SPRINGS. 1902 - 1970.

The following diagrams and dimensions are based on measurements taken from actual hubs.
In virtually all cases, variations have been noted amongst batches of the same springs. I have therefore used the dimensions which appear most typical.

The formula is the standard - $\text{Deflection} = \dfrac{8 \times P \times D^3 \times N}{G \times d^4}$

Where P = Load in lb.

D = Mean diameter of coil in inches.

d = Diameter of wire in inches. (d^4 = times 10^{-6}) The powers cancel out.

G = Modulus of Rigidity in lb/in^2. (Use $12 \times 10^6 lb/in^2$.)

N = Effective turns. (Open ends, same; closed ends, less 1.1/2 turns.)

For 1" deflection we transpose the above formula.

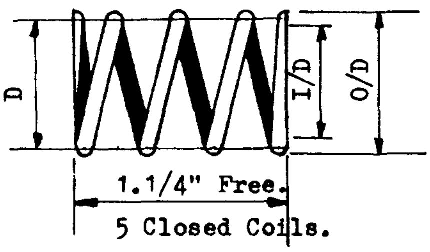
$$P.(lb) = \frac{G \times d^4}{8 \times D^3 \times N}$$

For example, taking the 1902 Compensating Spring below.

$$\text{Load for 1 inch deflection} = \frac{(12 \times 10^6) \times (26.87 \times 10^{-6})}{8 \times 0.768^3 \times (5 - 1.5)} = 25.4 \text{ lb/in.}$$

Hub of 1902. Taken from Hub No. 652.

Compensating Spring.

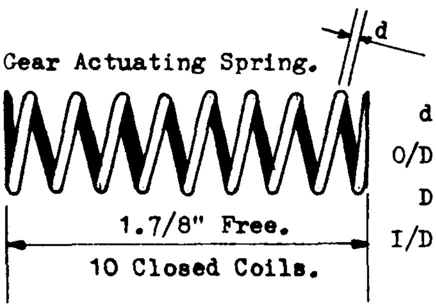


d = 0.072"
O/D = 0.840"
D = 0.768"
I/D = 0.696"

$$\frac{12 \times 26.87}{8 \times 0.768^3 \times 3.5} = \underline{25.4 \text{ lb/in.}}$$

In position spring has 5/16" compression, = 7.9 lb.

Gear Actuating Spring.



d = 0.056"
O/D = 0.574"
D = 0.518"
I/D = 0.462"

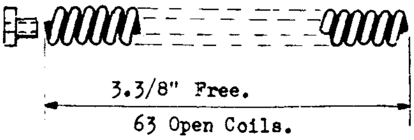
$$\frac{12 \times 9.83}{8 \times 0.518^3 \times 8.5} = \underline{12.5 \text{ lb/in.}}$$

In High Gear,	5/8"	compression,	=	7.8 lb.
In Normal "	15/16"	"	=	11.7 lb.
In Low "	1.5/16"	"	=	16.4 lb.

J.G. 1994.

Model X.

Axle Spring.

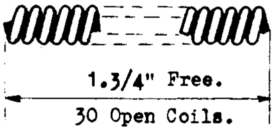


d = 0.032"
O/D = 0.164"
D = 0.132"
I/D = 0.100"

$$\frac{12 \times 1.05}{8 \times 0.132^3 \times 63} = \underline{10.9\ \text{lb/in.}}$$

Many variations occurred with this spring.
Up to 4" long with 68 open coils.
Some were 0.162" O/D and 0.028" wire diameter.

Indicator Spring.



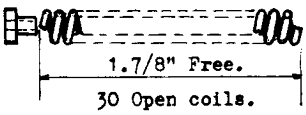
d = 0.032"
O/D = 0.164"
D = 0.132"
I/D = 0.100"

$$\frac{12 \times 1.05}{8 \times 0.132^3 \times 30} = \underline{22.8\ \text{lb/in.}}$$

(Later used as the Axle Spring in the following range of Hubs. See N.8.)

