"D" LINE DIE SPRINGS

MEET ISO 10423 SPECIFICATIONS

Associated Spring RAYMOND

A business of BARNES GROUP INC

“D” Line ISO Specification Die Springs

Associated Spring Raymond Die Springs are manufactured using a wire cross section developed to provide optimum balance between load-carrying characteristics and cycle life.

Produced under carefully controlled processes with special equipment developed by Barnes Group, Inc’s research and development facilities.

All of the manufacturing steps are closely monitored by rigid quality controls, inspection and testing to ensure that the long service life engineered into every die spring is constant.

Full technical specifications available on request from Associated Spring Raymond

Our new D-Line Die Springs are manufactured to ISO10243 standards and are designed to be interchangeable with many major manufacturers of the same type, size, and color.

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Selecting Die Springs

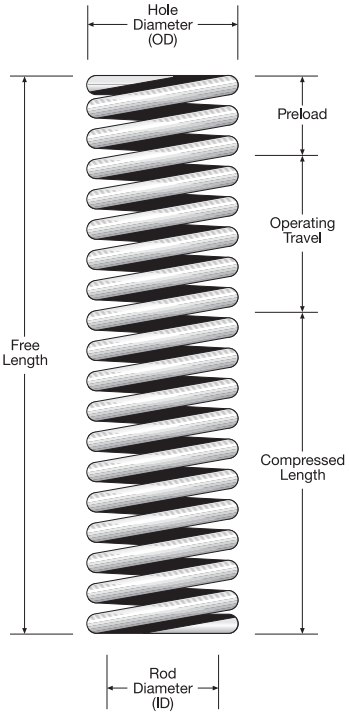
A general rule to observe in spring selection is to always use as many springs as the die will accommodate which will produce the required load with the least amount of deflection. This will increase the useful life of the spring, reduce the chances of spring failure and the resulting downtime, loss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



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.

Common Die Spring Terminology

HOLE DIAMETER This identifies the outside diameter (OD) of the die spring. Raymond die springs are available in eight different hole sizes matched to standard drill sizes. Each spring is made to fit in the hole, so the OD of the spring is actually less than the hole diameter.

ROD DIAMETER This is a nominal identification of the inside diameter (ID) of the die spring. Raymond die springs are available in eight different hole sizes matched to standard stripper bolts. Each spring is made to fit over the rod, so the ID of the springs is actually greater than the rod diameter.

FREE LENGTH The length of a die spring before it is subject to any operating force or load.

PRELOAD The distance the free length of the die spring is reduced by the pressure of assembled tool.

OPERATING TRAVEL The distance which is subtracted from the spring length after operating force has been applied.

DEFLECTION The amount of change in spring length after operating force has been applied. The compressed length is computed by subtracting the initial compression and the operating travel form the free length.

SOLID HEIGHT The length of a spring when it is compressed by enough load to bring all the coils into contact with each other.

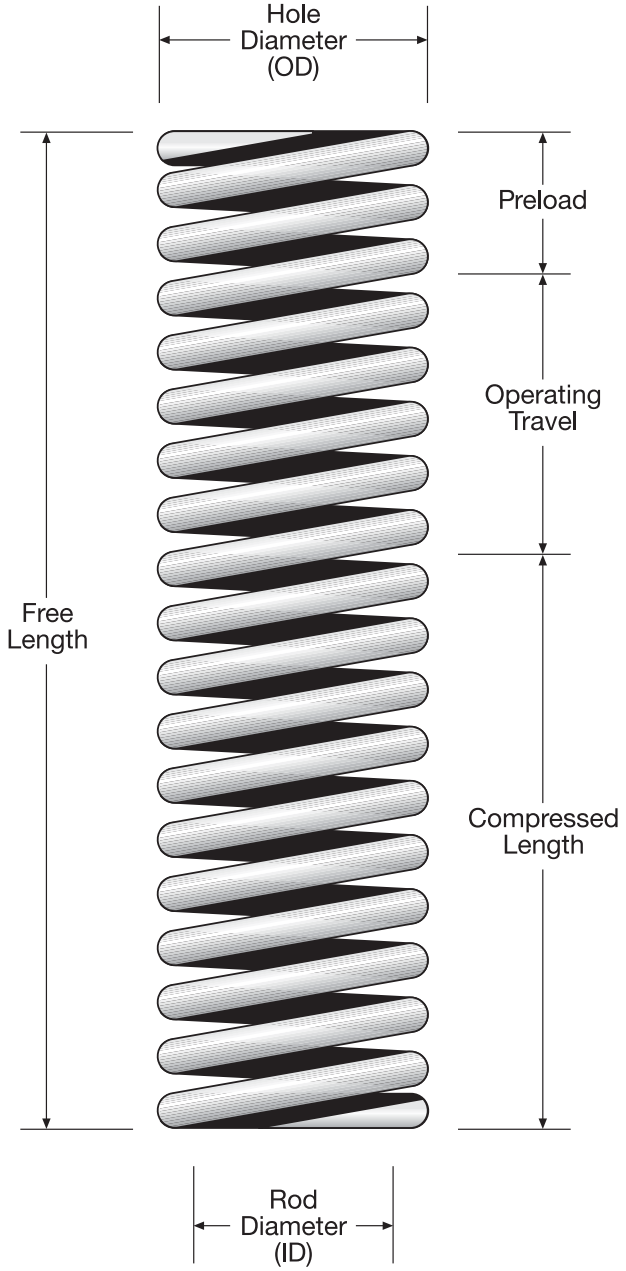
REMOVE SET The manufacturing process of closing a compression spring to solid to eliminate load loss in operation.

PERMANENT SET This happens when the elastic limits are exceeded and the spring does not return to its original length when the load is released.

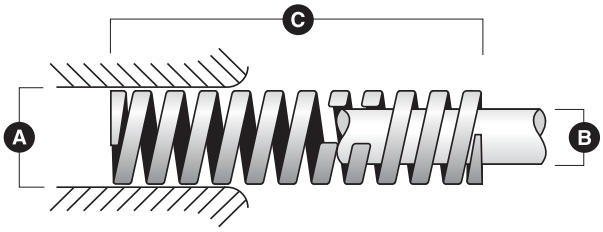
ELASTIC LIMIT The maximum compression stress that a die spring can endure without taking permanent set.

LOAD This is the force built up by compressing the spring. Load is expressed in terms of total Newtons, which is the load on the spring per a specific unit of deflection. Load is generated and stress on the coils increases.

STRESS In a spring, this describes the internal force that resists deflection under load. This force is equal to, and in the opposite direction of, the external load. Stress is expressed in Newtons per square millimeter of sectional area.



Ultra Light Duty | METRIC DIMENSIONS



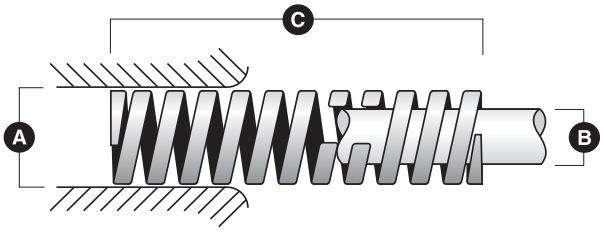
METRIC (mm)

Raymond®	ULTRA LIGHT DUTY ISO D-LINE SPRINGS (METRIC DIMENSIONS)										LIGHT GREEN
Hole Dia. (mm)	Rod Dia. (mm)	Free Length (mm)	CATALOG NUMBER	Spring Rate (N/mm)	LOAD DEFLECTION TABLE							
					Load @ 30% of free length		Load @ 40% of free length		Load @ 50% of free length		Load @ Max Recommended Deflection (N)	Max Deflection (mm)
A	B	C			Load (N)	Deflection (mm)	Load (N)	Deflection (mm)	Load (N)	Deflection (mm)		
20.0	10.0	25	302-404-D	29.4	221	7.5	294	10.0	368	12.5	488	16.6
		32	302-405-D	22.6	217	9.6	289	12.8	362	16.0	488	21.6
		38	302-406-D	18.6	212	11.4	283	15.2	353	19.0	476	25.6
		44	302-407-D	15.7	207	13.2	276	17.6	345	22.0	468	29.8
		51	302-408-D	13.7	210	15.3	279	20.4	349	25.5	478	34.9
		64	302-410-D	11.3	217	19.2	289	25.6	362	32.0	507	44.9
		76	302-412-D	9.8	223	22.8	298	30.4	372	38.0	530	54.1
		89	302-414-D	8.3	222	26.7	295	35.6	369	44.5	526	63.4
		102	302-416-D	7.4	226	30.6	302	40.8	377	51.0	544	73.5
		114	302-418-D	6.4	219	34.2	292	45.6	365	57.0	521	81.4
		127	302-420-D	5.9	225	38.1	300	50.8	375	63.5	542	91.9
		140	302-422-D	5.4	227	42.0	302	56.0	378	70.0	549	101.6
		152	302-424-D	4.9	223	45.6	298	60.8	372	76.0	539	109.9
		305	302-448-D	2.5	229	91.5	305	122.0	381	152.5	556	222.5
25.0	12.5	25	302-504-D	53.9	404	7.5	539	10.0	674	12.5	782	14.5
		32	302-505-D	42.2	405	9.6	540	12.8	675	16.0	806	19.1
		38	302-506-D	35.8	408	11.4	544	15.2	680	19.0	831	23.2
		44	302-507-D	31.4	414	13.2	553	17.6	691	22.0	860	27.4
		51	302-508-D	27.0	413	15.3	551	20.4	689	25.5	869	32.2
		64	302-510-D	21.6	415	19.2	553	25.6	691	32.0	886	41.0
		76	302-512-D	18.1	413	22.8	550	30.4	688	38.0	889	49.1
		89	302-514-D	15.2	406	26.7	541	35.6	676	44.5	869	57.2
		102	302-516-D	13.2	404	30.6	539	40.8	673	51.0	870	65.9
		114	302-518-D	11.8	404	34.2	538	45.6	673	57.0	870	73.7
		127	302-520-D	10.6	404	38.1	538	50.8	673	63.5	878	82.8
		140	302-522-D	9.6	403	42.0	538	56.0	672	70.0	876	91.3
		152	302-524-D	8.8	401	45.6	535	60.8	669	76.0	869	98.8
		178	302-528-D	7.6	406	53.4	541	71.2	676	89.0	885	116.4
		203	302-532-D	6.7	408	60.9	544	81.2	680	101.5	895	133.6
		305	302-548-D	4.4	403	91.5	537	122.0	671	152.5	884	200.8
32.0	16.0	38	302-606-D	43.1	491	11.4	655	15.2	819	19.0	1065	24.7
		44	302-607-D	37.3	492	13.2	656	17.6	821	22.0	1082	29.0
		51	302-608-D	32.4	496	15.3	661	20.4	826	25.5	1105	34.1
		64	302-610-D	25.5	490	19.2	653	25.6	816	32.0	1107	43.4
		76	302-612-D	21.6	492	22.8	657	30.4	821	38.0	1128	52.2
		89	302-614-D	18.1	483	26.7	644	35.6	805	44.5	1102	60.9
		102	302-616-D	15.7	480	30.6	641	40.8	801	51.0	1099	70.0
		114	302-618-D	14.2	486	34.2	648	45.6	809	57.0	1115	78.5
		127	302-620-D	12.7	484	38.1	645	50.8	806	63.5	1118	88.0
		140	302-622-D	11.6	487	42.0	650	56.0	812	70.0	1131	97.5
		152	302-624-D	10.6	483	45.6	644	60.8	806	76.0	1120	105.7
		178	302-628-D	9.0	481	53.4	641	71.2	801	89.0	1113	123.7
		203	302-632-D	7.8	475	60.9	633	81.2	792	101.5	1100	141.0
		254	302-640-D	6.4	488	76.2	650	101.6	813	127.0	1146	179.0
		305	302-648-D	5.3	485	91.5	647	122.0	808	152.5	1140	215.0
40.0	20.0	51	302-708-D	48.1	736	15.3	981	20.4	1227	25.5	1481	30.8
		64	302-710-D	39.2	753	19.2	1004	25.6	1254	32.0	1560	39.8
		76	302-712-D	33.3	759	22.8	1012	30.4	1265	38.0	1602	48.1
		89	302-714-D	28.4	758	26.7	1011	35.6	1264	44.5	1613	56.8
		102	302-716-D	24.5	750	30.6	1000	40.8	1250	51.0	1588	64.8

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

Raymond®	ULTRA LIGHT DUTY ISO D-LINE SPRINGS (METRIC DIMENSIONS)											LIGHT GREEN
Hole Dia. (mm)	Rod Dia. (mm)	Free Length (mm)	CATALOG NUMBER	Spring Rate (N/mm)	LOAD DEFLECTION TABLE							
					Load @ 25% of free length		Load @ 30% of free length		Load @ 40% of free length		Load @ Max Recommended Deflection (N)	Max Deflection (mm)
A	B	C			Load (N)	Deflection (mm)	Load (N)	Deflection (mm)	Load (N)	Deflection (mm)		
40.0	20.0	114	302-718-D	22.1	756	34.2	1008	45.6	1260	57.0	1622	73.4
		127	302-720-D	19.6	747	38.1	996	50.8	1245	63.5	1601	81.7
		140	302-722-D	17.7	743	42.0	991	56.0	1239	70.0	1595	90.1
		152	302-724-D	16.2	739	45.6	985	60.8	1231	76.0	1583	97.7
		178	302-728-D	13.7	732	53.4	975	71.2	1219	89.0	1567	114.4
		203	302-732-D	12.3	749	60.9	999	81.2	1248	101.5	1630	132.5
		254	302-740-D	9.8	747	76.2	996	101.6	1245	127.0	1631	166.4
		305	302-748-D	8.3	759	91.5	1013	122.0	1266	152.5	1676	201.9
50.0	25.0	64	302-810-D	86.3	1657	19.2	2209	25.6	2762	32.0	3461	40.1
		76	302-812-D	70.6	1610	22.8	2146	30.4	2683	38.0	3382	47.9
		89	302-814-D	59.8	1597	26.7	2129	35.6	2661	44.5	3373	56.4
		102	302-816-D	52.0	1591	30.6	2122	40.8	2652	51.0	3390	65.2
		114	302-818-D	46.1	1577	34.2	2102	45.6	2628	57.0	3379	73.3
		127	302-820-D	42.2	1608	38.1	2144	50.8	2680	63.5	3482	82.5
		140	302-822-D	38.2	1604	42.0	2139	56.0	2674	70.0	3503	91.7
		152	302-824-D	34.3	1564	45.6	2085	60.8	2607	76.0	3375	98.4
		178	302-828-D	29.4	1570	53.4	2093	71.2	2617	89.0	3410	116.0
		203	302-832-D	25.5	1553	60.9	2071	81.2	2588	101.5	3376	132.4
		254	302-840-D	20.6	1570	76.2	2093	101.6	2616	127.0	3459	167.9
		305	302-848-D	17.2	1574	91.5	2098	122.0	2623	152.5	3483	202.5

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



METRIC (mm)

Raymond® LIGHT DUTY ISO D-LINE SPRINGS (METRIC DIMENSIONS) GREEN

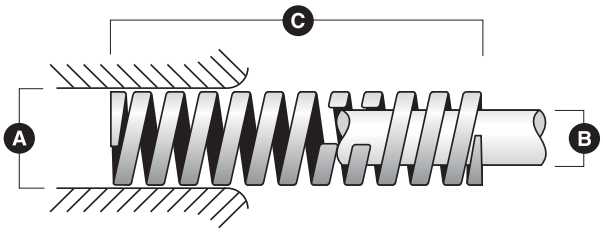
Hole Dia. (mm) A	Rod Dia. (mm) B	Free Length (mm) C	CATALOG NUMBER	Spring Rate (N/mm)	LOAD DEFLECTION TABLE							
					Load @ 25% of free length		Load @ 30% of free length		Load @ 40% of free length		Load @ Max Recommended Deflection (N)	Max Deflection (mm)
					Load (N)	Deflection (mm)	Load (N)	Deflection (mm)	Load (N)	Deflection (mm)		
10.0	5.0	25	303-104-D	12.2	76	6.3	92	7.5	122	10.0	156	12.8
		32	303-105-D	9.9	79	8.0	95	9.6	127	12.8	172	17.3
		38	303-106-D	8.2	78	9.5	94	11.4	125	15.2	168	20.5
		44	303-107-D	6.4	71	11.0	85	13.2	113	17.6	155	24.1
		51	303-108-D	6.3	80	12.8	96	15.3	129	20.4	174	27.6
		64	303-110-D	5.3	85	16.0	102	19.2	135	25.6	198	37.5
		76	303-112-D	4.3	81	19.0	97	22.8	129	30.4	184	43.4
		305	303-148-D	1.0	79	76.3	95	91.5	127	122.0	183	176.0
12.5	7.0	25	303-204-D	18.6	116	6.3	139	7.5	186	10.0	292	15.7
		32	303-205-D	14.9	119	8.0	143	9.6	190	12.8	309	20.8
		38	303-206-D	12.7	121	9.5	145	11.4	194	15.2	321	25.2
		44	303-207-D	11.1	123	11.0	147	13.2	196	17.6	329	29.5
		51	303-208-D	9.3	118	12.8	142	15.3	190	20.4	315	33.9
		64	303-210-D	7.2	115	16.0	138	19.2	184	25.6	305	42.4
		76	303-212-D	5.9	112	19.0	134	22.8	178	30.4	292	49.8
		89	303-214-D	4.7	105	22.3	127	26.7	169	35.6	270	57.0
		102	303-216-D	4.1	105	25.5	125	30.6	167	40.8	239	58.4
		305	303-248-D	1.4	104	76.3	124	91.5	166	122.0	268	196.9
16.0	8.5	25	303-304-D	31.7	198	6.3	238	7.5	317	10.0	441	13.9
		32	303-305-D	23.2	186	8.0	223	9.6	297	12.8	409	17.6
		38	303-306-D	20.5	195	9.5	234	11.4	312	15.2	449	21.9
		44	303-307-D	17.9	197	11.0	236	13.2	315	17.6	461	25.8
		51	303-308-D	15.5	198	12.8	237	15.3	316	20.4	470	30.3
		64	303-310-D	12.7	203	16.0	243	19.2	325	25.6	496	39.1
		76	303-312-D	10.0	189	19.0	227	22.8	303	30.4	446	44.8
		89	303-314-D	8.9	199	22.3	239	26.7	318	35.6	486	54.4
		102	303-316-D	7.6	193	25.5	232	30.6	309	40.8	486	64.1
		114	303-318-D	6.6	188	28.5	226	34.2	301	45.6	401	60.8
		305	303-348-D	2.6	195	76.3	234	91.5	312	122.0	484	188.9
20.0	10.0	25	303-404-D	55.4	346	6.3	415	7.5	554	10.0	742	13.4
		32	303-405-D	43.4	347	8.0	416	9.6	555	12.8	772	17.8
		38	303-406-D	34.4	327	9.5	392	11.4	523	15.2	712	20.7
		44	303-407-D	27.7	305	11.0	366	13.2	488	17.6	637	23.0
		51	303-408-D	24.9	318	12.8	381	15.3	509	20.4	591	23.7
		64	303-410-D	18.8	301	16.0	361	19.2	482	25.6	643	34.2
		76	303-412-D	16.1	306	19.0	367	22.8	489	30.4	667	41.5
		89	303-414-D	13.1	292	22.3	350	26.7	467	35.6	619	47.2
		102	303-416-D	11.9	303	25.5	363	30.6	484	40.8	666	56.1
		114	303-418-D	11.0	315	28.5	378	34.2	504	45.6	717	65.4
		127	303-420-D	9.4	298	31.8	358	38.1	478	50.8	665	70.7
		140	303-422-D	8.6	298	35.0	357	42.0	476	56.0	664	77.5
		152	303-424-D	7.6	287	38.0	344	45.6	459	60.8	612	81.1
		305	303-448-D	3.8	291	76.3	350	91.5	466	122.0	648	169.6
25.0	12.5	25	303-504-D	103.1	644	6.3	773	7.5	1031	10.0	1361	13.2
		32	303-505-D	80.7	646	8.0	775	9.6	1033	12.8	1420	17.6
		38	303-506-D	64.6	613	9.5	736	11.4	981	15.2	1336	20.7
		44	303-507-D	53.8	592	11.0	710	13.2	947	17.6	1280	23.8
		51	303-508-D	45.8	584	12.8	701	15.3	935	20.4	1260	27.5
		64	303-510-D	35.7	571	16.0	685	19.2	914	25.6	1246	34.9
		76	303-512-D	28.6	542	19.0	651	22.8	868	30.4	1151	40.3

