XH-105	1.50	27.00	1.80	36.00	2.40	45.00	3.00	50
1/2 13mm	9/32 7mm	WIRE .084 x .097	1.00	25	XH-110	32.00	48.00	0.15	64.00	0.20	80.00	0.25	100
			1.25	32	XH-110A	24.00	45.00	0.19	60.00	0.25	75.00	0.31	100
			1.50	38	XH-111	20.00	45.00	0.23	60.00	0.30	75.00	0.38	100
			1.75	44	XH-111A	17.00	44.60	0.26	59.50	0.35	74.40	0.44	100
			2.00	51	XH-112	14.00	42.00	0.30	56.00	0.40	70.00	0.50	100
			2.50	64	XH-113	11.50	43.10	0.38	57.50	0.50	71.90	0.63	50
			3.00	76	XH-114	9.00	40.50	0.45	54.00	0.60	67.50	0.75	50
			3.50	89	XH-115	8.00	42.00	0.53	56.00	0.70	70.00	0.88	50
12.00	305	XH-116	2.50	45.00	1.80	60.00	2.40	75.00	3.00	50			
5/8 16mm	11/32 8.5mm	WIRE .110 x .126	1.00	25	XH-120	63.00	94.50	0.15	126.00	0.20	157.50	0.25	100
			1.25	32	XH-120A	47.00	88.10	0.19	117.50	0.25	146.90	0.31	100
			1.50	38	XH-121	38.00	85.50	0.23	114.00	0.30	142.50	0.38	50
			1.75	44	XH-121A	32.00	84.00	0.26	112.00	0.35	140.00	0.44	50
			2.00	51	XH-122	29.00	87.00	0.30	116.00	0.40	145.00	0.50	50
			2.50	64	XH-123	22.00	82.00	0.38	110.00	0.50	137.50	0.63	50
			3.00	76	XH-124	19.00	85.50	0.45	114.00	0.60	142.50	0.75	50
			3.50	89	XH-125	16.00	84.00	0.53	112.00	0.70	140.00	0.88	50
4.00	102	XH-126	13.50	81.00	0.60	108.00	0.80	135.00	1.00	50			
12.00	305	XH-127	4.50	81.00	1.80	108.00	2.40	135.00	3.00	50			
3/4 19mm	3/8 9.5mm	WIRE .135 x .165	1.00	25	XH-1	140.00	210.00	0.15	280.00	0.20	350.00	0.25	50
			1.25	32	XH-1A	110.00	206.30	0.19	275.00	0.25	343.80	0.31	50
			1.50	38	XH-2	89.00	200.30	0.23	267.00	0.30	333.80	0.38	50
			1.75	44	XH-2A	75.00	196.90	0.26	262.50	0.35	328.10	0.44	50
			2.00	51	XH-3	66.00	204.00	0.30	272.00	0.40	340.00	0.50	50
			2.50	64	XH-4	50.00	187.50	0.38	250.00	0.50	312.50	0.63	50
			3.00	76	XH-5	40.50	182.30	0.45	243.00	0.60	303.80	0.75	50
			3.50	89	XH-6	34.50	181.10	0.53	241.50	0.70	301.90	0.88	50
			4.00	102	XH-7	30.00	180.00	0.60	240.00	0.80	300.00	1.00	50
			4.50	114	XH-8	26.50	178.90	0.68	238.50	0.90	298.10	1.13	50
			5.00	127	XH-9	23.50	146.30	0.75	235.00	1.00	293.80	1.25	50
			5.50	140	XH-10	21.50	177.40	0.83	236.50	1.10	295.60	1.38	50
6.00	152	XH-11	19.50	175.50	0.90	234.00	1.20	292.50	1.50	50			
12.00	305	XH-12	9.50	171.00	1.80	228.00	2.40	285.00	3.00	50			

*Deflection values shown represent compressed lengths near solid and are for design information only. The color green is a registered trademark of Barnes Group Inc.

See page 3 for Die Springs
"Do's and "Don'ts".

EXTRA HEAVY-DUTY DIE SPRINGS • INCH											GREEN	
Hole Dia.	Rod Dia.	Free Length		Part Number	Pounds at 1/10" Deflection	Deflection for Optimum Life 15% of Free Length		Deflection for Long Life 20% of Free Length		*Maximum Deflection 25% of Free Length		No. per Box
		Inch	mm			Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	
1 26mm WIRE .188 x .225	1/2 12.5mm	1.50	38	XH-13	160.00	360.00	0.23	480.00	0.30	600.00	0.38	50
		2.00	51	XH-14	116.00	348.00	0.30	464.00	0.40	580.00	0.50	50
		2.50	64	XH-15	89.60	336.00	0.38	448.00	0.50	560.00	0.63	50
		3.00	76	XH-16	73.60	331.20	0.45	441.60	0.60	552.00	0.75	25
		3.50	89	XH-17	62.40	327.60	0.53	436.80	0.70	546.00	0.88	25
		4.00	102	XH-18	55.20	331.20	0.60	441.60	0.80	552.00	1.00	25
		4.50	114	XH-19	48.80	329.40	0.68	439.20	0.90	549.00	1.13	25
		5.00	127	XH-20	43.20	324.00	0.75	432.00	1.00	540.00	1.25	25
		6.00	152	XH-21	36.00	324.00	0.90	432.00	1.20	540.00	1.50	25
		12.00	305	XH-22A	17.60	316.80	1.80	422.40	2.40	528.00	3.00	25
1-1/4 32mm WIRE .225 x .295	5/8 15.5mm	2.00	51	XH-37	192.00	576.00	0.30	768.00	0.40	960.00	0.50	50
		2.50	64	XH-38	144.00	540.00	0.38	720.00	0.50	900.00	0.63	25
		3.00	76	XH-39	118.40	532.80	0.45	710.40	0.60	888.00	0.75	25
		3.50	89	XH-40	100.80	529.20	0.53	705.60	0.70	882.00	0.88	25
		4.00	102	XH-41	84.00	504.00	0.60	672.00	0.80	840.00	1.00	25
		4.50	114	XH-42	78.40	529.20	0.68	705.60	0.90	882.00	1.13	25
		5.00	127	XH-43	68.00	510.00	0.75	680.00	1.00	850.00	1.25	25
		6.00	152	XH-45	56.00	504.00	0.90	672.00	1.20	840.00	1.50	25
		8.00	203	XH-47	41.60	499.20	1.20	665.60	1.60	832.00	2.00	25
		10.00	254	XH-48	33.60	504.00	1.50	672.00	2.00	840.00	2.50	25
12.00	305	XH-48A	26.40	475.20	1.80	633.60	2.40	792.00	3.00	25		
1-1/2 38mm WIRE .305 x .350	3/4 19mm	2.00	51	XH-49	376.00	1128.00	0.30	1504.00	0.40	1888.00	0.50	25
		2.50	64	XH-50	294.40	1104.00	0.38	1472.00	0.50	1840.00	0.63	25
		3.00	76	XH-51	231.20	1040.40	0.45	1387.20	0.60	1734.00	0.75	25
		3.50	89	XH-52	196.00	1029.00	0.53	1372.00	0.70	1715.00	0.88	25
		4.00	102	XH-53	171.20	1027.20	0.60	1369.60	0.80	1712.00	1.00	25
		4.50	114	XH-54	148.00	999.00	0.68	1332.00	0.90	1665.00	1.13	25
		5.00	127	XH-55	136.00	1020.00	0.75	1360.00	1.00	1700.00	1.25	25
		6.00	152	XH-56	110.40	993.60	0.90	1324.80	1.20	1656.00	1.50	25
		8.00	203	XH-57	80.80	969.60	1.20	1292.80	1.60	1616.00	2.00	25
		10.00	254	XH-58	67.20	1008.00	1.50	1344.00	2.00	1680.00	2.50	25
12.00	305	XH-58A	54.40	979.20	1.80	1305.60	2.40	1632.00	3.00	25		
2 51mm WIRE .365 x .460	1 25mm	2.50	64	XH-70	381.60	1431.00	0.38	1908.00	0.50	2385.00	0.63	25
		3.00	76	XH-71	312.00	1404.00	0.45	1872.00	0.60	2340.00	0.75	25
		3.50	89	XH-72	254.40	1335.60	0.53	1780.80	0.70	2226.00	1.88	25
		4.00	102	XH-73	220.00	1320.00	0.60	1760.00	0.80	2200.00	1.00	25
		4.50	114	XH-74	188.80	1274.40	0.68	1699.20	0.90	2124.00	1.13	25
		5.00	127	XH-75	172.80	1296.00	0.75	1728.00	1.00	2160.00	1.25	25
		6.00	152	XH-77	141.60	1274.40	0.90	1699.20	1.20	2124.00	1.50	25
		8.00	203	XH-80	100.00	1200.00	1.20	1600.00	1.60	2000.00	2.00	10
		10.00	254	XH-82	84.00	1260.00	1.50	1680.00	2.00	2100.00	2.50	10
		12.00	305	XH-83	71.20	1281.60	1.80	1708.80	2.40	2136.00	3.00	10

*Deflection values shown represent compressed lengths near solid and are for design information only.
The color green is a registered trademark of Barnes Group Inc.

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STANDARD TOLERANCES FOR FREE LENGTHS

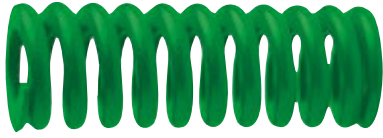
Up to 2.499" +.093
 -0.000

2.5" to 4.999" +.125
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5" to 7.999" +.187
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8" to 9.999" +.250
 -0.000

10" to 12" +.375
 -0.000

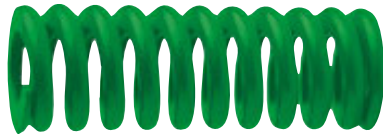


MM x .039837 = INCHES
 KG X 2.20463= LBS.

Associated Spring Raymond 

LIGHT DUTY DIE SPRINGS • METRIC					ISO SPECIFICATION SERIES				GREEN			
Hole Dia. (mm)	Rod Dia. (mm)	Free Length (mm)	PART NUMBER	Load at 1mm Def. (N)	LOAD DEFLECTION							
					For Long Life (25% of free length)		For Long Life (30% of free length)		*Maximum Operating Def. (35% of free length)		Maximum Deflection	Number Box
					Load (N)	Deflection mm	Load (N)	Deflection mm	Load (N)	Deflection mm		
A	B	C										
10 (3/8")	5 (3/16")	25	ILD010025	10.0	62.5	6.3	75.0	7.5	87.5	8.8	10.3	200
		32	ILD010032	8.5	68.0	8.0	81.6	9.6	95.2	11.2	13.1	200
		38	ILD010038	6.8	64.6	9.5	77.5	11.4	90.4	13.3	15.6	100
		44	ILD010044	6.0	66.0	11.0	79.2	13.2	92.4	15.4	18.0	100
		51	ILD010051	5.0	63.8	12.8	76.5	15.3	89.3	17.9	20.9	100
		64	ILD010064	4.3	68.8	16.0	82.6	19.2	96.3	22.4	26.0	100
		76	ILD010076	3.2	60.8	19.0	73.0	22.8	85.1	26.6	31.2	100
		305	ILD010305	1.1	83.9	76.3	100.7	91.5	117.4	106.8	125.0	50
12.5 (1/2")	6.3 (9/32")	25	ILD012025	17.9	111.9	6.3	134.3	7.5	156.6	8.8	10.3	100
		32	ILD012032	16.4	131.2	8.0	157.4	9.6	183.7	11.2	13.1	100
		38	ILD012038	13.6	129.2	9.5	155.0	11.4	180.9	13.3	15.6	100
		44	ILD012044	12.1	133.1	11.0	159.7	13.2	186.3	15.4	18.0	100
		51	ILD012051	11.4	145.4	12.8	174.4	15.3	203.5	17.9	20.9	100
		64	ILD012064	9.3	148.8	16.0	178.6	19.2	208.3	22.4	26.3	50
		76	ILD012076	7.1	134.9	19.0	161.9	22.8	188.9	26.6	31.2	50
		305	ILD012305	5.4	120.2	22.3	144.2	26.7	168.2	31.2	36.5	50
16 (5/8")	8 (11/32")	25	ILD016025	23.4	146.3	6.3	175.5	7.5	204.8	8.8	10.3	100
		32	ILD016032	22.9	183.2	8.0	219.8	9.6	256.5	11.2	13.1	100
		38	ILD016038	19.3	183.4	9.5	220.0	11.4	256.7	13.3	15.6	50
		44	ILD016044	17.1	188.1	11.0	225.7	13.2	263.3	15.4	18.0	50
		51	ILD016051	15.7	200.2	12.8	240.2	15.3	280.2	17.9	20.9	50
		64	ILD016064	10.7	171.2	16.0	205.4	19.2	239.7	22.4	26.3	50
		76	ILD016076	10.0	190.0	19.0	228.0	22.8	266.0	26.6	31.2	50
		305	ILD016089	8.6	191.4	22.3	229.6	26.7	267.9	31.2	36.5	50
20 (3/4")	10 (3/8")	25	ILD020025	55.8	348.8	6.3	418.5	7.5	488.3	8.8	10.2	50
		32	ILD020032	45.0	360.0	8.0	432.0	9.6	504.0	11.2	12.5	50
		38	ILD020038	33.3	316.4	9.5	379.6	11.4	442.9	13.3	15.0	50
		44	ILD020044	30.0	330.0	11.0	396.0	13.2	462.0	15.4	18.0	50
		51	ILD020051	24.5	312.4	12.8	374.9	15.3	437.3	17.9	20.0	50
		64	ILD020064	20.0	320.0	16.0	384.0	19.2	448.0	22.4	25.0	50
		76	ILD020076	16.0	304.0	19.0	364.8	22.8	425.6	26.6	30.0	50
		305	ILD020089	14.0	311.5	22.3	373.8	26.7	436.1	31.2	35.0	50
25 (1")	12.5 (1/2")	25	ILD025025	100.0	625.0	6.3	750.0	7.5	875.0	8.8	10.2	50
		32	ILD025032	80.3	642.4	8.0	770.9	9.6	899.4	11.2	12.5	50
		38	ILD025038	62.0	589.0	9.5	706.8	11.4	824.6	13.3	15.0	50
		44	ILD025044	52.9	581.9	11.0	698.3	13.2	814.7	15.4	18.0	50
		51	ILD025051	44.0	561.0	12.8	673.2	15.3	785.4	17.9	20.0	50
		64	ILD025064	35.2	563.2	16.0	675.8	19.2	788.5	22.4	25.0	50
		76	ILD025076	28.0	532.0	19.0	638.4	22.8	744.8	26.6	30.0	25
		305	ILD025089	24.0	534.0	22.3	640.8	26.7	747.6	31.2	35.0	25
		102	ILD025102	21.1	538.1	25.5	645.7	30.6	753.3	35.7	41.0	25
		115	ILD025115	18.7	537.6	28.8	645.2	34.5	752.7	40.3	46.0	25

*Tabulated deflections values shown represent compressed lengths near solid and are for design information only.

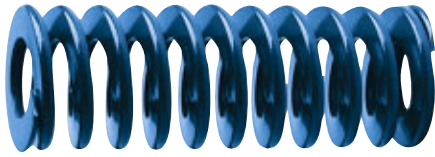


MM x .039837 = INCHES
 KG X 2.20463= LBS.

Associated Spring
 Raymond 

LIGHT DUTY DIE SPRINGS • METRIC					ISO SPECIFICATION SERIES					GREEN				
Hole Dia. (mm)	Rod Dia. (mm)	Free Length (mm)	PART NUMBER	Load at 1mm Def. (N)	LOAD DEFLECTION TABLE						Maximum Deflection	Number Box		
					For Long Life (25% of free length)		For Long Life (30% of free length)		*Maximum Operating Def. (35% of free length)					
					Load (N)	Deflection mm	Load (N)	Deflection mm	Load (N)	Deflection mm				
A	B	C												
25 (1")	12.5 (1/2")	127	ILD025127	16.7	530.2	31.8	636.3	38.1	742.3	44.5	51.0	25		
		139	ILD025139	15.3	531.7	34.8	638.0	41.7	744.3	48.7	56.0	25		
		152	ILD025152	14.0	532.0	38.0	638.4	45.6	744.8	53.2	61.0	25		
		178	ILD025178	12.5	556.3	44.5	667.5	53.4	778.8	62.3	71.0	25		
		203	ILD025203	10.4	527.8	50.8	633.4	60.9	738.9	71.1	81.0	25		
		305	ILD025305	7.0	533.8	76.3	640.5	91.5	747.3	106.8	122.0	25		
32 (1 1/4")	16 (5/8")	38	ILD032038	94.0	893.0	9.5	1071.6	11.4	1250.2	13.3	15.0	50		
		44	ILD032044	79.5	874.5	11.0	1049.4	13.2	1224.3	15.4	18.0	50		
		51	ILD032051	67.0	854.3	12.8	1025.1	15.3	1196.0	17.9	20.0	50		
		64	ILD032064	53.0	848.0	16.0	1017.6	19.2	1187.2	22.4	25.0	25		
		76	ILD032076	44.0	836.0	19.0	1003.2	22.8	1170.4	26.6	30.0	25		
		89	ILD032089	37.2	827.7	22.3	993.2	26.7	1158.8	31.2	35.0	25		
		102	ILD032102	32.0	816.0	25.5	979.2	30.6	1142.4	35.7	41.0	25		
		115	ILD032115	29.0	833.8	28.8	1000.5	34.5	1167.3	40.3	46.0	25		
		127	ILD032127	25.0	793.8	31.8	952.5	38.1	1111.3	44.5	51.0	25		
		139	ILD032139	23.0	799.3	34.8	959.1	41.7	1119.0	48.7	56.0	25		
		152	ILD032152	21.5	817.0	38.0	980.4	45.6	1143.8	53.2	61.0	25		
		178	ILD032178	18.2	809.9	44.5	971.9	53.4	1133.9	62.3	71.0	25		
		203	ILD032203	15.8	801.9	50.8	962.2	60.9	1122.6	71.1	81.0	25		
		254	ILD032254	12.5	793.8	63.5	952.5	76.2	1111.3	88.9	102.0	25		
		305	ILD032305	10.3	785.4	76.3	942.5	91.5	1099.5	106.8	122.0	25		
40 (1 1/2")	20 (3/4")	51	ILD040051	92.0	1173.0	12.8	1407.6	15.3	1642.2	17.9	20.0	25		
		64	ILD040064	73.0	1168.0	16.0	1401.6	19.2	1635.2	22.4	25.0	25		
		76	ILD040076	63.0	1197.0	19.0	1436.4	22.8	1675.8	26.6	30.0	25		
		89	ILD040089	51.0	1134.8	22.3	1361.7	26.7	1588.7	31.2	35.0	25		
		102	ILD040102	43.0	1096.5	25.5	1315.8	30.6	1535.1	35.7	41.0	25		
		115	ILD040115	39.6	1138.5	28.8	1366.2	34.5	1593.9	40.3	46.0	25		
		127	ILD040127	37.0	1174.8	31.8	1409.7	38.1	1644.7	44.5	51.0	25		
		139	ILD040139	32.0	1112.0	34.8	1334.4	41.7	1556.8	48.7	56.0	25		
		152	ILD040152	28.0	1064.0	38.0	1276.8	45.6	1489.6	53.2	61.0	25		
		178	ILD040178	25.2	1121.4	44.5	1345.7	53.4	1570.0	62.3	71.0	25		
		203	ILD040203	22.7	1152.0	50.8	1382.4	60.9	1612.8	71.1	81.0	25		
		254	ILD040254	17.0	1079.5	63.5	1295.4	76.2	1511.3	88.9	102.0	25		
		305	ILD040305	14.8	1128.5	76.3	1354.2	91.5	1579.9	106.8	122.0	25		
		50 (2")	25 (1")	64	ILD050064	156.0	2496.0	16.0	2995.2	19.2	3494.4	22.4	25.0	25
				76	ILD050076	125.0	2375.0	19.0	2850.0	22.8	3325.0	26.6	30.0	25
89	ILD050089			109.0	2425.3	22.3	2910.3	26.7	3395.4	31.2	35.0	25		
102	ILD050102			94.0	2397.0	25.5	2876.4	30.6	3355.8	35.7	41.0	25		
115	ILD050115			81.0	2328.8	28.8	2794.5	34.5	3260.3	40.3	46.0	25		
127	ILD050127			71.0	2254.3	31.8	2705.1	38.1	3156.0	44.5	51.0	25		
139	ILD050139			66.5	2310.9	34.8	2773.1	41.7	3235.2	48.7	56.0	25		
152	ILD050152			60.0	2280.0	38.0	2736.0	45.6	3192.0	53.2	61.0	25		
178	ILD050178			52.0	2314.0	44.5	2776.8	53.4	3239.6	62.3	71.0	25		
203	ILD050203			44.0	2233.0	50.8	2679.6	60.9	3126.2	71.1	81.0	10		
254	ILD050254			35.0	2222.5	63.5	2667.0	76.2	3111.5	88.9	102.0	10		
305	ILD050305			28.5	2173.1	76.3	2607.8	91.5	3042.4	106.8	122.0	10		
63 (2 1/2")	38 (1 1/2")			76	ILD063076	189.0	3591.0	19.0	4309.2	22.8	5027.4	26.6	30.0	25
				89	ILD063089	158.0	3515.5	22.3	4218.6	26.7	4921.7	31.2	35.0	25
				102	ILD063102	131.0	3340.5	25.5	4008.6	30.6	4676.7	35.7	41.0	25
		115	ILD063115	116.0	3335.0	28.8	4002.0	34.5	4669.0	40.3	46.0	10		
		127	ILD063127	103.0	3270.3	31.8	3924.3	38.1	4578.4	44.5	51.0	10		
		152	ILD063152	84.3	3203.4	38.0	3844.1	45.6	4484.8	53.2	61.0	10		
		178	ILD063178	71.5	3181.8	44.5	3818.1	53.4	4454.5	62.3	71.0	10		
		203	ILD063203	61.7	3131.3	50.8	3757.5	60.9	4383.8	71.1	81.0	10		
		254	ILD063254	47.0	2984.5	63.5	3581.4	76.2	4178.3	88.9	102.0	10		
		305	ILD063305	38.2	2912.8	76.3	3495.3	91.5	4077.9	106.8	122.0	10		

*Tabulated deflections values shown represent compressed lengths near solid and are for design information only.

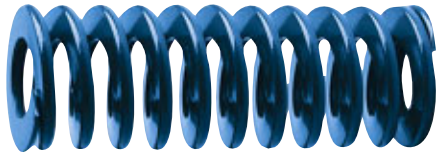


MM x .039837 = INCHES
 KG X 2.20463= LBS.

