



Flat Springs

Straight / One-Point Bend / Two-Point Bend

Springs / Shock Absorbers / Gas Springs

Flat Springs – Straight

Flat Springs – One-Point Bend

Flat Springs – Two-Point Bend

T	Tolerance
0.2	±0.02
0.3	±0.025
0.4	±0.03
0.5	±0.035
0.6	±0.04
0.7	±0.045
0.8	±0.05

Hole Machining Selection

(A) No Hole

(B) Hole

(C) 2-Holes

(D) 2-Holes

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
IBNK Tool Steel

Part Number Type	Shape	T Selection					H	L 1 mm Increment	A Selection	0.5 mm Increment	
		0.2	0.3	0.4	0.5	0.6				X	P
IBNK	A	0.2	0.3	0.4	0.5	0.6	6	20-300	2.0	X ≤ L/2	A+1.5 ≤ P
		0.2	0.3	0.4	0.5	0.6	7				
		0.2	0.3	0.4	0.5	0.6	8				
		0.3	0.4	0.5	0.6	0.7	9				
		0.3	0.4	0.5	0.6	0.7	10				
		0.3	0.4	0.5	0.6	0.7	11				
		0.3	0.4	0.5	0.6	0.7	12				
		0.3	0.4	0.5	0.6	0.7	13				
		0.4	0.5	0.6	0.7	0.8	14				
		0.4	0.5	0.6	0.7	0.8	15				
		0.4	0.5	0.6	0.7	0.8	18				
		0.5	0.6	0.7	0.8	0.9	21				
		0.5	0.6	0.7	0.8	0.9	25				

Part Number Example

IBN A - 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		0.5 mm Increment		F	Q
		0.2	0.3	0.4	0.5	0.6			A Selection	X	P			
IBNS	A	0.2	0.3	0.4	0.5	0.6	6	20-300	2.0	A/2 + 2 ≤ X ≤ L/2	A+1.5 ≤ P	3 ≤ F ≤ L-3	10-90	
		0.2	0.3	0.4	0.5	0.6	7							
		0.2	0.3	0.4	0.5	0.6	8							
		0.3	0.4	0.5	0.6	0.7	9							
		0.3	0.4	0.5	0.6	0.7	10							
		0.3	0.4	0.5	0.6	0.7	11							
		0.3	0.4	0.5	0.6	0.7	12							
		0.3	0.4	0.5	0.6	0.7	13							
		0.4	0.5	0.6	0.7	0.8	14							
		0.4	0.5	0.6	0.7	0.8	15							
		0.4	0.5	0.6	0.7	0.8	18							
		0.5	0.6	0.7	0.8	0.9	21							
		0.5	0.6	0.7	0.8	0.9	25							

Part Number Example

IBNS B - T0.6 - H15 - L200 - A3.5 - X20 - F50 - Q30

IBNW

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

Part Number Type	Shape	T Selection					H	1 mm Increment			5° Increment		B C D Only		C D Only	
		0.2	0.3	0.4	0.5	0.6		F	E	G	Q	R	A Selection	X	P	
IBNW	A	0.2	0.3	0.4	0.5	0.6	6	10-50	10-50	10-50	5-90	5-90	2.0	A/2 + 2 ≤ X	A+1.5 ≤ P	
		0.2	0.3	0.4	0.5	0.6	7									
		0.2	0.3	0.4	0.5	0.6	8									
		0.3	0.4	0.5	0.6	0.7	9									
		0.3	0.4	0.5	0.6	0.7	10									
		0.3	0.4	0.5	0.6	0.7	11									
		0.3	0.4	0.5	0.6	0.7	12									
		0.3	0.4	0.5	0.6	0.7	13									
		0.4	0.5	0.6	0.7	0.8	14									
		0.4	0.5	0.6	0.7	0.8	15									
		0.4	0.5	0.6	0.7	0.8	18									
		0.5	0.6	0.7	0.8	0.9	21									
		0.5	0.6	0.7	0.8	0.9	25									

