

Muelles

MUELLES SPRINGS

**Los muelles que presenta
AZOL-GAS cumplen normas
internacionales de dimensiones
y requerimientos.**

**Los muelles están fabricados
por Associated Spring, y los
servicios de diseño, estudio de
prototipos, pruebas de muestras,
análisis de fallos, solución de
problemas, asistencia técnica y
capacidad de producción están
disponibles por medio de un
único proveedor.**

***AZOL-GAS presented springs,
pass the requirements and
dimensions of international
norms.***

***The springs are made by
Associated Spring, and design
service, prototype work, sample
testing, failure analysis, problem
solving, technical assistance and
production capability are all
available through a single door.***



Muelles de troquel norma ISO

ISO Die Springs



AZOL-GAS SA

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Los muelles de troquel de Associated Spring se fabrican a partir de un hilo metálico de sección transversal desarrollado para garantizar un equilibrio óptimo entre la capacidad de carga y su duración máxima.

Nuestro proceso de producción se realiza mediante cuidadosos controles y con un equipo especial desarrollado por el equipo de investigación del Grupo Barnes.

Todas las etapas de la fabricación se efectúan bajo un estricto control de calidad, inspección y exámenes del producto para así garantizar una larga vida útil de cada uno de los muelles de troquel.

Detalles técnicos facilitados sobre demanda.

Muelles fabricados de acuerdo con la norma ISO 10243.

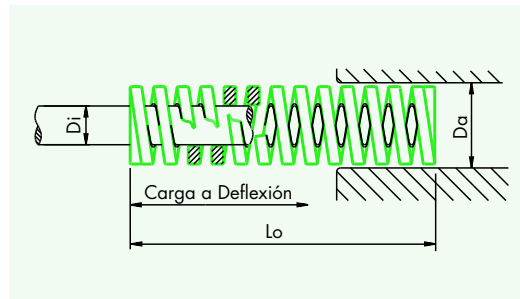
Associated Spring Die springs are manufactured using a wire cross section developed to provide the optimum balance between load carrying characteristics and cycle life.

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

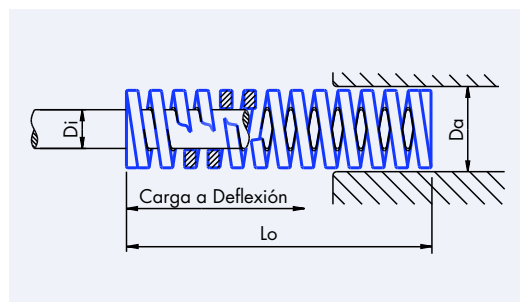
All of the manufacturing steps are closely monitored by rigid quality controls, inspection and testing to ensure that the long service life engineered into every die spring is constant.

Full technical specifications available on request from Azol-Gas, S.A.

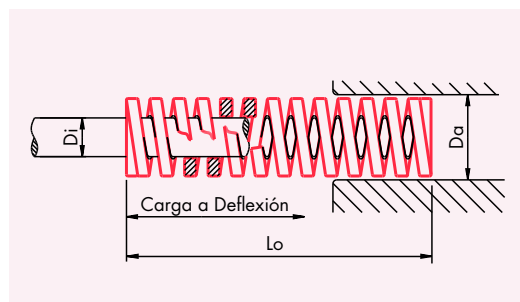
Springs manufactured in accordance with ISO 10243.



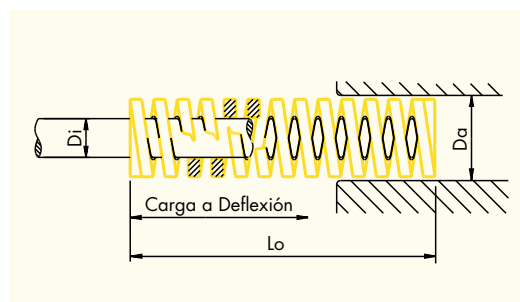
Verde · Carga Ligera
Green · Light Duty



Azul · Carga Media
Blue · Medium Duty



Rojo · Carga Fuerte
Red · Heavy Duty



Amarillo · Carga Extra Fuerte
Yellow · Extra Heavy Duty



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Características y Ventajas Features & Benefits

SOBRESALIENTES MATERIALES Y SECCION DE VARILLA

CARACTERISTICAS

- Todos los muelles están fabricados en acero de aleación de cromo de alta fuerza tensora.
- Sección de varilla de comportamiento óptimo.
- Extremos de muelles aplanados.
- Disponibilidad de otros materiales para condiciones y ambientes especiales.

VENTAJAS

- Resistencia inherente para soportar cargas pesadas.
- Sobresaliente comportamiento en aplicaciones de gran esfuerzo.
- Resistencia a temperaturas de hasta 230°C.
- Disponibilidad inmediata.
- Metalurgia cuidadosamente controlada.
- Máxima posibilidad de diseño.
- La sección de varilla proporciona una deflexión óptima frente a fallo debido a incremento brusco de la carga.
- Extremos planos para facilitar una superficie de soporte de carga máxima y segura.
- Materiales especiales disponibles para cubrir necesidades de los clientes.

ROBUSTEZ DIMENSIONAL

CARACTERISTICAS

- Las características dimensionales permanecen constantes e iguales de un lote de muelles a otro.

VENTAJAS

- Asegura un comportamiento uniforme del muelle.
- Consolida ratios de medida consistentes.
- Mayor exactitud de carga a una longitud de muelle determinada.
- Garantiza que Da pueda trabajar libre en el orificio y Di sobre el vástago especificado.
- Cumplimiento de los más exigentes niveles de producción y calidad.
- Muelles íntegros y fiables.

MAYOR DURACION

CARACTERISTICAS

- Diseñado para aguantar con toda seguridad cargas bruscas.
- Concebido para resistir continuas deflexiones en alta cadencias.
- Granallado para prolongar la vida útil del muelle.
- Menor período de paralización del trabajo.

VENTAJAS

- Funcionamiento fiable y seguro.
- Aumento de la vida útil del muelle en un 30%.
- Reducción de fallo o rotura del muelle.
- Comportamiento uniforme durante una mayor duración del muelle.
- Mayor rentabilidad.
- Márgenes adicionales de funcionamiento.

DEFLEXION SUPERIOR

CARACTERISTICAS

- Mayor carrera disponible a bloque.
- Mayor carrera en cada muelle.

VENTAJAS

- Mejores capacidades de carga.
- Mejores prestaciones bajo condiciones límite.
- Máxima versatilidad de aplicaciones.
- Completa fiabilidad y seguridad.
- Menor longitud a bloque.

SUPERIOR MATERIALS & WIRE PROFILE

FEATURES

- All die springs are made from chromium alloys.
- Optimal wire cross section features a rectangular shape with rounded corners.
- Spring ends are ground square.
- Other raw materials are available for special conditions and environments.

BENEFITS

- 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 a reliable, flat, maximum load-bearing surface.
- Specialty materials available to meet customer requirements.

DIMENSIONAL CONSISTENCY

FEATURES

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

BENEFITS

- More uniform spring performance.
- More 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.
- Assurance of the highest production and quality standards.
- Reliable performance engineered.

LONGER SPRING LIFE

FEATURES

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

BENEFITS

- 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

FEATURES

- Mayor carrera disponible a bloque.
- More travel in each spring.

BENEFITS

- Higher load capacities.
- Increased fatigue life.
- Greater application flexibility.
- Better, more reliable performance.
- Lower solid height.

Seleccionar un muelle de troquel

Selecting Die Springs



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Una regla general que hay que tener en cuenta a la hora de elegir un muelle es la de utilizar siempre tantos muelles como vaya a albergar el troquel que producirá la carga requerida con la menor cantidad de deflexión. Esto aumentará la vida útil del muelle, reducirá las posibilidades de fallo del muelle y el tiempo perdido que resulta de esto, así como las pérdidas productivas y los costes elevados de mantenimiento.

El muelle de troquel supone un porcentaje muy pequeño del coste del troquel. Ahorrar algo de dinero en los muelles resulta una elección equivocada que puede traer a largo plazo importantes costes en tiempo perdido y mano de obra.

Cuanto más rápido trabaja un muelle, más atención hay que prestar a sus límites de fatiga. En ciclos lentos, es posible obtener buenos resultados con los muelles trabajando cerca de la deflexión máxima. A medida que aumenta la velocidad, la vida útil del muelle disminuye.

Se pueden seleccionar los muelles para desmoldadoras, prensas y otros componentes de troquel de las páginas siguientes. Cuando se selecciona un muelle de troquel hay que determinar el tipo de resultados requeridos de los muelles: recorrido corto, normal o largo. Para aplicaciones de recorridos cortos o normales, se deben utilizar las deflexiones señaladas en la columna de larga vida. Para aplicaciones de recorrido largo, se deben utilizar las de la columna de vida óptima. Las deflexiones recomendadas para cada muelle basadas en los resultados requeridos se encuentran en las páginas "MUELLES 4" a "MUELLES 11".

