

2024版

MUBEA

DISC SPRINGS

INDUSTRY

慕贝尔碟形弹簧

大连罗德工程技术有限公司
上海罗德凯耘工程技术有限公司

始于2005年，高端碟簧的引路人

罗德自2005年起被正式授权销售德国慕贝尔碟形弹簧
近20年合作历史，优质资深代理商

Mubea
light ellicient global

DISTRIBUTORSIDP AGREEMENT

经销商协议书

This Agreement is entered into between:

本协议由以下双方签署：

Mubea Automotive Components (Taicang) Co., Ltd. Chereinafter referred to as "MUBEA")

慕贝尔汽车部件（太仓）有限公司（以下简称“慕贝尔”）

AND

Shanghai Rode Cayun Engineering Technology Co., Ltd (hereinafter referred to as "DISTRIBUTOR")

上海罗德凯耘工程技术有限公司（以下简称“经销商”）

In line with the principle of common development and mutual benefit, and in accordance with the Civil Code of the P.R.C and relevant laws and regulations, the Part es have reached the following terms and conditions through friendly negotiation:

协议双方本着共同发展，互惠互利的原则，根据《中华人民共和国民法典》等有关法律法规规定，经友好协商达成以下条款以资双方共同遵守：

MUBEA Mubea Automotive Components (Taicang) Co., Ltd慕贝尔汽车部件（太仓）有限公司 （盖章） 慕贝尔汽车部件（太仓）有限公司 3205850922194	DISTRIBUTOR Shanghai Rode Cayun Engineering Technology Co., Ltd上海罗德凯耘工程技术有限公司 （盖章） 合同专用章
Representative/授权代表：沈曙光 Date/日期：2023年1月1日 沈曙光	Representative/授权代表：陆海 Date/日期：2023年1月1日 陆海

上海罗德凯耘工程技术有限公司成立于2019年，是大连罗德工程技术有限公司的全资子公司，是一家以提供先进专业技术和优质服务为理念的技术服务公司，公司多年来为造船海工、机械制造、能源电力等高端客户提供了最先进的欧洲工业产品和最贴心的技术服务，深受用户支持和信赖。

我司是德国Mubea品牌正式授权的碟形弹簧、卡箍等产品的核准经销商。自2005年起，大连罗德代理德国Mubea碟形弹簧已有近20年历史。现已经逐步搭建了面向众多制造商、经销商的技术支持和以迅捷供应物流链为核心竞争力的服务平台。我司已建立上海、大连两大物流基地及全国多个销售网点，以便更快捷、高效地为各行各业客户提供高性价比的产品和服务。

大连罗德工程技术有限公司

地址：大连市沙河口区黄河路559号国际数控大厦607室

Tel: 0411-8462-3377

上海罗德凯耘工程技术有限公司

地址：上海市杨浦区平凉路2241号智慧坊17号楼301室

Tel: 400-0510-607

上海罗德凯耘工程技术有限公司无锡分公司

地址：无锡市滨湖区秀溪路50号K-PA-RK服务中心大厦1号楼607室

Tel: 400-0510-607



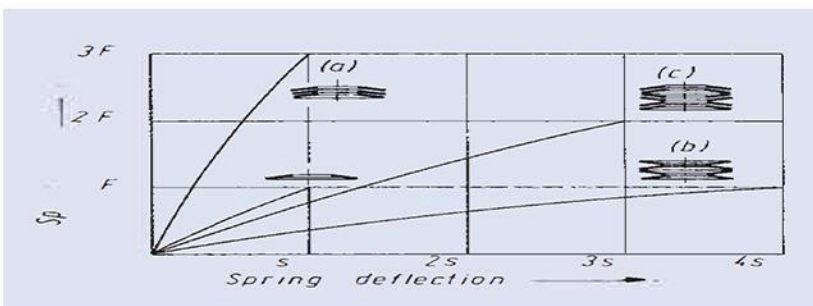
碟形弹簧 - 小空间范围内高承载性能

碟形弹簧是用以承受轴向载荷的锥形环状盘片，根据其应用情况，碟形弹簧可以承受静态和动态载荷，主要参数为：

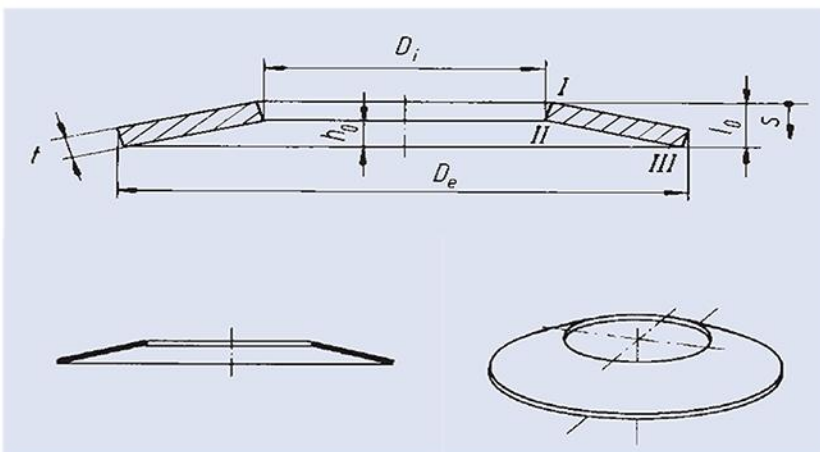
- 外径 D_e
- 内径 D_i
- 材料厚度 t
- 自由高度 L_0

碟形弹簧由于其以下特点而不同于其他类型的弹簧：

- 小变形大承载能力
- 与其他类型的弹簧相比具有较好的空间利用率
- 通过碟形弹簧不同的组合方式可获得理想的加载特性



- a) 叠合组合弹簧组承载能力正比于单片弹簧数量
- b) 对合组合弹簧变形量为单片弹簧变形量总和
- c) 两种方式组合使用



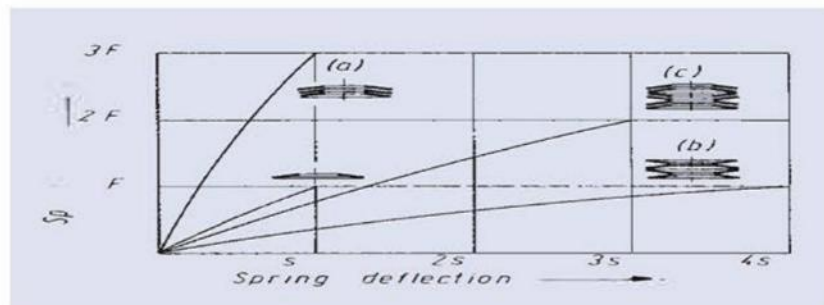
Disc Springs Application examples

Disc springs are shallow conical rings that are subjected to axial loads. Depending upon the application, disc springs can be subjected to static or dynamic loads and are defined by:

- outer diameter D_e ,
- inner diameter D_i ,
- material thickness t and
- overall height L_0

Disc springs are distinguished from other spring types by the following characteristics:

- high load capacity with a small spring deflection
- better space utilization when compared to other spring types
- different combinations of springs can be designed to achieve the desired load characteristics

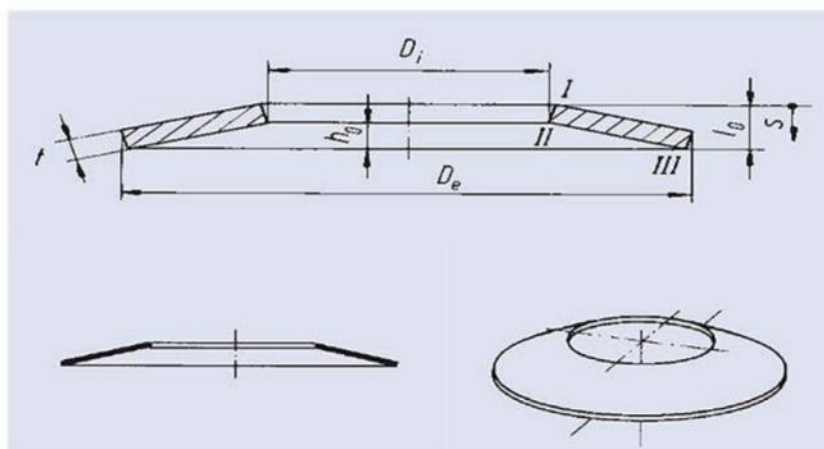


In a parallel spring stack, the load is proportional

(a) to the number of individual springs.

(b) In a series spring stack, the deflection of the stack is the sum of the deflection of the individual springs.

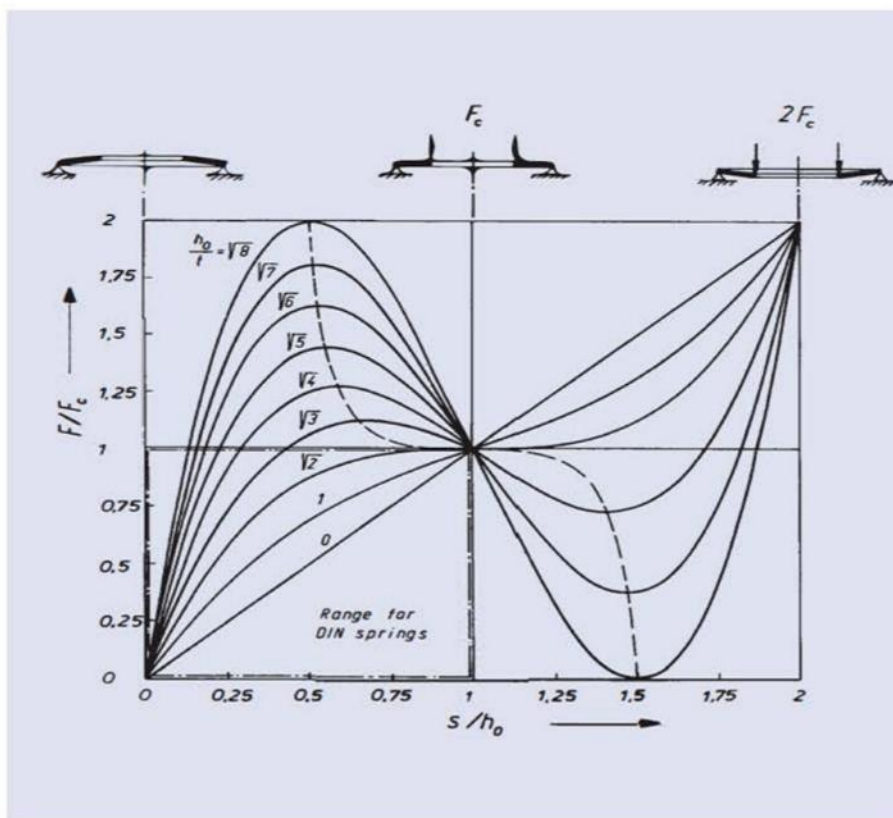
(c) It is possible to combine these methods of stacking.



碟形弹簧 - 广泛适应性

由于碟形弹簧的广泛适应性，其应用涵盖了从3000米海底深处的安全阀门系统到空间人造卫星的各个领域，要求能够在-269C°到500C°的温度范围内工作。慕贝尔公司库存的原材料即使在这种苛刻的条件下，依然可以满足碟形弹簧承载和疲劳寿命的要求。此外，碟形弹簧表面可以采用耐久涂层保护处理，保证其在腐蚀性气体中的长效抗腐蚀性能。

碟形弹簧被用于机床工业，石油工业，汽车工业以及航空航天工业等领域。

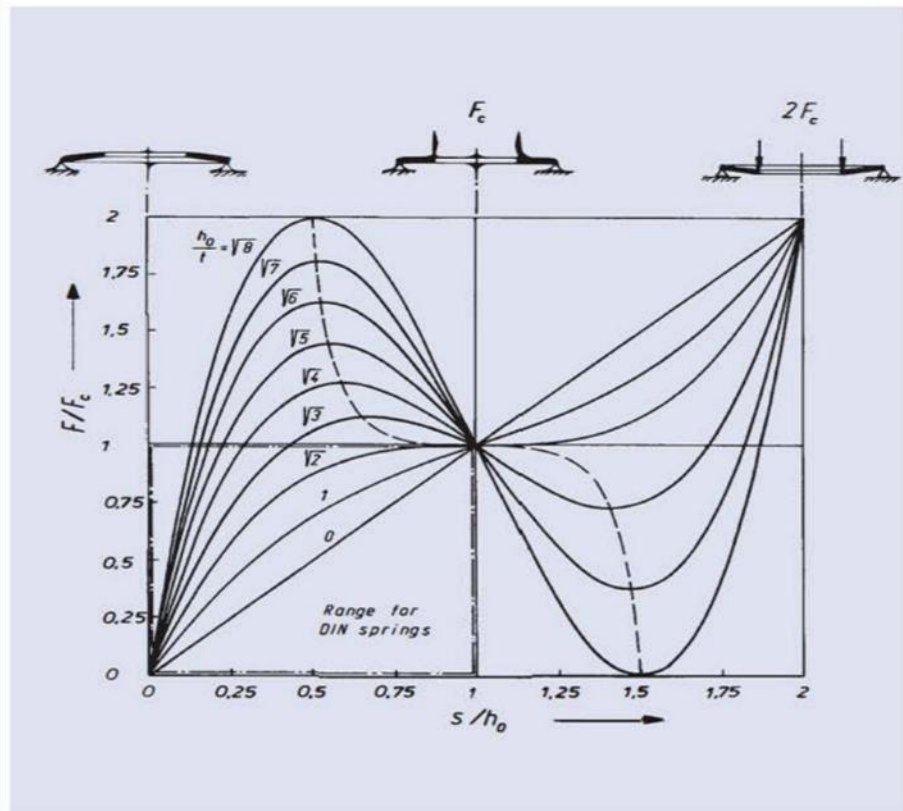


碟形弹簧内锥高度与材料厚度的比值 (h_0/t) 决定了其承载特性

Disc Springs -High versatility

Because of their versatility, disc springs are used extensively in a variety of applications, from safety valve systems 3000m under the sea to satellites up to 36,000km in space. Disc springs must function in temperatures from -26g'C up to 500'C. Mubea stocks the necessary materials to meet the required load and fatiguelife requirements even under these severe conditionsIn addition, disc springs can be coated with highly du-rable surface protections to withstand and guarantee along life in a corrosive atmosphere.

Due to the versatility of disc springs, they are used ina variety of applications including the machine-tool industry, the oil industry, the automobile industry, as welas the aerospace industry.



