CMW

HIGH-DENSITY metals

EXPERIENCE,
DEDICATION & QUALITY

HIGH-DENSITY metals

VISION, INNOVATION, SERVICE, EXPERTISE.

CMW leads the market in manufacturing world-class, engineered, tungsten alloys and composites. CMW's experience reaches back to the beginning of the last century, and with our focus on the next, CMW provides you a wealth of material, application, product and manufacturing knowledge. CMW customer care specialists, chemists, metallurgists, technicians, machinists and all of our associates seek to provide you with the highest overall quality experience possible.

CMW® high-density metals consist of a family of readily machinable, environmentally friendly, tungsten-based materials with densities 50% greater than lead, which allows you to design in less space. Produced by advanced powder metallurgy and state-of-the-art sintering technology, CMW® high-density metals consistently provide superior physical properties and product quality. CMW® high-density metals are available in several compositions that provide a high variety of density, tensile, elongation and thermal properties. These properties offer you broad choices for solving unique problems.

CMW provides our high-density metals "as-sintered" for use as a raw material in standard, near-net, semi-finished and fully machined configurations. CMW maintains a fully equipped CNC machine shop capable of precision milling, drilling, turning and grinding with the highest degree of accuracy. CMW also integrates advanced plating, painting and coating technologies to be your single source supplier.

SUPERIOR MATERIALS.
SUPERIOR PERFORMANCE.

CMW® tungsten alloys and composites are available in several compositions. Additives such as copper, nickel, iron and molybdenum create materials with unique properties for military, medical, commercial and industrial applications.

CMW® TUNGSTEN ALLOYS

All CMW® tungsten alloys contain between 90% and 97% tungsten, yet are readily machinable. Our CMW® 1000, 2000, and 3000 series materials conform to or exceed the MIL-T-21014, AMS-7725 specifications and ASTM B777 standards.

TYPICAL PROPERTIES OF CMW® TUNGSTEN ALLOYS

TUNGSTEN ALLOY	COMPOSITION % BY WEIGHT	DENSITY g/cm³ or lb/in³		HARDNESS ROCKWELL	SPECIFICATIONS
CMW® 1000 Tungsten, Nickel, Copper	90W; 6Ni; 4Cu	17.0	0.614	24 HRC	AMS 7725D Ty 1, AMS-T-21014 Cl 1, MIL-T-21014D Cl 1, ASTM B777 Cl 1
CMW® 3000 Tungsten, Nickel, Iron	90W; 7Ni; 3Fe	17.0	0.614	25 HRC	AMS 7725D Ty 2, AMS-T-21014 Cl 1, MIL-T-21014D Cl 1, ASTM B777 Cl 1
CMW® 2925 Tungsten, Nickel, Copper	92.5W; 4.5Ni; 3Cu	17.5	0.632	25 HRC	AMS-T-21014 Cl 2, MIL-T-21014D Cl 2, ASTM B777 Cl 2
CMW® 3925 Tungsten, Nickel, Iron	92.5W; 5.25Ni; 2.25Fe	17.5	0.632	26 HRC	AMS-T-21014 Cl 2, MIL-T-21014D Cl 2, ASTM B777 Cl 2
CMW® 2000 Tungsten, Nickel, Copper	95W; 3.5Ni; 1.5Cu	18.0	0.650	27 HRC	AMS-T-21014 Cl 3, MIL-T-21014D Cl 3, ASTM B777 Cl 3
CMW® 3950 Tungsten, Nickel, Iron	95W; 3.5Ni; 1.5Fe	18.0	0.650	28 HRC	AMS-T-21014 Cl 3, MIL-T-21014D Cl 3, ASTM B777 Cl 3
CMW® 3970 Tungsten, Nickel, Iron	97W; 2.1Ni; 0.9Fe	18.5	0.668	30 HRC	AMS-T-21014 Cl 4, MIL-T-21014D Cl 4, ASTM B777 Cl 4

ELKONITE® TUNGSTEN COPPER

Elkonite® is a registered trademark of CMW Inc. Elkonite® tungsten copper materials typically range from 50%-90% tungsten with the balance made of copper. These materials are chosen to solve unique challenges in a variety of applications ranging from EDM/ECM electrodes, weight and nozzle applications to gyroscope and inertial guidance systems.