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

Raymond® LIGHT DUTY ISO D-LINE SPRINGS (METRIC DIMENSIONS) GREEN

Hole Dia. (mm)	Rod Dia. (mm)	Free Length (mm)	CATALOG NUMBER	Spring Rate (N/mm)	LOAD DEFLECTION TABLE							
					Load @ 25% of free length		Load @ 30% of free length		Load @ 40% of free length		Load @ Max Recommended Deflection (N)	Max Deflection (mm)
A	B	C			Load (N)	Deflection (mm)	Load (N)	Deflection (mm)	Load (N)	Deflection (mm)		
25.0	12.5	89	303-514-D	24.8	551	22.3	661	26.7	881	35.6	1193	48.2
		102	303-516-D	20.6	526	25.5	631	30.6	841	40.8	1105	53.6
		114	303-518-D	18.6	534	28.5	640	34.2	854	45.6	1141	61.5
		127	303-520-D	16.7	530	31.8	636	38.1	847	50.8	1131	67.8
		140	303-522-D	14.6	506	35.0	607	42.0	810	56.0	1041	71.5
		152	303-524-D	13.6	518	38.0	621	45.6	828	60.8	1091	80.1
		178	303-528-D	11.8	524	44.5	629	53.4	839	71.2	1123	95.3
		203	303-532-D	10.6	535	50.8	642	60.9	857	81.2	1170	110.9
		305	303-548-D	6.8	515	76.3	618	91.5	824	122.0	1098	162.6
32.0	16.0	38	303-606-D	91.8	872	9.5	1046	11.4	1395	15.2	2230	24.3
		44	303-607-D	83.2	915	11.0	1098	13.2	1464	17.6	2305	27.7
		51	303-608-D	70.6	901	12.8	1081	15.3	1441	20.4	2289	32.4
		64	303-610-D	55.1	881	16.0	1057	19.2	1410	25.6	2257	41.0
		76	303-612-D	45.7	868	19.0	1041	22.8	1388	30.4	2233	48.9
		89	303-614-D	38.6	859	22.3	1031	26.7	1374	35.6	2220	57.5
		102	303-616-D	33.7	860	25.5	1032	30.6	1376	40.8	2240	66.4
		114	303-618-D	30.0	861	28.5	1033	34.2	1378	45.6	2255	75.3
		127	303-620-D	25.8	820	31.8	984	38.1	1312	50.8	2102	81.4
		140	303-622-D	23.8	826	35.0	991	42.0	1322	56.0	2135	89.8
		152	303-624-D	21.7	825	38.0	990	45.6	1319	60.8	2135	98.4
		178	303-628-D	17.6	784	44.5	941	53.4	1255	71.2	1986	112.7
		203	303-632-D	15.6	792	50.8	950	60.9	1267	81.2	2022	129.6
		254	303-640-D	12.6	799	63.5	959	76.2	1279	101.6	2062	163.8
		305	303-648-D	9.6	732	76.3	878	91.5	1171	122.0	1801	187.6
40.0	20.0	51	303-708-D	104.6	1333	12.8	1600	15.3	2133	20.4	2635	25.2
		64	303-710-D	79.6	1273	16.0	1528	19.2	2037	25.6	2506	31.5
		76	303-712-D	66.6	1264	19.0	1517	22.8	2023	30.4	2522	37.9
		89	303-714-D	57.2	1272	22.3	1527	26.7	2036	35.6	2596	45.4
		102	303-716-D	48.6	1239	25.5	1487	30.6	1982	40.8	2497	51.4
		114	303-718-D	43.2	1243	28.5	1491	34.2	1989	45.6	2538	58.7
		127	303-720-D	39.2	1245	31.8	1494	38.1	1992	50.8	2560	65.3
		140	303-722-D	35.0	1215	35.0	1458	42.0	1944	56.0	2462	70.4
		152	303-724-D	31.7	1206	38.0	1447	45.6	1929	60.8	2437	76.8
		178	303-728-D	27.3	1215	44.5	1458	53.4	1944	71.2	2493	91.3
		203	303-732-D	23.5	1191	50.8	1429	60.9	1905	81.2	2412	102.8
		254	303-740-D	18.9	1198	63.5	1438	76.2	1917	101.6	2461	130.4
		305	303-748-D	15.5	1179	76.3	1415	91.5	1886	122.0	2399	155.2
50.0	25.0	64	303-810-D	148.6	2377	16.0	2853	19.2	3804	25.6	6166	41.5
		76	303-812-D	125.2	2378	19.0	2853	22.8	3805	30.4	5782	46.2
		89	303-814-D	104.5	2324	22.3	2789	26.7	3719	35.6	5641	54.0
		102	303-816-D	90.4	2304	25.5	2765	30.6	3687	40.8	5629	62.3
		114	303-818-D	78.7	2261	28.5	2714	34.2	3618	45.6	5514	70.1
		127	303-820-D	70.4	2235	31.8	2681	38.1	3575	50.8	5447	77.4
		140	303-822-D	63.1	2192	35.0	2630	42.0	3507	56.0	5311	84.2
		152	303-824-D	56.9	2163	38.0	2595	45.6	3460	60.8	5224	91.8
		178	303-828-D	48.6	2164	44.5	2597	53.4	3462	71.2	5271	108.4
		203	303-832-D	41.8	2121	50.8	2545	60.9	3393	81.2	5132	122.8
		254	303-840-D	35.7	2264	63.5	2717	76.2	3623	101.6	5734	160.8
		305	303-848-D	26.8	2040	76.3	2448	91.5	3264	122.0	4879	182.4
63.0	38.0	76	303-912-D	191.2	3633	19.0	4359	22.8	5812	30.4	7036	36.8
		89	303-914-D	157.5	3503	22.3	4204	26.7	5605	35.6	6786	43.1
		102	303-916-D	136.1	3471	25.5	4165	30.6	5553	40.8	6819	50.1
		114	303-918-D	118.1	3395	28.5	4074	34.2	5432	45.6	6648	56.3
		127	303-920-D	105.7	3355	31.8	4026	38.1	5368	50.8	6583	62.3
		152	303-924-D	86.3	3281	38.0	3937	45.6	5249	60.8	6441	74.6
		178	303-928-D	73.7	3278	44.5	3934	53.4	5245	71.2	6527	88.6
		203	303-932-D	63.2	3209	50.8	3851	60.9	5134	81.2	6329	100.1
		254	303-940-D	49.9	3167	63.5	3800	76.2	5067	101.6	6264	125.6
		305	303-948-D	41.0	3124	76.3	3749	91.5	4998	122.0	6158	150.3

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



METRIC (mm)

Raymond® MEDIUM DUTY ISO D-LINE SPRINGS (METRIC DIMENSIONS) BLUE

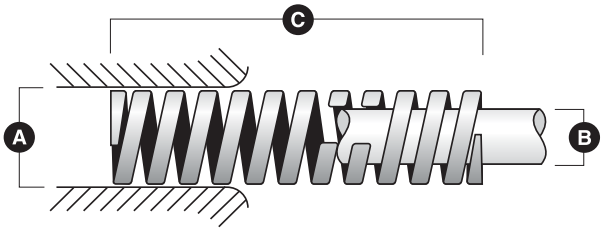
Hole Dia. (mm) A	Rod Dia. (mm) B	Free Length (mm) C	CATALOG NUMBER	Spring Rate (N/mm)	LOAD DEFLECTION TABLE							
					Load @ 25% of free length		Load @ 30% of free length		Load @ 40% of free length		Load @ Max Recommended Deflection (N)	Max Deflection (mm)
					Load (N)	Deflection (mm)	Load (N)	Deflection (mm)	Load (N)	Deflection (mm)		
10.0	5.0	25	304-104-D	15.7	98	6.3	117	7.5	157	10.0	188	12.00
		32	304-105-D	13.5	108	8.0	130	9.6	173	12.8	233	17.20
		38	304-106-D	11.7	111	9.5	133	11.4	177	15.2	246	21.10
		44	304-107-D	9.6	105	11.0	127	13.2	169	17.6	227	23.70
		51	304-108-D	8.6	110	12.8	132	15.3	176	20.4	247	28.60
		64	304-110-D	6.6	106	16.0	127	19.2	169	25.6	233	35.20
		76	304-112-D	5.5	105	19.0	126	22.8	168	30.4	230	41.70
		305	304-148-D	1.4	103	76.3	124	91.5	165	122.0	229	169.40
12.5	7.0	25	304-204-D	29.4	184	6.3	220	7.5	294	10.0	376	12.80
		32	304-205-D	22.5	180	8.0	216	9.6	287	12.8	373	16.60
		38	304-206-D	18.7	178	9.5	213	11.4	284	15.2	372	19.90
		44	304-207-D	15.9	175	11.0	210	13.2	280	17.6	366	23.00
		51	304-208-D	13.7	175	12.8	210	15.3	280	20.4	371	27.00
		64	304-210-D	10.5	167	16.0	201	19.2	268	25.6	345	33.00
		76	304-212-D	8.7	165	19.0	198	22.8	264	30.4	338	39.00
		89	304-214-D	7.5	166	22.3	200	26.7	266	35.6	347	46.40
		102	304-216-D	6.3	161	25.5	193	30.6	257	40.8	329	52.30
		305	304-248-D	2.2	164	76.3	197	91.5	262	122.0	347	161.20
16.0	8.5	25	304-304-D	55.7	348	6.3	418	7.5	557	10.0	646	11.60
		32	304-305-D	40.0	320	8.0	384	9.6	512	12.8	568	14.20
		38	304-306-D	34.7	329	9.5	395	11.4	527	15.2	617	17.80
		44	304-307-D	30.6	336	11.0	404	13.2	538	17.6	655	21.40
		51	304-308-D	26.6	339	12.8	406	15.3	542	20.4	672	25.30
		64	304-310-D	20.8	333	16.0	399	19.2	532	25.6	661	31.80
		76	304-312-D	17.8	339	19.0	407	22.8	542	30.4	692	38.80
		89	304-314-D	15.0	335	22.3	402	26.7	535	35.6	681	45.30
		102	304-316-D	13.3	339	25.5	406	30.6	542	40.8	701	52.80
		114	304-318-D	11.8	336	28.5	404	34.2	538	45.6	627	53.10
		305	304-348-D	4.2	319	76.3	383	91.5	511	122.0	644	153.80
20.0	10.0	25	304-404-D	91.0	569	6.3	682	7.5	910	10.0	946	10.40
		32	304-405-D	67.9	543	8.0	652	9.6	869	12.8	910	13.40
		38	304-406-D	55.1	524	9.5	629	11.4	838	15.2	860	15.60
		44	304-407-D	46.7	513	11.0	616	13.2	821	17.6	840	18.00
		51	304-408-D	39.9	509	12.8	611	15.3	814	20.4	842	21.10
		64	304-410-D	30.8	493	16.0	592	19.2	790	25.6	802	26.00
		76	304-412-D	25.7	488	19.0	586	22.8	781	30.4	797	31.00
		89	304-414-D	22.1	491	22.3	590	26.7	786	35.6	817	37.00
		102	304-416-D	19.4	494	25.5	592	30.6	790	40.8	832	43.00
		115	304-418-D	17.0	488	28.8	586	34.5	781	46.0	817	48.10
		127	304-420-D	15.3	485	31.8	583	38.1	777	50.8	810	53.00
		139	304-422-D	14.1	490	34.8	588	41.7	785	55.6	832	59.00
		152	304-424-D	12.8	486	38.0	583	45.6	777	60.8	818	64.00
		305	304-448-D	6.4	489	76.3	587	91.5	782	122.0	846	132.00
25.0	12.5	25	304-504-D	171.5	1072	6.3	1286	7.5	1715	10.0	1715	10.00
		32	304-505-D	126.5	1012	8.0	1214	9.6	1619	12.8	1619	12.80
		38	304-506-D	104.2	990	9.5	1188	11.4	1584	15.2	1605	15.40
		44	304-507-D	89.1	980	11.0	1176	13.2	1567	17.6	1639	18.40
		51	304-508-D	74.6	951	12.8	1141	15.3	1521	20.4	1573	21.10
		64	304-510-D	57.3	916	16.0	1099	19.2	1466	25.6	1489	26.00
		76	304-512-D	49.0	930	19.0	1116	22.8	1488	30.4	1571	32.10
		89	304-514-D	40.8	909	22.3	1090	26.7	1454	35.6	1515	37.10

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

Raymond® MEDIUM DUTY ISO D-LINE SPRINGS (METRIC DIMENSIONS) BLUE

Hole Dia. (mm)	Rod Dia. (mm)	Free Length (mm)	CATALOG NUMBER	Spring Rate (N/mm)	LOAD DEFLECTION TABLE							
					Load @ 25% of free length		Load @ 30% of free length		Load @ 40% of free length		Load @ Max Recommended Deflection (N)	Max Deflection (mm)
A	B	C			Load (N)	Deflection (mm)	Load (N)	Deflection (mm)	Load (N)	Deflection (mm)		
25.0	12.5	102	304-516-D	35.7	911	25.5	1093	30.6	1457	40.8	1540	43.10
		115	304-518-D	31.7	910	28.8	1092	34.5	1456	46.0	1551	49.00
		127	304-520-D	28.5	905	31.8	1086	38.1	1448	50.8	1539	54.00
		139	304-522-D	26.3	913	34.8	1096	41.7	1461	55.6	1579	60.10
		152	304-524-D	23.8	903	38.0	1083	45.6	1444	60.8	1544	65.00
		178	304-528-D	20.1	896	44.5	1075	53.4	1433	71.2	1530	76.00
		203	304-532-D	17.6	895	50.8	1074	60.9	1432	81.2	1536	87.10
		305	304-548-D	11.6	882	76.3	1059	91.5	1412	122.0	1504	130.00
32.0	16.0	38	304-606-D	166.8	1585	9.5	1902	11.4	2536	15.2	2903	17.40
		44	304-607-D	136.4	1500	11.0	1800	13.2	2400	17.6	2686	19.70
		51	304-608-D	116.2	1482	12.8	1778	15.3	2371	20.4	2697	23.20
		64	304-610-D	87.5	1401	16.0	1681	19.2	2241	25.6	2486	28.40
		76	304-612-D	70.9	1347	19.0	1617	22.8	2156	30.4	2333	32.90
		89	304-614-D	60.4	1343	22.3	1611	26.7	2148	35.6	2360	39.10
		102	304-616-D	51.6	1315	25.5	1578	30.6	2104	40.8	2285	44.30
		115	304-618-D	45.8	1315	28.8	1578	34.5	2105	46.0	4964	108.50
		127	304-620-D	41.7	1324	31.8	1589	38.1	2119	50.8	2361	56.60
		139	304-622-D	37.8	1314	34.8	1577	41.7	2103	55.6	2337	61.80
		152	304-624-D	33.8	1283	38.0	1539	45.6	2053	60.8	2228	66.00
		178	304-628-D	28.9	1288	44.5	1545	53.4	2061	71.2	2269	78.40
		203	304-632-D	24.9	1263	50.8	1515	60.9	2020	81.2	2184	87.80
		254	304-640-D	20.0	1268	63.5	1522	76.2	2029	101.6	2227	111.50
		305	304-648-D	16.7	1272	76.3	1526	91.5	2035	122.0	2255	135.20
40.0	20.0	51	304-708-D	170.3	2172	12.8	2606	15.3	3475	20.4	3577	21.00
		64	304-710-D	128.7	2059	16.0	2471	19.2	3295	25.6	3333	25.90
		76	304-712-D	107.3	2038	19.0	2445	22.8	3260	30.4	3357	31.30
		89	304-714-D	89.1	1982	22.3	2379	26.7	3172	35.6	3225	36.20
		102	304-716-D	75.5	1926	25.5	2312	30.6	3082	40.8	3067	40.60
		115	304-718-D	66.8	1921	28.8	2305	34.5	3074	46.0	3087	46.20
		127	304-720-D	61.0	1935	31.8	2323	38.1	3097	50.8	3176	52.10
		139	304-722-D	55.3	1923	34.8	2307	41.7	3076	55.6	3154	57.00
		152	304-724-D	50.8	1930	38.0	2316	45.6	3089	60.8	3211	63.20
		178	304-728-D	43.0	1914	44.5	2297	53.4	3062	71.2	3183	74.00
		203	304-732-D	37.4	1896	50.8	2275	60.9	3034	81.2	3138	84.00
		254	304-740-D	30.1	1909	63.5	2291	76.2	3054	101.6	3225	107.30
		305	304-748-D	24.8	1887	76.3	2265	91.5	3020	122.0	3168	128.00
50.0	25.0	64	304-810-D	211.8	3389	16.0	4067	19.2	5423	25.6	5910	27.90
		76	304-812-D	166.2	3158	19.0	3789	22.8	5052	30.4	5252	31.60
		89	304-814-D	139.4	3102	22.3	3722	26.7	4963	35.6	5186	37.20
		102	304-816-D	121.4	3095	25.5	3714	30.6	4952	40.8	5268	43.40
		115	304-818-D	107.0	3075	28.8	3690	34.5	4920	46.0	5284	49.40
		127	304-820-D	94.8	3009	31.8	3610	38.1	4814	50.8	5089	53.70
		139	304-822-D	86.4	3003	34.8	3604	41.7	4806	55.6	5117	59.20
		152	304-824-D	78.3	2975	38.0	3570	45.6	4759	60.8	5049	64.50
		178	304-828-D	65.9	2931	44.5	3517	53.4	4690	71.2	4953	75.20
		203	304-832-D	57.2	2901	50.8	3481	60.9	4641	81.2	4881	85.40
		229	304-836-D	50.8	2911	57.3	3493	68.7	4657	91.6	4962	97.60
		254	304-840-D	46.0	2919	63.5	3503	76.2	4671	101.6	5025	109.30
		305	304-848-D	37.9	2891	76.3	3469	91.5	4625	122.0	4959	130.80
63.0	38.0	76	304-912-D	303.5	5767	19.0	6920	22.8	9227	30.4	10199	33.60
		89	304-914-D	247.4	5506	22.3	6607	26.7	8809	35.6	9650	39.00
		102	304-916-D	210.8	5375	25.5	6450	30.6	8600	40.8	9464	44.90
		115	304-918-D	183.6	5278	28.8	6334	34.5	8445	46.0	9326	50.80
		127	304-920-D	162.6	5163	31.8	6195	38.1	8260	50.8	9041	55.60
		152	304-924-D	132.4	5029	38.0	6035	45.6	8047	60.8	8788	66.40
		178	304-928-D	111.1	4942	44.5	5930	53.4	7907	71.2	8629	77.70
		203	304-932-D	96.9	4916	50.8	5899	60.9	7866	81.2	8660	89.40
		229	304-936-D	85.9	4918	57.3	5901	68.7	7868	91.6	8762	102.00
		254	304-940-D	77.4	4917	63.5	5900	76.2	7867	101.6	8835	114.10
		305	304-948-D	64.1	4890	76.3	5868	91.5	7824	122.0	8850	138.00