The relationship between disc spring height and material thickness (h_0/t) determines the characteristic load curve of the spring

碟形弹簧 - 慕贝尔, 您强劲的合作伙伴

按照DIN EN16983 分类

碟形弹簧的设计、检测和生产已按照DIN EN 16984标准(碟形弹簧、计算)和DIN EN16983标准(碟形弹簧、尺寸、质量要求)进行了标准化。按照DIN EN16983标准, 碟形弹簧可以分为三组:

第一组: 盘片厚度 t 小于 1.25mm

第二组: 盘片厚度 t 从1.25mm 至6mm

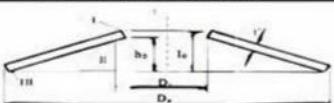
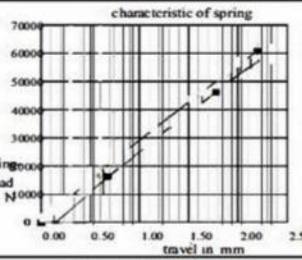
第三组: 盘片厚度 t 大于6mm至14mm

第一组和第二组为无支撑面碟形弹簧, 第三组为有支撑面碟形弹簧。

慕贝尔公司开发流程

首先, 我们提供碟形弹簧设计程序来进行设计(见下图)。

该程序基于DIN EN 16983的相关公式编制而成, 可以在我们的网站(www.shrode.cn)下载。此外, 我们有一支高素质的工程师团队致力于为每一个弹簧的应用领域找到优化解决方案, 包括选择正确的材料和表面防护处理。慕贝尔样件车间装备了所有必需的测试设备, 产品开发过程中的样件制作均是在样件车间完成。

Disc Springs, Data Sheet											
Mubea											
part./drawing no. Special						group 2					
customer											
2017/2/15						Muh and Bender, Tellerfödem GmbH, Postfach 120, 57364 Duden					
Rao Zhou						phone: +49 11-84423377					
											
dimensions outer diam. $D_o = 100.000$ mm inner diam. $D_i = 51.000$ mm thickness $t = 6.000$ mm rod thickness $t_o = 6.000$ mm spring height $h_o = 8.200$ mm											
1 spring						Wire centered springs					
data $h_o/t = 0.367$ $h_o/h_i = 0.367$ $D_o/D_i = 1.961$						wire diameter: mm groove depth: mm					
load points of one spring			calculated stresses				load points of one spring				
load-point	height l mm	travel s mm	load F N	σ_1	σ_2	σ_3	σ_{0M}	height l mm	travel s mm	load F N	
0	8.200							8.200			
1	7.650	0.550	16564	-740	412	399	-404	7.650	0.550	16564	
2	6.550	1.650	46623	-2080	1376	1106	-1211	6.550	1.650	46623	
Flat	6.000	2.200	60885	-2680	1929	1415	-1615	6.000	2.200	60885	
specification material: Inconel 718 surface finish: Youngs-modulus: 200000 MPa corrosion prot: temperature: 20 °C											
remarks Load tolerance: +10 / -5% at 75% of h0 of one spring tolerance inner diam.: 51.000 mm to 51.300 mm tolerance outer diam.: 99.650 mm to 100.000 mm											

Disc Springs -Mubea,your competent partner

Classification according to DIN EN16983

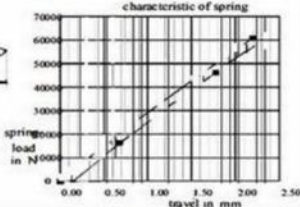
Disc spring design, sizing, and manufacture have been standardized according to DIN EN 16984 (Disc springs, Calculation) and DIN EN16983 (Disc springs, Calculation, Dimensions, Quality requirements). Disc springs in accordance with DIN EN16983 are classified into 3 groups:

- Group 1: Disc thickness, t , less than 1.25mm
- Group 2: Disc thickness, t , from 1.25 mm to 6mm
- Group 3: Disc thickness, t , over 6 mm up to 14mm

Group 1 and 2 springs are manufactured without contact surfaces, Group 3 springs are manufactured with contact surfaces.

Mubea Engineering

As a first step, we can provide our design calculation program for disc springs. This program is based on the equations defined by DIN EN 16983 and can be downloaded from our website at (www.shrode.cn). Additionally, we maintain a team of highly qualified engineers that is dedicated finding the optimal solution for every spring application, including the selection of the proper material and surface protection. Prototypes typically required during product development are manufactured in our sample shop, which is equipped with all necessary testing equipment.

Disc Springs, Data Sheet											
Mubea			group 2			part/drawing no. Special			customer		
Stand 31.10.08			2017/2/15								
Bin Zhou			Mahr and Bender, Teckelroden GmbH, Postfach 120, 57564 Dausen								
			photo. sales. 0411-8462377								
											
characteristic of spring											
dimensions											
outer diam. $D_o = 100.000$ mm											
inner diam. $D_i = 51.000$ mm											
thickness $t = 6.000$ mm											
rod thickness $t' = 6.000$ mm											
spring height $h_s = 8.200$ mm											
1 spring											
$h_o = 2.200$ mm											
$h_o/t = 0.367$											
$h_o/t' = 0.367$											
$D_o/D_i = 1.961$											
data											
$h_o/t = 0.367$											
$h_o/t' = 0.367$											
$D_o/D_i = 1.961$											
Wire centered springs											
wire diameter: mm											
groove depth: mm											
load points of one spring											
load-point			height l mm			travel s mm			load F N		
0			8.200			-			-		
1			7.650			-0.550			16564		
2			6.550			1.650			46623		
calculated stresses											
σ_1			σ_2			σ_3			$\sigma_{0.04}$		
0			-740			412			399		
1			-2080			1376			1106		
2			-			-			-		
load points of one spring											
height l mm			travel s mm			load F N					
8.200			-			-					
7.650			-0.550			16564					
6.550			1.650			46623					
Flat			6.000			2.200			60885		
-2690			1929			1415			-1615		
specification											
material: Inconel 718											
surface finish											
corrosion prot											
Youngs-modulus: 200000 MPa											
temperature: 20 °C											
remarks											
Load tolerance			+10 / -5% at 75% of h_0 of one spring								
tolerance inner diam.:			51.000 mm to 51.300 mm								

碟形弹簧 - 高承载弹簧元件

碟形弹簧材料

除采用51CrV4作标准材料外，在高温、低温以及易腐蚀的环境中，可以采用特殊材料以满足特定的要求。如热稳定材料（1.4122、1.2567、1.4923），耐腐蚀材料（1.4310、1.4568、1.4401）以及镍基合金（2.4668、2.4669、2.4969）和铍铜合金（2.1247、2.4132）。

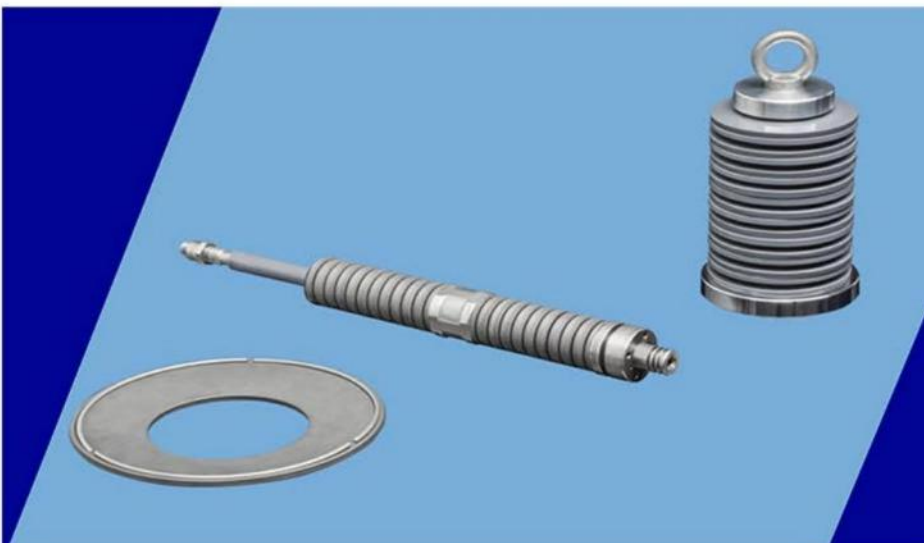
高疲劳寿命

几乎所有的慕贝尔碟形弹簧都在工厂内经过喷丸处理，以产生残余的压应力，从而使产品具有高出 DIN EN16g83 规定的疲劳寿命。

碟形弹簧防腐处理

标准的防腐处理工艺为锌—磷化处理加涂油。如果碟形弹簧工作的环境要求有更高的防腐蚀性能，则可选择以下的工艺：

- 锌-磷化加涂蜡
- 镀锌
- 机械镀锌或镀铬
- Delta Tone/Delta Seal 涂层
- 达克罗涂层
- 电化学镀镍



Disc Springs -Highly stressed

Materials for Disc Springs

For standard applications, the spring material 51CV4 (No.1.815 9) is used. Furthermore, special materials can be used for applications at very high and low temperatures or in a corrosive atmosphere. Depending upon the specific requirements, Mubea uses thermally stable materials (No. 1.4122, 1.2567, 1.4923), corrosion resistant materials (No. 1.4310, 1.4568, 1.4401), nickel based materials (2.4668, 2.4669, 2.4969) and beryllium copper alloys (2.1247, 2.4132).

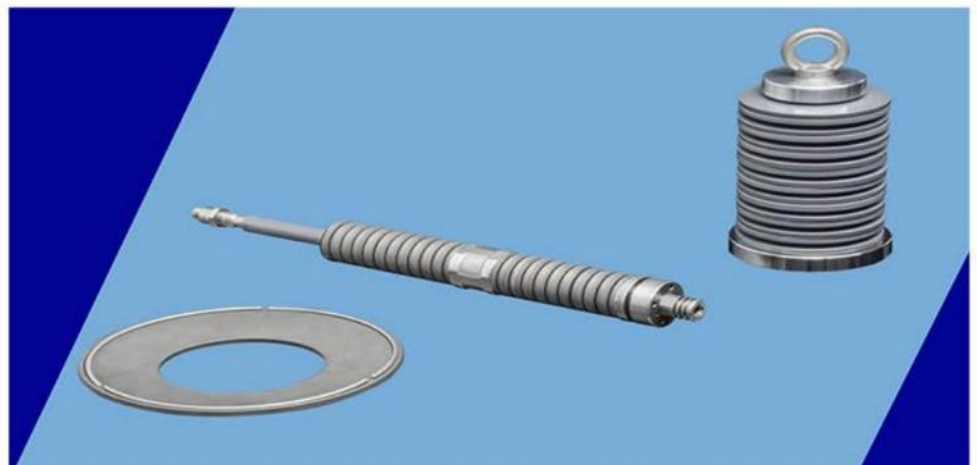
Increased Fatigue Life

Nearly all Mubea disc springs are shot-peened in-house. Shot-peening creates residual compressive stresses that result in a considerably higher fatigue life than required by DIN EN16983

Corrosion protection for Disc Springs

The standard corrosion protection for disc springs is zincphosphating and oiling. If a higher level of corrosion protection is required due to the operating environment of the disc spring, the following alternatives are available:

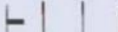
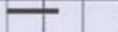
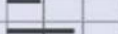
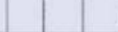
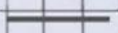
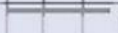
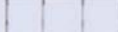
- Zinc-phosphating and waxing
- Galvanizing
- Mechanical zinc plating and chromating
- Delta Tone/Delta Seal Coating
- Dacromet/Geomet Coating
- Chemical (Electroless) nickel plating

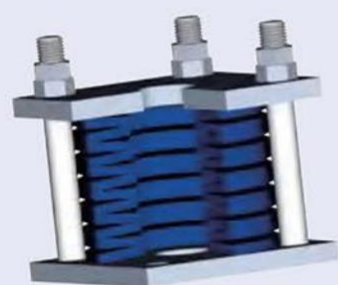


碟形弹簧材料对照表

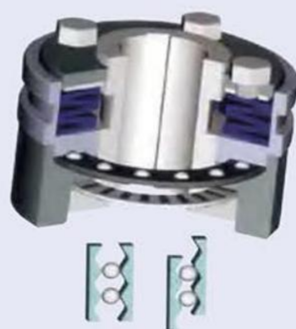
材料编号	DIN材料号	不同温度下的弹性模量(kN/mm²)							
		20℃	100℃	200℃	300℃	400℃	500℃	600℃	700℃
51CrV4	1.8159	206	202	196					
51CrMo4	1.7701	206	202	196					
X 12 CrNi177	1.4310	190	185	178					
X 7 CrNiAl177	1.4568	200	195	190					
X 5 CrNiMo1810	1.4401	190	185	178					
X 35 CrMo17	1.4122	209	205	199	192				
X 30 WCrV53	1.2567	206	202	196	189	178			
X 22 CrMoV121	1.4923	209	205	200	193				
Cu Be2	2.1247	135	131	126					
Ni Be2	2.4132	200	195	189	182	176			
Inconel 718 (Ni Cr 19 Nb Mo)	2.4668	200	196	190	186	179	172		
Inconel X 750 (Ni Cr 15Fe7TiAl)	2.4669	214	207	198	190	179	170		
Nimonic 90 (Ni Cr 20Co 18 Ti)	2.4969	206	201	195	189	181	175	167	160

碟簧涂层参照表

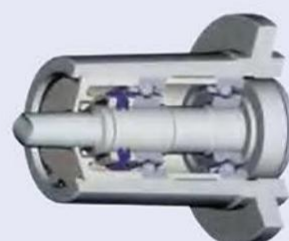
涂层方式	涂层成份	涂层厚度(um)	盐雾试验的稳定性 按DIN 50 021	
磷化处理	锌磷化+油	10-15		标准防护
磷化处理	锌磷化+蜡	10-40		
电镀	锌	> 8		
电镀	锌	> 12		
电镀+铬	锌+铬	> 8		
电镀+铬	锌+铬	> 12		
机械镀锌	锌	> 12		
机械镀锌+铬	锌+铬	> 12		
Delta Tone	磷酸锌+锌粉覆层	10-15		
Delta Seal	磷酸锌+、有机层+油	10-15		
达克罗 500-A	铬酸盐、锌叠片	> 5		
达克罗 500-B	铬酸盐、锌叠片	> 8		
化学镀镍	镍	约25		
焦美特720	无铬锌铝	> 8		



①



②



③



④



⑤



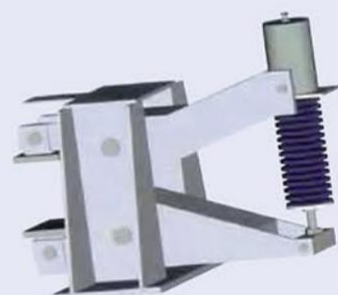
⑥



⑦



⑧



⑨

碟形弹簧应用案例

①预装配组合碟形弹簧

-设备制造、电站建造、机械制造

-组合碟形弹簧用于锅炉悬挂系统。碟形弹簧组用于补偿支撑面的位置偏移，确保由于热膨胀引起载荷变化时，锅炉能够均匀下降。

②过载离合器

-设备制造、机械制造、汽车制造

-在过载离合器中，碟形弹簧提供的载荷可以保证扭矩传递所需的摩擦力。载荷可以通过调整螺母精确调节，以便在发生过载时停止传递载荷。

③间隙补偿元件

-设备制造、机械制造

-碟形弹簧通常用于补偿装配元件间的几何公差。

④阀门

-设备制造、机械制造、化工

在开启状态下，快速制动阀门内的组合碟形弹簧通过液压作用预先加载。发生故障时，液压压力下降，碟形弹簧组复位，阀门关闭；流动停止。在这种情况下，通常使用滚珠自定心碟形弹簧组。

⑤活塞复位弹簧机械制造、汽车制造

联轴器卸载时，碟形弹簧确保液压促动活塞返回到初始位置。

⑥刀具卡紧元件

机械制造、模具制造刀具卡紧元件内的组合碟形弹簧起到将刀具牢固地夹持于锥形夹具里的作用。

⑦安全系统用储能元件

断路器、机械制造在液压弹簧机构中，能量储存通常通过组合碟形弹簧来实现。

⑧缆索卡紧元件

设备制造

组合碟形弹簧在缆索夹与缆索间建立磨擦锁紧。根据缆索夹紧元件的结构，载荷可以是静态的或是动态的。

⑨弹簧促动制动器

设备制造、机械制造、汽车制造

在液压载荷下降至预设水平时，组合碟形弹簧产生制动载荷。

Disc Spring Applications Cases

①Pre-assembled spring stacks

Plant construction, power station construction, and machine construction. Spring stacks are used for boiler suspension systems. The spring assemblies compensate for localized deflections in the bearing surface and thus guarantee an even lowering of the boiler with load fluctuations due to thermal expansion.