Otro punto que se debe tener en cuenta a la hora de seleccionar un muelle es el de considerar el número de ciclos que el troquel requiere que realice el muelle. Hay que seleccionar los muelles en función de la labor que vayan a desempeñar para que funcionen de acuerdo con la carrera requerida. Hay que calcular el número de muelles necesarios dividiendo la carga total suministrada por un muelle entre la carga total requerida. Redondear el número resultante de muelles hacia el mayor para obtener los resultados requeridos.

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 spring: short, normal or long run. For short or normal run applications use the deflections tabulated in the long life columns. For long run applications use deflections based on optimum life. The recommended deflections for each spring based on the performance required are shown on pages "MUELLES 4" to "MUELLES 11".

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.

TABLA DE CONVERSION / DEFLECTION TO COMPRESSED LENGTH CONVERSION TABLE

Longitud libre (mm) Free length	Carga Ligera Long. Comprimida (mm) Light Duty Compressed Length			Carga Media Long. Comprimida (mm) Medium Duty Compressed Length			Carga Pesada Long. Comprimida (mm) Heavy Duty Compressed Length			Carga Extra Pesada Long. Comprimida (mm) Extra Heavy Duty Compressed Length		
	Deflexión en % long. libre Deflection in % free length			Deflexión en % long. libre Deflection in % free length			Deflexión en % long. libre Deflection in % free length			Deflexión en % long. libre Deflection in % free length		
	25%	30%	35%	20%	25%	30%	15%	20%	25%	15%	17%	20%
25	18.8	17.5	16.3	20.0	18.8	17.5	21.3	20.0	18.8	21.3	20.8	20.0
32	24.0	22.4	20.8	25.6	24.0	22.4	27.2	25.6	24.0	27.2	26.6	25.6
38	28.5	26.6	24.7	30.4	28.5	26.6	32.3	30.4	28.5	32.3	31.5	30.4
44	33.0	30.8	28.6	35.2	33.0	30.8	37.4	35.2	33.0	37.4	36.5	35.2
51	38.3	35.7	33.2	40.8	38.3	35.7	43.4	40.8	38.3	43.4	42.3	40.8
64	48.0	44.8	41.6	51.2	48.0	44.8	54.4	51.2	48.0	54.4	53.1	51.2
76	57.0	53.2	49.4	60.8	57.0	53.2	64.6	60.8	57.0	64.6	63.1	60.8
89	66.8	62.3	57.9	71.2	66.8	62.3	75.7	71.2	66.8	75.7	73.9	71.2
102	76.5	71.4	66.3	81.6	76.5	71.4	86.7	81.6	76.5	86.7	84.7	81.6
115	86.3	80.5	74.8	92.0	86.3	80.5	97.8	92.0	86.3	97.8	95.5	92.0
127	95.3	88.9	82.6	101.6	95.3	88.9	108.0	101.6	95.3	108.0	105.4	101.6
139	104.3	97.3	90.4	111.2	104.3	97.3	118.2	111.2	104.3	118.2	115.4	111.2
152	114.0	106.4	98.8	121.6	114.0	106.4	129.2	121.6	114.0	129.2	126.2	121.6
178	133.5	124.6	115.7	142.4	133.5	124.6	151.3	142.4	133.5	151.3	147.7	142.4
203	152.3	142.1	132.0	162.4	152.3	142.1	172.6	162.4	152.3	172.6	168.5	162.4
254	190.5	177.8	165.1	203.2	190.5	177.8	215.9	203.2	190.5	215.9	210.8	203.2
305	228.8	213.5	198.3	244.0	228.8	213.5	259.3	244.0	228.8	259.3	253.2	244.0

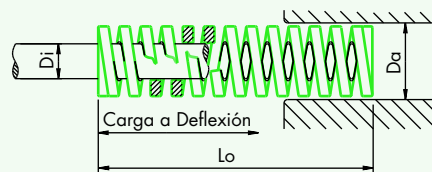


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Muelles para troquel Die springs

Carga Ligera - Verde Light Duty - Green



Do (mm)	Di (mm)	Lo (mm)	Referencia Reference	Carga a 1 mm deflexión (N) Load at 1 mm deflection	TABLA DE CARGA DE DEFLEXION / LOAD DEFLECTION TABLE							
					Para vida óptima (25% long. libre) For optimum life (25% of free length)		Para vida óptima (30% long. libre) For optimum life (30% of free length)		Para vida óptima (35% long. libre) For optimum life (35% of free length)		Deflexión máxima Maximum deflection	
					Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)
10	5	25	R203-104	10.0	62.5	6.3	75.0	7.5	87.5	8.8	103.0	10.3
		32	R203-105	8.5	68.0	8.0	81.6	9.6	95.2	11.2	111.4	13.1
		38	R203-106	6.8	64.6	9.5	77.5	11.4	90.4	13.3	106.1	15.6
		44	R203-107	6.0	66.0	11.0	79.2	13.2	92.4	15.4	108.0	18.0
		51	R203-108	5.0	63.8	12.8	76.5	15.3	89.3	17.9	104.5	20.9
		64	R203-110	4.3	68.8	16.0	82.6	19.2	96.3	22.4	111.8	26.0
		76	R203-112	3.2	60.8	19.0	73.0	22.8	85.1	26.6	99.8	31.2
12.5	6.3	305	R203-148	1.1	83.9	76.3	100.7	91.5	117.4	106.8	137.5	125.0
		25	R203-204	17.9	111.9	6.3	134.3	7.5	156.6	8.8	184.4	10.3
		32	R203-205	16.4	131.2	8.0	157.4	9.6	183.7	11.2	214.8	13.1
		38	R203-206	13.6	129.2	9.5	155.0	11.4	180.9	13.3	212.2	15.6
		44	R203-207	12.1	133.1	11.0	159.7	13.2	186.3	15.4	217.8	18.0
		51	R203-208	11.4	145.4	12.8	174.4	15.3	203.5	17.9	238.3	20.9
		64	R203-210	9.3	148.8	16.0	178.6	19.2	208.3	22.4	244.6	26.0
16	8	76	R203-212	7.1	134.9	19.0	161.9	22.8	188.9	26.6	221.5	31.2
		89	R203-214	5.4	120.2	22.3	144.2	26.7	168.2	31.2	197.1	36.5
		305	R203-248	1.4	106.8	76.3	128.1	91.5	149.5	106.8	175.0	125.0
		25	R203-304	23.4	146.3	6.3	175.5	7.5	204.8	8.8	241.0	10.3
		32	R203-305	22.9	183.2	8.0	219.8	9.6	256.5	11.2	300.0	13.1
		38	R203-306	19.3	183.4	9.5	220.0	11.4	256.7	13.3	301.1	15.6
		44	R203-307	17.1	188.1	11.0	225.7	13.2	263.3	15.4	307.8	18.0
20	10	51	R203-308	15.7	200.2	12.8	240.2	15.3	280.2	17.9	328.1	20.9
		64	R203-310	10.7	171.2	16.0	205.4	19.2	239.7	22.4	281.4	26.0
		76	R203-312	10.0	190.0	19.0	228.0	22.8	266.0	26.6	312.0	31.2
		89	R203-314	8.6	191.4	22.3	229.6	26.7	267.9	31.2	313.9	36.5
		102	R203-316	7.8	198.9	25.5	238.7	30.6	278.5	35.7	326.0	41.8
		305	R203-348	2.5	190.6	76.3	228.8	91.5	266.9	106.8	312.5	125.0
		25	R203-404	55.8	348.8	6.3	418.5	7.5	488.3	8.8	569.2	10.2
		32	R203-405	45.0	360.0	8.0	432.0	9.6	504.0	11.2	562.5	12.5
		38	R203-406	33.3	316.4	9.5	379.6	11.4	442.9	13.3	499.5	15.0
		44	R203-407	30.0	330.0	11.0	396.0	13.2	462.0	15.4	540.0	18.0
		51	R203-408	24.5	312.4	12.8	374.9	15.3	437.3	17.9	490.0	20.0
25	12.5	64	R203-410	20.0	320.0	16.0	384.0	19.2	448.0	22.4	500.0	25.0
		76	R203-412	16.0	304.0	19.0	364.8	22.8	425.6	26.6	480.0	30.0
		89	R203-414	14.0	311.5	22.3	373.8	26.7	436.1	31.2	490.0	35.0
		102	R203-416	12.0	306.0	25.5	367.2	30.6	428.4	35.7	492.0	41.0
		115	R203-418	10.9	313.4	28.8	376.1	34.5	438.7	40.3	501.4	46.0
		127	R203-420	9.5	301.6	31.8	362.0	38.1	422.3	44.5	484.5	51.0
		139	R203-422	8.4	291.9	34.8	350.3	41.7	408.7	48.7	470.4	56.0
		152	R203-424	7.5	285.0	38.0	342.0	45.6	399.0	53.2	457.5	61.0
		305	R203-448	4.0	305.0	76.3	366.0	91.5	427.0	106.8	488.0	122.0
		25	R203-504	100.0	625.0	6.3	750.0	7.5	875.0	8.8	1020.0	10.2
		32	R203-505	80.3	642.4	8.0	770.9	9.6	899.4	11.2	1003.8	12.5
38	R203-506	62.0	589.0	9.5	706.8	11.4	824.6	13.3	930.0	15.0		
44	R203-507	52.9	581.9	11.0	698.3	13.2	814.7	15.4	952.2	18.0		
51	R203-508	44.0	561.0	12.8	673.2	15.3	785.4	17.9	880.0	20.0		
64	R203-510	35.2	563.2	16.0	675.8	19.2	788.5	22.4	880.0	25.0		
76	R203-512	28.0	532.0	19.0	638.4	22.8	744.8	26.6	840.0	30.0		
89	R203-514	24.0	534.0	22.3	640.8	26.7	747.6	31.2	840.0	35.0		
102	R203-516	21.1	538.1	25.5	645.7	30.6	753.3	35.7	865.1	41.0		
115	R203-518	18.7	537.6	28.8	645.2	34.5	752.7	40.3	860.2	46.0		
127	R203-520	16.7	530.2	31.8	636.3	38.1	742.3	44.5	851.7	51.0		
139	R203-522	15.3	531.7	34.8	638.0	41.7	744.3	48.7	856.8	56.0		
152	R203-524	14.0	532.0	38.0	638.4	45.6	744.8	53.2	854.0	61.0		
178	R203-528	12.5	556.3	44.5	667.5	53.4	778.8	62.3	887.5	71.0		
203	R203-532	10.4	527.8	50.8	633.4	60.9	738.9	71.1	842.4	81.0		
305	R203-548	7.0	533.8	76.3	640.5	91.5	747.3	106.8	854.0	122.0		

