

MUBEA

DISC SPRINGS

INDUSTRY

Mubea
TELLERFEDERN GMBH

The name Mubea is internationally synonymous with spring technology of the highest standard. Our disc springs set the pattern for the global market as they are produced with professional expertise, modern quality assurance, and decades of experience.

For more than five decades, Mubea has specialized in the production of high quality disc springs. They are used globally in a wide variety of applications throughout numerous industrial markets, from subsea actuators 3,000m under

the sea to satellites 36,000km in space. Mubea also specializes in the production of related components including complex fine blanked parts.

Our headquarters is located in Daaden, Germany. In addition to a highly effective production, the engineering department, distribution center, prototype construction, and our internal tool manufacturing are all on site.





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THE DISC SPRING

Disc springs are shallow conical rings that are loaded in an axial direction. Depending on the specific application either static or dynamic, they are identified with an outer diameter (D_e), inner diameter (D_i), material thickness (t), and overall height (L_o).

Disc springs have the following characteristics:

- High load capacity with a small spring deflection
- High space utilization when compared with other spring types
- Modular elements for various load characteristics

/ DIN Classification

Mubea produces disc springs according to DIN EN 16983 (DIN2093). These springs fulfill the highest technical requirements regarding material characteristics, surface quality, and production processes.

/ Increased Lifetime Performance

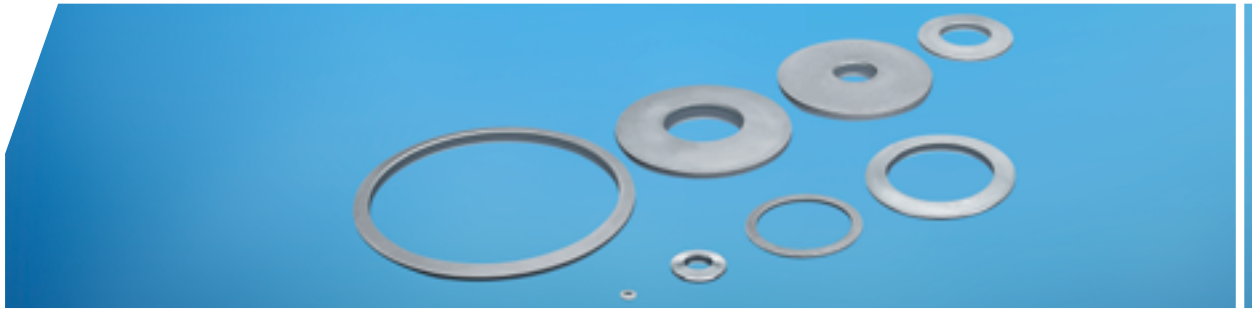
All Mubea disc springs thicker than 0.5 mm are produced utilizing a shot peening process. This process introduces residual compressive stresses that lead to an increased lifetime exceeding the DIN requirements.