Models C, V, A, N, FN, K range, T, TF, TC.

N.8. Axle Spring.

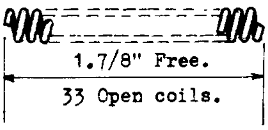


d = 0.032"
O/D = 0.164"
D = 0.132"
I/D = 0.100"

$$\frac{12 \times 1.05}{8 \times 0.132^3 \times 30} = \underline{22.8\ \text{lb/in.}}$$

C,V,A,N,FN, K range, T,TF,TC.

N.126. Indicator Spring.

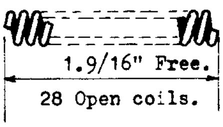


d = 0.032"
O/D = 0.148"
D = 0.116"
I/D = 0.084"

$$\frac{12 \times 1.05}{8 \times 0.116^3 \times 33} = \underline{30.6\ \text{lb/in.}}$$

C,V,A,N,FN, K range, TC.

TF.113. Indicator Spring.

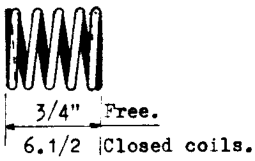


d = 0.032"
O/D = 0.148"
D = 0.116"
I/D = 0.084"

$$\frac{12 \times 1.05}{8 \times 0.116^3 \times 28} = \underline{36\ \text{lb/in.}}$$

T,TF.

K.46. Cage Spring.

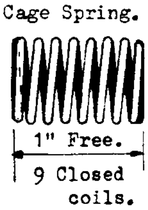


d = 0.036"
O/D = 0.550"
D = 0.514"
I/D = 0.478"

$$\frac{12 \times 1.68}{8 \times 0.514^3 \times 5} = \underline{3.7\ \text{lb/in.}}$$

K range, except KB.

K.125. Cage Spring.



d = 0.036"
O/D = 0.550"
D = 0.514"
I/D = 0.478"

$$\frac{12 \times 1.68}{8 \times 0.514^3 \times 7.5} = \underline{2.47\ \text{lb/in.}}$$

KB.

On the above two springs the O/D varied from 0.535" to 0.558".

J.G.1994.

Clutch Springs 1937 - 1970.

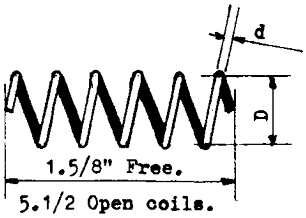
K.514.

d = 0.048"
O/D = 0.516"
D = 0.468"
I/D = 0.420" I/D to suit small diam. axles, 0.406". (13/32")

$$\frac{12 \times 5.3}{8 \times 0.468^3 \times 5} = 15.5 \text{ lb/in.}$$

AR 1937 - 39.
AW 1937 - 39.
AM 1937 - 39.

K.814.

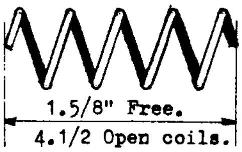


d = 0.040"
O/D = 0.492"
D = 0.452"
I/D = 0.412" I/D to suit small diam. axles, 0.406".(13/32")

$$\frac{12 \times 2.56}{8 \times 0.452^3 \times 5.5} = 7.56 \text{ lb/in.}$$

4 speed.
AF 1938 - 39.
FM 1939 only.

K.530.

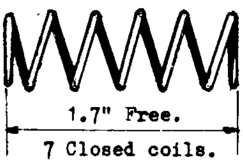


d = 0.040"
O/D = 0.534"
D = 0.494"
I/D = 0.454" I/D to suit larger diam.axles, 0.4375".(7/16") From 1940.

$$\frac{12 \times 2.56}{8 \times 0.494^3 \times 4.5} = 7.1 \text{ lb/in.}$$

All hubs
1940 - 1948.

K.530A.
HSA.128.