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



METRIC (mm) 10

Raymond® HEAVY DUTY ISO D-LINE SPRINGS (METRIC DIMENSIONS) RED

Hole Dia. (mm) A	Rod Dia. (mm) B	Free Length (mm) C	CATALOG NUMBER	Spring Rate (N/mm)	LOAD DEFLECTION TABLE							
					Load @ 20% of free length		Load @ 25% of free length		Load @ 30% of free length		Load @ Max Recommended Deflection (N)	Max Deflection (mm)
					Load (N)	Deflection (mm)	Load (N)	Deflection (mm)	Load (N)	Deflection (mm)		
10.0	5.0	25	305-104-D	23.4	117	5.0	146	6.3	175	7.5	222	9.50
		32	305-105-D	18.0	115	6.4	144	8.0	172	9.6	221	12.30
		38	305-106-D	16.6	126	7.6	158	9.5	189	11.4	279	16.80
		44	305-107-D	14.5	127	8.8	159	11.0	191	13.2	288	19.90
		51	305-108-D	12.0	122	10.2	153	12.8	183	15.3	266	22.20
		64	305-110-D	9.9	126	12.8	158	16.0	189	19.2	290	29.40
		76	305-112-D	7.9	120	15.2	150	19.0	179	22.8	260	33.10
		305	305-148-D	1.9	118	61.0	147	76.3	177	91.5	260	134.50
12.5	7.0	25	305-204-D	42.4	212	5.0	265	6.3	318	7.5	475	11.20
		32	305-205-D	31.8	203	6.4	254	8.0	305	9.6	455	14.30
		38	305-206-D	27.1	206	7.6	257	9.5	308	11.4	476	17.60
		44	305-207-D	23.8	209	8.8	261	11.0	314	13.2	499	21.00
		51	305-208-D	19.9	203	10.2	254	12.8	305	15.3	479	24.00
		64	305-210-D	15.2	194	12.8	243	16.0	291	19.2	443	29.20
		76	305-212-D	13.5	204	15.2	256	19.0	307	22.8	498	37.00
		89	305-214-D	11.1	197	17.8	246	22.3	295	26.7	465	42.00
		102	305-216-D	8.4	171	20.4	214	25.5	257	30.6	368	43.80
		305	305-248-D	3.2	192	61.0	240	76.3	288	91.5	458	145.40
16.0	8.5	25	305-304-D	78.0	390	5.0	487	6.3	585	7.5	741	9.50
		32	305-305-D	61.0	390	6.4	488	8.0	586	9.6	787	12.90
		38	305-306-D	50.7	385	7.6	482	9.5	578	11.4	786	15.50
		44	305-307-D	45.5	400	8.8	501	11.0	601	13.2	874	19.20
		51	305-308-D	36.9	377	10.2	471	12.8	565	15.3	779	21.10
		64	305-310-D	29.4	377	12.8	471	16.0	565	19.2	798	27.10
		76	305-312-D	25.7	390	15.2	488	19.0	585	22.8	875	34.10
		89	305-314-D	21.8	388	17.8	485	22.3	582	26.7	875	40.10
		102	305-316-D	18.9	386	20.4	482	25.5	579	30.6	870	46.00
		114	305-318-D	15.7	358	22.8	447	28.5	537	34.2	691	44.00
		305	305-348-D	6.2	375	61.0	469	76.3	563	91.5	849	138.00
20.0	10.0	25	305-404-D	219.2	1096	5.0	1370	6.3	1644	7.5	1731	7.90
		32	305-405-D	171.3	1097	6.4	1371	8.0	1645	9.6	1885	11.00
		38	305-406-D	136.6	1038	7.6	1298	9.5	1557	11.4	1721	12.60
		44	305-407-D	116.3	1024	8.8	1280	11.0	1536	13.2	1710	14.70
		51	305-408-D	96.7	986	10.2	1232	12.8	1479	15.3	1585	16.40
		64	305-410-D	74.2	950	12.8	1187	16.0	1425	19.2	1484	20.00
		76	305-412-D	62.8	955	15.2	1194	19.0	1433	22.8	1546	24.60
		89	305-414-D	53.9	959	17.8	1198	22.3	1438	26.7	1594	29.60
		102	305-416-D	46.5	949	20.4	1187	25.5	1424	30.6	1573	33.80
		114	305-418-D	41.9	963	22.8	1204	28.5	1445	34.2	1658	39.60
		127	305-420-D	37.3	948	25.4	1185	31.8	1422	38.1	1597	42.80
		140	305-422-D	33.9	942	28.0	1177	35.0	1413	42.0	1558	46.00
		152	305-424-D	30.9	939	30.4	1174	38.0	1409	45.6	1576	51.00
		305	305-448-D	15.2	927	61.0	1159	76.3	1391	91.5	1569	103.20
25.0	12.5	25	305-504-D	371.4	1857	5.0	2321	6.3	2785	7.5	2823	7.60
		32	305-505-D	280.7	1796	6.4	2246	8.0	2695	9.6	2891	10.30
		38	305-506-D	219.5	1668	7.6	2085	9.5	2502	11.4	2502	11.40
		44	305-507-D	201.3	1771	8.8	2214	11.0	2657	13.2	3100	15.40
		51	305-508-D	163.1	1664	10.2	2080	12.8	2495	15.3	2724	16.70
		64	305-510-D	127.1	1626	12.8	2033	16.0	2440	19.2	2681	21.10
		76	305-512-D	107.3	1631	15.2	2039	19.0	2446	22.8	2790	26.00
		89	305-514-D	90.1	1603	17.8	2004	22.3	2405	26.7	2720	30.20

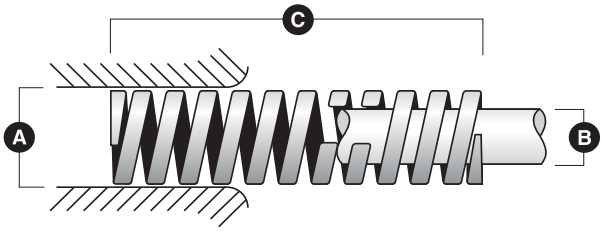
*Tabulated deflections shown represent near solid and are for design information only.

Raymond® HEAVY DUTY ISO D-LINE SPRINGS (METRIC DIMENSIONS) RED

Hole Dia. (mm)	Rod Dia. (mm)	Free Length (mm)	CATALOG NUMBER	Spring Rate (N/mm)	LOAD DEFLECTION TABLE							
					Load @ 20% of free length		Load @ 25% of free length		Load @ 30% of free length		Load @ Max Recommended Deflection (N)	Max Deflection (mm)
A	B	C			Load (N)	Deflection (mm)	Load (N)	Deflection (mm)	Load (N)	Deflection (mm)		
25.0	12.5	102	305-516-D	78.4	1599	20.4	1998	25.5	2398	30.6	2751	35.10
		114	305-518-D	70.6	1624	22.8	2029	28.5	2435	34.2	2908	41.20
		127	305-520-D	63.2	1605	25.4	2007	31.8	2408	38.1	2844	45.00
		140	305-522-D	57.5	1598	28.0	1997	35.0	2397	42.0	2834	49.30
		152	305-524-D	53.1	1613	30.4	2016	38.0	2420	45.6	2929	55.20
		178	305-528-D	45.2	1609	35.6	2012	44.5	2414	53.4	2943	65.10
		203	305-532-D	39.5	1602	40.6	2002	50.8	2403	60.9	2927	74.20
		305	305-548-D	26.8	1632	61.0	2040	76.3	2449	91.5	3136	117.20
32.0	16.0	38	305-606-D	387.2	2943	7.6	3678	9.5	4414	11.4	4879	12.60
		44	305-607-D	313.0	2754	8.8	3443	11.0	4131	13.2	4351	13.90
		51	305-608-D	267.5	2728	10.2	3410	12.8	4092	15.3	4467	16.70
		64	305-610-D	204.3	2615	12.8	3269	16.0	3923	19.2	4250	20.80
		76	305-612-D	171.7	2609	15.2	3261	19.0	3914	22.8	4360	25.40
		89	305-614-D	141.5	2518	17.8	3147	22.3	3777	26.7	4102	29.00
		102	305-616-D	123.6	2522	20.4	3152	25.5	3783	30.6	4215	34.10
		114	305-618-D	109.8	2525	22.8	3156	28.5	3787	34.2	4303	39.20
		127	305-620-D	98.7	2508	25.4	3135	31.8	3762	38.1	4285	43.40
		140	305-622-D	89.2	2478	28.0	3098	35.0	3718	42.0	4190	47.00
		152	305-624-D	81.7	2484	30.4	3105	38.0	3726	45.6	4258	52.10
		178	305-628-D	69.2	2465	35.6	3081	44.5	3697	53.4	4223	61.00
		203	305-632-D	60.7	2463	40.6	3078	50.8	3694	60.9	4264	70.30
		254	305-640-D	48.4	2458	50.8	3073	63.5	3687	76.2	4307	89.00
		305	305-648-D	40.2	2452	61.0	3064	76.3	3677	91.5	4316	107.40
40.0	20.0	51	305-708-D	371.7	3791	10.2	4739	12.8	5686	15.3	6244	16.80
		64	305-710-D	300.1	3841	12.8	4801	16.0	5761	19.2	6961	23.20
		76	305-712-D	233.6	3551	15.2	4439	19.0	5326	22.8	5934	25.40
		89	305-714-D	197.0	3507	17.8	4384	22.3	5260	26.7	5970	30.30
		102	305-716-D	170.3	3475	20.4	4344	25.5	5212	30.6	5979	35.10
		114	305-718-D	155.7	3582	22.8	4478	28.5	5373	34.2	6603	42.40
		127	305-720-D	137.4	3490	25.4	4363	31.8	5236	38.1	6266	45.60
		140	305-722-D	123.4	3431	28.0	4289	35.0	5147	42.0	6060	49.10
		152	305-724-D	114.4	3477	30.4	4346	38.0	5215	45.6	6347	55.50
		178	305-728-D	96.8	3445	35.6	4306	44.5	5167	53.4	6299	65.10
		203	305-732-D	84.7	3440	40.6	4300	50.8	5160	60.9	6355	75.00
		254	305-740-D	67.6	3433	50.8	4291	63.5	5149	76.2	6426	95.10
		305	305-748-D	56.2	3428	61.0	4285	76.3	5142	91.5	6474	115.20
50.0	25.0	64	305-810-D	424.3	5431	12.8	6788	16.0	8146	19.2	9800	23.10
		76	305-812-D	335.1	5094	15.2	6367	19.0	7640	22.8	8813	26.30
		89	305-814-D	276.8	4927	17.8	6159	22.3	7391	26.7	8415	30.40
		102	305-816-D	244.9	4996	20.4	6244	25.5	7493	30.6	8987	36.70
		114	305-818-D	214.6	4936	22.8	6170	28.5	7404	34.2	8928	41.60
		127	305-820-D	189.1	4804	25.4	6005	31.8	7205	38.1	8454	44.70
		140	305-822-D	169.0	4699	28.0	5874	35.0	7049	42.0	8080	47.80
		152	305-824-D	154.0	4683	30.4	5854	38.0	7024	45.6	8118	52.70
		178	305-828-D	130.8	4658	35.6	5822	44.5	6986	53.4	8164	62.40
		203	305-832-D	115.1	4671	40.6	5839	50.8	7007	60.9	8353	72.60
		254	305-840-D	90.5	4598	50.8	5748	63.5	6898	76.2	8174	90.30
		305	305-848-D	75.5	4606	61.0	5757	76.3	6908	91.5	8320	110.20
63.0	38.0	76	305-912-D	618	9394	15.2	11742	19.0	-	-	13411	21.70
		89	305-914-D	515	9167	17.8	11459	22.3	-	-	13493	26.20
		102	305-916-D	438	8935	20.4	11169	25.5	-	-	13140	30.00
		114	305-918-D	370	8436	22.8	10545	28.5	-	-	11470	31.00
		127	305-920-D	333	8458	25.4	10573	31.8	-	-	12221	36.70
		152	305-924-D	269	8178	30.4	10222	38.0	-	-	11675	43.40
		178	305-928-D	226	8046	35.6	10057	44.5	-	-	11277	49.90
		203	305-932-D	198	8039	40.6	10049	50.8	-	-	11801	59.60
		229	305-936-D	143.6	6577	45.8	8221	57.3	-	-	12307	85.70
		254	305-940-D	155	7874	50.8	9843	63.5	-	-	11811	76.20
		305	305-948-D	128	7808	61.0	9760	76.3	-	-	11712	91.50

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

Extra Heavy Duty | METRIC DIMENSIONS



METRIC (mm)

Raymond® EXTRA HEAVY DUTY ISO D-LINE SPRINGS (METRIC DIMENSIONS) YELLOW

Hole Dia. (mm) A	Rod Dia. (mm) B	Free Length (mm) C	CATALOG NUMBER	Spring Rate (N/mm)	LOAD DEFLECTION TABLE							
					Load @ 17% of free length		Load @ 20% of free length		Load @ 25% of free length		Load @ Max Recommended Deflection (N)	Max Deflection (mm)
					Load (N)	Deflection (mm)	Load (N)	Deflection (mm)	Load (N)	Deflection (mm)		
10.0	5.0	25	306-104-D	36.4	155	4.3	182	5.0	228	6.3	270	7.40
		32	306-105-D	27.5	149	5.4	176	6.4	220	8.0	256	9.30
		38	306-106-D	23.3	150	6.5	177	7.6	221	9.5	267	11.50
		44	306-107-D	19.6	147	7.5	173	8.8	216	11.0	255	13.00
		51	306-108-D	16.8	146	8.7	171	10.2	214	12.8	254	15.10
		64	306-110-D	13.3	145	10.9	170	12.8	213	16.0	255	19.20
		76	306-112-D	11.2	144	12.9	169	15.2	212	19.0	256	23.00
		305	306-148-D	2.7	141	51.9	166	61.0	207	76.3	256	94.30
12.5	7.0	25	306-204-D	54.7	233	4.3	274	5.0	342	6.3	487	8.90
		32	306-205-D	42.4	230	5.4	271	6.4	339	8.0	540	12.75
		38	306-206-D	34.6	223	6.5	263	7.6	328	9.5	480	13.90
		44	306-207-D	27.8	208	7.5	245	8.8	306	11.0	459	16.50
		51	306-208-D	25.3	219	8.7	258	10.2	322	12.8	477	18.90
		64	306-210-D	19.9	217	10.9	255	12.8	318	16.0	476	23.90
		76	306-212-D	16.6	215	12.9	253	15.2	316	19.0	474	28.50
		89	306-214-D	14.0	211	15.1	249	17.8	311	22.3	461	33.00
		102	306-216-D	12.7	220	17.3	259	20.4	324	25.5	457	36.00
		305	306-248-D	3.8	199	51.9	234	61.0	293	76.3	413	107.60
16.0	8.5	25	306-304-D	136.2	579	4.3	681	5.0	851	6.3	1076	7.90
		32	306-305-D	99.1	539	5.4	634	6.4	792	8.0	961	9.70
		38	306-306-D	82.8	535	6.5	629	7.6	786	9.5	985	11.90
		44	306-307-D	70.7	529	7.5	622	8.8	777	11.0	982	13.90
		51	306-308-D	60.5	525	8.7	617	10.2	772	12.8	993	16.40
		64	306-310-D	48.1	523	10.9	615	12.8	769	16.0	1019	21.20
		76	306-312-D	39.9	515	12.9	606	15.2	757	19.0	997	25.00
		89	306-314-D	34.2	518	15.1	609	17.8	762	22.3	1034	30.20
		102	306-316-D	29.5	511	17.3	601	20.4	751	25.5	1004	34.10
		114	306-318-D	26.4	512	19.4	602	22.8	752	28.5	1175	44.50
		305	306-348-D	9.8	508	51.9	597	61.0	746	76.3	1041	106.30
20.0	10.0	25	306-404-D	326.5	1345	4.3	1583	5.0	1978	6.3	1992	6.10
		32	306-405-D	244.9	1291	5.4	1518	6.4	1898	8.0	2008	8.20
		38	306-406-D	199.2	1247	6.5	1467	7.6	1834	9.5	1932	9.70
		44	306-407-D	170.3	1202	7.5	1415	8.8	1768	11.0	1975	11.60
		51	306-408-D	146.9	1202	8.7	1414	10.2	1768	12.8	2071	14.10
		64	306-410-D	114.7	1177	10.9	1385	12.8	1731	16.0	2052	17.90
		76	306-412-D	94.0	1147	12.9	1349	15.2	1686	19.0	1956	20.80
		89	306-414-D	78.4	1119	15.1	1316	17.8	1645	22.3	1850	23.60
		102	306-416-D	68.1	1115	17.3	1312	20.4	1640	25.5	1867	27.40
		115	306-418-D	60.3	1112	19.6	1308	23.0	1635	28.8	1820	30.20
		127	306-420-D	54.0	1101	21.6	1295	25.4	1619	31.8	1837	34.00
		139	306-422-D	48.5	1081	23.6	1272	27.8	1589	34.8	1785	36.80
		152	306-424-D	44.4	1082	25.8	1273	30.4	1591	38.0	1758	39.60
		305	306-448-D	22.0	1075	51.9	1265	61.0	1581	76.3	1815	82.50
25.0	12.5	25	306-504-D	459.0	1951	4.3	2295	5.0	2869	6.3	3351	7.30
		32	306-505-D	348.2	1894	5.4	2229	6.4	2786	8.0	3413	9.80
		38	306-506-D	277.2	1790	6.5	2106	7.6	2633	9.5	3132	11.30
		44	306-507-D	236.2	1767	7.5	2078	8.8	2598	11.0	3189	13.50
		51	306-508-D	196.8	1706	8.7	2008	10.2	2509	12.8	3011	15.30
		64	306-510-D	155.2	1689	10.9	1987	12.8	2483	16.0	3104	20.00
		76	306-512-D	129.3	1671	12.9	1966	15.2	2457	19.0	3117	24.10
		89	306-514-D	108.7	1644	15.1	1934	17.8	2417	22.3	3053	28.10

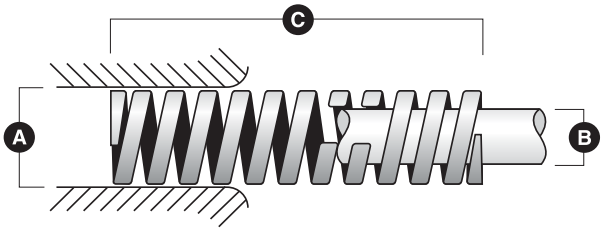
*Tabulated deflections shown represent near solid and are for design information only.