②Overload clutches

Plant construction, machine construction, and motor vehicle construction. In overload clutches, disc springs provide the load required to maintain sufficient friction to transmit the torque. The load level can be regulated with adjuster nuts. If overload occurs, the transmission of torque is interrupted.

③Backlash compensation

Plant and machine construction

Disc springs are often used to compensate for geometric tolerances in component assemblies.

④Valves

Plant and machine construction, chemical industry

In quick-action stop valves, the disc spring stack is hydraulically pre-loaded when in the open position. If a failure occurs, the hydraulic pressure drops and the disc spring stack is released, closing the valve and thus interrupting the flow. Often ball-centered disc spring stacks are used for this purpose.

⑤Piston return springs

Machine construction and motor vehicle construction

The disc spring ensures that the hydraulically actuated piston returns to its original position after the load on the coupling is released.

⑥Tool clamping components

Machine construction, tool-making

In tool clamping components, the function of the disc spring stack is to hold the tool securely in the tapered holder.

⑦Energy storage for safety systems

Circuit breakers, machine construction

In hydraulic spring mechanisms, energy storage is often achieved by means of a disc spring stack.

⑧Cableway grip

Plant construction

On cableways, a disc spring stack generates a friction lock between the cable grip and wire cable. Depending on the type of grip, the load can be static or dynamic.

⑨Spring-actuated brakes

Plant construction, machine construction, and motor vehicle construction. The braking load is generated by the disc springs when the hydraulic pressure is reduced to a predetermined level.

弹簧组设计指南

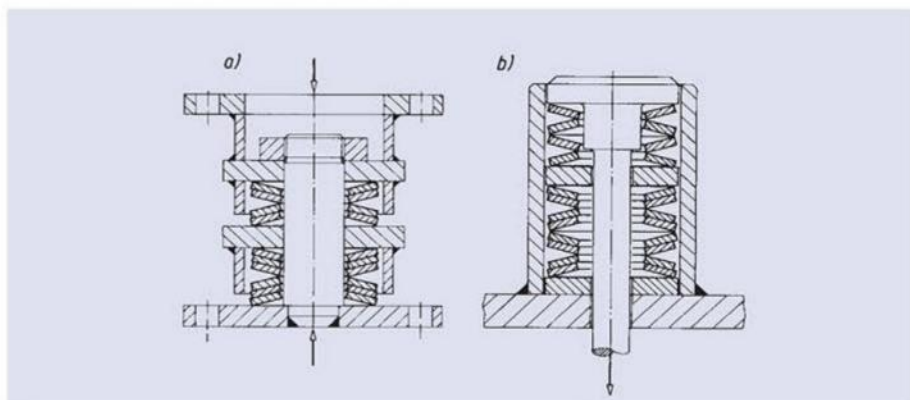
碟形弹簧组设计时，需要考虑下列因素：

| 如果单片弹簧不能达到行程要求时，采用由单片弹簧组成的对合组合弹簧组。

| 如果安装空间有限，而要达到较高的承载能力时，采用单片弹簧组成的叠合组合弹簧组。

| 采用大直径弹簧可以相应降低其自由高度。

| 通常情况下，叠合组合弹簧组内单片弹簧片数不应超过2个到4个，这是由于随着弹簧片数的增加，其内部弹簧间的摩擦将会导致计算和实测的碟形弹簧特性曲线之间的偏差增大（Mubea碟形弹簧计算程序不考虑摩擦的影响）。

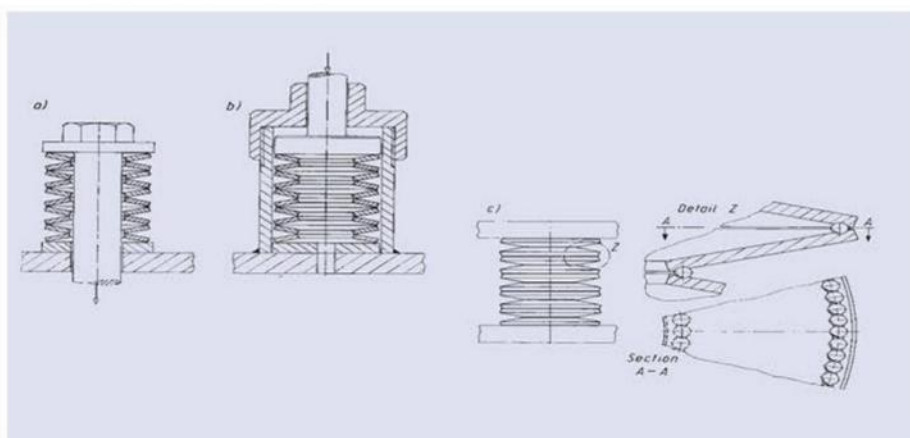


弹簧组导向

对合组合弹簧组和叠合组合弹簧组均需导向，该导向可由下列导向元件来实现：

| 导向杆（内部导向，下图左）

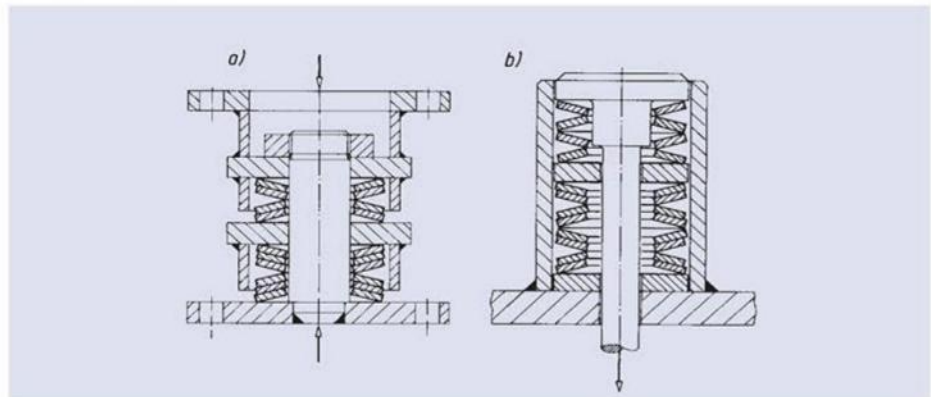
| 导向套（外部导向，下图中）或通过| 自定位装置（滚珠导向（下图右）或硬化钢丝。



Spring stack design guidelines

The following guidelines should be considered in the design of disc spring stacks:

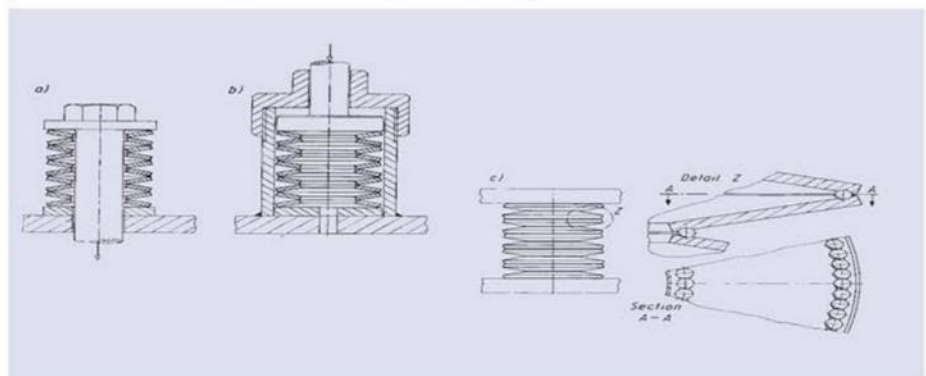
- | Individual springs stacked in series are used if the deflection of the individual spring is not sufficient.
- | Single springs stacked in parallel are used if high loads have to be obtained in a limited mounting space.
- | A large spring diameter enables a low overall height to be achieved.
- | Normally no more than 2 ... 4 springs should be stacked in parallel since the discrepancies between the calculated and measured characteristic load curves increase with an increasing number of discs due to friction (the influence of friction is not taken into consideration in the calculation program).



Spring stack guides

Both series and parallel spring stacks should be guided. This is done with a guide element such as

- | a guide rod (internal guidance, Fig. 3.19 a)
- | a guide sleeve (external guidance, Fig. 3.19 b) or by
- | self-centering devices (balls, Fig. 3.1)



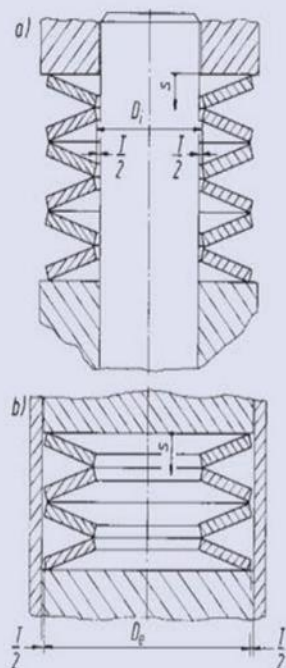
弹簧组设计指南

内导向和外导向元件的整个长度方向均需抛光和硬化，表面硬度应至少为55HRC。

在静态载荷或非交变载荷条件下，可以采用未经硬化的导向件。

碟形弹簧组可以通过外径和内径施加载荷，但通过内径加载将使接触压力增大。

对于内外两种导向方式，弹簧与导向件之间都需要一定的间隙， T （下图）以保证润滑剂有充分的流动空间，从而确保导向正确。为根据盘片内径 D_i （内部导向）和盘片外径 D_e （外部导向）给出的对两种向导方式总间隙 T 的规定。



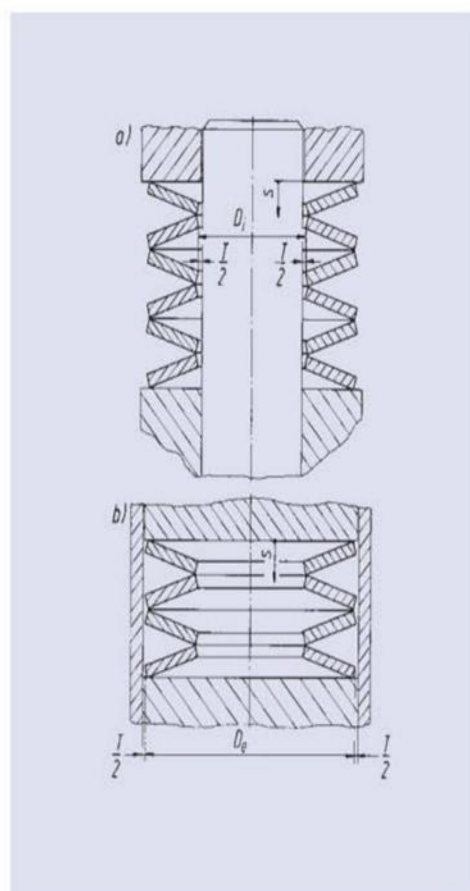
D_i or D_e (mm)	Total clearance T (mm)
- up to 16,0	0,2
over 16 up to 20,0	0,3
over 20 up to 26,0	0,4
over 26 up to 31,5	0,5
over 31,5 up to 50,0	0,6
over 50 up to 80,0	0,8
over 80 up to 140,0	1,0
over 140 up to 250,0	1,6
over 250 -	2,0

Spring stack design guidelines

Both internal and external guides should be polished over their entire length and hardened to at least 55 HRC.

In the case of purely static or rarely alternating loads, an un-hardened guide element can be used. In spring stacks, the load can be applied via either the inner or the outer diameter. If the load is applied via the inner diameter the contact pressures will be higher.

Both internal and external guides require some clearance, T , between the spring stack and guide element (Fig. 3.20). This allows adequate room for the displacement of the lubricant while ensuring proper guidance. Table 3.2 shows the total clearance, T , for both types of guides, depending on the disc inner diameter D_i (in the case of internal guides) or the disc spring outer diameter D_e (in the case of external guides).

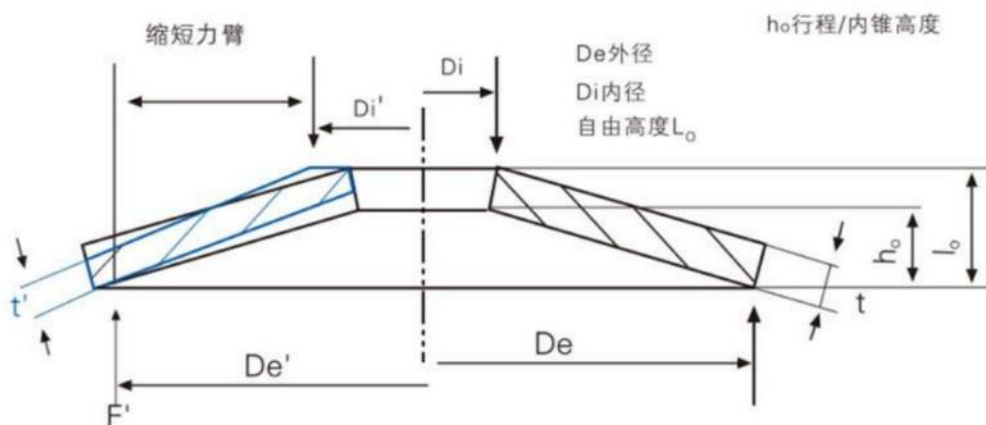


D_i or D_e (mm)	Total clearance T (mm)
– up to 16,0	0,2
over 16 up to 20,0	0,3
over 20 up to 26,0	0,4
over 26 up to 31,5	0,5
over 31,5 up to 50,0	0,6
over 50 up to 80,0	0,8
over 80 up to 140,0	1,0
over 140 up to 250,0	1,6
over 250 –	2,0

设计问卷表

第3章

为了按照您德要求设计, 请认真填写下面表格 (合适的打叉) 填后请电话0411-84623377或发电子邮箱info@dlrode.com



1) 机器设备类别: _____

2) 弹簧的用途: _____

3) 安装空间: 直径 $D_{max} =$ _____ $D_{min} =$ _____ mm
长度 $L_{max} =$ _____ $L_{min} =$ _____ mm

4) 组合方式: _____

5) 弹簧载荷和行程

$L_1 =$ _____ mm $S_1 =$ _____ mm $F_1 =$ _____ mm 公差: + _____ 公差: - _____ %
 $S_1 =$ _____ mm $S_1 =$ _____ mm $S_1 =$ _____ mm 公差: + _____ 公差: - _____ %
 $L_3 =$ _____ mm $S_3 =$ _____ mm $F_3 =$ _____ mm 公差: + _____ 公差: - _____ %

6) 加载方式:

☐ 静态 ☐ 动态

7) 载荷特性曲线

☐ 震动 ☐ 正弦

8) 要求的疲劳寿命: _____

9) 工作温度 (弹簧): _____

10) 导向方式: 内部 外部

11) 弹簧或弹簧组的位置: 垂直 水平

12) 是否需要特殊防腐方式

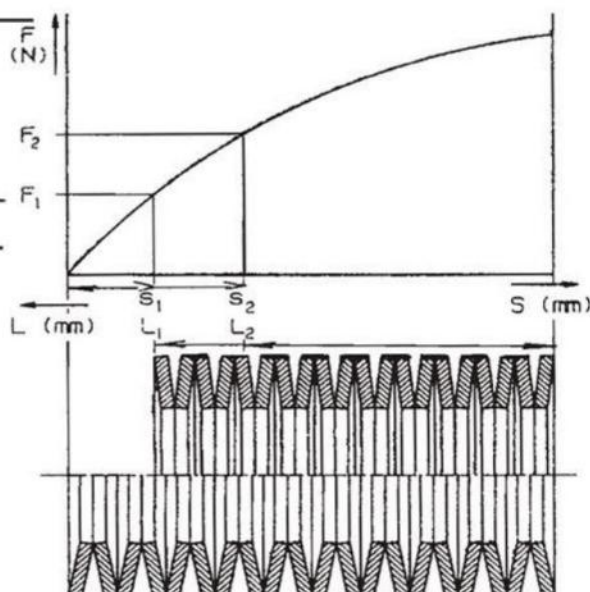
13) 腐蚀介质: _____

14) 注释: _____

负责人: _____

电话: _____ 传真: _____

日期: _____ 签名: _____



第4章

标准碟形弹簧

材料51CrV4, 材料号1.8159

零件号	DIN 列号	尺寸 (mm)							碟簧行程S(mm)和载荷F(N)				重量 每千件 kg
									S=0.25h ₀		S=0.75h ₀		
		De	Di	t	t'	l ₀	h ₀	h ₀ /t	S	F	S	F	
17 0001		8,00	3,20	0,30		0,55	0,25	0,833	0,062	45,6	0,187	104,3	0,099
17 0002		8,00	3,20	0,40		0,60	0,20	0,500	0,050	69,2	0,150	185,5	0,133
17 0003		8,00	3,20	0,50		0,70	0,20	0,400	0,050	128,4	0,150	357,4	0,166
17 0004	C	8,00	4,20	0,20		0,45	0,25	1,250	0,062	21,2	0,187	39,2	0,057
17 0005	B	8,00	4,20	0,30		0,55	0,25	0,833	0,062	51,6	0,187	117,9	0,086
17 0006	A	8,00	4,20	0,40		0,60	0,20	0,500	0,050	78,2	0,150	209,5	0,114
17 0007		10,00	3,20	0,30		0,65	0,35	1,166	0,087	51,1	0,262	98,3	0,166
17 0008		10,00	3,20	0,40		0,70	0,30	0,750	0,075	75,1	0,225	179,1	0,221
17 0009		10,00	3,20	0,50		0,85	0,35	0,700	0,087	165,3	0,262	404,0	0,277
17 0010		10,00	4,20	0,40		0,70	0,30	0,750	0,075	79,3	0,225	189,1	0,203
17 0011		10,00	4,20	0,50		0,75	0,25	0,500	0,062	109,8	0,187	294,0	0,254
17 0012		10,00	4,20	0,60		0,85	0,25	0,416	0,062	181,5	0,187	502,3	0,304
17 0013	C	10,00	5,20	0,25		0,55	0,30	1,200	0,075	30,4	0,225	57,5	0,112
17 0014	B	10,00	5,20	0,40		0,70	0,30	0,750	0,075	87,8	0,225	209,3	0,180
17 0015	A	10,00	5,20	0,50		0,75	0,25	0,500	0,062	121,5	0,187	325,3	0,225
17 0016		12,00	4,20	0,40		0,80	0,40	1,000	0,100	85,1	0,300	178,3	0,311
17 0017		12,00	4,20	0,50		0,90	0,40	0,800	0,100	142,6	0,300	331,4	0,389
17 0018		12,00	4,20	0,60		1,00	0,40	0,666	0,100	224,1	0,300	556,8	0,467
17 0019		12,00	5,20	0,50		0,90	0,40	0,800	0,100	150,4	0,300	349,6	0,360
17 0020		12,00	5,20	0,60		0,95	0,35	0,583	0,087	195,9	0,262	506,1	0,432
17 0021		12,00	6,20	0,50		0,85	0,35	0,700	0,087	133,5	0,262	326,4	0,325
17 0022		12,00	6,20	0,60		0,95	0,35	0,583	0,087	213,6	0,262	551,7	0,390
17 0023	C	12,50	6,20	0,35		0,80	0,45	1,285	0,112	83,5	0,337	151,2	0,254
17 0024	B	12,50	6,20	0,50		0,85	0,35	0,700	0,087	120,0	0,262	293,4	0,363
17 0025	A	12,50	6,20	0,70		1,00	0,30	0,428	0,075	239,4	0,225	659,5	0,508
17 0026		14,00	7,20	0,35		0,80	0,45	1,285	0,112	68,0	0,337	123,2	0,311
17 0027		14,00	7,20	0,50		0,90	0,40	0,800	0,100	120,1	0,300	279,2	0,444
17 0028		14,00	7,20	0,80		1,10	0,30	0,375	0,075	283,8	0,225	796,8	0,711
17 0029		15,00	5,20	0,40		0,95	0,55	1,375	0,137	101,2	0,412	175,5	0,488
17 0030		15,00	5,20	0,50		1,00	0,50	1,000	0,125	132,8	0,375	278,2	0,610
17 0031		15,00	5,20	0,60		1,05	0,45	0,750	0,112	170,8	0,337	407,2	0,732
17 0032		15,00	5,20	0,70		1,25	0,55	0,785	0,137	340,2	0,412	796,5	0,854

零件号	DIN 列号	尺寸 (mm)							碟簧行程S(mm)和载荷F(N)				重量 每千件 kg
									S=0.25h ₀		S=0.75h ₀		
		De	Di	t	t'	l ₀	h ₀	h ₀ /t	S	F	S	F	
17 0033		15,00	6,20	0,50		1,00	0,50	1,000	0,125	138,1	0,375	289,4	0,575
17 0034		15,00	6,20	0,60		1,05	0,45	0,750	0,112	177,6	0,337	423,5	0,690
17 0035		15,00	6,20	0,70		1,10	0,40	0,571	0,100	222,4	0,300	577,5	0,805
17 0036		15,00	8,20	0,70		1,10	0,40	0,571	0,100	256,3	0,300	665,6	0,681
17 0037		15,00	8,20	0,80		1,20	0,40	0,500	0,100	366,8	0,300	982,3	0,778
17 0038	C	16,00	8,20	0,40		0,90	0,50	1,250	0,125	83,7	0,375	154,3	0,465
17 0039	B	16,00	8,20	0,60		1,05	0,45	0,750	0,112	172,0	0,337	410,0	0,698
17 0040	A	16,00	8,20	0,90		1,25	0,35	0,388	0,087	362,5	0,262	1013,0	1047
17 0041		18,00	6,20	0,40		1,00	0,60	1,500	0,150	84,6	0,450	138,6	0,704
17 0042		18,00	6,20	0,50		1,10	0,60	1,200	0,150	129,9	0,450	245,4	0,880
17 0043		18,00	6,20	0,60		1,20	0,60	1,000	0,150	191,1	0,450	400,3	1056
17 0044		18,00	6,20	0,70		1,40	0,70	1,000	0,175	354,1	0,525	741,7	1232
17 0045		18,00	6,20	0,80		1,50	0,70	0,875	0,175	479,5	0,525	1072,0	1408
17 0046		18,00	8,20	0,70		1,25	0,55	0,785	0,137	254,6	0,412	596,0	1108
17 0047		18,00	8,20	0,80		1,30	0,50	0,625	0,125	308,9	0,375	782,6	1266
17 0048		18,00	8,20	1,00		1,50	0,50	0,500	0,125	559,0	0,375	1497,0	1582
17 0049	C	18,00	9,20	0,45		1,05	0,60	1,333	0,150	120,7	0,450	213,7	0,664
17 0050	B	18,00	9,20	0,70		1,20	0,50	0,714	0,125	233,4	0,375	566,4	1033
17 0051	A	18,00	9,20	1,00		1,40	0,40	0,400	0,100	450,6	0,300	1254,0	1476
17 0052		20,00	8,20	0,50		1,15	0,65	1,300	0,162	128,3	0,487	230,8	1026
17 0053		20,00	8,20	0,60		1,30	0,70	1,166	0,175	214,4	0,525	412,0	1231
17 0054		20,00	8,20	0,70		1,35	0,65	0,928	0,162	261,5	0,487	568,5	1436
17 0055		20,00	8,20	0,80		1,40	0,60	0,750	0,150	315,0	0,450	751,0	1641
17 0056		20,00	8,20	0,90		1,50	0,60	0,666	0,150	423,2	0,450	1051,0	1846
17 0057		20,00	8,20	1,00		1,60	0,60	0,600	0,150	555,6	0,450	1424,0	2051
17 0058		20,00	10,20	0,40		0,90	0,50	1,250	0,125	53,4	0,375	98,5	0,730
17 0059	C	20,00	10,20	0,50		1,15	0,65	1,300	0,162	141,3	0,487	254,1	0,912
17 0060	B	20,00	10,20	0,80		1,35	0,55	0,687	0,137	304,3	0,412	748,2	1,460
17 0061		20,00	10,20	0,90		1,45	0,55	0,611	0,137	411,7	0,412	1050,0	1,642
17 0062		20,00	10,20	1,00		1,55	0,55	0,550	0,137	543,6	0,412	1425,0	1,824
17 0063	A	20,00	10,20	1,10		1,55	0,45	0,409	0,112	548,2	0,337	1521,0	2,007
17 0064		22,50	11,20	0,60		1,40	0,80	1,330	0,200	240,4	0,600	425,4	1,409

第4章

标准碟形弹簧

材料51CrV4, 材料号1.8159

零件号	DIN 列号	尺寸 (mm)							碟簧行程S(mm)和载荷F(N)				重量 每千件 kg
									S=0.25h ₀		S=0.75h ₀		
		De	Di	t	t'	l ₀	h ₀	h ₀ /t	S	F	S	F	
17 0065		22,50	11,20	0,80		1,45	0,65	0,812	0,162	306,3	0,487	707,4	1,878
18 0001		22,50	11,20	1,25		1,75	0,50	0,400	0,125	693,1	0,375	1929,0	2,935
17 0066		23,00	8,20	0,70		1,50	0,80	1,142	0,200	279,4	0,600	543,6	1,993
17 0067		23,00	8,20	0,80		1,55	0,75	0,937	0,187	332,0	0,562	718,5	2,277
17 0068		23,00	8,20	0,90		1,70	0,80	0,888	0,200	485,7	0,600	1078,0	2,561
17 0069		23,00	10,20	0,90		1,65	0,75	0,833	0,187	463,1	0,562	1058,0	2,357
17 0070		23,00	10,20	1,00		1,70	0,70	0,700	0,175	538,2	0,525	1315,0	2,619
17 0071		23,00	12,20	1,00		1,60	0,60	0,600	0,150	474,7	0,450	1217,0	2,343
18 0002		23,00	12,20	1,25		1,85	0,60	0,480	0,150	863,4	0,450	2331,0	2,929
18 0003		23,00	12,20	1,50		2,10	0,60	0,400	0,150	1432,0	0,450	3986,0	3,514
17 0072	C	25,00	12,20	0,70		1,60	0,90	1,285	0,255	331,2	0,675	599,6	2,055
17 0073	B	25,00	12,20	0,90		1,60	0,70	0,777	0,175	366,8	0,525	862,3	2,642
18 0004	A	25,00	12,20	1,50		2,05	0,55	0,366	0,137	1040,0	0,412	2926,0	4,403
17 0074		28,00	10,2	0,80		1,75	0,95	1,187	0,237	347,9	0,712	661,5	3,354
17 0075		28,00	10,2	1,00		2,00	1,00	1,000	0,25	615,2	0,750	1289,0	4,191
18 0005		28,00	10,20	1,25		2,25	1,00	0,800	0,250	1030,0	0,750	2394,0	5,238
18 0006		28,00	10,20	1,50		2,20	0,70	0,466	0,175	1003,0	0,525	2723,0	6,286
17 0076		28,00	12,20	1,00		1,95	0,95	0,950	0,237	589,9	0,712	1268,0	3,914
18 0007		28,00	12,20	1,25		2,10	0,85	0,680	0,212	843,8	0,637	2083,0	4,893
18 0008		28,00	12,20	1,50		2,25	0,75	0,500	0,187	1149,0	0,562	3077,0	5,872
17 0077	C	28,00	14,20	0,80		1,80	1,00	1,250	0,250	434,8	0,750	801,4	2,872
17 0078	B	28,00	14,20	1,00		1,80	0,80	0,800	0,200	476,4	0,600	1107,0	3,590
18 0009		28,00	14,20	1,25		2,10	0,85	0,680	0,212	907,4	0,637	2240,0	4,486
18 0010	A	28,00	14,20	1,50		2,15	0,65	0,433	0,162	1033,0	0,487	2841,0	5,386
17 0079	C	31,50	16,30	0,80		1,85	1,05	1,312	0,262	384,3	0,787	686,8	3,583
18 0011	B	31,50	16,30	1,25		2,15	0,90	0,720	0,225	790,5	0,675	1913,0	5,599
18 0012		31,50	16,30	1,50		2,40	0,90	0,600	0,225	1260,0	0,675	3230,0	6,717
18 0013	A	31,50	16,30	1,75		2,45	0,70	0,400	0,175	1391,0	0,525	3871,0	7,839
18 0014		31,50	16,30	2,00		2,75	0,75	0,375	0,187	2199,0	0,562	6173,0	8,956
17 0080		34,00	12,30	1,00		2,20	1,20	1,200	0,300	587,2	0,900	2024,0	6,194
18 0015		34,00	12,30	1,25		2,45	1,20	0,960	0,300	946,4	0,900	1110,0	7,743
18 0016		34,00	12,30	1,50		2,70	1,20	0,800	0,300	1447,0	0,900	3363,0	9,280
18 0017		34,00	14,30	1,25		2,40	1,15	0,920	0,287	912,8	0,862	1993,0	7,330
18 0018		34,00	14,30	1,50		2,55	1,05	0,700	0,262	1224,0	0,787	2990,0	8,799
18 0019		34,00	16,30	1,50		2,55	1,05	0,700	0,262	1291,0	0,787	3155,0	8,233
18 0020		34,00	16,30	2,00		2,85	0,85	0,425	0,212	2097,0	0,637	5783,0	10,978
17 0081	C	35,50	18,30	0,90		2,05	1,15	1,277	0,287	457,7	0,862	831,9	5,134
18 0021	B	35,50	18,30	1,25		2,25	1,00	0,800	0,250	730,9	0,750	1699,0	7,131
18 0022	A	35,50	18,30	2,00		2,80	0,80	0,400	0,200	1864,0	0,600	5187,0	11,410
18 0023		40,00	14,30	1,25		2,65	1,40	1,120	0,350	904,4	1,050	1780,0	10,755
18 0024		40,00	14,30	1,50		2,80	1,30	0,866	0,325	1188,0	0,975	2668,0	12,905
18 0025		40,00	14,30	1,75		3,05	1,30	0,742	0,325	1722,0	0,975	4119,0	15,056
18 0026		40,00	14,30	2,00		3,05	1,05	0,525	0,262	1800,0	0,787	4769,0	17,207
18 0027		40,00	16,30	1,50		2,80	1,30	0,866	0,325	1224,0	0,975	2749,0	12,339
18 0028		40,00	16,30	1,75		3,10	1,35	0,771	0,337	1881,0	1,012	4435,0	16,499
18 0029		40,00	16,30	2,00		3,10	1,10	0,550	0,275	1972,0	0,825	5169,0	14,396
18 0030		40,00	18,30	2,00		3,15	1,15	0,575	0,287	2182,0	0,862	5656,0	15,599
17 0082	C	40,00	20,40	1,00		2,30	1,30	1,300	0,325	565,3	0,975	1017,0	7,299

