

PENTHOR 1064

Edition 01/2012
Replaces edition 01/2010

Oil tempered silicon/chromium/vanadium + nickel alloyed valve spring wire from shaved wire rod suitable for nitriding of coiled springs

External standard :
none existing

Applications :
Especially suitable for coil springs subjected to high dynamic stresses requiring good fatigue resistance (eg valve springs), as well as for springs which require high tensile strength and excellent relaxation properties at moderately elevated working temperatures (up to approx. 250 °C).

Range of diameters :
1.30 to 6.00 mm Ø

Chemical composition (heat analysis):

C %	Si %	Mn %	P max. %	S max. %	Cu max. %	Cr %	V %	Ni %
0.50 - 0.70	1.80 - 2.20	0.30 - 1.00	0.020	0.020	0.06	0.85 - 1.05	0.05 - 0.25	0.20 - 0.40

Raw material :

Wire rod made of Si-killed steel according to in-house specifications.
The wire rod is shaved to eliminate surface defects such as seams, cracks and decarburization.

Cleanliness acc. to max. t-method:

Number of non metallic inclusions in the surface area detected on end samples of the wire rod

Size of inclusions	5 - 10	>10 - 15	>15 ¹⁾	µm
max. number/1000 mm ²	50	7	0	

¹⁾ As stated by IVSWMA* it is likely to find occasional inclusions in valve spring quality steel of a size large than 15 µm

* IVSWMA: International Valve Spring Wire Manufacturers Association

Mechanical properties: Penthor 1064 - Edition 01/2012 (replaces edition 01/2010)

Wire diameter mm	Tolerance mm	Tensile strength MPa	Minimum reduction area %	Minimum number of torsions		Permissible depth of surf. defects ¹⁾	Permissible part.decarburi- zation depth ¹⁾
				right	left		
1.30 to 1.40	± 0,020	2280 to 2380	-	5	0	max. 0.5 % of wire diameter	
> 1.40 to 1.60		2280 to 2360					
> 1.60 to 2.00		2230 to 2330					
> 2.00 to 2.50		2180 to 2280					
> 2.50 to 2.70		2130 to 2230					
> 2.70 to 3.00		2130 to 2230					
> 3.00 to 3.20	± 0,025	2130 to 2230	45				
> 3.20 to 3.50		2080 to 2180					
> 3.50 to 4.00		2080 to 2180					
> 4.00 to 4.20		2030 to 2130					
> 4.20 to 4.50		2030 to 2130					
> 4.50 to 4.70		2030 to 2130					
> 4.70 to 5.00		2030 to 2130					
> 5.00 to 5.60		± 0,030	1980 to 2080	40	3	0	
> 5.60 to 6.00	± 0,035	1980 to 2080					

- 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 6.0 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.

Heat treatment:

After coiling, the springs should be stress relieved as soon as possible at 450 °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.