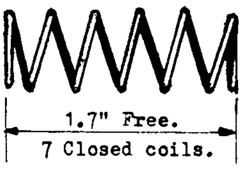


d = 0.036"
O/D = 0.520"
D = 0.484"
I/D = 0.448"

$$\frac{12 \times 1.68}{8 \times 0.484^3 \times 5.5} = 4.0 \text{ lb/in.}$$

3 sp. 1948 on.
4 sp. 1948 - 1950
5 sp. 1966 on.

K.530B.
HSA.148.



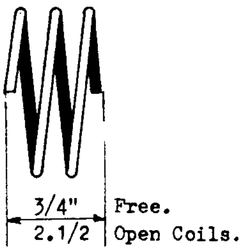
d = 0.030"
O/D = 0.512"
D = 0.482"
I/D = 0.452"

$$\frac{12 \times 0.81}{8 \times 0.482^3 \times 5.5} = 2.0 \text{ lb/in.}$$

4 sp. from 1950.

Springs for the SW Range.

L.15. Thrust Spring.

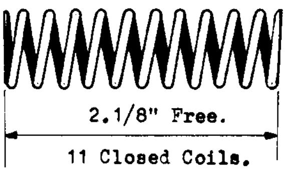


d = 0.056"
O/D = 1.200"
D = 1.144"
I/D = 1.088"

$$\frac{12 \times 9.83}{8 \times 1.144^3 \times 2.5} = 3.9 \text{ lb/in.}$$

SB,SG,SW.

L.17. Clutch Spring.



d = 0.040"
O/D = 0.540"
D = 0.500"
I/D = 0.460"

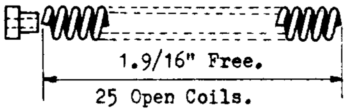
$$\frac{12 \times 2.56}{8 \times 0.500^3 \times 9.5} = 3.2 \text{ lb/in.}$$

SB,SG,SW.

J.G. 1994.

4 - Speed Inner Compensating Springs.

K.813.

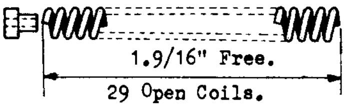


d = 0.032"
O/D = 0.164"
D = 0.132"
I/D = 0.100"

$\frac{12 \times 1.05}{8 \times 0.132^3 \times 25}$ = 27.4 lb/in.

Hubs to '50.
ASC to '50.

K.813B. HSA.147.



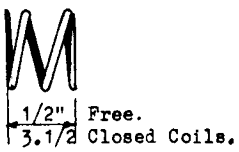
d = 0.028"
O/D = 0.156"
D = 0.128"
I/D = 0.100"

$\frac{12 \times 0.615}{8 \times 0.128^3 \times 29}$ = 15.2 lb/in.

Hubs from '50.
ASC from '50.

Low Gear Springs. FW,FG,S5.

K.410.

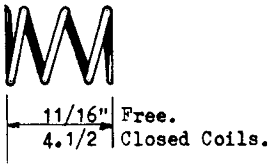


d = 0.048"
O/D = 0.596"
D = 0.548"
I/D = 0.500"

$\frac{12 \times 5.3}{8 \times 0.548^3 \times 2}$ = 24.1 lb/in.

FW,FG. 1945 - 1950

K.410B. HSA.143.

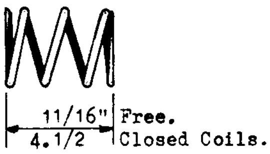


d = 0.034"
O/D = 0.568"
D = 0.534"
I/D = 0.500"

$\frac{12 \times 1.33}{8 \times 0.534^3 \times 3}$ = 4.4 lb/in.

FW,FG. 1950 - on.

HSA.273.



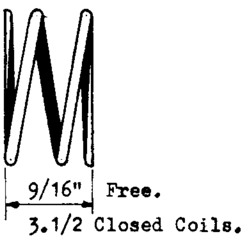
d = 0.038"
O/D = 0.576"
D = 0.538"
I/D = 0.500"

$\frac{12 \times 2.09}{8 \times 0.538^3 \times 3}$ = 6.7 lb/in.

S5.1966 - on.

Low Gear Springs. AF, FC, FM & ASC.

K.810.