Part Number Example

IBNW B - T0.6 - H10 - F35 - E10 - G15 - Q10 - R90 - A3.0 - X5

Simple Force Calculation Method (Reference)

Formula of Spring Constant: $E = 186000$
 Spring Constant (N/mm) = $\frac{Eb^3}{4L^3}$
 Load Formula: $L = \text{Length}$
 Load (N) = Spring Constant x Deflection

Torsion Springs

Right Winding 90° / Left Winding 180°

Springs / Shock Absorbers / Gas Springs

Torsion Springs – Right Winding 90°

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			Max. Angle Used deg (deg)				
					Arm Angle 90°	Arm Angle 135°	Arm Angle 180°	Arm Angle 90°	Arm Angle 135°	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		
			0.4		0.0088	0.0090	0.0093	59	58	56		
			0.5		0.0428	0.0441	0.0455	38	36	35		
			0.6		0.0345	0.0354	0.0363	52	50	47		
	Arm Angle 135° UA135R Right Winding UA135L Left Winding	3	2	0.2	30	0.1054	0.1080	0.1108	38	36	34	
				0.3		0.0289	0.0295	0.0302	61	60	58	
				0.4		0.0882	0.0900	0.0920	46	45	43	
				0.5		0.0387	0.0403	0.0420	40	38	36	
				0.6		0.1199	0.1248	0.1301	30	27	25	
		Arm Angle 180° UA180R Right Winding UA180L Left Winding	4	2	0.2	40	0.0918	0.0955	0.0996	39	37	34
					0.3		0.2206	0.2296	0.2394	29	28	27
					0.4		0.0700	0.0722	0.0744	56	54	52
					0.5		0.1680	0.1732	0.1787	42	41	40
					0.6		0.1357	0.1390	0.1425	57	54	52
Arm Angle 90° UA90R Right Winding UA90L Left Winding			5	3	0.2	50	0.2763	0.2831	0.2903	48	47	45
					0.3		0.1138	0.1161	0.1185	69	67	65
					0.4		0.2315	0.2363	0.2413	60	59	58
					0.5		0.1793	0.1866	0.1944	39	36	34
					0.6		0.3672	0.3821	0.3983	31	30	27
	Arm Angle 135° UA135R Right Winding UA135L Left Winding		6	3	0.2	60	0.1368	0.1409	0.1454	55	52	51
					0.3		0.2797	0.2883	0.2974	47	44	42
					0.4		0.2259	0.2314	0.2373	60	58	56
					0.5		0.6936	0.7108	0.7289	42	41	40
					0.6		0.1894	0.1933	0.1974	75	73	71
		Arm Angle 180° UA180R Right Winding UA180L Left Winding	7	4	0.2	70	0.5811	0.5931	0.6056	54	53	52
					0.3		0.3099	0.3224	0.3360	37	36	34
					0.4		0.9590	0.9981	1.0406	26	25	24
					0.5		0.2363	0.2436	0.2512	56	52	50
					0.6		0.7299	0.7523	0.7762	38	36	35
Arm Angle 90° UA90R Right Winding UA90L Left Winding			8	5	0.2	80	0.5891	0.6037	0.6190	50	48	47
					0.3		1.4045	1.4394	1.4760	42	40	39
					0.4		0.4939	0.5041	0.5147	63	61	60
					0.5		1.1765	1.2008	1.2262	51	50	49

Part Number Example

UA90R4 - 3 - 0.5

Part Number Alterations

UA90R4 - 3 - 0.5 - LC12-RC15-LBC90-LZ5

Alterations Code	Arm Cut		Bend Left Arm		Bend Right Arm			
	LC	RC	LBC	RBC	RBC	RBC		
Spec.	Right Winding Type		Right Winding Type		Right Winding Type			
	Left Winding Type		Left Winding Type		Left Winding Type			
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		