TYPICAL PROPERTIES OF CMW® ELKONITE® COMPOSITES

TUNGSTEN COMPOSITE	COMPOSITION % BY WEIGHT	DENSITY g/cm³	HARDNESS ROCKWELL	ELECTRICAL CONDUCTIVITY % IACS	THERMAL CONDUCTIVITY Btu/(hr•ft•°F)
ELKONITE® 10W3 **ELKONITE® 30W3**	75W; 25Cu 80W; 20Cu	14.84 15.56	98 HRB 103 HRB	45 41	150 145
ELKONITE® 40W3 **ELKONITE® 50W3**	87W; 13Cu 90W; 10Cu	16.70 17.23	25 HRC 27 HRC	37 35	135 115
OTHER ELKONITE®	42 to 90W; 10 to 58Cu	10.50 to 17.23	32 HRA to 109 HRB	28 to 58	85 to 190

Please visit www.cmwinc.com to see hundreds of detailed chemistries and specifications.

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ANVILOY® 1150 AND ANVILOY® WELD ROD

CMW developed Anviloy® 1150 material primarily as an alternative to H-13 tool steel for aluminum die cast tooling. CMW Anviloy® 1150 possesses a low coefficient of thermal expansion, excellent thermal conductivity and material properties at elevated temperatures, and provides increased cooling in difficult to cool die areas that increase die casting production rates. We establish the material properties as we manufacture Anviloy® 1150 which eliminate the need for heat treatment required with using other tool steel materials. CMW also manufactures Anviloy® Weld Rod which is applied via the MIG/TIG welding process, providing a longer lasting, better quality weld for building up erosion areas and repairing cracked dies. You can use Anviloy® Weld Rod with any base tool steel material, extending the life of your tooling investment.

TYPICAL PROPERTIES OF CMW® ANVILOY® 1150

TYPICAL ROOM TEMPERATURE MECHANICAL PROPERTIES	
Ultimate Tensile Strength, psi (MPa)	140,000 (965)
Yield Strength, 0.2% offset, psi (MPa)	125,000 (862)
Elongation, % in 2 inches	3.0
Hardness, HRC	34
Modulus of Elasticity, psi x 10^6 psi (GPa)	49.0 (338)
THERMAL CONDUCTIVITY, Btu/(hr•ft•°F) [W/(m•K)]	74.0 (128)
DENSITY, lb/in^3 (g/cm^3)	0.623 (17.25)

THERMKON® COPPER TUNGSTEN AND COPPER MOLYBDENUM

Thermkon® is a registered trademark of CMW Inc. Thermkon® materials are engineered to provide controlled coefficients of thermal expansion and have high strength and thermal conductivity. They are joined with ceramics or other semi-conductors used in the electronics industry (thus, they are excellent bases, heat sinks and structural members for integrated circuits, semi-conductors and high power electron tubes).

TYPICAL PROPERTIES OF CMW® THERMKON® COMPOSITES

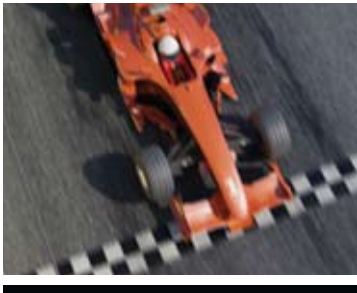
TUNGSTEN COMPOSITE	COMPOSITION % BY WEIGHT	DENSITY g/cm^3	HARDNESS ROCKWELL	CTE x10^{-6} W /°F
THERMKON® 83	75W; 25Cu	14.84	95 HRB	4.6
THERMKON® 76	80W; 20Cu	15.56	103 HRB	4.2
THERMKON® 68	85W; 15Cu	16.31	25 HRC	3.6
THERMKON® 62	90W; 10Cu	17.17	27 HRC	3.2
THERMKON® 70M	80Mo; 20Cu	9.85	90 HRB	3.6
THERMKON® 65M	85Mo; 15Cu	9.92	95 HRB	3.3

CUSTOMIZED SOLUTIONS FOR EVERY APPLICATION.

Applications for CMW® high-density metals are as varied as the industries we serve.

