AMERICAN CNC INC.

Precision CNC Machine Shop

Catalog No. 2

CNC Machine Shop

5-axis Milling, Turning, Grinding, Wire EDM

Cage Code 7DW52

SCAN ME

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BUSINESS INFORMATION

American CNC Inc. Business information

Doing Business As:	
AMERICAN CNC INC.	
www.AmericanCNC.net	
COMPANY SNAPSHOT	
CAGE:	**7DW52**
DUNS:	**05-979-0767**
Government Business POC:	**Patrick Talverdi**
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Address:	**12430 Montague Street Unit 207** **Pacoima, CA. 91331**
NAICS &PSC CODES	
NAICS CODE	
336412	**Aircraft Engine & Engine Parts Manufacturing**
332510	**Hardware Manufacturing**
332710	**Machine Shops**
332722	**Bolt, Nut, Screw, Rivet, & Washer Manufacturing**
336413	**Other Aircraft Parts & Auxiliary Equipment Mfg.**
336415	**Guided Missile & Space Vehicle Propulsion Unit & Propulsion Unit Parts Manufacturing**
PRODUCT & SERVICE CODES SELECTED (PSC)	
5307	**Studs**
4820	**Valves, Nonpowered**
2840	**Gas Turbines & Jet Engines, Aircraft, Prime Moving &Components**
5365	**Bushings, Rings, Shims & Spacers**
1620	**Aircraft Landing Gear Components**
1680	**Miscellaneous Aircraft Accessories &Components**
CERTIFICATIONS & REGISTRATIONS	
- Defense Logistics Agency, Military Critical Technical Data Agreement Joint Certification Program (JCP)	
- United Technologies Supplier Registration (UTC)	
- No Foreign/NOFORN Technical Data Agreement	
- DLA-Inventory Control Points (ICP) NORTHROP GRUMMAN	
- DLA-Inventory Control Points (ICP) BOEING RIGHT GUARD	
- HUBZone Certified	
- AS9100 Certified	

OWNERS MESSAGE

Owners Message

At American CNC Inc., we're passionate about helping our customers succeed with top-quality precision CNC machined components and outstanding service. We're here to ensure you get the reliability and excellence you need to stand out in your industry.

Thanks for taking the time to check out our business catalog. We look forward to working with you!

President: Patrick Talverdi patrick@americancnc.net (818) 669-2913

Vice President: Sebooh Talverdi sebooh@americancnc.net (818) 934-2551

QUALITY POLICY
&
MISSION STATEMENT

Quality Policy

American CNC, Inc. and its employees are committed to meeting customer and applicable legal requirements in order to achieve customer satisfaction. We will always strive to provide quality products on time and continually improve our Quality Management System.

QUALITY OBJECTIVES and PROCESS METRICS

Customer Product Acceptance ≥ 95%

Customer OTD (On-Time-Delivery) ≥ 95%

Customer Satisfaction Average ≥ 3.5 Stars

Order Receipt to Entry within 2 Business Days ≥ 95%

Supplier Quality ≥ 95%

Supplier OTD (On-Time-Delivery) ≥ 95%

MISSION

At American CNC Inc. we recognize the significance of thriving for continuous quality improvement, conforming to internal and customer driven procedures and specifications, and the importance of meeting customer delivery deadlines. Regardless of the task at hand, our commitment to providing quality parts on time, the first time, each and every time remains the same.

VALUES

Ethics - We exercise our duties with honesty and integrity at all times.

Teamwork - We respect and support each other, without blame, to create a stronger and better performing team.

Customer Service - We respond to every customer quickly, thoroughly, professionally and with courtesy.

ABOUT AMERICAN CNC, INC.

About American CNC, Inc.

American CNC Inc., founded in 2011, is your go-to partner for precision machining. Based in sunny Southern California, our 3,000 square foot, climate-controlled facility is equipped to handle everything from prototypes to high-volume production, operating around the clock to meet your deadlines.

Our shop features cutting-edge machinery, including high-speed 5-axis milling centers, turning and grinding equipment, and ultra-precision WIRE EDM machines.

