

# ORTHODONTIC WIRE



**RMO**®  
rocky mountain orthodontics

## TERMS, TESTS AND CONTROLS FOR ORTHODONTIC WIRE

“Hardness” to an orthodontist means the ability of wire to exert continuous spring pressure. “Soft” means ease of bending. Engineers use “hardness” to indicate resistance to indentation and “soft” to denote low resistance to indentation. To the engineer, many “hard” wires have poor spring qualities and many “soft” wires do not bend easily. To establish common terminology, the following terms and test facts are worth doing:

### Test

Mechanical properties for wires are determined by tensile test, where a wire is pulled until it breaks. The pull (load) causes the wire to stretch (extension) until it breaks. People may use different size wires when they do this test. To normalize and compare results from different test shapes, results are reported as stress and strain. Stress is the intensity of the force that is applied over a cross-sectional area of the wire. Stress or “strength” is reported in units of pounds per square inch (psi), or in the metric (SI) system as pascals. Strain is the resulting change in length of the wire when a force is applied, referred to as the original length. Because strain is a ratio tensile strength or ultimate tensile is the highest stress recorded before the wire breaks. Tensile strength determines spring qualities of orthodontic wire. High tensile strength wires may make poor springs.

### Elastic Limit

Maximum stress that can be applied before material is permanently deformed. At the elastic limit, the material will return to original length when load is released.

### Resiliency

tendency of material to return to original shape after release of load.

### Yield Strength

Stress that when applied will permanently deform the wire to a smaller amount.

### Modulus of Elasticity

Ratio between stress applied and deformation that results from stress.

### Proportional Limit

Maximum value of stress that is proportional to strain. Proportion limit and elastic limit are the same.

### Toughness

ability of wire to be ductile and strong. “Tough” materials take much bending before breaking. Brittleness implies lack of ductility. Brittle wire may have great tensile strength but fail when manipulated. A degree of brittleness is acceptable for certain orthodontic wires but not generally for orthodontic wires. Spring performance is the continuous deflecting of wire to test resistance to set and fatigue. The specimen withstanding the most severe defections without being deformed permanently, possesses the greatest resistance to set. Wire withstanding the most defections before failure has the greatest resistance to fatigue.

### Corrosion Resistance

A metal’s ability to maintain original finish and dimensions in certain solutions and in the mouth. While many more tests than outlined here are involved in establishing a practical selection of “controlled wires”, the final evaluation of the types best suited to clinical use is up to the orthodontist.

## WIRE SELECTION GUIDE

	ALIGNMENT	TORQUING	ROTATIONS	RETRACTIONS	FINISHING
Elgiloy® Blue	.	.	.	.	.
Elgiloy® Yellow	.	.	.	.	.
Elgiloy® Green	.	.	.	.	.
Elgiloy® Red	.	.	.	.	.
Bendaloy™ Round	.	.	.	.	.
Bendaloy™ Rectangle	.	.	.	.	.
Thermaloy® Round	.	.	.	.	.
Thermaloy® Rectangle	.	.	.	.	.
Orthonol® Round	.	.	.	.	.
Orthonol® Rectangle	.	.	.	.	.
Tru-Chrome® Round	.	.	.	.	.
Tru-Chrome® Rectangle	.	.	.	.	.
Tri-Flex™ Round (Twisted)	.	.	.	.	.
Tri-Flex™ Rect. (Twisted)	.	.	.	.	.
Supra-Flex™ Rnd. (Twisted)	.	.	.	.	.
Flex-VIII™ Rect. (Braided)	.	.	.	.	.

This Guide indicates suggestions for wire selections. Today, orthodontic wire offers a vast range of alloy selection to fit each specific treatment modalities. There are many variables in the arch wire selection. The clinician has to determine the individual needs at each point of treatment time and make the appropriate selection based upon education and experience.

