

EXERA® 12R10 / 12R10 HV MEDICAL WIRE WIRE

DATASHEET

Exera® 12R10 and Exera® 12R10 HV (vacuum remelted) are austenitic stainless steels characterized by moderate tensile strength, good corrosion resistance and moderate fatigue and relaxation resistance.

Vacuum-remelted Exera® 12R10 HV offers higher cleanliness compared to Exera® 12R10, which is usually required for medical applications.

Service temperature: -200 to 250°C (-330 to 480°F).

Exera® 12R10 and Exera® 12R10 HV are characterized by:

- High tensile strength and tempering effect
- Good relaxation resistance, especially at elevated temperatures
- High fatigue strength

STANDARDS

- ASTM: 302/302VM, '304V'
- ISO: X9 CrNi 18-8 Grade 1 NS
- EN Number: 1.4310 NS
- EN Name: X10CrNi18-8NS
- W.Nr.: 1.4310
- JIS: SUS 302/304-WPB

Product standards

EN	10270-3
ISO	6931-1
ASTM	A 313/A 313M, F899
JIS	G 4314

APPLICATIONS

Exera® 12R10/12R10HV can be used for blood lancets, stylets, acupuncture needles and dental files and reamers.

CHEMICAL COMPOSITION (NOMINAL) %

C	Si	Mn	P	S	Cr	Ni
0.08	0.5	1.2	≤0.040	≤0.010	18	8.3

FORMS OF SUPPLY

Surface finish	Size range, mm
Coated	0.20 - 10.00
Nicoat A (nickel coating)	0.22 - 2.50
Bright	0.11 - 0.80
Nicoat P (nickel coating + bright)	0.11 - 0.80
Mechanically polished	0.40 - 6.00
Degreased	0.50 - 5.00

Wire is delivered in a number of different forms to meet customers' requirements:

- In coils with weights up to 150 kg
- On spools with wire weights up to 500 kg
- In straightened lengths up to 4 m, diameters between 0.6 to 10 mm

MECHANICAL PROPERTIES

Mechanical properties in the 'as delivered' condition

Tensile strength and proof strength, MPa (ksi)

Wire diameter		Nominal, R _m ¹ Nominal R _{p0.2}			
mm	in.	MPa	ksi	MPa	ksi
0.15 – 0.20	0.0059 - 0.0079	2365	343	1890	274
>0.20 – 0.30	>0.0079 - 0.012	2310	335	1850	268
>0.30 – 0.40	>0.012 - 0.016	2260	328	1810	262
>0.40 – 0.50	>0.016 - 0.020	2200	319	1760	255
>0.50 – 0.65	>0.020 - 0.026	2150	312	1720	249
>0.65 – 0.80	>0.026 - 0.031	2095	304	1680	244
>0.80 – 1.00	>0.031 - 0.039	2045	297	1635	237
>1.00 – 1.25	>0.039 - 0.049	1990	289	1590	231
>1.25 – 1.50	>0.049 - 0.059	1935	281	1550	225
>1,50 – 1,75	>0.059 - 0.069	1880	273	1505	218
>1.75 – 2.00	>0.069 - 0.079	1830	265	1465	212
>2.00 – 2.50	>0.079 - 0.098	1775	257	1420	206
>2.50 – 3.00	>0.098 - 0.118	1720	249	1375	199
>3.00 – 3.50	>0.118 - 0.138	1665	241	1330	193
>3.50 – 4.25	>0.138 - 0.167	1615	234	1290	187
>4.25 – 5.00	>0.167 - 0.197	1560	232	1250	181
>5.00 – 6.00	>0.197 - 0.236	1505	218	1205	175
>6.00 – 7.00	>0.236 - 0.276	1450	210	1160	168
>7.00 – 8.50	>0.276 - 0.335	1400	203	1120	162
>8.50 – 10.00	>0.335 - 0.394	1345	195	1075	156

¹tolerance on tensile strength + /- 7.0 % in accordance with EN 10 270-3 (ISO 6931-1).

Exera® 12R10 can be supplied in the annealed condition.

Tensile strength can be increased by 150–250 MPa (22 - 36 ksi) by tempering. Click on heat treatment for further information. The tensile strength variation between spools/coils within the same production lot is ±50 MPa (7 ksi) maximum.

Proof strength in the tempered condition is approx. 85% of the tempered tensile strength. Tensile strength values are guaranteed and are measured directly after production. During storage, the strength will increase slightly due to ageing. Depending on storage conditions, ageing can increase the strength by 0 - 50 MPa (0 - 7 ksi)

The strength will decrease by 3–4% per 100°C (184°F) increase in service temperature.

Straightened lengths

After straightening, the strength is approx. 7% lower.

PHYSICAL PROPERTIES

Density: 7.9 g/cm³, 0.29 lb/in³

Specific heat capacity

500 J/kg °C	in the temperature range 50 - 100°C
0.12 Btu/lb °F	in the temperature range 120 - 210°F

Thermal conductivity

Temperature, °C	W/m °C	Temperature, °F	Btu/ft h °F
20	15	68	9
100	16	210	9
200	18	390	10.5
300	19	570	11.5

Resistivity

Temperature, °C	μΩm	Temperature, °F	μΩin.
20	0.80	68	31
100	0.85	200	33
200	0.90	400	36
300	0.95	600	38

Thermal expansion ¹⁾

Temperature, °C	per °C	Temperature, °F	per °F
20 - 100	17	68 - 210	9.5
20 - 200	17.5	68 - 390	9.5
20 - 300	18.5	68 - 570	10.0

1) mean values in temperature ranges (x10⁻⁶)

Magnetic permeability, μ_{max}: about 10

Shear modulus, MPa (ksi)

As delivered: approx 71 000 (10 295)
Tempered: approx 73 000 (10 585)

Modulus of elasticity, MPa (ksi)

As delivered: approx 185 000 (26 825)
Tempered: approx 190 000 (27 550)

HEAT TREATMENT

By tempering at 350°C (660°F)/0.5–3 h, the tensile strength will increase by about 100-250 MPa (15 - 35 ksi). If a shorter tempering time is used the tempering effect will be lower.

- In continuous conveyor furnaces, where the holding time at temperature is very short (min. 3 minutes), the temperature can be increased to about 425°C (780°F)
- In the 'as delivered' condition, the ratio proof strength/tensile strength is about 0.80. After tempering the ratio will be about 0.85

Please note that tension springs coiled with initial tension must not be tempered at the same high temperature as other types of spring. We recommend batch annealing at 200°C (390°F)/0.5–3 h, or continuous tempering in a conveyor furnace with a holding time of 3–20 minutes at about 250°C (480°F).

BENDING

The minimum bending radius should not be less than half the wire diameter. Wire surfaces should be free from any damage caused by tooling, since slight imperfections in the surface can lead to fracture even at large bending radii.

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