

# OTEVA 75 SC

## Oil tempered SiCrV-alloyed high tensile valve spring wire

OTEVA® 75 SC is a Super Clean steel, especially intended for the manufacture of clutch/transmission springs with extremely high fatigue properties and good relaxation properties at moderately increased working temperatures.

Manufactured as standard in shaved condition in sizes from Ø 1.60 mm to 10.0 mm, or in egg or elliptical shape corresponding to round cross section 2.50 mm to 6.50 mm. Other wire sizes and shapes on request.

## Chemical composition

Element	Weight %
C	0.50% - 0.70%
Si	1.20% - 1.65%
Mn	0.50% - 0.80%
P max.	0.020%
S max.	0.020%
Cr	0.50% - 1.00%
V	0.05% - 0.20%

## Cleanliness in steel

The presence of non-metallic inclusions in the wire rod is inspected for every heat of OTEVA® 75 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 75 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

### For round wire

Diameter (mm)	Tolerance (mm)	Tensile Strength (N/mm <sup>2</sup> )	Torsions (l=300 mm, min. revs)	Reduct. of area (min. %)
1.60 - 2.00	±0.020	2160 - 2260	5	45
2.01 - 2.50	±0.020	2110 - 2210	5	45
2.51 - 3.20	±0.020	2060 - 2160	5	45
3.21 - 4.00	±0.025	2010 - 2110	4	45
4.01 - 5.00	±0.025	1960 - 2060	3	45
5.01 - 5.60	±0.030	1910 - 2010	3	40
5.61 - 6.00	±0.035	1910 - 2010	3	40
6.01 - 6.50	±0.035	1910 - 2010		35
6.51 - 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

### Yield point

The proof stress  $R_{p0.2}$  is min. 0.9 x tensile strength of the wire.

## 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 kN/mm <sup>2</sup>

### Steel grades and product standards

Nearest equivalent product standards	EN 10270-2	ASTM A877 B
Nearest equivalent steel grades	EN VDSiCrV	

## Recommendations

### Heat treatment

As soon as possible after coiling, the springs should be stress relieved. See recommended procedure in the table below.

### Hot presetting

After shot peening, the springs should be hot preset or stress relieved. In order to reach optimum fatigue and relaxation properties, the springs must be preset at an appropriate stress.

### Shot peening

In order to obtain optimum fatigue properties, the process time should be adjusted to get a complete treatment. Size of shots should be adapted to wire dimension, pitch and shot peening equipment.

Shot peening of the inside of the spring coils is particularly critical.

## Spring conditions for tests

### Spring conditions for fatigue and relaxation tests (specially designed test spring) Diagram 1 and 2:

Wire size	Ø 4.00 mm
Diameter external	28.00 mm
Spring length, l0	59.5 mm
N active	4.80
Spring index	6.0

### Stress relieving

Temperature	420 ±5°C (790 ±10 °F)
Time	30 minutes

### Shot peening (double shot peening)

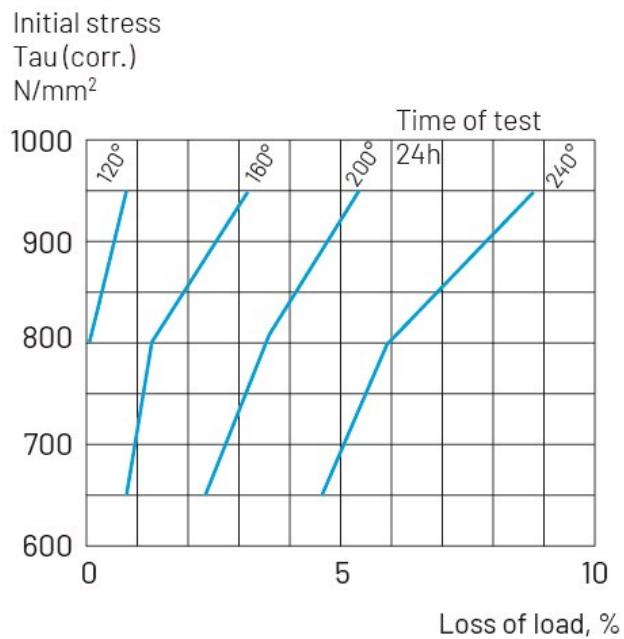
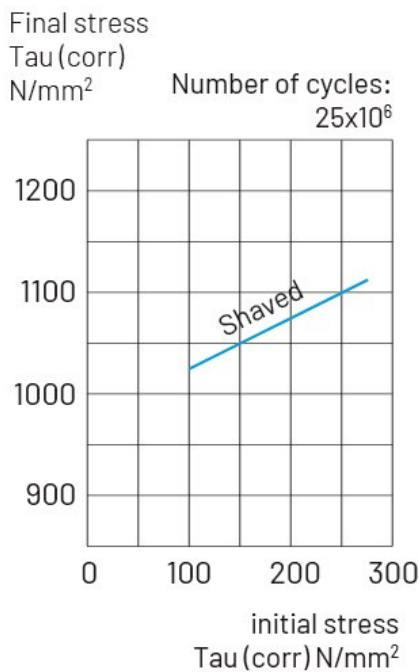
1st treatment	Speed 56 m/sec. for 20 minutes, size of shots 0.8 mm
2nd treatment	Speed 30 m/sec. for 10 minutes, size of shots 0.8 mm
Hardness of Shot-peening grit (shot):	610-670 Hv
Aim for Almen arc-height	Min 0.45 mm

### Hot presetting (theoretically set)

 1300 N/mm<sup>2</sup>

Temperature	200°C (max. 250°C)
Time	10 minutes

### Relaxation and fatigue properties



In diagram 1 the fatigue properties of this grade are illustrated in a Goodman-diagram, based on a special test spring design.

Diagram 2 shows the relaxation properties (loss of load) of springs made from OTEVA® 75 SC wire subjected to static compression at different temperatures.

## Additional

### Additional information

#### **Delivery forms**

See separate sheet.