Associated Spring Raymond 

MEDIUM DUTY DIE SPRINGS • METRIC					ISO SPECIFICATION SERIES						BLUE	
Hole Dia. (mm)	Rod Dia. (mm)	Free Length (mm)	PART NUMBER	Load at 1mm Def. (N)	LOAD DEFLECTION TABLE						Maximum Deflection	Number Box
					For Long Life (20% of free length)		For Long Life (25% of free length)		*Maximum Operating Def. (30% of free length)			
					Load (N)	Deflection mm	Load (N)	Deflection mm	Load (N)	Deflection mm		
A	B	C										
10 (3/8")	5 (3/16")	25	IMD010025	16.0	80.0	5.0	100.0	6.3	120.0	7.5	9.5	200
		32	IMD010032	13.0	83.2	6.4	104.0	8.0	124.8	9.6	12.2	200
		38	IMD010038	11.9	90.4	7.6	113.1	9.5	135.7	11.4	14.4	100
		44	IMD010044	10.3	90.6	8.8	113.3	11.0	136.0	13.2	16.7	100
		51	IMD010051	8.9	90.8	10.2	113.5	12.8	136.2	15.3	19.4	100
		64	IMD010064	7.5	96.0	12.8	120.0	16.0	144.0	19.2	24.3	100
		76	IMD010076	5.3	80.6	15.2	100.7	19.0	120.8	22.8	28.9	100
		305	IMD010305	1.6	97.6	61.0	122.0	76.3	146.4	91.5	116.0	50
12.5 (1/2")	6.3 (9/32")	25	IMD012025	30.0	150.0	5.0	187.5	6.3	225.0	7.5	9.5	100
		32	IMD012032	24.8	158.7	6.4	198.4	8.0	238.1	9.6	12.2	100
		38	IMD012038	21.4	162.6	7.6	203.3	9.5	244.0	11.4	14.4	100
		44	IMD012044	18.5	162.8	8.8	203.5	11.0	244.2	13.2	16.7	100
		51	IMD012051	15.5	158.1	10.2	197.6	12.8	237.2	15.3	19.4	100
		64	IMD012064	12.1	154.9	12.8	193.6	16.0	232.3	19.2	24.3	50
		76	IMD012076	10.2	155.0	15.2	193.8	19.0	232.6	22.8	28.9	50
		305	IMD012305	2.1	128.1	61.0	160.1	76.3	192.2	91.5	116.0	50
16 (5/8")	8 (11/32")	25	IMD016025	49.4	247.0	5.0	308.8	6.3	370.5	7.5	9.5	100
		32	IMD016032	37.1	237.4	6.4	296.8	8.0	356.2	9.6	12.2	100
		38	IMD016038	33.9	257.6	7.6	322.1	9.5	386.5	11.4	14.4	50
		44	IMD016044	30.0	264.0	8.8	330.0	11.0	396.0	13.2	16.7	50
		51	IMD016051	26.4	269.3	10.2	336.6	12.8	403.9	15.3	19.4	50
		64	IMD016064	20.5	262.4	12.8	328.0	16.0	393.6	19.2	24.3	50
		76	IMD016076	17.8	270.6	15.2	338.2	19.0	405.8	22.8	28.9	50
		305	IMD016089	15.2	270.6	17.8	338.2	22.3	405.8	26.7	33.8	50
20 (3/4")	10 (3/8")	25	IMD020025	98.0	490.0	5.0	612.5	6.3	735.0	7.5	9.4	50
		32	IMD020032	72.6	464.6	6.4	580.8	8.0	697.0	9.6	12.0	50
		38	IMD020038	56.0	425.6	7.6	532.0	9.5	638.4	11.4	14.0	50
		44	IMD020044	47.5	418.0	8.8	522.5	11.0	627.0	13.2	16.5	50
		51	IMD020051	41.7	425.3	10.2	531.7	12.8	638.0	15.3	19.0	50
		64	IMD020064	32.3	413.4	12.8	516.8	16.0	620.2	19.2	24.0	50
		76	IMD020076	25.1	381.5	15.2	476.9	19.0	572.3	22.8	28.0	50
		305	IMD020089	22.0	391.6	17.8	489.5	22.3	587.4	26.7	33.0	50
25 (1")	12.5 (1/2")	25	IMD025025	147.0	735.0	5.0	918.8	6.3	1102.5	7.5	9.4	50
		32	IMD025032	118.0	755.2	6.4	944.0	8.0	1132.8	9.6	12.0	50
		38	IMD025038	93.0	706.8	7.6	883.5	9.5	1060.2	11.4	14.0	50
		44	IMD025044	80.8	711.0	8.8	888.8	11.0	1066.6	13.2	16.5	50
		51	IMD025051	68.6	699.7	10.2	874.7	12.8	1049.6	15.3	19.0	50
		64	IMD025064	53.0	678.4	12.8	848.0	16.0	1017.6	19.2	24.0	50
		76	IMD025076	43.2	656.6	15.2	820.8	19.0	985.0	22.8	28.0	25
		305	IMD025089	38.2	680.0	17.8	850.0	22.3	1019.9	26.7	33.0	25
25 (1")	12.5 (1/2")	102	IMD025102	33.0	673.2	20.4	841.5	25.5	1009.8	30.6	38.0	25
		115	IMD025115	28.0	644.0	23.0	805.0	28.8	966.0	34.5	43.0	25
		127	IMD025127	25.9	657.9	25.4	822.3	31.8	986.8	38.1	48.0	25
		139	IMD025139	23.2	645.0	27.8	806.2	34.8	967.4	41.7	52.0	25

*Tabulated deflections values shown represent compressed lengths near solid and are for design information only.

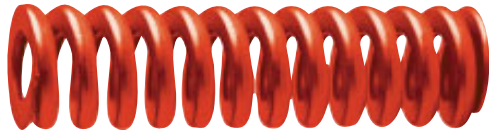


MM x .039837 = INCHES
 KG X 2.20463= LBS.

Associated Spring
 Raymond 

MEDIUM DUTY DIE SPRINGS • METRIC					ISO SPECIFICATION SERIES					BLUE		
Hole Dia. (mm)	Rod Dia. (mm)	Free Length (mm)	PART NUMBER	Load at 1mm Def. (N)	LOAD DEFLECTION TABLE						Maximum Deflection	Number Box
					For Long Life (20% of free length)		For Long Life (25% of free length)		*Maximum Operating Def. (30% of free length)			
					Load (N)	Deflection mm	Load (N)	Deflection mm	Load (N)	Deflection mm		
A	B	C										
25 (1")	12.5 (1/2")	152	IMD025152	20.8	632.3	30.4	790.4	38.0	948.5	45.6	57.0	25
		178	IMD025178	17.8	633.7	35.6	792.1	44.5	950.5	53.4	67.0	25
		203	IMD025203	15.8	641.5	40.6	801.9	50.8	962.2	60.9	76.0	25
		305	IMD025305	10.2	622.2	61.0	777.8	76.3	933.3	91.5	114.0	25
32 (1 1/4")	16 (5/8")	38	IMD032038	185.0	1406.0	7.6	1757.5	9.5	2109.0	11.4	14.0	50
		44	IMD032044	158.0	1390.4	8.8	1738.0	11.0	2085.6	13.2	16.5	50
		51	IMD032051	134.0	1366.8	10.2	1708.5	12.8	2050.2	15.3	19.0	50
		64	IMD032064	99.0	1267.2	12.8	1584.0	16.0	1900.8	19.2	24.0	25
		76	IMD032076	80.5	1223.6	15.2	1529.5	19.0	1835.4	22.8	28.0	25
		89	IMD032089	69.1	1230.0	17.8	1537.5	22.3	1845.0	26.7	33.0	25
		102	IMD032102	58.8	1199.5	20.4	1499.4	25.5	1799.3	30.6	38.0	25
		115	IMD032115	51.5	1184.5	23.0	1480.6	28.8	1776.8	34.5	43.0	25
		127	IMD032127	44.8	1137.9	25.4	1422.4	31.8	1706.9	38.1	48.0	25
		139	IMD032139	42.3	1175.9	27.8	1469.9	34.8	1763.9	41.7	52.0	25
		152	IMD032152	37.8	1149.1	30.4	1436.4	38.0	1723.7	45.6	57.0	25
		178	IMD032178	32.5	1157.0	35.6	1446.3	44.5	1735.5	53.4	67.0	25
		203	IMD032203	28.9	1173.3	40.6	1466.7	50.8	1760.0	60.9	76.0	25
		254	IMD032254	21.4	1087.1	50.8	1358.9	63.5	1630.7	76.2	95.0	25
305	IMD032305	18.3	1116.3	61.0	1395.4	76.3	1674.5	91.5	114.0	25		
40 (1 1/2")	20 (3/4")	51	IMD040051	181.6	1852.3	10.2	2315.4	12.8	2778.5	15.3	19.0	25
		64	IMD040064	140.0	1792.0	12.8	2240.0	16.0	2688.0	19.2	24.0	25
		76	IMD040076	108.0	1641.6	15.2	2052.0	19.0	2462.4	22.8	28.0	25
		89	IMD040089	90.7	1614.5	17.8	2018.1	22.3	2421.7	26.7	33.0	25
		102	IMD040102	81.0	1652.4	20.4	2065.5	25.5	2478.6	30.6	38.0	25
		115	IMD040115	71.8	1651.4	23.0	2064.3	28.8	2477.1	34.5	43.0	25
		127	IMD040127	62.7	1592.6	25.4	1990.7	31.8	2388.9	38.1	48.0	25
		139	IMD040139	57.5	1598.5	27.8	1998.1	34.8	2397.8	41.7	52.0	25
		152	IMD040152	51.6	1568.6	30.4	1960.8	38.0	2353.0	45.6	57.0	25
		178	IMD040178	44.1	1570.0	35.6	1962.5	44.5	2354.9	53.4	67.0	25
		203	IMD040203	36.7	1490.0	40.6	1862.5	50.8	2235.0	60.9	76.0	25
254	IMD040254	30.1	1529.1	50.8	1911.4	63.5	2293.6	76.2	95.0	25		
305	IMD040305	24.6	1500.6	61.0	1875.8	76.3	2250.9	91.5	114.0	25		
50 (2")	25 (1")	64	IMD050064	209.0	2675.2	12.8	3344.0	16.0	4012.8	19.2	24.0	25
		76	IMD050076	168.0	2553.6	15.2	3192.0	19.0	3830.4	22.8	28.0	25
		89	IMD050089	140.0	2492.0	17.8	3115.0	22.3	3738.0	26.7	33.0	25
		102	IMD050102	119.0	2427.6	20.4	3034.5	25.5	3641.4	30.6	38.0	25
		115	IMD050115	106.0	2438.8	23.0	3047.5	28.8	3657.0	34.5	43.0	25
		127	IMD050127	97.0	2463.8	25.4	3079.8	31.8	3695.7	38.1	48.0	25
		139	IMD050139	87.0	2418.6	27.8	3023.3	34.8	3627.9	41.7	52.0	25
		152	IMD050152	80.0	2432.0	30.4	3040.0	38.0	3648.0	45.6	57.0	25
		178	IMD050178	69.5	2474.2	35.6	3092.8	44.5	3711.3	53.4	67.0	25
		203	IMD050203	59.8	2427.9	40.6	3034.9	50.8	3641.8	60.9	76.0	10
		229	IMD050229	50.9	2331.2	45.8	2914.0	57.3	3496.8	68.7	86.0	10
254	IMD050254	43.9	2230.1	50.8	2787.7	63.5	3345.2	76.2	95.0	10		
305	IMD050305	38.6	2354.6	61.0	2943.3	76.3	3531.9	91.5	114.0	10		
63 (2 1/2")	38 (1 1/2")	76	IMD063076	312.0	4742.4	15.2	5928.0	19.0	7113.6	22.8	28.0	25
		89	IMD063089	260.0	4628.0	17.8	5785.0	22.3	6942.0	26.7	33.0	25
		102	IMD063102	221.0	4508.4	20.4	5635.5	25.5	6762.6	30.6	38.0	25
		115	IMD063115	187.0	4301.0	23.0	5376.3	28.8	6451.5	34.5	43.0	10
		127	IMD063127	168.0	4267.2	25.4	5334.0	31.8	6400.8	38.1	48.0	10
		152	IMD063152	136.0	4134.4	30.4	5168.0	38.0	6201.6	45.6	57.0	10
		178	IMD063178	114.0	4058.4	35.6	5073.0	44.5	6087.6	53.4	67.0	10
		203	IMD063203	100.0	4060.0	40.6	5075.0	50.8	6090.0	60.9	76.0	10
		229	IMD063229	89.2	4085.4	45.8	5106.7	57.3	6128.0	68.7	86.0	10
		254	IMD063254	78.4	3982.7	50.8	4978.4	63.5	5974.1	76.2	95.0	10
305	IMD063305	64.7	3946.7	61.0	4933.4	76.3	5920.1	91.5	114.0	10		

*Tabulated deflections values shown represent compressed lengths near solid and are for design information only.

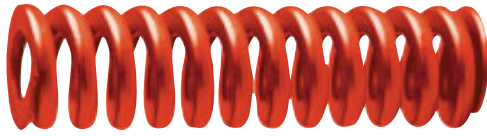


MM x .039837 = INCHES
 KG X 2.20463= LBS.

Associated Spring Raymond 

HEAVY DUTY DIE SPRINGS • METRIC					ISO SPECIFICATION SERIES						RED	
Hole Dia. (mm)	Rod Dia. (mm)	Free Length (mm)	PART NUMBER	Load at 1mm Def. (N)	LOAD DEFLECTION TABLE							
					For Long Life (15% of free length)		For Long Life (20% of free length)		*Maximum Operating Def. (25% of free length)		Maximum Deflection	Number Box
					Load (N)	Deflection mm	Load (N)	Deflection mm	Load (N)	Deflection mm		
A	B	C										
10 (3/8")	5 (3/16")	25	IHD010025	22.1	82.9	3.8	110.5	5.0	138.1	6.3	7.5	200
		32	IHD010032	17.5	84.0	4.8	112.0	6.4	140.0	8.0	9.6	200
		38	IHD010038	17.1	97.5	5.7	130.0	7.6	162.5	9.5	11.4	100
		44	IHD010044	15.0	99.0	6.6	132.0	8.8	165.0	11.0	13.2	100
		51	IHD010051	12.8	97.9	7.7	130.6	10.2	163.2	12.8	15.3	100
		64	IHD010064	10.7	102.7	9.6	137.0	12.8	171.2	16.0	19.2	100
		76	IHD010076	7.5	85.5	11.4	114.0	15.2	142.5	19.0	22.8	100
		305	IHD010305	2.1	96.1	45.8	128.1	61.0	160.1	76.3	91.5	50
12.5 (1/2")	6.3 (9/32")	25	IHD012025	42.1	157.9	3.8	210.5	5.0	263.1	6.3	7.5	100
		32	IHD012032	33.2	159.4	4.8	212.5	6.4	265.6	8.0	9.6	100
		38	IHD012038	29.3	167.0	5.7	222.7	7.6	278.4	9.5	11.4	100
		44	IHD012044	24.6	162.4	6.6	216.5	8.8	270.6	11.0	13.2	100
		51	IHD012051	19.6	149.9	7.7	199.9	10.2	249.9	12.8	15.3	100
		64	IHD012064	15.0	144.0	9.6	192.0	12.8	240.0	16.0	19.2	50
		76	IHD012076	13.2	150.5	11.4	200.6	15.2	250.8	19.0	22.8	50
		89	IHD012089	11.4	152.2	13.4	202.9	17.8	253.7	22.3	26.7	50
305	IHD012305	2.8	128.1	45.8	170.8	61.0	213.5	76.3	91.5	50		
16 (5/8")	8 (11/32")	25	IHD016025	75.7	283.9	3.8	378.5	5.0	473.1	6.3	7.5	100
		32	IHD016032	52.8	253.4	4.8	337.9	6.4	422.4	8.0	9.6	100
		38	IHD016038	48.5	276.5	5.7	368.6	7.6	460.8	9.5	11.4	50
		44	IHD016044	42.8	282.5	6.6	376.6	8.8	470.8	11.0	13.2	50
		51	IHD016051	37.1	283.8	7.7	378.4	10.2	473.0	12.8	15.3	50
		64	IHD016064	30.3	290.9	9.6	387.8	12.8	484.8	16.0	19.2	50
		76	IHD016076	25.7	293.0	11.4	390.6	15.2	488.3	19.0	22.8	50
		89	IHD016089	21.7	289.7	13.4	386.3	17.8	482.8	22.3	26.7	50
102	IHD016102	19.3	295.3	15.3	393.7	20.4	492.2	25.5	30.6	50		
305	IHD016305	7.1	324.8	45.8	433.1	61.0	541.4	76.3	91.5	50		
20 (3/4")	10 (3/8")	25	IHD020025	216.0	810.0	3.8	1080.0	5.0	1350.0	6.3	7.5	50
		32	IHD020032	168.0	806.4	4.8	1075.2	6.4	1344.0	8.0	9.6	50
		38	IHD020038	129.0	735.3	5.7	980.4	7.6	1225.5	9.5	11.0	50
		44	IHD020044	112.0	739.2	6.6	985.6	8.8	1232.0	11.0	13.0	50
		51	IHD020051	94.0	719.1	7.7	958.8	10.2	1198.5	12.8	15.0	50
		64	IHD020064	72.1	692.2	9.6	922.9	12.8	1153.6	16.0	19.0	50
		76	IHD020076	59.7	680.6	11.4	907.4	15.2	1134.3	19.0	23.0	50
		89	IHD020089	50.5	674.2	13.4	898.9	17.8	1123.6	22.3	27.0	50
		102	IHD020102	44.2	676.3	15.3	901.7	20.4	1127.1	25.5	31.0	50
		115	IHD020115	38.4	662.4	17.3	883.2	23.0	1104.0	28.8	35.0	50
		127	IHD020127	34.1	649.6	19.1	866.1	25.4	1082.7	31.8	38.0	50
		139	IHD020139	31.0	646.4	20.9	861.8	27.8	1077.3	34.8	42.0	50
		152	IHD020152	28.2	643.0	22.8	857.3	30.4	1071.6	38.0	46.0	50
305	IHD020305	15.0	686.3	45.8	915.0	61.0	1143.8	76.3	91.0	50		
25 (1")	12.5 (1/2")	25	IHD025025	375.0	1406.3	3.8	1875.0	5.0	2343.8	6.3	7.5	50
		32	IHD025032	297.0	1425.6	4.8	1900.8	6.4	2376.0	8.0	9.6	50
		38	IHD025038	219.0	1248.3	5.7	1664.4	7.6	2080.5	9.5	11.0	50
		44	IHD025044	187.0	1234.2	6.6	1645.6	8.8	2057.0	11.0	13.0	50
		51	IHD025051	156.0	1193.4	7.7	1591.2	10.2	1989.0	12.8	15.0	50
		64	IHD025064	123.0	1180.8	9.6	1574.4	12.8	1968.0	16.0	19.0	50
		76	IHD025076	99.0	1128.6	11.4	1504.8	15.2	1881.0	19.0	23.0	25

*Tabulated deflections values shown represent compressed lengths near solid and are for design information only.

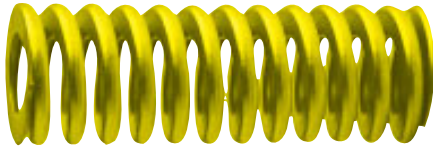


MM x .039837 = INCHES
 KG X 2.20463= LBS.

Associated Spring
 Raymond 

HEAVY DUTY DIE SPRING • METRIC					ISO SPECIFICATION SERIES						RED	
Hole Dia. (mm)	Rod Dia. (mm)	Free Length (mm)	PART NUMBER	Load at 1mm Def. (N)	LOAD DEFLECTION TABLE						Maximum Deflection	Number Box
					For Long Life (15% of free length)		For Long Life (20% of free length)		*Maximum Operating Def. (25% of free length)			
					Load (N)	Deflection mm	Load (N)	Deflection mm	Load (N)	Deflection mm		
A	B	C										
25 (1")	12.5 (1/2")	89	IHD025089	84.0	1121.4	13.4	1495.2	17.8	1869.0	22.3	27.0	25
		102	IHD025102	73.0	1116.9	15.3	1489.2	20.4	1861.5	25.5	31.0	25
		115	IHD025115	65.0	1121.3	17.3	1495.0	23.0	1868.8	28.8	35.0	25
		127	IHD025127	57.7	1099.2	19.1	1465.6	25.4	1832.0	31.8	38.0	25
		139	IHD025139	52.7	1098.8	20.9	1465.1	27.8	1831.3	34.8	42.0	25
		152	IHD025152	47.8	1089.8	22.8	1453.1	30.4	1816.4	38.0	46.0	25
		178	IHD025178	41.0	1094.7	26.7	1459.6	35.6	1824.5	44.5	53.0	25
		203	IHD025203	35.8	1090.1	30.5	1453.5	40.6	1816.9	50.8	61.0	25
		305	IHD025305	22.9	1047.7	45.8	1396.9	61.0	1746.1	76.3	91.0	25
32 (1 1/4")	16 (5/8")	38	IHD032038	388.0	2211.6	5.7	2948.8	7.6	3686.0	9.5	11.0	50
		44	IHD032044	324.0	2138.4	6.6	2851.2	8.8	3564.0	11.0	13.0	50
		51	IHD032051	272.0	2080.8	7.7	2774.4	10.2	3468.0	12.8	15.0	50
		64	IHD032064	212.0	2035.2	9.6	2713.6	12.8	3392.0	16.0	19.0	25
		76	IHD032076	172.0	1960.8	11.4	2614.4	15.2	3268.0	19.0	23.0	25
		89	IHD032089	141.0	1882.4	13.4	2509.8	17.8	3137.3	22.3	27.0	25
		102	IHD032102	122.0	1866.6	15.3	2488.8	20.4	3111.0	25.5	31.0	25
		115	IHD032115	107.0	1845.8	17.3	2461.0	23.0	3076.3	28.8	35.0	25
		127	IHD032127	93.0	1771.7	19.1	2362.2	25.4	2952.8	31.8	38.0	25
		139	IHD032139	86.0	1793.1	20.9	2390.8	27.8	2988.5	34.8	42.0	25
		152	IHD032152	78.0	1778.4	22.8	2371.2	30.4	2964.0	38.0	46.0	25
		178	IHD032178	67.2	1794.2	26.7	2392.3	35.6	2990.4	44.5	53.0	25
		203	IHD032203	59.1	1799.6	30.5	2399.5	40.6	2999.3	50.8	61.0	25
		254	IHD032254	46.4	1767.8	38.1	2357.1	50.8	2946.4	63.5	76.0	25
305	IHD032305	38.0	1738.5	45.8	2318.0	61.0	2897.5	76.3	91.0	25		
40 (1 1/2")	20 (3/4")	51	IHD040051	350.0	2677.5	7.7	3570.0	10.2	4462.5	12.8	15.0	25
		64	IHD040064	269.0	2582.4	9.6	3443.2	12.8	4304.0	16.0	19.0	25
		76	IHD040076	219.0	2496.6	11.4	3328.8	15.2	4161.0	19.0	23.0	25
		89	IHD040089	190.0	2536.5	13.4	3382.0	17.8	4227.5	22.3	27.0	25
		102	IHD040102	163.0	2493.9	15.3	3325.2	20.4	4156.5	25.5	31.0	25
		115	IHD040115	142.0	2449.5	17.3	3266.0	23.0	4082.5	28.8	35.0	25
		127	IHD040127	128.0	2438.4	19.1	3251.2	25.4	4064.0	31.8	38.0	25
		139	IHD040139	115.0	2397.8	20.9	3197.0	27.8	3996.3	34.8	42.0	25
		152	IHD040152	105.0	2394.0	22.8	3192.0	30.4	3990.0	38.0	46.0	25
		178	IHD040178	89.0	2376.3	26.7	3168.4	35.6	3960.5	44.5	53.0	25
		203	IHD040203	77.0	2344.7	30.5	3126.2	40.6	3907.8	50.8	61.0	25
		254	IHD040254	61.0	2324.1	38.1	3098.8	50.8	3873.5	63.5	76.0	25
305	IHD040305	51.0	2333.3	45.8	3111.0	61.0	3888.8	76.3	91.0	25		
50 (2")	25 (1")	64	IHD050064	413.0	3964.8	9.6	5286.4	12.8	6608.0	16.0	19.0	25
		76	IHD050076	339.0	3864.6	11.4	5152.8	15.2	6441.0	19.0	23.0	25
		89	IHD050089	288.0	3844.8	13.4	5126.4	17.8	6408.0	22.3	27.0	25
		102	IHD050102	245.0	3748.5	15.3	4998.0	20.4	6247.5	25.5	31.0	25
		115	IHD050115	215.0	3708.8	17.3	4945.0	23.0	6181.3	28.8	35.0	25
		127	IHD050127	192.0	3657.6	19.1	4876.8	25.4	6096.0	31.8	38.0	25
		139	IHD050139	168.0	3502.8	20.9	4670.4	27.8	5838.0	34.8	42.0	25
		152	IHD050152	154.0	3511.2	22.8	4681.6	30.4	5852.0	38.0	46.0	25
		178	IHD050178	134.0	3577.8	26.7	4770.4	35.6	5963.0	44.5	53.0	25
		203	IHD050203	117.0	3562.7	30.5	4750.2	40.6	5937.8	50.8	61.0	10
		254	IHD050254	89.0	3390.9	38.1	4521.2	50.8	5651.5	63.5	76.0	10
305	IHD050305	73.0	3339.8	45.8	4453.0	61.0	5566.3	76.3	91.0	10		

*Tabulated deflections values shown represent compressed lengths near solid and are for design information only.