We maintain strict quality control in our climate-controlled QC room, outfitted with state-of-the-art equipment like CMMs and vision systems. From machining and deburring to outsourcing tests and processes, we handle it all, working with pre-approved suppliers for any additional requirements. Our services also include part marking, labeling, and packaging, with options for RFID tracking or other customer-specific methods.

We specialize in R&D, short runs, and production orders, and have extensive experience crafting precision jigs and fixtures for the aerospace industry. Our diverse clientele includes government agencies, the Department of Defense, aerospace companies, racing teams, oil and gas sectors, medical equipment manufacturers, and more.

Our dedicated team is committed to delivering top-notch products and services, leveraging the latest technology and machinery to ensure your needs are met with precision and punctuality. At American CNC Inc., we're not just about meeting expectations—we're about exceeding them.

American CNC Inc. DBA as American CNC Inc.
Single location HUB Zone certified
Government contracting Cage Code 7DW52

AMERICAN CNC INC.

Precision CNC Machine Shop

CNC MACHINE SHOP

5-axis Milling, Turning, Grinding, Wire EDM

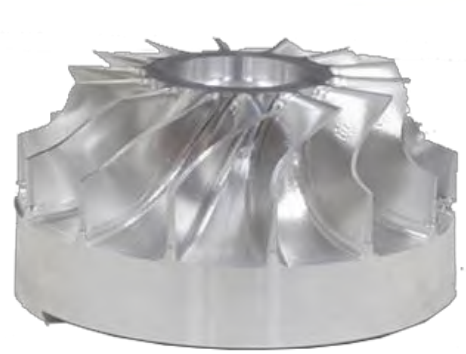
Cage Code 7DW52

MANUFACTURING EQUIPMENT

5-Axis Milling Center

With our deep expertise in manufacturing and years of experience machining tough materials to tight tolerances, plus our state-of-the-art 5-axis UMC 750ss, we've established ourselves as one of the top high-tech machine shops in the LA area. We excel at handling tight tolerances and complex geometries for R&D, short runs, and production orders, all while offering highly competitive prices and the shortest lead times.

UMC 750ss travels **30" x 20" x 20"**



MANUFACTURING EQUIPMENT

3 to 4th axis CNC Milling

At American CNC Inc., our high precision CNC Milling Centers can quickly and accurately perform various operations from simple drilling and tapping to complex tight tolerance true position Machining.

VF-3YT extended table is helping operator to hold larger size material compare to regular VF-3 milling machines.

Renishaw touch probe and tool pre-setter are options that all our milling machines are equipped with. It helps to reduce setup time and giving the accuracy and repeatability.

VF-3YT travels **40" x 26" x 25"**

VF-2 travels **30" x 16" x 20”**

4-th axis hookup and installed on each machine giving us opportunity to program and run more complex parts.

MANUFACTURING EQUIPMENT

Turning

Max. Turning Diameter **11.75”**
Max. Turning Length **22.5”**

At American CNC Inc., our high precision CNC Turning Centers can quickly and accurately perform various turning operations producing components with precise contours, diameters, and depths. Our turning centers are extremely versatile and efficient allowing us to rapidly produce single prototypes to thousands of parts without sacrificing the precision and quality that you expect.

Hard Turning on Box Way Machine

Max. Turning Diameter **15.39”**
Max. Turning Length **22.05”**

Thanks to our extensive knowledge and experience with advanced cutting tools, our team can hard turn materials up to 60 HRC with precision. This sophisticated technique helps us avoid costly post-processing steps like grinding. We apply hard turning to various aspects of machining, including boring, grooving, and facing, achieving excellent precision and micro finishes comparable to or better than grinding. By handling all processes in-house, we can better control both the quality and cost of your parts. Additionally, hard turning ensures that parts remain perfectly round, eliminating the lobbing issues often associated with centerless grinding.





