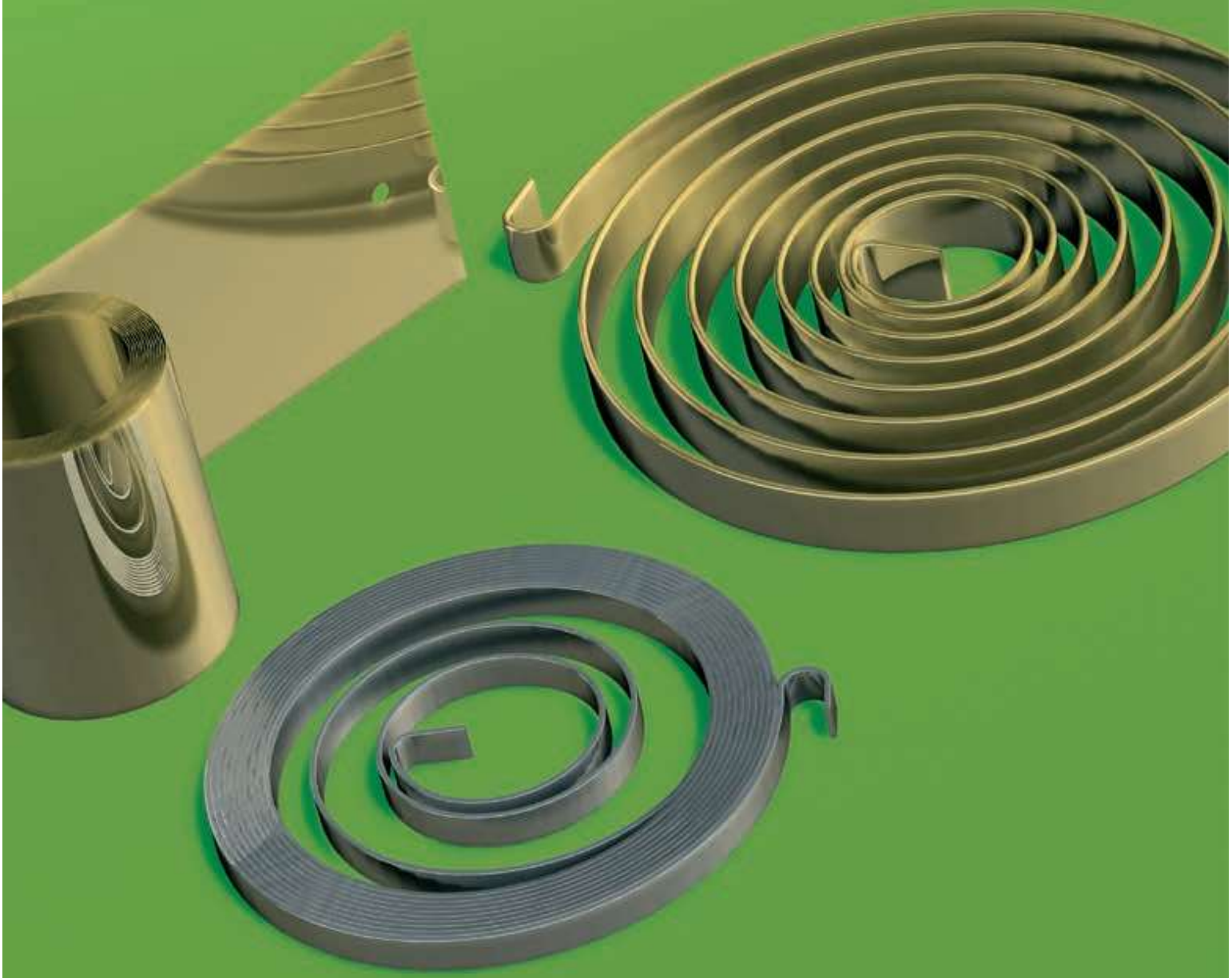
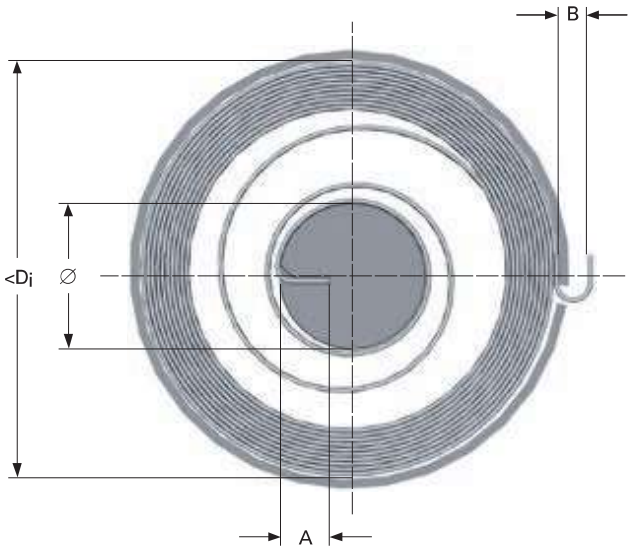
CONSTANT FORCE SPRINGS