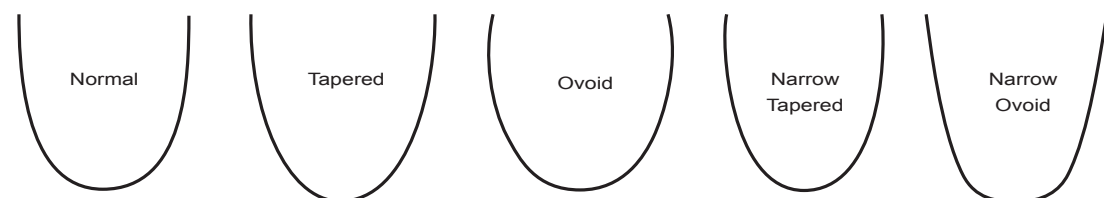
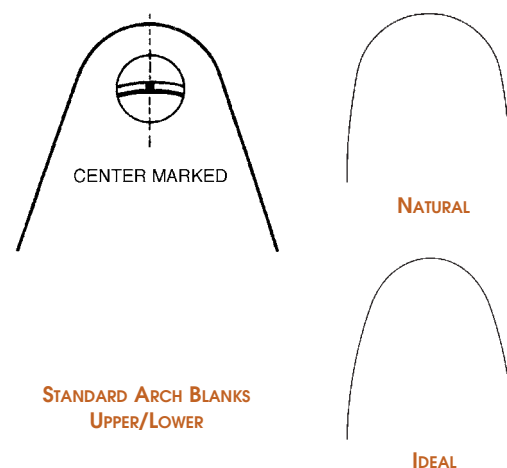
# ELGILOY®

COBALT-BASED ALLOY

Elgiloy is a premium, specially fabricated, cobalt-based alloy wire in four tempers. It is superior for forming and in performance time. All tempers are capable of beginning as a soft wire or can be heat-treated providing flexibility and control in force applications.

### Elgiloy Properties Are:

- Set resistant. Retains power longer than stainless steel.
- Fatigue resistant. More cycles than stainless steel without breakage.
- Greater spring efficiency. Up to 20% more power than spring steel without an increase in dimensions.
- Corrosion resistant. Out-performs chrome stainless steel by 17%.
- Non-magnetic. Non-magnetic through all temperature ranges.



PENTA-MORPHIC® ARCHES (RICKETTS®)

### Blue Elgiloy®

Blue Elgiloy® is the softest of the tempers. It can be welded with low heat and soldered without embrittling. Excellent for Edgewise arches, lingual arches, retainers and removables.

Blue Elgiloy® is ideal for:

- Alignment
- Retractions
- Torquing
- Finishing
- Rotations

### Green Elgiloy®

Green Elgiloy® is semi-resilient and will temper comparable to high spring-tempered wires. It can be shaped easily before heat-treating.

Green Elgiloy® is ideal for:

- Alignment
- Torquing
- Finishing

### Yellow Elgiloy®

Yellow Elgiloy® is ductile and slightly harder than Blue. You can weld and solder to large Yellow Elgiloy without embrittling. It can also be heat-treated for more resiliency or spring.

Yellow Elgiloy® is ideal for:

- Alignment
- Retractions
- Torquing
- Finishing
- Rotations

### Red Elgiloy®

Red Elgiloy® is hard with high spring. It is not recommended for heat-treating unless adjustments are not made after heat-treating.

Red Elgiloy® is ideal for:

- Alignment

# BENDALOY™

TITANIUM / MOLYBDENUM BASED ALLOY

Bendaloy™ is a titanium-molybdenum based alloy wire that has a large springback with better control over tooth movement and minimizes adjustment intervals. With less stiffness than stainless steel, it allows wires to fill the bracket for control with lighter forces.

Bendaloy is formable and capable of being formed into complicated configurations without fracture. Springback of this wire make it excellent for sectional arches, auxiliaries and detailing arch wires.

### Bendaloy Round is ideal for:

- Alignment
- Retractions
- Rotations
- Finishing

### Bendaloy Rectangle is ideal for:

- Torquing
- Retractions
- Rotations
- Finishing

# THERMALOY®

BODY HEAT-ACTIVATED, SUPER ELASTIC NICKEL-TITANIUM BASED ALLOY

Thermaloy is a body heat-activated super elastic, nickel-titanium wire. It is flexible to bend, but will always spring back to its original shape when activated by body heat. Thermaloy allows larger rectangular wire earlier in treatment. Initial leveling, aligning and rotating can be started earlier without the use of smaller round wires or stranded wires. Patients experience more comfort with less arch wire changes and faster, more efficient tooth movement.