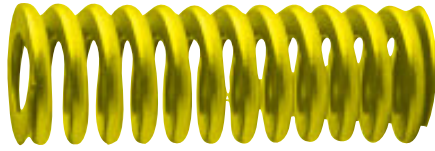


MM x .039837 = INCHES
 KG X 2.20463= LBS.

Associated Spring Raymond 

EXTRA HEAVY DUTY DIE SPRINGS • METRIC ISO SPECIFICATION SERIES YELLOW												
Hole Dia. (mm)	Rod Dia. (mm)	Free Length (mm)	PART NUMBER	Load at 1mm Def. (N)	LOAD DEFLECTION TABLE						Maximum Deflection	Number Box
					For Long Life (15% of free length)		For Long Life (17% of free length)		*Maximum Operating Def. (20% of free length)			
					Load (N)	Deflection mm	Load (N)	Deflection mm	Load (N)	Deflection mm		
A	B	C										
10 (3/8")	5 (3/16")	25	IXD010025	36.8	138.0	3.8	156.4	4.3	184.0	5.0	6.2	200
		32	IXD010032	27.9	133.9	4.8	151.8	5.4	178.6	6.4	8.0	200
		38	IXD010038	23.7	135.1	5.7	153.1	6.5	180.1	7.6	9.5	100
		44	IXD010044	19.2	126.7	6.6	143.6	7.5	169.0	8.8	11.0	100
		51	IXD010051	16.5	126.2	7.7	143.1	8.7	168.3	10.2	13.0	100
		64	IXD010064	13.2	126.7	9.6	143.6	10.9	169.0	12.8	16.0	100
		76	IXD010076	10.9	124.3	11.4	140.8	12.9	165.7	15.2	19.0	100
		305	IXD010305	2.6	119.0	45.8	134.8	51.9	158.6	61.0	76.0	50
12.5 (1/2")	6.3 (9/32")	25	IXD012025	58.5	219.4	3.8	248.6	4.3	292.5	5.0	6.2	100
		32	IXD012032	43.9	210.7	4.8	238.8	5.4	281.0	6.4	8.0	100
		38	IXD012038	36.0	205.2	5.7	232.6	6.5	273.6	7.6	9.5	100
		44	IXD012044	30.3	200.0	6.6	226.6	7.5	266.6	8.8	11.0	100
		51	IXD012051	26.2	200.4	7.7	227.2	8.7	267.2	10.2	13.0	100
		64	IXD012064	21.2	203.5	9.6	230.7	10.9	271.4	12.8	16.0	50
		76	IXD012076	17.1	194.9	11.4	220.9	12.9	259.9	15.2	19.0	50
		89	IXD012089	14.5	193.6	13.4	219.4	15.1	258.1	17.8	22.0	50
		305	IXD012305	4.3	196.7	45.8	223.0	51.9	262.3	61.0	76.0	50
16 (5/8")	8 (11/32")	25	IXD016025	118.0	442.5	3.8	501.5	4.3	590.0	5.0	6.2	100
		32	IXD016032	89.0	427.2	4.8	484.2	5.4	569.6	6.4	8.0	50
		38	IXD016038	72.1	411.0	5.7	465.8	6.5	548.0	7.6	9.5	50
		44	IXD016044	60.9	401.9	6.6	455.5	7.5	535.9	8.8	11.0	50
		51	IXD016051	52.3	400.1	7.7	453.4	8.7	533.5	10.2	13.0	50
		64	IXD016064	41.2	395.5	9.6	448.3	10.9	527.4	12.8	16.0	50
		76	IXD016076	34.1	388.7	11.4	440.6	12.9	518.3	15.2	19.0	50
		89	IXD016089	29.5	393.8	13.4	446.3	15.1	525.1	17.8	22.0	50
		102	IXD016102	25.6	391.7	15.3	443.9	17.3	522.2	20.4	26.0	50
		305	IHD016305	8.4	384.3	45.8	435.5	51.9	512.4	61.0	76.0	50
20 (3/4")	10 (3/8")	25	IXD020025	293.0	1098.8	3.8	1245.3	4.3	1465.0	5.0	6.2	50
		32	IXD020032	224.0	1075.2	4.8	1218.6	5.4	1433.6	6.4	8.0	50
		38	IXD020038	177.0	1008.9	5.7	1143.4	6.5	1345.2	7.6	9.5	50
		44	IXD020044	149.0	983.4	6.6	1114.5	7.5	1311.2	8.8	11.0	50
		51	IXD020051	128.0	979.2	7.7	1109.8	8.7	1305.6	10.2	13.0	50
		64	IXD020064	99.0	950.4	9.6	1077.1	10.9	1267.2	12.8	16.0	50
		76	IXD020076	81.7	931.4	11.4	1055.6	12.9	1241.8	15.2	19.0	50
		89	IXD020089	69.5	927.8	13.4	1051.5	15.1	1237.1	17.8	22.0	50
		102	IXD020102	60.6	927.2	15.3	1050.8	17.3	1236.2	20.4	26.0	50
		115	IXD020115	53.0	914.3	17.3	1036.2	19.6	1219.0	23.0	29.0	50
		127	IXD020127	47.5	904.9	19.1	1025.5	21.6	1206.5	25.4	32.0	50
		139	IXD020139	43.0	896.6	20.9	1016.1	23.6	1195.4	27.8	35.0	50
		152	IXD020152	39.0	889.2	22.8	1007.8	25.8	1185.6	30.4	38.0	50
305	IXD020305	21.2	969.9	45.8	1099.2	51.9	1293.2	61.0	76.0	50		
25 (1")	12.5 (1/2")	32	IXD025032	374.4	1797.1	4.8	2036.7	5.4	2396.2	6.4	8.0	50
		38	IXD025038	346.0	1972.2	5.7	2235.2	6.5	2629.6	7.6	9.5	50
		44	IXD025044	244.0	1610.4	6.6	1825.1	7.5	2147.2	8.8	11.0	50
		51	IXD025051	207.5	1587.4	7.7	1799.0	8.7	2116.5	10.2	13.0	50
		64	IXD025064	161.0	1545.6	9.6	1751.7	10.9	2060.8	12.8	16.0	50
		76	IXD025076	130.8	1491.1	11.4	1689.9	12.9	1988.2	15.2	19.0	25
		89	IXD025089	110.5	1475.2	13.4	1671.9	15.1	1966.9	17.8	22.0	25

* Tabulated deflections values shown represent compressed lengths near solid and are for design information only.



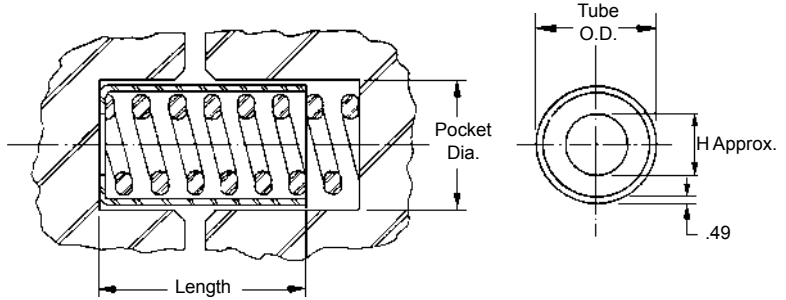
MM x .039837 = INCHES
 KG X 2.20463= LBS.

Associated Spring
 Raymond 

EXTRA HEAVY DUTY DIE SPRINGS • METRIC ISO SPECIFICATION SERIES YELLOW												
Hole Dia. (mm)	Rod Dia. (mm)	Free Length (mm)	PART NUMBER	Load at 1mm Def. (N)	LOAD DEFLECTION TABLE						Maximum Deflection	Number Box
					For Long Life (15% of free length)		For Long Life (17% of free length)		*Maximum Operating Def. (20% of free length)			
					Load (N)	Deflection mm	Load (N)	Deflection mm	Load (N)	Deflection mm		
A	B	C										
25 (1")	12.5 (1/2")	102	IXD025102	96.3	1473.4	15.3	1669.8	17.3	1964.5	20.4	26.0	25
		115	IXD025115	85.7	1478.3	17.3	1675.4	19.6	1971.1	23.0	29.0	25
		127	IXD025127	76.3	1453.5	19.1	1647.3	21.6	1938.0	25.4	32.0	25
		152	IXD025152	63.5	1447.8	22.8	1640.8	25.8	1930.4	30.4	38.0	25
		178	IXD025178	53.9	1439.1	26.7	1631.0	30.3	1918.8	35.6	44.0	25
		203	IXD025203	47.0	1431.2	30.5	1622.0	34.5	1908.2	40.6	51.0	25
		305	IXD025305	30.9	1413.7	45.8	1602.2	51.9	1884.9	61.0	76.0	25
32 (1 1/4")	16 (5/8")	38	IXD032038	528.2	3010.7	5.7	3412.2	6.5	4014.3	7.6	9.5	50
		44	IXD032044	424.4	2801.0	6.6	3174.5	7.5	3734.7	8.8	11.0	25
		51	IXD032051	353.0	2700.5	7.7	3060.5	8.7	3600.6	10.2	13.0	25
		64	IXD032064	269.2	2584.3	9.6	2928.9	10.9	3445.8	12.8	16.0	25
		76	IXD032076	218.5	2490.9	11.4	2823.0	12.9	3321.2	15.2	19.0	25
		89	IXD032089	180.3	2407.0	13.4	2727.9	15.1	3209.3	17.8	22.0	25
		102	IXD032102	155.0	2371.5	15.3	2687.7	17.3	3162.0	20.4	26.0	25
		115	IXD032115	140.0	2415.0	17.3	2737.0	19.6	3220.0	23.0	29.0	25
		127	IXD032127	124.0	2362.2	19.1	2677.2	21.6	3149.6	25.4	32.0	25
		152	IXD032152	102.0	2325.6	22.8	2635.7	25.8	3100.8	30.4	38.0	25
		178	IXD032178	88.2	2354.9	26.7	2668.9	30.3	3139.9	35.6	44.0	25
		203	IXD032203	76.0	2314.2	30.5	2622.8	34.5	3085.6	40.6	51.0	25
		254	IXD032254	60.8	2316.5	38.1	2625.3	43.2	3088.6	50.8	64.0	25
305	IXD032305	49.0	2241.8	45.8	2540.7	51.9	2989.0	61.0	76.0	25		
40 (1 1/2")	20 (3/4")	51	IXD040051	628.0	4804.2	7.7	5444.8	8.7	6405.6	10.2	13.0	25
		64	IXD040064	487.0	4675.2	9.6	5298.6	10.9	6233.6	12.8	16.0	25
		76	IXD040076	379.0	4320.6	11.4	4896.7	12.9	5760.8	15.2	19.0	25
		89	IXD040089	321.0	4285.4	13.4	4856.7	15.1	5713.8	17.8	22.0	25
		102	IXD040102	281.0	4299.3	15.3	4872.5	17.3	5732.4	20.4	26.0	25
		115	IXD040115	245.0	4226.3	17.3	4789.8	19.6	5635.0	23.0	29.0	25
		127	IXD040127	221.0	4210.1	19.1	4771.4	21.6	5613.4	25.4	32.0	25
		152	IXD040152	168.0	3830.4	22.8	4341.1	25.8	5107.2	30.4	38.0	25
		203	IXD040203	132.0	4019.4	30.5	4555.3	34.5	5359.2	40.6	51.0	25
		254	IXD040254	107.0	4076.7	38.1	4620.3	43.2	5435.6	50.8	64.0	25
305	IXD040305	87.8	4016.9	45.8	4552.4	51.9	5355.8	61.0	76.0	25		
50 (2")	25 (1")	64	IXD050064	709.0	6806.4	9.6	7713.9	10.9	9075.2	12.8	16.0	25
		76	IXD050076	572.0	6520.8	11.4	7390.2	12.9	8694.4	15.2	19.0	25
		89	IXD050089	475.0	6341.3	13.4	7186.8	15.1	8455.0	17.8	22.0	25
		102	IXD050102	405.0	6196.5	15.3	7022.7	17.3	8262.0	20.4	26.0	25
		115	IXD050115	352.0	6072.0	17.3	6881.6	19.6	8096.0	23.0	29.0	25
		127	IXD050127	316.0	6019.8	19.1	6822.4	21.6	8026.4	25.4	32.0	25
		152	IXD050152	239.0	5449.2	22.8	6175.8	25.8	7265.6	30.4	38.0	25
		203	IXD050203	187.0	5694.2	30.5	6453.4	34.5	7592.2	40.6	51.0	10
		254	IXD050254	153.0	5829.3	38.1	6606.5	43.2	7772.4	50.8	64.0	10
305	IXD050305	127.0	5810.3	45.8	6585.0	51.9	7747.0	61.0	76.0	10		

* Tabulated deflections values shown represent compressed lengths near solid and are for design information only.

SPRING CAGES



SPRING O.D.	POCKET DIA.	TUBE O.D.	H DIA.
3/4	29/32	.855	7/16
1	1-5/32	1.105	9/16
1-1/4	1-13/32	1.355	3/4
1-1/2	1-21/32	1.605	31/32
2	2-5/32	2.105	1-3/8

3/4 SPRING		1" SPRING		1-1/4" SPRING		1-1/2" SPRING		2" SPRING	
Part #	Length	Part #	Length	Part #	Length	Part #	Length	Part #	Length
LSC0608	1.00	LSC0808	1.00	LSC1008	1.00	LSC1208	1.00	LSC1608	1.00
LSC0610	1.25	LSC0810	1.25	LSC1010	1.25	LSC1210	1.25	LSC1610	1.25
LSC0612	1.50	LSC0812	1.50	LSC1012	1.50	LSC1212	1.50	LSC1612	1.50
LSC0614	1.75	LSC0814	1.75	LSC1014	1.75	LSC1214	1.75	LSC1614	1.75
LSC0616	2.00	LSC0816	2.00	LSC1016	2.00	LSC1216	2.00	LSC1616	2.00
LSC0618	2.25	LSC0818	2.25	LSC1018	2.25	LSC1218	2.25	LSC1618	2.25
LSC0620	2.50	LSC0820	2.50	LSC1020	2.50	LSC1220	2.50	LSC1620	2.50
LSC0622	2.75	LSC0822	2.75	LSC1022	2.75	LSC1222	2.75	LSC1622	2.75
LSC0624	3.00	LSC0824	3.00	LSC1024	3.00	LSC1224	3.00	LSC1624	3.00
LSC0626	3.25	LSC0826	3.25	LSC1026	3.25	LSC1226	3.25	LSC1626	3.25
LSC0628	3.50	LSC0828	3.50	LSC1028	3.50	LSC1228	3.50	LSC1628	3.50
LSC0630	3.75	LSC0830	3.75	LSC1030	3.75	LSC1230	3.75	LSC1630	3.75
LSC0632	4.00	LSC0832	4.00	LSC1032	4.00	LSC1232	4.00	LSC1632	4.00
LSC0634	4.25	LSC0834	4.25	LSC1034	4.25	LSC1234	4.25	LSC1634	4.25
LSC0636	4.50	LSC0836	4.50	LSC1036	4.50	LSC1236	4.50	LSC1636	4.50
LSC0638	4.75	LSC0838	4.75	LSC1038	4.75	LSC1238	4.75	LSC1638	4.75
LSC0640	5.00	LSC0840	5.00	LSC1040	5.00	LSC1240	5.00	LSC1640	5.00
LSC0644	5.50	LSC0844	5.50	LSC1044	5.50	LSC1244	5.50	LSC1644	5.50
LSC0648	6.00	LSC0848	6.00	LSC1048	6.00	LSC1248	6.00	LSC1648	6.00
LSC0652	6.50	LSC0852	6.50	LSC1052	6.50	LSC1252	6.50	LSC1652	6.50
LSC0656	7.00	LSC0856	7.00	LSC1056	7.00	LSC1256	7.00	LSC1656	7.00
LSC0664	8.00	LSC0864	8.00	LSC1064	8.00	LSC1264	8.00	LSC1664	8.00
LSC0672	9.00	LSC0872	9.00	LSC1072	9.00	LSC1272	9.00	LSC1672	9.00
LSC0680	10.00	LSC0880	10.00	LSC1080	10.00	LSC1280	10.00	LSC1680	10.00
								LSC1688	11.00
								LSC1696	12.00

Spring cages are a natural addition to the Lamina spring collection.

They are in stock and ready to ship.

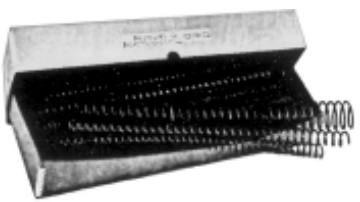


UTILITY SPRINGS

MM x .039837 = INCHES
 KG X 2.20463 = LBS.

ROUND WIRE DIE • FIXTURE SPRINGS													
10 & 18 INCH LENGTHS • PLAIN ENDS													
MUSIC WIRE • 10" LENGTHS							CARBON STEEL • 18" LENGTHS						
O.D. Inches	Part No.	Max. Rod Dia.	Wire Dia.	Coils Per Inch	Pounds Per Inch of Compression	No. Per Box	O.D. Inches	Part No.	Max. Rod Dia.	Wire Dia.	Coils Per Inch	Pounds Per Inch of Compression	No. Per Box
.087	RW-1	.062	.010	28	.135	12	.487	RW-9	.391	.041	4.5	.6	12
.089	RW-1A	.062	.014	28.5	.6	12	.493	RW-9A	.375	.054	4	2.1	12
.116	RW-2	.092	.012	25	.11	12	.520	RW-9B	.375	.062	5.75	2.0	12
.120	RW-2A	.078	.016	25	.4	12	.532	RW-9C	.375	.072	4	5.25	12
.176	RW-3	.141	.014	14	.1	12	.612	RW-10	.500	.054	3	1.31	12
.180	RW-3A	.141	.018	14	.3	12	.678	RW-10A	.531	.062	3	1.9	12
.180	RW-3B	.125	.026	13	1.95	12	.676	RW-10B	.531	.072	3.25	3.25	12
.178	RW-3C	.094	.035	19	5.6	12	.675	RW-10C	.531	.068	3.5	2.5	12
.240	RW-4	.188	.018	9.5	.31	12	.805	RW-11	.672	.062	2.5	1.3	12
.238	RW-4A	.188	.022	11	.26	12	.805	RW-11A	.625	.080	2.5	3.5	12
.241	RW-4B	.188	.026	9.5	.78	12	.865	RW-11B	.656	.098	2.25	8.0	12
.248	RW-4C	.171	.031	10	1.6	12	.922	RW-11C	.640	.125	2.75	15.0	12
.242	RW-4D	.171	.035	13	2.3	12	.921	RW-12A	.750	.080	2.5	2.1	12
.238	RW-4E	.141	.041	9	6.25	12	.975	RW-12B	.781	.098	2	5.75	6
.243	RW-4F	.141	.047	10	11.0	12	1.020	RW-13	.844	.085	2.25	2.1	6
.302	RW-5	.250	.022	10	.175	12	1.020	RW-12C	.750	.125	2	13.5	6
.304	RW-5A	.234	.031	11	.65	12	1.100	RW-12	.828	.125	2.75	7.75	6
.304	RW-5B	.219	.037	11	1.5	12	1.055	RW-12D	.765	.135	3	11.0	6
.303	RW-5C	.219	.041	8	3.25	12	1.145	RW-13A	.890	.125	2	9.0	6
.305	RW-5D	.203	.047	7.5	6.5	12	1.145	RW-14	.953	.090	1.75	2.5	6
.302	RW-5E	.185	.055	8	12.5	12	1.343	RW-14A	1.031	.148	1.75	14.0	6
.366	RW-6	.304	.031	11	.57	12	1.591	RW-15	1.281	.148	1.5	8.75	6
.361	RW-6A	.281	.035	10	.675	12	1.820	RW-16	1.500	.148	1.75	5.0	6
.365	RW-6B	.266	.043	7	2.15	12							
.368	RW-6C	.266	.047	8.5	2.8	12							
.365	RW-6D	.250	.055	6	8.2	12							
.365	RW-6E	.234	.062	6.5	13.0	12							
.368	RW-6F	.203	.075	7	28.0	12							
.426	RW-7	.344	.035	7	.55	12							
.425	RW-7A	.328	.047	7	2.0	12							
.425	RW-7B	.297	.055	6	4.7	12							
.427	RW-7C	.281	.062	6.5	7.4	12							
.429	RW-7D	.266	.075	5.5	20.0	12							
.430	*RW-7E	.250	.085	6	35.0	12							
.488	RW-8	.406	.035	9	.28	12							
.488	RW-8A	.391	.047	7.5	1.2	12							
.495	RW-8B	.375	.055	7	2.5	12							
.492	RW-8C	.360	.062	4	7.4	12							
.490	RW-8D	.325	.075	4.5	15.0	12							
.495	*RW-8E	.310	.091	5	33.0	12							
.500	*RW-8F	.270	.115	5.5	95.0	12							

Compression Spring Assortment
111-850 (R50)
 ASSORTMENT CONSISTS OF
 1 EACH OF THE 18" LONG
 SPRINGS



FORMULA TO CALCULATE LBS. PER INCH
 FOR ALL ALTERED SPRINGS

$$\frac{A \times B}{C} = D$$

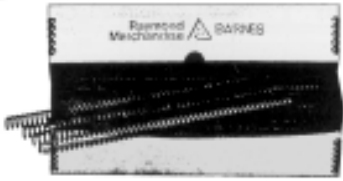
A = Catalog Free Length
 B = Rate in lbs. Per Inch, Per "A"
 C = Req'd Cut Free Length
 D = Lbs. Per Inch of Req'd Free Length

*Indicates carbon steel; All other items music wire

COMPRESSION SPRING

11-845 (R-45)

