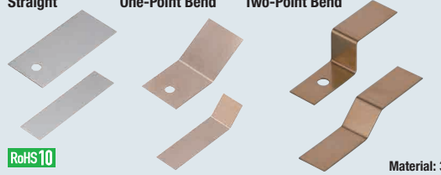
Flat Springs

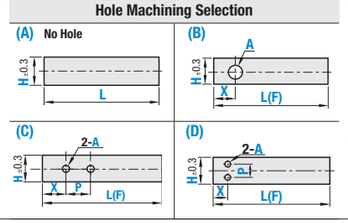
Straight / One-Point Bend / Two-Point Bend



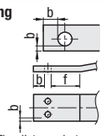
T	Tolerance
0.2	±0.02
0.3	±0.025
0.4	
0.5	±0.035
0.6	
0.7	±0.040
0.8	

Material: 304 Stainless Steel-CSP

Hole Machining Selection



Machining Limits



! b≥1.5 The distance between the hole and the edge should be 1.5 mm or more. f≥3 The distance between holes and bends should be 3 mm or more.

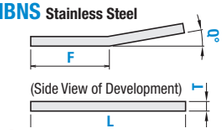
IBN Stainless Steel

Part Number Type	Shape	T Selection	H	L 1 mm Increment	A Selection	0.5 mm Increment X	0.5 mm Increment P
IBN	A B C D	0.2 0.3 0.4 0.5	6	20–300	2.0 2.5 3.0 3.5 4.5 5.5 6.5 9.0	$X \leq \frac{L}{2}$	A+1.5≤P
		0.2 0.3 0.4 0.5	7				
		0.2 0.3 0.4 0.5	8				
		0.3 0.4 0.5 0.6	9				
		0.3 0.4 0.5 0.6	10				
		0.3 0.4 0.5 0.6	11				
		0.3 0.4 0.5 0.6	12				
		0.3 0.4 0.5 0.6	13				
		0.4 0.5 0.6 0.7	14				
		0.4 0.5 0.6 0.7	15				
		0.4 0.5 0.6 0.7	18				
		0.5 0.6 0.7 0.8	21				
		0.5 0.6 0.7 0.8	25				

Part Number Example

Part Number	Type	Shape	T	H	L	A	X	P
IBN	A		T0.2	H8	L20			
IBN	C		T0.2	H8	L20	A3.5	X5	P10

IBNS Stainless Steel



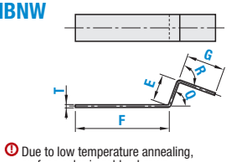
! Due to low temperature annealing, surface color is golden brown.

Part Number Type	Shape	T Selection	H	L 1 mm Increment	B C D Only A Selection	0.5 mm Increment B C D Only X	0.5 mm Increment C D Only P	F	5° Increment Q
IBNS	A B C D	0.2 0.3 0.4 0.5	6	20–300	2.0 2.5 3.0 3.5 4.5 5.5 6.5 9.0	$\frac{A}{2}+2 \leq X \leq \frac{L}{2}$	A+1.5≤P	3≤F≤L-3	10–90
		0.2 0.3 0.4 0.5	7						
		0.2 0.3 0.4 0.5	8						
		0.3 0.4 0.5 0.6	9						
		0.3 0.4 0.5 0.6	10						
		0.3 0.4 0.5 0.6	11						
		0.3 0.4 0.5 0.6	12						
		0.3 0.4 0.5 0.6	13						
		0.4 0.5 0.6 0.7	14						
		0.4 0.5 0.6 0.7	15						
		0.4 0.5 0.6 0.7	18						
		0.5 0.6 0.7 0.8	21						
		0.5 0.6 0.7 0.8	25						

Part Number Example

Part Number	Type	Shape	T	H	L	A	X	P	F	Q
IBNS	B		T0.6	H15	L200	A3.5	X20		F50	Q30
IBNS	C		T0.3	H12	L40	A3.5	X5	P10	F20	Q45

IBNW



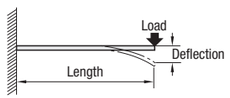
! Due to low temperature annealing, surface color is golden brown.