Muelles para troquel

Die Springs

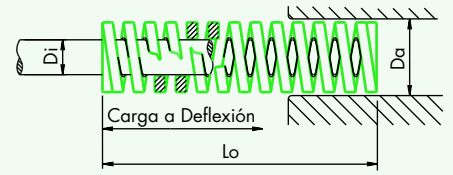


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Carga Ligera - Verde

Light Duty - Green



Do (mm)	Di (mm)	Lo (mm)	Referencia Reference	Carga a 1mm deflexión (N) Load at 1mm deflection	TABLA DE CARGA DE DEFLEXION / LOAD DEFLECTION TABLE									
					Para vida óptima (25% long. libre) For optimum life (25% of free length)		Para vida óptima (30% long. libre) For optimum life (30% of free length)		Para vida óptima (35% long. libre) For optimum life (35% of free length)		Deflexión máxima Maximum deflection			
					Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)		
32	16	38	R203-606	94.0	893.0	9.5	1071.6	11.4	1250.2	13.3	1410.0	15.6		
		44	R203-607	79.5	874.5	11.0	1049.4	13.2	1224.3	15.4	1431.0	18.0		
		51	R203-608	67.0	854.3	12.8	1025.1	15.3	1196.0	17.9	1340.0	20.0		
		64	R203-610	53.0	848.0	16.0	1017.6	19.2	1187.2	22.4	1325.0	25.0		
		76	R203-612	44.0	836.0	19.0	1003.2	22.8	1170.4	26.6	1320.0	30.0		
		89	R203-614	37.2	827.7	22.3	993.2	26.7	1158.8	31.2	1302.0	35.0		
		102	R203-616	32.0	816.0	25.5	979.2	30.6	1142.4	35.7	1312.0	41.0		
		115	R203-618	29.0	833.8	28.8	1000.5	34.5	1167.3	40.3	1334.0	46.0		
		127	R203-620	25.0	793.8	31.8	952.5	38.1	1111.3	44.5	1275.0	51.0		
		139	R203-622	23.0	799.3	34.8	959.1	41.7	1119.0	48.7	1288.0	56.0		
		152	R203-624	21.5	817.0	38.0	980.4	45.6	1143.8	53.2	1311.5	61.0		
		178	R203-628	18.2	809.9	44.5	971.9	53.4	1133.9	62.3	1292.2	71.0		
		203	R203-632	15.8	801.9	50.8	962.2	60.9	1122.6	71.1	1279.8	81.0		
		254	R203-640	12.5	793.8	63.5	952.5	76.2	1111.3	88.9	1275.0	102.0		
305	R203-648	10.3	785.4	76.3	942.5	91.5	1099.5	106.8	1256.6	122.0				
40	20	51	R203-708	92.0	1173.0	12.8	1407.6	15.3	1642.2	17.9	1840.0	20.0		
		64	R203-710	73.0	1168.0	16.0	1401.6	19.2	1635.2	22.4	1825.0	25.0		
		76	R203-712	63.0	1197.0	19.0	1436.4	22.8	1675.8	26.6	1890.0	30.0		
		89	R203-714	51.0	1134.8	22.3	1361.7	26.7	1588.7	31.2	1785.0	35.0		
		102	R203-716	43.0	1096.5	25.5	1315.8	30.6	1535.1	35.7	1763.0	41.0		
		115	R203-718	39.6	1138.5	28.8	1366.2	34.5	1593.9	40.3	1821.6	46.0		
		127	R203-720	37.0	1174.8	31.8	1409.7	38.1	1644.7	44.5	1887.0	51.0		
		139	R203-722	32.0	1112.0	34.8	1334.4	41.7	1556.8	48.7	1792.0	56.0		
		152	R203-724	28.0	1064.0	38.0	1276.8	45.6	1489.6	53.2	1708.0	61.0		
		178	R203-728	25.2	1121.4	44.5	1345.7	53.4	1570.0	62.3	1789.2	71.0		
		203	R203-732	22.7	1152.0	50.8	1382.4	60.9	1612.8	71.1	1838.7	81.0		
		254	R203-740	17.0	1079.5	63.5	1295.4	76.2	1511.3	88.9	1734.0	102.0		
		305	R203-748	14.8	1128.5	76.3	1354.2	91.5	1579.9	106.8	1805.6	122.0		
		50	25	64	R203-810	156.0	2496.0	16.0	2995.2	19.2	3494.4	22.4	3900.0	25.0
76	R203-812			125.0	2375.0	19.0	2850.0	22.8	3325.0	26.6	3750.0	30.0		
89	R203-814			109.0	2425.3	22.3	2910.3	26.7	3395.4	31.2	3815.0	35.0		
102	R203-816			94.0	2397.0	25.5	2876.4	30.6	3355.8	35.7	3854.0	41.0		
115	R203-818			81.0	2328.8	28.8	2794.5	34.5	3260.3	40.3	3726.0	46.0		
127	R203-820			71.0	2254.3	31.8	2705.1	38.1	3156.0	44.5	3621.0	51.0		
139	R203-822			66.5	2310.9	34.8	2773.1	41.7	3235.2	48.7	3724.0	56.0		
152	R203-824			60.0	2280.0	38.0	2736.0	45.6	3192.0	53.2	3660.0	61.0		
178	R203-828			52.0	2314.0	44.5	2776.8	53.4	3239.6	62.3	3692.0	71.0		
203	R203-832			44.0	2233.0	50.8	2679.6	60.9	3126.2	71.1	3564.0	81.0		
254	R203-840			35.0	2222.5	63.5	2667.0	76.2	3111.5	88.9	3570.0	102.0		
305	R203-848			28.5	2173.1	76.3	2607.8	91.5	3042.4	106.8	3477.0	122.0		
63	38			76	R203-912	189.0	3591.0	19.0	4309.2	22.8	5027.4	26.6	5670.0	30.0
				89	R203-914	158.0	3515.5	22.3	4218.6	26.7	4921.7	31.2	5530.0	35.0
		102	R203-916	131.0	3340.5	25.5	4008.6	30.6	4676.7	35.7	5371.0	41.0		
		115	R203-918	116.0	3335.0	28.8	4002.0	34.5	4669.0	40.3	5336.0	46.0		
		127	R203-920	103.0	3270.3	31.8	3924.3	38.1	4578.4	44.5	5253.0	51.0		
		152	R203-924	84.3	3203.4	38.0	3844.1	45.6	4484.8	53.2	5142.3	61.0		
		178	R203-928	71.5	3181.8	44.5	3818.1	53.4	4454.5	62.3	5076.5	71.0		
		203	R203-932	61.7	3131.3	50.8	3757.5	60.9	4383.8	71.1	4997.7	81.0		
		254	R203-940	47.0	2984.5	63.5	3581.4	76.2	4178.3	88.9	4794.0	102.0		
		305	R203-948	38.2	2912.8	76.3	3495.3	91.5	4077.9	106.8	4660.4	122.0		

MUELLES SPRINGS

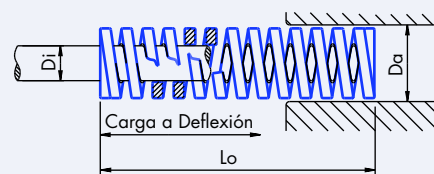


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Muelles para troquel Die springs