零件号	DIN 列号	尺寸 (mm)							碟簧行程S(mm)和载荷F(N)				重量 每千件 kg
									S=0.25h ₀		S=0.75h ₀		
		De	Di	t	t'	l ₀	h ₀	h ₀ /t	S	F	S	F	
18 0031	B	40,00	20,40	1,50		2,65	1,15	0,766	0,287	1109,0	0,862	2621,0	10,948
18 0032		40,00	20,40	2,00		3,10	1,10	0,550	0,275	2175,0	0,825	5701,0	14,590
18 0033	A	40,00	20,40	2,25		3,15	0,90	0,400	0,225	2336,0	0,675	6500,0	16,422
18 0034		40,00	20,40	2,50		3,45	0,95	0,380	0,237	3351,0	0,712	9390,0	18,246
18 0035	C	45,00	22,40	1,25		2,85	1,60	1,280	0,400	1041,0	1,200	1891,0	11,739
18 0036	B	45,00	22,40	1,75		3,05	1,30	0,742	0,325	1524,0	0,975	3646,0	16,434
18 0037	A	45,00	22,40	2,50		3,50	1,00	0,400	0,250	2773,0	0,750	7716,0	23,478
18 0038		48,00	16,30	1,50		3,00	1,50	1,000	0,375	1048,0	1,125	2195,0	18,850
18 0039		50,00	18,40	1,25		2,85	1,60	1,280	0,400	756,9	1,200	1375,0	16,657
18 0040		50,00	18,40	1,50		3,15	1,65	1,100	0,412	1166,0	1,237	2319,0	19,988
18 0041		50,00	18,40	2,00		3,65	1,65	0,825	0,412	2229,0	1,237	5114,0	26,651
18 0042		50,00	18,40	2,50		4,15	1,65	0,660	0,412	3870,0	1,237	9643,0	33,314
18 0043		50,00	18,40	3,00		4,20	1,20	0,400	0,300	4179,0	0,900	11630,0	39,977
18 0044		50,00	20,40	2,00		3,50	1,50	0,750	0,375	1966,0	1,125	4687,0	25,695
18 0045		50,00	20,40	2,50		3,85	1,35	0,540	0,337	3008,0	1,012	7919,0	32,118
18 0046		50,00	22,40	2,00		3,60	1,60	0,800	0,400	2247,0	1,200	5222,0	24,639
18 0047		50,00	22,40	2,50		3,90	1,40	0,560	0,350	3261,0	1,050	8510,0	30,799
18 0048	C	50,00	25,40	1,25		2,85	1,60	1,280	0,400	853,7	1,200	1550,0	14,294
18 0049		50,00	25,40	1,50		3,10	1,60	1,066	0,400	1242,0	1,200	2512,0	17,153
18 0050	B	50,00	25,40	2,00		3,40	1,40	0,700	0,350	1949,0	1,050	4762,0	22,871
18 0051		50,00	25,40	2,25		3,75	1,50	0,666	0,375	2905,0	1,125	7217,0	25,730
18 0052		50,00	25,40	2,50		3,90	1,40	0,560	0,350	3473,0	1,050	9063,0	28,589
18 0053	A	50,00	25,40	3,00		4,10	1,10	0,366	0,275	4255,0	0,825	11976,0	34,306
18 0054	C	56,00	28,50	1,50		3,45	1,95	1,300	0,487	1458,0	1,462	2622,0	21,489
18 0055	B	56,00	28,50	2,00		3,60	1,60	0,800	0,400	1910,0	1,200	4438,0	28,653
18 0056		56,00	28,50	2,50		4,20	1,70	0,680	0,425	3638,0	1,275	8978,0	35,816
18 0057	A	56,00	28,50	3,00		4,30	1,30	0,433	0,325	4142,0	0,975	11388,0	42,979
18 0058		60,00	20,50	2,00		4,20	2,20	1,100	0,550	2528,0	1,650	5026,0	39,208
18 0059		60,00	20,50	2,50		4,70	2,20	0,880	0,550	4151,0	1,650	9255,0	49,009
18 0060		60,00	20,50	3,00		5,20	2,20	0,733	0,550	6434,0	1,650	15465,0	58,811
18 0061		60,00	25,50	2,50		4,40	1,90	0,760	0,475	3447,0	1,425	8175,0	45,465
18 0062		60,00	25,50	3,00		4,65	1,65	0,550	0,412	4495,0	1,237	11784,0	54,557
18 0063		60,00	30,50	2,50		4,50	2,00	0,800	0,500	4059,0	1,500	9432,0	41,149
18 0064		60,00	30,50	2,75		4,75	2,00	0,727	0,500	5125,0	1,500	12356,0	45,264
18 0065		60,00	30,50	3,00		4,70	1,70	0,566	0,425	5083,0	1,275	13226,0	57,608
18 0066		60,00	30,50	3,50		5,00	1,50	0,428	0,375	6591,0	1,125	18153,0	57,608
18 0067	C	63,00	31,00	1,80		4,15	2,35	1,305	0,587	2364,0	1,762	4238,0	33,381
18 0068	B	63,00	31,00	2,50		4,25	1,75	0,700	0,437	2942,0	1,312	7189,0	46,362
18 0069		63,00	31,00	3,00		4,70	1,70	0,566	0,425	4524,0	1,275	11772,0	56,635
18 0070	A	63,00	31,00	3,50		4,90	1,40	0,400	0,350	5399,0	1,050	15025,0	64,907
18 0071		70,00	24,50	3,00		5,30	2,30	0,766	0,575	5080,0	1,725	12007,0	79,526
18 0072		70,00	24,50	3,50		6,00	2,50	0,714	0,625	8446,0	1,875	20495,0	92,781
18 0073		70,00	25,50	2,00		4,50	2,50	1,250	0,625	2408,0	1,875	4437,0	52,401
18 0074		70,00	30,50	2,50		4,90	2,40	0,960	0,600	3755,0	1,800	8031,0	61,186
18 0075		70,00	30,50	3,00		5,10	2,10	0,700	0,525	4676,0	1,575	11426,0	73,423
18 0076		70,00	35,50	3,00		5,10	2,10	0,700	0,525	5028,0	1,575	12287,0	67,319
18 0077		70,00	35,50	3,50		5,30	1,80	0,514	0,450	6077,0	1,350	16177,0	78,539
18 0078		70,00	35,50	4,00		5,80	1,80	0,450	0,450	8757,0	1,350	23923,0	89,759

第4章

标准碟形弹簧

材料51CrV4, 材料号1.8159

零件号	DIN 列号	尺寸 (mm)							碟簧行程S(mm)和载荷F(N)				重量 每千件 kg
									S=0.25h ₀		S=0.75h ₀		
		De	Di	t	t'	l ₀	h ₀	h ₀ /t	S	F	S	F	
18 0079		70,00	35,50	4,00	3,75	5,80	1,80	0,450	0,450	9167,0	1,350	23923,0	84,149
18 0080		70,00	40,50	4,00		5,70	1,70	0,425	0,425	9025,0	1,275	24889,0	80,388
18 0081		70,00	40,50	4,00	3,75	5,70	1,70	0,425	0,425	9423,0	1,275	24889,0	75,364
18 0082		70,00	40,50	5,00		6,40	1,40	0,280	0,350	13646,0	1,050	39410,0	100,485
18 0083		70,00	40,50	5,00	4,70	6,40	1,40	0,280	0,350	14004,0	1,050	39410,0	94,456
18 0084	C	71,00	36,00	2,00		4,60	2,60	1,300	0,650	2861,0	1,950	5144,0	46,177
18 0085	B	71,00	36,00	2,50		4,50	2,00	0,800	0,500	2894,0	1,500	6725,0	57,722
18 0086	A	71,00	36,00	4,00		5,60	1,60	0,400	0,400	7379,0	1,200	20535,0	92,355
18 0087		71,00	36,00	4,00	3,75	5,60	1,60	0,400	0,400	7685,0	1,200	20535,0	86,582
18 0088		80,00	30,50	2,50		5,30	2,80	1,120	0,700	3664,0	2,100	7211,0	84,305
18 0089		80,00	31,00	3,00		5,50	2,50	0,833	0,625	4531,0	1,875	10352,0	100,598
18 0090		80,00	31,00	4,00		6,10	2,10	0,525	0,525	7319,0	1,575	19394,0	134,130
18 0091		80,00	31,00	4,00	3,75	6,10	2,10	0,525	0,525	7717,0	1,575	19394,0	125,747
18 0092		80,00	35,50	4,00		6,20	2,20	0,550	0,550	8118,0	1,650	21280,0	126,750
18 0093		80,00	35,50	4,00	3,75	6,20	2,20	0,550	0,550	8577,0	1,650	21280,0	118,828
18 0094		80,00	36,00	3,00		5,70	2,70	0,900	0,675	5401,0	2,025	11919,0	94,401
18 0095	C	80,00	41,00	2,25		5,20	2,95	1,311	0,737	3698,0	2,212	6613,0	65,460
18 0096	B	80,00	41,00	3,00		5,30	2,30	0,766	0,575	4450,0	1,725	10518,0	87,281
18 0097		80,00	41,00	4,00		6,20	2,20	0,550	0,550	8726,0	1,650	22874,0	116,374
18 0098		80,00	41,00	4,00	3,75	6,20	2,20	0,550	0,550	9220,0	1,650	22874,0	109,100
18 0099	A	80,00	41,00	5,00		6,70	1,70	0,340	0,425	11821,0	1,275	33559,0	145,468
18 0100		80,00	41,00	5,00	4,70	6,70	1,70	0,340	0,425	12211,0	1,275	33559,0	136,740
18 0101	C	90,00	46,00	2,50		5,70	3,20	1,280	0,800	4232,0	2,400	7684,0	92,231
18 0102	B	90,00	46,00	3,50		6,00	2,50	0,714	0,625	5836,0	1,875	14161,0	129,124
18 0103	A	90,00	46,00	5,00		7,00	2,00	0,400	0,500	11267,0	1,500	31354,0	184,463
18 0104		90,00	46,00	5,00	4,70	7,00	2,00	0,400	0,500	11713,0	1,500	31354,0	173,395
18 0105		100,00	41,00	4,00		7,20	3,20	0,800	0,800	8715,0	2,400	20251,0	205,153
18 0106		100,00	41,00	4,00	3,80	7,20	3,20	0,800	0,800	9215,0	2,400	20251,0	194,896
18 0107		100,00	41,00	5,00		7,75	2,75	0,550	0,687	12345,0	2,062	32361,0	256,441
18 0108		100,00	41,00	5,00	4,70	7,75	2,75	0,550	0,687	13013,0	2,062	32361,0	241,055
18 0109	C	100,00	51,00	2,70		6,20	3,50	1,296	0,875	4779,0	2,625	8609,0	123,164
18 0110	B	100,00	51,00	3,50		6,30	2,80	0,800	0,700	5624,0	2,100	13070,0	159,657
18 0111		100,00	51,00	4,00		7,00	3,00	0,750	0,750	8673,0	2,250	20674,0	182,465
18 0112		100,00	51,00	4,00	3,80	7,00	3,00	0,750	0,750	9156,0	2,250	20674,0	173,342
18 0113		100,00	51,00	5,00		7,80	2,80	0,560	0,700	13924,0	2,100	36339,0	228,081
18 0114		100,00	51,00	5,00	4,70	7,80	2,80	0,560	0,700	14689,0	2,100	36339,0	214,397
18 0115	A	100,00	51,00	6,00		8,20	2,20	0,366	0,550	17061,0	1,650	48022,0	273,698
18 0116		100,00	51,00	6,00	5,60	8,20	2,20	0,366	0,550	17753,0	1,650	48022,0	255,451
19 0001		100,00	51,00	7,00	6,55	9,20	2,20	0,314	0,550	27374,0	1,650	75840,0	298,787
18 0117	C	112,00	57,00	3,00		6,90	3,90	1,300	0,975	5834,0	2,925	10489,0	171,917
18 0118	B	112,00	57,00	4,00		7,20	3,20	0,800	0,800	7639,0	2,400	17752,0	229,222
18 0119		112,00	57,00	4,00	3,75	7,20	3,20	0,800	0,800	8192,0	2,400	17752,0	214,896
18 0120	A	112,00	57,00	6,00		8,50	2,50	0,416	0,625	15800,0	1,875	43707,0	343,833
18 0121		112,00	57,00	6,00	5,60	8,50	2,50	0,416	0,625	16536,0	1,875	43707,0	320,911
18 0122		125,00	51,00	4,00		8,50	4,50	1,125	1,125	10096,0	3,375	19817,0	321,182
18 0123		125,00	51,00	4,00	3,80	8,50	4,50	1,125	1,125	10705,0	3,375	19817,0	305,123
18 0124		125,00	51,00	5,00		8,90	3,90	0,780	0,975	13063,0	2,925	30669,0	401,478
18 0125		125,00	51,00	5,00	4,75	8,90	3,90	0,780	0,975	13804,0	2,925	30669,0	381,404