All dimensions are in mm

t = Material thickness

b = Strip width

M_1 = Torque at 1.5 and 2.5 coils pre-tension for 10 and 20 coils respectively

M_2 = Torque at at maximum torsion 10 and 20 coils

N_C = *Original range:* up to 250 000 oscillations
Cross curved range: up to 35 000 oscillations
Not using the total torque angle (min 0.5 turns left), an increase in load cycle can be achieved with up to 100 000 oscillations, provided that lubrications is used.

D_i = Internal housing diameter

Material: Stainless steel EN 10151 1.4310

Nominal torque without effect from friction stated.

1 kp = 9.80665 Newtons, 1 Newton = 0.10197 kp

Power spring for circular motion in max 10 and 20 coils, except pre-tension as specified below. The spring is usually positioned in a housing with the outer hook located around a pin or in a slot on the housing with the smallest internal diameter as specified below. It can also be placed in a larger housing, but with an associated decrease in force. It should be positioned on a shaft with a groove in it, in accordance with the dimensions listed below. It is also possible to slightly increase the diameter of the inner coil for placement on a larger shaft.

To minimise friction, the spring should be lubricated when it is fitted and the coils separated. If no lubrication is applied, there may be a reduction in spring force of up to 20%. If more torque is required, two or more springs can be placed next to each other. In such circumstances, it is preferable to position a washer between the springs. Power springs are supplied with a protective ring or nylon band that must be removed during assembly. The spring should be handled with care and held using a suitable tool whilst it is being positioned in the housing.

POWER SPRINGS

SPS

Original range

Lesjöfors original range for normal usage, see page 103 for more details.

t	b	Shaft ∅	A	B	10 coils D_i	10 coils M_1 Nmm	10 coils M_2 Nmm	10 coils Cat.no	20 coils D_i	20 coils M_1 Nmm	20 coils M_2 Nmm	20 coils Cat.no
0,4	8	12	3	4	55	52	219	8964	77	57	219	8984
0,4	10	12	3	4	55	66	275	8965	77	72	275	8985
0,5	10	15	4	5	70	103	417	8966	97	97	417	8986
0,5	12	15	4	5	70	124	503	8967	97	117	503	8987
0,5	15	15	4	5	70	155	631	8968	97	147	631	8988
0,6	10	18	5	5	85	143	588	8969	116	127	588	8989
0,6	12	18	5	5	85	172	709	8970	116	153	709	8990
0,6	15	18	5	5	85	216	891	8971	116	192	891	8991
0,7	12	20	6	6	100	228	942	8972	136	184	942	8992
0,7	15	20	6	6	100	287	1184	8973	136	232	1184	8993
0,7	20	20	6	6	100	384	1589	8974	136	311	1589	8994
0,8	12	25	7	6	115	292	1205	8975	157	243	1205	8995
0,8	15	25	7	6	115	368	1516	8976	157	306	1516	8996
0,8	20	25	7	6	115	494	2036	8977	157	411	2036	8997
1	15	30	8	8	145	570	2312	8978	196	437	2312	8998
1	20	30	8	8	145	766	3110	8979	196	587	3110	8999
1	25	30	8	8	145	963	3907	8980	196	738	3707	9450
1,5	20	40	12	10	220	1599	6713	8981	295	1306	6713	9451
1,5	25	40	12	10	220	2014	8457	8982	295	1646	8457	9452
1,5	30	40	12	10	220	2429	10200	8983	295	1985	10200	9453