ASSORTMENT
 CONSISTS OF
 2 EACH OF
 ABOVE 10"
 LONG SPRINGS



UTILITY SPRINGS

IN STOCK



COMPRESSION SPRINGS • STEEL FIXTURE								
INCHES X 25.4 = mm			LBS. X .454 = KG					
O.D. Inches	MAX. Rod Dia.	Length Inches	Part Number	Wire Dia.	Comp. Rate Per Inch Lbs.	Total Coils	Type of Ends	No. Per Box.
.078	.047	.53	020-074 (G-74)	.012	4.87	17	Plain	12
.078	.047	.56	020-073 (G-73)	.011	3.87	18	Plain	12
.108	.062	.81	020-076 (G-76)	.018	12.50	16	Plain	12
.110	.062	.91	020-075 (G-75)	.018	9.25	22	Plain	12
.120	.078	.62	020-0125 (G-125)	.016	6.60	13	Squared	25
.120	.075	.75	020-126 (G-126)	.016	5.30	18	Squared	25
.170	.141	.21	020-077 (G-77)	.012	.75	7	Plain	12
.178	.141	10.00	020-056 (G-56)	.014	.03	138	Plain	12
.180	.125	.75	020-127 (G-127)	.022	8.60	11	Squared	25
.180	.125	1.00	020-128 (G-128)	.022	6.80	14	Squared	25
.180	.125	1.12	020-129	.022	6.00	15	Squared	25
.180	.125	1.25	020-130	.022	5.30	17	Squared	25
.185	.156	.93	020-084 (G-84)	.012	.03	19	Plain	12
.240	.188	10.00	020-055 (G-55)	.022	.25	112	Plain	12
.240	.172	1.00	020-131	.026	7.80	11	Squared	25
.240	.172	1.25	020-132	.026	6.10	14	Squared	25
.240	.172	1.50	020-133	.026	5.10	15	Squared	25
.280	.188	1.25	020-080 (G-80)	.040	18.00	15	Plain	12
.281	.234	2.06	020-098 (G-98)	.020	.25	5	Squared	12
.282	.188	1.31	020-079 (G-79)	.040	17.00	13	Plain	12
.300	.250	10.00	020-054 (G-54)	.022	.03	101	Squared	12
.313	.250	.87	020-085 (G-85)	.0254 Ph. Bronze	2.25	7	Squared	12
.315	.266	1.96	020-081 (G-81)	.022	.56	23.5	Squared	12
.315	.250	2.43	020-083 (G-83)	.0285 Brass	.87	23	Squared	12
.325	.250	2.43	020-082 (G-82)	.032 Brass	1.31	23	Squared	12
.340	.250	2.50	107-103 (WA-103)	.042	8.00	24	Sq. & Gr.	12
.345	.250	1.00	107-100 (WA-100)	.042	20.00	10.5	Sq. & Gr.	12
.345	.250	1.50	107-101 (WA-101)	.042	14.00	15	Sq. & Gr.	12
.345	.250	2.00	107-102 (WA-102)	.042	12.00	19.5	Sq. & Gr.	12
.350	.250	3.00	107-104 (WA-104)	.042	6.00	29	Sq. & Gr.	12
.360	.281	1.50	020-134	.035	7.30	10	Squared	25
.360	.281	1.75	020-135	.035	6.20	11	Squared	25
.360	.281	2.00	020-136	.035	5.40	13	Squared	25
.360	.250	12.00	020-053 (G-53)	.0475	2.25	92	Plain	12
.369	.281	.78	020-086 (G-86)	.042 Brass	7.37	9	Sq. & Gr	12
.375	.266	11.50	020-052 (G-52)	.0475	2.25	88	Plain	12
.380	.250	2.12	020-094 (G-94)	.063	42.00	18.5	Sq. & Gr	12
.385	.281	2.03	020-088 (G-88)	.0475	11.00	19	Sq. & Gr	12
.440	.328	2.00	020-093 (G-93)	.054	13.00	17	Squared	12
.440	.344	2.56	020-071 (G-71)	.041	2.62	26	Squared	12
.440	.328	2.62	020-089 (G-89)	.0475	6.00	20	Sq. & Gr	12
.460	.328	2.00	107-107 (WA-107)	.062	32.00	14.5	Sq. & Gr	12
.465	.344	2.50	020-090 (G-90)	.054	12.00	17	Sq. & Gr	12
.465	.328	1.50	107-106 (WA-106)	.062	42.00	11	Sq. & Gr	12
.465	.328	2.50	107-108 (WA-108)	.062	25.00	17	Sq. & Gr	12
.465	.328	3.00	107-109 (WA-109)	.062	24.00	20	Sq. & Gr	12
.470	.328	1.00	107-105 (WA-105)	.062	58.00	8	Sq. & Gr	12
.473	.344	3.50	107-110 (WA-110)	.062	18.00	24	Sq. & Gr	12
.495	.360	2.50	020-091 (G-91)	.0625	18.00	16	Sq. & Gr	12
.500	.344	.96	020-060 (G-60)	.072 Ph. Brass	52.00	6.5	Sq. & Gr	12
.505	.406	2.06	020-092 (G-92)	.048	5.50	16	Squared	12
.518	.375	12.00	020-051 (G-51)	.0625	2.75	73	Plain	12
.532	.313	1.03	020-059 (G-59)	.1055	210.00	7	Sq. & Gr	12
.575	.484	2.15	020-069 (G-69)	.041	3.12	8.5	Squared	12

UTILITY SPRINGS

IN STOCK



COMPRESSION SPRINGS • STEEL FIXTURE								
INCHES X 25.4 = mm			LBS. X .454 = KG					
O.D. Inches	Max Rod Dia.	Length Inches	Part Number	Wire Dia.	Comp. Rate Per Inch Lbs.	Total Coils	Type of Ends	No. Per Box.
.581	.438	1.00	107-111 (WA-111)	.072	74.00	6	Sq. & Gr.	12
.585	.438	3.00	107-115 (WA-115)	.072	20.00	15	Sq. & Gr.	12
.588	.438	2.50	107-114 (WA-114)	.072	26.00	13	Sq. & Gr.	12
.590	.438	4.00	107-117 (WA-117)	.072	16.00	19.5	Sq. & Gr.	12
.594	.438	1.50	107-112 (WA-112)	.072	34.00	8	Sq. & Gr.	12
.594	.438	2.00	107-113 (WA-113)	.072	32.00	11.25	Sq. & Gr.	12
.600	.438	3.50	107-116 (WA-116)	.072	18.00	17.5	Sq. & Gr.	12
.615	.438	2.84	020-068 (G-68)	.080	30.00	13.5	Sq. & Gr.	12
.620	.500	11.50	020-050 (G-50)	.054	1.00	60	Plain	6
.690	.469	4.06	020-067 (G-67)	.1055	58.00	18.5	Sq. & Gr.	12
.735	.563	12.00	020-049 (G-49)	.080	3.80	55	Plain	3
.755	.532	2.60	020-072 (G-72)	.1055	66.40	11	Sq. & Gr.	12
.850	.688	1.09	020-070 (G-70)	.080 Brass	22.00	4.5	Sq. & Gr.	12
.860	.578	2.59	020-066 (G-66)	.135	154.00	10	Sq. & Gr.	12
.870	.672	3.06	020-064 (G-64)	.0915	21.80	12	Sq. & Gr.	12
.870	.640	12.00	020-047 (G-47)	.1055	8.00	48	Plain	3
.875	.625	2.03	020-065 (G-65)	.1205	110.00	8	Sq. & Gr.	12
.875	.703	10.00	020-048 (G-48)	.080	3.25	36	Plain	3
.920	.750	2.03	020-063 (G-63)	.080	16.00	8	Sq. & Gr.	12
1.000	.750	2.56	020-062 (G-62)	.1205	56.00	9.5	Sq. & Gr.	12
.28x.16	.125	.50	020-078 (G-78)	.013	.87	8	Squared	12
.53x.28	.125	.90	020-087 (G-87)	.072 Ph. Bronze	56.00	6	Squared	12
.53x1.03x.86	.421	3.50	020-061 (G-61)	.051	1.20	13	Sq. & Gr.	12
.62x.75	.453	1.00	020-058 (G-58)	.080 Brass	31.00	5.5	Sq. & Gr.	12
.66x.94	.531	.93	020-057 (G-57)	.057 Ph. Bronze	6.00	5	Squared	12

Order by part number



EXTENSION SPRINGS • STEEL FIXTURE										
O.D. Inches	Length Inches	Part Number	Wire Diameter	Coils	Approx. Initial Tension Lbs.	Rate Lbs./Inch	Max. Ext.	Max. Safe Load Lbs.	Types of Ends	No. Per Box
.120	.62	020-137	.016	27	.06	3.70	.641	2.04	Full loops	25
.120	.75	020-138	.016	34	.31	2.50	.714	2.07	Full loops	25
.120	.88	020-139	.016	44	.19	2.20	.990	2.07	Full loops	25
.156	2.06	020-035 (G-35)	.020 Brass	90	.25	.50	1.180	1.75	Full loops	12
.156	6.62	020-011 (G-11)	.0258	232	1.50	.81	4.000	6.75	Full loops	12
.172	9.06	020-008 (G-8)	.0256	302	1.50	1.00	5.500	7.50	Full loops	12
.180	1.00	020-140	.022	32	.19	2.8	1.238	3.50	Full loops	25
.180	1.12	020-141	.022	36	.31	2.4	1.344	3.50	Full loops	25
.180	1.25	020-142	.022	42	.04	2.2	1.700	3.50	Full loops	25
.187	1.00	020-042 (G-42)	.014	70	.12	.18	4.000	.87	Plain ends	12
.234	1.12	020-040 (G-40)	.020	34	.50	.75	2.380	2.25	Full loops	12
.240	1.37	020-143	.026	39	.06	1.8	2.450	4.27	Full loops	25
.240	1.50	020-144	.026	42	.22	1.60	2.540	4.27	Full loops	25
.240	1.75	020-145	.026	53	.25	1.37	3.177	4.27	Full loops	25
.250	4.00	020-020 (G-20)	.0286	118	.25	.81	1.500	4.00	Full loops	12

EXTENSION SPRING ASSORTMENT

020-835 R-35

- (2) G-5 (2) G-9 (2) G-12 (2) G-8 (2) G-18
- (2) G-7 (2) G-10 (2) G-22 (2) G-27 (2) G-17
- (2) G-11 (2) G-28 (2) G-14 (2) G-15 (2) G-37



UTILITY SPRINGS



EXTENSION SPRINGS • STEEL FIXTURE										
O.D. Inches	Length Inches	Part Number	Wire Diameter	Coils	Approx. Initial Tension Lbs.	Rate Per Inch Lbs.	Max. Ext.	Max. Safe Load Lbs.	Types of Ends	No. Per Box
.250	5.34	020-018 (G-18)	.041	118	5.50	5.00	3.000	17.00	Full loops	12
.250	5.75	020-017 (G-17)	.0286	181	.62	.44	2.250	4.50	Full loops	12
.265	6.12	020-016 (G-16)	.0348	153	1.75	1.10	5.500	9.25	Full loops, side	12
.296	1.12	020-039 (G-39)	.040Brass	14.5	.50	3.80	.310	5.00	Dbl. loops	12
.296	5.75	020-015 (G-15)	.0475	108	2.00	3.60	3.500	17.00	Full loops, side	12
.312	5.00	020-026 (G-26)	.041	106	.75	1.60	4.950	11.25	Full loops	12
.328	6.50	020-010 (G-10)	.0348	162	1.25	.50	9.000	6.25	Dbl. loops, side	12
.343	1.44	020-037 (G-37)	.0475	17	4.37	15.00	.375	17.50	Full loops	12
.343	5.37	020-027 (G-27)	.0475	103	1.12	2.60	3.620	24.00	Full loops	12
.343	8.12	020-007 (G-7)	.0475	158	2.18	1.60	7.500	16.25	Full loops	12
.359	10.00	020-005 (G-5)	.054	193.5	1.50	2.30	8.000	20.00	Full loops	12
.360	1.50	020-146	.037	25	.19	3.40	2.385	7.80	Full loops	25
.360	1.75	020-147	.037	29	.38	2.60	2.700	7.83	Full loops	25
.360	2.00	020-148	.037	36	.56	2.20	3.268	7.80	Full loops	25
.370	3.25	020-019 (G-19)	.041	66	1.50	1.90	4.000	8.00	Half loops	12
.370	5.50	020-014 (G-14)	.054	90	2.00	4.00	3.250	15.50	Full loops	12
.370	10.00	020-006 (G-6)	.0475	193.5	2.00	1.10	8.500	11.50	Full loops	12
.440	5.25	020-028 (G-28)	.0625	74	3.00	6.50	4.000	58.00	Full loops	12
.440	6.44	020-009 (G-9)	.048	118.5	2.00	1.10	7.500	10.50	Dbl. loops	12
.480	4.50	020-022 (G-22)	.0625	57.5	1.00	6.20	3.000	17.00	Full loops	12
.500	1.62	020-034 (G-34)	.080	11	28.00	64.00	.620	67.00	Half loops	12
.500	10.00	020-004 (G-4)	.0625	144	4.50	1.87	8.500	20.50	Full loops	12
.530	5.25	020-025 (G-25)	.0625	49	3.75	5.00	4.000	21.75	Swiv. loops	12
.550	5.62	020-012 (G-12)	.080	58.5	4.00	10.00	2.620	31.00	Full loops	12
.560	5.50	020-013 (G-13)	.080	55	9.00	10.50	2.940	38.00	Half loops	12
.620	10.00	020-003 (G-3)	.072	118.5	2.44	2.10	9.500	21.50	Full loops	6
.680	4.00	*020-099 (G-99)	.1055	30.5	9.00	34.00	1.530	58.00	Half loops	6
.720	2.00	020-095 (G-95)	.105	9	11.00	80.00	.530	57.00	Full loops	12
.720	4.00	020-024 (G-24)	.1055	26	24.00	12.50	2.120	82.00	Half loops	12
.740	4.06	020-023 (G-23)	.0625	45	1.50	1.40	6.500	12.00	Full loops	12
.750	2.59	020-032 (G-32)	.1055	13	12.25	46.00	.810	44.00	Full loops	12
.750	2.66	020-033 (G-33)	.080	18.5	2.25	10.30	4.000	47.00	Full loops	12
.810	10.00	020-002 (G-2)	.072	119	4.12	.75	21.000	23.12	Full loops	3
.870	6.00	*020-029 (G-29)	.1205	38.5	8.00	18.50	2.380	68.20	Half loops	6
.870	10.00	020-001 (G-1)	.0915	94	4.38	2.50	11.000	30.50	Full loops	3
1.000	8.50	020-031 (G-31)	.1055	65	9.00	6.00	8.500	41.00	Half loops	3
1.060	8.00	*020-030 (G-30)	.135	49	13.00	24.00	5.000	45.00	Half loops	6
1.120	10.00	*020-100 (G-100)	.148	59	8.00	14.00	6.000	95.00	Half loops	6
1.250	12.00	*020-101 (G-101)	.162	65	31.00	15.00	7.400	112.00	Half loops	6
1.370	14.00	*020-102 (G-102)	.177	70	14.00	14.00	8.750	130.00	Half loops	6
1.560	16.00	*020-103 (G-103)	.207	70	32.00	16.00	9.000	175.00	Half loops	6
1.250	7.62	020-104	.207	26	61.00	94.00	2.468	281.82	Full loops	2
1.812	8.19	020-105	.250	22	61.00	68.00	4.189	341.56	Full loops	2
.297	16.00	020-152	.041	15.30	2.94	.69	14.583	12.43	Full loops	12
.344	16.00	020-153	.048	15.125	3.19	1.06	14.445	16.72	Full loops	12
.375	16.00	020-154	.054	15.310	3.50	1.50	13.724	21.45	Full loops	12
.422	16.00	020-155	.063	15.150	5.00	2.25	11.903	29.58	Full loops	12
.438	16.00	020-156	.072	15.375	4.08	3.90	9.950	40.97	Full loops	12

MACHINERY BRAKE & SHEAR SPRINGS

* The following part numbers identify certain standard springs described in the table above that are of oil-tempered carbon steel and specially suited to heavy duty-extension spring use.

G - 29 G - 30 G - 99 G - 100 G - 101 G - 102 G - 103 *These are flagged with an asterisk to simplify finding them.*

Specials Quoted Upon Request

Engineered for durability these quality springs have unlimited applications for general utility and Industry.

Abbreviations:
ext., extension
comp., compression



UTILITY SPRINGS

- Heavy duty
- 2-drawer case
- numbered dividers
- Display ready
- 41 different no's
- 310 comp. & ext. spg's

Length 17-¹/₂"
Width 12-¹/₄"
Height 5-⁷/₈"
Shipping Weight 57 lbs.

GENERAL MAINTENANCE ASSORTMENT #020-819-1

Part Number	Type	Length in Inches	O.D. Inches	Wire Size	Lbs. Rate/Inch	Approx. Load @ Reference Extension	Ass't Qty.	Unit Pack
020-042	Ext.	1.000	.188	.014	3. oz.	30. oz. @ 1.500	12	12
020-040	Ext.	1.125	.234	.020	12. oz.	9. oz @ 1.625	6	12
020-039	Ext.	1.125	.297	.040 Brass	3.8	1.6 lbs. @ .875	12	12
020-037	Ext.	1.438	.344	.048	15.0	10.0 lbs. @ .375	12	12
020-034	Ext.	1.625	.500	.080	64.0	23.0 lbs. @ 1.250	6	12
020-032	Ext.	2.594	.750	.105	46.0	29.5 lbs. @ 2.375	6	12
020-033	Ext.	1.656	.750	.080	10.3	12.5 lbs. @ 3.968	6	12
020-019	Ext.	3.250	.375	.041	1.9	5.2 lbs. @ 5.250	12	12
020-020	Ext.	4.000	.250	.028	13. oz.	1.9 lbs. @ 6.000	12	12
020-024	Ext.	4.000	.719	.105	12.5	36.5 lbs. @ 5.000	6	12
020-023	Ext.	4.062	.734	.063	1.4	4.3 lbs. @ 6.062	6	12
020-022	Ext.	4.500	.484	.063	6.3	14.0 lbs. @ 6.500	6	12
020-025	Ext.	5.250	.531	.062	8.5	8.5 lbs. @ 6.250	6	12
020-012	Ext.	5.625	.547	.080	10.0	24.0 lbs. @ 7.625	6	12
020-017	Ext.	5.750	.250	.028	7. oz.	1.6 lbs. @ 7.750	12	12
020-009	Ext.	6.438	.438	.048	1.1	4.2 lbs. @ 8.437	10	12
020-010	Ext.	6.500	.328	.035	7.5	2.2 lbs. @ 8.500	12	12
020-031	Ext.	8.500	1.000	.105	6.00	16.75 lbs. @ 10.250	2	3
020-004	Ext.	10.000	.500	.062	1.8	10.2 lbs. @ 13.000	8	12
020-003	Ext.	10.000	.625	.072	2.1	8.8 lbs. @ 13.000	6	12
020-002	Ext.	10.000	.812	.072	12. oz.	5.6 lbs. @ 12.000	4	3
Part Number	Type	Length in Inches	O.D. Inches	Wire Size	Lbs. Rate/Inch	Approx. Solid Ext.	Ass't Qty.	Unit Pack
020-078	Tap.Comp.	.500	.281x.156	.013	14. oz.	.117	12	12
020-086	Comp.	.781	.375	.042 Brass	7.4 oz.	.378	6	12
020-084	Comp.	.938	.188	.012	5. oz.	.240	6	12
020-060	Comp.	.969	.500	.072	52.0	.612	6	12
020-059	Comp.	1.031	.531	.105	21.0	.950	6	12
020-080	Comp.	1.250	.281	.040	18.0	.640	12	12
020-081	Comp.	1.969	.312	.022	9. oz	.528	12	12
020-065	Comp.	2.000	.875	.120	110.0	.964	6	12
020-063	Comp.	2.031	.938	.080	16.0	.640	6	12
020-069	Comp.	2.193	.590	.040	3.1	.380	6	12
020-091	Comp.	2.500	.500	.063	18.0	1.000	10	12
020-062	Comp.	2.562	1.015	.120	56.00	1.148	6	12
020-089	Comp.	2.625	.438	.048	6.0	.950	10	12
020-068	Comp.	2.844	.625	.080	30.0	1.080	6	12
020-064	Comp.	3.062	.875	.092	21.5	1.098	4	12
020-067	Comp.	4.062	.688	1.05	58.0	1.952	6	12
020-056	Comp.	10.000	.176	.014	.5 oz.	2.254	6	12
020-048	Comp.	10.000	.875	.080	3.2	3.000	4	12
020-052	Comp.	11.500	.375	.047	2.3	4.240	6	12
020-050	Comp.	11.500	.625	.054	1.0	3.564	6	12



This is the baby of our general maintenance assortment. So when a larger stock of springs are not needed, have our midget ass't in its enameled steel case ready in each department for quick application. Kit contains 105 of 18 different extension & compression springs.

105 MIDGET SPRINGS ASSORTMENT • NO. 020-081

O.D. Inches	Length Inches	Part Number	Wire Diameter	Coils	Approx. Initial Tension Lbs.	Rate Per Inch Lbs.	Max. Ext.	Max. Safe Load Lbs.	Type of Ends	Asst. Qty.	No. Per Box
.187	1.00	020-042 (G-42)	.014	70	.12	.18	4.000	87	Plain ends	5	12
.234	1.12	020-040 (G-40)	.020	34	.50	.75	2.380	2.25	Full loops	5	12
.156	2.06	020-035 (G-35)	.020 Brass	90	.25	.50	1.180	1.75	Full loops	10	12
.370	3.25	020-019 (G-19)	.041	66	1.50	1.90	4.000	8.00	Half loops	9	12
.250	4.00	020-020 (G-20)	.0286	118	.25	.81	1.500	4.00	Full loops	10	12
.480	4.50	020-022 (G-22)	.0625	57.5	1.00	6.20	3.000	17.00	Full loops	5	12
.440	5.25	020-028 (G-28)	.0625	74	3.00	6.50	4.000	58.00	Full loops	5	12
.550	5.62	020-012 (G-12)	.080	58.5	4.00	10.00	2.620	31.00	Full loops	4	12
.250	5.75	020-017 (G-17)	.0286	181	.62	.44	2.250	4.50	Full loops	10	12
.440	6.44	020-009 (G-9)	.048	118.5	2.00	1.10	7.500	10.50	Dbl. loops	5	12
.328	6.50	020-010 (G-10)	.0348	162	1.25	.50	9.000	6.25	Dbl. loop,side	10	12

O.D. Inches	Max. Rod Dia.	Length Inches	Part Number	Wire Diameter	Comp. Rate Per Inch Lbs.	Total Coils	Type of Ends	Asst. Qty. Box	No. Per
.369	.281	.78	020-086 (G-86)	.042 Brass	7.37	9	Sq. & Gr.	6	12
.282	.188	1.31	020-079 (G-79)	.040	17.00	13	Plain	5	12
.315	.266	1.96	020-081 (G-81)	.022	.56	23.5	Squared	5	12
.53X1.03X.86	.421	3.50	020-061 (G-61)	.051	1.20	13	Sq. & Gr.	4	12
.875	.703	10.00	020-048 (G-48)	.080	3.25	36	Plain	1	3
.375	.266	11.50	020-052 (G-52)	.0475	2.25	88	Plain	3	12
.620	.500	11.50	020-050 (G-50)	.054	1.00	60	Plain	3	6



For the small compression spring requirements, these 12 engineered sizes in quantities of 25 each make this assortment the perfect helper.

300 COMPRESSION SPRINGS ASSORTMENT • NO. 020-802

O.D. Inches	Max. Rod Dia.	length Inches	Part Number	Wire Diameter	Comp. Rate Per Inch Lbs.	Total Coils	Type of Ends	No. Per
.120	.078	.62	020-125	.016	6.60	13	Squared	25
.120	.075	.75	020-126	.016	5.30	18	Squared	25
.180	.125	.75	020-127	.022	8.60	11	Squared	25
.180	.125	1.00	020-128	.022	6.80	14	Squared	25
.180	.125	1.12	020-129	.022	6.00	15	Squared	25
.180	.125	1.25	020-130	.022	5.30	17	Squared	25
.240	.172	1.00	020-131	.026	7.80	11	Squared	25
.240	.172	1.25	020-132	.026	6.10	14	Squared	25
.240	.172	1.50	020-133	.026	5.10	15	Squared	25
.360	.281	1.50	020-134	.035	7.30	10	Squared	25
.360	.281	1.75	020-135	.035	6.20	11	Squared	25
.360	.281	2.00	020-136	.035	5.40	13	Squared	25



Like the above compression kit, only extension springs. This kit can be a real helper. Packaged in the same quantities in a clear container of 300 little giants.

