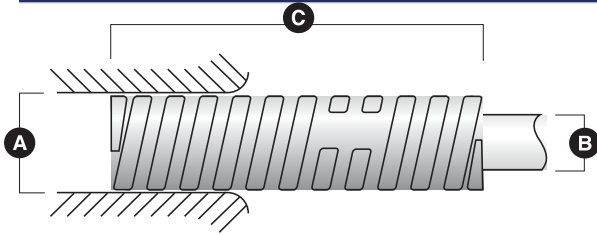


Medium Duty

INCH DIMENSIONS



US Series

Raymond®		MEDIUM DUTY DIE SPRINGS			INCH DIMENSIONS						BLUE
Hole Dia. (in)	Rod Dia. (in)	Free Length (in)	CATALOG NUMBER	Load at 1/10 in. Def. (lb)	LOAD DEFLECTION TABLE						
					For Optimum Life (25% of free length)		For Long Life (35% of free length)		Maximum Operating Def. (40% of free length)		*Maximum Deflection (50% of free length)
A	B	C			Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Deflection (in)
3/8	3/16	1	103-104	6.0	15.0	0.25	21.0	0.35	24.0	0.40	0.50
		1 1/4	103-105	5.0	15.6	0.31	21.9	0.44	25.0	0.50	0.63
		1 1/2	103-106	4.2	15.8	0.38	22.1	0.53	25.2	0.60	0.75
		1 3/4	103-107	3.7	16.2	0.44	22.7	0.61	25.9	0.70	0.88
		2	103-108	3.1	15.5	0.50	21.7	0.70	24.8	0.80	1.00
		2 1/2	103-110	2.6	16.3	0.63	22.8	0.88	26.0	1.00	1.25
		3	103-112	2.1	15.8	0.75	22.0	1.05	25.2	1.20	1.50
		12	103-148	0.6	18.0	3.00	25.2	4.20	28.8	4.80	6.00
1/2	9/32	1	103-204	11.0	27.5	0.25	38.5	0.35	44.0	0.40	0.50
		1 1/4	103-205	8.2	25.6	0.31	35.9	0.44	41.0	0.50	0.63
		1 1/2	103-206	6.8	25.5	0.38	35.7	0.53	40.8	0.60	0.75
		1 3/4	103-207	6.0	26.3	0.44	36.8	0.61	42.0	0.70	0.88
		2	103-208	5.5	27.5	0.50	38.5	0.70	44.0	0.80	1.00
		2 1/2	103-210	4.5	28.1	0.63	39.4	0.88	45.0	1.00	1.25
		3	103-212	3.5	26.3	0.75	36.8	1.05	42.0	1.20	1.50
		3 1/2	103-214	3.0	26.3	0.88	36.8	1.23	42.0	1.40	1.75
		4 1/2	103-218	2.3	25.9	1.13	36.2	1.58	41.4	1.80	2.25
		5 1/2	103-222	2.0	27.5	1.38	38.5	1.93	44.0	2.20	2.75
		6 1/2	103-226	1.4	22.8	1.63	31.9	2.28	36.4	2.60	3.25
		7 1/2	103-230	1.2	22.5	1.88	31.5	2.63	36.0	3.00	3.75
12	103-248	0.7	21.0	3.00	29.4	4.20	33.6	4.80	6.00		
5/8	11/32	1	103-304	16.4	41.0	0.25	57.4	0.35	65.6	0.40	0.50
		1 1/4	103-305	12.4	38.8	0.31	54.3	0.44	62.0	0.50	0.63
		1 1/2	103-306	10.8	40.5	0.38	56.7	0.53	64.8	0.60	0.75
		1 3/4	103-307	9.6	42.0	0.44	58.8	0.61	67.2	0.70	0.88
		2	103-308	8.6	43.0	0.50	60.2	0.70	68.8	0.80	1.00
		2 1/2	103-310	6.5	40.6	0.63	56.9	0.88	65.0	1.00	1.25
		3	103-312	5.8	43.5	0.75	60.9	1.05	69.6	1.20	1.50
		3 1/2	103-314	5.0	43.8	0.88	61.3	1.23	70.0	1.40	1.75
3/4	3/8	4	103-316	4.4	44.0	1.00	61.6	1.40	70.4	1.60	2.00
		12	103-348	1.5	45.0	3.00	63.0	4.20	72.0	4.80	6.00
		1	103-404	32.0	80.0	0.25	112.0	0.35	128.0	0.40	0.50
		1 1/4	103-405	25.6	80.0	0.31	112.0	0.44	128.0	0.50	0.63
		1 1/2	103-406	20.0	75.0	0.38	105.0	0.53	120.0	0.60	0.75
		1 3/4	103-407	17.6	77.0	0.44	107.8	0.61	123.2	0.70	0.88
		2	103-408	15.0	75.0	0.50	105.0	0.70	120.0	0.80	1.00
		2 1/2	103-410	12.0	75.0	0.63	105.0	0.88	120.0	1.00	1.25
3/4	3/8	3	103-412	10.1	75.8	0.75	106.1	1.05	121.2	1.20	1.50
		3 1/2	103-414	8.3	72.6	0.88	101.7	1.23	116.2	1.40	1.75
		4	103-416	7.5	75.0	1.00	105.0	1.40	120.0	1.60	2.00
		4 1/2	103-418	6.4	72.0	1.13	100.8	1.58	115.2	1.80	2.25
		5	103-420	6.0	75.0	1.25	105.0	1.75	120.0	2.00	2.50
		5 1/2	103-422	5.5	75.6	1.38	105.9	1.93	121.0	2.20	2.75
		6	103-424	5.0	75.0	1.50	105.0	2.10	120.0	2.40	3.00
		6 1/2	103-426	4.7	76.4	1.63	106.9	2.28	122.2	2.60	3.25
		7 1/2	103-430	3.8	71.3	1.88	99.8	2.63	114.0	3.00	3.75
		12	103-448	2.4	72.0	3.00	100.8	4.20	115.2	4.80	6.00