### Thermaloy Round is ideal for:

- Alignment
- Rotations

### Thermaloy Rectangle is ideal for:

- Alignment
- Rotations
- Torquing
- Finishing

# BIOLASTIC™

SUPER ELASTIC NICKEL-TITANIUM SHAPE MEMORY ALLOY

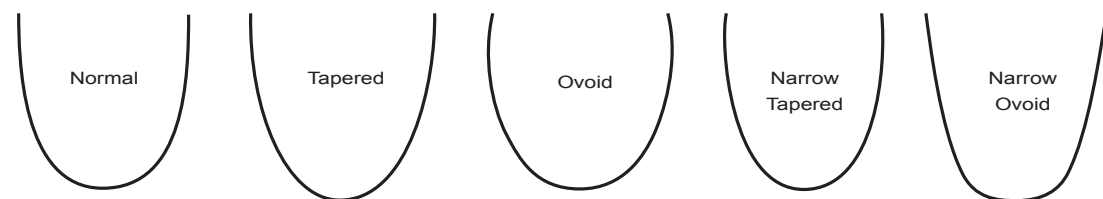
Bio-Lastic is a super elastic nickel-titanium wire. Its reliable shape recovery gives force and displacement on a repeatable basis. Its efficiency enables you to store five times more energy than stainless steel. Built-in spring back and thermal recovery return Bio-Lastic to specified shape even after mechanical deformation as high as ten times greater than competitive materials.

### BioLastic Round is ideal for:

- Alignment
- Rotations

### BioLastic Rectangle is ideal for:

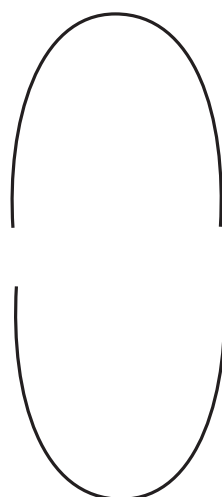
- Alignment
- Rotations
- Torquing
- Finishing



PENTA-MORPHIC® ARCHES (RICKETS®)

# ORTHONOL®

SUPER ELASTIC NICKEL-TITANIUM SHAPE MEMORY ALLOY



Orthonol is a nickel-titanium alloy providing light, continuous forces for efficient tooth movement. This wire has a great working range with fewer wire changes and adjustments needed. Resistance to deformation and memory eliminate the need for special bends. Light continuous force means a more comfortable treatment for patients. Its ultra-smooth finish reduces friction in the arch slot. Available in Ideal, Natural Arches and Straight Lengths.

### Orthonol Round is ideal for:

- Alignment
- Rotations

### Orthonol Rectangle is ideal for:

- Alignment
- Torquing
- Rotations
- Finishing



REVERSE VECTOR ARCHES

Orthonol is available in 7 3/16" straight lengths

# TRUCHROME™

STAINLESS STEEL

Tru-Chrome is the standard in orthodontics. With holding, anchoring and spring elements, it is able to stimulate tooth movement predictably and precisely. It possesses, to an unusual degree, the requisites of hardness, elastic limit and tensile strength.

Tru-Chrome is a stable consistent, predictable performance wire offered in four tempers.

- **RESILIENT ARCH WIRE TEMPER** - available in preformed arches and straight lengths.

- **RETAINER WIRE OR NUMBER 2 TEMPER** - this temper has a softer temper than Arch Wire Temper, which enables the operator to more easily form the wire into retainer appliances. Forming the wire work-hardens it and provides a working resiliency for retainer appliances

- **CLASP WIRE TEMPER** - this wire is between the Arch

Wire Temper and Retainer Wire Temper. It is soft enough to be instrument-formed to the clasp configuration and, in forming, gains sufficient hardening from pliering to have a satisfactory spring resiliency for clasps.

- **LIGATURE WIRE TEMPER** - this wire is a dead-soft temper that allows ligating and tying to be done with minimal work-hardening.

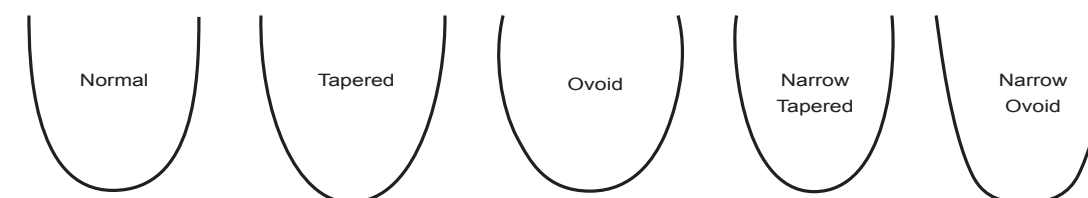
### BioLastic Round is ideal for:

- Alignment
- Rotations
- Retractions

### BioLastic Rectangle is ideal for:

- Retractions
- Rotations
- Torquing
- Finishing

Available in Ideal, Penta-Morphic, Natural, and Ideal Arches. Also available in straight lengths.