300 EXTENSION SPRINGS ASSORTMENT • NO. 020-803

O.D. Inches	Length Inches	Part Number	Wire Diameter	Coils	Appr. Init. Tension Lbs.	Rate Per Inch Lbs.	Max. Ext.	Max. Safe Load Lbs.	Type of Ends	No. Per Box
.120	.62	020-137	.016	27	.06	3.70	.641	2.04	Full loops	25
.120	.75	020-138	.016	34	.31	2.50	.714	2.07	Full loops	25
.120	.88	020-139	.016	44	.19	2.20	.990	2.07	Full loops	25
.180	1.00	020-140	.022	32	.19	2.8	1.238	3.50	Full loops	25
.180	1.12	020-141	.022	36	.31	2.4	1.344	3.50	Full loops	25
.180	1.25	020-142	.022	42	.04	2.2	1.700	3.50	Full loops	25
.240	1.37	020-143	.026	39	.06	1.8	2.450	4.27	Full loops	25
.240	1.50	020-144	.026	42	.22	1.60	2.540	4.27	Full loops	25
.240	1.75	020-145	.026	53	.25	1.37	3.177	4.27	Full loops	25
.360	1.50	020-146	.037	25	.19	3.40	2.385	7.80	Full loops	25
.360	1.75	020-147	.037	29	.38	2.60	2.700	7.83	Full loops	25
.360	2.00	020-148	.037	36	.56	2.20	3.268	7.80	Full loops	25

UTILITY SPRINGS



INCH X 25.4 = MM
LBS. X .454 = KG

SQUARE WIRE CARBON STEEL DIE & FIXTURE SPRINGS									
12-INCH LENGTHS • PLAIN ENDS									
Hole Dia.	Rod Dia.	Stock No.	Wire Size	Space Between Coils	Max Safe Load Lbs.	Total Coils	Pounds Per Inch of Compression	Approx. Solid Height	No. Per Box
.375	.187	SR-0	.062	.047	25	111	12 ¹ / ₂	7.50	12
.437	.250	SR-1A	.062	.078	40	86	9	5.67	12
.500	.250	SR-1B	.094	.078	100	70	42	7.10	12
.562	.312	SR-1	.094	.094	100	64 ¹ / ₄	29	6.425	12
.562	.250	SR-4	.125	.062	245	64 ¹ / ₄	118	9.05	12
.687	.437	SR-2	.094	.125	75	55	15 ¹ / ₂	5.42	12
.687	.375	SR-5	.125	.094	214	55	60	7.52	12
.687	.312	SR-10	.156	.062	450	55	180	9.68	12
.812	.562	SR-3	.094	.125	65	55	8.6	5.34	12
.812	.500	SR-6	.125	.109	170	51 ¹ / ₄	35	6.87	12
.812	.437	SR-11	.156	.109	335	45 ¹ / ₄	110	7.79	12
.812	.375	SR-16	.187	.094	550	42 ³ / ₄	280	9.10	12
.937	.625	SR-7	.125	.125	145	48	21 ¹ / ₂	6.35	12
.937	.562	SR-12	.156	.109	275	45 ¹ / ₄	44	7.50	12
1.062	.750	SR-8	.125	.187	120	38 ¹ / ₂	18	5.075	6
1.062	.687	SR-13	.156	.172	245	36 ³ / ₄	50	6.15	6
1.062	.625	SR-18	.187	.156	400	35	120	7.00	6
1.062	.437	SR-23	.250	.109	1200	33 ¹ / ₂	575	9.67	6
1.187	.875	SR-9	.125	.250	100	32	14 ¹ / ₂	4.20	6
1.187	.812	SR-14	.156	.187	220	35	45	5.80	6
1.187	.750	SR-19	.187	.187	350	32	90	6.30	6
1.187	.562	SR-24	.250	.125	1000	32	380	9.05	6
1.312	.937	SR-15	.156	.250	290	29 ¹ / ₂	29	4.88	6
1.312	.875	SR-20	.187	.187	300	32	65	6.25	6
1.437	1.000	SR-21	.187	.312	270	24	60	4.63	6
1.562	1.125	SR-22	.187	.312	240	24	42 ¹ / ₂	4.59	6
1.562	.937	SR-27	.250	.203	650	26 ¹ / ₂	155	7.26	6
1.562	.203	SR-31	.312	.187	1350	24	490	8.15	6
1.812	1.187	SR-28	.250	.343	575	20 ¹ / ₄	115	5.52	6
1.812	1.062	SR-32	.312	.250	1150	21 ¹ / ₂	305	7.425	6
2.062	1.437	SR-29	.250	.437	500	17 ¹ / ₂	85	4.77	6
2.062	1.312	SR-33	.312	.297	1000	19 ³ / ₄	210	6.79	6
2.312	1.687	SR-30	.250	.531	425	15 ¹ / ₂	65	4.18	6
2.312	1.562	SR-34	.312	.406	850	16 ³ / ₄	160	5.75	6
2.562	1.812	SR-35	.312	.437	750	16	115	5.45	6

GLOSSARY OF MECHANICAL SPRING TERMINOLOGY

ACTIVE COILS: those coils, which are free to deflect under load.

ANGULAR RELATIONSHIP OF ENDS: the relative position of the plane of the hooks of loops of extension springs to each other.

BLUE: a thin blue film of oxide on ferrous alloys, sometimes used to indicate that the material has been stress relieved.

BAKING: heating of electroplated springs to relieve hydrogen embrittlement.

BUCKLING: bowing or lateral deflection of compression springs when compressed, related to the slenderness ratio.

CLOSED ENDS: ends of compression springs where pitch of the end coils is reduced so that the end coils touch.

CLOSED AND GROUND ENDS: as with closed ends, except that the end is ground to provide a flat plane.

CLOSED LENGTH: see Solid Height.

CLOSE-WOUND: coiled with adjacent coils touching.

COILS PER INCH: see Pitch.

FREQUENCY (NATURAL): the lowest inherent rate of free vibration of a spring itself (usually in cycles per second) with ends restrained.

GRADIENT: see Rate.

HEAT SETTING: fixturing a spring at elevated temperature to minimize loss of load at operating temperature.

HELIX: the spiral form (open or closed) of compression, extension and torsion springs.

HOOKS: open loops or ends of extension springs.

HOT PRESSING: see Heat Setting.

HYDROGEN EMBRITTLEMENT: hydrogen absorbed in electroplating or pickling of carbon steels, tending to make the spring material brittle and susceptible to cracking and failure, particularly under sustained loads.

HYSTERESIS: the mechanical energy loss that always occurs under cyclic loading and unloading of a spring, proportional to the area between the loading and unloading load-deflection curves within the elastic range of a spring.

INITIAL TENSION: the force that tends to keep the coils of an extension spring closed and which must be overcome before the coils start to open.

LOAD: the force applied to a spring that causes a deflection.

LOOPS: coil-like wire shapes at the ends of extension springs that provide for attachment and force application.

MEAN COIL DIAMETER: outside spring diameter (O.D.) minus one wire diameter.

MODULUS IN SHEAR OR TORSION: coefficient of stiffness for extension and compression springs.

MODULUS IN TENSION OR BENDING: coefficient of stiffness used for torsion and flat springs (Young's Modulus).

MOMENT: see Torque.

OPEN ENDS, NOT GROUND: end of a compression spring with a constant pitch for each coil.

OPEN ENDS GROUND: "open ends, not ground", followed by and end grinding operation.

PASSIVATING: acid treatment of stainless steel to remove contaminants and improve corrosion resistance.

PERMANENT SET: a material that is deflected so far that its elastic properties have been exceeded and it does not return to its original condition upon release of load is said to have taken a "permanent set".

PITCH: the distance from center to center of the wire in adjacent active coils (recommended) practice is to specify number of active coils rather than pitch).

PRESET: see Remove Set.

RATE: change in load per unit deflection, generally given in pounds per inch.

REMOVE SET: the process of closing to

solid height a compression spring which has been coiled longer than the desired finished length, so as to increase the apparent elastic limit.

RESIDUAL STRESS: stresses induced by set removal, shot peening cold-working, forming or other means. These stresses may or may not be beneficial, depending on the application.

SET: permanent distortion, which occurs when a spring is stressed beyond the elastic limit of the material.

SHOT PEENING: a cold-working process in which the material surface is peened to induce compressive stresses and thereby improve fatigue life.

SLENDERNESS RATIO: ratio of spring length to mean coil diameter.

SOLID HEIGHT: length of a compression spring when under sufficient load to bring all coils into contact with adjacent coils.

SPRING INDEX: ratio of mean coil diameter to wire diameter.

SQUARED AND GROUND ENDS: Refer to Closed and Ground Ends.

SQUARED ENDS: Refer to Closed Ends.

SQUARENESS OF ENDS: angular deviation between the axis of a compression spring and a normal to the plane of the ends.

SQUARENESS UNDER LOAD: as in Squareness of Ends, except with the spring under load.

STRESS RANGE: the difference in operation stresses at minimum and maximum loads.

STRESS RELIEVE: to subject springs to low-temperature heat treatment so as to relieve residual stresses.

TORQUE: a twisting action in torsion spring, which tends to produce rotation, equal to the load multiplied by the distance (or moment arm) from the load to the axis of spring body. Usually express in inch-oz., inch pounds or in foot-pounds.

TOTAL NUMBER OF COILS: number of active coils plus the coils forming the ends.

TRAPPED STRESS: see Residual Stress.

Lami-Flex Urethane Springs

PRESSURE RANGE GUIDE

(Force per 1/8" deflection)

Conventional heavy duty steel die spring

--- Up to 488 lbs.

LAMI-FLEX Urethane Die Springs & Strippers

--- Up to 2593 lbs.

LAMI-FLEX Bars (Pressure Pads)

---Up to 90,000 lbs.

LAMI-FLEX Slabs (Pressure Pads)

--- Unlimited

LAMI-FLEX bar or rectangular stock is ideally suited for replacement of rows of springs because of its long, horizontal axis. Characteristics of rubber are surpassed with LAMI-FLEX having three times the wear life.

For optimum tool & die operation, specific characteristics have been specially compounded and processed for LAMI-FLEX springs. These qualities enhance their use in the aircraft, automotive, appliance, electrical and electronic industries. These special qualities are:

1. Corrosion resistant
2. Higher pressures
3. Increased durability
4. Unaffected by oil, chemicals, solvents
5. Lighter weight
6. Longer life
7. Abrasion resistant
8. Low noise
9. No sharpnelling
10. Low cost

LAMI-FLEX springs exceed the capability of coiled steel springs in generated forces and strokes in a smaller space. This is accomplished by the non-compressibility and resiliency. Its volume remains constant under force but changes shape, similar to a solid fluid with a memory. Under load, LAMI-FLEX springs produce a high, uniform, and continuous counter pressure, returning to original shape when load is released.

Temperatures, many of our compounds stay flexible at well below -40°F, even though they gradually stiffen as the temperature falls below 0°F. Continuous use above 230°F is not recommended. Our urethanes can be used intermittently up to 250°F.

Heat build-up, due to internal friction (hysteresis effect), is the most common cause of premature failure of urethane. The amount of heat generated is a direct function of effective strokes per hour and/or degree of deflection per stroke. Thus, in selecting springs or pressure pads, minimize the percentage of deflection for longer life - particularly when exceeding 700 strokes per hour.

Operating Speed & % of Deflection,

Short runs or slow speed -- Up to 200 strokes per hour --above 25% of spring height.

Intermittent -- Up to 700 strokes per hour -- up to 25% of spring height.

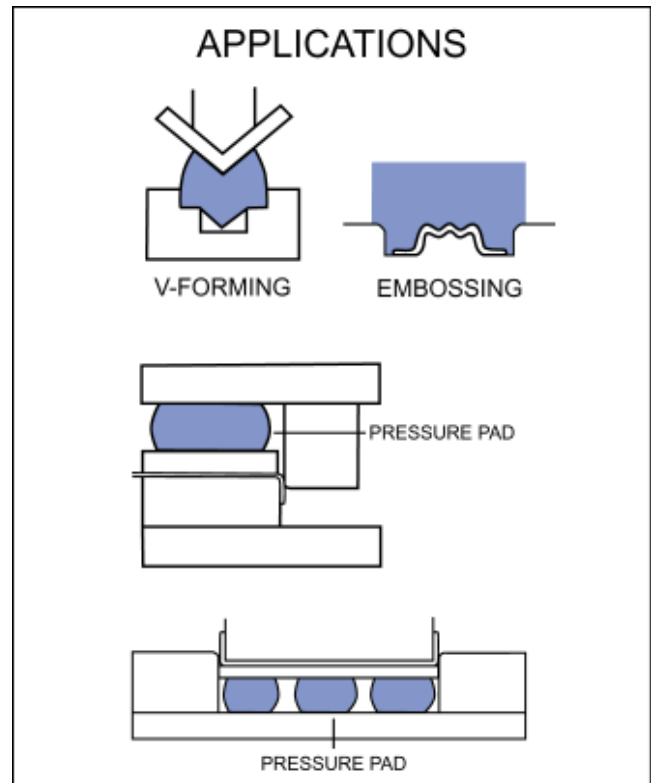
Continuous -- Up to 12,000 strokes per hour -- up to 15% of spring height.

Cutting of Urethane

Bandsawing -- Use any type of conventional saw with 4 hook (sharp) carbon blade with raker set.

Lathe Cutting -- Use H.S.S. tool bits with positive rake of from 5 to 10 degrees.

**Available in 90A or 95A Durometer. Custom sizes and hardness available upon request.*



WHEN ORDERING PLEASE SPECIFY:

1. Quantity
2. Thickness or Diameter
3. Length

LAMI-FLEX 90A bars, slabs, sheets and rods:

L = Length W = Width r = radius h = height d = diameter

*** Area (A)**

- 1) For Solid rectangles or square:
 $A = L \times W$

*** Shape Factor (S.F.)**

- 1) For solid sheets, slabs or bars:
 $S.F. = \frac{L \times W}{2h(L+W)}$
- 2) For solid rods:
 $S.F. = \frac{d}{4h}$

P.S.I. or Deflection from graph

- 1) Interpolate for in between shape factor
 2) For shape factors less than 0.5 use 0.5 line

*** Convert P.S.I. to load pounds**

- 1) Load pounds = p.s.i. x area
 2) This is total force required to deflect a given distance

EXAMPLE: How much pressure will be required to deflect a 6" x 6" x 1" slab by .150"?

$A = 6 \times 6 = 36$

$S.F. = \frac{6 \times 6}{2(1)(6+6)} = 1.5$

Load = 1220 x 36

- * Since .150 is 15% of 1", find 15% on graph below
- * Since 1.5 shape factor is halfway between 1.0 and 2.0 lines on the graph the p.s.i. value for 15% is 1220.
- * Multiply p.s.i. times area to get load pounds = 43,920

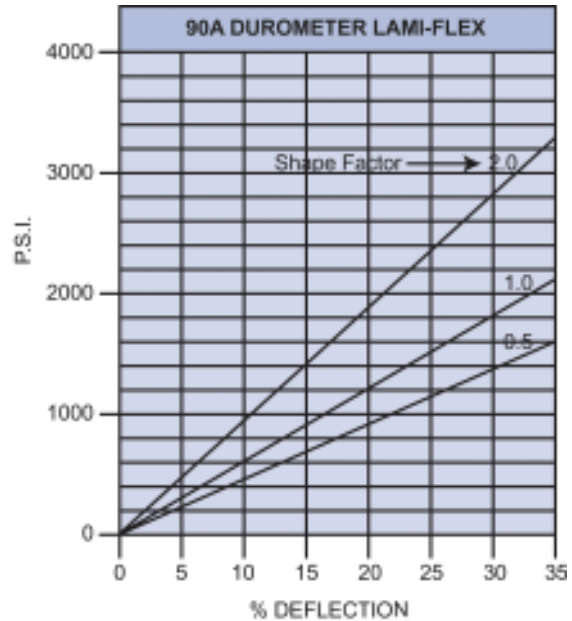
LAMI-FLEX SHEET, SLAB, ROD SAMPLE PRESSURES 90A DUROMETER			
SIZE	Load Pounds Required to Deflect		
	1/8"	1/4"	3/8"
1/4" dia. x 1/2" height	55	N.R.	N.R.
3/8" dia. x 3/4" height	90	165	N.R.
1/2" dia. x 1" height	125	225	N.R.
5/8" dia. x 1-1/4" height	165	290	455
3/4" dia. x 1-1/2" height	210	360	510
7/8" dia. x 1-3/4" height	245	425	600
1" dia. x 2" height	300	505	705
1-1/8" dia. x 2-1/4" height	350	585	795
1-1/4" dia. x 2-1/2" height	380	665	910
1-1/2" dia. x 3" height	510	815	1130
2" dia. x 3" height	910	1445	2010
3" dia. x 3" height	2050	3250	3620
4" dia. x 3" height	3645	5780	7070
6" dia. x 3" height	8200	13005	18095
1" wide x 12" long x 1" height	7560	12900	N.R.
2" wide x 2" long x 3" height	7200	11400	15000
2" wide x 12" long x 2" height	9600	15120	21600
6" wide x 12" long x 2" height	36500	61200	86400
6" wide x 6" long x 1" height	37800	70200	N.R.
12" wide x 12" long x 1-1/2" height	120960	230400	338400
18" wide x 18" long x 3" height	145800	270540	405000

N.R. = RECOMMENED

Urethane will conform to the many shapes and angles of forming tools. This feature, along with ease of installation makes urethane a top choice among metal stampers in Europe and Asia. LAMI-FLEX urethane is a stocked item, which is readily available to you here in the USA & Canada.

Custom sizes, shape, colors and durometers of LAMI-FLEX can also be custom molded for special needs and prototypes. Please send requests for quotations to your local Lamina distributor or to:

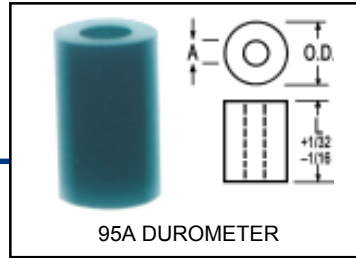
Lamina Components
 P.O. Box 2540, Farmington Hills, MI. 48333
 Phone: 248-489-9122, 800-652-6462
 Fax: 248-553-6842
 E-mail: Sales@lamina.com



- **LAMI-FLEX** springs can be used as die springs and strippers.
- **LAMI-FLEX** solid rod can be used as springs, pressure pads, in roll forming operations and in bulging operations.
- **LAMI-FLEX** bars can be used in place of rows of steel springs, as pressure pads and in press brake tooling.
- **LAMI-FLEX** solid sheets and slabs can be used as pressure pads, forming blocks, embossing, pressbrakes, dampeners and bumpers.

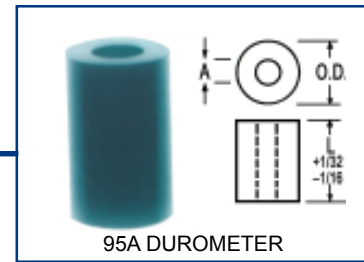
Note: All values in this publication are based on tests as free standing cylinders or sections with ends unattached. Confinement of any portion of the diameter or periphery, or bonding of ends to restrict lateral movement will substantially increase these values. Conversely, lubrication of ends will assist lateral movement, and will tend to reduce these values.

Light Duty LAMI-FLEX SPRINGS



PART NUMBER	OUTSIDE DIA (O.D.)	FITS PUNCH SHANK (A)	LENGTH (L)	LOAD LBS. REQ. TO DEFLECT 1/8"	LOAD POUNDS REQUIRED TO DEFLECT									
					5%		10%		15%		20%		25%	
					LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.
LFL06918-100 LFL06918-125 LFL06918-150 LFL06918-1250	11/16	3/16	1 1-1/4 1-1/2 12-1/2	270 240 220	175	.0500 .0625 .0750	240	.1000 .1250 .1500	295	.1500 .1875 .2250	350	.2000 .2500 .3000	375	.2500 .3125 .3750
LFL07525-100 LFL07525-125 LFL07525-150 LFL07525-175 LFL07525-200 LFL07525-1250	3/4	1/4	1 1-1/4 1-1/2 1-3/4 2 12-1/2	300 270 250 230 220	200	.0500 .0625 .0750 .0875 .1000	270	.1000 .1250 .1500 .1750 .2000	335	.1500 .1875 .2250 .2625 .3000	395	.2000 .2500 .3000 .3500 .4000	430	.2500 .3125 .3750 .4375 .5000
LFL08131-100 LFL08131-125 LFL08131-150 LFL08131-175 LFL08131-200 LFL08131-1250	13/16	5/16	1 1-1/4 1-1/2 1-3/4 2 12-1/2	340 300 275 255 245	220	.0500 .0625 .0750 .0875 .1000	300	.1000 .1250 .1500 .1750 .2000	375	.1500 .1875 .2250 .2625 .3000	445	.2000 .2500 .3000 .3500 .4000	480	.2500 .3125 .3750 .4375 .5000
LFL08838-100 LFL08838-125 LFL08838-150 LFL08838-175 LFL08838-200 LFL08838-225 LFL08838-250 LFL08838-2500	7/8	3/8	1 1-1/4 1-1/2 1-3/4 2 2-1/4 2-1/2 25	375 335 305 280 270 250 245	245	.0500 .0625 .0750 .0875 .1000 .1125 .1250	335	.1000 .1250 .1500 .1750 .2000 .2250 .2500	415	.1500 .1875 .2250 .2625 .3000 .3375 .3750	490	.2000 .2500 .3000 .3500 .4000 .4500 .5000	530	.2500 .3125 .3750 .4375 .5000 .5625 .6250
LFL10050-100 LFL10050-125 LFL10050-150 LFL10050-175 LFL10050-200 LFL10050-225 LFL10050-250 LFL10050-2500	1	1/2	1 1-1/4 1-1/2 1-3/4 2 2-1/4 2-1/2 25	440 395 360 330 315 270 290	290	.0500 .0625 .0750 .0875 .1000 .1125 .1250	395	.1000 .1250 .1500 .1750 .2000 .2250 .2500	490	.1500 .1875 .2250 .2625 .3000 .3375 .3750	585	.2000 .2500 .3000 .3500 .4000 .4500 .5000	635	.2500 .3125 .3750 .4375 .5000 .5625 .6250
LFL11363-100 LFL11363-125 LFL11363-150 LFL11363-175 LFL11363-200 LFL11363-225 LFL11363-250 LFL11363-2500	1-1/8	5/8	1 1-1/4 1-1/2 1-3/4 2 2-1/4 2-1/2 25	515 460 420 385 365 345 335	335	.0500 .0625 .0750 .0875 .1000 .1125 .1250	460	.1000 .1250 .1500 .1750 .2000 .2250 .2500	570	.1500 .1875 .2250 .2625 .3000 .3375 .3750	680	.2000 .2500 .3000 .3500 .4000 .4500 .5000	735	.2500 .3125 .3750 .4375 .5000 .5625 .6250
LFL13875-125 LFL13875-150 LFL13875-175 LFL13875-200 LFL13875-225 LFL13875-250 LFL13875-275 LFL13875-300 LFL13875-2500	1-3/8	3/4	1-1/4 1-1/2 1-3/4 2 2-1/4 2-1/2 2-3/4 3 25	685 625 575 545 515 495 455 410	495	.0625 .0750 .0875 .1000 .1125 .1250 .1375 .1500	685	.1250 .1500 .1750 .2000 .2250 .2500 .2750 .3000	855	.1875 .2250 .2625 .3000 .3375 .3750 .4125 .4500	1020	.2500 .3000 .3500 .4000 .4500 .5000 .5500 .6000	1105	.3125 .3750 .4375 .5000 .5625 .6250 .6875 .7500
LFL15088-125 LFL15088-150 LFL15088-175 LFL15088-200 LFL15088-225 LFL15088-250 LFL15088-275 LFL15088-300 LFL15088-2500	1-1/2	7/8	1-1/4 1-1/2 1-3/4 2 2-1/4 2-1/2 2-3/4 3 25	1000 950 890 850 800 750 710 670	750	.0625 .0750 .0875 .1000 .1125 .1250 .1375 .1500	1000	.1250 .1500 .1750 .2000 .2250 .2500 .2750 .3000	1200	.1875 .2250 .2625 .3000 .3375 .3750 .4125 .4500	1400	.2500 .3000 .3500 .4000 .4500 .5000 .5500 .6000	1650	.3125 .3750 .4375 .5000 .5625 .6250 .6875 .7500