MANUFACTURING EQUIPMENT

Surface Grinding

Grinder working area is **10”x20”**

Surface grinding is one of the most commonly used grinding processes, known for its ability to create a smooth finish on flat surfaces. This finishing technique employs a rotating abrasive wheel to refine the surface of both metallic and non-metallic materials, enhancing their appearance or achieving specific functional requirements. At American CNC Inc., we provide top-notch surface grinding services to high-tech industries including aerospace, defense, automotive, medical, technology, and oil and gas. Whether you're working on R&D projects, precision parts, or production assemblies, we have the expertise to handle it. If you need precise thickness and a flawless surface finish for your workpiece, get in touch with us to learn more about our advanced surface grinding capabilities.

MANUFACTURING EQUIPMENT

MARKING

SAKO LASER MARKING MACHINE

We proudly name our designed and built machines after our father, **SAKO**.

The **SAKO FL 350-R** is a testament to our commitment to innovation and craftsmanship. Designed and built by our expert team, this versatile machine excels in marking a wide array of materials, including part and serial numbers, logos, barcodes, and QR codes.

Featuring a rotary unit mounted on the machine table. The **SAKO FL 350-R** delivers precise marking on both cylindrical and flat or curved surfaces. Its adjustable table accommodates products of various sizes, from tiny components to large automobile parts. The machine's laser marking technology ensures a clean, refined surface, often surpassing traditional methods.

Our Fiber Optics and CO2 laser machines are always ready to mark your products.

Stamping

Stamping the required information on finished parts are mostly requested by DOD projects. The special ink and the text of the stamping are all per customer supplied specification.

Notes:

QUALITY CONTROL EQUIPMENT

Q.C. Equipment

Our state-of-the-art calibrated precision measuring equipment and tools are as following:

- ✓ CNC VISION MEASURING SYSTEM, QUICK VISION ACTIVE 404 INCLUDE CNC RENISHAW PROBING SYSTEM WITH STYLUS CHANGE RACK

- ✓ CMM, CRYSTA-PLUS CRT-PM574 -FLOATING TYPE CMM

- ✓ PROFILE PROJECTOR, PH-A14

- ✓ TRIMOS V5 16"/407MM ELECTRONIC HEIGHT GAGE 54-199-540-0

QUALITY CONTROL EQUIPMENT

Q.C. Equipment

- ✓ ROUGHNESS TESTER, SURFTEST SJ-210- SERIES
- ✓ BOWERS HOLEMATIC PISTOL GRIP SET BLUETOOTH XTH3 IP67 0.750” – 3.750”
- ✓ BOWERS MICROGAUGE SET BLUETOOTH IP65 0.089" - 0.250"
- ✓ BOWERS DIGITAL CYLINDER BORE GAGE

- ✓ DIGITAL VISION MICROSCOPE
- ✓ DEPTH MICROMETER SET
- ✓ TUBULAR INSIDE MICROMETERS SERIES WITH EXTENSION ROD

- ✓ COMPLETE SET OF DIGITAL MICROMETERS IP65
- ✓ VERIETY SET OF DIGITAL AND DIAL CALIPERS
- ✓ VERIETY OF HEIGHT GAUGES

- ✓ INTERAPID DIAL TEST INDICATOR
- ✓ GRANITE TABLES 12”X24” & 24”X36” & 36”X36”
- ✓ ULTRA PRECISION GAGE BLOCK SET
- ✓ VERIETY OF THREAD PIN AND PLUG GAGES
- ✓ VERMONT PIN GAGE SET

All Q.C. tools and equipment are calibrated and ready for daily use.

The calibration management software is Microsoft compatible and the calibration due reminder is powered by Microsoft Outlook event scheduler.

WORKPIECE MATERIALS

Workpiece Materials

In American CNC Inc. we do machining from all ISO and Non-ISO group of material.

P	M	K
		
Steel	Stainless steel	Cast Iron

N	S	H
		
Non-ferrous material	Super-alloys and Titanium	Hardened material

O

Non-ISO

Material examples we usually work with are as following:

P- 12L14, 1018, 1045, 1060, 1144 (stress proof), 4130, 4140, 4340, 8620, 1144, A2, A6, O1, O7, D2, H13

M- 303, 303S, 304, 304L, 316, Nitronic, 17-4PH, 15-5PH, 410, 420, 440, PH 13-8 MO

K- A159G1800, A159G2500, A159G3000, 80-55-06, 35018, A220-8002, A536

N- 2025, 6061, 6061-T6, 7075, 7075-T6, C52400, C77000, CUZn10, CUZn20, C360

S- Inconel 625, Inconel 718, Ti6AL4V

H- Heat Treated Steels

O- (Non-ISO) PEEK 30% glass filled, Acetal (Delrin), HDPE, LDPE, Polyurethane

Next Page is some information for ISO and Non-ISO material.