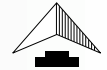
Carga Media - Azul Medium Duty - Blue



Do (mm)	Di (mm)	Lo (mm)	Referencia Reference	Carga a 1mm deflexión (N) Load at 1mm deflection	TABLA DE CARGA DE DEFLEXION / LOAD DEFLECTION TABLE							
					Para vida óptima (20% long. libre) For optimum life (20% of free length)		Para vida óptima (25% long. libre) For optimum life (25% of free length)		Para vida óptima (30% long. libre) For optimum life (30% of free length)		Deflexión máxima Maximum deflection	
					Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)
10	5	25	R204-104	16.0	80.0	5.0	100.0	6.3	120.0	7.5	152.0	9.5
		32	R204-105	13.0	83.2	6.4	104.0	8.0	124.8	9.6	158.6	12.2
		38	R204-106	11.9	90.4	7.6	113.1	9.5	135.7	11.4	171.4	14.4
		44	R204-107	10.3	90.6	8.8	113.3	11.0	136.0	13.2	172.0	16.7
		51	R204-108	8.9	90.8	10.2	113.5	12.8	136.2	15.3	172.7	19.4
		64	R204-110	7.5	96.0	12.8	120.0	16.0	144.0	19.2	182.3	24.3
		76	R204-112	5.3	80.6	15.2	100.7	19.0	120.8	22.8	153.2	28.9
12.5	6.3	305	R204-148	1.6	97.6	61.0	122.0	76.3	146.4	91.5	185.6	116.0
		25	R204-204	30.0	150.0	5.0	187.5	6.3	225.0	7.5	285.0	9.5
		32	R204-205	24.8	158.7	6.4	198.4	8.0	238.1	9.6	302.6	12.2
		38	R204-206	21.4	162.6	7.6	203.3	9.5	244.0	11.4	308.2	14.4
		44	R204-207	18.5	162.8	8.8	203.5	11.0	244.2	13.2	309.0	16.7
		51	R204-208	15.5	158.1	10.2	197.6	12.8	237.2	15.3	300.7	19.4
		64	R204-210	12.1	154.9	12.8	193.6	16.0	232.3	19.2	294.0	24.3
16	8	76	R204-212	10.2	155.0	15.2	193.8	19.0	232.6	22.8	294.8	28.9
		89	R204-214	8.4	149.5	17.8	186.9	22.3	224.3	26.7	283.9	33.8
		305	R204-248	2.1	128.1	61.0	160.1	76.3	192.2	91.5	243.6	116.0
		25	R204-304	49.4	247.0	5.0	308.8	6.3	370.5	7.5	469.3	9.5
		32	R204-305	37.1	237.4	6.4	296.8	8.0	356.2	9.6	452.6	12.2
		38	R204-306	33.9	257.6	7.6	322.1	9.5	386.5	11.4	488.2	14.4
		44	R204-307	30.0	264.0	8.8	330.0	11.0	396.0	13.2	501.0	16.7
20	10	51	R204-308	26.4	269.3	10.2	336.6	12.8	403.9	15.3	512.2	19.4
		64	R204-310	20.5	262.4	12.8	328.0	16.0	393.6	19.2	498.2	24.3
		76	R204-312	17.8	270.6	15.2	338.2	19.0	405.8	22.8	514.4	28.9
		89	R204-314	15.2	270.6	17.8	338.2	22.3	405.8	26.7	513.8	33.8
		102	R204-316	13.5	275.4	20.4	344.3	25.5	413.1	30.6	523.8	38.8
		305	R204-348	4.8	292.8	61.0	366.0	76.3	439.2	91.5	556.8	116.0
		25	12.5	25	R204-404	98.0	490.0	5.0	612.5	6.3	735.0	7.5
32	R204-405			72.6	464.6	6.4	580.8	8.0	697.0	9.6	871.2	12.0
38	R204-406			56.0	425.6	7.6	532.0	9.5	638.4	11.4	784.0	14.0
44	R204-407			47.5	418.0	8.8	522.5	11.0	627.0	13.2	783.8	16.5
51	R204-408			41.7	425.3	10.2	531.7	12.8	638.0	15.3	792.3	19.0
64	R204-410			32.3	413.4	12.8	516.8	16.0	620.2	19.2	775.2	24.0
76	R204-412			25.1	381.5	15.2	476.9	19.0	572.3	22.8	702.8	28.0
25	12.5	89	R204-414	22.0	391.6	17.8	489.5	22.3	587.4	26.7	726.0	33.0
		102	R204-416	19.8	403.9	20.4	504.9	25.5	605.9	30.6	752.4	38.0
		115	R204-418	18.1	416.3	23.0	520.4	28.8	624.5	34.5	778.3	43.0
		127	R204-420	16.6	421.6	25.4	527.1	31.8	632.5	38.1	796.8	48.0
		139	R204-422	15.1	419.8	27.8	524.7	34.8	629.7	41.7	785.2	52.0
		152	R204-424	13.2	401.3	30.4	501.6	38.0	601.9	45.6	752.4	57.0
		305	R204-448	6.1	372.1	61.0	465.1	76.3	558.2	91.5	695.4	114.0
25	12.5	25	R204-504	147.0	735.0	5.0	918.8	6.3	1102.5	7.5	1381.8	9.4
		32	R204-505	118.0	755.2	6.4	944.0	8.0	1132.8	9.6	1416.0	12.0
		38	R204-506	93.0	706.8	7.6	883.5	9.5	1060.2	11.4	1302.0	14.0
		44	R204-507	80.8	711.0	8.8	888.8	11.0	1066.6	13.2	1333.2	16.5
		51	R204-508	68.6	699.7	10.2	874.7	12.8	1049.6	15.3	1303.4	19.0
		64	R204-510	53.0	678.4	12.8	848.0	16.0	1017.6	19.2	1272.0	24.0
		76	R204-512	43.2	656.6	15.2	820.8	19.0	985.0	22.8	1209.6	28.0
25	12.5	89	R204-514	38.2	680.0	17.8	850.0	22.3	1019.9	26.7	1260.6	33.0
		102	R204-516	33.0	673.2	20.4	841.5	25.5	1009.8	30.6	1254.0	38.0
		115	R204-518	28.0	644.0	23.0	805.0	28.8	966.0	34.5	1204.0	43.0
		127	R204-520	25.9	657.9	25.4	822.3	31.8	986.8	38.1	1243.2	48.0
		139	R204-522	23.2	645.0	27.8	806.2	34.8	967.4	41.7	1206.4	52.0
		152	R204-524	20.8	632.3	30.4	790.4	38.0	948.5	45.6	1185.6	57.0
		178	R204-528	17.8	633.7	35.6	792.1	44.5	950.5	53.4	1192.6	67.0
25	12.5	203	R204-532	15.8	641.5	40.6	801.9	50.8	962.2	60.9	1200.8	76.0
		305	R204-548	10.2	622.2	61.0	777.8	76.3	933.3	91.5	1162.8	114.0