Light Duty LAMI-FLEX SPRINGS, Continued

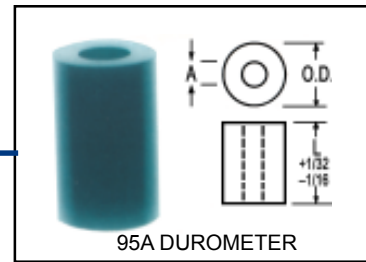


PART NUMBER	OUTSIDE DIA. (O.D.)	FITS PUNCH SHANK (A)	LENGTH (L)	LOAD LBS. REQD. TO DEFLECT 1/8"	LOAD POUNDS REQUIRED TO DEFLECT													
					5%		10%		15%		20%		25%					
					LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.				
LFL17510-125	1-3/4	1	1-1/4	1050	750	.0625	.1250	950	.1875	1650	.2500	2000	.3125					
LFL17510-150			1-1/2	910										.0750	.1500	.2250	.3000	.3750
LFL17510-175			1-3/4	880										.0875	.1750	.2625	.3500	.4375
LFL17510-200			2	840										.1000	.2000	.3000	.4000	.5000
LFL17510-225			2-1/4	790										.1125	.2250	.3375	.4500	.5625
LFL17510-250			2-1/2	755										.1250	.2500	.3750	.5000	.6250
LFL17510-275			2-3/4	690										.1375	.2750	.4125	.5500	.6875
LFL17510-300			3	625										.1500	.3000	.4500	.6000	.7500
LFL17510-400			4	570										.2000	.4000	.6000	.8000	1.0000
LFL17510-2500			25															

Medium Duty LAMI-FLEX SPRINGS

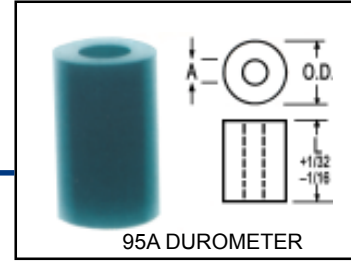
PART NUMBER	OUTSIDE DIA. (O.D.)	FITS PUNCH SHANK (A)	LENGTH (L)	LOAD LBS. REQD. TO DEFLECT 1/8"	LOAD POUNDS REQUIRED TO DEFLECT																		
					5%		10%		15%		20%		25%										
					LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.									
LFM08118-100	13/16	3/16	1	440	235	.0500	.1000	375	.1500	600	.2000	750	.2500										
LFM08118-125			1-1/4	375										.0625	.1250	.1875	.2500	.3125					
LFM08118-150			1-1/2	330										.0750	.1500	.2250	.3000	.3750					
LFM08118-1250			12-1/2																				
LFM08825-100	7/8	1/4	1	420	205	.0500	.1000	365	.1500	630	.2000	825	.2500										
LFM08825-125			1-1/4	365										.0625	.1250	.1875	.2500	.3125					
LFM08825-150			1-1/2	310										.0750	.1500	.2250	.3000	.3750					
LFM08825-175			1-3/4	245										.0875	.1750	.2625	.3500	.4375					
LFM08825-1250			12-1/2																				
LFM09431-100	15/16	5/16	1	500	225	.0500	.1000	425	.1500	750	.2000	965	.2500										
LFM09431-125			1-1/4	425										.0625	.1250	.1875	.2500	.3125					
LFM09431-150			1-1/2	355										.0750	.1500	.2250	.3000	.3750					
LFM09431-175			1-3/4	310										.0875	.1750	.2625	.3500	.4375					
LFM09431-200			2	270										.1000	.2000	.3000	.4000	.5000					
LFM09431-2500			25																				
LFM10038-100	1	3/8	1	610	345	.0500	.1000	500	.1500	915	.2000	1150	.2500										
LFM10038-125			1-1/4	500										.0625	.1250	.1875	.2500	.3125					
LFM10038-150			1-1/2	470										.0750	.1500	.2250	.3000	.3750					
LFM10038-175			1-3/4	430										.0875	.1750	.2625	.3500	.4375					
LFM10038-200			2	400										.1000	.2000	.3000	.4000	.5000					
LFM10038-225			2-1/4	360										.1125	.2250	.3375	.4500	.5625					
LFM10038-250			2-1/2	345										.1250	.2500	.3750	.5000	.6250					
LFM10038-2500			25																				
LFM11350-100	1-1/8	1/2	1	590	385	.0500	.1000	530	.1500	785	.2000	850	.2500										
LFM11350-125			1-1/4	530										.0625	.1250	.1875	.2500	.3125					
LFM11350-150			1-1/2	485										.0750	.1500	.2250	.3000	.3750					
LFM11350-175			1-3/4	445										.0875	.1750	.2625	.3500	.4375					
LFM11350-200			2	425										.1000	.2000	.3000	.4000	.5000					
LFM11350-225			2-1/4	400										.1125	.2250	.3375	.4500	.5625					
LFM11350-250			2-1/2	385										.1250	.2500	.3750	.5000	.6250					
LFM11350-2500			25																				

Medium Duty LAMI-FLEX SPRINGS, Continued



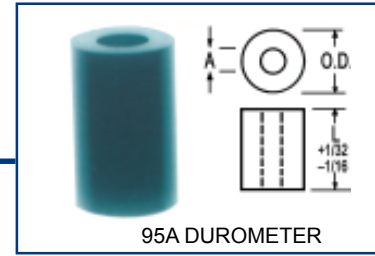
PART NUMBER	OUTSIDE DIA. (O.D.)	FITS PUNCH SHANK (A)	LENGTH (L)	LOAD LBS. REQD. TO DEFLECT 1/8"	LOAD POUNDS REQUIRED TO DEFLECT									
					5%		10%		15%		20%		25%	
					LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.
LFM12563-100	1-1/4	5/8	1	680	440	.0500	605	.1000	760	.1500	905	.2000	975	.2500
LFM12563-125			1-1/4	605		.0625		.1250		.1875		.2500		
LFM12563-150			1-1/2	555		.0750		.1500		.2250		.3000		
LFM12563-175			1-3/4	510		.0875		.1750		.2625		.3500		
LFM12563-200			2	485		.1000		.2000		.3000		.4000		
LFM12563-225			2-1/4	460		.1125		.2250		.3375		.4500		
LFM12563-250			2-1/2	450		.1250		.2500		.3750		.5000		
LFM12563-2500	25													
LFM15075-125	1-1/2	3/4	1-1/4	865	625	.0625	865	.1250	1085	.1875	1290	.2500	1400	.3125
LFM15075-150			1-1/2	790		.0750		.1500		.2250		.3000		
LFM15075-175			1-3/4	720		.0875		.1750		.2625		.3500		
LFM15075-200			2	690		.1000		.2000		.3000		.4000		
LFM15075-225			2-1/4	650		.1125		.2250		.3375		.4500		
LFM15075-250			2-1/2	625		.1250		.2500		.3750		.5000		
LFM15075-275			2-3/4	570		.1375		.2750		.4125		.5500		
LFM15075-300	3	515	.1500	.3000	.4500	.6000								
LFM15075-2500	25													
LFM16388-125	1-5/8	7/8	1-1/4	970	585	.0625	970	.1250	1375	.1875	1725	.2500	3000	.3125
LFM16388-150			1-1/2	890		.0750		.1500		.2250		.3000		
LFM16388-175			1-3/4	810		.0875		.1750		.2625		.3500		
LFM16388-200			2	730		.1000		.2000		.3000		.4000		
LFM16388-225			2-1/4	650		.1125		.2250		.3375		.4500		
LFM16388-250			2-1/2	585		.1250		.2500		.3750		.5000		
LFM16388-275			2-3/4	515		.1375		.2750		.4125		.5500		
LFM16388-300	3	440	.1500	.3000	.4500	.6000								
LFM16388-2500	25													
LFM20010-125	2	1	1-1/4	1520	1090	.0625	1520	.1250	1910	.1875	N.R.		N.R.	
LFM20010-150			1-1/2	1385		.0750		.1500		.2250				
LFM20010-175			1-3/4	1470		.0875		.1750		.2625				
LFM20010-200			2	1210		.1000		.2000		.3000				
LFM20010-225			2-1/4	1140		.1125		.2250		.3375				
LFM20010-250			2-1/2	1090		.1250		.2500		.3750				
LFM20010-275			2-3/4	1000		.1375		.2750		.4125				
LFM20010-300	3	905	.1500	.3000	.4500									
LFM20010-400	4	785	.2000	.4000	.6000									
LFM20010-2500	25													
LFM25012-125	2-1/2	1-1/4	1-1/4	2365	1695	.0625	2365	.1250	3115	.1875	N.R.		N.R.	
LFM25012-150			1-1/2	2255		.0750		.1500		.2250				
LFM25012-175			1-3/4	1930		.0875		.1750		.2625				
LFM25012-200			2	1880		.1000		.2000		.3000				
LFM25012-225			2-1/4	1770		.1125		.2250		.3375				
LFM25012-250			2-1/2	1695		.1250		.2500		.3750				
LFM25012-275			2-3/4	1550		.1375		.2750		.4125				
LFM25012-300	3	1400	.1500	.3000	.4500									
LFM25012-400	4	1260	.2000	.4000	.6000									
LFM25012-2500	25													
LFM25015-125	2-1/2	1-1/2	1-1/4	2760	1990	.0625	2760	.1250	3200	.1875	N.R.		N.R.	
LFM25015-150			1-1/2	2640		.0750		.1500		.2250				
LFM25015-175			1-3/4	2500		.0875		.1750		.2625				
LFM25015-200			2	2360		.1000		.2000		.3000				
LFM25015-225			2-1/4	2220		.1125		.2250		.3375				
LFM25015-250			2-1/2	1990		.1250		.2500		.3750				
LFM25015-275			2-3/4	1860		.1375		.2750		.4125				
LFM25015-300	3	1730	.1500	.3000	.4500									
LFM25015-400	4	1610	.2000	.4000	.6000									
LFM25015-2500	25													

Heavy Duty LAMI-FLEX SPRINGS



PART NUMBER	OUTSIDE DIA. (O.D.)	FITS PUNCH SHANK (A)	LENGTH (L)	LOAD LBS. REQD. TO DEFLECT 1/8"	LOAD POUNDS REQUIRED TO DEFLECT										
					5%		10%		15%		20%		25%		
					LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	
LFH09418-100	15/16	3/16	1	480	265	.0500	.1000	610	.1500	825	.2000	1060	.2500		
LFH09418-125			1-1/4	355										.1250	.3125
LFH09418-150			1-1/2	340										.1500	.3750
LFH09418-1250			12-1/2												
LFH10025-100	1	1/4	1	667	365	.0500	.1000	760	.1500	985	.2000	1300	.2500		
LFH10025-125			1-1/4	575										.1250	.3125
LFH10025-150			1-1/2	520										.1500	.3750
LFH10025-175			1-3/4	445										.1750	.4375
LFH10025-1250		12-1/2													
LFH11331-100	1-1/8	5/16	1	775	460	.0500	.1000	880	.1500	1125	.2000	1435	.2500		
LFH11331-125			1-1/4	670										.1250	.3125
LFH11331-150			1-1/2	625										.1500	.3750
LFH11331-175			1-3/4	535										.1750	.4375
LFH11331-200		2	470	.2000	.5000										
LFH11331-2500		25													
LFH11338-100	1-1/8	3/8	1	785	420	.0500	.1000	900	.1500	1185	.2000	1485	.2500		
LFH11338-125			1-1/4	675										.1250	.3125
LFH11338-150			1-1/2	610										.1500	.3750
LFH11338-175			1-3/4	520										.1750	.4375
LFH11338-200		2	470	.2000	.5000										
LFH11338-225		2-1/4	435	.2250	.5625										
LFH11338-250		2-1/2	420	.2500	.6250										
LFH11338-2500		25													
LFH12550-100	1-1/4	1/2	1	760	490	.0500	.1000	845	.1500	1010	.2000	1090	.2500		
LFH12550-125			1-1/4	675										.1250	.3125
LFH12550-150			1-1/2	620										.1500	.3750
LFH12550-175			1-3/4	565										.1750	.4375
LFH12550-200		2	540	.2000	.5000										
LFH12550-225		2-1/4	510	.2250	.5625										
LFH12550-250		2-1/2	490	.2500	.6250										
LFH12550-2500		25													
LFH13863-100	1-3/8	5/8	1	1105	660	.0500	.1000	1250	.1500	1610	.2000	1800	.2500		
LFH13863-125			1-1/4	960										.1250	.3125
LFH13863-150			1-1/2	900										.1500	.3750
LFH13863-175			1-3/4	770										.1750	.4375
LFH13863-200		2	725	.2000	.5000										
LFH13863-225		2-1/4	695	.2250	.5625										
LFH13863-250		2-1/2	660	.2500	.6250										
LFH13863-2500		25													
LFH17575-125	1-3/4	3/4	1-1/4	1270	915	.0625	.1250	1595	.1875	1905	.2500	2065	.3125		
LFH17575-150			1-1/2	1160										.1500	.3750
LFH17575-175			1-3/4	1060										.1750	.4375
LFH17575-200			2	1010										.2000	.5000
LFH17575-225		2-1/4	955	.2250	.5625										
LFH17575-250		2-1/2	915	.2500	.6250										
LFH17575-275		2-3/4	835	.2750	.6875										
LFH17575-300		3	755	.3000	.7500										
LFH17575-2500		25													
LFH17588-125	1-3/4	7/8	1-1/4	1170	840	.0625	.1250	1465	.1875	1750	.2500	1895	.3125		
LFH17588-150			1-1/2	1065										.1500	.3750
LFH17588-175			1-3/4	975										.1750	.4375
LFH17588-200			2	930										.2000	.5000
LFH17588-225		2-1/4	875	.2250	.5625										
LFH17588-250		2-1/2	840	.2500	.6250										
LFH17588-275		2-3/4	770	.2750	.6875										
LFH17588-300		3	695	.3000	.7500										
LFH17588-2500		25													

Heavy Duty LAMI-FLEX SPRINGS, Continued



PART NUMBER	OUTSIDE DIA. (O.D.)	FITS PUNCH SHANK (A)	LENGTH (L)	LOAD LBS. REQD. TO DEFLECT 1/8	LOAD POUNDS REQUIRED TO DEFLECT																																							
					5%		10%		15%		20%		25%																															
					LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.																														
LFH22510-125	2-1/4	1	1-1/4	2050	1470	.0625	.1250	.1875	N.R.	N.R.																																		
LFH22510-150			1-1/2	1955									2050	.0750	.1500	.2250																												
LFH22510-175			1-3/4	1670													2580	.0875	.1750	.2625																								
LFH22510-200			2	1600																	N.R.	.1000	.2000	.3000																				
LFH22510-225			2-1/4	1530																					N.R.	.1125	.2250	.3375																
LFH22510-250			2-1/2	1470																									N.R.	.1250	.2500	.3750												
LFH22510-275			2-3/4	1410																													N.R.	.1375	.2750	.4125								
LFH22510-300			3	1360																																	N.R.	.1500	.3000	.4500				
LFH22510-400			4	1315																																					N.R.	.2000	.4000	.6000
LFH22510-2500			25																																									
LFH27515-125	2-3/4	1-1/2	1-1/4	2680	1920	.0625	.1250	.1875	N.R.	N.R.																																		
LFH27515-150			1-1/2	2550									2680	.0750	.1500	.2250																												
LFH27515-175			1-3/4	2185													3365	.0875	.1750	.2625																								
LFH27515-200			2	2125																	N.R.	.1000	.2000	.3000																				
LFH27515-225			2-1/4	2000																					N.R.	.1125	.2250	.3375																
LFH27515-250			2-1/2	1920																									N.R.	.1250	.2500	.3750												
LFH27515-275			2-3/4	1790																													N.R.	.1375	.2750	.4125								
LFH27515-300			3	1585																																	N.R.	.1500	.3000	.4500				
LFH27515-400			4	1435																																					N.R.	.2000	.4000	.6000
LFH27515-2500			25																																									

Extra Heavy Duty LAMI-FLEX SPRINGS

PART NUMBER	OUTSIDE DIA. (O.D.)	FITS PUNCH SHANK (A)	LENGTH (L)	LOAD LBS. REQD. TO DEFLECT 1/8	LOAD POUNDS REQUIRED TO DEFLECT																																																																												
					5%		10%		15%		20%		25%																																																																				
					LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.	LOAD LBS.	LENGTH OF DEFL.																																																																			
LFX15063-100	1-1/2	5/8	1	1220	780	.0500	.1000	.1500	.2000	.2500	.3000	.3500	.4000	.4500	.5000	.5625	.6250																																																																
LFX15063-125			1-1/4	1085														1083	.0625	.1250	.1875	.2500	.3000	.3500	.4000	.4500	.5000	.5625	.6250																																																				
LFX15063-150			1-1/2	990																										1360	.0750	.1500	.2250	.3000	.3750	.4500	.5000	.5625	.6250																																										
LFX15063-175			1-3/4	905																																				1620	.0875	.1750	.2625	.3500	.4375	.5000	.5625	.6250																																	
LFX15063-200			2	865																																													1755	.1000	.2000	.3000	.4000	.5000	.5625	.6250																									
LFX15063-225			2-1/4	815																																																					N.R.	.1125	.2250	.3375	.4500	.5000	.5625	.6250																	
LFX15063-250			2-1/2	780																																																													N.R.	.1250	.2500	.3750	.5000	.5625	.6250										
LFX15063-2500			25																																																																														
LFX20088-125			2	7/8																																																																				1-1/4	1640	1175	.0625	.1250	.1875	N.R.	N.R.		
LFX20088-150																																																																								1-1/2	1495								
LFX20088-175	1-1/4	1365			2055	.0875	.1750	.2625	.3375	.4125	.4500																																																																						
LFX20088-200	2	1305										N.R.	.1000	.2000	.3000	.4125	.4500																																																																
LFX20088-225	2-1/4	1225																N.R.	.1125	.2250	.3375	.4125	.4500																																																										
LFX20088-250	2-1/2	1175																						N.R.	.1250	.2500	.3750	.4125	.4500																																																				
LFX20088-275	2-3/4	1075																												N.R.	.1375	.2750	.4125	.4500																																															
LFX20088-300	3	975																																	N.R.	.1500	.3000	.4500																																											
LFX20088-2500	25																																																																																
LFX25010-125	2-1/2	1																																					1-1/4	3765	2445	.0625	.1250	.1875	N.R.	N.R.																																			
LFX25010-150			1-1/2	3445																																			3765	.0750									.1500	.2250	.3000	.3750	.4500																												
LFX25010-175			1-3/4	2950																																																		4875	.0875	.1750	.2625	.3375	.4125	.4500																					
LFX25010-200			2	2780	N.R.	.1000	.2000	.3000	.4125	.4500																																																																							
LFX25010-225			2-1/4	2610							N.R.	.1125	.2250	.3375	.4125	.4500																																																																	
LFX25010-250			2-1/2	2445													N.R.	.1250	.2500	.3750	.4125	.4500																																																											
LFX25010-275			2-3/4	2345																			N.R.	.1375	.2750	.4125	.4500																																																						
LFX25010-300			3	2265																								N.R.	.1500	.3000	.4500																																																		
LFX25010-400			4																													N.R.	.2000	.4000	.6000																																														
LFX25010-2500			25																																																																														

LAMI-FLEX Solid Rods

90A and 95A Durometer



PART NUMBER		OUTSIDE DIA.	LENGTH	PART NUMBER		OUTSIDE DIA.	LENGTH	PART NUMBER		DIAMETER	LENGTH
90A Natural	95A Blue			90A Natural	95A Blue			90A Natural	95A Blue		
LFR025-03	LFR025-03B	1/4	3"	LFR100-03	LFR100-03B	1	3"	LFR200-03	LFR200-03B	2	3"
LFR025-06	LFR025-06B		6"	LFR100-06	LFR100-06B		6"	LFR200-06	LFR200-06B		6"
LFR025-12	LFR025-12B		12"	LFR100-12	LFR100-12B		12"	LFR200-12	LFR200-12B		12"
LFR025-24	LFR025-24B		24"	LFR100-24	LFR100-24B		24"	LFR200-24	LFR200-24B		24"
LFR038-03	LFR038-03B	3/8	3"	LFR113-03	LFR113-03B	1-1/8	3"	LFR250-03	LFR250-03B	2-1/2	3"
LFR038-06	LFR038-06B		6"	LFR113-06	LFR113-06B		6"	LFR250-06	LFR250-06B		6"
LFR038-12	LFR038-12B		12"	LFR113-12	LFR113-12B		12"	LFR250-12	LFR250-12B		12"
LFR038-24	LFR038-24B		24"	LFR113-24	LFR113-24B		24"	LFR250-24	LFR250-24B		24"
LFR050-03	LFR050-03B	1/2	3"	LFR125-03	LFR125-03B	1-1/4	3"	LFR300-03	LFR300-03B	3	3"
LFR050-06	LFR050-06B		6"	LFR125-06	LFR125-06B		6"	LFR300-06	LFR300-06B		6"
LFR050-12	LFR050-12B		12"	LFR125-12	LFR125-12B		12"	LFR300-12	LFR300-12B		12"
LFR050-24	LFR050-24B		24"	LFR125-24	LFR125-24B		24"	LFR300-24	LFR300-24B		24"
LFR063-03	LFR063-03B	5/8	3"	LFR138-03	LFR138-03B	1-3/8	3"	LFR400-03	LFR400-03B	4	3"
LFR063-06	LFR063-06B		6"	LFR138-06	LFR138-06B		6"	LFR400-06	LFR400-06B		6"
LFR063-12	LFR063-12B		12"	LFR138-12	LFR138-12B		12"	LFR400-12	LFR400-12B		12"
LFR063-24	LFR063-24B		24"	LFR138-24	LFR138-24B		24"	LFR400-24	LFR400-24B		24"
LFR075-03	LFR075-03B	3/4	3"	LFR150-03	LFR150-03B	1-1/2	3"	LFR600-03	LFR600-03B	6	3"
LFR075-06	LFR075-06B		6"	LFR150-06	LFR150-06B		6"	LFR600-06	LFR600-06B		6"
LFR075-12	LFR075-12B		12"	LFR150-12	LFR150-12B		12"	LFR600-12	LFR600-12B		12"
LFR075-24	LFR075-24B		21"	LFR150-24	LFR150-24B		21"	LFR600-24	LFR600-24B		24"
LFR088-03	LFR088-03B	7/8	3"	LFR175-03	LFR175-03B	1-3/4	3"				3"
LFR088-06	LFR088-06B		6"	LFR175-06	LFR175-06B		6"				6"
LFR088-12	LFR088-12B		12"	LFR175-12	LFR175-12B		12"				12"
LFR088-24	LFR088-24B		24"	LFR175-24	LFR175-24B		24"				24"