Cross-curved range

Lesjöfors cross-curved range use thinner material and achieve same properties as on our original range.
We use our own developed "cross-curved" manufacturing process to achieve a lighter spring.
See page 103 for more details.

t	b	Shaft ∅	A	B	10 coils D_i	10 coils M_1 Nmm	10 coils M_2 Nmm	10 coils Cat.no	20 coils D_i	20 coils M_1 Nmm	20 coils M_2 Nmm	20 coils Cat.no
0,28	8	12	3	4	55	90	230	61700	77	70	240	61720
0,28	10	12	3	4	55	100	270	61701	77	90	290	61721
0,34	10	15	4	5	70	160	420	61702	97	140	440	61722
0,34	12	15	4	5	70	190	500	61703	97	170	520	61723
0,34	15	15	4	5	70	240	630	61704	97	210	650	61724
0,40	10	18	5	5	85	230	600	61705	116	190	590	61725
0,40	12	18	5	5	85	280	710	61706	116	230	710	61726
0,40	15	18	5	5	85	350	890	61707	116	280	890	61727
0,47	12	20	6	6	100	360	950	61708	136	300	960	61728
0,47	15	20	6	6	100	450	1180	61709	136	370	1200	61729
0,47	20	20	6	6	100	600	1580	61710	136	500	1600	61730
0,56	12	25	7	6	115	480	1250	61711	157	400	1240	61731
0,56	15	25	7	6	115	600	1560	61712	157	490	1550	61732
0,56	20	25	7	6	115	800	2080	61713	157	660	2070	61733
0,66	15	30	8	8	145	920	2350	61714	196	740	2310	61734
0,66	20	30	8	8	145	1220	3130	61715	196	1010	3140	61735
0,66	25	30	8	8	145	1530	3920	61716	196	1210	3780	61736
0,98	20	40	12	10	220	2540	6760	61717	295	2130	6940	61737
0,98	25	40	12	10	220	3170	8450	61718	295	2660	8670	61738
0,98	30	40	12	10	220	3810	10140	61719	295	3190	10410	61739

Customized solutions

Besides our standard range we also provide customized solutions using design capabilities that feature our advanced, proprietary spring design software. We also offer performance testing that allows for rapid production of spring prototypes to help our customers achieve a competitive advantage by improving their speed-to-market.
By providing expert metallurgical knowledge with long experience in spring production, we have the expertise to optimize spring design, which will contribute to better end-product performance for our customers.

Products

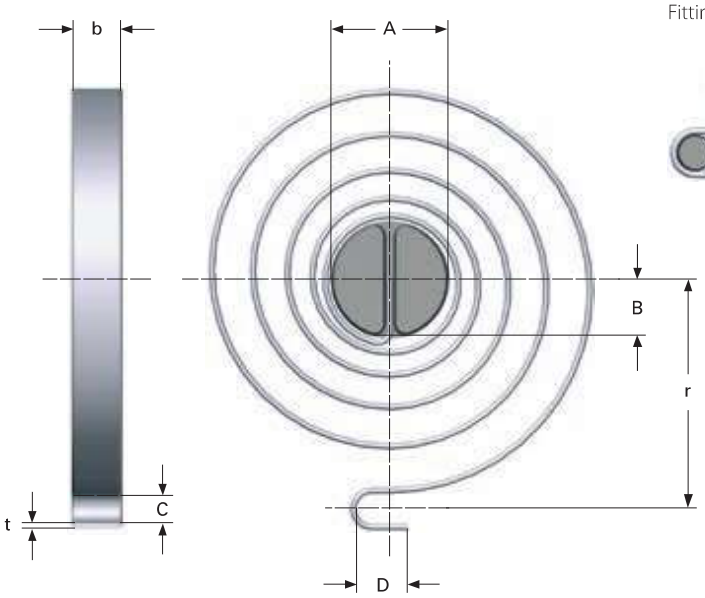
Our product portfolio includes a wide variety of flat spring categories such as constant force springs, constant torque springs, clock springs, power springs, and reels. All products are designed and manufactured to each customer's unique performance and size requirements.

Applications

From small electronic and precision instrumentation springs to large industrial springs, we confidently serve engineers and buyers of OEM and replacement spring components in almost every area of apparatus and equipment manufacturing. Applications for our springs include medical, automotive, appliance, cord reels, cable reels, defense, elevator door closures, fall safety restraints, hose reels, outdoor power equipment, tool balancers, window balance systems, and other specialized retraction and counter balance systems.