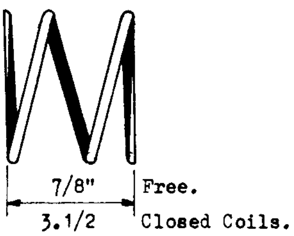


d = 0.066"
O/D = 1.080"
D = 1.014"
I/D = 0.948"

$\frac{12 \times 18.9}{8 \times 1.014^3 \times 2}$ = 13.6 lb/in.

AF,FM. 1938-1939.

K.810A.

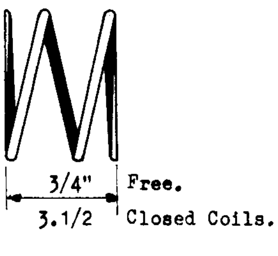


d = 0.056"
O/D = 1.056"
D = 1.000"
I/D = 0.944"

$\frac{12 \times 9.8}{8 \times 1.0^3 \times 2}$ = 7.35 lb/in.

FM,FC. 1940 - 1950
ASC.

K.810B.



d = 0.052"
O/D = 1.050"
D = 0.998"
I/D = 0.946"

$\frac{12 \times 7.3}{8 \times 0.998^3 \times 2}$ = 5.5 lb/in.

FM,FC 1950 on.
ASC "

J.G. 1994.

SPRINGS FOR THE S5 RANGE OF HUBS.

E:\Hubs\Springs.Sam

d = diameter of wire; O/D = Outside diam. of spring; I/D = Inside diam.of spring; D = Mean diam. of spring.

						Calculated Load.
S5. 1966 - 1974.						
Clutch Spring.	HSA.128.	7 Closed coils.	1.700" free.	d = 0.036"		
		O/D = 0.520"	I/D = 0.448"	D = 0.484"		**4 lb/in.**
Low Gear Spring.	HSA.273.	4½ Closed coils.	11/16" free.	d = 0.038"		
		O/D = 0.576"	I/D = 0.500"	D = 0.538"		**6.7 lb/in.**
S5/1 1974 - 1981.						
Clutch Spring.	HSA.128.	7 Closed coils.	1.700" free.	d = 0.036"		
		O/D = 0.520"	I/D = 0.448"	D = 0.484"		**4 lb/in.**
Low Gear Spring.	HSA.273.	4½ Closed coils.	11/16" free.	d = 0.038"		
		O/D = 0.576"	I/D = 0.500"	D = 0.538"		**6.7 lb/in.**
Pinion Return Spring.	HSA.319.	3 Open coils.	0.870" free.	d = 0.044"		
		O/D = 0.565"	I/D = 0.477"	D = 0.521"		**13.25 lb/in.**
S5/2 1981 - 8-1988.						
Clutch Spring.	HSA.128.	7 Closed coils.	1.700" free.	d = 0.036"		
		O/D = 0.520"	I/D = 0.448"	D = 0.484"		**4 lb/in.**
Low Gear Spring.	HSA.347.	4½ Closed coils.	0.660" free.	d = 0.040"		
		O/D = 0.568"	I/D = 0.488	D = 0.528"		**9 lb.in.**
Pinion Return Spring.	HSA.346.	4½ Closed coils.	0.850" free.	d = 0.048"		
		O/D = 0.576"	I/D = 0.480	D = 0.528"		**18 lb/in.**
S5/2 After 1988-8.						
Clutch Spring.	HSA.128.	7 Closed coils.	1.700" free.	d = 0.036"		
		O/D = 0.520"	I/D = 0.448"	D = 0.484"		**4 lb/in.**
Pinion Return Spring.	HSA.422.	7 Closed coils.	1.200" free.	d = 0.039"		
		O/D = 0.559"	I/D = 0.481"	D = 0.520"		**4.5 lb/in.**

Note: Many variations have been noted with the Clutch springs. 1.7" is a typical free length but I have found springs as low as 1.47" in some hubs. A few springs have been seen with only 6½ closed coils. Also some with an O/D of 0.540".

J.G. 1997.