Muelles para troquel

Die Springs

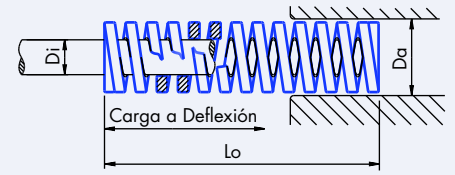


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Carga Media - Azul

Medium Duty - Blue



Do (mm)	Di (mm)	Lo (mm)	Referencia Reference	Carga a 1mm deflexión (N) Load at 1mm deflection	TABLA DE CARGA DE DEFLEXION / LOAD DEFLECTION TABLE									
					Para vida óptima (20% long. libre) For optimum life (20% of free length)		Para vida óptima (25% long. libre) For optimum life (25% of free length)		Para vida óptima (30% long. libre) For optimum life (30% of free length)		Deflexión máxima Maximum deflection			
					Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)		
32	16	38	R204-606	185.0	1406.0	7.6	1757.5	9.5	2109.0	11.4	2590.0	14.0		
		44	R204-607	158.0	1390.4	8.8	1738.0	11.0	2085.6	13.2	2607.0	16.5		
		51	R204-608	134.0	1366.8	10.2	1708.5	12.8	2050.0	15.3	2546.0	19.0		
		64	R204-610	99.0	1267.2	12.8	1584.0	16.0	1900.8	19.2	2376.0	24.0		
		76	R204-612	80.5	1223.6	15.2	1529.5	19.0	1835.4	22.8	2254.0	28.0		
		89	R204-614	69.1	1230.0	17.8	1537.5	22.3	1845.0	26.7	2280.3	33.0		
		102	R204-616	58.8	1199.5	20.4	1499.4	25.5	1799.3	30.6	2234.4	38.0		
		115	R204-618	51.5	1184.5	23.0	1480.6	28.8	1776.8	34.5	2214.5	43.0		
		127	R204-620	44.8	1137.9	25.4	1422.4	31.8	1706.9	38.1	2150.4	48.0		
		139	R204-622	42.3	1175.9	27.8	1469.9	34.8	1763.9	41.7	2199.6	52.0		
		152	R204-624	37.8	1149.1	30.4	1436.4	38.0	1723.7	45.6	2154.6	57.0		
		178	R204-628	32.5	1157.0	35.6	1446.3	44.5	1735.5	53.4	2177.5	67.0		
		203	R204-632	28.9	1173.3	40.6	1466.7	50.8	1760.0	60.9	2196.4	76.0		
		254	R204-640	21.4	1087.1	50.8	1358.9	63.5	1630.7	76.2	2033.0	95.0		
		305	R204-648	18.3	1116.3	61.0	1395.4	76.3	1674.5	91.5	2086.2	114.0		
40	20	51	R204-708	181.6	1852.3	10.2	2315.4	12.8	2778.5	15.3	3450.4	19.0		
		64	R204-710	140.0	1792.0	12.8	2240.0	16.0	2688.0	19.2	3360.0	24.0		
		76	R204-712	108.0	1641.6	15.2	2052.0	19.0	2462.4	22.8	3024.0	28.0		
		89	R204-714	90.7	1614.5	17.8	2018.1	22.3	2421.7	26.7	2993.1	33.0		
		102	R204-716	81.0	1652.4	20.4	2065.5	25.5	2478.6	30.6	3078.0	38.0		
		115	R204-718	71.8	1651.4	23.0	2064.3	28.8	2477.1	34.5	3087.4	43.0		
		127	R204-720	62.7	1592.6	25.4	1990.7	31.8	2388.9	38.1	3009.6	48.0		
		139	R204-722	57.5	1598.5	27.8	1998.1	34.8	2397.8	41.7	2990.0	52.0		
		152	R204-724	51.6	1568.6	30.4	1960.8	38.0	2353.0	45.6	2941.2	57.0		
		178	R204-728	44.1	1570.0	35.6	1962.5	44.5	2354.9	53.4	2954.7	67.0		
		203	R204-732	36.7	1490.0	40.6	1862.5	50.8	2235.0	60.9	2789.2	76.0		
		254	R204-740	30.1	1529.1	50.8	1911.4	63.5	2293.6	76.2	2859.5	95.0		
		305	R204-748	24.6	1500.6	61.0	1875.8	76.3	2250.9	91.5	2804.4	114.0		
		50	25	64	R204-810	209.0	2675.2	12.8	3344.0	16.0	4012.8	19.2	5016.0	24.0
				76	R204-812	168.0	2553.6	15.2	3192.0	19.0	3830.4	22.8	4704.0	28.0
89	R204-814			140.0	2492.0	17.8	3115.0	22.3	3738.0	26.7	4620.0	33.0		
102	R204-816			119.0	2427.6	20.4	3034.5	25.5	3641.4	30.6	4522.0	38.0		
115	R204-818			106.0	2438.0	23.0	3047.5	28.8	3657.0	34.5	4558.0	43.0		
127	R204-820			97.0	2463.8	25.4	3079.8	31.8	3695.7	38.1	4656.0	48.0		
139	R204-822			87.0	2418.6	27.8	3023.3	34.8	3627.9	41.7	4524.0	52.0		
152	R204-824			80.0	2432.0	30.4	3040.0	38.0	3648.0	45.6	4560.0	57.0		
178	R204-828			69.5	2474.2	35.6	3092.8	44.5	3711.3	53.4	4656.5	67.0		
203	R204-832			59.8	2427.9	40.6	3034.9	50.8	3641.8	60.9	4544.8	76.0		
229	R204-836			50.9	2331.2	45.8	2914.0	57.3	3496.8	68.7	4377.4	86.0		
254	R204-840			43.9	2230.1	50.8	2787.7	63.5	3345.2	76.2	4170.5	95.0		
305	R204-848			38.6	2354.6	61.0	2943.3	76.3	3531.9	91.5	4400.4	114.0		
63	38			76	R204-912	312.0	4742.4	15.2	5928.0	19.0	7113.6	22.8	8736.0	28.0
				89	R204-914	260.0	4628.0	17.8	5785.0	22.3	6942.0	26.7	8580.0	33.0
		102	R204-916	221.0	4508.4	20.4	5635.5	25.5	6762.6	30.6	8398.0	38.0		
		115	R204-918	187.0	4301.0	23.0	5376.3	28.8	6451.5	34.5	8041.0	43.0		
		127	R204-920	168.0	4267.2	25.4	5334.0	31.8	6400.8	38.1	8064.0	48.0		
		152	R204-924	136.0	4134.4	30.4	5168.0	38.0	6201.6	45.6	7752.0	57.0		
		178	R204-928	114.0	4058.4	35.6	5073.0	44.5	6087.6	53.4	7638.0	67.0		
		203	R204-932	100.0	4060.0	40.6	5075.0	50.8	6090.0	60.9	7600.0	76.0		
		229	R204-936	89.2	4085.4	45.8	5106.7	57.3	6128.0	68.7	7671.2	86.0		
		254	R204-940	78.4	3982.7	50.8	4978.4	63.5	5974.1	76.2	7448.0	95.0		
		305	R204-948	64.7	3946.7	61.0	4933.4	76.3	5920.1	91.5	7375.8	114.0		

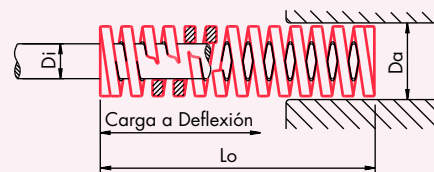


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Muelles para troquel Die springs

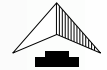
Carga Fuerte - Rojo Heavy Duty - Red



Do (mm)	Di (mm)	Lo (mm)	Referencia Reference	Carga a 1 mm deflexión (N) Load at 1 mm deflection	TABLA DE CARGA DE DEFLEXION / LOAD DEFLECTION TABLE							
					Para vida óptima (15% long. libre) For optimum life (15% of free length)		Para vida óptima (20% long. libre) For optimum life (20% of free length)		Para vida óptima (25% long. libre) For optimum life (25% of free length)		Deflexión máxima Maximum deflection	
					Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)
10	5	25	R205-104	22.1	82.9	3.8	110.5	5.0	138.1	6.3	165.8	7.5
		32	R205-105	17.5	84.0	4.8	112.0	6.4	140.0	8.0	168.0	9.6
		38	R205-106	17.1	97.5	5.7	130.0	7.6	162.5	9.5	194.9	11.4
		44	R205-107	15.0	99.0	6.6	132.0	8.8	165.0	11.0	198.0	13.2
		51	R205-108	12.8	97.9	7.7	130.6	10.2	163.2	12.8	195.8	15.3
		64	R205-110	10.7	102.7	9.6	137.0	12.8	171.2	16.0	205.4	19.2
		76	R205-112	7.5	85.5	11.4	114.0	15.2	142.5	19.0	171.0	22.8
12.5	6.3	305	R205-148	2.1	96.1	45.8	128.1	61.0	160.1	76.3	192.2	91.5
		25	R205-204	42.1	157.9	3.8	210.5	5.0	263.1	6.3	315.8	7.5
		32	R205-205	33.2	159.4	4.8	212.5	6.4	265.6	8.0	318.7	9.6
		38	R205-206	29.3	167.0	5.7	222.7	7.6	278.4	9.5	334.0	11.4
		44	R205-207	24.6	162.4	6.6	216.5	8.8	270.6	11.0	324.7	13.2
		51	R205-208	19.6	149.9	7.7	199.9	10.2	249.9	12.8	299.9	15.3
		64	R205-210	15.0	144.0	9.6	192.0	12.8	240.0	16.0	288.0	19.2
		76	R205-212	13.2	150.5	11.4	200.6	15.2	250.8	19.0	301.0	22.8
		89	R205-214	11.4	152.2	13.4	202.9	17.8	253.7	22.3	304.4	26.7
		305	R205-248	2.8	128.1	45.8	170.8	61.0	213.5	76.3	256.2	91.5
16	8	25	R205-304	75.7	283.9	3.8	378.5	5.0	473.1	6.3	567.8	7.5
		32	R205-305	52.8	253.4	4.8	337.9	6.4	422.4	8.0	506.9	9.6
		38	R205-306	48.5	276.5	5.7	368.6	7.6	460.8	9.5	552.9	11.4
		44	R205-307	42.8	282.5	6.6	376.6	8.8	470.8	11.0	565.0	13.2
		51	R205-308	37.1	283.8	7.7	378.4	10.2	473.0	12.8	567.6	15.3
		64	R205-310	30.3	290.9	9.6	387.8	12.8	484.8	16.0	581.8	19.2
		76	R205-312	25.7	293.0	11.4	390.6	15.2	488.3	19.0	586.0	22.8
		89	R205-314	21.7	289.7	13.4	386.3	17.8	482.8	22.3	579.4	26.7
		102	R205-316	19.3	295.3	15.3	393.7	20.4	492.2	25.5	590.6	30.6
		305	R205-348	7.1	324.8	45.8	433.1	61.0	541.4	76.3	649.7	91.5
20	10	25	R205-404	216.0	810.0	3.8	1080.0	5.0	1350.0	6.3	1620.0	7.5
		32	R205-405	168.0	806.4	4.8	1075.2	6.4	1344.0	8.0	1612.8	9.6
		38	R205-406	129.0	735.3	5.7	980.4	7.6	1225.5	9.5	1419.0	11.4
		44	R205-407	112.0	739.2	6.6	985.6	8.8	1232.0	11.0	1456.0	13.2
		51	R205-408	94.0	719.1	7.7	958.8	10.2	1198.5	12.8	1410.0	15.3
		64	R205-410	72.1	692.2	9.6	922.9	12.8	1153.6	16.0	1369.9	19.2
		76	R205-412	59.7	680.6	11.4	907.4	15.2	1134.3	19.0	1373.1	23.0
		89	R205-414	50.5	674.2	13.4	898.9	17.8	1123.6	22.3	1363.5	27.0
		102	R205-416	44.2	676.3	15.3	901.7	20.4	1127.1	25.5	1370.2	31.0
		115	R205-418	38.4	662.4	17.3	883.2	23.0	1104.0	28.8	1344.0	35.0
		127	R205-420	34.1	649.6	19.1	866.1	25.4	1082.7	31.8	1295.8	38.0
		139	R205-422	31.0	646.4	20.9	861.8	27.8	1077.3	34.8	1302.0	42.0
		152	R205-424	28.2	643.0	22.8	857.3	30.4	1071.6	38.0	1297.2	46.0
		305	R205-448	15.0	686.3	45.8	915.0	61.0	1143.8	76.3	1365.0	91.0
25	12.5	25	R205-504	375.0	1406.3	3.8	1875.0	5.0	2343.8	6.3	2812.5	7.5
		32	R205-505	297.0	1425.6	4.8	1900.8	6.4	2376.0	8.0	2851.2	9.6
		38	R205-506	219.0	1248.3	5.7	1664.4	7.6	2080.5	9.5	2409.0	11.4
		44	R205-507	187.0	1234.2	6.6	1645.6	8.8	2057.0	11.0	2431.0	13.2
		51	R205-508	156.0	1193.4	7.7	1591.2	10.2	1989.0	12.8	2340.0	15.3
		64	R205-510	123.0	1180.8	9.6	1574.4	12.8	1968.0	16.0	2337.0	19.0
		76	R205-512	99.0	1128.6	11.4	1504.8	15.2	1881.0	19.0	2277.0	23.0
		89	R205-514	84.0	1121.4	13.4	1495.2	17.8	1869.0	22.3	2268.0	27.0
		102	R205-516	73.0	1116.9	15.3	1489.2	20.4	1861.5	25.5	2263.0	31.0
		115	R205-518	65.0	1121.3	17.3	1495.0	23.0	1868.8	28.8	2275.0	35.0
		127	R205-520	57.7	1099.2	19.1	1465.6	25.4	1832.0	31.8	2192.6	38.0
		139	R205-522	52.7	1098.8	20.9	1465.1	27.8	1831.3	34.8	2213.4	42.0
		152	R205-524	47.8	1089.8	22.8	1453.1	30.4	1816.4	38.0	2198.8	46.0
		178	R205-528	41.0	1094.7	26.7	1459.6	35.6	1824.5	44.5	2173.0	53.0
		203	R205-532	35.8	1090.1	30.5	1453.5	40.6	1816.9	50.8	2183.8	61.0
		305	R205-548	22.9	1047.7	45.8	1396.9	61.0	1746.1	76.3	2083.9	91.0