/ Disc Spring Materials

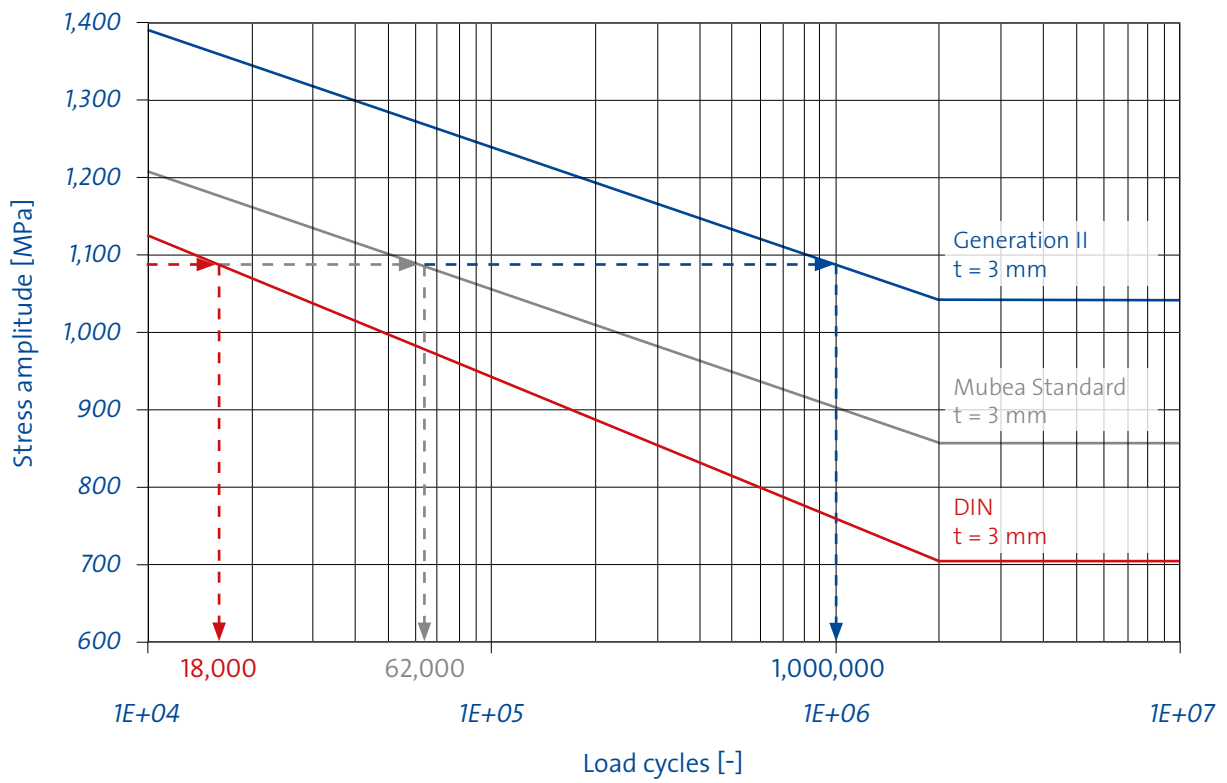
For standard applications, the spring material 51CrV4 (SAE 6150) is used. Stainless spring materials with nickel base and beryllium alloys are offered in special cases where the application requires a high corrosion resistance and/or specific temperature demands.

/ Corrosion Prevention

The standard corrosion protection for disc springs are “phosphating” and “oiling”. We are able to offer various alternatives such as: electrolytic, mechanic zinc plate (chromating), Delta Tone/Delta Seal, Geomet, and chemical nickel plating.



WÖHLER (SN) CURVE



DEVELOPMENT

Using decades of engineering experience combined with customer feedback we are able to innovate today for our products of tomorrow.

/ Generation II

Generation II technology significantly improves the disc springs fatigue life. The size and weight can also be optimized as an additional advantage.

/ Tolerances

Our innovation process derives from our customer's technical requirements.

For example, we can produce disc springs with tighter diameter tolerances, which allows higher spindle speeds for tool clamping systems.

Our complete in house production allows us to manufacture disc springs up to 800mm outer diameter.

Advantages of using GEN II disc spring stacks



- *The outer diameter can be reduced up to 25 %*
- *The installation space can be reduced up to 33 %*
- *The lifetime can be increased up to 10 times*



MUBEA PRODUCTION PROCESS

It is the Mubea philosophy to implement vertical integration to control the quality of our disc springs throughout the entire process while meeting tight tolerances. The majority of the steel strip we use is produced in our own cold rolling mill with our most modern technology.

/ Fine Blanking

Disc springs with material thickness between 1 mm and 6 mm are generally fine blanked. This process improves the fatigue life of the spring due to smoother edge surfaces.

/ Heat Treatment

The heat treatment of disc springs is a fundamental production step for achieving the required spring characteristic. Depending upon the spring dimensions, modern continuous feed furnaces or chamber ovens are available. We have austempering and martensite processes available.