95A Durometer is Blue
90A Durometer is Natural Color

LAMI-FLEX Solid Bars

90A Durometer

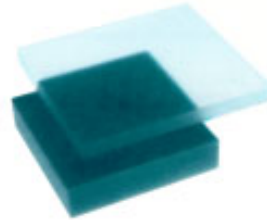
95A Durometer is Blue
90A Durometer is Natural Color

PART NUMBER		Thick.	Width	Length	PART NUMBER		Thick.	Width	Length
90A Natural	95A Blue				90A Natural	95A Blue			
LFB10010-06	LFB10010-06B	1	1	6"	LFB20030-06	LFB20030-06B	2	3	6"
LFB10010-12	LFB10010-12B			12"	LFB20030-12	LFB20030-12B			12"
LFB10010-24	LFB10010-24B			24"	LFB20030-24	LFB20030-24B			24"
LFB10010-36	LFB10010-36B			36"	LFB20030-36	LFB20030-36B			36"
LFB10010-48	LFB10010-48B			48"	LFB20030-48	LFB20030-48B			48"
LFB10020-06	LFB10020-06B	1	2	6"	LFB20040-06	LFB20040-06B	2	4	6"
LFB10020-12	LFB10020-12B			12"	LFB20040-12	LFB20040-12B			12"
LFB10020-24	LFB10020-24B			24"	LFB20040-24	LFB20040-24B			24"
LFB10020-36	LFB10020-36B			36"	LFB20040-36	LFB20040-36B			36"
LFB10020-48	LFB10020-48B			48"	LFB20040-48	LFB20040-48B			48"
LFB10030-06	LFB10030-06B	1	3	6"	LFB30030-06	LFB30030-06B	3	3	6"
LFB10030-12	LFB10030-12B			12"	LFB30030-12	LFB30030-12B			12"
LFB10030-24	LFB10030-24B			24"	LFB30030-24	LFB30030-24B			24"
LFB10030-36	LFB10030-36B			36"	LFB30030-36	LFB30030-36B			36"
LFB10030-48	LFB10030-48B			48"	LFB30030-48	LFB30030-48B			48"
LFB10040-06	LFB10040-06B	1	4	6"	LFB30040-06	LFB30040-06B	3	4	6"
LFB10040-12	LFB10040-12B			12"	LFB30040-12	LFB30040-12B			12"
LFB10040-24	LFB10040-24B			24"	LFB30040-24	LFB30040-24B			24"
LFB10040-36	LFB10040-36B			36"	LFB30040-36	LFB30040-36B			36"
LFB10040-48	LFB10040-48B			48"	LFB30040-48	LFB30040-48B			48"
LFB20020-06	LFB20020-06B	2	2	6"	LFB40040-06	LFB40040-06B	4	4	6"
LFB20020-12	LFB20020-12B			12"	LFB40040-12	LFB40040-12B			12"
LFB20020-24	LFB20020-24B			24"	LFB40040-24	LFB40040-24B			24"
LFB20020-36	LFB20020-36B			36"	LFB40040-36	LFB40040-36B			36"
LFB20020-48	LFB20020-48B			48"	LFB40040-48	LFB40040-48B			48"



LAMI-FLEX Solid Sheets and Slabs

95A Durometer is Blue
90A Durometer is Natural Color



PART NUMBER		Thick.	Width	Lgth.	PART NUMBER		Thick.	Width	Lgth.	PART NUMBER		Thick.	Width	Lgth.			
90A Natural	95A Blue				90A Natural	95A Blue				90A Natural	95A Blue						
LFS01306-06	LFS01306-06B	1/8	6	6"	LFS06312-12	LFS06312-12B	5/8	12	12"	LFS15018-18	LFS15018-18B	1-1/2	18	18"			
LFS01306-12	LFS01306-12B			12"	LFS06312-18	LFS06312-18B			18"	LFS15018-24	LFS15018-24B			24"			
LFS01306-18	LFS01306-18B			18"	LFS06312-24	LFS06312-24B			24"	LFS15024-24	LFS15024-24B			24"			
LFS01306-24	LFS01306-24B	1/8	12	24"	LFS06318-18	LFS06318-18B	5/8	18	18"	LFS20006-06	LFS20006-06B	2	6	6"			
LFS01312-12	LFS01312-12B			12"	LFS06318-24	LFS06318-24B			24"	LFS20006-12	LFS20006-12B			12"			
LFS01312-18	LFS01312-18B			18"	LFS06324-24	LFS06324-24B			24"	LFS20006-18	LFS20006-18B			18"			
LFS01312-24	LFS01312-24B	1/8	18	24"	LFS07506-06	LFS07506-06B	3/4	6	6"	LFS20006-24	LFS20006-24B	2	12	24"			
LFS01318-18	LFS01318-18B			18"	LFS07506-12	LFS07506-12B			12"	LFS20012-12	LFS20012-12B			12"			
LFS01218-24	LFS01218-24B			24"	LFS07506-18	LFS07506-18B			18"	LFS20012-18	LFS20012-18B			18"			
LFS01324-24	LFS01324-24B	1/8	24	24"	LFS07506-24	LFS07506-24B	3/4	12	24"	LFS20012-24	LFS20012-24B	2	18	24"			
LFS02506-06	LFS02506-06B	1/4	6	6"	LFS07512-12	LFS07512-12B			12"	LFS20018-18	LFS20018-18B			18"	LFS20018-24	LFS20018-24B	24"
LFS02506-12	LFS02506-12B			12"	LFS07512-18	LFS07512-18B			18"	LFS20024-24	LFS20024-24B			24"			
LFS02506-18	LFS02506-18B			18"	LFS07512-24	LFS07512-24B	24"	LFS25006-06	LFS25006-06B	6"							
LFS02506-24	LFS02506-24B	1/4	12	24"	LFS07518-18	LFS07518-18B	3/4	18	18"	LFS25006-12	LFS25006-12B	2-1/2	6	12"			
LFS02512-12	LFS02512-12B			12"	LFS07518-24	LFS07518-24B			24"	LFS25006-18	LFS25006-18B			18"			
LFS02512-18	LFS02512-18B			18"	LFS07524-24	LFS07524-24B			24"	LFS25006-24	LFS25006-24B			24"			
LFS02512-24	LFS02512-24B	1/4	18	24"	LFS10006-06	LFS10006-06B	1	6	6"	LFS25012-12	LFS25012-12B	2-1/2	12	12"			
LFS02518-18	LFS02518-18B			18"	LFS10006-12	LFS10006-12B			12"	LFS25012-18	LFS25012-18B			18"			
LFS02518-24	LFS02518-24B			24"	LFS10006-18	LFS10006-18B			18"	LFS25012-24	LFS25012-24B			24"			
LFS02524-24	LFS02524-24B	1/4	24	24"	LFS10006-24	LFS10006-24B	1	12	24"	LFS25018-18	LFS25018-18B	2-1/2	18	18"			
LFS03806-06	LFS03806-06B	3/8	6	6"	LFS10012-12	LFS10012-12B			12"	LFS25018-24	LFS25018-24B			24"			
LFS03806-12	LFS03806-12B			12"	LFS10012-18	LFS10012-18B			18"	LFS25024-24	LFS25024-24B			24"			
LFS03806-18	LFS03806-18B			18"	LFS10012-24	LFS10012-24B	24"	LFS30006-06	LFS30006-06B	6"							
LFS03806-24	LFS03806-24B	3/8	12	24"	LFS10018-18	LFS10018-18B	1	18	18"	LFS30006-12	LFS30006-12B	3	6	12"			
LFS03812-12	LFS03812-12B			12"	LFS10018-24	LFS10018-24B			24"	LFS30006-18	LFS30006-18B			18"			
LFS03812-18	LFS03812-18B			18"	LFS10024-24	LFS10024-24B			24"	LFS30006-24	LFS30006-24B			24"			
LFS03812-24	LFS03812-24B	3/8	18	24"	LFS12506-06	LFS12506-06B	1-1/4	6	6"	LFS30012-12	LFS30012-12B	3	12	12"			
LFS03818-18	LFS03818-18B			18"	LFS12506-12	LFS12506-12B			12"	LFS30012-18	LFS30012-18B			18"			
LFS03818-24	LFS03818-24B			24"	LFS12506-18	LFS12506-18B			18"	LFS30012-24	LFS30012-24B			24"			
LFS03824-24	LFS03824-24B	3/8	24	24"	LFS12506-24	LFS12506-24B	1-1/4	12	24"	LFS30018-18	LFS30018-18B	3	18	18"			
LFS05006-06	LFS05006-06B	1/2	6	6"	LFS12512-12	LFS12512-12B			12"	LFS30018-24	LFS30018-24B			24"			
LFS05006-12	LFS05006-12B			12"	LFS12512-18	LFS12512-18B			18"	LFS30024-24	LFS30024-24B			24"			
LFS05006-18	LFS05006-18B			18"	LFS12512-24	LFS12512-24B	24"	LFS40006-06	LFS40006-06B	6"							
LFS05006-24	LFS05006-24B	1/2	12	24"	LFS12518-18	LFS12518-18B	1-1/4	18	18"	LFS40006-12	LFS40006-12B	4	6	12"			
LFS05012-12	LFS05012-12B			12"	LFS12518-24	LFS12518-24B			24"	LFS40006-18	LFS40006-18B			18"			
LFS05012-18	LFS05012-18B			18"	LFS12524-24	LFS12524-24B			24"	LFS40006-24	LFS40006-24B			24"			
LFS05012-24	LFS05012-24B	1/2	18	24"	LFS15006-06	LFS15006-06B	1-1/2	6	6"	LFS40012-12	LFS40012-12B	4	12	12"			
LFS05018-18	LFS05018-18B			18"	LFS15006-12	LFS15006-12B			12"	LFS40012-18	LFS40012-18B			18"			
LFS05018-24	LFS05018-24B			24"	LFS15006-18	LFS15006-18B			18"	LFS40012-24	LFS40012-24B			24"			
LFS05024-24	LFS05024-24B	1/2	24	24"	LFS15006-24	LFS15006-24B	1-1/2	12	24"	LFS40018-18	LFS40018-18B	4	18	18"			
LFS06306-06	LFS06306-06B	5/8	6	6"	LFS15012-12	LFS15012-12B			12"	LFS40018-24	LFS40018-24B			24"			
LFS06306-12	LFS06306-12B			12"	LFS15012-18	LFS15012-18B			18"	LFS40024-24	LFS40024-24B			24"			
LFS06306-18	LFS06306-18B			18"	LFS15012-24	LFS15012-24B	24"										
LFS06306-24	LFS06306-24B			24"													

Schnorr Disc Springs

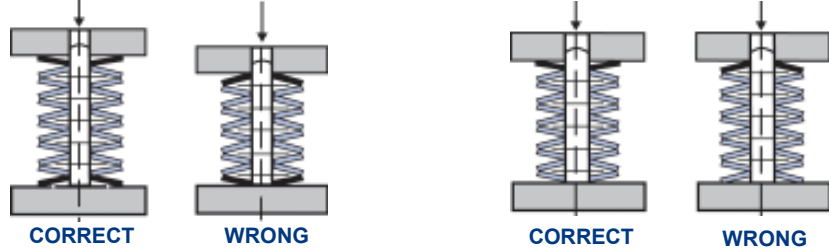
Guiding the Disc Spring

Disc springs arranged in stacks require a guide to prevent lateral movement under load. Guides may be located on the inside diameter D_i or in the outside diameter D_o of the springs, but the internal guide is to be preferred. The following values are recommended for the clearance between the guide surface and the inside or outside diameter if the spring: (chart lists values).

Using close tolerance for the guides, the clearance can be reduced a little since the inside diameter does not reduce during the stroke when the edges are at right angles to the flank. See para. 6.6.

If possible, and particularly on dynamic application, the guide rod and end thrust faces should be case hardened to a minimum of RC 55. The guide surface should be turned

to a fine finish, or better still, ground. Additionally, lubrication with a molybdenum based high pressure grease is recommended.



DISC SPRINGS MAY BE USED SINGLY OR IN COMBINATION

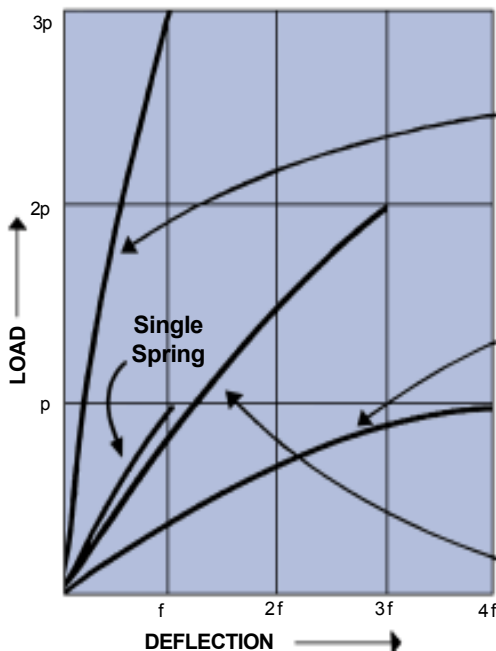
When disc springs are used in stacks, effort should be made to keep the stacks as short as possible. As the length increases so does the friction and therefore the deflection of the individual discs becomes unequal, with the greatest deflection being at the moving end. As a guide it is recommended that the stack length be restricted to approximately 3 times the outside diameter of the disc, and the largest disc diameter be used.

To ensure stackability the end springs should have their outside diameter in contact with the abutment faces. This is only possible of course with an even number of disc springs.

It is necessary to have the inside diameter in contact when the abutment faces are just a little larger than inside diameter of the disc springs.

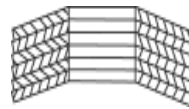
Not more than 2 or 3 discs should normally be used in parallel for multiple stacks, especially under dynamic conditions where considerable heat is generated.

DIAMETER D_i or D_o		CLEARANCE =
	up to 16.0	0.2
over 16.0	up to 20.0	0.3
over 20.0	up to 28.0	0.4
over 26.0	up to 31.0	0.5
over 31.5	up to 50.0	0.6
over 50.0	up to 80.0	0.8
over 80.0	up to 140.0	1.0
over 140.0	up to 250.0	1.6



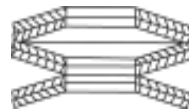
Spring Stacking – Linear or Regressive Curve

Stack of Springs in PARALLEL



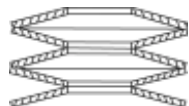
LOAD: Single spring load multiplied by the number of springs in parallel.
DEFLECTION: Same as for the single spring.

Single Springs Stacked in SERIES



LOAD: Same as for the single spring.
DEFLECTION: Single spring deflection multiplied by the number of springs in series.

Springs Stacked in SERIES – PARALLEL



LOAD: Single spring load multiplied by the number of springs in each parallel set.
DEFLECTION: Single spring deflection multiplied by the number of sets in the stack.

Schnorr Corporation has specialized in the manufacture of disc springs for more than 50 years. During this period of extraordinary technical development many applications have been found for Schnorr disc springs because of their unique characteristics and advantages.

Original **SCHNORR DISC SPRINGS** offer a number of benefits with particular mention for the following features:

1. Load/deflection curves of straight, progressive, or regressive character according to the design requirements.
2. The simple adjustment of the springs stack length by the addition or removal of individual discs, thus altering the spring stack characteristic.
3. An efficient use of space and high spring forces with small deflections.
4. Self-demanding, particularly with parallel stacking.
5. No setting or fatigue under normal loads.
6. Long service life.
7. A large range of possible applications for individual spring sizes simplifies stock-keeping.

Term and Symbols

- D—Outside diameter in millimeters/inch
- d—Inside diameter in millimeters/inch
- P—Spring load
- h—Formed height of unloaded single disc in millimeters/inch
- OH—Overall height of unloaded single disc in millimeters/inch
- f—Deflection in millimeters/inch
- t—Thickness of a single disc in millimeters/inch

Material for Disc Springs

The most important characteristic of a spring is its ability to absorb elastic deformations caused by outside loads. Because of their high load/deflection ratios disc springs are especially suitable for storing energy, dissipating shock loads, suspending moving masses, and for load measurement.

It is preferable to make a spring as small as possible, so special materials are used which are highly elastic, or which possess high tensile strength and a high elastic limit.

They should also have sufficient plastic deformation ability beyond the elastic limit to permit the manufacture of cold worked springs, as well as to minimize failure of springs under unexpectedly high loads.

The Design & Manufacturing of Disc Springs

According to the Standard DIN 2093 There are three different groups of execution:

Group 1: under 1.25mm

Group 2: from 1.25 to 6.0mm

Group 3: over 6 up to 16mm

Schnorr manufactures the three groups as follows:

Group 1: Cold formed

Group 2: Cold formed, outside and inside diameters turned, corners on inner edge radiused.

Group 3: Hot formed, springs turned all over, contact surfaces formed, all corners radiused, and material thickness reduced.

Tolerance

Allowable variations are laid down in Din 2093. The tolerances on disc spring diameters are H 12/h 12. The permissible tolerance for the spring force F at $s=0.75 h_0$ is given in the following table:

GROUP	SPRING THICKNESS	PERMISSIBLE DEVIATION FOR THE SPRING FORCE F AT THE TEST LENGTH $l_0 = 0.75 h_0$	
		%	
1	mm		
	under 1.25	+25	-7.5
2	1.25 to 3.00	+15	-7.5
	over 3.00 to 6.00	+10	-5.0
3	over 6.00 to 16.00	+5	-5.0

The spring force must be measure on a single disc exactly as specified in the standard.

The following table gives the tolerance for the over all height OH according to DIN 2093

GROUP	SPRING THICKNESS	PERMISSIBLE DEVIATION FOR l_0	
		mm	
1	mm		
	under 1.25	+0.10	-0.05
2	1.25 to 2.00	+0.15	-0.08
	over 2.00 to 3.00	+0.20	-0.10
	over 3.00 to 6.00	+0.30	-0.15
3	over 6.00 to 16.00	+0.30	-0.30

Since these tolerance were computed for disc sizes specified in DIN 2093 certain limitations must be imposed for other discs in which the dimensional ratios differ from the standard springs. This also applies in the case of "K" disc springs.

Heat Treatment

All our springs are austempered. This method of heat treatment is particularly effective for springs, as it gives the maximum toughness and therefore considerable durability.

According to DIN 2093 the hardness should be RC 42-52 and in manufacture the optimum value is selected with regard to spring size and tensile stress.

Pre-setting

After heat treatment each disc spring is scragged, i.e., pressed flat at least once. By doing so the spring is preset in such a way that the overall height OH stays within the permissible tolerance after being subject to loads up 1.5, the maximum force at $f=h$.

Surface Protection

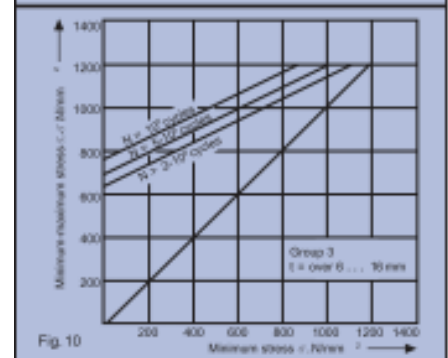
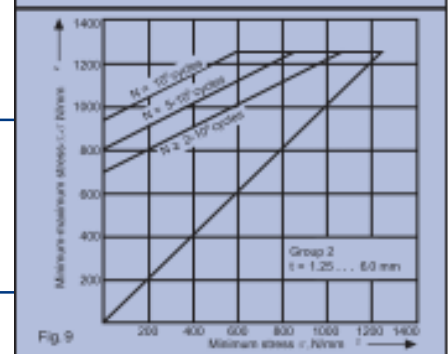
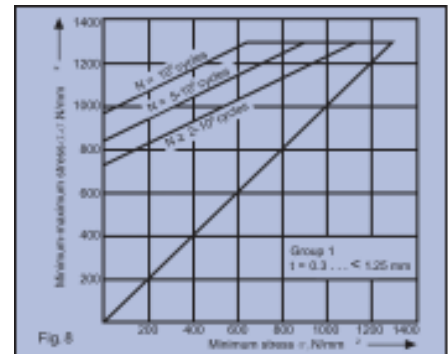
Unless stated, all our disc springs are supplied Phosphated or oil blackened before oil dipping. The Phosphated surface is preferred for the better protection it provides over oil blackening. Deposition of a metal coating on the surface is also possible. The most frequently used material is Zinc with a final passivation in Chrome solution. Unfortunately, current methods of electronically depositing metal coating from aqueous solutions cause hydrogen embrittlement which cannot be completely avoided in cases of higher tensile steels – this is the case with disc springs and safety washers. Schnorr therefore introduced a mechanical plating process which proves to be very successful over a number of years where no Hydrogen embrittlement occurs.

Since the method is carried out in a drum it is possible only with larger quantities and limitation of an external diameter up to approximately 80mm. Zinc and Cadmium are lower than steel on the electrochemical table and therefore a self protecting effect occurs in the case of surface damage.

A Chemical Nickel plating surface treatment is also possible ie, the Durni-Coat process. With this method embrittlement is also avoided to a large extent. Because of the greater hardness of the nickel layer, durability under dynamic loading comes into question. In the event of damage, no self protection occurs since nickel lies higher than steel in the electrochemical table. Further advice on specific applications can be obtained from our engineers.

Surface Working

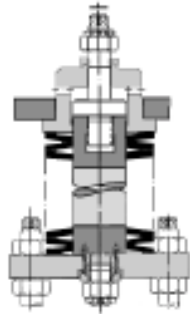
Surface working, especially by shot-peening, has proved to be beneficial for disc springs subjected to dynamic loads. The result may increase the working life far in excess for the values shown in Figs 8,9 and 10. However, as shot-peening reduces the internal tensile stresses arising from scragging, shot-peening or other methods of surface working are not recommended for discs carrying static loads.



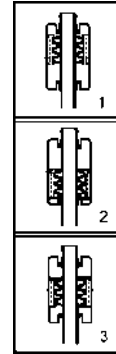
TYPICAL DISC SPRING APPLICATIONS

Shown here are just a few examples that show the versatility of Schnorr Disc Springs in industrial product. Contact our sales representatives or design engineers for assistance on your specific spring application.

- Spring
- Die Spring
- Lock Washer
- Sealing Gaskets
- Shock Loading/Absorption
- Vibration Control
- Thermal Expansion

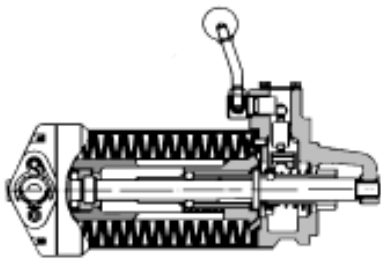


This picture shows M.A.N. steam turbine condensers weighing several hundred tons being supported by a very small number of discs arranged in 3 stacks.

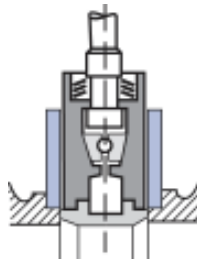


This disc spring stack is used in a pile-driving machine. The operation is shown in three typical phases.

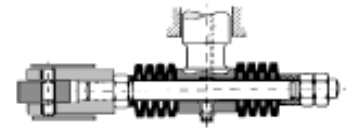
1. Initial position
2. Impact - the springs are compressed progressively from top to bottom carried out by pneumatic assistance.
3. Return to initial position also assisted by pneumatics.