Associated Spring RAYMOND
A business of BARNES GROUP INC

Raymond® EXTRA HEAVY DUTY ISO D-LINE SPRINGS (METRIC DIMENSIONS) YELLOW

Hole Dia. (mm)	Rod Dia. (mm)	Free Length (mm)	CATALOG NUMBER	Spring Rate (N/mm)	LOAD DEFLECTION TABLE							
					Load @ 17% of free length		Load @ 20% of free length		Load @ 25% of free length		Load @ Max Recommended Deflection (N)	Max Deflection (mm)
A	B	C			Load (N)	Deflection (mm)	Load (N)	Deflection (mm)	Load (N)	Deflection (mm)		
25.0	12.5	102	306-516-D	95.3	1653	17.3	1944	20.4	2430	25.5	3164	33.20
		115	306-518-D	84.9	1659	19.6	1952	23.0	2440	28.8	3251	38.30
		127	306-520-D	76.3	1647	21.6	1938	25.4	2423	31.8	3220	42.20
		139	306-522-D	69.3	1637	23.6	1926	27.8	2408	34.8	3194	46.10
		152	306-524-D	63.5	1640	25.8	1929	30.4	2411	38.0	3236	51.00
		178	306-528-D	54.5	1650	30.3	1942	35.6	2427	44.5	3343	61.30
		203	306-532-D	47.7	1644	34.5	1935	40.6	2418	50.8	3340	70.10
		305	306-548-D	31.5	1634	51.9	1922	61.0	2403	76.3	3353	106.40
32.0	16.0	38	306-606-D	478.3	3090	6.5	3635	7.6	4544	9.5	4975	10.40
		44	306-607-D	420.0	3142	7.5	3696	8.8	4620	11.0	5334	12.70
		51	306-608-D	351.4	3047	8.7	3584	10.2	4481	12.8	5236	14.90
		64	306-610-D	273.3	2974	10.9	3499	12.8	4373	16.0	5275	19.30
		76	306-612-D	226.6	2927	12.9	3444	15.2	4305	19.0	5302	23.40
		89	306-614-D	193.5	2927	15.1	3444	17.8	4305	22.3	5514	28.50
		102	306-616-D	162.5	2817	17.3	3314	20.4	4142	25.5	5052	31.10
		115	306-618-D	144.7	2829	19.6	3328	23.0	4160	28.8	5238	36.20
		127	306-620-D	132.5	2860	21.6	3364	25.4	4206	31.8	5484	41.40
		139	306-622-D	118.8	2806	23.6	3302	27.8	4127	34.8	5261	44.30
		152	306-624-D	109.0	2816	25.8	3313	30.4	4142	38.0	5384	49.40
		178	306-628-D	91.8	2779	30.3	3270	35.6	4087	44.5	5272	57.40
		203	306-632-D	80.5	2777	34.5	3267	40.6	4084	50.8	5327	66.20
		254	306-640-D	64.3	2774	43.2	3264	50.8	4080	63.5	5416	84.30
		305	306-648-D	53.4	2768	51.9	3257	61.0	4071	76.3	5446	102.00
40.0	20.0	51	306-708-D	588.7	5104	8.7	6004	10.2	7505	12.8	8594	14.60
		64	306-710-D	452.8	4927	10.9	5796	12.8	7245	16.0	8286	18.30
		76	306-712-D	373.8	4829	12.9	5681	15.2	7101	19.0	8297	22.20
		89	306-714-D	314.0	4750	15.1	5588	17.8	6985	22.3	8288	26.40
		102	306-716-D	273.8	4748	17.3	5585	20.4	6982	25.5	8570	31.30
		115	306-718-D	242.8	4746	19.6	5583	23.0	6979	28.8	8788	36.20
		127	306-720-D	218.0	4707	21.6	5538	25.4	6922	31.8	8743	40.10
		139	306-722-D	196.2	4637	23.6	5455	27.8	6819	34.8	8496	43.30
		152	306-724-D	179.7	4644	25.8	5464	30.4	6830	38.0	8663	48.20
		178	306-728-D	151.9	4597	30.3	5408	35.6	6760	44.5	8598	56.60
		203	306-732-D	132.7	4578	34.5	5386	40.6	6732	50.8	8623	65.00
		254	306-740-D	105.6	4559	43.2	5364	50.8	6705	63.5	8722	82.60
		305	306-748-D	87.9	4556	51.9	5359	61.0	6699	76.3	8830	100.50
50.0	25.0	64	306-810-D	671.4	7305	10.9	8594	12.8	10742	16.0	14435	21.50
		76	306-812-D	537.1	6940	12.9	8164	15.2	10205	19.0	13428	25.00
		89	306-814-D	451.2	6826	15.1	8031	17.8	10039	22.3	13445	29.80
		102	306-816-D	389.0	6744	17.3	7935	20.4	9918	25.5	13497	34.70
		115	306-818-D	341.8	6682	19.6	7861	23.0	9827	28.8	13535	39.60
		127	306-820-D	304.9	6582	21.6	7743	25.4	9679	31.8	13230	43.40
		139	306-822-D	275.1	6501	23.6	7648	27.8	9560	34.8	13013	47.30
		152	306-824-D	250.7	6477	25.8	7620	30.4	9525	38.0	13059	52.10
		178	306-828-D	208.9	6321	30.3	7436	35.6	9295	44.5	12491	59.80
		203	306-832-D	184.9	6381	34.5	7507	40.6	9384	50.8	13055	70.60
		254	306-840-D	146.5	6325	43.2	7442	50.8	9302	63.5	13038	89.00
		305	306-848-D	120.0	6221	51.9	7319	61.0	9149	76.3	12647	105.40
63.0	38.0	76	306-912-D	952	12300	12.9	14470	15.2	-	-	16374	17.20
		89	306-914-D	819	12391	15.1	14578	17.8	-	-	17265	21.08
		102	306-916-D	700	12138	17.3	14280	20.4	-	-	16863	24.09
		114	306-918-D	620	12016	19.4	14136	22.8	-	-	16907	27.27
		127	306-920-D	565	12198	21.6	14351	25.4	-	-	18600	32.92
		152	306-924-D	458	11835	25.8	13923	30.4	-	-	17102	37.34
		178	306-928-D	384	11620	30.3	13670	35.6	-	-	16136	42.02
		203	306-932-D	337	11630	34.5	13682	40.6	-	-	16395	48.65
		254	306-940-D	263	11356	43.2	13360	50.8	-	-	15575	59.22
		305	306-948-D	218	11303	51.9	13298	61.0	-	-	15537	71.27

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



METRIC (mm) 10

Raymond® ULTRA STRONG DUTY ISO D-LINE SPRINGS (METRIC DIMENSIONS) GRAY												
Hole Dia. (mm)	Rod Dia. (mm)	Free Length (mm)	CATALOG NUMBER	Spring Rate (N/mm)	LOAD DEFLECTION TABLE							
					Load @ 10% of free length		Load @ 13.5% of free length		Load @ 15% of free length		Load @ Max Recommended Deflection (N)	Max Deflection (mm)
A	B	C			Load (N)	Deflection (mm)	Load (N)	Deflection (mm)	Load (N)	Deflection (mm)		
25.0	12.5	64	307-510-D	644.0	4122	6.4	5564	8.6	6182	9.6	8372	13.00
		76	307-512-D	556.0	4226	7.6	5705	10.3	6338	11.4	8896	16.00
		89	307-514-D	462.0	4112	8.9	5551	12.0	6168	13.4	9240	20.00
		102	307-516-D	390.0	3978	10.2	5370	13.8	5967	15.3	8970	23.00
		115	307-518-D	360.0	4140	11.5	5589	15.5	6210	17.3	9360	26.00
		127	307-520-D	326.0	4140	12.7	5589	17.1	6210	19.1	9128	28.00
		152	307-524-D	255.0	3876	15.2	5233	20.5	5814	22.8	8670	34.00
		178	307-528-D	230.0	4094	17.8	5527	24.0	6141	26.7	8970	39.00
		203	307-532-D	202.0	4101	20.3	5536	27.4	6151	30.5	9090	45.00
		305	307-548-D	136.0	4148	30.5	5600	41.2	6222	45.8	8568	63.00
32.0	16.0	64	307-610-D	1077.0	6893	6.4	9305	8.6	10339	9.6	14001	13.00
		76	307-612-D	874.0	6642	7.6	8967	10.3	9964	11.4	13984	16.00
		89	307-614-D	721.0	6417	8.9	8663	12.0	9625	13.4	14420	20.00
		102	307-616-D	620.0	6324	10.2	8537	13.8	9486	15.3	14260	23.00
		115	307-618-D	560.0	6440	11.5	8694	15.5	9660	17.3	14560	26.00
		127	307-620-D	496.0	6299	12.7	8504	17.1	9449	19.1	13888	28.00
		152	307-624-D	408.0	6202	15.2	8372	20.5	9302	22.8	13872	34.00
		178	307-628-D	353.0	6283	17.8	8483	24.0	9425	26.7	13767	39.00
		203	307-632-D	304.0	6171	20.3	8331	27.4	9257	30.5	13680	45.00
		254	307-640-D	243.0	6172	25.4	8332	34.3	9258	38.1	15066	62.00
		305	307-648-D	196.0	5978	30.5	8070	41.2	8967	45.8	14700	75.00
40.0	20.0	89	307-714-D	880.0	7832	8.9	10573	12.0	11748	13.4	17600	20.00
		102	307-716-D	762.0	7772	10.2	10493	13.8	11659	15.3	17526	23.00
		115	307-718-D	679.0	7809	11.5	10541	15.5	11713	17.3	17654	26.00
		127	307-720-D	622.0	7899	12.7	10664	17.1	11849	19.1	17416	28.00
		152	307-724-D	509.0	7737	15.2	10445	20.5	11605	22.8	18324	36.00
		178	307-728-D	429.0	7636	17.8	10309	24.0	11454	26.7	18447	43.00
		203	307-732-D	374.0	7592	20.3	10249	27.4	11388	30.5	18326	49.00
		254	307-740-D	296.0	7518	25.4	10150	34.3	11278	38.1	18352	62.00
		305	307-748-D	246.0	7503	30.5	10129	41.2	11255	45.8	18450	75.00
50.0	25.0	89	307-814-D	1410.0	12549	8.9	16941	12.0	18824	13.4	26790	19.00
		102	307-816-D	1215.0	12393	10.2	16731	13.8	18590	15.3	26730	22.00
		115	307-818-D	1076.0	12374	11.5	16705	15.5	18561	17.3	26900	25.00
		127	307-820-D	968.0	12294	12.7	16596	17.1	18440	19.1	27104	28.00
		152	307-824-D	806.0	12251	15.2	16539	20.5	18377	22.8	27404	34.00
		178	307-828-D	698.0	12424	17.8	16773	24.0	18637	26.7	27920	40.00
		203	307-832-D	612.0	12424	20.3	16772	27.4	18635	30.5	27540	45.00
		254	307-840-D	472.0	11989	25.4	16185	34.3	17983	38.1	27376	58.00
		305	307-848-D	388.0	11834	30.5	15976	41.2	17751	45.8	27160	70.00

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

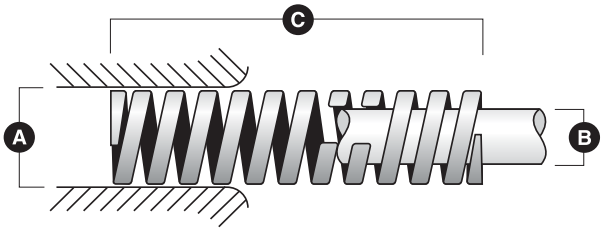
Raymond® COMPRESSED – FREE LENGTH (METRIC DIMENSIONS)

Free Length (mm)	ULTRA LIGHT LOAD			LIGHT LOAD			MEDIUM LOAD		
	30% DEFLECTION	40% DEFLECTION	50% DEFLECTION	25% DEFLECTION	30% DEFLECTION	40% DEFLECTION	25% DEFLECTION	30% DEFLECTION	40% DEFLECTION
25	7.62	10.16	12.70	6.35	7.62	10.16	6.35	7.62	10.16
32	9.53	12.70	15.88	7.94	9.53	12.70	7.94	9.53	12.70
38	11.43	15.24	19.05	9.53	11.43	15.24	9.53	11.43	15.24
44	13.34	17.78	22.23	11.11	13.34	17.78	11.11	13.34	17.78
51	15.24	20.32	25.40	12.70	15.24	20.32	12.70	15.24	20.32
64	19.05	25.40	31.75	15.88	19.05	25.40	15.88	19.05	25.40
76	22.86	30.48	38.10	19.05	22.86	30.48	19.05	22.86	30.48
89	26.67	35.56	44.45	22.23	26.67	35.56	22.23	26.67	35.56
102	30.48	40.64	50.80	25.40	30.48	40.64	25.40	30.48	40.64
114	34.29	45.72	57.15	28.58	34.29	45.72	28.58	34.29	45.72
127	38.10	50.80	63.50	31.75	38.10	50.80	31.75	38.10	50.80
140	41.91	55.88	69.85	34.93	41.91	55.88	34.93	41.91	55.88
152	45.72	60.96	76.20	38.10	45.72	60.96	38.10	45.72	60.96
178	53.34	71.12	88.90	44.45	53.34	71.12	44.45	53.34	71.12
203	60.96	81.28	101.60	50.80	60.96	81.28	50.80	60.96	81.28
229	68.58	91.44	114.30	57.15	68.58	91.44	57.15	68.58	91.44
254	76.20	101.60	127.00	63.50	76.20	101.60	63.50	76.20	101.60
305	91.44	121.92	152.40	76.20	91.44	121.92	76.20	91.44	121.92

Raymond® COMPRESSED – FREE LENGTH (METRIC DIMENSIONS)

Free Length (mm)	HEAVY LOAD			EXTRA HEAVY LOAD			ULTRA STRONG LOAD		
	20% DEFLECTION	25% DEFLECTION	30% DEFLECTION	17% DEFLECTION	20% DEFLECTION	25% DEFLECTION	10% DEFLECTION	13.5% DEFLECTION	15% DEFLECTION
25	5.08	6.35	7.62	4.32	5.08	6.35	2.54	3.43	3.81
32	6.35	7.94	9.53	5.40	6.35	7.94	3.18	4.29	4.76
38	7.62	9.53	11.43	6.48	7.62	9.53	3.81	5.14	5.72
44	8.89	11.11	13.34	7.56	8.89	11.11	4.45	6.00	6.67
51	10.16	12.70	15.24	8.64	10.16	12.70	5.08	6.86	7.62
64	12.70	15.88	19.05	10.80	12.70	15.88	6.35	8.57	9.53
76	15.24	19.05	22.86	12.95	15.24	19.05	7.62	10.29	11.43
89	17.78	22.23	26.67	15.11	17.78	22.23	8.89	12.00	13.34
102	20.32	25.40	30.48	17.27	20.32	25.40	10.16	13.72	15.24
114	22.86	28.58	34.29	19.43	22.86	28.58	11.43	15.43	17.15
127	25.40	31.75	38.10	21.59	25.40	31.75	12.70	17.15	19.05
140	27.94	34.93	41.91	23.75	27.94	34.93	13.97	18.86	20.96
152	30.48	38.10	45.72	25.91	30.48	38.10	15.24	20.57	22.86
178	35.56	44.45	53.34	30.23	35.56	44.45	17.78	24.00	26.67
203	40.64	50.80	60.96	34.54	40.64	50.80	20.32	27.43	30.48
229	45.72	57.15	68.58	38.86	45.72	57.15	22.86	30.86	34.29
254	50.80	63.50	76.20	43.18	50.80	63.50	25.40	34.29	38.10
305	60.96	76.20	91.44	51.82	60.96	76.20	30.48	41.15	45.72