Muelles para troquel

Die Springs

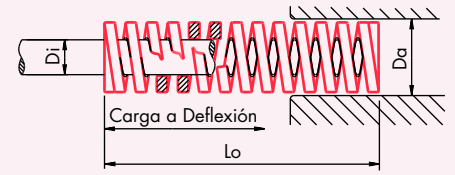


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Carga Fuerte - Rojo

Heavy Duty - Red



Do (mm)	Di (mm)	Lo (mm)	Referencia Reference	Carga a 1mm deflexión (N) Load at 1mm deflection	TABLA DE CARGA DE DEFLEXION / LOAD DEFLECTION TABLE									
					Para vida óptima (15% long. libre) For optimum life (15% of free length)		Para vida óptima (20% long. libre) For optimum life (20% of free length)		Para vida óptima (25% long. libre) For optimum life (25% of free length)		Deflexión máxima Maximum deflection			
					Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)		
32	16	38	R205-606	388.0	2211.6	5.7	2948.8	7.6	3686.0	9.5	4268.0	11.0		
		44	R205-607	324.0	2138.4	6.6	2851.2	8.8	3564.0	11.0	4212.0	13.0		
		51	R205-608	272.0	2080.8	7.7	2774.4	10.2	3468.0	12.8	4080.0	15.0		
		64	R205-610	212.0	2035.2	9.6	2713.6	12.8	3392.0	16.0	4028.0	19.0		
		76	R205-612	172.0	1960.8	11.4	2614.4	15.2	3268.0	19.0	3956.0	23.0		
		89	R205-614	141.0	1882.4	13.4	2509.8	17.8	3137.3	22.3	3807.0	27.0		
		102	R205-616	122.0	1866.6	15.3	2488.8	20.4	3111.0	25.5	3782.0	31.0		
		115	R205-618	107.0	1845.8	17.3	2461.0	23.0	3076.3	28.8	3745.0	35.0		
		127	R205-620	93.0	1771.7	19.1	2362.2	25.4	2952.8	31.8	3534.0	38.0		
		139	R205-622	86.0	1793.1	20.9	2390.8	27.8	2988.5	34.8	3612.0	42.0		
		152	R205-624	78.0	1778.4	22.8	2371.2	30.4	2964.0	38.0	3588.0	46.0		
		178	R205-628	67.2	1794.2	26.7	2392.3	35.6	2990.4	44.5	3561.6	53.0		
		203	R205-632	59.1	1799.6	30.5	2399.5	40.6	2999.3	50.8	3605.1	61.0		
		254	R205-640	46.4	1767.8	38.1	2357.1	50.8	2946.4	63.5	3526.4	76.0		
		305	R205-548	38.0	1738.5	45.8	2318.0	61.0	2897.5	76.3	3458.0	91.0		
40	20	51	R205-708	350.0	2677.5	7.7	3570.0	10.2	4462.5	12.8	5250.0	15.0		
		64	R205-710	269.0	2582.4	9.6	3443.2	12.8	4304.0	16.0	5111.0	19.0		
		76	R205-712	219.0	2496.6	11.4	3328.8	15.2	4161.0	19.0	5037.0	23.0		
		89	R205-714	190.0	2536.5	13.4	3382.0	17.8	4227.5	22.3	5130.0	27.0		
		102	R205-716	163.0	2493.9	15.3	3325.2	20.4	4156.5	25.5	5053.0	31.0		
		115	R205-718	142.0	2449.5	17.3	3266.0	23.0	4082.5	28.8	4970.0	35.0		
		127	R205-720	128.0	2438.4	19.1	3251.2	25.4	4064.0	31.8	4864.0	38.0		
		139	R205-722	115.0	2397.8	20.9	3197.0	27.8	3996.3	34.8	4830.0	42.0		
		152	R205-724	105.0	2394.0	22.8	3192.0	30.4	3990.0	38.0	4830.0	46.0		
		178	R205-728	89.0	2376.3	26.7	3168.4	35.6	3960.5	44.5	4717.0	53.0		
		203	R205-732	77.0	2344.7	30.5	3126.2	40.6	3907.8	50.8	4697.0	61.0		
		254	R205-740	61.0	2324.1	38.1	3098.8	50.8	3873.5	63.5	4636.0	76.0		
		305	R205-748	51.0	2333.3	45.8	3111.0	61.0	3888.8	76.3	4641.0	91.0		
		50	25	64	R205-810	413.0	3964.8	9.6	5286.4	12.8	6608.0	16.0	7847.0	19.0
				76	R205-812	339.0	3864.6	11.4	5152.8	15.2	6441.0	19.0	7797.0	23.0
89	R205-814			288.0	3844.8	13.4	5126.4	17.8	6408.0	22.3	7776.0	27.0		
102	R205-816			245.0	3748.5	15.3	4998.0	20.4	6247.5	25.5	7595.0	31.0		
115	R205-818			215.0	3708.8	17.3	4945.0	23.0	6181.3	28.8	7525.0	35.0		
127	R205-820			192.0	3657.6	19.1	4876.8	25.4	6096.0	31.8	7296.0	38.0		
139	R205-822			168.0	3502.8	20.9	4670.4	27.8	5838.0	34.8	7056.0	42.0		
152	R205-824			154.0	3511.2	22.8	4681.6	30.4	5852.0	38.0	7084.0	46.0		
178	R205-828			134.0	3577.8	26.7	4770.4	35.6	5963.0	44.5	7102.0	53.0		
203	R205-832			117.0	3562.7	30.5	4750.2	40.6	5937.8	50.8	7137.0	61.0		
254	R205-840			89.0	3390.9	38.1	4521.2	50.8	5651.5	63.5	6764.0	76.0		
305	R205-848			73.0	3339.8	45.8	4453.0	61.0	5566.3	76.3	6643.0	91.0		

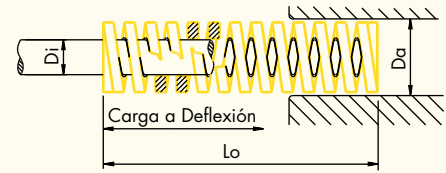


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Muelles para troquel Die springs