PENTA-MORPHIC® ARCHES (RICKETS®)

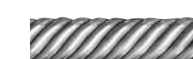
# FLEX®

TRU-CHROME STAINLESS STEEL MULTI-STRANDED



### Tri-Flex™

Tri-Flex is a 3-stranded wire. This spring-tempered, twisted, leveling wire is ideal for early stages of treatment. It bends readily and can accept great deflection before its limit is reached. It provides gentle force and will not unravel or fray when cut. Available in preformed arches and 14' straight lengths.



### Supra-Flex™

This 6-stranded wire is cable-designed to be an initial stage arch wire with 5 exterior wires helically wound around a core wire. It can be flexed to a great degree without taking a set. It delivers constant uniform light force over a long period of time and does not fray when cut. Available in preformed arches, 14' straight lengths and spools.



### Flex VIII™

This 8-stranded wire is a braided wire for unscrambling and leveling. Flex VIII, with its bright finish, is an ideal wire for early stages of treatment. Available in preformed arches.

# CONVERSION TABLES

RMO's products are made to inch specifications and are not perfectly interchangeable with products made to metric measurements. The attached tables may be used when product measurement conversions are needed. The figures have been rounded to useable form. It should be noted that when converting from measurements already expressed in millimeters (such as manufacturer's specifications) to inches, a discrepancy due to rounding may occur.

INCHES	DECIMALS	MILLIMETERS
1/64	.0156	.396
1/32	.0312	.793
1/16	.0625	1.588
1/8	.1250	3.175
3/16	.1875	4.763
1/4	.2500	6.350
5/16	.3125	7.938
3/8	.3750	9.525
1/2	.5000	12.700
5/8	.6250	15.875
3/4	.7500	19.050
1	1.000	25.400

AVOIRDUPOIS	
1 pound	= .4536 kilograms
	= 16 ounces
	= 7000 grains
1 ounce	= 28.36 grams
	= 437.5 grains
1 gram	= 15.432 grains
1 grain	= .0648 grams
TROY	
1 pound	= 12 ounces
	= 5760 grains
1 ounce	= 20 pennyweights
	= 480 grains
1 grain troy	= 1 grain avoirdupois

FAHRENHEIT TO CENTIGRADE					
°F	°C	°F	°C	°F	°C
-40	-40	60	15.6	200	93.3
-30	-34.4	70	21.1	300	148.9
-20	-28.9	80	26.7	400	204.4
-10	-23.3	90	32.2	500	260
0	-17.8	100	37.8	600	316
10	-12.2	110	43.3	700	371
20	-6.7	120	48.9	800	427
30	-1.1	130	54.4	900	482
40	4.4	140	60	1000	538
50	10	150	65.6	2000	1093

INCH	MM	GAUGE	INCH	MM	GAUGE	INCH	MM	GAUGE	INCH	MM	GAUGE
.001	.03		.026	.66		.051	1.30	16	.076	1.93	
.002	.05		.027	.69		.052	1.32		.077	1.96	
.003	.08		.028	.71	21	.053	1.35		.078	1.98	
.004	.10		.029	.74		.054	1.37		.079	2.01	
.005	.13		.030	.76		.055	1.40		.080	2.03	
.006	.15		.031	.79		.056	1.42		.081	2.06	12
.007	.18	33	.032	.81	20	.057	1.45	15	.082	2.08	
.008	.20	32	.033	.84		.058	1.47		.083	2.11	
.009	.23	31	.034	.86		.059	1.50		.084	2.13	
.010	.25	30	.035	.89		.060	1.52		.085	2.16	
.011	.28	29	.036	.91	19	.061	1.55		.086	2.18	
.012	.30		.037	.94		.062	1.57		.087	2.21	
.013	.33	28	.038	.96		.063	1.60		.088	2.23	
.014	.36	27	.039	.99		.064	1.63	14	.089	2.26	
.015	.38		.040	1.02	18	.065	1.65		.090	2.29	
.016	.41	26	.041	1.04		.066	1.68		.091	2.31	11
.017	.43		.042	1.07		.067	1.70		.092	2.34	
.018	.46	25	.043	1.09		.068	1.73		.093	2.36	
.019	.48		.044	1.12		.069	1.75		.094	2.39	
.020	.51	24	.045	1.14	17	.070	1.78		.095	2.41	
.021	.53		.046	1.17		.071	1.80		.096	2.44	
.022	.56		.047	1.19		.072	1.83	13	.097	2.45	
.023	.58	23	.048	1.22		.073	1.85		.098	2.49	
.024	.61		.049	1.24		.074	1.88		.099	2.51	
.025	.64	22	.050	1.27		.075	1.90		.102	2.59	