Ultra Light Duty | INCH DIMENSIONS

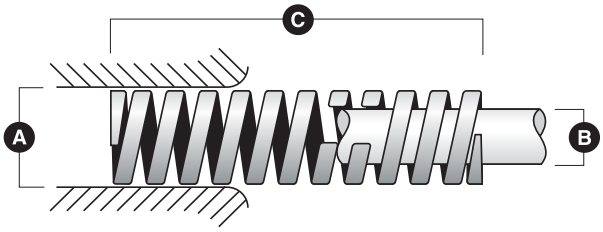


INCH (in) 1

Raymond®	ULTRA LIGHT DUTY ISO D-LINE SPRINGS (INCH DIMENSIONS)				LIGHT GREEN							
Hole Dia. (in)	Rod Dia. (in)	Free Length (in)	CATALOG NUMBER	Spring Rate per 1/10 Inch Deflection	LOAD DEFLECTION TABLE							
					Load @ 30% of free length		Load @ 40% of free length		Load @ 50% of free length		Load @ Max Recommended Deflection	Max Deflection (in)
A	B	C			Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)		
3/4	3/8	1	302-404-D	16.8	50	0.30	67	0.39	84	0.49	110	0.65
		1 1/4	302-405-D	12.9	49	0.38	65	0.50	81	0.63	110	0.85
		1 1/2	302-406-D	10.6	48	0.45	64	0.60	79	0.75	107	1.01
		1 3/4	302-407-D	9.0	47	0.52	62	0.69	78	0.87	105	1.17
		2	302-408-D	7.8	47	0.60	63	0.80	79	1.00	107	1.37
		2 1/2	302-410-D	6.5	49	0.76	65	1.01	81	1.26	114	1.77
		3	302-412-D	5.6	50	0.90	67	1.20	84	1.50	119	2.13
		3 1/2	302-414-D	4.7	50	1.05	66	1.40	83	1.75	118	2.50
		4	302-416-D	4.2	51	1.20	68	1.61	85	2.01	122	2.89
		4 1/2	302-418-D	3.7	49	1.35	66	1.80	82	2.24	117	3.20
		5	302-420-D	3.4	51	1.50	67	2.00	84	2.50	122	3.62
		5 1/2	302-422-D	3.1	51	1.65	68	2.20	85	2.76	123	4.00
		6	302-424-D	2.8	50	1.80	67	2.39	84	2.99	121	4.33
		12	302-448-D	1.4	51	3.60	69	4.80	86	6.00	125	8.76
1	1/2	1	302-504-D	30.8	91	0.30	121	0.39	151	0.49	176	0.57
		1 1/4	302-505-D	24.1	91	0.38	121	0.50	152	0.63	181	0.75
		1 1/2	302-506-D	20.4	92	0.45	122	0.60	153	0.75	187	0.91
		1 3/4	302-507-D	17.9	93	0.52	124	0.69	155	0.87	193	1.08
		2	302-508-D	15.4	93	0.60	124	0.80	155	1.00	195	1.27
		2 1/2	302-510-D	12.3	93	0.76	124	1.01	155	1.26	199	1.61
		3	302-512-D	10.3	93	0.90	124	1.20	155	1.50	200	1.93
		3 1/2	302-514-D	8.7	91	1.05	122	1.40	152	1.75	195	2.25
		4	302-516-D	7.5	91	1.20	121	1.61	151	2.01	196	2.59
		4 1/2	302-518-D	6.7	91	1.35	121	1.80	151	2.24	195	2.90
		5	302-520-D	6.1	91	1.50	121	2.00	151	2.50	197	3.26
		5 1/2	302-522-D	5.5	91	1.65	121	2.20	151	2.76	197	3.59
		6	302-524-D	5.0	90	1.80	120	2.39	150	2.99	195	3.89
		7	302-528-D	4.3	91	2.10	122	2.80	152	3.50	199	4.58
		8	302-532-D	3.8	92	2.40	122	3.20	153	4.00	201	5.26
		12	302-548-D	2.5	91	3.60	121	4.80	151	6.00	199	7.91
1 1/4	5/8	1 1/2	302-606-D	24.6	110	0.45	147	0.60	184	0.75	239	0.97
		1 3/4	302-607-D	21.3	111	0.52	148	0.69	184	0.87	243	1.14
		2	302-608-D	18.5	111	0.60	149	0.80	186	1.00	248	1.34
		2 1/2	302-610-D	14.6	110	0.76	147	1.01	183	1.26	249	1.71
		3	302-612-D	12.3	111	0.90	148	1.20	185	1.50	253	2.06
		3 1/2	302-614-D	10.3	109	1.05	145	1.40	181	1.75	248	2.40
		4	302-616-D	9.0	108	1.20	144	1.61	180	2.01	247	2.76
		4 1/2	302-618-D	8.1	109	1.35	146	1.80	182	2.24	251	3.09
		5	302-620-D	7.3	109	1.50	145	2.00	181	2.50	251	3.46
		5 1/2	302-622-D	6.6	110	1.65	146	2.20	183	2.76	254	3.84
		6	302-624-D	6.1	109	1.80	145	2.39	181	2.99	252	4.16
		7	302-628-D	5.1	108	2.10	144	2.80	180	3.50	250	4.87
		8	302-632-D	4.5	107	2.40	142	3.20	178	4.00	247	5.55
		10	302-640-D	3.7	110	3.00	146	4.00	183	5.00	258	7.05
		12	302-648-D	3.0	109	3.60	145	4.80	182	6.00	256	8.46
1 1/2	3/4	2	302-708-D	27.5	165	0.60	221	0.80	276	1.00	333	1.21
		2 1/2	302-710-D	22.4	169	0.76	226	1.01	282	1.26	351	1.57
		3	302-712-D	19.0	171	0.90	228	1.20	284	1.50	360	1.89
		3 1/2	302-714-D	16.2	170	1.05	227	1.40	284	1.75	363	2.24
		4	302-716-D	14.0	169	1.20	225	1.61	281	2.01	357	2.55

Associated Spring RAYMOND
A business of BARNES GROUP INC

Raymond®	ULTRA LIGHT DUTY ISO D-LINE SPRINGS (INCH DIMENSIONS)											LIGHT GREEN
Hole Dia. (in)	Rod Dia. (in)	Free Length (in)	CATALOG NUMBER	Spring Rate per 1/10 Inch Deflection	LOAD DEFLECTION TABLE							
					Load @ 25% of free length		Load @ 30% of free length		Load @ 40% of free length		Load @ Max Recommended Deflection	Max Deflection (in)
A	B	C			Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)		
1 1/2	3/4	4 1/2	302-718-D	12.6	170	1.35	227	1.80	283	2.24	365	2.89
		5	302-720-D	11.2	168	1.50	224	2.00	280	2.50	360	3.22
		5 1/2	302-722-D	10.1	167	1.65	223	2.20	279	2.76	359	3.55
		6	302-724-D	9.3	166	1.80	221	2.39	277	2.99	356	3.85
		7	302-728-D	7.8	164	2.10	219	2.80	274	3.50	352	4.50
		8	302-732-D	7.0	168	2.40	225	3.20	281	4.00	366	5.22
		10	302-740-D	5.6	168	3.00	224	4.00	280	5.00	367	6.55
		12	302-748-D	4.7	171	3.60	228	4.80	285	6.00	377	7.95
2	1	2 1/2	302-810-D	49.3	372	0.76	497	1.01	621	1.26	778	1.58
		3	302-812-D	40.3	362	0.90	482	1.20	603	1.50	760	1.89
		3 1/2	302-814-D	34.1	359	1.05	479	1.40	598	1.75	758	2.22
		4	302-816-D	29.7	358	1.20	477	1.61	596	2.01	762	2.57
		4 1/2	302-818-D	26.3	354	1.35	473	1.80	591	2.24	760	2.89
		5	302-820-D	24.1	361	1.50	482	2.00	602	2.50	783	3.25
		5 1/2	302-822-D	21.8	361	1.65	481	2.20	601	2.76	787	3.61
		6	302-824-D	19.6	352	1.80	469	2.39	586	2.99	759	3.87
		7	302-828-D	16.8	353	2.10	471	2.80	588	3.50	767	4.57
		8	302-832-D	14.6	349	2.40	465	3.20	582	4.00	759	5.21
		10	302-840-D	11.8	353	3.00	470	4.00	588	5.00	778	6.61
		12	302-848-D	9.8	354	3.60	472	4.80	590	6.00	783	7.97



INCH (in) 1

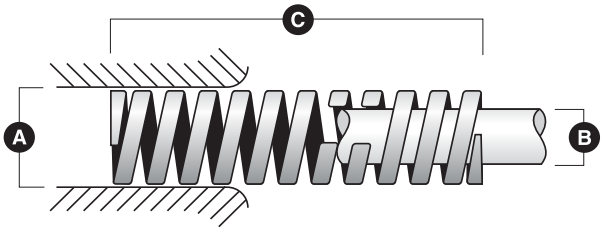
Raymond® LIGHT DUTY ISO D-LINE SPRINGS (INCH DIMENSIONS) GREEN

Hole Dia. (in) A	Rod Dia. (in) B	Free Length (in) C	CATALOG NUMBER	Spring Rate per 1/10 Inch Deflection	LOAD DEFLECTION TABLE							
					Load @ 25% of free length		Load @ 30% of free length		Load @ 40% of free length		Load @ Max Recommended Deflection	Max Deflection (in)
					Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)		
3/8	3/16	1	303-104-D	7.0	17	0.25	21	0.30	27	0.39	35	0.50
		1 1/4	303-105-D	5.7	18	0.31	21	0.38	29	0.50	39	0.68
		1 1/2	303-106-D	4.7	18	0.37	21	0.45	28	0.60	38	0.81
		1 3/4	303-107-D	3.7	16	0.43	19	0.52	25	0.69	35	0.95
		2	303-108-D	3.6	18	0.50	22	0.60	29	0.80	39	1.09
		2 1/2	303-110-D	3.0	19	0.63	23	0.76	30	1.01	45	1.48
		3	303-112-D	2.4	18	0.75	22	0.90	29	1.20	41	1.71
		12	303-148-D	0.6	18	3.00	21	3.60	29	4.80	41	6.93
1/2	9/32	1	303-204-D	10.6	26	0.25	31	0.30	42	0.39	66	0.62
		1 1/4	303-205-D	8.5	27	0.31	32	0.38	43	0.50	69	0.82
		1 1/2	303-206-D	7.3	27	0.37	33	0.45	44	0.60	72	0.99
		1 3/4	303-207-D	6.4	28	0.43	33	0.52	44	0.69	74	1.16
		2	303-208-D	5.3	27	0.50	32	0.60	43	0.80	71	1.33
		2 1/2	303-210-D	4.1	26	0.63	31	0.76	41	1.01	69	1.67
		3	303-212-D	3.4	25	0.75	30	0.90	40	1.20	66	1.96
		3 1/2	303-214-D	2.7	24	0.88	28	1.05	38	1.40	61	2.24
		4	303-216-D	2.3	24	1.00	28	1.20	38	1.61	54	2.30
		12	303-248-D	0.8	23	3.00	28	3.60	37	4.80	60	7.75
5/8	11/32	1	303-304-D	18.1	45	0.25	53	0.30	71	0.39	99	0.55
		1 1/4	303-305-D	13.3	42	0.31	50	0.38	67	0.50	92	0.69
		1 1/2	303-306-D	11.7	44	0.37	53	0.45	70	0.60	101	0.86
		1 3/4	303-307-D	10.2	44	0.43	53	0.52	71	0.69	104	1.02
		2	303-308-D	8.9	44	0.50	53	0.60	71	0.80	106	1.19
		2 1/2	303-310-D	7.2	46	0.63	55	0.76	73	1.01	111	1.54
		3	303-312-D	5.7	43	0.75	51	0.90	68	1.20	100	1.76
		3 1/2	303-314-D	5.1	45	0.88	54	1.05	72	1.40	109	2.14
		4	303-316-D	4.3	43	1.00	52	1.20	70	1.61	109	2.52
		4 1/2	303-318-D	3.8	42	1.13	51	1.35	68	1.80	90	2.39
		12	303-348-D	1.5	44	3.00	53	3.60	70	4.80	109	7.44
3/4	3/8	1	303-404-D	31.6	78	0.25	93	0.30	125	0.39	167	0.53
		1 1/4	303-405-D	24.8	78	0.31	94	0.38	125	0.50	173	0.70
		1 1/2	303-406-D	19.6	73	0.37	88	0.45	117	0.60	160	0.81
		1 3/4	303-407-D	15.8	68	0.43	82	0.52	110	0.69	143	0.91
		2	303-408-D	14.2	71	0.50	86	0.60	114	0.80	133	0.93
		2 1/2	303-410-D	10.7	68	0.63	81	0.76	108	1.01	145	1.35
		3	303-412-D	9.2	69	0.75	82	0.90	110	1.20	150	1.63
		3 1/2	303-414-D	7.5	66	0.88	79	1.05	105	1.40	139	1.86
		4	303-416-D	6.8	68	1.00	82	1.20	109	1.61	150	2.21
		4 1/2	303-418-D	6.3	70	1.12	84	1.35	112	1.80	161	2.57
		5	303-420-D	5.4	67	1.25	81	1.50	107	2.00	149	2.78
		5 1/2	303-422-D	4.9	67	1.38	81	1.65	108	2.20	149	3.05
		6	303-424-D	4.3	64	1.50	77	1.80	103	2.39	138	3.19
		12	303-448-D	2.2	65	3.00	79	3.60	105	4.80	146	6.68
1	1/2	1	303-504-D	58.9	145	0.25	174	0.30	232	0.39	306	0.52
		1 1/4	303-505-D	46.1	145	0.31	174	0.38	232	0.50	319	0.69
		1 1/2	303-506-D	36.9	138	0.37	165	0.45	221	0.60	300	0.81
		1 3/4	303-507-D	30.7	133	0.43	160	0.52	213	0.69	288	0.94
		2	303-508-D	26.2	131	0.50	158	0.60	210	0.80	283	1.08
		2 1/2	303-510-D	20.4	128	0.63	154	0.76	205	1.01	280	1.37
		3	303-512-D	16.3	122	0.75	146	0.90	195	1.20	259	1.59

Associated Spring RAYMOND
A business of BARNES GROUP INC

Raymond® LIGHT DUTY ISO D-LINE SPRINGS (INCH DIMENSIONS) GREEN

Hole Dia. (in)	Rod Dia. (in)	Free Length (in)	CATALOG NUMBER	Spring Rate per 1/10 Inch Deflection	LOAD DEFLECTION TABLE							
					Load @ 25% of free length		Load @ 30% of free length		Load @ 40% of free length		Load @ Max Recommended Deflection	Max Deflection (in)
A	B	C			Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)		
1	1/2	3 1/2	303-514-D	14.1	124	0.88	149	1.05	198	1.40	268	1.90
		4	303-516-D	11.8	118	1.00	142	1.20	189	1.61	248	2.11
		4 1/2	303-518-D	10.6	119	1.12	143	1.35	190	1.80	257	2.42
		5	303-520-D	9.5	119	1.25	143	1.50	190	2.00	254	2.67
		5 1/2	303-522-D	8.3	115	1.38	137	1.65	183	2.20	234	2.81
		6	303-524-D	7.8	116	1.50	140	1.80	186	2.39	245	3.15
		7	303-528-D	6.7	118	1.75	141	2.10	189	2.80	252	3.75
		8	303-532-D	6.0	120	2.00	144	2.40	193	3.20	263	4.37
		12	303-548-D	3.9	116	3.00	139	3.60	185	4.80	247	6.40
1 1/4	5/8	1 1/2	303-606-D	52.4	196	0.37	235	0.45	314	0.60	501	0.96
		1 3/4	303-607-D	47.5	206	0.43	247	0.52	329	0.69	518	1.09
		2	303-608-D	40.3	202	0.50	243	0.60	324	0.80	515	1.28
		2 1/2	303-610-D	31.4	198	0.63	238	0.76	317	1.01	508	1.61
		3	303-612-D	26.1	195	0.75	234	0.90	312	1.20	502	1.93
		3 1/2	303-614-D	22.0	193	0.88	232	1.05	309	1.40	499	2.26
		4	303-616-D	19.3	193	1.00	232	1.20	309	1.61	504	2.61
		4 1/2	303-618-D	17.1	192	1.12	230	1.35	307	1.80	507	2.96
		5	303-620-D	14.7	184	1.25	221	1.50	295	2.00	473	3.20
		5 1/2	303-622-D	13.6	187	1.38	224	1.65	299	2.20	480	3.54
		6	303-624-D	12.4	185	1.50	222	1.80	297	2.39	480	3.87
		7	303-628-D	10.1	176	1.75	212	2.10	282	2.80	446	4.44
		8	303-632-D	8.9	178	2.00	214	2.40	285	3.20	455	5.10
		10	303-640-D	7.2	180	2.50	216	3.00	288	4.00	464	6.45
		12	303-648-D	5.5	165	3.00	197	3.60	263	4.80	405	7.39
1 1/2	3/4	2	303-708-D	59.7	300	0.50	360	0.60	480	0.80	592	0.99
		2 1/2	303-710-D	45.4	286	0.63	343	0.76	458	1.01	563	1.24
		3	303-712-D	38.0	284	0.75	341	0.90	455	1.20	567	1.49
		3 1/2	303-714-D	32.7	286	0.88	343	1.05	458	1.40	584	1.79
		4	303-716-D	27.7	278	1.00	334	1.20	446	1.61	561	2.02
		4 1/2	303-718-D	24.7	277	1.12	332	1.35	443	1.80	571	2.31
		5	303-720-D	22.4	280	1.25	336	1.50	448	2.00	576	2.57
		5 1/2	303-722-D	20.0	275	1.38	330	1.65	440	2.20	553	2.77
		6	303-724-D	18.1	271	1.50	325	1.80	434	2.39	548	3.02
		7	303-728-D	15.6	273	1.75	328	2.10	437	2.80	561	3.59
		8	303-732-D	13.4	268	2.00	321	2.40	428	3.20	542	4.05
		10	303-740-D	10.8	269	2.50	323	3.00	431	4.00	553	5.13
		12	303-748-D	8.8	265	3.00	318	3.60	424	4.80	539	6.11
2	1	2 1/2	303-810-D	84.8	534	0.63	641	0.76	855	1.01	1386	1.63
		3	303-812-D	71.5	535	0.75	641	0.90	855	1.20	1300	1.82
		3 1/2	303-814-D	59.7	523	0.88	627	1.05	836	1.40	1268	2.13
		4	303-816-D	51.6	518	1.00	622	1.20	829	1.61	1266	2.45
		4 1/2	303-818-D	44.9	504	1.12	605	1.35	806	1.80	1240	2.76
		5	303-820-D	40.2	502	1.25	603	1.50	804	2.00	1225	3.05
		5 1/2	303-822-D	36.0	496	1.38	596	1.65	794	2.20	1194	3.31
		6	303-824-D	32.5	486	1.50	583	1.80	778	2.39	1175	3.61
		7	303-828-D	27.8	486	1.75	584	2.10	778	2.80	1185	4.27
		8	303-832-D	23.9	477	2.00	572	2.40	763	3.20	1154	4.83
		10	303-840-D	20.4	509	2.50	611	3.00	814	4.00	1289	6.33
		12	303-848-D	15.3	459	3.00	550	3.60	734	4.80	1097	7.18
2 1/2	1 1/2	3	303-912-D	109.2	817	0.75	980	0.90	1307	1.20	1582	1.45
		3 1/2	303-914-D	89.9	788	0.88	945	1.05	1260	1.40	1526	1.70
		4	303-916-D	77.7	780	1.00	936	1.20	1248	1.61	1533	1.97
		4 1/2	303-918-D	67.4	757	1.12	908	1.35	1211	1.80	1495	2.22
		5	303-920-D	60.3	754	1.25	905	1.50	1207	2.00	1480	2.45
		6	303-924-D	49.3	738	1.50	885	1.80	1180	2.39	1448	2.94
		7	303-928-D	42.1	737	1.75	884	2.10	1179	2.80	1467	3.49
		8	303-932-D	36.1	721	2.00	866	2.40	1154	3.20	1423	3.94
		10	303-940-D	28.5	712	2.50	854	3.00	1139	4.00	1408	4.94
		12	303-948-D	23.4	702	3.00	843	3.60	1124	4.80	1384	5.92