* 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.

Medium Duty

INCH DIMENSIONS



US Series

Raymond® MEDIUM DUTY DIE SPRINGS					INCH DIMENSIONS						BLUE	
Hole Dia. (in)	Rod Dia. (in)	Free Length (in)	CATALOG NUMBER	Load at 1/10 in. Def. (lb)	LOAD DEFLECTION TABLE							
					For Optimum Life (25% of free length)		For Long Life (35% of free length)		Maximum Operating Def. (40% of free length)		*Maximum Deflection (50% of free length)	
					Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Load (lb)	Deflection (in)	Deflection (in)	
A	B	C										
1	1/2	1	103-504	55.0	137.5	0.25	192.5	0.35	220.0	0.40	0.50	
		1 1/4	103-505	45.0	140.6	0.31	196.9	0.44	225.0	0.50	0.63	
		1 1/2	103-506	37.3	139.9	0.38	195.8	0.53	223.8	0.60	0.75	
		1 3/4	103-507	32.0	140.0	0.44	196.0	0.61	224.0	0.70	0.88	
		2	103-508	26.8	134.0	0.50	187.6	0.70	214.4	0.80	1.00	
		2 1/2	103-510	20.9	130.6	0.63	182.9	0.88	209.0	1.00	1.25	
		3	103-512	17.1	128.3	0.75	179.6	1.05	205.2	1.20	1.50	
		3 1/2	103-514	14.5	126.9	0.88	177.6	1.23	203.0	1.40	1.75	
		4	103-516	12.5	125.0	1.00	175.0	1.40	200.0	1.60	2.00	
		4 1/2	103-518	11.0	123.8	1.13	173.3	1.58	198.0	1.80	2.25	
		5	103-520	9.6	120.0	1.25	168.0	1.75	192.0	2.00	2.50	
		5 1/2	103-522	8.8	121.0	1.38	169.4	1.93	193.6	2.20	2.75	
6	103-524	8.0	120.0	1.50	168.0	2.10	192.0	2.40	3.00			
7	103-528	7.2	126.0	1.75	176.4	2.45	201.6	2.80	3.50			
8	103-532	6.0	120.0	2.00	168.0	2.80	192.0	3.20	4.00			
12	103-548	4.0	120.0	3.00	168.0	4.20	192.0	4.80	6.00			
1 1/4	5/8	1 1/2	103-606	49.6	186.0	0.38	260.4	0.53	297.6	0.60	0.75	
		1 3/4	103-607	40.6	177.6	0.44	248.7	0.61	284.2	0.70	0.88	
		2	103-608	37.6	188.0	0.50	263.2	0.70	300.8	0.80	1.00	
		2 1/2	103-610	28.8	180.0	0.63	252.0	0.88	288.0	1.00	1.25	
		3	103-612	24.0	180.0	0.75	252.0	1.05	288.0	1.20	1.50	
		3 1/2	103-614	20.0	175.0	0.88	245.0	1.23	280.0	1.40	1.75	
		4	103-616	17.6	176.0	1.00	246.4	1.40	281.6	1.60	2.00	