1 Hot-rolled strip



2 Stamping / Fine blanking / Plasma cutting



3 Annealing*



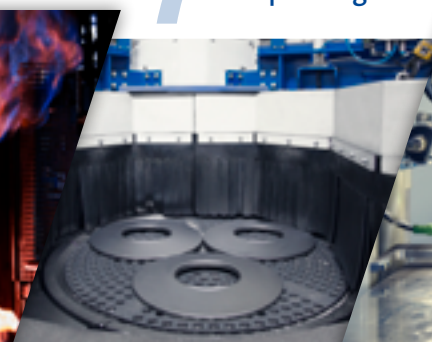
4 Forming



6 Hardening



7 Shot-peening



8 Pre-setting





/ Pre-setting

Set loss can occur due to high stresses of the spring. In order to reduce the risk of set loss, Mubea pre-sets all disc springs at least to the flat position. This process greatly improves the quality of the spring and is a requirement of the DIN standard.

/ Phosphating

The standard corrosion protection, zinc phosphating and oiling, is applied with a fully automated continuous flow process. This guarantees uniform coating thickness at a reasonable cost.

/ Delivery of Disc Spring Stacks

Mubea is able to deliver pre-assembled stacks, and if desired install these stacks in the final assembly device. We can also manufacture these assembly devices per the customer's request. Test certificates (e.g. 100 % load testing) or certificates according to DIN EN 10204 (2.2/2.3/3.1B) can also be provided upon request.

5 Machining*



/ Two Production Processes

* Steps for production of disc springs with thickness over 6 mm

9 Phosphating



10 Stacking



11 Packaging

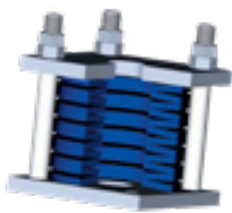


APPLICATION EXAMPLES

Due to their versatility, disc springs are used in many areas of machine and plant engineering, oil & gas, aviation, aerospace, and the automotive industries.

Customized solutions on the basis of our vast experience is our specialty.

What is your challenge?



Pre-assembled spring stacks



Energy storage



Cableway grips



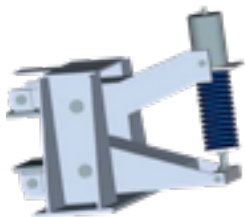
Piston return springs



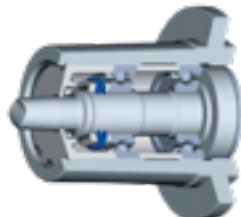
Slip clutches



Valves



Spring-actuated brakes



Backflash compensation



Overload clutches



DIN DISC SPRINGS IN STOCK

Ref. No.	Dimensions (mm)			Ref. No.	Dimensions (mm)		
	De	Di	t		De	Di	t
170001	8	3.2	0.30	170040	16	8.2	0.90
170002	8	3.2	0.40	170041	18	6.2	0.40
170003	8	3.2	0.50	170042	18	6.2	0.50
170005	8	4.2	0.30	170043	18	6.2	0.60
170006	8	4.2	0.40	170044	18	6.2	0.70
170007	10	3.2	0.30	170045	18	6.2	0.80
170008	10	3.2	0.40	170046	18	8.2	0.70
170009	10	3.2	0.50	170047	18	8.2	0.80
170010	10	4.2	0.40	170048	18	8.2	1.00
170011	10	4.2	0.50	170049	18	9.2	0.45
170012	10	4.2	0.60	170050	18	9.2	0.70
170014	10	5.2	0.40	170051	18	9.2	1.00
170015	10	5.2	0.50	170052	20	8.2	0.50
170016	12	4.2	0.40	170053	20	8.2	0.60
170017	12	4.2	0.50	170054	20	8.2	0.70
170018	12	4.2	0.60	170055	20	8.2	0.80
170019	12	5.2	0.50	170056	20	8.2	0.90
170020	12	5.2	0.60	170057	20	8.2	1.00
170021	12	6.2	0.50	170058	20	10.2	0.40
170022	12	6.2	0.60	170059	20	10.2	0.50
170023	12.5	6.2	0.35	170060	20	10.2	0.80
170024	12.5	6.2	0.50	170061	20	10.2	0.90
170025	12.5	6.2	0.70	170062	20	10.2	1.00
170026	14	7.2	0.35	170063	20	10.2	1.10
170027	14	7.2	0.50	170064	22.5	11.2	0.60
170028	14	7.2	0.80	170065	22.5	11.2	0.80
170029	15	5.2	0.40	180001	22.5	11.2	1.25
170030	15	5.2	0.50	170066	23	8.2	0.70
170031	15	5.2	0.60	170067	23	8.2	0.80
170032	15	5.2	0.70	170068	23	8.2	0.90
170033	15	6.2	0.50	170069	23	10.2	0.90
170034	15	6.2	0.60	170070	23	10.2	1.00
170035	15	6.2	0.70	170071	23	12.2	1.00
170036	15	8.2	0.70	180002	23	12.2	1.25
170037	15	8.2	0.80	180003	23	12.2	1.50
170038	16	8.2	0.40	170072	25	12.2	0.70
170039	16	8.2	0.60	170073	25	12.2	0.90