CLOCK SPRINGS

SCS



Fitting example

The clock spring (also referred to as a flat torsion spring) is designed to produce a torsional force (circular movement). In contrast to the tightly coiled motor spring on the previous page, the clock spring has open coils that, when mounted correctly, reduces fricton to zero. However, torque capacity is reduced as a result. The standard range is made from rounded edge stainless steel, which affords a better fatigue life.

All dimensions are in mm

t = Material thickness
b = Material width
A = Shaft (recommended)
r = Radius from spring centre to locating centre
n = Number of coils
φ = Torque angle at M_n
M_n = Maximum permitted torque in Nmm
R = Rate, Nmm per degree of torque
N_C = Number of oscillations (life)

Material: Stainless steel EN 10270-3-1.4310

Tolerance: Tolerance for the position between inner and outer locating points is ±10 degrees for 5 coil springs and ±15 degrees for 8 coil springs.

1 kp = 9.80665 Newtons, 1 Newton = 0.10197 kp

Assembly

The spring is best assembled on a grooved shaft. The end of the groove should be milled or rounded. To prevent the spring from getting an eccentric shape, leading to friction during load, the outer end should be fixed as shown in one of the above examples. Otherwise, both torque force and spring life will be compromised.

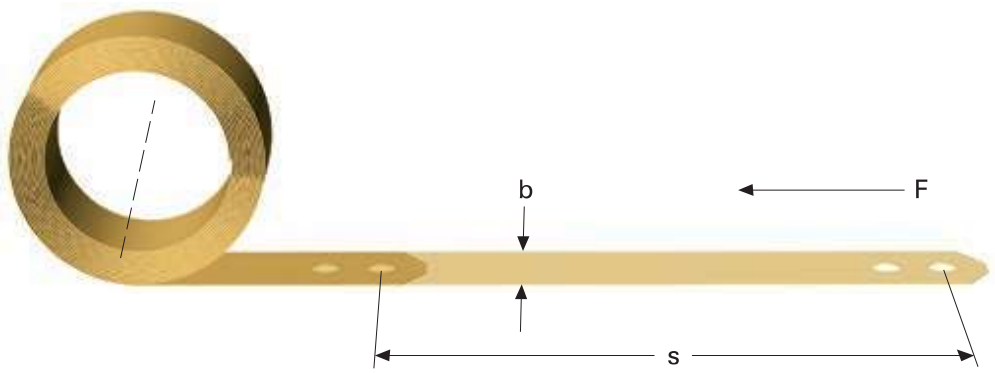
Spring life

For a static load (N_C < 10 000), the highest torque angle shown in the table is recommended. The table also shows the approximative torque angle for 100 000 oscillations. If a higher N_C is required, please contact us for information about permitted torques.