Carga Extra Fuerte - Amarillo Extra Heavy Duty - Yellow



Do (mm)	Di (mm)	Lo (mm)	Referencia Reference	Carga a 1 mm deflexión (N) Load at 1 mm deflection	TABLA DE CARGA DE DEFLEXION / LOAD DEFLECTION TABLE							
					Para vida óptima (20% long. libre) For optimum life (20% of free length)		Para vida óptima (25% long. libre) For optimum life (25% of free length)		Para vida óptima (30% long. libre) For optimum life (30% of free length)		Deflexión máxima Maximum deflection	
					Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)
10	5	25	R206-104	36.8	138.0	3.8	156.4	4.3	184.0	5.0	228.2	6.2
		32	R206-105	27.9	133.9	4.8	151.8	5.4	178.6	6.4	223.2	8.0
		38	R206-106	23.7	135.1	5.7	153.1	6.5	180.1	7.6	225.2	9.5
		44	R206-107	19.2	126.7	6.6	143.6	7.5	169.0	8.8	211.2	11.0
		51	R206-108	16.5	126.2	7.7	143.1	8.7	168.3	10.2	214.5	13.0
		64	R206-110	13.2	126.7	9.6	143.6	10.9	169.0	12.8	211.2	16.0
		76	R206-112	10.9	124.3	11.4	140.8	12.9	165.7	15.2	207.1	19.0
12.5	6.3	305	R206-148	2.6	119.0	45.8	134.8	51.9	158.6	61.0	197.6	76.0
		25	R206-204	58.5	219.4	3.8	248.6	4.3	292.5	5.0	362.7	6.2
		32	R206-205	43.9	210.7	4.8	238.8	5.4	281.0	6.4	351.2	8.0
		38	R206-206	36.0	205.2	5.7	232.6	6.5	273.6	7.6	342.0	9.5
		44	R206-207	30.3	200.0	6.6	226.6	7.5	266.6	8.8	333.3	11.0
		51	R206-208	26.2	200.4	7.7	227.2	8.7	267.2	10.2	340.6	13.0
		64	R206-210	21.2	203.5	9.6	230.7	10.9	271.4	12.8	339.2	16.0
16	8	76	R206-212	17.1	194.9	11.4	220.9	12.9	259.9	15.2	324.9	19.0
		89	R206-214	14.5	193.6	13.4	219.4	15.1	258.1	17.8	319.0	22.0
		305	R206-248	4.3	196.7	45.8	223.0	51.9	262.3	61.0	326.8	76.0
		25	R206-304	118.0	442.5	3.8	501.5	4.3	590.0	5.0	731.6	6.2
		32	R206-305	89.0	427.2	4.8	484.2	5.4	569.6	6.4	712.0	8.0
		38	R206-306	72.1	411.0	5.7	465.8	6.5	548.0	7.6	685.0	9.5
		44	R206-307	60.9	401.9	6.6	455.5	7.5	535.9	8.8	669.9	11.0
20	10	51	R206-308	52.3	400.1	7.7	453.4	8.7	533.5	10.2	679.9	13.0
		64	R206-310	41.2	395.5	9.6	448.3	10.9	527.4	12.8	659.2	16.0
		76	R206-312	34.1	388.7	11.4	440.6	12.9	518.3	15.2	647.9	19.0
		89	R206-314	29.5	393.8	13.4	446.3	15.1	525.1	17.8	649.0	22.0
		102	R206-316	25.6	391.7	15.3	443.9	17.3	522.2	20.4	665.6	26.0
		305	R206-348	8.4	384.3	45.8	435.5	51.9	512.4	61.0	638.4	76.0
		25	12.5	25	R206-404	293.0	1098.8	3.8	1245.3	4.3	1465.0	5.0
32	R206-405			224.0	1075.2	4.8	1218.6	5.4	1433.6	6.4	1792.0	8.0
38	R206-406			177.0	1008.9	5.7	1143.4	6.5	1345.2	7.6	1681.5	9.5
44	R206-407			149.0	983.4	6.6	1114.5	7.5	1311.2	8.8	1639.0	11.0
51	R206-408			128.0	979.2	7.7	1109.8	8.7	1305.6	10.2	1664.0	13.0
64	R206-410			99.0	950.4	9.6	1077.1	10.9	1267.2	12.8	1584.0	16.0
76	R206-412			81.7	931.4	11.4	1055.6	12.9	1241.8	15.2	1552.3	19.0
25	12.5	89	R206-414	69.5	927.8	13.4	1051.5	15.1	1237.1	17.8	1529.0	22.0
		102	R206-416	60.6	927.2	15.3	1050.8	17.3	1236.2	20.4	1575.6	26.0
		115	R206-418	53.0	914.3	17.3	1036.2	19.6	1219.0	23.0	1537.0	29.0
		127	R206-420	47.5	904.9	19.1	1025.5	21.6	1206.5	25.4	1520.0	32.0
		139	R206-422	43.0	896.6	20.9	1016.1	23.6	1195.4	27.8	1505.0	35.0
		152	R206-424	39.0	889.2	22.8	1007.8	25.8	1185.6	30.4	1482.0	38.0
		305	R206-448	21.2	969.9	45.8	1099.2	51.9	1293.2	61.0	1611.2	76.0
25	12.5	32	R206-505	374.4	1797.1	4.8	2036.7	5.4	2396.2	6.4	2995.2	8.0
		38	R206-506	346.0	1972.2	5.7	2235.2	6.5	2629.6	7.6	3287.0	9.5
		44	R206-507	244.0	1610.4	6.6	1825.1	7.5	2147.2	8.8	2684.0	11.0
		51	R206-508	207.5	1587.4	7.7	1799.0	8.7	2116.5	10.2	2697.5	13.0
		64	R206-510	161.0	1545.6	9.6	1751.7	10.9	2060.8	12.8	2576.0	16.0
		76	R206-512	130.8	1491.1	11.4	1689.9	12.9	1988.2	15.2	2485.2	19.0
		89	R206-514	110.5	1475.2	13.4	1671.9	15.1	1966.9	17.8	2431.0	22.0
25	12.5	102	R206-516	96.3	1473.4	15.3	1669.8	17.3	1964.5	20.4	2503.8	26.0
		115	R206-518	85.7	1478.3	17.3	1675.4	19.6	1971.1	23.0	2485.3	29.0
		127	R206-520	76.3	1453.5	19.1	1647.3	21.6	1938.0	25.4	2441.6	32.0
		152	R206-524	63.5	1447.8	22.8	1640.8	25.8	1930.4	30.4	2413.0	38.0
		178	R206-528	53.9	1439.1	26.7	1631.0	30.3	1918.8	35.6	2371.6	44.0
		203	R206-532	47.0	1431.2	30.5	1622.0	34.5	1908.2	40.6	2397.0	51.0
		305	R206-548	30.9	1413.7	45.8	1602.2	51.9	1884.9	61.0	2348.4	76.0

Muelles para troquel

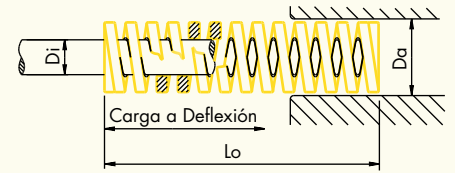
Die Springs



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Carga Extra Fuerte - Amarillo

Extra Heavy Duty - Yellow



Do (mm)	Di (mm)	Lo (mm)	Referencia Reference	Carga a 1mm deflexión (N) Load at 1mm deflection	TABLA DE CARGA DE DEFLEXION / LOAD DEFLECTION TABLE							
					Para vida óptima (20% long. libre) For optimum life (20% of free length)		Para vida óptima (25% long. libre) For optimum life (25% of free length)		Para vida óptima (30% long. libre) For optimum life (30% of free length)		Deflexión máxima Maximum deflection	
					Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)	Carga (N) Load (N)	Deflexión (mm) Deflection (mm)
32	16	38	R206-606	528.2	3010.7	5.7	3412.2	6.5	4014.3	7.6	5017.9	9.5
		44	R206-607	424.4	2801.0	6.6	3174.5	7.5	3734.7	8.8	4668.4	11.0
		51	R206-608	353.0	2700.5	7.7	3060.5	8.7	3600.6	10.2	4589.0	13.0
		64	R206-610	269.2	2584.3	9.6	2928.9	10.9	3445.8	12.8	4307.2	16.0
		76	R206-612	218.5	2490.9	11.4	2823.0	12.9	3321.2	15.2	4151.5	19.0
		89	R206-614	180.3	2407.0	13.4	2727.9	15.1	3209.3	17.8	3966.6	22.0
		102	R206-616	155.0	2371.5	15.3	2687.7	17.3	3162.0	20.4	4030.0	26.0
		115	R206-618	140.0	2415.0	17.3	2737.0	19.6	3220.0	23.0	4060.0	29.0
		127	R206-620	124.0	2362.2	19.1	2677.2	21.6	3149.6	25.4	3968.0	32.0
		152	R206-624	102.0	2325.6	22.8	2635.7	25.8	3100.8	30.4	3876.0	38.0
		178	R206-628	88.2	2354.9	26.7	2668.9	30.3	3139.9	35.6	3880.8	44.0
		203	R206-632	76.0	2314.2	30.5	2622.8	34.5	3085.6	40.6	3876.0	51.0
		254	R206-640	60.8	2316.5	38.1	2625.3	43.2	3088.6	50.8	3891.2	64.0
		305	R206-648	49.0	2241.8	45.8	2540.7	51.9	2989.0	61.0	3724.0	76.0
40	20	51	R206-708	628.0	4804.2	7.7	5444.8	8.7	6405.6	10.2	8164.0	13.0
		64	R206-710	487.0	4675.2	9.6	5298.6	10.9	6233.6	12.8	7792.0	16.0
		76	R206-712	379.0	4320.6	11.4	4896.7	12.9	5760.8	15.2	7201.0	19.0
		89	R206-714	321.0	4285.4	13.4	4856.7	15.1	5713.8	17.8	7062.0	22.0
		102	R206-716	281.0	4299.3	15.3	4872.5	17.3	5732.4	20.4	7306.0	26.0
		115	R206-718	245.0	4226.3	17.3	4789.8	19.6	5635.0	23.0	7105.0	29.0
		127	R206-720	221.0	4210.1	19.1	4771.4	21.6	5613.4	25.4	7072.0	32.0
		152	R206-724	168.0	3830.4	22.8	4341.1	25.8	5107.2	30.4	6384.0	38.0
		203	R206-732	132.0	4019.4	30.5	4555.3	34.5	5359.2	40.6	6732.0	51.0
		254	R206-740	107.0	4076.7	38.1	4620.3	43.2	5435.6	50.8	6848.0	64.0
50	25	305	R206-748	87.8	4016.9	45.8	4552.4	51.9	5355.8	61.0	6672.8	76.0
		64	R206-810	709.0	6806.4	9.6	7713.9	10.9	9075.2	12.8	11344.0	16.0
		76	R206-812	572.0	6520.8	11.4	7390.2	12.9	8694.4	15.2	10868.0	19.0
		89	R206-814	475.0	6341.3	13.4	7186.8	15.1	8455.0	17.8	10450.0	22.0
		102	R206-816	405.0	6196.5	15.3	7022.7	17.3	8262.0	20.4	10530.0	26.0
		115	R206-818	352.0	6072.0	17.3	6881.6	19.6	8096.0	23.0	10208.0	29.0
		127	R206-820	316.0	6019.8	19.1	6822.4	21.6	8026.4	25.4	10112.0	32.0
		152	R206-824	239.0	5449.2	22.8	6175.8	25.8	7265.6	30.4	9082.0	38.0
		203	R206-832	187.0	5694.2	30.5	6453.4	34.5	7592.2	40.6	9537.0	51.0
		254	R206-840	153.0	5829.3	38.1	6606.5	43.2	7772.4	50.8	9792.0	64.0
305	R206-848	127.0	5810.3	45.8	6585.0	51.9	7747.0	61.0	9652.0	76.0		