WORKPIECE MATERIALS

Workpiece Materials

ISO P – *Steel is the largest material group, ranging from unalloyed to high-alloyed material. Machinability is usually good, but differs a lot depending on material hardness, carbon content, etc.*

ISO M – *Stainless steels are materials alloyed with a minimum of 12% chromium. Other alloys may include nickel and molybdenum. Different conditions, such as ferritic, martensitic, austenitic and austenitic-ferritic (duplex), create a large range of materials. A commonality among all these materials is that the cutting edges are exposed to a great deal of heat, notch wear and built-up edge.*

ISO K – *Cast iron, unlike steel, is a short-chipping type of material. Gray cast irons (GCI) and malleable cast irons (MCI) are quite easy to machine, while nodular cast irons (NCI), compact cast irons (CGI) and austempered cast irons (ADI) are more difficult. All cast irons contain SiC, which is very abrasive to the cutting edge.*

ISO N – *Non-ferrous metals are softer metals, such as aluminum, copper, brass, etc. Aluminum with a Si-content of 13% is very abrasive. Generally, high cutting speeds and long tool life can be expected for inserts with sharp edges.*

ISO S – *Heat resistant super alloys include a great number of high-alloyed iron-, nickel-, cobalt- and titanium-based materials. They are sticky, create built-up edge, harden during working (work hardening), and generate heat. They are very similar to the ISO M materials but are much more difficult to cut, and reduce the tool life of the insert edges.*

ISO H – *This group includes steels with a hardness between 45–65 HRC, and also chilled cast iron around 400–600 HB. The hardness makes them difficult to machine. The materials generate heat during cutting and are very abrasive for the cutting edge.*

O (Other) Non-ISO. *Thermoplastics, thermosets, GFRP (Glass Fiber Reinforced Polymer/Plastic), CFRP (Carbon Fiber Reinforced Plastic), carbon fiber composites, aramid fiber reinforced plastic, hard rubber, graphite (technical). Various industries are now using composites to a greater extent, especially in the aerospace industry.*

MANUFACTURING & QUALITY SYSTEM OVERVIEW

Manufacturing Process

At American CNC Inc., each line item in a Purchase Order is assigned a unique job number, making it easy to trace every step of the process. We store all job data securely on a server with access limited to authorized personnel.

Each job is divided into phases, including material procurement, machining, outside processing, marking, packaging, and shipping. We meticulously document each phase in a traveler (M&IR), which is stamped and signed by the responsible person upon completion. Once the order is shipped, we keep a hard copy of the traveler in the job folder and scan it for digital storage on our server.

As the order progresses, we add all relevant certifications to the traveler, including material certificates, heat treating certificates, process certificates, test certificates, shipping documents, and inspection reports.

Outside Process

We handle outside processes like heat treating, coating, painting, and NDT testing through our trusted, pre-approved suppliers. We maintain a list of these suppliers on our secure server.

If a supplier wants to join our list, they must meet our terms and conditions. You can find our Supplier Terms and Conditions available for download on our website at www.americancnc.net.

Material Purchasing Policy

According to our internal guidelines, we purchase materials that are both domestic and certified, with traceable heat numbers. If the material is supplied by a customer, we will need a copy of the material certificate for our records.

AS9100 Certified

At American CNC Inc., we follow **AS9100** standards for all our procedures. We're proud to hold an **AS9100 Quality Management System Certificate**, which reflects our commitment to maintaining the highest quality in everything we do.

MANUFACTURING & QUALITY SYSTEM OVERVIEW

Quality Manual

At American CNC Inc., the quality manual is the foundation of our quality management system. In quality manual, we describe the scope of the Quality Management System and documented procedures necessary to meet the AS9100 requirements utilized by American CNC Inc.