t	b	A	r	n	B	C	D	R	N_c max 10 000 Torque angle at M_n	M_n Nmm	N_c max 100 000 Torque angle at M_n	M_n Nmm	Cat. no
0,5	3	7	13	5	2,5	2,7	3,5	0,56	354	198	284	158	900
0,5	5	7	13	5	2,5	2,7	3,5	0,93	354	329	284	263	901
0,5	3	7	21	8	2,5	2,7	3,5	0,26	762	198	610	158	902
0,5	5	7	21	8	2,5	2,7	3,5	0,43	762	329	610	263	903
0,6	4	8	16	5	3	3,2	4,5	0,9	416	374	332	300	904
0,6	6	8	16	5	3	3,2	4,5	1,35	416	562	332	449	905
0,6	4	8	25	8	3	3,2	4,5	0,43	862	374	690	300	906
0,6	6	8	25	8	3	3,2	4,5	0,65	862	562	690	449	907
0,7	4	10	19	5	3,5	3,7	5	1,43	354	506	283	405	908
0,7	7	10	19	5	3,5	3,7	5	2,5	354	886	283	709	909
0,7	4	10	29	8	3,5	3,7	5	0,67	761	506	609	405	910
0,7	7	10	29	8	3,5	3,7	5	1,16	761	886	609	709	911
0,8	5	12	21	5	4,5	4,2	6	1,79	456	816	364	653	912
0,8	8	12	21	5	4,5	4,2	6	2,87	456	1306	364	1044	913
0,8	5	12	34	8	4,5	4,2	6	0,83	986	816	789	653	914
0,8	8	12	34	8	4,5	4,2	6	1,32	986	1306	789	1044	915
1	6	14	25	5	5	5,2	7	4	375	1500	300	1200	916
1	10	14	25	5	5	5,2	7	6,66	375	2500	300	2000	917
1	6	14	40	8	5	5,2	7	1,86	805	1500	644	1200	918
1	10	14	40	8	5	5,2	7	3,1	805	2500	644	2000	919
1,25	7	16	28	5	6	6,3	9	7,71	340	2625	272	2100	920
1,25	12	16	28	5	6	6,3	9	13,2	340	4500	272	3600	921
1,25	7	16	42	8	6	6,3	9	3,67	716	2625	573	2100	922
1,25	12	16	42	8	6	6,3	9	6,29	716	4500	573	3600	923
1,5	10	20	33	5	7	6,3	9	16,1	336	5400	269	4320	924
1,5	15	20	33	5	7	6,3	9	24,1	336	8100	269	6480	925
1,5	10	20	52	8	7	6,3	9	7,64	706	5400	565	4320	926
1,5	15	20	52	8	7	6,3	9	11,5	706	8100	565	6480	927
2	12	24	43	5	8	8,4	12	35,9	312	11200	250	8960	928
2	20	24	43	5	8	8,4	12	59,8	312	18667	250	14933	929
2	12	24	68	8	8	8,4	12	16,9	663	11200	530	8960	930
2	20	24	68	8	8	8,4	12	28,2	663	18667	530	14933	931
2,5	15	28	48	5	10	10,4	15	79,5	265	21094	212	16875	932
2,5	25	28	48	5	10	10,4	15	132,5	265	35156	212	28125	933
2,5	15	28	76	8	10	10,4	15	34,2	617	21094	494	16875	934
2,5	25	28	76	8	10	10,4	15	57	594	33854	475	27083	935
3	18	32	60	5	12	12,5	18	139,2	262	36450	210	29160	936
3	30	32	60	5	12	12,5	18	232	262	60750	210	48600	937
3	18	32	90	8	12	12,5	18	62,8	581	36450	465	29160	938
3	30	32	90	8	12	12,5	18	104,6	581	60750	465	48600	939

CONSTANT FORCE SPRINGS

SCF



The constant force spring consists of strip material, which has been shaped and pre-tensioned into a tightly wound roll. The spring is used in a linear movement and produces almost constant force throughout its deflection. Constant force springs can be fitted in a number of ways and extended partly or completely. There is practically no limit on extension speed and acceleration.

Spring life

The life of the spring is determined by the relation between the diameter of the spring and the thickness of the material. See information for the relevant item. For applications demanding a higher number of oscillations, the spring must be changed once the recommended number of oscillations has been reached. Spring life is not time-dependent, it is only determined by the number of oscillations made.

Fitting

Fitting can be done in a number of ways. During long extensions, the spring must be laterally guided to prevent movement in a sideways direction. Suitable play on each side is 0.5–1.5 mm.

When fitting on a bearing or conduit, the spring can be located using its own force providing that sufficient strip length remains on the bearing. If there is no operating extension limit in the application, we recommend that a screw or rivet is used to secure the inner end of the spring.

If the spring is fitted as shown in figures D or E, a low friction material must be used.

Fitting on a bearing and conduit

Our standard springs and slide bearings are normally supplied separately. Fitting is done by loosening the outer end of the spring and winding it onto the bearing (securing it if necessary), after which the complete spring is wound onto the bearing.