零件号	DIN 列号	尺寸 (mm)							碟簧行程S(mm)和载荷F(N)				重量 每千件 kg
									S=0.25ho		S=0.75ho		
		De	Di	t	t'	lo	ho	ho/t	S	F	S	F	
18 0126		125,00	51,00	6,00		9,40	3,40	0,566	0,850	17027,0	2,550	44307,0	481,773
18 0127		125,00	51,00	6,00	5,65	9,40	3,40	0,566	0,850	17944,0	2,550	44307,0	453,700
18 0128		125,00	61,00	5,00		9,00	4,00	0,800	1,000	14615,0	3,000	33965,0	366,953
18 0129		125,00	61,00	5,00	4,75	9,00	4,00	0,800	1,000	15455,0	3,000	33965,0	348,605
18 0130		125,00	61,00	6,00		9,60	3,60	0,600	0,900	19789,0	2,700	50722,0	440,343
18 0131		125,00	61,00	6,00	5,60	9,60	3,60	0,600	0,900	21079,0	2,700	50722,0	410,987
19 0002		125,00	61,00	8,00	7,50	10,90	2,90	0,362	0,725	34434,0	2,175	93577,0	550,429
18 0132	C	125,00	64,00	3,50		8,00	4,50	1,285	1,125	8514,0	3,375	15416,0	248,775
18 0133	B	125,00	64,00	5,00		8,50	3,50	0,700	0,875	12238,0	2,625	29908,0	355,393
18 0134		125,00	64,00	5,00	4,70	8,50	3,50	0,700	0,875	13031,0	2,625	29908,0	334,069
18 0135		125,00	64,00	6,00		9,60	3,60	0,600	0,900	20348,0	2,700	52155,0	426,471
18 0136		125,00	64,00	6,00	5,60	9,60	3,60	0,600	0,900	21674,0	2,700	52155,0	398,040
19 0003		125,00	64,00	7,00	6,55	10,00	3,00	0,428	0,750	25528,0	2,250	67216,0	465,564
19 0004	A	125,00	64,00	8,00	7,50	10,60	2,60	0,325	0,650	31118,0	1,950	85926,0	533,039
18 0137		125,00	71,00	6,00		9,30	3,30	0,550	0,825	19538,0	2,475	51217,0	391,515
18 0138		125,00	71,00	6,00	5,60	9,30	3,30	0,550	0,825	20725,0	2,475	51217,0	365,414
19 0005		125,00	71,00	8,00	7,45	10,90	2,90	0,362	0,725	38416,0	2,175	103964,0	486,131
19 0006		125,00	71,00	10,00	9,30	11,80	1,80	0,180	0,450	42821,0	1,350	124124,0	606,848
18 0139	C	140,00	72,00	3,80		8,70	4,90	1,289	1,225	9514,0	3,675	17195,0	337,734
18 0140	B	140,00	72,00	5,00		9,00	4,00	0,800	1,000	12014,0	3,000	27920,0	444,388
18 0141		140,00	72,00	5,00	4,70	9,00	4,00	0,800	1,000	12847,0	3,000	27920,0	417,724
19 0007	A	140,00	72,00	8,00	7,50	11,20	3,20	0,400	0,800	31903,0	2,400	85251,0	666,581
18 0142		150,00	61,00	5,00		10,30	5,30	1,060	1,325	15292,0	3,975	31041,0	578,881
18 0143		150,00	61,00	5,00	4,75	10,30	5,30	1,060	1,325	16221,0	3,975	31041,0	549,937
18 0144		150,00	61,00	6,00		10,80	4,80	0,800	1,200	19560,0	3,600	45456,0	694,658
18 0145		150,00	61,00	6,00	5,70	10,80	4,80	0,800	1,200	20684,0	3,600	45456,0	659,925
19 0008		150,00	61,00	7,00	6,55	11,80	4,80	0,685	1,200	30593,0	3,600	70442,0	758,335
18 0146		150,00	71,00	6,00		10,85	4,85	0,808	1,212	21067,0	3,637	48749,0	645,829
18 0147		150,00	71,00	6,00	5,60	10,85	4,85	0,808	1,212	22703,0	3,637	48749,0	602,774
19 0009		150,00	71,00	8,00	7,50	12,05	4,05	0,506	1,012	35885,0	3,037	91060,0	807,287
19 0010		150,00	81,00	8,00	7,50	12,00	4,00	0,500	1,000	38230,0	3,000	97319,0	737,000
19 0011		150,00	81,00	10,00	9,40	13,40	3,40	0,340	0,850	57601,0	2,550	158300,0	923,710
18 0148	C	160,00	82,00	4,30		9,90	5,60	1,302	1,400	12162,0	4,200	21843,0	500,409
18 0149		160,00	82,00	4,30	4,15	9,90	5,60	1,302	1,400	12653,0	4,200	21843,0	482,953
18 0150	B	160,00	82,00	6,00		10,50	4,50	0,750	1,125	17203,0	3,375	41008,0	698,246
18 0151		160,00	82,00	6,00	5,60	10,50	4,50	0,750	1,125	18496,0	3,375	41008,0	651,696
19 0012	A	160,00	82,00	10,00	9,40	13,50	3,50	0,350	0,875	50547,0	2,625	138331,0	1,094,000
19 0013		160,00	82,00	11,00	10,20	14,50	3,50	0,318	0,875	66678,0	2,625	183518,0	1,187,000
18 0152	C	180,00	92,00	4,80		11,00	6,20	1,291	1,550	14646,0	4,650	26442,0	708,337
18 0153		180,00	92,00	4,80	4,60	11,00	6,20	1,291	1,550	15352,0	4,650	26442,0	678,822
18 0154	B	180,00	92,00	6,00		11,10	5,10	0,850	1,275	16558,0	3,825	37502,0	885,421
18 0155		180,00	92,00	6,00	5,60	11,10	5,10	0,850	1,275	17866,0	3,825	37502,0	826,393
19 0014	A	180,00	92,00	10,00	9,40	14,00	4,00	0,400	1,000	46850,0	3,000	125417,0	1,387,000
19 0015		180,00	92,00	13,00	12,10	16,50	3,50	0,269	0,875	84574,0	2,625	237883,0	1,786,000
18 0173		200,00	82,00	5,00	4,80	10,50	5,50	1,100	1,375	9700,0	4,125	18400,0	980,000
18 0174		200,00	82,00	6,00	5,80	13,00	7,00	11,767	1,750	22300,0	5,250	41200,0	1,190,000
19 0016		200,00	82,00	8,00	7,50	14,20	6,20	0,775	1,550	35519,0	4,650	78034,0	1,539,000
19 0041		200,00	82,00	8,50	8,10	14,50	6,00	0,706	1,500	38500,0	4,500	89300,0	1,660,000

第4章

标准碟形弹簧

材料51CrV4, 材料号1.8159

零件号	DIN 列号	尺寸 (mm)							碟簧行程S(mm)和载荷F(N)				重量 每千件 kg
									S=0.25ho		S=0.75ho		
		De	Di	t	t'	lo	ho	ho/t	S	F	S	F	
19 0017		200,00	82,00	10,00	9,40	15,50	5,50	0,550	1,375	52053,0	4,125	129445,0	1,928,000
19 0018		200,00	82,00	12,00	11,25	16,60	4,60	0,383	1,150	67868,0	3,450	182737,0	2,308,000
19 0042		200,00	82,00	13,00	12,10	16,50	3,50	0,269	0,875	62100,0	2,625	174800,0	2,480,000
19 0019		200,00	92,00	10,00	9,40	15,60	5,60	0,560	1,400	55657,0	4,200	137688,0	1,828,000
19 0020		200,00	92,00	12,00	11,25	16,80	4,80	0,400	1,200	74572,0	3,600	199269,0	2,187,000
19 0021		200,00	92,00	14,00	13,05	18,10	4,10	0,292	1,025	95817,0	3,075	267227,0	2,537,000
18 0156	C	200,00	102,00	5,50		12,50	7,00	1,272	1,750	19817,0	5,250	36111,0	1,004,000
18 0157		200,00	102,00	5,50	5,30	12,50	7,00	1,272	1,750	20659,0	5,250	36111,0	967,970
19 0022	B	200,00	102,00	8,00	7,50	13,60	5,60	0,700	1,400	33367,0	4,200	76378,0	1,368,000
19 0043		200,00	102,00	8,30	7,80	14,30	6,00	0,723	1,500	40500,0	4,500	91800,0	1,420,000
19 0044		200,00	102,00	9,00	8,60	14,60	5,60	0,622	1,400	44100,0	4,200	107100,0	1,570,000
19 0023		200,00	102,00	10,00	9,40	15,60	5,60	0,560	1,400	58756,0	4,200	145357,0	1,716,000
19 0045		200,00	102,00	11,00	10,30	15,00	4,00	0,364	1,000	49500,0	3,000	134500,0	1,880,000
19 0024	A	200,00	102,00	12,00	11,25	16,20	4,20	0,350	1,050	66983,0	3,150	183020,0	2,053,000
19 0025		200,00	102,00	14,00	13,05	18,20	4,20	0,300	1,050	103986,0	3,150	289181,0	2,381,000
18 0175		200,00	112,00	6,00	5,80	12,00	6,00	1,000	1,500	19700,0	4,500	39700,0	980,000
19 0026		200,00	112,00	12,00	11,25	16,20	4,20	0,350	1,050	71671,0	3,150	195830,0	1,904,000
19 0027		200,00	112,00	14,00	13,05	17,50	3,50	0,250	0,875	90576,0	2,625	256758,0	2,209,000
19 0046		200,00	112,00	15,00	14,00	18,00	3,00	0,200	0,750	93500,0	2,250	269700,0	2,370,000
19 0028		200,00	112,00	16,00	14,80	19,80	3,80	0,237	0,950	146464,0	2,850	415725,0	2,505,000
19 0029	C	225,00	112,00	6,50	6,20	13,60	7,10	1,092	1,775	23582,0	5,325	44580,0	1,455,000
19 0030	B	225,00	112,00	8,00	7,50	14,50	6,50	0,812	1,625	32870,0	4,875	70749,0	1,761,000
19 0047		225,00	112,00	9,00	8,45	15,50	6,50	0,722	1,625	43600,0	4,875	98800,0	1,980,000
19 0048		225,00	112,00	10,00	9,40	16,20	6,20	0,620	1,550	52800,0	4,650	126700,0	2,200,000
19 0049		225,00	112,00	10,80	10,00	16,50	5,70	0,528	1,425	58100,0	4,275	144400,0	2,350,000
19 0031	A	225,00	112,00	12,00	11,25	17,00	5,00	0,416	1,250	64497,0	3,750	171016,0	2,641,000
19 0032		225,00	112,00	16,00	14,90	20,50	4,50	0,281	1,125	128407,0	3,375	359590,0	3,498,000
19 0033		250,00	102,00	10,00	9,40	18,00	8,00	0,800	2,000	58157,0	6,000	126387,0	3,019,000
19 0034		250,00	102,00	12,00	11,25	19,00	7,00	0,583	1,750	75052,0	5,250	182962,0	3,613,000
19 0035	C	250,00	127,00	7,00	6,70	14,80	7,80	1,114	1,950	26895,0	5,850	50466,0	1,915,000
19 0050		250,00	127,00	7,50	7,00	16,50	9,00	1,200	2,250	41900,0	6,750	73500,0	2,000,000
19 0036		250,00	127,00	8,00	7,50	16,00	8,00	1,000	2,000	38439,0	6,000	74819,0	2,144,000
19 0051		250,00	127,00	9,00	8,45	16,60	7,60	0,844	1,900	45900,0	5,700	97300,0	2,420,000
19 0052		250,00	127,00	9,20	8,60	17,40	8,20	0,891	2,050	55200,0	6,150	113400,0	2,460,000
19 0037	B	250,00	127,00	10,00	9,40	17,00	7,00	0,700	1,750	51871,0	5,250	119053,0	2,687,000
19 0053		250,00	127,00	10,50	9,90	18,00	7,50	0,714	1,875	64800,0	5,625	148100,0	2,830,000
19 0054		250,00	127,00	11,00	10,40	18,80	7,80	0,709	1,950	77000,0	5,850	176900,0	2,970,000
19 0038		250,00	127,00	12,00	11,25	19,30	7,30	0,608	1,825	87633,0	5,475	210806,0	3,216,000
19 0055		250,00	127,00	13,00	12,20	19,60	6,60	0,508	1,650	93900,0	4,950	238300,0	3,490,000
19 0056		250,00	127,00	13,50	12,60	19,60	6,10	0,452	1,525	94200,0	4,575	244700,0	3,600,000
19 0039	A	250,00	127,00	14,00	13,10	19,60	5,60	0,400	1,400	93239,0	4,200	248828,0	3,745,000
19 0057		250,00	127,00	14,50	13,60	20,00	5,50	0,379	1,375	100400,0	4,125	270800,0	3,890,000
19 0058		250,00	127,00	15,00	14,10	21,00	6,00	0,400	1,500	122500,0	4,500	327900,0	4,030,000
19 0040		250,00	127,00	16,00	14,90	21,80	5,80	0,362	1,450	141529,0	4,350	383017,0	4,260,000
19 0059		250,00	127,00	16,80	15,65	22,00	5,20	0,310	1,300	142800,0	3,900	395400,0	4,470,000
19 0060		250,00	127,00	17,50	16,35	22,00	4,50	0,257	1,125	136000,0	3,375	384900,0	4,670,000
19 0061		250,00	127,00	18,50	17,30	23,00	4,50	0,243	1,125	159700,0	3,375	454300,0	4,950,000
19 0062		270,00	127,00	10,65	10,00	18,00	7,35	0,690	1,838	53800,0	5,513	123900,0	3,500,000