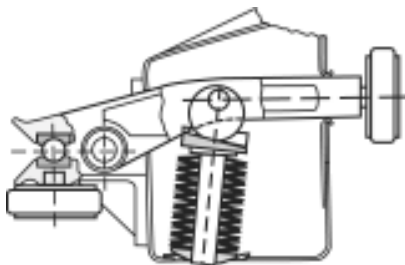
Sectional view of the starter showing the general arrangement of components. The windingspindle with ratchet is on the left.



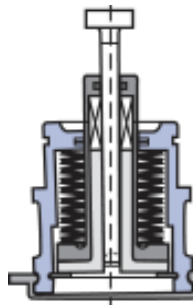
Improvement of sealing performance applies to closing the gate until the cone engages. The springs compress and the wedge forces the side plate into close watertight contact with the valve faces.



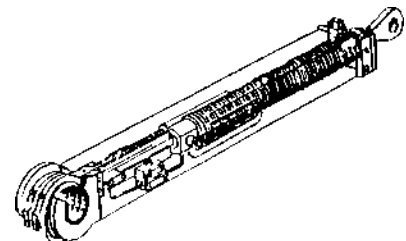
This illustration shows a shear pin assembly to a main shaft. To protect the shear pin from transient shock overload while working the connection link is fitted with double acting SCHNORR disc spring stack.



A spring with almost a "zero" rate is used for a negligible amount of force variance despite the differences in the cable diameter. Should one disc of the stack fracture, the clamping force would barely be affected and the unit would still be operational.



This device maintains a working clearance, while aircraft adjuster friction materials wear, to ensure constant fluid displacement during operation. The force/travel curve of the springs within the confines of such small assemblies must match the hydraulic pressure and friction bushings. The rate and accuracy of Schnorr Disc Springs make them ideal for this purposes.



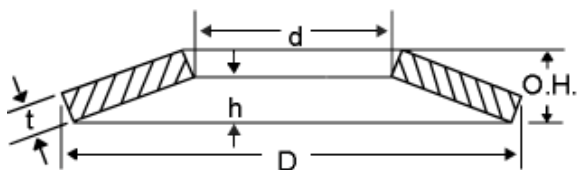
The Demag unit shown is a standard device on all cranes used to automatically compensate for load and angle. Note the small size of the disc spring stack when tremendous working loads are considered.

Disc Springs Inch Series



EN (NEWTON) = 0.102 kg inches x 25.4 = mm
= 0.225 lb. lbs. x .454 = kg

PART NUMBER	SIZE mm			SIZE inch					LOAD P - in lb, Deflection f in inch							
	O.D. D	I.D. d	Matl. t	O.D. D	I.D. d	Matl. t	Travel h	Overall Hgt. O.H.	f = 0.25 h		f = 0.50 h		f = 0.75 h		Flat = h	
									P	f	P	f	P	f	P	f
DSZ010	9.53	4.960	0.40	.375	.195	.016	.012	.028	23	.003	41	.006	55	.008	68	.012
DSZ020	12.70	6.550	0.50	.500	.258	.020	.016	.035	35	.004	61	.008	82	.012	89	.016
DSZ030	12.70	6.550	0.60	.500	.258	.024	.016	.038	55	.004	100	.008	137	.012	171	.016
DSZ040	17.46	9.700	0.60	.687	.382	.024	.020	.043	44	.005	75	.010	100	.015	120	.020
DSZ050	17.46	9.700	0.70	.687	.382	.028	.020	.047	83	.005	113	.010	154	.015	180	.020
DSZ060	19.05	8.137	0.70	.750	.320	.028	.024	.051	61	.006	108	.012	138	.018	166	.024
DSZ070	19.05	8.137	0.80	.750	.320	.031	.024	.055	78	.006	138	.012	184	.018	225	.024
DSZ080	19.05	9.700	0.80	.750	.382	.031	.022	.053	74	.006	133	.011	181	.017	224	.022
DSZ090	19.05	9.700	0.90	.750	.382	.035	.022	.057	101	.006	185	.011	256	.017	322	.022
DSZ100	25.40	11.310	0.90	1.000	.445	.035	.031	.067	90	.008	154	.016	201	.023	239	.031
DSZ110	25.40	11.310	1.00	1.000	.445	.039	.031	.071	117	.008	204	.018	272	.023	330	.031
DSZ120	25.40	11.310	1.25	1.000	.445	.049	.026	.075	163	.007	304	.013	430	.020	549	.028
DSZ121	28.00	13.000	1.00	1.100	.512	.039	.035	.075	119	.009	204	.018	264	.026	313	.035
DSZ122	28.00	13.000	1.25	1.100	.512	.049	.033	.083	190	.008	342	.017	470	.025	585	.033
DSZ123	28.00	13.000	1.50	1.100	.512	.059	.028	.087	248	.007	470	.014	672	.021	866	.028
DSZ130	34.92	16.175	1.25	1.375	.637	.049	.045	.094	189	.011	337	.023	434	.034	511	.045
DSZ140	34.92	16.175	1.50	1.375	.637	.059	.043	.102	288	.011	511	.022	693	.032	853	.043
DSZ150	34.92	16.175	2.00	1.375	.637	.079	.031	.110	406	.008	781	.016	1130	.023	1480	.031
DSZ160	38.10	19.350	1.50	1.500	.762	.059	.055	.114	378	.014	638	.028	820	.041	963	.055
DSZ170	38.10	19.350	2.00	1.500	.762	.079	.043	.122	539	.011	1000	.022	1420	.032	1810	.043
DSZ180	38.10	19.350	2.50	1.500	.762	.098	.035	.134	760	.008	1470	.018	2150	.026	2810	.035
DSZ190	50.80	25.800	2.00	2.000	1.016	.078	.059	.138	476	.015	843	.030	1140	.044	1390	.059
DSZ200	50.80	25.800	2.50	2.000	1.016	.098	.059	.157	824	.015	1510	.030	2110	.044	2660	.059
DSZ210	50.80	25.800	3.00	2.000	1.016	.118	.047	.165	1020	.012	1960	.024	2840	.035	3700	.047
DSZ220	60.33	25.800	2.00	2.375	1.016	.079	.079	.157	508	.020	840	.040	1060	.059	1220	.079
DSZ230	60.33	25.800	2.50	2.375	1.016	.098	.079	.177	832	.020	1450	.040	1930	.058	2330	.079
DSZ240	60.33	25.800	3.00	2.375	1.016	.118	.063	.181	964	.016	1800	.032	2540	.047	3250	.063



Disc Spring Terminology and Symbols

- D Outside Diameter (Inch or MM)
- d Inside Diameter (Inch or MM)
- P Load (Newtons or Pounds)
- H Overall Height (Inch or MM)
- h Formed Height of Disc (total travel to flat) (Inch or MM)
- f Deflection (Inch or MM)
- t Thickness of Material (Inch or MM)

Disc Springs



EN (NEWTON) = 0.102 kg inches x 25.4 = mm
 = 0.225 lb. lbs. x .454 = kg

PART NUMBER		O.D. D	I.D. d	MATL. t	O/A HGT O.H.	[f = 0.25 h]		[f = 0.50 h]		[f = 0.75 h]		[FLAT f = h]	
						LOAD P	DEFL. f	LOAD P	DEFL. f	LOAD P	DEFL. f	LOAD P	DEFL. f
DSM0063203	MM	6.000	3.200	0.300	0.450	45	0.038	84	0.075	119	0.113	153	0.150
	IN	0.236	0.126	0.012	0.018	10	0.001	19	0.003	27	0.004	35	0.006
DSM0083202	MM	8.000	3.200	0.200	0.400	12	0.050	20	0.100	26	0.150	30	0.200
	IN	0.315	0.126	0.008	0.016	3	0.002	5	0.004	6	0.006	7	0.008
DSM0083203	MM	8.000	3.200	0.300	0.550	46	0.063	79	0.125	104	0.188	126	0.250
	IN	0.315	0.126	0.012	0.022	10	0.002	18	0.005	24	0.007	28	0.010
DSM0083204	MM	8.000	3.200	0.400	0.600	69	0.050	130	0.100	185	0.150	238	0.200
	IN	0.315	0.126	0.016	0.024	16	0.002	29	0.004	42	0.006	54	0.008
DSM0084202	MM	8.000	4.200	0.200	0.450	21	0.063	33	0.125	39	0.188	42	0.250
	IN	0.315	0.165	0.008	0.018	5	0.002	8	0.005	9	0.007	9	0.010
DSM0084203	MM	8.000	4.200	0.300	0.550	52	0.063	147	0.100	210	0.150	269	0.200
	IN	0.315	0.165	0.012	0.022	18	0.002	33	0.004	47	0.006	61	0.009
DSM0084204	MM	8.000	4.200	0.400	0.600	78	0.050	89	0.125	118	0.188	142	0.250
	IN	0.315	0.165	0.016	0.024	18	0.002	20	0.005	27	0.007	32	0.010
DSM0103203	MM	10.000	3.200	0.300	0.650	51	0.088	82	0.175	98	0.263	108	0.350
	IN	0.394	0.126	0.012	0.026	12	0.003	18	0.007	22	0.010	24	0.014
DSM0103204	MM	10.000	3.200	0.400	0.700	75	0.075	133	0.150	179	0.225	220	0.300
	IN	0.394	0.126	0.016	0.028	17	0.003	30	0.006	40	0.009	50	0.012
DSM0103205	MM	10.000	3.200	0.500	0.750	104	0.063	195	0.125	279	0.188	357	0.250
	IN	0.394	0.126	0.020	0.030	23	0.002	44	0.005	63	0.007	81	0.010
DSM0105202	MM	10.000	5.200	0.250	0.550	30	0.075	48	0.150	58	0.225	63	0.300
	IN	0.394	0.205	0.010	0.022	7	0.003	11	0.006	13	0.009	14	0.012
DSM0105204	MM	10.000	5.200	0.400	0.700	88	0.075	155	0.150	209	0.225	257	0.300
	IN	0.394	0.205	0.016	0.028	20	0.003	35	0.006	47	0.009	58	0.012
DSM0105205	MM	10.000	5.200	0.500	0.750	122	0.063	228	0.125	325	0.188	418	0.250
	IN	0.394	0.205	0.020	0.030	27	0.002	52	0.005	73	0.007	94	0.010
DSM0124204	MM	12.000	4.200	0.400	0.800	85	0.100	141	0.200	178	0.300	206	0.400
	IN	0.472	0.165	0.016	0.031	19	0.004	32	0.008	40	0.012	46	0.016
DSM0124205	MM	12.000	4.200	0.500	0.850	116	0.088	208	0.175	284	0.263	352	0.350
	IN	0.472	0.165	0.020	0.033	26	0.003	47	0.007	64	0.010	79	0.014
DSM0124206	MM	12.000	4.200	0.600	1.000	224	0.100	405	0.200	557	0.300	694	0.400
	IN	0.472	0.165	0.024	0.039	51	0.004	91	0.008	126	0.012	157	0.016
DSM0125205	MM	12.000	5.200	0.500	0.900	150	0.100	263	0.200	350	0.300	424	0.400
	IN	0.472	0.205	0.020	0.035	34	0.004	59	0.008	79	0.012	96	0.016
DSM0125206	MM	12.000	5.200	0.600	0.950	196	0.088	361	0.175	506	0.263	641	0.350
	IN	0.472	0.205	0.024	0.037	44	0.003	82	0.007	114	0.010	145	0.014
DSM0126205	MM	12.000	6.200	0.500	0.850	134	0.088	239	0.175	326	0.263	404	0.350
	IN	0.472	0.244	0.020	0.033	30	0.003	54	0.007	74	0.010	91	0.014
DSM0126206	MM	12.000	6.200	0.600	0.950	214	0.088	394	0.175	552	0.263	699	0.350
	IN	0.472	0.244	0.024	0.037	48	0.003	89	0.007	125	0.010	158	0.014
DSM0135205	MM	12.500	5.200	0.500	0.850	111	0.088	200	0.175	272	0.263	337	0.350
	IN	0.492	0.205	0.020	0.033	25	0.003	45	0.007	61	0.010	76	0.014
DSM0136203	MM	12.500	6.200	0.350	0.800	84	0.113	130	0.225	151	0.338	160	0.450
	IN	0.492	0.244	0.014	0.031	19	0.004	29	0.009	34	0.013	36	0.018
DSM0136205	MM	12.500	6.200	0.500	0.850	120	0.088	215	0.175	293	0.263	363	0.350
	IN	0.492	0.244	0.020	0.033	27	0.003	49	0.007	66	0.010	82	0.014
DSM0136207	MM	12.500	6.200	0.700	1.000	239	0.075	457	0.150	660	0.225	855	0.300
	IN	0.492	0.244	0.028	0.039	54	0.003	103	0.006	149	0.009	193	0.012
DSM0147203	MM	14.000	7.200	0.350	0.800	68	0.113	106	0.225	123	0.338	131	0.450
	IN	0.551	0.283	0.014	0.031	15	0.004	24	0.009	28	0.013	29	0.018
DSM0147205	MM	14.000	7.200	0.500	0.900	120	0.100	210	0.200	279	0.300	338	0.400
	IN	0.551	0.283	0.020	0.035	27	0.004	47	0.008	63	0.012	76	0.016
DSM0147208	MM	14.000	7.200	0.080	1.100	284	0.075	547	0.150	797	0.225	1040	0.300
	IN	0.551	0.283	0.031	0.043	64	0.003	124	0.006	180	0.009	235	0.012
DSM0155204	MM	15.000	5.200	0.400	0.950	101	0.138	154	0.275	176	0.413	181	0.550
	IN	0.591	0.205	0.016	0.037	23	0.005	35	0.011	40	0.016	41	0.022
DSM0155205	MM	15.000	5.200	0.500	1.000	133	0.125	221	0.250	278	0.375	321	0.500
	IN	0.591	0.205	0.020	0.039	30	0.005	50	0.010	63	0.015	72	0.020
DSM0155206	MM	15.000	5.200	0.600	1.050	171	0.113	302	0.225	407	0.338	499	0.450
	IN	0.591	0.205	0.024	0.041	39	0.004	68	0.009	92	0.013	113	0.018
DSM0155207	MM	15.000	5.200	0.700	1.100	214	0.100	395	0.200	555	0.300	704	0.400
	IN	0.591	0.205	0.028	0.043	48	0.004	89	0.008	125	0.012	159	0.016
DSM0156205	MM	15.000	6.200	0.500	1.000	138	0.125	229	0.250	289	0.375	334	0.500
	IN	0.591	0.244	0.020	0.039	31	0.005	52	0.010	65	0.015	75	0.022
DSM0156206	MM	15.000	6.200	0.600	1.050	178	0.113	314	0.225	423	0.338	519	0.450
	IN	0.591	0.244	0.024	0.041	40	0.004	71	0.009	96	0.013	117	0.018
DSM0156207	MM	15.000	6.200	0.700	1.100	222	0.100	411	0.200	578	0.300	733	0.400
	IN	0.591	0.244	0.028	0.043	50	0.004	93	0.008	130	0.012	165	0.016

Disc Springs



EN (NEWTON) = 0.102 kg inches x 25.4 = mm
= 0.225 lb. lbs. x .454 = kg

PART NUMBER	O.D. D	I.D. d	MATL. t	O/A HGT O.H.	[f = 0.25 h]		[f = 0.50 h]		[f = 0.75 h]		[FLAT f = h]	
					LOAD P	DEFL. f	LOAD P	DEFL. f	LOAD P	DEFL. f	LOAD P	DEFL. f
DSM0803140	MM 80.000	31.000	4.000	6.100	7320	0.525	13700	1.050	19400	1.575	24800	2.100
	IN 3.150	1.220	0.157	0.240	1650	0.021	3090	0.041	4380	0.062	5600	0.083
DSM0803630	MM 80.000	36.000	3.000	5.700	5400	0.675	9200	1.350	11900	2.025	14100	2.700
	IN 3.150	1.417	0.118	0.224	1220	0.027	2080	0.053	2690	0.080	3180	0.106
DSM0803640	MM 80.000	36.000	4.000	6.200	8160	0.550	15200	1.100	21400	1.650	27200	2.200
	IN 3.150	1.417	0.157	0.224	1840	0.022	3420	0.043	4830	0.065	6150	0.087
DSM0804122	MM 80.000	41.000	2.250	5.200	3700	0.738	5720	1.475	6610	2.213	6950	2.950
	IN 3.150	1.614	0.089	0.205	835	0.029	1290	0.058	1490	0.087	1570	0.116
DSM0804130	MM 80.000	41.000	3.000	5.300	4450	0.575	7840	1.150	10500	1.725	12800	2.300
	IN 3.150	1.614	0.118	0.209	1000	0.023	1770	0.045	2370	0.068	2900	0.091
DSM0804140	MM 80.000	41.000	4.000	6.200	8730	0.550	16200	1.100	22900	1.650	29100	2.200
	IN 3.150	1.614	0.157	0.244	1970	0.022	3660	0.043	5160	0.065	6570	0.087
DSM0804150	MM 80.000	41.000	5.000	6.700	11800	0.425	22900	0.850	33600	1.275	44000	1.700
	IN 3.150	1.614	0.197	0.264	2670	0.017	5180	0.033	7580	0.050	9920	0.067
DSM0904625	MM 90.000	46.000	2.500	5.700	4230	0.800	6580	1.600	7680	2.400	8160	3.200
	IN 3.543	1.811	0.098	0.224	955	0.031	1490	0.063	1730	0.094	1840	0.126
DSM0904635	MM 90.000	46.000	3.500	6.000	5840	0.625	10400	1.250	14200	1.874	17500	2.500
	IN 3.543	1.811	0.138	0.236	1320	0.025	2350	0.049	3200	0.074	3950	0.098
DSM0904650	MM 90.000	46.000	5.000	7.000	11300	0.500	21600	1.000	31400	1.500	40800	2.000
	IN 3.543	1.811	0.197	0.276	2540	0.020	4880	0.039	7080	0.059	9210	0.079
DSM1004140	MM 100.000	41.000	4.000	7.200	8710	0.800	15200	1.600	20300	2.400	24500	3.200
	IN 3.937	1.614	0.157	0.283	1970	0.031	3440	0.063	4570	0.094	5540	0.126
DSM1004150	MM 100.000	41.000	5.000	7.750	12300	0.688	22900	1.375	32400	2.063	41200	2.750
	IN 3.937	1.614	0.197	0.305	2790	0.027	5180	0.054	7300	0.081	9300	0.108
DSM1005127	MM 100.000	51.000	2.700	6.200	4780	0.875	7410	1.750	8610	2.625	9090	3.500
	IN 3.937	2.008	0.106	0.244	1080	0.034	1670	0.069	1940	0.103	2050	0.138
DSM1005135	MM 100.000	51.000	3.500	6.300	5620	0.700	9820	1.400	13100	2.100	15800	2.800
	IN 3.937	2.008	0.138	0.248	1270	0.028	2220	0.055	2950	0.083	3580	0.110
DSM1005140	MM 100.000	51.000	4.000	7.000	8760	0.750	15300	1.500	20700	2.250	25300	3.000
	IN 3.937	2.008	0.157	0.276	1960	0.030	3460	0.059	4670	0.089	5720	0.118
DSM1005150	MM 100.000	51.000	5.000	7.800	13900	0.700	25800	1.400	36300	2.100	46200	2.800
	IN 3.937	2.008	0.197	0.307	3140	0.028	5830	0.055	8200	0.083	10400	0.110
DSM1005160	MM 100.000	51.000	6.000	8.200	17100	0.550	32900	1.100	48000	1.650	62700	2.200
	IN 3.937	2.008	0.236	0.323	3850	0.022	7430	0.043	10800	0.065	14200	0.087
DSM1125730	MM 112.000	57.000	3.000	6.900	5830	0.975	9040	1.950	10500	2.925	11100	3.900
	IN 4.409	2.244	0.118	0.272	1320	0.038	2040	0.077	2370	0.115	2500	0.154
DSM1125740	MM 112.000	57.000	4.000	7.200	7640	0.800	13300	1.600	17800	2.400	21500	3.200
	IN 4.409	2.244	0.157	0.283	1720	0.031	3010	0.063	4010	0.094	4860	0.126
DSM1125760	MM 112.000	57.000	6.000	8.500	15800	0.625	30200	1.250	43700	1.875	56700	2.500
	IN 4.409	2.224	0.236	0.335	3570	0.025	6820	0.049	9870	0.074	12800	0.098
DSM1254140	MM 125.000	41.000	4.000	8.200	8500	1.050	13900	2.100	17300	3.150	19700	4.200
	IN 4.921	1.614	0.157	0.323	1920	0.041	3150	0.083	3920	0.124	4450	0.165
DSM1255140	MM 125.000	51.000	4.000	8.500	10100	1.125	16300	2.250	19800	3.375	22100	4.500
	IN 4.921	2.008	0.157	0.335	2280	0.044	3670	0.089	4470	0.133	4980	0.177
DSM1255150	MM 125.000	51.000	5.000	8.900	13100	0.975	22900	1.950	30700	2.925	37300	3.900
	IN 4.921	2.008	0.197	0.350	2950	0.038	5180	0.077	6920	0.115	8430	0.154
DSM1255160	MM 125.000	51.000	6.000	9.400	17000	0.850	31500	1.700	44300	2.550	56300	3.400
	IN 4.921	2.008	0.236	0.370	3840	0.033	7110	0.067	10000	0.100	12700	0.134
DSM1256150	MM 125.000	61.000	5.000	9.000	14600	1.000	25500	2.000	34000	3.000	41200	4.000
	IN 4.921	2.402	0.197	0.354	3300	0.039	5760	0.079	7670	0.118	9290	0.157
DSM1256160	MM 125.000	61.000	6.000	9.600	19800	0.900	36300	1.800	50700	2.700	64000	3.600
	IN 4.921	2.402	0.236	0.378	4470	0.035	8200	0.071	11400	0.106	14500	0.142
DSM1256180	MM 125.000	61.000	8.000	10.900	33200	0.725	64100	1.450	93600	2.175	122000	2.900
	IN 4.921	2.402	0.315	0.429	7490	0.029	14500	0.057	21100	0.086	27600	0.114
DSM1256435	MM 125.000	64.000	3.500	8.000	8510	1.125	13200	2.250	15400	3.375	16300	4.500
	IN 4.921	2.520	0.138	0.315	1920	0.044	2990	0.089	3480	0.133	3690	0.177
DSM1256450	MM 125.000	64.000	5.000	8.500	12200	0.875	21900	1.750	29900	2.625	37000	3.500
	IN 4.921	2.520	0.197	0.335	2760	0.034	4950	0.069	6750	0.103	8360	0.138
DSM1256480	MM 125.000	64.000	8.000	10.600	30100	0.650	58600	1.300	85900	1.950	113000	2.600
	IN 4.921	2.520	0.315	0.417	6800	0.026	13200	0.051	19400	0.077	25400	0.102
DSM1257160	MM 125.000	71.000	6.000	9.300	19500	0.825	36300	1.650	51200	2.475	65200	3.300
	IN 4.921	2.795	0.236	0.366	4410	0.032	8190	0.065	11600	0.097	14700	0.130
DSM1257180	MM 125.000	71.000	8.000	10.400	29800	0.600	58100	1.200	85500	1.800	112000	2.400
	IN 4.921	2.795	0.315	0.409	6720	0.024	13100	0.047	19300	0.071	25400	0.094
DSM1257199	MM 125.000	71.000	10.000	11.800	42000	0.450	83300	0.900	124000	1.350	165000	1.800
	IN 4.921	2.795	0.394	0.465	9490	0.018	18800	0.035	28000	0.053	37200	0.071

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