Fitting example

A. Shaft fitting

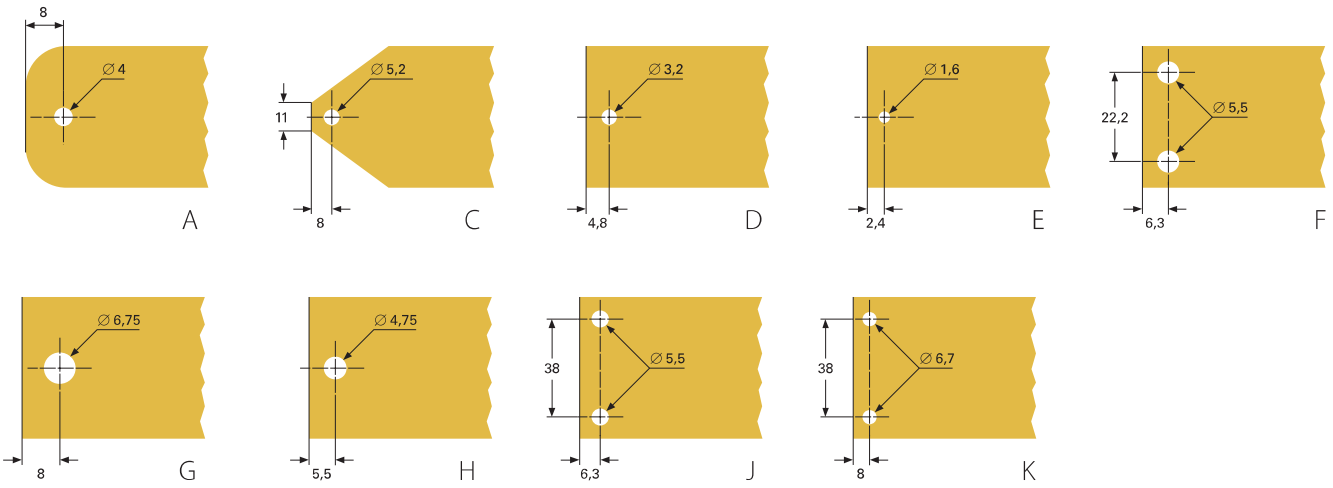
B. Bearing or conduit

C. Bearing or conduit with inner fixing

D. Fitting in a location pocket

E. Fitting to a movable device.

Hole types (on both ends)



Application methods

Please note the maximum extended length decreases when two springs are installed as per figures 2, 3 and 5.

1. Single assembly

2. Dual assembly

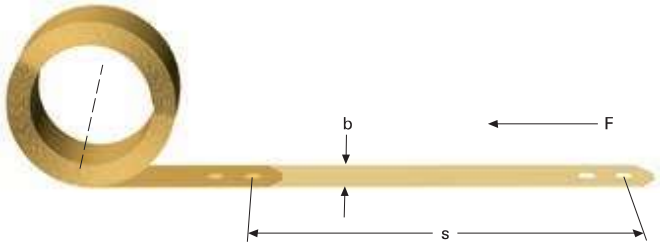
3. Dual front to front

4. Dual back to back

5. Dual dual back to back

CONSTANT FORCE SPRINGS

SCF



All dimensions are in mm

t = Strip thickness
b = Strip width
s = Travel
D_y = Outer diameter without bearing*
D_i = Inner diameter without bearing*
D_1 = Outer diameter fitted on slide bearing
D_2 = Inner diameter fitted on slide bearing (recommended approx. outer dimension of bearing)
F = Spring force in Newtons
A = Material length

** May vary in order to comply with the force specification.*

Material: Stainless steel EN 10270-3-1.4310

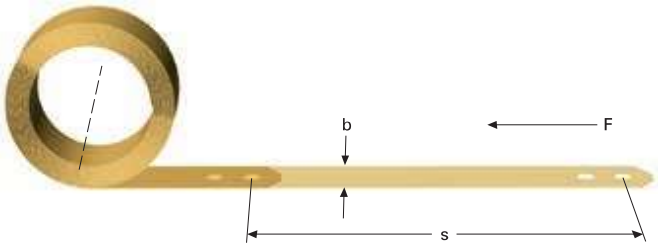
Approximate life: 15 000 oscillations

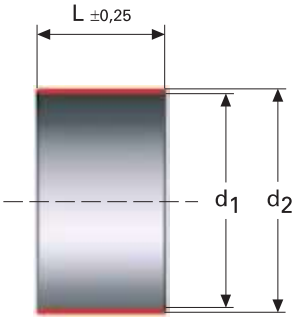
1 kp = 9.80665 Newtons, 1 Newton = 0.10197 kp

Constant force springs for general use based on imperial dimensions. These springs are normally fitted on bearings. If the spring is to be placed directly onto a shaft, the chosen shaft diameter must afford sufficient play on the inner diameter to prevent the spring from locking onto the shaft.