零件号	DIN 列号	尺寸 (mm)							碟簧行程S(mm)和载荷F(N)				重量 每千件 kg
									S=0.25ho		S=0.75ho		
		De	Di	t	t'	lo	ho	ho/t	S	F	S	F	
19 0063		270,00	142,00	22,00		26,90	4,90	0,223	1,225	248700,0	3,675	728300,0	7,150,000
19 0064		280,00	127,00	12,00	11,40	21,40	9,40	0,783	2,350	95400,0	7,050	211600,0	4,380,000
19 0065		280,00	127,00	19,00	18,00	25,00	6,00	0,316	1,500	178200,0	4,500	496800,0	6,910,000
19 0066		280,00	142,00	12,00	11,30	21,00	9,00	0,750	2,250	95100,0	6,750	212900,0	4,060,000
19 0067		280,00	142,00	15,00	14,10	21,40	6,40	0,427	1,600	105700,0	4,800	279500,0	5,060,000
19 0068		280,00	142,00	16,60	15,60	23,25	6,65	0,401	1,663	146600,0	4,988	392300,0	5,600,000
19 0069		280,00	142,00	17,45	16,40	23,90	6,45	0,370	1,613	162300,0	4,838	440400,0	5,890,000
19 0070		280,00	142,00	18,00	16,90	24,00	6,00	0,333	1,500	162600,0	4,500	447900,0	6,070,000
19 0071		280,00	142,00	18,90	17,80	24,60	5,70	0,302	1,425	175800,0	4,275	491000,0	6,390,000
19 0072		280,00	142,00	20,30	19,10	25,40	5,10	0,251	1,275	190600,0	3,825	542100,0	6,860,000
19 0073		280,00	142,00	22,00	20,65	26,35	4,35	0,198	1,088	202800,0	3,263	586300,0	7,410,000
19 0074		280,00	152,00	12,80	11,90	19,80	7,00	0,547	1,750	82100,0	5,250	202500,0	4,060,000
19 0075		280,00	152,00	15,00	14,00	21,40	6,40	0,427	1,600	111300,0	4,800	292700,0	4,770,000
19 0076		280,00	152,00	18,50	17,40	23,60	5,10	0,276	1,275	152700,0	3,825	430600,0	5,930,000
19 0077		300,00	127,00	12,00	11,30	21,00	9,00	0,750	2,250	76300,0	6,750	170700,0	5,150,000
19 0078		300,00	127,00	13,00	12,30	20,50	7,50	0,577	1,875	70900,0	5,625	174900,0	5,600,000
19 0079		300,00	127,00	14,00	13,30	21,00	7,00	0,500	1,750	78300,0	5,250	201400,0	6,060,000
19 0080		300,00	127,00	15,30	22,80		7,50	0,490	1,875	104600,0	5,625	281200,0	6,970,000
19 0081		300,00	127,00	16,00	15,20	24,30	8,30	0,519	2,075	140200,0	6,225	357400,0	6,920,000
19 0082		300,00	127,00	17,00	16,10	23,80	6,80	0,400	1,700	128400,0	5,100	345500,0	7,330,000
19 0083		300,00	127,00	17,40	16,45	22,65	5,25	0,302	1,313	101100,0	3,938	283000,0	7,490,000
19 0084		300,00	152,00	8,50	8,25	16,80	8,30	0,976	2,075	31300,0	6,225	64100,0	3,400,000
19 0085		300,00	152,00	10,00	9,40	20,00	10,00	1,000	2,500	64900,0	7,500	126600,0	3,880,000
19 0086		300,00	152,00	12,00	11,30	21,00	9,00	0,750	2,250	82800,0	6,750	185300,0	4,660,000
19 0087		300,00	152,00	13,00	12,20	22,00	9,00	0,692	2,250	101200,0	6,750	232800,0	5,030,000
19 0088		300,00	152,00	14,00	13,20	22,00	8,00	0,571	2,000	102500,0	6,000	252700,0	5,440,000
19 0089		300,00	152,00	14,50	13,60	22,00	7,50	0,517	1,875	103400,0	5,625	260900,0	5,610,000
19 0090		300,00	152,00	15,00	14,10	23,00	8,00	0,533	2,000	123100,0	6,000	308900,0	5,820,000
19 0091		300,00	152,00	15,50	14,60	23,50	8,00	0,516	2,000	134100,0	6,000	339900,0	6,020,000
19 0092		300,00	152,00	16,10	15,10	23,70	7,60	0,472	1,900	139200,0	5,700	359500,0	6,230,000
19 0093		300,00	152,00	16,50		23,00	6,50	0,394	1,625	117500,0	4,875	327600,0	6,810,000
19 0094		300,00	152,00	17,00	16,00	24,40	7,40	0,435	1,850	155600,0	5,550	410000,0	6,600,000
19 0095		300,00	152,00	18,00	16,80	25,00	7,00	0,389	1,750	170900,0	5,250	457700,0	6,930,000
19 0096		300,00	152,00	18,50	17,40	25,00	6,50	0,351	1,625	167900,0	4,875	459500,0	7,180,000
19 0097		300,00	152,00	19,50	18,30	26,20	6,70	0,344	1,675	202200,0	5,025	554200,0	7,550,000
19 0098		300,00	152,00	20,00	18,80	25,50	5,50	0,275	1,375	173000,0	4,125	487600,0	7,750,000
19 0099		300,00	152,00	20,50	19,30	26,50	6,00	0,293	1,500	204700,0	4,500	573800,0	7,960,000
19 0100		300,00	182,00	12,00	11,10	18,00	6,00	0,500	1,500	54400,0	4,500	136900,0	3,890,000
19 0101		320,00	172,00	8,10	7,60	16,30	8,20	1,012	2,050	26200,0	6,150	50600,0	3,410,000
19 0102		320,00	172,00	9,00	8,50	19,00	10,00	1,111	2,500	47000,0	7,500	87100,0	3,820,000
19 0103		320,00	172,00	13,00	12,20	20,00	7,00	0,538	1,750	64400,0	5,250	161000,0	5,480,000
19 0104		320,00	172,00	15,00	14,10	21,00	6,00	0,400	1,500	77600,0	4,500	207900,0	6,330,000
19 0105		340,00	172,00	9,20	8,65	19,40	10,20	1,109	2,550	43700,0	7,650	80700,0	4,590,000
19 0106		340,00	172,00	9,50	8,90	20,80	11,30	1,189	2,825	57000,0	8,475	100800,0	4,720,000
19 0107		340,00	172,00	10,50	9,90	22,50	12,00	1,143	3,000	78300,0	9,000	142500,0	5,250,000
19 0108		340,00	172,00	11,00	10,40	22,40	11,40	1,036	2,850	78300,0	8,550	151000,0	5,520,000
19 0109		340,00	172,00	11,50	10,80	22,90	11,40	0,991	2,850	87000,0	8,550	170400,0	5,730,000
19 0110		340,00	172,00	12,50	11,80	23,00	10,50	0,840	2,625	90800,0	7,875	194000,0	6,260,000

第4章

标准碟形弹簧

材料51CrV4, 材料号1.8159

零件号	DIN 列号	尺寸 (mm)							碟簧行程S(mm)和载荷F(N)				重量 每千件 kg
									S=0.25ho		S=0.75ho		
		De	Di	t	t'	lo	ho	ho/t	S	F	S	F	
19 0111		340,00	172,00	13,50	12,70	23,50	10,00	0,741	2,500	101300,0	7,500	227600,0	6,740,000
19 0112		340,00	172,00	13,70	12,90	24,30	10,60	0,774	2,650	115000,0	7,950	253900,0	6,840,000
19 0113		340,00	172,00	14,20	13,30	24,40	10,20	0,718	2,550	118800,0	7,650	268900,0	7,050,000
19 0114		340,00	172,00	14,60	13,70	25,10	10,50	0,719	2,625	132700,0	7,875	300900,0	7,270,000
19 0115		340,00	172,00	15,30	14,40	24,70	9,40	0,614	2,350	126200,0	7,050	303700,0	7,640,000
19 0116		340,00	172,00	15,80	14,80	25,50	9,70	0,614	2,425	144000,0	7,275	345200,0	7,850,000
19 0117		340,00	172,00	16,20	15,20	25,60	9,40	0,580	2,350	146700,0	7,050	358400,0	8,060,000
19 0118		340,00	172,00	17,00	16,00	25,30	8,30	0,488	2,075	140300,0	6,225	360400,0	8,490,000
19 0119		340,00	172,00	17,30	16,30	26,10	8,80	0,509	2,200	158700,0	6,600	403900,0	8,640,000
19 0120		340,00	172,00	18,00	16,90	26,00	8,00	0,444	2,000	156400,0	6,000	409800,0	8,960,000
19 0121		340,00	172,00	20,00	18,70	28,00	8,00	0,400	2,000	209500,0	6,000	558900,0	9,920,000
19 0122		340,00	172,00	22,00	20,60	28,00	6,00	0,273	1,500	195500,0	4,500	550600,0	10,900,000
19 0123		360,00	182,00	15,50	14,60	23,50	8,00	0,516	2,000	93000,0	6,000	235700,0	8,680,000
19 0124		360,00	182,00	20,00	18,80	28,30	8,30	0,415	2,075	194800,0	6,225	518000,0	11,200,000
19 0125		360,00	182,00	21,00	19,70	28,00	7,00	0,333	1,750	182000,0	5,250	501000,0	11,700,000
19 0126		360,00	182,00	21,50	20,20	29,50	8,00	0,372	2,000	227700,0	6,000	617000,0	12,000,000
19 0127		360,00	182,00	23,00	21,60	30,20	7,20	0,313	1,800	243300,0	5,400	675700,0	12,800,000
19 0128		370,00	202,00	25,00	23,20	31,40	6,40	0,256	1,600	271200,0	4,800	765700,0	13,700,000
19 0129		370,00	202,00	26,00	24,20	32,80	6,80	0,262	1,700	324500,0	5,100	915500,0	14,300,000
19 0130		380,00	152,00	19,00	18,00	29,00	10,00	0,526	2,500	174600,0	7,500	442400,0	13,500,000
19 0131		380,00	192,00	13,50	12,70	26,20	12,70	0,941	3,175	120300,0	9,525	242400,0	8,420,000
19 0132		380,00	192,00	25,00	23,40	33,00	8,00	0,320	2,000	313100,0	6,000	865600,0	15,500,000
19 0133		380,00	202,00	12,00	11,50	25,00	13,00	1,083	3,250	98100,0	9,750	187300,0	7,350,000
19 0134		380,00	202,00	15,00	14,10	27,00	12,00	0,800	3,000	144400,0	9,000	313900,0	9,000,000
19 0135		380,00	212,00	18,00	16,70	27,00	9,00	0,500	2,250	158000,0	6,750	398700,0	10,200,000
19 0136		400,00	202,00	10,00	9,60	22,00	12,00	1,200	3,000	50100,0	9,000	90400,0	7,050,000
19 0137		400,00	202,00	12,00	11,30	26,50	14,50	1,208	3,625	107500,0	10,875	189200,0	8,300,000
19 0138		400,00	202,00	14,00	13,20	27,00	13,00	0,929	3,250	122400,0	9,750	248900,0	9,700,000
19 0139		400,00	202,00	16,00	15,10	28,00	12,00	0,750	3,000	146600,0	9,000	328800,0	11,100,000
19 0140		400,00	202,00	19,00	17,90	30,00	11,00	0,579	2,750	198900,0	8,250	488200,0	13,200,000
19 0141		400,00	202,00	20,30	19,10	31,10	10,80	0,532	2,700	230900,0	8,100	580100,0	14,000,000
19 0142		400,00	202,00	21,20	19,90	31,40	10,20	0,481	2,550	240700,0	7,650	619200,0	14,600,000
19 0143		400,00	202,00	22,50	21,20	32,50	10,00	0,444	2,500	274900,0	7,500	722000,0	15,600,000
19 0144		400,00	202,00	30,00	28,20	37,20	7,20	0,240	1,800	422500,0	5,400	1206000,0	20,700,000
19 0145		440,00	212,00	18,50		32,00	13,50	0,730	3,375	190400,0	10,125	458400,0	17,000,000
19 0146		440,00	252,00	25,00	23,20	33,00	8,00	0,320	2,000	257500,0	6,000	708500,0	18,600,000
19 0147		450,00	202,00	25,50	24,00	34,10	8,60	0,337	2,150	241500,0	6,450	665000,0	23,900,000
19 0148		450,00	252,00	21,00	19,50	33,00	12,00	0,571	3,000	251200,0	9,000	610900,0	16,700,000
19 0149		450,00	252,00	25,00	23,30	33,80	8,80	0,352	2,200	269500,0	6,600	733000,0	20,000,000
19 0150		470,00	237,00	33,00	31,00	42,00	9,00	0,273	2,250	516100,0	6,750	1456000,0	31,500,000
19 0151		480,00	252,00	20,30	19,00	33,00	12,70	0,626	3,175	207400,0	9,525	493500,0	19,600,000
19 0152		480,00	252,00	20,70		36,60	15,90	0,768	3,975	285500,0	11,925	674300,0	21,300,000
19 0153		500,00	202,00	37,00	35,00	44,40	7,40	0,200	1,850	466200,0	5,550	1350000,0	45,100,000
19 0154		500,00	242,00	32,00	30,00	41,00	9,00	0,281	2,250	408400,0	6,750	1147000,0	35,400,000
19 0155		500,00	252,00	19,00		34,50	15,50	0,816	3,875	200100,0	11,625	461300,0	21,900,000
19 0156		600,00	282,00	22,00		44,00	22,00	1,000	5,500	340100,0	16,500	712400,0	38,000,000
19 0157		600,00	282,00	24,00		46,00	22,00	0,917	5,500	413600,0	16,500	905000,0	41,500,000

零件号	DIN 列号	尺寸 (mm)							碟簧行程S(mm)和载荷F(N)				重量 每千件 kg
									S=0.25h ₀		S=0.75h ₀		
		De	Di	t	t'	l ₀	h ₀	h ₀ /t	S	F	S	F	
171 005		8,0	4,20	0,30		0,50	0,20	0,666	0,05	33,8	0,150	83,9	0,087
171 006		8,0	4,20	0,40		0,60	0,20	0,500	0,05	72,2	0,150	193,0	0,115
171 014		10,0	5,20	0,40		0,65	0,25	0,625	0,063	61,9	0,188	156,9	0,181
171 015		10,0	5,20	0,50		0,70	0,20	0,400	0,05	85,1	0,150	237,0	0,226
171 016		12,0	4,20	0,40		0,80	0,40	1,000	0,10	78,6	0,300	164,5	0,313
171 017		12,0	4,20	0,50		0,80	0,30	0,600	0,075	85,9	0,225	220,1	0,390
171 024		12,5	6,20	0,50		0,85	0,35	0,700	0,088	110,8	0,263	270,7	0,365
171 025		12,5	6,20	0,70		0,95	0,25	0,357	0,063	178,0	0,188	502,6	0,511
171 027		14,0	7,20	0,50		0,90	0,40	0,800	0,10	110,8	0,225	735,0	0,445
171 028		14,0	7,20	0,80		1,10	0,30	0,375	0,075	261,8	0,300	906,0	0,715
171 037		15,0	8,20	0,80		1,20	0,40	0,500	0,10	338,3	0,338	378,2	0,783
171 039		16,0	8,20	0,60		1,05	0,45	0,750	0,113	158,7	0,300	761,2	0,702
171 220		16,0	8,20	0,80		1,20	0,40	0,500	0,10	284,2	0,300	257,5	0,940
171 040		16,0	8,20	0,90		1,25	0,35	0,388	0,088	334,4	0,263	934,2	1,060
171 050		18,0	9,20	0,70		1,20	0,50	0,714	0,125	215,3	0,375	522,4	1,040
171 051		18,0	9,20	1,00		1,40	0,40	0,400	0,10	415,7	0,300	1157,0	1,485
171 052		20,0	8,20	0,50		1,15	0,65	1,300	0,163	118,4	0,488	212,9	1,030
171 056		20,0	8,20	0,90		1,50	0,60	0,667	0,15	390,4	0,450	969,6	1,858
170 159		20,0	10,20	0,60		1,20	0,60	1,000	0,15	163,3	0,450	342,0	1,101
171 060		20,0	10,20	0,80		1,35	0,55	0,687	0,138	280,7	0,413	690,1	1,470
170 158		20,0	10,20	0,90		1,40	0,50	0,555	0,125	333,5	0,375	872,0	1,650
171 062		20,0	10,20	1,00		1,55	0,55	0,550	0,138	501,5	0,413	1315,0	1,840
171 063		20,0	10,20	1,10		1,55	0,45	0,409	0,113	506,0	0,338	1403,0	2,020
171 065		22,5	11,20	0,80		1,45	0,65	0,812	0,163	282,6	0,488	653,0	1,890
181 001		22,5	11,20	1,25		1,75	0,50	0,400	0,125	639,3	0,375	1779,0	2,950
171 072		25,0	12,20	0,70		1,60	0,90	1,285	0,225	305,5	0,675	553,1	2,070
171 073		25,0	12,20	0,90		1,60	0,70	0,777	0,175	338,4	0,525	795,3	2,660
181 004		25,0	12,20	1,50		2,00	0,50	0,333	0,125	859,4	0,375	2445,0	4,430
171 074		28,0	10,20	0,80		1,75	0,95	1,187	0,238	320,9	0,713	610,2	3,480
181 005		28,0	10,20	1,25		2,05	0,80	0,640	0,200	679,3	0,600	1709,0	5,270
171 078		28,0	14,20	1,00		1,80	0,80	0,800	0,200	439,4	0,600	1021,0	3,610
181 010		28,0	14,20	1,50		2,15	0,65	0,433	0,163	953,1	0,488	2620,0	5,420