		4 1/2	103-618	16.0	180.0	1.13	252.0	1.58	288.0	1.80	2.25	
		5	103-620	14.3	178.8	1.25	250.3	1.75	286.0	2.00	2.50	
		5 1/2	103-622	12.8	176.0	1.38	246.4	1.93	281.6	2.20	2.75	
		6	103-624	12.0	180.0	1.50	252.0	2.10	288.0	2.40	3.00	
		7	103-628	10.4	182.0	1.75	254.8	2.45	291.2	2.80	3.50	
8	103-632	8.8	176.0	2.00	246.4	2.80	281.6	3.20	4.00			
10	103-640	7.2	180.0	2.50	252.0	3.50	288.0	4.00	5.00			
12	103-648	6.0	180.0	3.00	252.0	4.20	288.0	4.80	6.00			
1 1/2	3/4	2	103-708	53.0	265.0	0.50	371.0	0.70	424.0	0.80	1.00	
		2 1/2	103-710	42.7	266.9	0.63	373.6	0.88	427.0	1.00	1.25	
		3	103-712	36.0	270.0	0.75	378.0	1.05	432.0	1.20	1.50	
		3 1/2	103-714	30.0	262.5	0.88	367.5	1.23	420.0	1.40	1.75	
		4	103-716	24.9	249.0	1.00	348.6	1.40	398.4	1.60	2.00	
		4 1/2	103-718	23.0	258.8	1.13	362.3	1.58	414.0	1.80	2.25	
		5	103-720	21.0	262.5	1.25	367.5	1.75	420.0	2.00	2.50	
		5 1/2	103-722	18.5	254.4	1.38	356.1	1.93	407.0	2.20	2.75	
		6	103-724	17.0	255.0	1.50	357.0	2.10	408.0	2.40	3.00	
		7	103-728	15.3	267.8	1.75	374.9	2.45	428.4	2.80	3.50	
		8	103-732	13.2	264.0	2.00	369.6	2.80	422.4	3.20	4.00	
		10	103-740	10.6	265.0	2.50	371.0	3.50	424.0	4.00	5.00	
12	103-748	8.5	255.0	3.00	357.0	4.20	408.0	4.80	6.00			
2	1	2 1/2	103-810	100.0	625.0	0.63	875.0	0.88	1000.0	1.00	1.25	
		3	103-812	83.0	622.5	0.75	871.5	1.05	996.0	1.20	1.50	
		3 1/2	103-814	67.7	592.4	0.88	829.3	1.23	947.8	1.40	1.75	
		4	103-816	60.0	600.0	1.00	840.0	1.40	960.0	1.60	2.00	
		4 1/2	103-818	53.0	596.3	1.13	834.8	1.58	954.0	1.80	2.25	
		5	103-820	47.0	587.5	1.25	822.5	1.75	940.0	2.00	2.50	
		5 1/2	103-822	40.5	556.9	1.38	779.6	1.93	891.0	2.20	2.75	
		6	103-824	39.0	585.0	1.50	819.0	2.10	936.0	2.40	3.00	
		7	103-828	31.2	546.0	1.75	764.4	2.45	873.6	2.80	3.50	
		8	103-832	28.5	570.0	2.00	798.0	2.80	912.0	3.20	4.00	
		10	103-840	21.6	540.0	2.50	756.0	3.50	864.0	4.00	5.00	
		12	103-848	18.5	555.0	3.00	777.0	4.20	888.0	4.80	6.00	

* 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.