Part Number Type	Shape	T Selection	H	1 mm Increment F	1 mm Increment E	1 mm Increment G	5° Increment Q	5° Increment R	B C D Only A Selection	C D Only 0.5 mm Increment X	C D Only P
IBNW	A B C D	0.2 0.3 0.4 0.5	6	10–50	10–50	10–50	5–90	5–90	2.0 2.5 3.0 3.5 4.5 5.5 6.5 9.0	$\frac{A}{2}+2 \leq X \leq F-A-(P)$	A+1.5≤P
		0.2 0.3 0.4 0.5	7								
		0.2 0.3 0.4 0.5	8								
		0.3 0.4 0.5 0.6	9								
		0.3 0.4 0.5 0.6	10								
		0.3 0.4 0.5 0.6	11								
		0.3 0.4 0.5 0.6	12								
		0.3 0.4 0.5 0.6	13								
		0.4 0.5 0.6 0.7	14								
		0.4 0.5 0.6 0.7	15								
		0.4 0.5 0.6 0.7	18								
		0.5 0.6 0.7 0.8	21								
		0.5 0.6 0.7 0.8	25								

Part Number Example

Part Number	Type	Shape	T	H	F	E	G	Q	R	A	X	P
IBNW	B		T0.6	H10	F35	E10	G15	Q10	R90	A3.0	X5	
IBNW	C		T0.5	H15	F50	E20	G40	Q90	R85	A3.5	X7	P15

Simple Force Calculation Method (Reference)

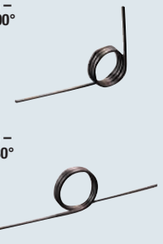


Formula of Spring Constant
Spring Constant (N/mm) = $\frac{Ebh^3}{4L^3}$
Load Formula
Load (N) = Spring Constant x Deflection

E=186000
b = Plate width
h = Plate thickness
L = Length

Torsion Springs

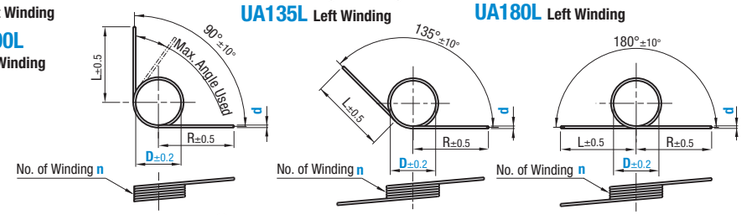
Right Winding 90° / Left Winding 180°



Arm Angle 90°
UA90R Right Winding
UA90L Left Winding

Arm Angle 135°
UA135R Right Winding
UA135L Left Winding

Arm Angle 180°
UA180R Right Winding
UA180L Left Winding



*The above drawing is right winding type.

! Torsion springs should compressed in the "closing" direction.