t	b	s	D_i	D_y	D_1	D_2	F	A	Bore type	Cat.no
0,051	3,175	167	4,83	6,18	6,91	5,79	0,46	203	E	8036
0,076	3,175	252	7,24	9,25	10,3	8,69	0,7	305	E	8037
0,051	6,35	167	4,83	6,18	6,91	5,79	0,93	203	E	8038
0,102	4,76	338	9,67	12,36	13,8	11,6	1,4	406	E	8039
0,076	7,94	252	7,24	9,25	10,3	8,69	1,7	305	E	8040
0,102	9,52	338	9,67	12,36	13,8	11,6	2,8	406	D	8041
0,127	9,52	422	12,06	15,42	17,3	14,5	3,5	508	D	8042
0,127	12,7	422	12,06	15,42	17,3	14,5	4,7	508	D	8043
0,152	12,7	505	14,53	18,54	20,7	17,4	5,6	610	A	8044
0,152	15,88	505	14,53	18,54	20,7	17,4	7	610	A	8045
0,203	14,29	673	19,38	24,73	27,7	23,2	8,4	813	A	8046
0,254	15,88	844	24,23	30,92	34,5	29	11,7	1016	A	8047
0,254	19,05	844	24,23	30,92	34,5	29	14	1016	A	8048
0,305	19,05	1011	28,96	37,02	41,4	34,8	16,9	1219	A	8049
0,356	19,05	1179	33,78	43,18	48,3	40,6	19,6	1422	A	8070
0,305	25,4	1011	28,96	37,02	41,4	34,8	22,5	1219	C	8071
0,356	25,4	1179	33,78	43,18	48,3	40,6	26,3	1422	C	8072
0,406	25,4	1340	38,86	49,54	55,4	46,5	30	1626	C	8073
0,456	25,4	1515	43,43	55,48	62	52	34	1829	C	8074
0,356	38,1	1179	33,78	43,18	48,3	40,6	40	1422	F	8075
0,305	50,8	1011	28,96	37,02	41,4	34,8	45	1219	F	8076
0,457	38,1	1516	43,43	55,51	62	52	50	1829	F	8077
0,406	50,8	1340	38,86	49,54	55,4	46,5	60	1626	F	8078
0,635	38,1	2103	60,45	77,21	86,4	72,7	71	2540	G	8079
0,559	50,8	1852	53,09	67,86	76	63,7	83	2235	K	8080
0,635	50,8	2100	60,45	77,21	86,4	72,7	94	2540	K	8081

Series C is a programme based on the metric standard adapted for standard slide bearings. Springs can be supplied with or without the bearing. See the following pages. Please note, the bearing is supplied unassembled.





Spring

All dimensions are in mm

t = Strip thickness
b = Strip width
s = Travel
D_y = Outer diameter without bearing*
D_i = Inner diameter without bearing*
D_1 = Outer diameter fitted on slide bearing
D_2 = Inner diameter fitted on slide bearing
F = Spring force in Newtons ±10%
A = Material length

** May vary in order to comply with the force specification.*

Material: EN10270-3-1.4310

Slide bearing

All dimensions are in mm

d_1 = Internal diameter
d_2 = External diameter
L = Length
N_C = Life in approximate number of load cycles

Recommended shaft dimension: d_1

Material: SBT, lubrication free three-layer bearing comprising a steel case, a sintered middle layer of bronze and a sliding layer of PTFE.