第4章

耐腐蚀碟簧

材料X12CrNi77 材料号1.4310

零件号	DIN 列号	尺寸 (mm)							碟簧行程S(mm)和载荷F(N)				重量 每千件 kg
									S=0.25h ₀		S=0.75h ₀		
		De	Di	t	t'	l ₀	h ₀	h ₀ /t	S	F	S	F	
181 011		31,5	16,30	1,25		2,15	0,90	0,720	0,225	729,1	0,675	1764,0	5,630
181 013		31,5	16,30	1,75		2,45	0,70	0,400	0,175	1283,0	0,525	3571,0	7,180
181 021		35,5	18,30	1,25		2,25	1,00	0,800	0,250	674,2	0,750	1567,0	7,890
181 031		40,0	20,40	1,50		2,65	1,15	0,768	0,288	1023,0	0,863	2418,0	11,020
181 036		45,0	22,40	1,75		3,05	1,30	0,742	0,325	1406,0	0,975	3363,0	16,540
180 880		31,5	16,30	1,25		2,00	0,75	0,600	0,188	590,0	0,563	1512,0	5,630
180 881		31,5	16,30	1,75		2,30	0,55	0,314	0,138	1023,0	0,413	2926,0	7,89
180 882		35,5	18,30	2,00		2,65	0,65	0,325	0,163	1423,0	0,488	4058,0	11,480
180 883		40,0	20,40	1,50		2,45	0,95	0,633	0,238	810,8	0,713	2046,0	11,020
180 884		40,0	20,40	2,00		2,80	0,80	0,400	0,200	1416,0	0,600	3940,0	14,680
180 885		40,0	20,40	2,25		2,95	0,70	0,311	0,175	1698,0	0,525	4861,0	16,530
180 886		45,0	22,40	1,75		2,80	1,05	0,600	0,263	1085,0	0,788	2780,0	16,540
180 887		45,0	22,40	2,50		3,30	0,80	0,320	0,200	2080,0	0,600	5940,0	23,630
180 888		50,0	25,40	1,50		3,10	1,60	1,066	0,400	1206,0	1,200	2439,0	17,260
180 889		50,0	25,40	2,00		3,15	1,15	0,575	0,288	1431,0	0,863	3710,0	23,020
180 890		50,0	25,40	2,50		3,50	1,00	0,400	0,250	2207,0	0,750	6141,0	28,770
180 891		50,0	25,40	3,00		3,85	0,85	0,283	0,213	3088,0	0,638	8910,0	34,520
180 892		56,0	28,50	2,00		3,40	1,40	0,700	0,350	1510,0	1,050	3690,0	28,840
180 893		56,0	28,50	3,00		4,05	1,05	0,350	0,263	3124,0	0,788	8842,0	43,250
180 894		63,0	31,00	2,50		3,95	1,45	0,580	0,363	2186,0	1,088	5654,0	46,660
180 895		71,0	36,00	2,50		4,25	1,75	0,700	0,438	2288,0	1,313	5592,0	58,090
180 896		80,0	41,00	3,00		4,90	1,90	0,633	0,475	3253,0	1,425	8210,0	87,840

零件号	DIN 列号	尺寸 (mm)							碟簧行程S(mm)和载荷F(N)				重量 每千件 kg
									S=0.25h ₀		S=0.75h ₀		
		De	Di	t	t'	l ₀	h ₀	h ₀ /t	S	F	S	F	
200 001		9,8	6,2	0,2		0,4	0,2	1,000	0,050	11	0,150	23,1	0,071
200 002		12,8	7,2	0,25		0,5	0,25	1,000	0,062	13,9	0,187	29,3	0,173
200 003		15,8	8,2	0,25		0,55	0,3	1,200	0,075	12,1	0,225	23	0,281
200 004		18,8	9,2	0,3		0,65	0,35	1,166	0,087	16,3	0,262	31,3	0,497
200 005		18,8	10,2	0,35		0,7	0,35	1,000	0,087	24,2	0,262	50,6	0,538
200 006		21,8	12,3	0,35		0,75	0,4	1,142	0,100	23,8	0,300	46,3	0,699
200 007		23,7	14,3	0,4		0,9	0,5	1,250	0,125	43,7	0,375	80,6	0,881
200 008		25,7	14,3	0,4		0,9	0,5	1,250	0,125	34,4	0,375	63,4	1,124
200 009		27,7	17,3	0,4		1,0	0,6	1,500	0,150	48,8	0,450	80	1,154
200 010		29,7	17,4	0,4		1,1	0,7	1,750	0,175	56,2	0,525	82,8	1,429
200 011		31,7	20,4	0,4		1,1	0,7	1,750	0,175	54,9	0,525	81	1,452
200 012		34,6	20,4	0,4		1,1	0,7	1,750	0,175	41,6	0,525	61,4	1,926
200 013		34,6	22,4	0,5		1,2	0,7	1,400	0,175	69	0,525	118,3	2,144
200 014		36,6	20,4	0,5		1,3	0,8	1,600	0,200	70,3	0,600	110,2	2,846
200 015		39,6	25,5	0,5		1,3	0,8	1,600	0,200	70,1	0,600	109,8	2,830
200 016		41,6	25,5	0,5		1,4	0,9	1,800	0,225	78,3	0,675	113,30	3,331
200 017		46,5	30,5	0,6		1,5	0,9	1,500	0,225	93,7	0,675	153,4	4,557
200 018		51,5	35,5	0,6		1,5	0,9	1,500	0,225	82,7	0,675	135,4	5,149
200 019		54,5	40,5	0,6		1,5	0,9	1,500	0,225	86,3	0,675	141,3	4,920
200 020		61,5	40,5	0,7		1,8	1,1	1,571	0,275	110,6	0,825	175,6	9,244
200 021		67,5	50,5	0,7		1,7	1,0	1,428	0,250	95,3	0,750	161,2	8,657
200 022		71,5	45,5	0,7		2,1	1,4	2,000	0,350	137,4	1,050	184,8	13,128
200 023		71,5	50,5	0,7		2,1	1,4	2,000	0,350	162,3	1,050	218,3	11,057
200 024		74,5	55,5	0,8		1,9	1,1	1,375	0,275	121,8	0,825	211,2	12,182
200 025		79,5	60,5	0,8		2,3	1,5	1,875	0,375	161,8	1,125	227,5	18,594
200 026		79,5	55,5	0,8		2,3	1,5	1,875	0,375	187,4	1,125	263,4	15,980
200 027		84,5	60,5	0,9		2,5	1,6	1,777	0,400	246	1,200	358,7	19,309
200 028		89,5	60,5	0,9		2,5	1,6	1,777	0,400	197,3	1,200	287,7	24,137
200 029		89,5	65,5	0,9		2,5	1,6	1,777	0,400	229,9	1,200	335,2	20,641
200 030		94,5	75,5	1,0		2,2	1,2	1,200	0,300	171,8	0,900	324,7	19,914
200 031		99	65,5	1,0		2,6	1,6	1,600	0,400	186,5	1,200	292,3	33,975
200 032		99	70,5	1,0		2,6	1,6	1,600	0,400	212	1,200	332,2	29,782
200 033		109	70,5	1,25		2,7	1,45	1,160	0,362	185,2	1,087	357,1	53,285
200 034		109	75,5	1,25		2,7	1,45	1,160	0,362	206,3	1,087	397,9	47,632
200 035		114	90,5	1,25		2,45	1,2	0,960	0,300	186,1	0,900	398,1	37,035
200 036		119	75,5	1,25		2,8	1,55	1,240	0,387	172,7	1,169	319,9	65,203

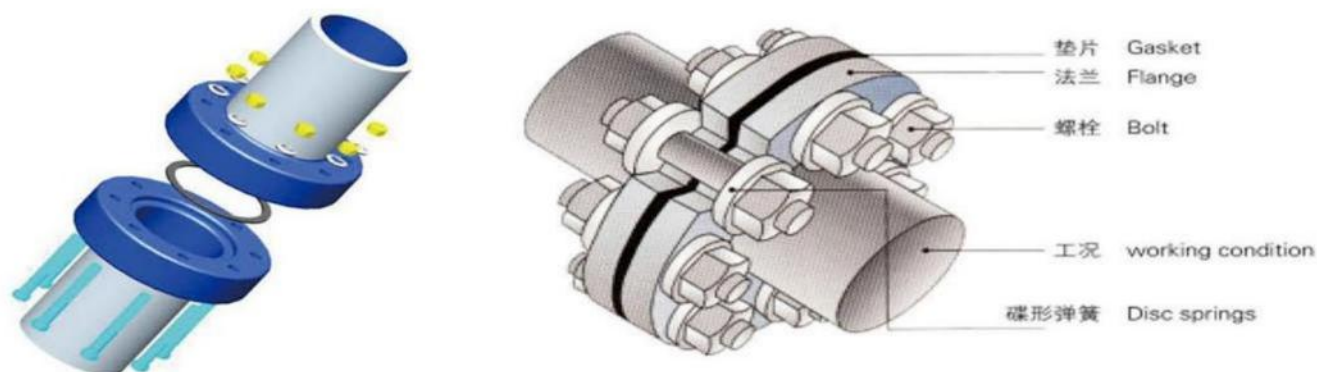
第4章

滚珠轴承用碟形弹簧

零件号	DIN 列号	尺寸 (mm)							碟簧行程S(mm)和载荷F(N)				重量 每千件 kg
									S=0.25h ₀		S=0.75h ₀		
		De	Di	t	t'	l ₀	h ₀	h ₀ /t	S	F	S	F	
200 037		119	85,5	1,25		2,8	1,55	1,240	0,387	211,9	1,162	392,5	52,795
200 038		124	90,5	1,25		3,0	1,75	1,400	0,437	259,4	1,312	444,7	55,377
200 039		129	85,5	1,25		3,2	1,95	1,560	0,487	254,1	1,462	405,1	71,907
200 040		129	95,5	1,25		3,2	1,95	1,560	0,487	313,6	1,462	500	57,959
200 041		139	90,5	1,25		3,25	2,0	1,600	0,500	225,6	1,500	353,6	85,779
200 042		139	101	1,25		3,25	2,0	1,600	0,500	273,9	1,500	429,3	70,283
200 043		149	95,5	1,5		3,2	1,7	1,133	0,425	194,1	1,275	379,4	120,968
200 044		149	106	1,5		3,2	1,7	1,133	0,425	230,3	1,275	450,2	101,402
200 045		159	101	1,5		3,5	2,0	1,333	0,500	233	1,500	412,2	139,457
200 046		159	111	1,5		3,5	2,0	1,333	0,500	269,8	1,500	477,3	119,851
200 047		169	111	1,5		3,8	2,3	1,533	0,575	291,5	1,725	470,2	150,184
200 048		169	121	1,5		3,8	2,3	1,533	0,575	338,6	1,725	546,2	128,729
200 049		179	121	2,0		4,2	2,2	1,100	0,550	434,5	1,650	864	214,549
200 050		179	126	2,0		4,2	2,2	1,100	0,550	466,8	1,650	928,2	199,321
200 051		189	121	2,0		4,3	2,3	1,150	0,575	391,5	1,725	758,8	259,925
200 052		189	131	2,0		4,3	2,3	1,150	0,575	442,8	1,725	858,3	228,852
200 053		198	131	2,0		4,5	2,5	1,250	0,625	440,5	1,875	811,8	271,799
200 054		198	141	2,0		4,5	2,5	1,250	0,625	500,7	1,875	922,8	238,260
200 055		213	151	2,25		4,5	2,25	1,000	0,562	449,3	1,687	941,1	313,056
200 056		223	161	2,25		4,6	2,35	1,040	0,587	460,5	1,762	942,4	330,257
200 057		228	161	2,25		4,95	2,7	1,200	0,675	548,4	2,025	1036,2	361,538
200 058		238	161	2,25		5,25	3,0	1,330	0,750	577	2,250	1020,9	426,180
200 059		248	171	2,5		5,0	2,5	1,000	0,625	479,7	1,875	1004,7	497,270
200 060		258	171	2,5		5,5	3,0	1,200	0,750	585,5	2,250	1106,4	575,259
200 061		268	181	2,5		5,7	3,2	1,280	0,800	636,1	2,400	1155	602,078
200 062		278	181	2,5		6,0	3,5	1,400	0,875	673,8	2,625	1154,9	686,233
200 063		288	191	2,75		5,75	3,0	1,090	0,750	573,2	2,250	1145,2	787,747
200 064		298	191	2,75		6,35	3,6	1,310	0,900	730,1	2,700	1306,9	887,100
200 065		308	202	3,0		6,1	3,1	1,030	0,775	631,5	2,325	1299,9	999,872
200 066		318	212	3,0		6,2	3,2	1,070	0,800	643,7	2,400	1302,1	1,039,083
200 067		338	232	3,0		6,6	3,6	1,200	0,900	748,7	2,700	1414,6	1,117,504
200 068		358	242	3,0		7,2	4,2	1,400	1,050	892	3,150	1528,9	1,287,294

高温法兰预紧弹簧

石油化工等工业的飞速发展，对一些管道，法兰螺栓连接有了更高的要求，尤其对于有密封要求的连接。目前国内外主要采用碟形弹簧来提高螺栓连接的可靠性，防松能力以及连接的紧密性。慕贝尔作为专注于碟形簧数十年历史的企业，从碟形弹簧的材料，工艺，方案等角度提供了更加安全可靠的解决方案。



尺寸表

螺栓规格	尺寸 (mm)				建议载荷 Recommend load 80%	压平载荷 Flat load	重量(g)/个 weight(g)/pcs
	De	Di	t	Lo			
M10	20.00	10.40	3.00	3.20	14438	18038	5.40
M12	22.00	12.40	3.50	3.72	22147	27671	9.10
M14	25.30	14.40	4.00	4.30	34386	42953	10.00
M16	29.20	16.30	5.00	5.30	49572	61938	20.00
M18	32.50	18.50	5.50	5.80	54158	67674	30.00
M20	40.00	20.40	6.00	6.50	57872	72301	40.00
M22	41.00	22.60	6.50	6.91	74729	93366	55.00
M24	45.00	24.60	7.00	7.50	95252	118992	75.00
M27	52.00	27.60	7.50	8.10	103028	128686	100.00
M30	54.00	30.80	8.00	8.65	133182	166122	120.00
M33	60.00	33.60	9.00	9.70	162576	203073	170.00
M36	65.00	37.00	10.00	10.70	189931	237274	220.00
M39	70.00	40.00	11.00	11.70	218702	273245	220.00
M42	75.00	43.00	12.00	12.80	283537	354233	280.00
M45	80.00	46.00	13.00	13.80	317655	396888	340.00
M48	86.00	49.00	14.00	14.90	358722	448180	460.00
M52	95.00	53.00	15.00	16.00	421340	526395	570.00
M56	104.00	57.00	16.00	17.10	462695	578041	750.00
M64	115.00	65.00	17.00	18.30	550268	687353	940.00
M70	125.00	71.00	16.00	17.60	480196	599526	1040.00
M90	160.00	91.00	18.00	20.00	522389	652020	1920.00
M100	180.00	102.00	20.00	22.50	705735	880517	2710.00

www.shrode.cn

RO↓DE | 大连罗德

地址: 大连市沙河口区黄河路559号国际数
控大厦607室

电话: 0411-8462-3377

RO↓DE | 上海罗德

地址: 上海市杨浦区平凉路2241号智慧坊
17号楼301室

电话: 400-0510-607

RO↓DE | 无锡罗德

地址: 无锡市滨湖区秀溪路50号K-PARK服
务中心大厦1号楼607室

电话: 400-0510-607



上海罗德凯耘
1688店铺



上海罗德凯耘
官方抖音号



上海罗德凯耘
官方微信公众号