A business of BARNES GROUP INC

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Selecting Die Springs



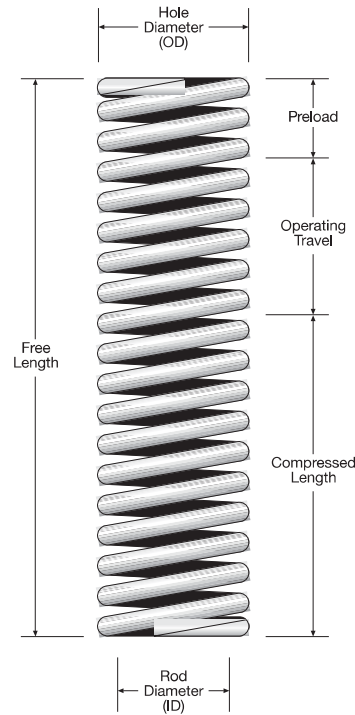
A general rule to observe in spring selection is to always use as many springs as the die will accommodate which will produce the required load with the least amount of deflection. This will increase the useful life of the spring, reduce the chances of spring failure and the resulting downtime, loss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

Die spring costs are a very small percentage 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.

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.

Springs for strippers, pressure pads, and other die components can be selected from the following pages. When selecting a die spring it is necessary to determine the type of performance required of the springs: short, normal, or long run. For short- or normal-run a d on optimum life. The recommended deflections for each spring based on the performance required are shown on pages 6 to 28.

Another approach when selecting a spring is to work back from the amount of operating travel the springs will be subjected to as indicated by the die layout. Select springs in the appropriate duty range which will operate efficiently at the required travel. Calculate the number of springs needed by dividing the load supplied by one spring into the total load required. Round the total number of springs to the next higher even number for balanced performance.



Associated Spring Raymond has capabilities well beyond the catalog components shown. We supply custom components and functional assemblies. If you simply need a Raymond® die spring or other spring type with a different finish this can be easily done.

Some common finishes are:

- Plain
- Dacromet®
- Geomet®
- Zinc
- Black Oxide
- Temperature Indicating
- Teflon®

Additional catalogs are available for other catalog stocked parts for:



CloverDome

m-Struts®



Our engineers can also customize the dimensions and/or rates for your OEM or aftermarket application based on the design constraints. Even further we can design and supply functional sub-assemblies for new designs or cost reduction efforts. Contact Associated Spring Raymond to learn more about the possibilities for your application:

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RAYMOND
A business of BARNES GROUP INC.

Die Spring Features & Benefits



Raymond Die Springs Offer

Features

Benefits

Superior Materials & Wire Profile

- All Raymond die springs are made from high tensile strength chromium alloy steels.
- Optimal wire cross section.
- Spring ends are ground square.
- Other raw materials are available for special conditions and environments.

- Inherent toughness to withstand heavy load demands.
- Superior performance in high stress applications.
- Heat resistance up to 230°C.
- Readily available, cost efficient raw material.
- Consistent controlled metallurgy.
- Offers maximum design possibilities.
- Wire cross section provides optimum deflection and protection against failure due to excessive stress build-up.
- Square ends create reliable, flat, maximum load-bearing surface.
- Specialty materials available to meet customer requirements.

Dimensional Consistency

- Dimensional requirements remain consistent and measurably the same from one batch of springs to the next.

- Provides uniform spring performance.
- Ensures consistent rate recordings.
- Greater load accuracy at a given test height.
- Certainty that OD will work freely in prescribed hole and ID will work freely over prescribed rod.
- Raymond assurance of the highest production and quality standards.
- Reliable performance engineered into every Raymond die spring.

Longer Spring Life

- Engineered to better withstand shock loading.
- Designed to endure constant high-speed deflections.
- Shot-peened to increase fatigue life.
- Less downtime.

- Reliable, trouble-free performance.
- Increased fatigue life by as much as 30%.
- Reduced spring breakage.
- Uniform performance over a longer lifetime.
- More cost effective.
- Extra performance margins.

Excellent Deflection

- Springs provide greater available travel to solid.

- More travel in each spring.
- Higher load capacities.
- Increased fatigue life.
- Greater application flexibility.
- More reliable performance.
- Lower solid height.