1 kp = 9.80665 Newtons, 1 Newton = 0.10197 kp

t	b	s	D_y	D_i	D_1	D_2	F	A	Type of hole	d_1	d_2	L	N_c	Spring Cat. no	Bearing Cat.no
0,1	10	300	12,3	10	14	12	2,8	360	D	10	12	10	15000	1000	1042
0,1	10	300	15,9	14	17,7	16	1,6	400	D	12	16	10	40000	1001	1043
0,15	15	500	17,9	14	20,4	17	6,2	600	D	15	17	15	15000	1002	1044
0,15	15	500	22,3	19	25,8	23	4,4	640	D	20	23	15	40000	1003	1045
0,15	20	500	17,9	14	20,4	17	8,4	600	H	15	17	20	15000	1004	1046
0,15	20	500	22,3	19	25,8	23	5,5	640	H	20	23	20	40000	1005	1047
0,2	15	700	24,3	19	27,6	23	9,3	830	D	20	23	15	15000	1006	1048
0,2	15	700	33,1	29	37,6	34	4,3	900	D	30	34	15	40000	1007	1049
0,2	20	700	24,3	19	27,6	23	12,3	830	H	20	23	20	15000	1008	1047
0,2	20	700	33,1	29	37,6	34	5,7	900	H	30	34	20	40000	1009	1050
0,2	25	700	24,3	19	27,6	23	15,4	830	H	20	23	25	15000	1010	1051
0,2	25	700	33,1	29	37,6	34	7,1	900	H	30	34	25	40000	1011	1052
0,25	15	1000	31,2	24	34,5	28	11,5	1170	D	25	28	15	15000	1012	1053
0,25	15	1000	39	33	44,3	39	6,1	1250	D	35	39	15	40000	1013	1054
0,25	20	1000	31,2	24	34,5	28	15,4	1170	H	25	28	20	15000	1014	1055
0,25	20	1000	39	33	44,3	39	8,1	1250	H	35	39	20	40000	1015	1056
0,25	25	1000	31,2	24	34,5	28	19,2	1170	H	25	28	25	15000	1016	1057
0,25	25	1000	39	33	44,3	39	10,1	1250	H	35	39	25	40000	1017	1058

CONSTANT FORCE SPRINGS

SCF

t	b	s	D_y	D_i	D_1	D_2	F	A	Type of hole	d_1	d_2	L	N_c	Spring Cat. no	Bearing Cat.no
0,3	20	1000	37,4	30	42,4	36	17	1200	H	32	36	20	15000	1018	1059
0,3	20	1000	48	42	55,2	50	9,8	1270	H	45	50	20	40000	1019	1060
0,3	25	1000	35,8	28	40,7	34	21,3	1200	H	30	34	25	15000	1020	1052
0,3	25	1000	48	42	55,2	50	12,3	1270	H	45	50	25	40000	1021	1061
0,3	30	1000	37,4	30	42,4	36	25,5	1200	G	32	36	30	15000	1022	1062
0,3	30	1000	48	42	55,2	50	14,7	1270	G	45	50	30	40000	1023	1063
0,4	25	1500	48,8	37	54,4	44	33,7	1850	G	40	44	25	15000	1024	1064
0,4	25	1500	64,8	56	72,8	65	16,3	1900	G	60	65	30	40000	1025	1065
0,4	30	1500	48,8	37	54,4	44	40,4	1850	G	40	44	30	15000	1026	1066
0,4	30	1500	64,8	56	72,8	65	19,5	1900	G	60	65	30	40000	1027	1065
0,4	40	1500	48,8	37	54,4	44	54	1850	F	40	44	40	15000	1028	1067
0,4	40	1500	65	56	73	65	26	1950	F	60	65	40	40000	1029	1068
0,5	30	1500	58,6	46	66	55	51,2	1900	G	50	55	30	15000	1030	1069
0,5	30	1500	75,1	65	88,6	80	27,9	2000	G	75	80	30	40000	1031	1070
0,5	40	1500	58,6	46	66	55	68,3	1900	F	50	55	40	15000	1032	1071
0,5	40	1500	75,1	65	88,6	80	37,1	2000	F	75	80	40	40000	1033	1072
0,5	50	1500	58,6	46	66	55	85,3	1900	F	50	55	50	15000	1034	1073
0,5	50	1500	75,1	65	88,6	80	46,5	2000	F	75	80	50	40000	1035	1074
0,6	40	2000	69,2	53	78,9	65	100	2400	F	60	65	40	15000	1036	1068
0,6	40	2000	100,2	88	115,6	105	35,7	2700	F	100	105	40	40000	1037	1075
0,6	50	2000	69,2	53	78,9	65	125,2	2400	F	60	65	50	15000	1038	1076
0,6	50	2000	100,2	88	115,6	105	44,6	2700	F	100	105	50	40000	1039	1077
0,6	60	2000	69,2	53	78,9	65	150,2	2400	K	60	65	60	15000	1040	1078
0,6	60	2000	100,2	88	115,6	105	53,5	2700	K	100	105	60	40000	1041	1079