

# OTEVA 91 SC Plus

**Oil tempered SiCrVMo-alloyed ultra-high tensile valve spring wire for surface nitriding.**

OTEVA® 91 SC PLUS is intended for manufacture of valve springs and other springs requiring extremely high fatigue properties and good relaxation properties at increased working temperatures. Manufactured as standard in shaved condition in sizes from Ø 2.00 mm to 10.0 mm, or in egg or elliptical shape corresponding to round cross section 2.50 mm to 6.00 mm. Other wire sizes on request.

## Chemical composition

Element	Weight %
C	0.50% - 0.70%
Si	1.80% - 2.20%
Mn	0.30% - 0.60%
P max.	0.020%
S max.	0.025%
Cr	0.80% - 1.00%
V	0.05% - 0.15%
Mo	0.05% - 0.15%

## Cleanliness in steel

The presence of non-metallic inclusions in the wire rod is inspected for every heat of OTEVA® 91 SC in accordance with the Suzuki Garphyttan method by the steel supplier.

Before release for production, Suzuki Garphyttan performs non-metallic inclusion inspection for every fifth heat. The criteria for supplier inspection and releasing inspection are the following;

For wire rod samples: Inclusion size max. 15 µm down to 1 mm below surface. Inspection area: 1 000 mm<sup>2</sup>.

Inclusion size, surface	5-10 µm	>10-15 µm	>15 µm
Max. number of inclusions	50	7	0

For OTEVA 91 SC PLUS, every heat is inspected including a SEM-EDS analysis of inclusions > 10µm to verify a Super Clean composition.

*As stated by IVSWMA, International Valve Spring Wire Manufacturers Association, it is likely to find occasional inclusions in valve spring quality steel of a size larger than 30 µm*

## Mechanical properties

### Table definitions

Diameter: Other wire sizes on request.

Tolerance: Ovality, i. e. the difference between the largest and smallest dimension of a cross section, is maximum half the tolerance range.

Tensile strength: Conversion from tensile strength to hardness values can be calculated in standard ISO EN 18265. The tensile strength Rm within one coil does not vary more than 50 N/mm<sup>2</sup>.

Torsions: Torsion test is carried out at ≤ 6.0 mm for assessing deformability. The fracture of the torsion test piece shall be smooth and perpendicular to the wire axis. The rupture shall show no longitudinal cracks.

### For round wire

Diameter (mm)	Tolerance (mm)	Tensile Strength (N/mm <sup>2</sup> )	Torsion (l=300 mm, min. revs)	Reduct. of area (min%)
2.00 - 2.50	±0.020	2180 - 2280	5	45
2.51 - 3.20	±0.020	2130 - 2230	5	45
3.21 - 4.00	±0.025	2080 - 2180	4	45
4.01 - 5.00	±0.025	2030 - 2130	3	40
5.61 - 6.00	±0.035	1980 - 2080	3	40
6.01 - 7.00	±0.040	1910 - 2010		35
7.01 - 8.00	±0.045	1860 - 1960		35
8.01 - 9.00	±0.045	1860 - 1960		35
9.01 - 10.00	±0.050	1860 - 1960		35

## Surface conditions

### Surface condition

#### Surface condition – non-destructive testing

In the standard size range 2.00 – 6.00 mm the wire is tested continuously in Eddy Current equipment to a surface level of  $\geq 40$  microns. For size range 6.01–8.60 mm is tested continuously in Eddy Current equipment to a surface level of  $\geq 60$  microns. Other wire sizes on request.

#### Surface condition – end sample test

The wire is end sample tested by means of etch testing and binocular inspection as well as microscopical inspection of the material structure.

Max. permissible depth of partial surface decarburization and surface defects, 1 % x wire diameter. In shaved condition; for diameters  $\leq 2.00$  mm 10  $\mu\text{m}$ , for diameters  $> 2.00$  mm 0.5% x d. For diameters  $> 6.60$ –10.00 mm 0.7% x d.

## Technical specification

Property	Value
E modulus of elasticity	206 kN/mm <sup>2</sup>
G modulus of shear	79.5

### Steel grades and product standards

Nearest equivalent product standards	ASTM A877 D
--------------------------------------	-------------