The purpose of our Quality Assurance Manual is to provide an effective resource in defining testing, inspection, documentation, and associated functions. The fundamental end result is to produce a product of the highest quality that is consistent with the contractual and/or purchase order requirements of the end article. Our quality manual is a controlled document which is reviewed and approved by top management, and is controlled as specified in P-750 (Control of Documented information).

Configuration Management (P-812)

Operational planning and control at American CNC, Inc. is structured around specific procedures and diagrams, including M&IRs (F-850-001, F-850-002) and the Order Review and Planning Core Process Diagram #1. This framework ensures meticulous planning for outsourced manufacturing and work transfers, adhering to the Purchasing procedure (P-840) and Control of Production & Service Provision procedure (P-850). Operational risk management is governed by the Risk Management and Human Factors procedure (P-610) and Customer Related Processes procedure (P-820), while configuration management follows the Identification and Traceability procedure (P-852) and includes comprehensive inspections before product release. The company also emphasizes product safety and the prevention of counterfeit parts through dedicated procedures.

For managing externally provided processes, products, and services, American CNC, Inc. relies on the Purchasing procedure (P-840) and ensures compliance through various control measures, including assessing high-level supply chain risks and preventing counterfeit parts as outlined in the Counterfeit Prevention procedure (P-814). Production and service provision are carefully controlled with work instructions and equipment validation, while outsourced special processes are monitored through customer-approved or NADCAP certified sources. The company maintains stringent identification, traceability, and preservation of products throughout their lifecycle, and addresses post-delivery support in line with statutory requirements and customer feedback. Changes are managed according to established procedures, and control of nonconforming outputs is handled as specified in the relevant control procedures.

Inspection

We do Inspection for First Article (FAI); In process and Final.

MANUFACTURING & QUALITY SYSTEM OVERVIEW

Sampling Plan (F-860-001)

If there are no specific customer requirements stated in the purchase order or customer specifications, the inspection will be conducted according to American CNC Inc.'s Statistical Sampling Plan (F-860-001). According to this standard process, any defect found in the inspected parts will lead to the rejection of the entire lot.

*General Inspection level AQL 2 - C=0

NORMAL			
lot or batch size	**sample size**	**Accept**	**Reject**
2-8	2	0	1
9-15	3	0	1
16-25	5	0	1
26-50	8	0	1
51-90	13	0	1
91-150	20	0	1
151-280	32	0	1
281-500	50	0	1
501-1200	80	0	1
1201-3200	125	0	1
3201-10000	200	0	1
10001-35000	315	0	1
35001-150000	500	0	1

After one rejection has been identified, inspect at 100%

***BASED ON ANSI Z1.4**

AMERICAN CNC INC.

Precision CNC Machine Shop

CLIENTS

CNC MACHINE SHOP

5-axis Milling, Turning, Grinding, Wire EDM

Cage Code 7DW52

CLIENTS

Aerospace | Defense | Racing | Contract Mfg.

Aerospace

American CNC Inc. takes great pride in providing top-quality precision machined parts to the Aerospace Industry. Whether we're delivering parts directly to aircraft manufacturers or through other suppliers, we are honored to have our components flying high in various aircraft around the world.

We work with a diverse range of materials, including plate, bar, extrusion, casting, and forging, and are dedicated to delivering the highest quality parts to our customers.

CLIENTS


Aerospace


Defense


Racing


Contract Mfg.

Defense

Since 2015, we have proudly been an approved contractor for the Department of Defense (DoD). We have consistently delivered high-quality parts for aircraft carriers, tanks, firearms, and missiles.

Our components can be found in carrier planes, naval vessels, and ground combat units.

We take great pride in supporting the brave men and women who defend our nation.

CLIENTS


Aerospace


Defense


Racing


Contract Mfg.

Racing

American CNC Inc. has partnered with manufacturing engineering teams across various companies to deliver top-quality auto parts to the market. We have successfully provided high-quality prototype parts for R&D projects and have efficiently produced dyno tools and components with quick turnaround times and competitive pricing.