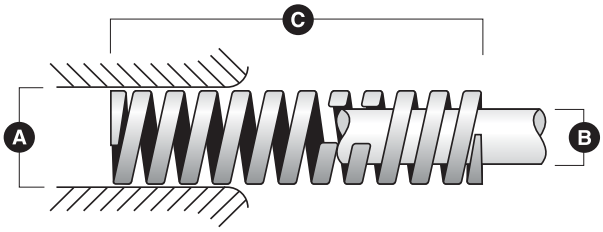
INCH (in) 1

Raymond® MEDIUM DUTY ISO D-LINE SPRINGS (INCH DIMENSIONS) BLUE

Hole Dia. (in) A	Rod Dia. (in) B	Free Length (in) C	CATALOG NUMBER	Spring Rate per 1/10 Inch Deflection	LOAD DEFLECTION TABLE							
					Load @ 25% of free length		Load @ 30% of free length		Load @ 40% of free length		Load @ Max Recommended Deflection	Max Deflection (in)
					Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)		
3/8	3/16	1	304-104-D	8.9	22	0.25	26	0.30	35	0.39	42	0.47
		1 1/4	304-105-D	7.7	24	0.31	29	0.38	39	0.50	52	0.68
		1 1/2	304-106-D	6.7	25	0.37	30	0.45	40	0.60	55	0.83
		1 3/4	304-107-D	5.5	24	0.43	28	0.52	38	0.69	51	0.93
		2	304-108-D	4.9	25	0.50	30	0.60	40	0.80	55	1.13
		2 1/2	304-110-D	3.8	24	0.63	29	0.76	38	1.01	52	1.39
		3	304-112-D	3.1	24	0.75	28	0.90	38	1.20	52	1.64
		12	304-148-D	0.8	23	3.00	28	3.60	37	4.80	51	6.67
1/2	9/32	1	304-204-D	16.8	41	0.25	50	0.30	66	0.39	84	0.50
		1 1/4	304-205-D	12.8	40	0.31	48	0.38	65	0.50	84	0.65
		1 1/2	304-206-D	10.7	40	0.37	48	0.45	64	0.60	84	0.78
		1 3/4	304-207-D	9.1	39	0.43	47	0.52	63	0.69	82	0.91
		2	304-208-D	7.8	39	0.50	47	0.60	63	0.80	83	1.06
		2 1/2	304-210-D	6.0	38	0.63	45	0.76	60	1.01	78	1.30
		3	304-212-D	5.0	37	0.75	44	0.90	59	1.20	76	1.54
		3 1/2	304-214-D	4.3	37	0.88	45	1.05	60	1.40	78	1.83
		4	304-216-D	3.6	36	1.00	43	1.20	58	1.60	74	2.06
		12	304-248-D	1.2	37	3.00	44	3.60	59	4.80	78	6.35
5/8	11/32	1	304-304-D	31.8	78	0.25	94	0.30	125	0.39	145	0.46
		1 1/4	304-305-D	22.8	72	0.31	86	0.38	115	0.50	128	0.56
		1 1/2	304-306-D	19.8	74	0.37	89	0.45	118	0.60	139	0.70
		1 3/4	304-307-D	17.5	76	0.43	91	0.52	121	0.69	147	0.84
		2	304-308-D	15.2	76	0.50	91	0.60	122	0.80	151	1.00
		2 1/2	304-310-D	11.9	75	0.63	90	0.76	120	1.01	149	1.25
		3	304-312-D	10.2	76	0.75	91	0.90	122	1.20	156	1.53
		3 1/2	304-314-D	8.6	75	0.88	90	1.05	120	1.40	153	1.78
		4	304-316-D	7.6	76	1.00	91	1.20	122	1.61	158	2.08
		4 1/2	304-318-D	6.7	76	1.13	91	1.35	121	1.80	141	2.09
		12	304-348-D	2.4	72	3.00	86	3.60	115	4.80	145	6.06
3/4	3/8	1	304-404-D	52.0	128	0.25	153	0.30	205	0.39	213	0.41
		1 1/4	304-405-D	38.8	122	0.31	147	0.38	195	0.50	205	0.53
		1 1/2	304-406-D	31.5	118	0.37	141	0.45	188	0.60	193	0.61
		1 3/4	304-407-D	26.6	115	0.43	138	0.52	185	0.69	189	0.71
		2	304-408-D	22.8	114	0.50	137	0.60	183	0.80	189	0.83
		2 1/2	304-410-D	17.6	111	0.63	133	0.76	177	1.01	180	1.02
		3	304-412-D	14.7	110	0.75	132	0.90	176	1.20	179	1.22
		3 1/2	304-414-D	12.6	110	0.88	133	1.05	177	1.40	184	1.46
		4	304-416-D	11.1	111	1.00	133	1.20	178	1.61	187	1.69
		4 1/2	304-418-D	9.7	110	1.13	132	1.36	176	1.81	184	1.89
		5	304-420-D	8.7	109	1.25	131	1.50	175	2.00	182	2.09
		5 1/2	304-422-D	8.1	110	1.37	132	1.64	176	2.19	187	2.32
		6	304-424-D	7.3	109	1.50	131	1.80	175	2.39	184	2.52
		12	304-448-D	3.7	110	3.00	132	3.60	176	4.80	190	5.20
1	1/2	1	304-504-D	97.9	241	0.25	289	0.30	385	0.39	385	0.39
		1 1/4	304-505-D	72.2	228	0.31	273	0.38	364	0.50	364	0.50
		1 1/2	304-506-D	59.5	223	0.37	267	0.45	356	0.60	361	0.61
		1 3/4	304-507-D	50.9	220	0.43	264	0.52	352	0.69	368	0.72
		2	304-508-D	42.6	214	0.50	256	0.60	342	0.80	354	0.83
		2 1/2	304-510-D	32.7	206	0.63	247	0.76	329	1.01	335	1.02
		3	304-512-D	28.0	209	0.75	251	0.90	335	1.20	353	1.26
		3 1/2	304-514-D	23.3	204	0.88	245	1.05	327	1.40	341	1.46

Raymond® MEDIUM DUTY ISO D-LINE SPRINGS (INCH DIMENSIONS) BLUE

Hole Dia. (in)	Rod Dia. (in)	Free Length (in)	CATALOG NUMBER	Spring Rate per 1/10 Inch Deflection	LOAD DEFLECTION TABLE							
					Load @ 25% of free length		Load @ 30% of free length		Load @ 40% of free length		Load @ Max Recommended Deflection	Max Deflection (in)
A	B	C			Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)		
		4	304-516-D	20.4	205	1.00	246	1.20	328	1.61	346	1.70
		4 1/2	304-518-D	18.1	205	1.13	246	1.36	327	1.81	349	1.93
		5	304-520-D	16.3	203	1.25	244	1.50	325	2.00	346	2.13
1	1/2	5 1/2	304-522-D	15.0	205	1.37	246	1.64	329	2.19	355	2.37
		6	304-524-D	13.6	203	1.50	243	1.80	325	2.39	347	2.56
		7	304-528-D	11.5	201	1.75	242	2.10	322	2.80	344	2.99
		8	304-532-D	10.1	201	2.00	242	2.40	322	3.20	345	3.43
		12	304-548-D	6.6	198	3.00	238	3.60	317	4.80	338	5.12
		1 1/2	304-606-D	95.3	356	0.37	428	0.45	570	0.60	653	0.69
		1 3/4	304-607-D	77.9	337	0.43	405	0.52	540	0.69	604	0.78
		2	304-608-D	66.4	333	0.50	400	0.60	533	0.80	606	0.91
		2 1/2	304-610-D	50.0	315	0.63	378	0.76	504	1.01	559	1.12
		3	304-612-D	40.5	303	0.75	363	0.90	485	1.20	524	1.30
		3 1/2	304-614-D	34.5	302	0.88	362	1.05	483	1.40	531	1.54
		4	304-616-D	29.4	296	1.00	355	1.20	473	1.61	514	1.74
1 1/4	5/8	4 1/2	304-618-D	26.1	296	1.13	355	1.36	473	1.81	1116	4.27
		5	304-620-D	23.8	298	1.25	357	1.50	476	2.00	531	2.23
		5 1/2	304-622-D	21.6	295	1.37	355	1.64	473	2.19	525	2.43
		6	304-624-D	19.3	288	1.50	346	1.80	461	2.39	501	2.60
		7	304-628-D	16.5	290	1.75	347	2.10	463	2.80	510	3.09
		8	304-632-D	14.2	284	2.00	341	2.40	454	3.20	491	3.46
		10	304-640-D	11.4	285	2.50	342	3.00	456	4.00	501	4.39
		12	304-648-D	9.5	286	3.00	343	3.60	458	4.80	507	5.32
		2	304-708-D	97.3	488	0.50	586	0.60	781	0.80	804	0.83
		2 1/2	304-710-D	73.5	463	0.63	556	0.76	741	1.01	749	1.02
		3	304-712-D	61.2	458	0.75	550	0.90	733	1.20	755	1.23
		3 1/2	304-714-D	50.9	446	0.88	535	1.05	713	1.40	725	1.43
		4	304-716-D	43.1	433	1.00	520	1.20	693	1.61	690	1.60
		4 1/2	304-718-D	38.2	432	1.13	518	1.36	691	1.81	694	1.82
1 1/2	3/4	5	304-720-D	34.8	435	1.25	522	1.50	696	2.00	714	2.05
		5 1/2	304-722-D	31.6	432	1.37	519	1.64	692	2.19	709	2.24
		6	304-724-D	29.0	434	1.50	521	1.80	694	2.39	722	2.49
		7	304-728-D	24.6	430	1.75	516	2.10	688	2.80	716	2.91
		8	304-732-D	21.3	426	2.00	512	2.40	682	3.20	706	3.31
		10	304-740-D	17.2	429	2.50	515	3.00	687	4.00	725	4.22
		12	304-748-D	14.1	424	3.00	509	3.60	679	4.80	712	5.04
		2 1/2	304-810-D	121.0	762	0.63	914	0.76	1219	1.01	1329	1.10
		3	304-812-D	94.9	710	0.75	852	0.90	1136	1.20	1181	1.24
		3 1/2	304-814-D	79.6	697	0.88	837	1.05	1116	1.40	1166	1.46
		4	304-816-D	69.3	696	1.00	835	1.20	1113	1.61	1184	1.71
		4 1/2	304-818-D	61.1	691	1.13	830	1.36	1106	1.81	1188	1.94
		5	304-820-D	54.1	676	1.25	812	1.50	1082	2.00	1144	2.11
2	1	5 1/2	304-822-D	49.4	675	1.37	810	1.64	1080	2.19	1150	2.33
		6	304-824-D	44.7	669	1.50	803	1.80	1070	2.39	1135	2.54
		7	304-828-D	37.6	659	1.75	791	2.10	1054	2.80	1114	2.96
		8	304-832-D	32.6	652	2.00	783	2.40	1043	3.20	1097	3.36
		9	304-836-D	29.0	654	2.25	785	2.70	1047	3.61	1116	3.84
		10	304-840-D	26.2	656	2.50	788	3.00	1050	4.00	1130	4.30
		12	304-848-D	21.6	650	3.00	780	3.60	1040	4.80	1115	5.15
		3	304-912-D	173.3	1297	0.75	1556	0.90	2074	1.20	2293	1.32
		3 1/2	304-914-D	141.3	1238	0.88	1485	1.05	1980	1.40	2170	1.54
		4	304-916-D	120.4	1208	1.00	1450	1.20	1933	1.61	2128	1.77
		4 1/2	304-918-D	104.8	1187	1.13	1424	1.36	1899	1.81	2097	2.00
		5	304-920-D	92.8	1161	1.25	1393	1.50	1857	2.00	2033	2.19
2 1/2	1 1/2	6	304-924-D	75.6	1131	1.50	1357	1.80	1809	2.39	1976	2.61
		7	304-928-D	63.4	1111	1.75	1333	2.10	1778	2.80	1940	3.06
		8	304-932-D	55.3	1105	2.00	1326	2.40	1768	3.20	1947	3.52
		9	304-936-D	49.0	1106	2.25	1327	2.70	1769	3.61	1970	4.02
		10	304-940-D	44.2	1105	2.50	1326	3.00	1769	4.00	1986	4.49
		12	304-948-D	36.6	1099	3.00	1319	3.60	1759	4.80	1990	5.43



INCH (in) 1

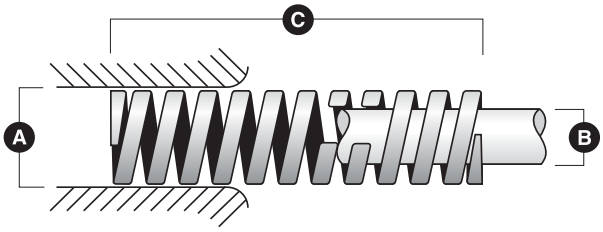
Raymond® HEAVY DUTY ISO D-LINE SPRINGS (INCH DIMENSIONS) RED

Hole Dia. (in) A	Rod Dia. (in) B	Free Length (in) C	CATALOG NUMBER	Spring Rate per 1/10 Inch Deflection	LOAD DEFLECTION TABLE							
					Load @ 20% of free length		Load @ 25% of free length		Load @ 30% of free length		Load @ Max Recommended Deflection	Max Deflection (in)
					Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)		
3/8	3/16	1	305-104-D	13.3	26	0.20	33	0.25	39	0.30	50	0.37
		1 1/4	305-105-D	10.2	26	0.25	32	0.31	39	0.38	50	0.48
		1 1/2	305-106-D	9.5	28	0.30	35	0.37	43	0.45	63	0.66
		1 3/4	305-107-D	8.3	29	0.35	36	0.43	43	0.52	65	0.78
		2	305-108-D	6.8	27	0.40	34	0.50	41	0.60	60	0.87
		2 1/2	305-110-D	5.6	28	0.50	35	0.63	43	0.76	65	1.16
		3	305-112-D	4.5	27	0.60	34	0.75	40	0.90	59	1.30
		12	305-148-D	1.1	26	2.40	33	3.00	40	3.60	58	5.30
1/2	9/32	1	305-204-D	24.2	48	0.20	60	0.25	71	0.30	107	0.44
		1 1/4	305-205-D	18.2	46	0.25	57	0.31	69	0.38	102	0.56
		1 1/2	305-206-D	15.4	46	0.30	58	0.37	69	0.45	107	0.69
		1 3/4	305-207-D	13.6	47	0.35	59	0.43	71	0.52	112	0.83
		2	305-208-D	11.4	46	0.40	57	0.50	69	0.60	108	0.94
		2 1/2	305-210-D	8.7	44	0.50	55	0.63	66	0.76	100	1.15
		3	305-212-D	7.7	46	0.60	57	0.75	69	0.90	112	1.46
		3 1/2	305-214-D	6.3	44	0.70	55	0.88	66	1.05	104	1.65
		4 1/2	305-216-D	4.8	43	0.90	54	1.13	65	1.35	82	1.72
		12	305-248-D	1.8	43	2.40	54	3.00	65	3.60	103	5.72
5/8	11/32	1	305-304-D	44.5	88	0.20	110	0.25	131	0.30	167	0.37
		1 1/4	305-305-D	34.8	88	0.25	110	0.31	132	0.38	177	0.51
		1 1/2	305-306-D	29.0	87	0.30	108	0.37	130	0.45	177	0.61
		1 3/4	305-307-D	26.0	90	0.35	113	0.43	135	0.52	196	0.76
		2	305-308-D	21.1	85	0.40	106	0.50	127	0.60	175	0.83
		2 1/2	305-310-D	16.8	85	0.50	106	0.63	127	0.76	179	1.07
		3	305-312-D	14.7	88	0.60	110	0.75	132	0.90	197	1.34
		3 1/2	305-314-D	12.5	87	0.70	109	0.88	131	1.05	197	1.58
		4	305-316-D	10.8	87	0.80	108	1.00	130	1.20	196	1.81
		4 1/2	305-318-D	9.0	81	0.90	101	1.13	121	1.35	155	1.73
		12	305-348-D	3.5	84	2.40	105	3.00	127	3.60	191	5.43
3/4	3/8	1	305-404-D	125.1	246	0.20	308	0.25	370	0.30	389	0.31
		1 1/4	305-405-D	97.8	247	0.25	308	0.31	370	0.38	424	0.43
		1 1/2	305-406-D	78.0	233	0.30	292	0.37	350	0.45	387	0.50
		1 3/4	305-407-D	66.4	230	0.35	288	0.43	345	0.52	384	0.58
		2	305-408-D	55.2	222	0.40	277	0.50	332	0.60	356	0.65
		2 1/2	305-410-D	42.4	214	0.50	267	0.63	320	0.76	334	0.79
		3	305-412-D	35.9	215	0.60	268	0.75	322	0.90	347	0.97
		3 1/2	305-414-D	30.7	215	0.70	269	0.88	323	1.05	358	1.17
		4	305-416-D	26.6	213	0.80	267	1.00	320	1.20	354	1.33
		4 1/2	305-418-D	23.9	217	0.91	271	1.13	325	1.36	373	1.56
		5	305-420-D	21.3	213	1.00	266	1.25	320	1.50	359	1.69
		5 1/2	305-422-D	19.3	212	1.09	265	1.37	318	1.64	350	1.81
		6	305-424-D	17.6	211	1.20	264	1.50	317	1.80	354	2.01
		12	305-448-D	8.7	208	2.40	261	3.00	313	3.60	353	4.06
1	1/2	1	305-504-D	212.1	417	0.20	522	0.25	626	0.30	635	0.30
		1 1/4	305-505-D	160.3	404	0.25	505	0.31	606	0.38	650	0.41
		1 1/2	305-506-D	125.3	375	0.30	469	0.37	562	0.45	562	0.45
		1 3/4	305-507-D	114.9	398	0.35	498	0.43	597	0.52	697	0.61
		2	305-508-D	93.1	374	0.40	468	0.50	561	0.60	612	0.66
		2 1/2	305-510-D	72.6	366	0.50	457	0.63	548	0.76	603	0.83
		3	305-512-D	61.3	367	0.60	458	0.75	550	0.90	627	1.02
		3 1/2	305-514-D	51.4	360	0.70	451	0.88	541	1.05	612	1.19