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Problemas y soluciones Problems and answers

PROBLEMAS Y SOLUCIONES

La mayoría de los problemas que aparecen en la utilización de los muelles de troquel vienen provocados por la mala aplicación de los mismos.

FALLOS DE LOS MUELLES

Los muelles de troquel se producen bajo un control tan cuidadoso que los problemas de fabricación han prácticamente desaparecido. Los fallos de los muelles de troquel se deben bien a una mala fabricación, bien a una aplicación incorrecta de los mismos. La causa del problema reside en la utilización del muelle al límite de su elasticidad. La solución, claro está, consiste en la selección concienzuda de los muelles de troquel adecuados para cada aplicación.

GUIA DEL MUELLE

Los muelles de troquel se fabrican con los extremos de sección transversal cuadrada, por lo que se sujetan sobre su propia base y se comprimen aún por de bajo de su carga. Existe una relación positiva entre el diámetro exterior del muelle y la longitud total, que es la que determina si el muelle corre el riesgo de deformarse o no con una carga inferior. Como norma general, si la longitud libre es cuatro veces mayor que el diámetro medio del muelle, podría producirse la deformación bajo compresión. Para solucionarlo basta con guiarlo por una cavidad o una varilla o ambas opciones. Se recomienda siempre suministrar una guía para cualquier muelle de troquel.

La figura A aporta información acerca de si un muelle específico con extremos de sección transversal cuadrada está sujeto a posibles deformaciones. La curva indica que un muelle con los extremos de sección transversal cuadrada que se comprime por ambos lados puede sufrir deformaciones si los valores caen por debajo o a la derecha de la curva.

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

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

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.

Figure A 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.

Curva para encontrar condiciones críticas de pandeo
 Curve for finding critical buckling conditions

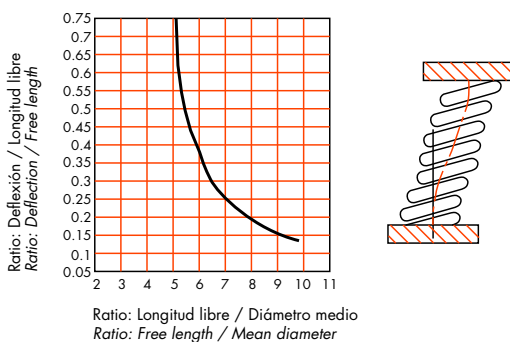


FIG. A

ORIFICIOS Y VARILLAS

Los orificios o cavidades del troquel en el que se van a insertar los muelles han de tener el tamaño que se especifica en las páginas "MUELLES 4" a "MUELLES 11". Los muelles aumentan su tamaño a medida que se comprimen. Si el orificio es de menor tamaño, existe el riesgo de que el frotamiento haga fallar al muelle antes de lo estipulado.

Los orificios también han de tener el fondo plano y las esquinas cuadradas. Esto permitirá al muelle trabajar sobre una superficie plana y aportar una tensión uniforme sobre las espiras cuando el muelle esté comprimido.

Hacer que el muelle trabaje sobre una varilla también proporciona una buena protección contra la deformación. Hay que cuidar que la varilla sea lisa. Si la varilla es más corta que el muelle, esta deberá tener un extremo pulido a fin de evitar todo contacto entre las espiras y un borde afilado.

HOLES AND RODS

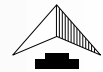
Holes or pockets provided in the die for springs must be the specified size listed on pages "MUELLES 4" to "MUELLES 11". Springs increase in diameter as they are compressed. If the hole is undersized, a wearing or binding action will produce early spring failure.

Hole 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.

Problemas y soluciones

Problems and answers



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ALINEACION

Hay que cuidar que cualquier mecanismo que se utilice para contener o guiar el muelle esté bien alineado a ambos lados del troquel. Los orificios y las varillas que no correspondan pueden causar problemas que produzcan el fallo del muelle y que dañen la herramienta.

TEMPERATURA

El calor es un problema que se ignora frecuentemente en el fallo del muelle o en la pérdida de carga. La temperatura máxima que puede soportar el acero al cromo de aleación es de 230°C. La figura B muestra el porcentaje de pérdida de carga atribuido a la combinación del calor y la tensión. Llama la atención el calor generado por el troquel en marcha que puede ser muy significativo en numerosas aplicaciones. El calor que absorbe la herramienta puede ser transferido a los muelles y de esta forma producirse una pérdida de carga y el fallo prematuro del muelle.

DEFLEXION

Si se aplica una deflexión mayor a la recomendada por el fabricante se puede producir el fallo prematuro de los muelles. Compruebe la carrera de la prensa o troquel para asegurarse de la deflexión real a la que estará sometido el muelle. Si se encuentra por debajo de un límite de seguridad, deberían realizarse una serie de cambios sin demora.

MODIFICACION DEL MUELLE

Cada uno de los muelles de troquel están diseñados para obtener una serie de resultados dentro de áreas determinadas de trabajo. La modificación de la longitud del muelle o del número de espiras, el pulido del diámetro interior o exterior o la introducción de restricciones en el movimiento de las espiras pueden causar el fallo prematuro del muelle. Intentar modificar un muelle puliendo los extremos puede cambiar el comportamiento del material y afectar negativamente al funcionamiento del muelle.

La modificación de un muelle tras su fabricación trae consigo problemas y fallos. No estropee un troquel costoso por culpa de la pequeña cantidad de dinero que se ha ahorrado en una modificación barata.

CORROSION

Con frecuencia, los fallos del muelle se deben a elementos corrosivos. La corrosión reduce considerablemente la vida útil del muelle. Tenga cuidado con los productos que puedan modificar el muelle, tales como el óxido, los lubricantes, detergentes, productos químicos, etc. Los muelles limpios y protegidos proporcionan mejores resultados.

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. Figure B 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 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, chemical, etc. Clean, protected springs give the best job performance.

PERDIDA DE CARGA/TEMPERATURA / LOAD LOSS VS. TEMPERATURE

Tensión inicial MPa Initial stress	ACERO AL CARBON CARBON STEEL			CLORO ALEADO CHROMIUM ALLOY		
	Porcentaje aproximado de pérdida de carga Approximate percent loss of load			Porcentaje aproximado de pérdida de carga Approximate percent loss of load		
	120°C	177°C	200°C	120°C	177°C	230°C
276	2.0	3.5	4.5	1.0	2.0	5.0
345	2.0	4.0	5.0	1.0	2.0	5.0
414	2.5	4.5	5.5	1.0	2.0	5.5
483	3.0	5.5	6.5	1.0	2.5	6.0
552	3.0	6.0	8.0	1.5	2.5	6.0
620	4.0	8.0	9.0	1.5	3.0	7.0
689	4.5	9.5	10.5	2.0	4.0	8.0
758	7.0	11.5	14.0	2.0	5.0	10.0
827	9.5	13.0	17.5	3.5	8.0	13.0

FIG. B