

PENTHOR 844S

Oil tempered silicon/chromium alloyed spring wire from shaved wire rod

External standard:

None existing.

Further equivalent standards:

EN 10270-2:2011

Applications:

For coil springs subjected to dynamic stresses requiring excellent relaxation properties at elevated temperatures (up to approx. 250 °C).

Range of diameters :

0.40 to 6.50 mm Ø

Chemical composition (heat analysis):

C %	Si %	Mn %	P max. %	S max. %	Cu max. %	Cr %
0.50 - 0.60	1.20 - 1.60	0.50 - 0.90	0.025	0.020	0.08	0.50 - 0.80

Raw material :

Wire rod according to in-house specifications.

The wire rod is shaved to eliminate surface defects such as seams, cracks and decarburization.

Cleanliness acc to DIN 50602, inclusions chart 1 :

max. size 2 for all types of inclusions

* IVSWMA: International Valve Spring Wire Manufacturers Association

Mechanical properties: Penthor 844S - Edition 04/2016 (replaces edition 01/2012)

Wire diameter mm	Tolerance mm	Tensile strength MPa	Minimum reduction area %	Minimum number of torsions min.	Permissible depth of surf. defects ¹⁾	Permissible part.decarburi- zation depth ¹⁾
0.40 to 0.60	± 0.010	2080 to 2230	-	-	max. 0.005 mm	
> 0.60 to 0.80		2080 to 2230		6		
> 0.80 to 1.00	± 0.015	2080 to 2230	50	5		
> 1.00 to 1.30	± 0.020	2080 to 2230		4		
> 1.30 to 1.40		2060 to 2210				
> 1.40 to 1.60		2060 to 2210				
> 1.60 to 2.00	± 0.025	2010 to 2160		4		
> 2.00 to 2.50		1960 to 2060				
> 2.50 to 2.70		1910 to 2010				
> 2.70 to 3.00	± 0.030	1910 to 2010	45	3		
> 3.00 to 3.20		1910 to 2010				
> 3.20 to 3.50		1910 to 2010				
> 3.50 to 4.00		1860 to 1960				
> 4.00 to 4.20		1860 to 1960				
> 4.20 to 4.50	± 0.035	1860 to 1960	40	-		
> 4.50 to 4.70		1810 to 1910				
> 4.70 to 5.00		1810 to 1910				
> 5.00 to 5.60	± 0.040	1810 to 1910	40	-		
> 5.60 to 6.00		1760 to 1860				
> 6.00 to 6.50		1760 to 1860				

- a) Range of tensile strength within one coil max. 50 MPa
- b) Ovality: Difference between the largest and smallest diameter of a cross section does not exceed 50 % of the diameter tolerance.
- c) Yield point (0.2% limit) at least 90 % of the tensile strength
- d) Modulus of elasticity E = 206.000 MPa } Standard
Shear modulus G = 79.500 MPa }
- e) Torsion tests are carried out according to EN 10218 - 1
- ¹⁾ End samples

Surface inspection:

Wires with diameters from 2.5 to 6.5 mm are eddy current surface inspected after oil hardening and tempering using a combination of two methods to detect both transverse and longitudinal defects.

Testing of wires < 2.50 mm can be agreed upon separately.

Defects ≥ 40 µm are recorded and marked.

Based on type and shape a surface defect of more than 40 µm may not be detected by EC testing. See Position statement of IVSWMA.*

Heat treatment:

After coiling, the springs should be stress relieved as soon as possible at 380 - 425 °C, with a holding time of 30 minutes at temperature.

After shot peening, the springs must be stress relieved at approx. 240 °C for 30 minutes.

Shot peening:

The shot size and blast time must be chosen to ensure complete coverage of the inside of the springs.

Particular attention should be paid to the above in case of springs with small index and pitch.

Please inquire for special tolerances, tensiles, sections, etc.