Raymond® HEAVY DUTY ISO D-LINE SPRINGS (INCH DIMENSIONS) RED

Hole Dia. (in)	Rod Dia. (in)	Free Length (in)	CATALOG NUMBER	Spring Rate per 1/10 Inch Deflection	LOAD DEFLECTION TABLE							
					Load @ 20% of free length		Load @ 25% of free length		Load @ 30% of free length		Load @ Max Recommended Deflection	Max Deflection (in)
A	B	C			Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)		
		4	305-516-D	44.7	359	0.80	449	1.00	539	1.20	618	1.38
		4 1/2	305-518-D	40.3	365	0.91	456	1.13	548	1.36	654	1.62
		5	305-520-D	36.1	361	1.00	451	1.25	541	1.50	639	1.77
1	1/2	5 1/2	305-522-D	32.8	359	1.09	449	1.37	539	1.64	637	1.94
		6	305-524-D	30.3	363	1.20	453	1.50	544	1.80	658	2.17
		7	305-528-D	25.8	362	1.40	452	1.75	543	2.10	662	2.56
		8	305-532-D	22.5	360	1.60	450	2.00	540	2.40	658	2.92
		12	305-548-D	15.3	367	2.40	459	3.00	550	3.60	705	4.61
		1 1/2	305-606-D	221.1	662	0.30	827	0.37	992	0.45	1097	0.50
		1 3/4	305-607-D	178.7	619	0.35	774	0.43	929	0.52	978	0.55
		2	305-608-D	152.7	613	0.40	767	0.50	920	0.60	1004	0.66
		2 1/2	305-610-D	116.7	588	0.50	735	0.63	882	0.76	955	0.82
		3	305-612-D	98.0	587	0.60	733	0.75	880	0.90	980	1.00
		3 1/2	305-614-D	80.8	566	0.70	708	0.88	849	1.05	922	1.14
		4	305-616-D	70.6	567	0.80	709	1.00	850	1.20	948	1.34
1 1/4	5/8	4 1/2	305-618-D	62.7	568	0.91	710	1.13	851	1.36	967	1.54
		5	305-620-D	56.4	564	1.00	705	1.25	846	1.50	963	1.71
		5 1/2	305-622-D	50.9	557	1.09	696	1.37	836	1.64	942	1.85
		6	305-624-D	46.7	559	1.20	698	1.50	838	1.80	957	2.05
		7	305-628-D	39.5	554	1.40	693	1.75	831	2.10	949	2.40
		8	305-632-D	34.6	554	1.60	692	2.00	831	2.40	959	2.77
		10	305-640-D	27.6	553	2.00	691	2.50	829	3.00	968	3.50
		12	305-648-D	22.9	551	2.40	689	3.00	827	3.60	970	4.23
		2	305-708-D	212.2	852	0.40	1065	0.50	1278	0.60	1404	0.66
		2 1/2	305-710-D	171.3	863	0.50	1079	0.63	1295	0.76	1565	0.91
		3	305-712-D	133.4	798	0.60	998	0.75	1197	0.90	1334	1.00
		3 1/2	305-714-D	112.5	788	0.70	986	0.88	1183	1.05	1342	1.19
		4	305-716-D	97.3	781	0.80	977	1.00	1172	1.20	1344	1.38
		4 1/2	305-718-D	88.9	805	0.91	1007	1.13	1208	1.36	1485	1.67
1 1/2	3/4	5	305-720-D	78.5	785	1.00	981	1.25	1177	1.50	1409	1.80
		5 1/2	305-722-D	70.5	771	1.09	964	1.37	1157	1.64	1362	1.93
		6	305-724-D	65.3	782	1.20	977	1.50	1172	1.80	1427	2.19
		7	305-728-D	55.2	774	1.40	968	1.75	1162	2.10	1416	2.56
		8	305-732-D	48.4	773	1.60	967	2.00	1160	2.40	1429	2.95
		10	305-740-D	38.6	772	2.00	965	2.50	1158	3.00	1445	3.74
		12	305-748-D	32.1	771	2.40	963	3.00	1156	3.60	1456	4.54
		2 1/2	305-810-D	242.3	1221	0.50	1526	0.63	1831	0.76	2203	0.91
		3	305-812-D	191.3	1145	0.60	1431	0.75	1718	0.90	1981	1.04
		3 1/2	305-814-D	158.1	1108	0.70	1385	0.88	1662	1.05	1892	1.20
		4	305-816-D	139.8	1123	0.80	1404	1.00	1685	1.20	2020	1.44
		4 1/2	305-818-D	122.5	1110	0.91	1387	1.13	1665	1.36	2007	1.64
2	1	5	305-820-D	108.0	1080	1.00	1350	1.25	1620	1.50	1901	1.76
		5 1/2	305-822-D	96.5	1056	1.09	1321	1.37	1585	1.64	1816	1.88
		6	305-824-D	88.0	1053	1.20	1316	1.50	1579	1.80	1825	2.07
		7	305-828-D	74.7	1047	1.40	1309	1.75	1571	2.10	1835	2.46
		8	305-832-D	65.7	1050	1.60	1313	2.00	1575	2.40	1878	2.86
		10	305-840-D	51.7	1034	2.00	1292	2.50	1551	3.00	1838	3.56
		12	305-848-D	43.1	1035	2.40	1294	3.00	1553	3.60	1871	4.34
		3	305-912-D	352.9	2112	0.60	2640	0.75	-	-	3176	0.90
		3 1/2	305-914-D	294.1	2061	0.70	2576	0.88	-	-	3088	1.05
		4	305-916-D	250.1	2009	0.80	2511	1.00	-	-	3001	1.20
		4 1/2	305-918-D	211.3	1896	0.90	2371	1.12	-	-	2852	1.35
		5	305-920-D	190.1	1901	1.00	2377	1.25	-	-	2852	1.50
2 1/2	1 1/2	6	305-924-D	153.6	1838	1.20	2298	1.50	-	-	2765	1.80
		7	305-928-D	129.0	1809	1.40	2261	1.75	-	-	2710	2.10
		8	305-932-D	113.1	1807	1.60	2259	2.00	-	-	2713	2.40
		9	305-936-D	82.0	1476	1.80	1845	2.25	-	-	2214	2.70
		10	305-940-D	88.5	1770	2.00	2213	2.50	-	-	2655	3.00
		12	305-948-D	73.1	1755	2.40	2194	3.00	-	-	2633	3.60

Extra Heavy Duty | INCH DIMENSIONS



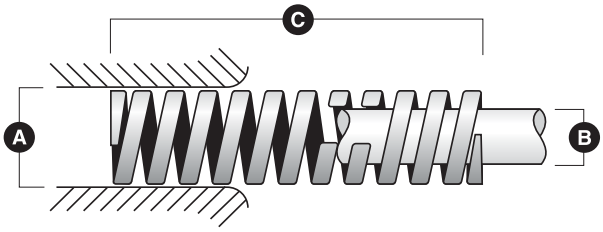
INCH (in) 1

Raymond®	EXTRA HEAVY DUTY ISO D-LINE SPRINGS (INCH DIMENSIONS)										YELLOW
Hole Dia. (in)	Rod Dia. (in)	Free Length (in)	CATALOG NUMBER	Spring Rate per 1/10 Inch Deflection	LOAD DEFLECTION TABLE							
					Load @ 17% of free length		Load @ 20% of free length		Load @ 25% of free length		Load @ Max Recommended Deflection	Max Deflection (in)
A	B	C			Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)		
3/8	3/16	1	306-104-D	20.8	35	0.17	41	0.20	51	0.25	61	0.29
		1 1/4	306-105-D	15.7	34	0.21	40	0.25	49	0.31	57	0.37
		1 1/2	306-106-D	13.3	34	0.25	40	0.30	50	0.37	60	0.45
		1 3/4	306-107-D	11.2	33	0.29	39	0.35	49	0.43	57	0.51
		2	306-108-D	9.6	33	0.34	39	0.40	48	0.50	57	0.59
		2 1/2	306-110-D	7.6	33	0.43	38	0.50	48	0.63	57	0.76
		3	306-112-D	6.4	32	0.51	38	0.60	48	0.75	58	0.91
		12	306-148-D	1.6	32	2.04	37	2.40	47	3.00	58	3.71
1/2	9/32	1	306-204-D	31.2	52	0.17	61	0.20	77	0.25	109	0.35
		1 1/4	306-205-D	24.2	52	0.21	61	0.25	76	0.31	121	0.50
		1 1/2	306-206-D	19.7	50	0.25	59	0.30	74	0.37	108	0.55
		1 3/4	306-207-D	15.9	47	0.29	55	0.35	69	0.43	103	0.65
		2	306-208-D	14.4	49	0.34	58	0.40	72	0.50	107	0.74
		2 1/2	306-210-D	11.4	49	0.43	57	0.50	72	0.63	107	0.94
		3	306-212-D	9.5	48	0.51	57	0.60	71	0.75	106	1.12
		3 1/2	306-214-D	8.0	48	0.60	56	0.70	70	0.88	104	1.30
		4	306-216-D	7.3	49	0.68	58	0.80	73	1.00	103	1.42
		12	306-248-D	2.2	45	2.04	53	2.40	66	3.00	93	4.24
5/8	11/32	1	306-304-D	77.8	130	0.17	153	0.20	191	0.25	242	0.31
		1 1/4	306-305-D	56.6	121	0.21	143	0.25	178	0.31	216	0.38
		1 1/2	306-306-D	47.3	120	0.25	141	0.30	177	0.37	221	0.47
		1 3/4	306-307-D	40.4	119	0.29	140	0.35	175	0.43	221	0.55
		2	306-308-D	34.6	118	0.34	139	0.40	174	0.50	223	0.65
		2 1/2	306-310-D	27.4	118	0.43	138	0.50	173	0.63	229	0.83
		3	306-312-D	22.8	116	0.51	136	0.60	170	0.75	224	0.98
		3 1/2	306-314-D	19.5	116	0.60	137	0.70	171	0.88	232	1.19
		4	306-316-D	16.8	115	0.68	135	0.80	169	1.00	226	1.34
		4 1/2	306-318-D	15.1	115	0.77	136	0.90	170	1.13	264	1.75
		12	306-348-D	5.6	114	2.04	134	2.40	168	3.00	234	4.19
3/4	3/8	1	306-404-D	186.4	302	0.17	356	0.20	445	0.25	448	0.24
		1 1/4	306-405-D	139.8	290	0.21	341	0.25	427	0.31	451	0.32
		1 1/2	306-406-D	113.7	280	0.25	330	0.30	412	0.37	434	0.38
		1 3/4	306-407-D	97.2	270	0.29	318	0.35	398	0.43	444	0.46
		2	306-408-D	83.9	270	0.34	318	0.40	397	0.50	466	0.56
		2 1/2	306-410-D	65.5	265	0.43	311	0.50	389	0.63	461	0.70
		3	306-412-D	53.7	258	0.51	303	0.60	379	0.75	440	0.82
		3 1/2	306-414-D	44.8	252	0.60	296	0.70	370	0.88	416	0.93
		4	306-416-D	38.9	251	0.68	295	0.80	369	1.00	420	1.08
		4 1/2	306-418-D	34.4	250	0.77	294	0.91	368	1.13	409	1.19
		5	306-420-D	30.9	248	0.85	291	1.00	364	1.25	413	1.34
		5 1/2	306-422-D	27.7	243	0.93	286	1.09	357	1.37	401	1.45
		6	306-424-D	25.4	243	1.02	286	1.20	358	1.50	395	1.56
		12	306-448-D	12.6	242	2.04	284	2.40	355	3.00	408	3.25
1	1/2	1	306-504-D	262.1	446	0.17	524	0.20	655	0.25	753	0.29
		1 1/4	306-505-D	198.8	426	0.21	501	0.25	626	0.31	767	0.39
		1 1/2	306-506-D	158.3	403	0.25	474	0.30	592	0.37	704	0.44
		1 3/4	306-507-D	134.9	397	0.29	467	0.35	584	0.43	717	0.53
		2	306-508-D	112.4	384	0.34	451	0.40	564	0.50	677	0.60
		2 1/2	306-510-D	88.6	380	0.43	447	0.50	558	0.63	698	0.79
		3	306-512-D	73.9	376	0.51	442	0.60	552	0.75	701	0.95
		3 1/2	306-514-D	62.0	370	0.60	435	0.70	543	0.88	686	1.11

Associated Spring RAYMOND
A business of BARNES GROUP INC

Raymond® EXTRA HEAVY DUTY ISO D-LINE SPRINGS (INCH DIMENSIONS) YELLOW

Hole Dia. (in)	Rod Dia. (in)	Free Length (in)	CATALOG NUMBER	Spring Rate per 1/10 Inch Deflection	LOAD DEFLECTION TABLE							
					Load @ 17% of free length		Load @ 20% of free length		Load @ 25% of free length		Load @ Max Recommended Deflection	Max Deflection (in)
A	B	C			Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)		
1	1/2	4	306-516-D	54.4	372	0.68	437	0.80	546	1.00	711	1.31
		4 1/2	306-518-D	48.5	373	0.77	439	0.91	549	1.13	731	1.51
		5	306-520-D	43.6	370	0.85	436	1.00	545	1.25	724	1.66
		5 1/2	306-522-D	39.6	368	0.93	433	1.09	541	1.37	718	1.81
		6	306-524-D	36.2	369	1.02	434	1.20	542	1.50	728	2.01
		7	306-528-D	31.1	371	1.19	437	1.40	546	1.75	752	2.41
		8	306-532-D	27.2	370	1.36	435	1.60	544	2.00	751	2.76
		12	306-548-D	18.0	367	2.04	432	2.40	540	3.00	754	4.19
1 1/4	5/8	1 1/2	306-606-D	273.1	695	0.25	817	0.30	1022	0.37	1118	0.41
		1 3/4	306-607-D	239.8	706	0.29	831	0.35	1039	0.43	1199	0.50
		2	306-608-D	200.7	685	0.34	806	0.40	1007	0.50	1177	0.59
		2 1/2	306-610-D	156.1	669	0.43	787	0.50	983	0.63	1186	0.76
		3	306-612-D	129.4	658	0.51	774	0.60	968	0.75	1192	0.92
		3 1/2	306-614-D	110.5	658	0.60	774	0.70	968	0.88	1240	1.12
		4	306-616-D	92.8	633	0.68	745	0.80	931	1.00	1136	1.22
		4 1/2	306-618-D	82.6	636	0.77	748	0.91	935	1.13	1178	1.43
		5	306-620-D	75.6	643	0.85	756	1.00	946	1.25	1233	1.63
		5 1/2	306-622-D	67.8	631	0.93	742	1.09	928	1.37	1183	1.74
		6	306-624-D	62.2	633	1.02	745	1.20	931	1.50	1210	1.94
		7	306-628-D	52.4	625	1.19	735	1.40	919	1.75	1185	2.26
		8	306-632-D	45.9	624	1.36	735	1.60	918	2.00	1198	2.61
		10	306-640-D	36.7	624	1.70	734	2.00	917	2.50	1218	3.32
		12	306-648-D	30.5	622	2.04	732	2.40	915	3.00	1224	4.02
1 1/2	3/4	2	306-708-D	336.1	1147	0.34	1350	0.40	1687	0.50	1932	0.57
		2 1/2	306-710-D	258.6	1108	0.43	1303	0.50	1629	0.63	1863	0.72
		3	306-712-D	213.4	1086	0.51	1277	0.60	1597	0.75	1865	0.87
		3 1/2	306-714-D	179.3	1068	0.60	1256	0.70	1570	0.88	1863	1.04
		4	306-716-D	156.3	1067	0.68	1256	0.80	1570	1.00	1927	1.23
		4 1/2	306-718-D	138.6	1067	0.77	1255	0.91	1569	1.13	1976	1.43
		5	306-720-D	124.5	1058	0.85	1245	1.00	1556	1.25	1966	1.58
		5 1/2	306-722-D	112.0	1042	0.93	1226	1.09	1533	1.37	1910	1.70
		6	306-724-D	102.6	1044	1.02	1228	1.20	1536	1.50	1948	1.90
		7	306-728-D	86.7	1033	1.19	1216	1.40	1520	1.75	1933	2.23
		8	306-732-D	75.7	1029	1.36	1211	1.60	1514	2.00	1939	2.56
		10	306-740-D	60.3	1025	1.70	1206	2.00	1507	2.50	1961	3.25
		12	306-748-D	50.2	1024	2.04	1205	2.40	1506	3.00	1985	3.96
2	1	2 1/2	306-810-D	383.4	1642	0.43	1932	0.50	2415	0.63	3245	0.85
		3	306-812-D	306.7	1560	0.51	1835	0.60	2294	0.75	3019	0.98
		3 1/2	306-814-D	257.6	1535	0.60	1806	0.70	2257	0.88	3023	1.17
		4	306-816-D	222.1	1516	0.68	1784	0.80	2230	1.00	3034	1.37
		4 1/2	306-818-D	195.2	1502	0.77	1767	0.91	2209	1.13	3043	1.56
		5	306-820-D	174.1	1480	0.85	1741	1.00	2176	1.25	2974	1.71
		5 1/2	306-822-D	157.1	1462	0.93	1719	1.09	2149	1.37	2926	1.86
		6	306-824-D	143.1	1456	1.02	1713	1.20	2141	1.50	2936	2.05
		7	306-828-D	119.3	1421	1.19	1672	1.40	2090	1.75	2808	2.35
		8	306-832-D	105.6	1435	1.36	1688	1.60	2110	2.00	2935	2.78
		10	306-840-D	83.6	1422	1.70	1673	2.00	2091	2.50	2931	3.50
		12	306-848-D	68.5	1399	2.04	1646	2.40	2057	3.00	2843	4.15
2 1/2	1 1/2	3	306-912-D	544	2765	0.51	3253	0.60	-	-	3681	0.68
		3 1/2	306-914-D	468	2786	0.60	3277	0.70	-	-	3881	0.83
		4	306-916-D	400	2729	0.68	3210	0.80	-	-	3791	0.95
		4 1/2	306-918-D	354	2701	0.76	3178	0.90	-	-	3801	1.07
		5	306-920-D	323	2742	0.85	3226	1.00	-	-	4181	1.30
		6	306-924-D	262	2660	1.02	3130	1.20	-	-	3845	1.47
		7	306-928-D	219	2612	1.19	3073	1.40	-	-	3627	1.65
		8	306-932-D	192	2614	1.36	3076	1.60	-	-	3686	1.92
		10	306-940-D	150	2553	1.70	3003	2.00	-	-	3501	2.33
		12	306-948-D	124	2541	2.04	2989	2.40	-	-	3493	2.81



