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Extension spring statement

Dear Mr. Azril, Thank you very much for your inquiry.

Please find our reply below for your reference.

Design condition

- Free length = variable.
- Thickness = 1.8.
- Material = SWC.
- Mean Coil = 12.4
- Total Active Coil = Variable
- Outer Diameter = 14.2
- The spring is able to lift up a load = 100N more than 15mm.
- The maximum working for spring is fix at 75.70.

① Spring specifications

Material	Material diameter [d]	Mean coil diameter [D]	Free length [Lo]	Number of Active coils [Na]	Shear modulus [G]	Tensile strength [σ_B]
SWP-B	1.8 mm	10.8 mm	53.1 mm	18.50	78500 N/mm ²	2059 N/mm ²

•Outer coil diameter: 12.6 (mm)

※1 It cannot be designed with one spring.

It is necessary to use three springs in parallel.

※2 Working condition is static use.

②The calculation formula is shown below

Load: $P = k \delta$ (N)

δ : Spring deflection

Spring constant: $k = \frac{G d^4}{8Na D^3}$ (N/mm)

Uncorrected torsional stress: $\tau_0 = \frac{8D}{\pi d^3} P$ (N/mm²)

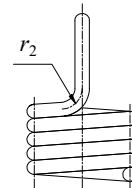
Corrected torsional stress: $\tau = \kappa \tau_0$ (N/mm²)

$$\left. \begin{array}{l} \text{Stress correction factor: } \kappa = \frac{4c - 1}{4c - 4} + \frac{0.615}{c} \\ \text{Spring index: } c = \frac{D}{d} \end{array} \right\}$$

Maximum bending stress of hook part:

$$\sigma = \kappa_1 \frac{16DP}{\pi d^3} + \frac{4P}{\pi d^2} \quad \kappa_1 = \frac{4C_2 - C_2 - 1}{4C_2(C_2 - 1)} \quad C_2 = \frac{2r_2}{d}$$

$r_2 = 2.7$ (Inner radius: rin = 1.8)



③The calculation result is shown below.

SPRING CONSTANT			N/mm	INITIAL TENSION (N)		≒ 0
MAX.	99.90	75.7	22.6	590	471	1296
P1	33.60	60.7	7.6	198	158	436
FREE	—	53.1	—	τ	τ_0	σ
STATE	LOAD (N)	Length (mm)	DEFLECTION (mm)	TORSIONAL STRESS (N/mm ²)		Maximum bending stress of hook part (N/mm ²)

④ The combined load is shown below.

SPRING CONSTANT			N/mm
MAX.	299.7	75.7	22.6
P1	100.8	60.7	7.6
FREE	—	53.1	—
STATE	LOAD (N)	Length (mm)	DEFLECTION (mm)