- **Aerospace** customers require quality, dependability, high performance materials and precision machined products. Our alloys, composites and machined parts are used for weights, counter-balances and heat sinks throughout the world.
- **Industrial and Medical Radiation Shielding** use CMW® high-density metals for containing and directing radioactive material, and tungsten-based materials are much more environmentally responsible, hold tighter tolerances, and use less space than those made of lead. Typical uses are for collimators, syringe and vial shields, and radioactive source containers.
- **Military & Defense** customers use CMW® high-density metals for weights and counterbalances, rotating inertia members (gyroscope rotors), guidance components (vector control vanes), and high-reliability heat sinks.
- **Die Casting** companies enjoy up to 10 times normal die life by using CMW Anviloy® 1150 in problem areas to solve thermal fatigue failures and by utilizing Anviloy® Weld Rod to build up erosion areas and repair cracked dies whether made of tool steel or Anviloy® 1150.
- **Hot Runner Systems and Plastic Injection Molding** utilize Anviloy® 1150 in place of P20 Tool Steel, Copper Beryllium and TZM for longer life, better machining properties and lower overall costs.
- **Precision Tooling** uses No-Chat® and No-Chat® Max materials for heavy metal boring bars. These materials are perfect for machining and grinding where rigidity and minimal vibration are critical.
- **Performance Racing & Recreation** applications include balance weighting for adjusting center of gravity locations whether for darts, golf clubs, tennis rackets or race cars.
- **Electronics Industry** applications utilize CMW's Thermkon® copper tungsten and copper molybdenum for high thermal conductivity and a low, stable thermal expansion curve to solve unique packaging and heat transfer problems for high reliability applications.
- **Oil & Gas Exploration** applications are supported by the high mass properties and radiation shielding properties of CMW® tungsten alloys.
- **EDM / ECM Machining** uses Elkonite® materials for electrodes because of the spark erosion resistance, good electron emission characteristics, wear resistance, high metal removal rates, and the ability to retain detail. Elkonite® materials are particularly effective at machining tungsten carbides.



UNIQUE MANUFACTURING CAPABILITIES

Our manufacturing expertise in powder mixing, pressing, sintering and machining allow us to provide world-class quality, and our responsive service and application experience allows us to offer valuable solutions to many customers around the world. Our ability to integrate complex CNC machining with state-of-the-art plating, painting and coating technologies makes CMW your sole choice as a world-class supplier.

CMW blends elemental powders into specific compositions and uses hydraulic and cold isostatic pressing to press the material to the desired density. The parts are then sintered in high-temperature furnaces and either shipped as-sintered, near-net shape, or precision-machined by our highly experienced workforce.

CMW'S COMMITMENT: SUPERIOR QUALITY.

CMW enjoys a long history of producing superior, world-class quality in all of its products. As an ISO 9001:2008 certified facility, CMW takes great pride in managing and continuously improving its robust quality system. CMW's quality system is focused on ensuring that quality is reinforced at every step of managing your order. Many of the products CMW manufactures involve a significant amount of critical detail that must be accommodated with the highest degree of accuracy.

CMW understands that you must receive parts that adhere strictly to all standards and specifications set forth. CMW's depth of professional experience, unique manufacturing processes, and demonstrated consistency come together to produce products of the highest quality. Document control, processing detail, first article inspections, in-process inspections, final quality inspections, corrective action and continuous improvement are all key elements of our quality assurance system. Manufacturing high quality parts is a core tenet of our business.

Continuous improvement is ingrained in every element of CMW's business. From how we professionally engage you in the process, to how we securely package product for shipment, every aspect of our business system is constantly evaluated so that we might realize improvements for the betterment of your experience.

