Technically Speaking 15

The Spring Supply Chain

Springs are utilised by all sectors of manufacturing industry, often as devices to store energy in a highly efficient manner. Most of them are supplied by relatively small specialised manufacturers, who purchase their raw material from wire or strip producers. The spring manufacturer's role in this supply chain is to convert the end user's design into a spring that will function accurately and reliably. It is important to recognise here that a significant majority of springs are specially designed for each application.

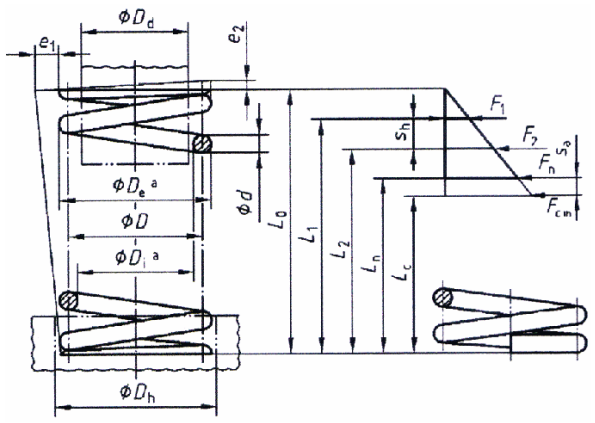
The spring manufacturer will usually be an ISO 9001 accredited supplier, and the best will seek to continuously improve their product by investing for the future. One aspect of the service that IST advocate for springmakers to offer is advice about the designs of their customers. That is advice to make the product easier to make, cheaper, lighter and more reliable. To provide this advice springmakers need access to the very best spring design software. IST have just launched "Spring Calculator Professional", the latest version of its spring design software. This has a number of upgrades to enable spring designs to be checked more thoroughly than ever before.

This column will first list the upgrades, and in future columns the importance of each item in this list will be described in more detail.

1. A production drawing available for compression springs – see figure 1.
2. The majority of spring materials have relaxation prediction data –these are based upon IST's own research results.
3. 190 out of 284 of the spring materials in SCP have fatigue data, and many of the materials that don't are intended for static applications only.
4. Prestressing of compression springs is described more accurately.
5. Dynamic effects on fatigue of compression springs are estimated for the first time.
6. Shot peening conditions used for data generation are detailed.
7. Fatigue data for extension spring end loops are given for the first time.
8. Torsion spring leg types have improved definition.
9. Maintenance contracts enable free electronic upgrades and database improvements to SCP.

The production drawing shown in figure 1 is approximately based upon the format of EN15800. It has omitted sections that IST do not regard as essential, but has added other sections that help spring users to ensure springmakers supply a product that will be fit for their purpose. It is intended to be used by spring manufacturers and users alike as a production drawing and definition of requirements. Production drawings for the other seven modules will be developed and supplied as part of the maintenance contract described in 9.

SPECIFICATION OF HELICAL COMPRESSION SPRING EN 15800:2010 Designed to EN 13906-1: 2002	Part no: 820	Issue no:



d	=	2.33	mm				
De	=	18.77	±	0.2	mm		
Di	=	14.11	mm				
D	=	16.44	mm				
Dd	=	0	mm				
Dh	=	0	mm				
L0	=	28.00	mm				
L1	=	25.00	mm				
L2	=	20.00	mm				
Ln	=	16.65	mm				
Lc	=	14.14	mm				
Sh	=	5.00	mm				
e1	=		mm				
e2	=		mm				
F1	=	45.90	N			$\tau k1$ =	152 N/mm^2
F2	=	122.40	±	9.11	N	$\tau k2$ =	405 N/mm^2
Fn	=	173.72	N			τkn =	575 N/mm^2
Fc	=	212.09	N			τc =	701 N/mm^2

Stress range	τkh	=	253.00 N/mm^2
Spring rate R	*R*	=	15.30 N/mm
Spring index	*w*	=	7.06
Stress correction factor	*k*	=	1.20

● Type 1 - Closed and ground end coils ○ Type 2 - Closed end coils

1	Active coils	*n* =	4.11
	Total coils	*nt* =	5.91
2	Direction of coils		Optional ● Right ○ Left ○
3	Chamfer of spring ends		No ○ Inside ○ Outside ○
4	Working deflection	Sh =	5.00 mm
5	Stress cycle frequency	f =	5.00 Hz
6	Range of working temperature	from	-20 to 250 °C
7	Application	Dynamic	
		Shot peened	No
8	Surface protection	None	
9	Material standard:	Inconel X750 Drawn - Sprng Temp	
	Permissable shearing stress, using lower tensile		
	Unprestressed,	τ zul =	590 N/mm^2
	Prestressed,	τ zul =	734 N/mm^2
	Rigidity modulus	G =	75800 N/mm^2
13	Additional information		

10 Permissable deviations to EN 15800: 2010

	Tolerance grade 1	2	3	Specified	Value
De	●	○	○	○	0.200 mm
L0	○	○	○	○	
F1	○	○	○	○	
F2	●	○	○	○	9.11 N
e1	○	○	○	○	
e2	○	○	○	○	
R	○	○	○	●	0.750 mm

11	Production compensation	by:
	(a) if the spring force and the spring length are specified	L0 ●
	(b) if the spring force, the spring length and L0 are specified	n and d ○
		n and De/Di ○
	(c) if two spring forces and the spring lengths are specified	L0, n and d ○
		L0, n and De/Di ○
12	Prestressing Prestress all springs Setting length: to solid	

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