Ref. No.	Dimensions (mm)			Ref. No.	Dimensions (mm)		
	De	Di	t		De	Di	t
180004	25	12.2	1.50	170082	40	20.4	1.00
170074	28	10.2	0.80	180031	40	20.4	1.50
170075	28	10.2	1.00	180032	40	20.4	2.00
180005	28	10.2	1.25	180033	40	20.4	2.25
180006	28	10.2	1.50	180034	40	20.4	2.50
170076	28	12.2	1.00	180035	45	22.4	1.25
180007	28	12.2	1.25	180036	45	22.4	1.75
180008	28	12.2	1.50	180037	45	22.4	2.50
170077	28	14.2	0.80	180038	48	16.3	1.50
170078	28	14.2	1.00	180039	50	18.4	1.25
180009	28	14.2	1.25	180040	50	18.4	1.50
180010	28	14.2	1.50	180041	50	18.4	2.00
170079	31.5	16.3	0.80	180042	50	18.4	2.50
180011	31.5	16.3	1.25	180043	50	18.4	3.00
180012	31.5	16.3	1.50	180044	50	20.4	2.00
180013	31.5	16.3	1.75	180045	50	20.4	2.50
180014	31.5	16.3	2.00	180046	50	22.4	2.00
170080	34	12.3	1.00	180047	50	22.4	2.50
180015	34	12.3	1.25	180048	50	25.4	1.25
180016	34	12.3	1.50	180049	50	25.4	1.50
180017	34	14.3	1.25	180050	50	25.4	2.00
180018	34	14.3	1.50	180051	50	25.4	2.25
180019	34	16.3	1.50	180052	50	25.4	2.50
180020	34	16.3	2.00	180053	50	25.4	3.00
170081	35.5	18.3	0.90	180054	56	28.5	1.50
180021	35.5	18.3	1.25	180055	56	28.5	2.00
180022	35.5	18.3	2.00	180056	56	28.5	2.50
180023	40	14.3	1.25	180057	56	28.5	3.00
180024	40	14.3	1.50	180058	60	20.5	2.00
180025	40	14.3	1.75	180059	60	20.5	2.50
180026	40	14.3	2.00	180060	60	20.5	3.00
180027	40	16.3	1.50	180061	60	25.5	2.50
180028	40	16.3	1.75	180062	60	25.5	3.00
180029	40	16.3	2.00	180063	60	30.5	2.50
180030	40	18.3	2.00	180064	60	30.5	2.75
				180065	60	30.5	3.00
				180066	60	30.5	3.50
				180067	63	31	1.80