CMW actively encourages and expects every employee to participate in the continual improvement process. CMW's employees understand that only by way of continuous improvement will they be able to keep the company's leading position in an increasingly competitive global economy. CMW employs professionals, including chemists, metallurgists, metallography technicians, and dedicates its people, facilities and equipment to quality production. CMW enjoys a first-tier reputation for quality in all markets it serves, and customer satisfaction at all levels is our own expectation.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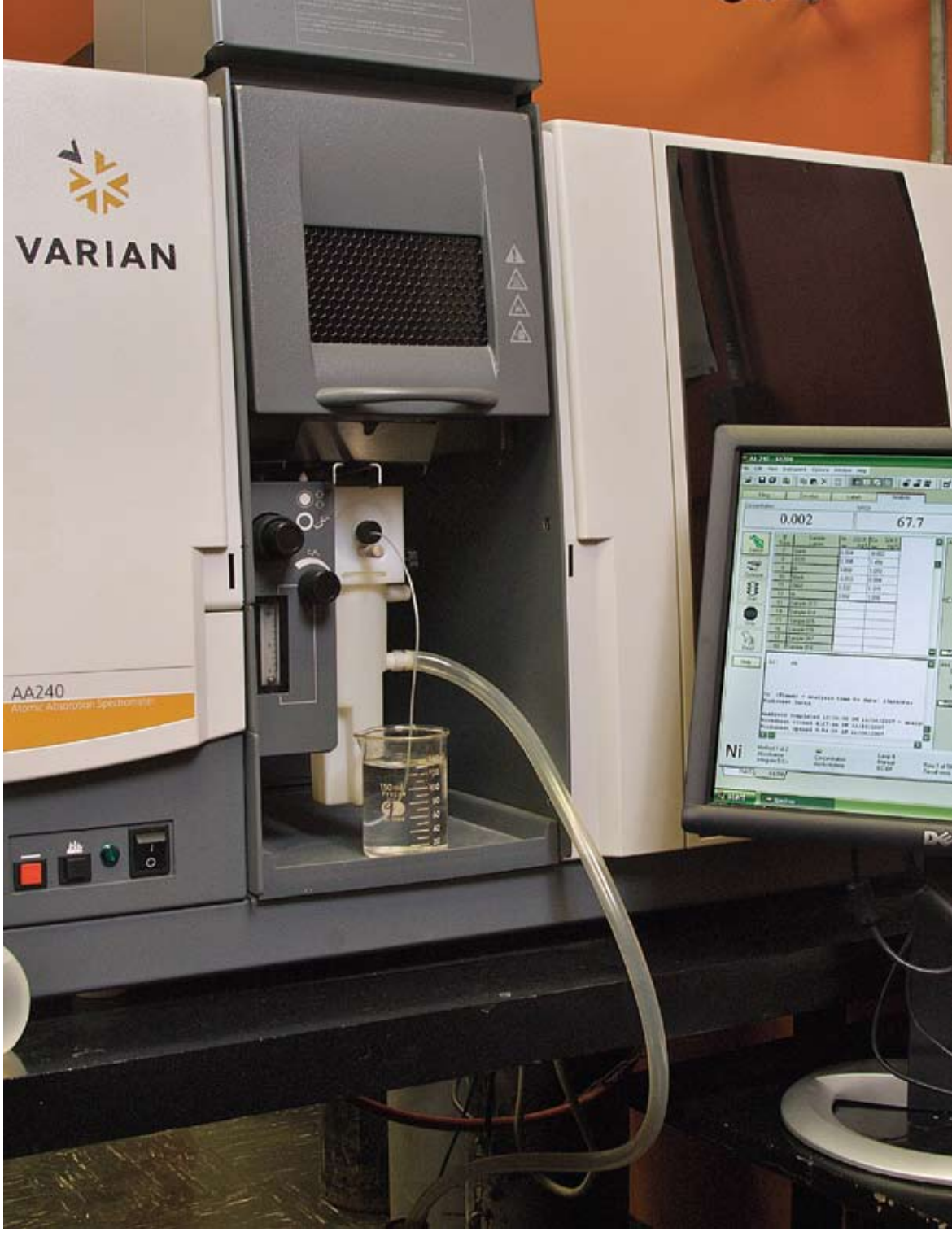
VARIAN
AA240
Atomic Absorption Spectrometer
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67.7
Ni

A DEDICATED PARTNER.

CMW's commitment to outstanding customer service provides each of our clients with confidence. We look forward to serving as your dedicated partner to craft solutions for your high-density metals needs.

THE FORERUNNER IN SPECIALTY METALS

CMW Inc.
Post Office Box 2266
Indianapolis, Indiana 46206-2266 USA

Tele: 317-634-8884
Fax: 317-638-2706
Toll Free Phone: 866-634-8884
Toll Free Fax: 866-239-6995

Email: *cmw@cmwinc.com*

www.cmwinc.com