Leveraging our extensive network of professional suppliers, we offer a comprehensive "ONE-STOP SHOP" experience to meet all your needs.

CLIENTS


Aerospace


Defense


Racing


Contract Mfg.

Contract Manufacturing

American CNC Inc. is well-equipped to offer a broad range of manufacturing services for industries seeking to outsource their production. We have a proven track record of success across various sectors, including medical, oil and gas, sound and film, and many more.

Leveraging our extensive network of professional suppliers, we offer a comprehensive "ONE-STOP SHOP" experience to meet all your needs.

Notes:

AMERICAN CNC INC.

Precision CNC Machine Shop

MACHINIST HANDY REFERENCE CHARTS

CNC MACHINE SHOP

5-axis Milling, Turning, Grinding, Wire EDM

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INCH TAP DRILL SIZES

Recommended tap drill sizes (for approx. 75% thread)

INCH SIZES - NATIONAL COARSE

TAP SIZE	DRILL SIZE
#1-64	#53
#2-56	#51
#3-48	5/64"
#4-40	#43
#5-40	#38
#6-32	#36
#8-32	#29
#10-24	#25
#12-24	#17
1/4-20	#7
5/16-18	F
3/8-16	5/16
7/16-14	U
1/2-13	27/64
9/16-12	31/64
5/8-11	17/32
3/4-10	21/32
7/8-9	49/64
1"-8	7/8
1-1/8-7	63/64
1-1/4-7	1-7/64
1-1/2-6	1-11/32
1-3/4-5	1-35/64
2"-4-1/2	1-25/32

INCH SIZES - NATIONAL FINE

TAP SIZE	DRILL SIZE
#0-80	3/64"
#1-72	#53
#2-64	#50
#3-56	#46
#4-48	#42
#5-44	#37
#6-40	#33
#8-36	#29
#10-32	#21
#12-28	#15
1/4-28	#3
5/16-24	I
3/8-24	Q
7/16-20	W
1/2-20	29/64
9/16-18	33/64
5/8-18	37/64
3/4-16	11/16
7/8-14	13/16
1"-14	15/16
1-1/8-12	1-3/64
1-1/4-12	1-11/64
1-1/2-12	1-27/64
1-3/4-12	1-43/64
2"-12	1-59/64

TAPER PIPE SIZES - NPT

TAP SIZE	DRILL SIZE
1/8-27	R
1/4-18	7/16
3/8-18	37/64
1/2-14	23/32
3/4-14	59/64
1"-11-1/2	1-5/32
1-1/4-11-1/2	1-1/2
1-1/2-11-1/2	1-47/64
2"-11-1/2	2-7/32
2-1/2-8	2-5/8
3"-8	3-1/4
3-1/2-8	3-3/4
4"-8	4-1/4

STRAIGHT PIPE SIZES - NPS

TAP SIZE	DRILL SIZE
1/8-27	S
1/4-18	29/64
3/8-18	19/32
1/2-14	47/64
3/4-14	15/16
1"-11-1/2	1-3/16
1-1/4-11-1/2	1-33/64
1-1/2-11-1/2	1-3/4
2"-11-1/2	2-7/32
2-1/2-8	2-21/32
3"-8	3-9/32
3-1/2-8	3-25/32
4"-8	4-9/32

METRIC TAP DRILL SIZES

Recommended tap drill sizes (for approx. 75% thread)

METRIC COARSE SIZES

TAP SIZE	DRILL SIZE
1mm x .25	.75mm
1.1 x .25	.85
1.2 x .25	.95
1.4 x .3	1.1
1.6 x .35	1.25
1.7 x .35	1.3
1.8 x .35	1.45
2 x .4	1.6
2.2 x .45	1.75
2.5 x .45	2.05
3 x .5	2.5
3.5 x .6	2.9
4 x .7	3.3
4.5 x .75	3.7
5 x .8	4.2
6 x 1	5
7 x 1	6
8 x 1.25	6.8
9 x 1.25	7.8
10 x 1.5	8.5
11 x 1.5	9.5
12 x 1.75	10.2
14 x 2	12
16 x 2	14
18 x 2.5	15.5
20 x 2.5	17.5
22 x 2.5	19.5
24 x 3	21
27 x 3	24
30 x 3.5	26.5
33 x 3.5	29.5
36 x 4	32
39 x 4	35