INCH (in) 1

Raymond® ULTRA STRONG DUTY ISO D-LINE SPRINGS (INCH DIMENSIONS) GRAY

Hole Dia. (in) A	Rod Dia. (in) B	Free Length (in) C	CATALOG NUMBER	Spring Rate per 1/10 Inch Deflection	LOAD DEFLECTION TABLE							
					Load @ 10% of free length		Load @ 13.5% of free length		Load @ 15% of free length		Load @ Max Recommended Deflection	Max Deflection (in)
					Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)	Load (lbs)	Deflection (in)		
1	1/2	2 1/2	307-510-D	367.7	927	0.25	1251	0.34	1390	0.38	188	0.51
		3	307-512-D	317.5	950	0.30	1282	0.40	1425	0.45	200	0.63
		3 1/2	307-514-D	263.8	924	0.35	1248	0.47	1387	0.53	208	0.79
		4	307-516-D	222.7	894	0.40	1207	0.54	1341	0.60	202	0.91
		4 1/2	307-518-D	205.6	931	0.45	1256	0.61	1396	0.68	210	1.02
		5	307-520-D	186.1	931	0.50	1256	0.68	1396	0.75	205	1.10
		6	307-524-D	145.6	871	0.60	1176	0.81	1307	0.90	195	1.34
		7	307-528-D	131.3	920	0.70	1242	0.95	1381	1.05	202	1.54
		8	307-532-D	115.3	922	0.80	1244	1.08	1383	1.20	204	1.77
		12	307-548-D	77.7	932	1.20	1259	1.62	1399	1.80	193	2.48
1 1/4	5/8	2 1/2	307-610-D	615.0	1550	0.25	2092	0.34	2324	0.38	315	0.51
		3	307-612-D	499.1	1493	0.30	2016	0.40	2240	0.45	314	0.63
		3 1/2	307-614-D	411.7	1443	0.35	1947	0.47	2164	0.53	324	0.79
		4	307-616-D	354.0	1422	0.40	1919	0.54	2132	0.60	321	0.91
		4 1/2	307-618-D	319.8	1448	0.45	1954	0.61	2172	0.68	327	1.02
		5	307-620-D	283.2	1416	0.50	1912	0.68	2124	0.75	312	1.10
		6	307-624-D	233.0	1394	0.60	1882	0.81	2091	0.90	312	1.34
		7	307-628-D	201.6	1413	0.70	1907	0.95	2119	1.05	309	1.54
		8	307-632-D	173.6	1387	0.80	1873	1.08	2081	1.20	308	1.77
		10	307-640-D	138.8	1388	1.00	1873	1.35	2081	1.50	339	2.44
		12	307-648-D	111.9	1344	1.20	1814	1.62	2016	1.80	330	2.95
1 1/2	3/4	3 1/2	307-714-D	502.5	1761	0.35	2377	0.47	2641	0.53	396	0.79
		4	307-716-D	435.1	1747	0.40	2359	0.54	2621	0.60	394	0.91
		4 1/2	307-718-D	387.7	1755	0.45	2370	0.61	2633	0.68	397	1.02
		5	307-720-D	355.2	1776	0.50	2397	0.68	2664	0.75	392	1.10
		6	307-724-D	290.6	1739	0.60	2348	0.81	2609	0.90	412	1.42
		7	307-728-D	245.0	1717	0.70	2317	0.95	2575	1.05	415	1.69
		8	307-732-D	213.6	1707	0.80	2304	1.08	2560	1.20	412	1.93
		10	307-740-D	169.0	1690	1.00	2282	1.35	2535	1.50	413	2.44
		12	307-748-D	140.5	1687	1.20	2277	1.62	2530	1.80	415	2.95
2	1	3 1/2	307-814-D	805.1	2821	0.35	3808	0.47	4232	0.53	602	0.75
		4	307-816-D	693.8	2786	0.40	3761	0.54	4179	0.60	601	0.87
		4 1/2	307-818-D	614.4	2782	0.45	3755	0.61	4173	0.68	605	0.98
		5	307-820-D	552.7	2764	0.50	3731	0.68	4145	0.75	609	1.10
		6	307-824-D	460.2	2754	0.60	3718	0.81	4131	0.90	616	1.34
		7	307-828-D	398.6	2793	0.70	3771	0.95	4190	1.05	628	1.57
		8	307-832-D	349.5	2793	0.80	3770	1.08	4189	1.20	619	1.77
		10	307-840-D	269.5	2695	1.00	3638	1.35	4043	1.50	615	2.28
		12	307-848-D	221.5	2660	1.20	3591	1.62	3990	1.80	611	2.76

Raymond® COMPRESSED – FREE LENGTH (INCH DIMENSIONS)

Free Length (in)	ULTRA LIGHT LOAD			LIGHT LOAD			MEDIUM LOAD		
	30% DEFLECTION	40% DEFLECTION	50% DEFLECTION	25% DEFLECTION	30% DEFLECTION	40% DEFLECTION	25% DEFLECTION	30% DEFLECTION	40% DEFLECTION
1	0.30	0.40	0.50	0.25	0.30	0.40	0.25	0.30	0.40
1 1/4	0.38	0.50	0.63	0.31	0.38	0.50	0.31	0.38	0.50
1 1/2	0.45	0.60	0.75	0.38	0.45	0.60	0.38	0.45	0.60
1 3/4	0.53	0.70	0.88	0.44	0.53	0.70	0.44	0.53	0.70
2	0.60	0.80	1.00	0.50	0.60	0.80	0.50	0.60	0.80
2 1/2	0.75	1.00	1.25	0.63	0.75	1.00	0.63	0.75	1.00
3	0.90	1.20	1.50	0.75	0.90	1.20	0.75	0.90	1.20
3 1/2	1.05	1.40	1.75	0.88	1.05	1.40	0.88	1.05	1.40
4	1.20	1.60	2.00	1.00	1.20	1.60	1.00	1.20	1.60
4 1/2	1.35	1.80	2.25	1.13	1.35	1.80	1.13	1.35	1.80
5	1.50	2.00	2.50	1.25	1.50	2.00	1.25	1.50	2.00
5 1/2	1.65	2.20	2.75	1.38	1.65	2.20	1.38	1.65	2.20
6	1.80	2.40	3.00	1.50	1.80	2.40	1.50	1.80	2.40
7	2.10	2.80	3.50	1.75	2.10	2.80	1.75	2.10	2.80
8	2.40	3.20	4.00	2.00	2.40	3.20	2.00	2.40	3.20
9	2.70	3.60	4.50	2.25	2.70	3.60	2.25	2.70	3.60
10	3.00	4.00	5.00	2.50	3.00	4.00	2.50	3.00	4.00
12	3.60	4.80	6.00	3.00	3.60	4.80	3.00	3.60	4.80

Raymond® COMPRESSED – FREE LENGTH (INCH DIMENSIONS)

Free Length (in)	HEAVY LOAD			EXTRA HEAVY LOAD			ULTRA STRONG LOAD		
	20% DEFLECTION	25% DEFLECTION	30% DEFLECTION	17% DEFLECTION	20% DEFLECTION	25% DEFLECTION	10% DEFLECTION	13.5% DEFLECTION	15% DEFLECTION
1	0.20	0.25	0.30	0.17	0.20	0.25	0.10	0.14	0.15
1 1/4	0.25	0.31	0.38	0.21	0.25	0.31	0.13	0.17	0.19
1 1/2	0.30	0.38	0.45	0.26	0.30	0.38	0.15	0.20	0.23
1 3/4	0.35	0.44	0.53	0.30	0.35	0.44	0.18	0.24	0.26
2	0.40	0.50	0.60	0.34	0.40	0.50	0.20	0.27	0.30
2 1/2	0.50	0.63	0.75	0.43	0.50	0.63	0.25	0.34	0.38
3	0.60	0.75	0.90	0.51	0.60	0.75	0.30	0.41	0.45
3 1/2	0.70	0.88	1.05	0.60	0.70	0.88	0.35	0.47	0.53
4	0.80	1.00	1.20	0.68	0.80	1.00	0.40	0.54	0.60
4 1/2	0.90	1.13	1.35	0.77	0.90	1.13	0.45	0.61	0.68
5	1.00	1.25	1.50	0.85	1.00	1.25	0.50	0.68	0.75
5 1/2	1.10	1.38	1.65	0.94	1.10	1.38	0.55	0.74	0.83
6	1.20	1.50	1.80	1.02	1.20	1.50	0.60	0.81	0.90
7	1.40	1.75	2.10	1.19	1.40	1.75	0.70	0.95	1.05
8	1.60	2.00	2.40	1.36	1.60	2.00	0.80	1.08	1.20
9	1.80	2.25	2.70	1.53	1.80	2.25	0.90	1.22	1.35
10	2.00	2.50	3.00	1.70	2.00	2.50	1.00	1.35	1.50
12	2.40	3.00	3.60	2.04	2.40	3.00	1.20	1.62	1.80

Problems and Answers

Problems & Answers
Most problems that arise in the use of die springs usually result from improper application... failure to take advantage of and protect the features engineered into the spring.

Spring Failure
Raymond die springs are produced under such careful controls that manufacturing problems have virtually been eliminated. Die spring failure is usually due to either poor spring design and manufacture or incorrect application of the spring. The most common problem source is the use of die springs too close to, or beyond, the springs' physical limitations. The solution, of course, lies with careful selection of die springs for each application.

Other solutions to common spring problems are as follows:

Spring Guidance
Raymond die springs are manufactured with ends ground and squared so that they stand on their own base and compress evenly under load. There is a positive relationship between the spring's outside diameter and total length which determines whether or not a spring will buckle under load.

Generally, if the free length is more than four times the mean diameter of the spring, it could have a buckling problem under compression. This is solved by providing guidance by a pocket, a rod, or both to reduce buckling. It is always recommended to provide guidance for any die spring.

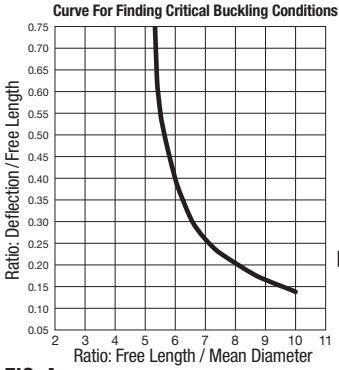


FIG. A

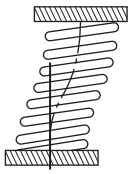


FIG. A

Fig. A (below left) provides information as to whether a specific spring with squared, ground ends is subject to buckling. The curve indicates that buckling may occur to a squared-and-ground spring, both ends of which are compressed against parallel plates, if the values fall above and to the right of the curve.

Holes and Rods
Holes or pockets provided in the die for springs must be the specified size listed on pages 6 to 28. Springs increase in diameter as they are compressed. If the hole is undersized, a wearing or binding action will produce early spring failure.

Holes also must have flat bottoms with square corners. This will allow the spring to work on a flat surface and provide uniform stress on the coils when the spring is compressed.

Working a spring over a rod also provides good protection against buckling. Care should be taken to be sure the rod is smooth. If the rod is shorter than the spring, it should have a tapered nose so that there is no danger of the spring coils coming in contact with a sharp edge.

Alignment
Care should be taken to make certain that whatever device is used to contain or guide the spring is properly aligned on both sides of the die. Holes or rods that do not match can cause problems that create spring failure and damage to the tool.

Temperature
Heat is a frequently ignored factor in spring failure or load loss. The maximum rated service temperature for our chromium alloy steel is 230°C. **Fig. B (below)** shows the percentage of load-loss due to heat and stress combinations. Thought should be given to the heat generated by the working die which can be significant in many applications. Heat absorbed by the tool can be transferred to the springs resulting in a loss of load and premature spring failure.

Deflection
Deflection beyond the manufacturer's recommendation can cause early spring failure. Check the press or die travel to be sure of the actual deflection to which the spring will be subjected. If it is beyond a safe limit, changes should be made without delay.

Spring Alteration
Each Raymond die spring is carefully engineered to perform within specific areas of work. Altering the spring such as reducing its length or number of coils, grinding the inside or outside diameter, or placing restrictions on the movement of the coils can cause early spring failure. Trying to alter a spring by grinding down its ends can change the temper of the material and negatively affect spring performance.

Altering springs from their manufactured state almost invariably leads to problems and failure. Don't gamble an expensive die for the small amount saved on a cheap alteration.

Corrosion
Frequently, spring failure can be traced to corrosive elements. Reduction of material or pitting of the spring will reduce its useful life. Be alert to conditions that may effect the spring's surface such as rust, lubricants, soaps, chemicals, etc. Clean, protected springs give the best job performance.

Load Loss vs. Temperature

INITIAL STRESS P.S.I./bar	CARBON STEEL			CHROMIUM ALLOY		
	Approximate Percent Loss of Load Degrees F/C°			Approximate Percent Loss of Load Degrees F/C°		
	250/121°	350/177°	400/204°	250/121°	350/177°	450/232°
40,000/2,760	2.0	3.5	4.5	1.0	2.0	5.0
50,000/3,450	2.0	4.0	5.0	1.0	2.0	5.0
60,000/4,400	2.5	4.5	5.5	1.0	2.0	5.5
70,000/4,830	3.0	5.5	6.5	1.0	2.5	6.0
80,000/5,515	3.0	6.0	8.0	1.5	2.5	6.0
90,000/6,205	4.0	8.0	9.0	1.5	3.0	7.0
100,000/6,895	4.5	9.5	10.5	2.0	4.0	8.0
110,000/7,585	7.0	11.5	14.0	2.0	5.0	10.0
120,000/8,275	9.5	13.0	17.5	3.5	8.0	13.0

FIG. B

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Proper Die Spring Application

The most common die spring problems are generally the most basic – the result of improper selection and application. But trying to save a few pennies on die springs or a few minutes on selection can result in enormous expenses in terms of premature spring failure, increased maintenance costs and lost productivity. That's why making sure you have the best die spring for every application is truly a wise investment.

DO make spring selection a part of the early design function, and work within the spring's physical limits. It's best to determine w hich springs and how many are needed for the job before the die is built.

DO preload each spring into the assembled tool to prevent the possibility of shock loading, which causes a stress surge in the vibration frequency and may result in early spring failure.

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

DO provide proper guidance on all springs to reduce the chance of buckling. As a general rule, if the free length is more than four times the mean diameter of the spring, it could have a buckling problem under compression. This is solved by using a guide rod, boring a pocket, or both.

DO deepen spring pockets proportionately when the die is sharpened to maintain the same spring travel and load level. Each spring pocket needs to have a flat bottom and square corners, so the spring will provide uniform stress on each coil as it is compressed.

DO perform preventative maintenance on a regularly scheduled basis. Keep records on the number of cycles each die performs, and replace all the die springs at predetermined intervals.

DON'T replace only one spring, or mix springs of assorted lengths and deflection ranges on a die. Instead of using an unbalanced, mixed assembly of old and new springs, replace all of the springs to distribute the load evenly.

DON'T alter a die spring by cutting off coils or grinding the inside or outside diameter. Altering a die spring causes early failure and creates the potential for damaging the die.

DON'T expect maximum performance life from a spring that is producing at maximum load. Although die springs are designed to produce maximum load, they are highly stressed when maximum loads are met.

DON'T wait – make spring selection a part of the early design function, and work within the spring's physical limits. It's best to determine which springs and how many are needed for the job before the die is built.

DO call – our knowledgeable customer service and engineering professionals are always available to assist you with everything from custom sizes and special materials to technical questions and unusual applications.

Partners for Success

Make Us Your Partner for Success

A world wide leader in the design and manufacture of springs, Associated Spring Raymond supplies thousands of products to industry, including our standard English dimension die springs, service parts and special order services. Our broad product lines and vast, off-the-shelf inventories assures we have the right products to meet all of your essential application requirements. We can also apply our design and manufacturing capabilities to meet your needs for custom springs and critical metal parts, supplying you with unique solutions for your products.

So think of us as your partner and call us toll-free at 800-458-0867. We are ready to help with technical assistance, inquiries, order placement and your success.

Other Products

- Standard English Dimension Raymond Die Springs
- JIS Standard Die Springs
- Service Parts
  - Compression Springs
  - Extension Springs
  - Compression and Extension Spring Assortment Kits
  - Miscellaneous Springs
- Special Order Springs
- Nitrogen Gas Springs
- SPD Gas Springs and Hardware
  - Gas Struts and Dampers
  - Drawer Slides
  - Hinges
  - Handles
  - Latches and Catches
  - Weather Stripping
  - Engineered Hardware
- SPEC® Springs and Spring Washers
  - Compression, Extension and Torsion Springs
  - Belleville and Disc Washers
  - Wave Washers, Finger Washers, Curved Washers
  - Clover® Domes
  - And many more...

Metric Conversion Factors

	To Convert	To	Multiply By
Dimensions	in	mm	25.4
	mm	in	0.039
Force	lb	kg	0.454
	lb	N	4.448
	kg	lb	2.205
	N	kg	0.102
	kg	N	9.807
Rate	lb/in	kg/mm	0.018
	lb/in	N/mm	0.175
	kg/mm	lb/in	56.0
	N/mm	lb/in	5.71

Special Springs

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City:	
State:	
Attn:	
Phone:	Fax:
Email:	

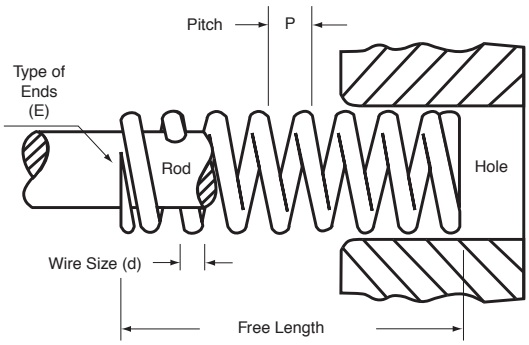
In Office Use Only
Date Received:
Date Quoted:
Quoted By:

Compression

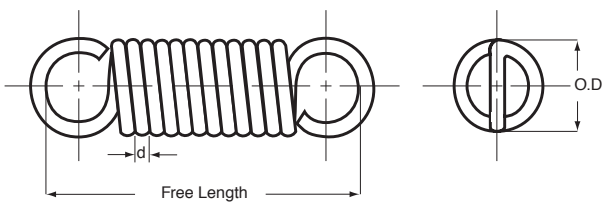
Quantity Required
Wire Size
Type of Wire
Outside Diameter
Inside Diameter
Free Length
Hole Size
Rod Size
No. of Coils
Pitch
Rate
Solid Height
Direction of Coils
Type of Ends
Test Loads
Print Available?
Finish
Comments

Extension

Quantity Required
Wire Size
Type of Wire
Outside Diameter
Inside Diameter
Free Length
Initial Tension
No. of Coils
Pitch
Rate
Maximum Extension
Direction of Coils
Type of Loops
Test Loads
Print Available?
Finish
Comments



CALL OUR SPECIAL ORDER DEPARTMENT FOR DESIGN ASSISTANCE AND QUOTES: 1-800-228-1156



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Notes

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Our International Locations. Associated Spring Raymond products are distributed throughout the world. To locate our local distributor, see the listing below

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Fax: 419-891-9192
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Website: www.asraymond.com

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13055-760 Campinas - SP
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Fax: 019 725 1084
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Website: www.cecho.cz

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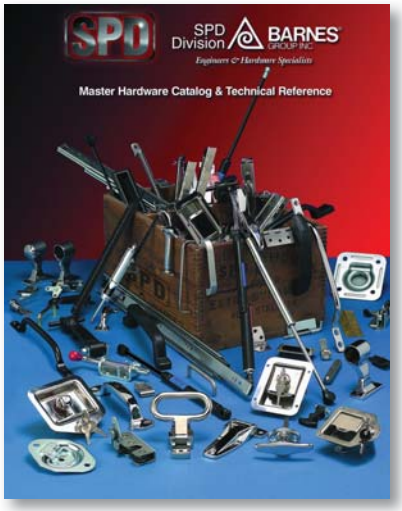

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