Material: 304 Stainless Steel-WPB

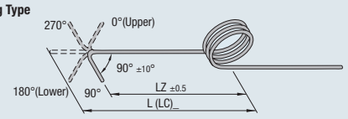
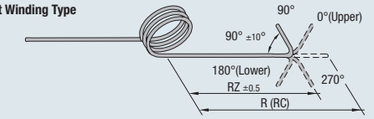
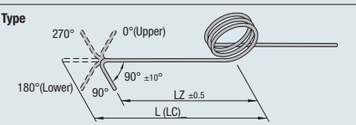
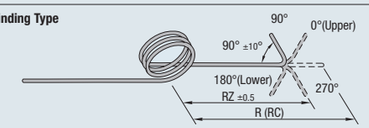
Part Number Type	Inner Diameter D	No. of Winding n	Wire Dia. d	Arm Length L / R	Spring Constant (Torque) Nmm/deg Arm Angle 90°	Spring Constant (Torque) Nmm/deg Arm Angle 135°	Spring Constant (Torque) Nmm/deg Arm Angle 180°	Max. Angle Used deg (deg) Arm Angle 90°	Max. Angle Used deg (deg) Arm Angle 135°	Max. Angle Used deg (deg) Arm Angle 180°
Arm Angle 90° UA90R Right Winding UA90L Left Winding	2	2	0.2	20	0.0115	0.0119	0.0124	41	40	36
			0.3		0.0563	0.0586	0.0611	26	25	23
		3	0.2		0.0088	0.0090	0.0093	59	58	56
			0.3		0.0428	0.0441	0.0455	38	36	35
		4	0.3		0.0345	0.0354	0.0363	52	50	47
			0.4		0.1054	0.1080	0.1108	38	36	34
		5	0.3		0.0289	0.0295	0.0302	61	60	58
			0.4		0.0882	0.0900	0.0920	46	45	43
	3	2	0.3	30	0.0387	0.0403	0.0420	40	38	36
			0.4		0.1199	0.1248	0.1301	30	27	25
		3	0.3		0.0295	0.0304	0.0314	56	54	52
			0.4		0.0912	0.0940	0.0970	42	40	39
		4	0.4		0.0736	0.0755	0.0774	55	53	51
			0.5		0.1756	0.1799	0.1845	44	42	41
		5	0.4		0.0617	0.0630	0.0643	71	68	66
			0.5		0.1471	0.1501	0.1533	54	53	51
Arm Angle 135° UA135R Right Winding UA135L Left Winding	4	2	0.4	40	0.0918	0.0955	0.0996	39	37	34
			0.5		0.2206	0.2296	0.2394	29	28	27
		3	0.4		0.0700	0.0722	0.0744	56	54	52
			0.5		0.1680	0.1732	0.1787	42	41	40
		4	0.5		0.1357	0.1390	0.1425	57	54	52
			0.6		0.2763	0.2831	0.2903	48	47	45
		5	0.5		0.1138	0.1161	0.1185	69	67	65
			0.6		0.2315	0.2363	0.2413	60	59	58
Arm Angle 180° UA180R Right Winding UA180L Left Winding	5	2	0.5	50	0.1793	0.1866	0.1944	39	36	34
			0.6		0.3672	0.3821	0.3983	31	30	27
		3	0.5		0.1368	0.1409	0.1454	55	52	51
			0.6		0.2797	0.2883	0.2974	47	44	42
		4	0.6		0.2259	0.2314	0.2373	60	58	56
			0.8		0.6936	0.7108	0.7289	42	41	40
		5	0.6		0.1894	0.1933	0.1974	75	73	71
			0.8		0.5811	0.5931	0.6056	54	53	52
! (Spring constant is a reference value when arm length is cut to be L/2, R/2.) 1N=0.101972kgf 1deg = 1°(Angle)	6	2	0.6	60	0.3099	0.3224	0.3360	37	36	34
			0.8		0.9590	0.9981	1.0406	26	25	24
		3	0.6		0.2363	0.2436	0.2512	56	52	50
			0.8		0.7299	0.7523	0.7762	38	36	35
		4	0.8		0.5891	0.6037	0.6190	50	48	47
			1.0		1.4045	1.4394	1.4760	42	40	39
		5	0.8		0.4939	0.5041	0.5147	63	61	60
			1.0		1.1765	1.2008	1.2262	51	50	49

Part Number Example

Part Number	n	d
UA90R4	3	0.5

Part Number Alterations

Part Number	n	d	(LC / RC / LBC / RBC)
UA90R4	3	0.5	LC12–RC15–LBC90–LZ5

Alterations Code	Arm Cut LC	Arm Cut RC	Bend Left Arm LBC	Bend Right Arm RBC
Spec.				
				
	Cuts arm down to the length of LC or RC. ! LC≥3, RC≥3 1mm Increment **Ordering Code:** LC12		LBC: Specifies the angle (refer to the above drawing) ! Select from LBC0, LBC90, LBC180 and LBC270. LZ: Specifies the position (1mm increment) ! LZ≥3L-LZ≥3 **Ordering Code:** LBC90–LZ10	RBC: Specifies the angle (refer to the above drawing) ! Select from RBC0, RBC90, RBC180 and RBC270. RZ: Specifies the position (1mm increment) ! RZ≥3R-RZ≥3 **Ordering Code:** RBC90–RZ10