

GARBA 177 Premium

**Precipitation hardenable stainless spring wire. Shaved and EC-tested.
For applications demanding high fatigue properties.**

GARBA 177 Premium is a semi-austenitic precipitation-hardenable stainless steel with high relaxation resistance at elevated temperatures and excellent fatigue properties. This material has good formability and good form stability during the precipitation hardening heat treatment and a moderate level of corrosion resistance. The shaved surface improves the fatigue resistance as compared to GARBA 177PH.

Chemical composition

| Element | Weight % |
|---------|-----------------|
| C | 0.09% |
| Si | 0.70% |
| Mn | 1.00% |
| P max. | 0.040% |
| S max. | 0.015% |
| Cr | 16.00% - 18.00% |
| Ni | 6.50% - 7.80% |
| Al | 0.70% - 1.50% |

Mechanical properties

For round wire

| Diameter (mm) | Tolerance (mm) | Tensile strength (N/mm ²) | Tensile strength after heat treatment 480C 1h (N/mm ²) |
|---------------|----------------|---------------------------------------|--|
| 0.30 - 0.40 | ±0.005 | 1885 - 2165 | 2205 - 2525 |
| 0.41 - 0.50 | ±0.008 | 1860 - 2130 | 2180 - 2490 |
| 0.51 - 0.65 | ±0.008 | 1810 - 2070 | 2130 - 2430 |
| 0.66 - 0.80 | ±0.010 | 1810 - 2060 | 2130 - 2430 |
| 0.81 - 1.00 | ±0.010 | 1780 - 2030 | 2100 - 2390 |
| 1.01 - 1.25 | ±0.015 | 1720 - 1960 | 2040 - 2310 |
| 1.26 - 1.50 | ±0.015 | 1670 - 1910 | 1990 - 2260 |
| 1.51 - 1.75 | ±0.015 | 1610 - 1850 | 1910 - 2180 |
| 1.76 - 2.00 | ±0.015 | 1570 - 1800 | 1900 - 2160 |
| 2.01 - 2.50 | ±0.015 | 1540 - 1770 | 1860 - 2120 |
| 2.51 - 3.00 | ±0.020 | 1500 - 1710 | 1820 - 2060 |
| 3.01 - 3.50 | ±0.020 | 1400 - 1600 | 1660 - 1940 |
| 3.51 - 4.25 | ±0.020 | 1350 - 1550 | 1620 - 1920 |

| Diameter (mm) | Tolerance (mm) | Tensile strength (N/mm ²) | Tensile strength after heat treatment 480C 1h (N/mm ²) |
|---------------|----------------|---------------------------------------|--|
| 4.26 - 5.00 | ±0.025 | 1310 - 1500 | 1580 - 1800 |
| 5.01 - 5.60 | ±0.025 | 1300 - 1490 | 1550 - 1790 |

Surface conditions

Surface condition

Surface performance

AC-surface 0.30-5.60 mm Ø. The AC-coating can be removed before heat treatment by using a 10-20% nitric acid pickle at room temperature.

SURFACE CONDITION

Surface condition - non-destructive testing

In the standard size range 2.00-5,60 mm the wire can be tested continuously in Eddy Current equipment to a surface level of >40 microns.

Physical properties

Heat conductivity

| | | | |
|----------------|------|------|------|
| Temperature °C | 20 | 100 | 300 |
| W/(m*°C) | 15.0 | 15.5 | 19.0 |

Linear expansion

| | | | |
|-------------------|--------|--------|--------|
| Pro °C | 30-100 | 30-200 | 30-300 |
| x10 ⁻⁶ | 13.0 | 13.5 | 14.0 |

Technical specification

| Property | Value | |
|-------------------------|---|---|
| E modulus of elasticity | Abt. 190 kN/mm ² in drawn condition. | Abt. 200 kN/mm ² after heat treatment. |
| G modulus of shear | Abt. 73 kN/mm ² in drawn condition. | Abt. 78 kN/mm ² after heat treatment. |
| Density | 7.90 kg/dm ³ | |

Steel grades and product standards

| | | | | | |
|--------------------------------------|---------------|--------------|-------------|-----------------|-----------|
| Nearest equivalent product standards | EN ISO 6931-1 | ASTM A313 | AMS 5678 | BS 2056 301 S81 | JIS G4314 |
| Nearest equivalent steel grades | EN/DIN 1.4568 | AISI/SAE 631 | JIS SUS 631 | | |

Recommendations

Heat treatment

Normal procedure for precipitation hardening is heat treatment at 480°C (896°F) for 1 hour and then air cooling. This should be done as soon as possible after spring coiling. The tensile strength of the wire before and after this treatment is given in the table in previous page.

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.