Ref. No.	Dimensions (mm)			Ref. No.	Dimensions (mm)		
	De	Di	t		De	Di	t
180068	63	31	2.50	180106*	100	41	4.00
180069	63	31	3.00	180107	100	41	5.00
180070	63	31	3.50	180108*	100	41	5.00
180071	70	24.5	3.00	180109	100	51	2.70
180072	70	24.5	3.50	180110	100	51	3.50
180073	70	25.5	2.00	180111	100	51	4.00
180074	70	30.5	2.50	180112*	100	51	4.00
180075	70	30.5	3.00	180113	100	51	5.00
180076	70	35.5	3.00	180114*	100	51	5.00
180077	70	35.5	3.50	180115	100	51	6.00
180078	70	35.5	4.00	180116*	100	51	6.00
180079*	70	35.5	4.00	190001	100	51	7.00
180080	70	40.5	4.00	180117	112	57	3.00
180081*	70	40.5	4.00	180118	112	57	4.00
180082	70	40.5	5.00	180119*	112	57	4.00
180083*	70	40.5	5.00	180120	112	57	6.00
180084	71	36	2.00	180121*	112	57	6.00
180085	71	36	2.50	180122	125	51	4.00
180086	71	36	4.00	180123*	125	51	4.00
180087*	71	36	4.00	180124	125	51	5.00
180088	80	30.5	2.50	180125*	125	51	5.00
180089	80	31	3.00	180126	125	51	6.00
180090	80	31	4.00	180127*	125	51	6.00
180091*	80	31	4.00	180128	125	61	5.00
180092	80	35.5	4.00	180129*	125	61	5.00
180093*	80	35.5	4.00	180130	125	61	6.00
180094	80	36	3.00	180131*	125	61	6.00
180095	80	41	2.25	190002	125	61	8.00
180096	80	41	3.00	180132	125	64	3.50
180097	80	41	4.00	180133	125	64	5.00
180098*	80	41	4.00	180134*	125	64	5.00
180099	80	41	5.00	180135	125	64	6.00
180100*	80	41	5.00	180136*	125	64	6.00
180101	90	46	2.50	190003	125	64	7.00
180102	90	46	3.50	190004	125	64	8.00
180103	90	46	5.00	180137	125	71	6.00
180104*	90	46	5.00	180138*	125	71	6.00
180105	100	41	4.00	190005	125	71	8.00

Ref. No.	Dimensions (mm)			Ref. No.	Dimensions (mm)		
	De	Di	t		De	Di	t
190006	125	71	10.00	190025	200	102	14.00
180139	140	72	3.80	190026	200	112	12.00
180140	140	72	5.00	190027	200	112	14.00
180141*	140	72	5.00	190028	200	112	16.00
190007	140	72	8.00	190029	225	112	6.50
180142	150	61	5.00	190030	225	112	8.00
180143*	150	61	5.00	190031	225	112	12.00
180144	150	61	6.00	190032	225	112	16.00
180145*	150	61	6.00	190033	250	102	10.00
190008	150	61	7.00	190034	250	102	12.00
180146	150	71	6.00	190035	250	127	7.00
180147*	150	71	6.00	190036	250	127	8.00
190009	150	71	8.00	190037	250	127	10.00
190010	150	81	8.00	190038	250	127	12.00
190011	150	81	10.00	190039	250	127	14.00
180148	160	82	4.30	190040	250	127	16.00
180149*	160	82	4.30				
180150	160	82	6.00				
180151*	160	82	6.00				
190012	160	82	10.00				
190013	160	82	11.00				
180152	180	92	4.80				
180153*	180	92	4.80				
180154	180	92	6.00				
180155*	180	92	6.00				
190014	180	92	10.00				
190015	180	92	13.00				
190016	200	82	8.00				
190017	200	82	10.00				
190018	200	82	12.00				
190019	200	92	10.00				
190020	200	92	12.00				
190021	200	92	14.00				
180156	200	102	5.50				
180157*	200	102	5.50				
190022	200	102	8.00				
190023	200	102	10.00				
190024	200	102	12.00				

De: Outer diameter

Di: Inner diameter

t: Material thickness

■ Group 1

□ Group 2

*Disc springs with contact surfaces and reduced thickness

■ Group 3



THE MUBEA GROUP

FACTS AND CORE COMPETENCIES

- Owner-operated family enterprise since 1916
- More than 12,000 employees worldwide
- Production, development, and distribution locations worldwide
- Vertical integration from raw material to the finished product
- Intern development of production processes

LOCATIONS





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