METRIC FINE SIZES

TAP SIZE	DRILL SIZE
4 mm x .35	3.6mm
4 x .5	3.5
5 x .5	4.5
6 x .5	5.5
6 x .75	5.25
7 x .75	6.25
8 x .5	7.5
8 x .75	7.25
8 x 1	7
9 x 1	8
10 x .75	9.25
10 x 1	9
10 x 1.25	8.8
11 x 1	10
12 x .75	11.25
12 x 1	11
12 x 1.5	10.5
14 x 1	13
14 x 1.25	12.8
14 x 1.5	12.5
16 x 1	15
16 x 1.5	14.5
18 x 1	17
18 x 2	16
20 x 1	19
20 x 1.5	18.5
20 x 2	18
22 x 1	21
22 x 1.5	20.5
22 x 2	20
24 x 1.5	22.5
24 x 2	22
26 x 1.5	24.5
27 x 1.5	25.5
27 x 2	25
28 x 1.5	26.5
30 x 1.5	28.5
30 x 2	28
33 x 2	31
36 x 3	33
39 x 3	36

U.S. DRILL SIZES

DRILL	Decimal	DRILL	Decimal	DRILL	Decimal	DRILL	Decimal
80	.0135	40	.0980	2	.2210	33/64	.5156
79	.0145	39	.0995	1	.2280	17/32	.5312
1/64	.0156	38	.1015	A	.2340	35/64	.5469
78	.0160	37	.1040	15/64	.2344	**9/16**	**.5625**
77	.0180	36	.1065	B	.2380	37/64	.5781
76	.0200	7/64	.1094	C	.2420	19/32	.5938
75	.0210	35	.1100	D	.2460	39/64	.6094
74	.0225	34	.1110	E	.2500	**5/8**	**.6250**
73	.0240	33	.1130	**1/4**	**.2500**	41/64	.6406
72	.0250	32	.1160	F	.2570	21/32	.6562
71	.0260	31	.1200	G	.2610	43/64	.6719
70	.0280	**1/8**	**.1250**	17/64	.2656	**11/16**	**.6875**
69	.0292	30	.1285	H	.2660	45/64	.7031
68	.0310	29	.1360	I	.2720	23/32	.7188
1/32	.0312	28	.1405	J	.2770	47/64	.7344
67	.0320	9/64	.1406	K	.2810	**3/4**	**.7500**
66	.0330	27	.1440	9/32	.2812	49/64	.7656
65	.0350	26	.1470	L	.2900	25/32	.7812
64	.0360	25	.1495	M	.2950	51/64	.7969
63	.0370	24	.1520	19/64	.2969	**13/16**	**.8125**
62	.0380	23	.1540	N	.3020	23/64	.8281
61	.0390	5/32	.1562	**5/16**	**.3125**	27/32	.8438
60	.0400	22	.1570	O	.3160	55/64	.8594
59	.0410	21	.1590	P	.3230	**7/8**	**.8750**
58	.0420	20	.1610	21/64	.3281	57/64	.8906
57	.0430	19	.1660	Q	.3320	29/32	.9062
56	.0465	18	.1695	R	.3390	59/64	.9219
3/64	.0469	11/64	.1719	11/32	.3438	**15/16**	**.9375**
55	.0520	17	.1730	S	.3480	61/64	.9531
54	.0550	16	.1770	T	.3580	31/32	.9688
53	.0595	15	.1800	23/64	.3594	63/64	.9844
1/16	**.0625**	14	.1820	U	.3680	**1**	**1.0000**
52	.0635	13	.1850	**3/8**	**.3750**		
51	.0670	**3/16**	**.1875**	V	.3770	+64th	
50	.0700	12	.1890	W	.3860	increments	
49	.0730	11	.1910	25/64	.3906	up to 1-7/8"	
48	.0760	10	.1935	X	.3970		
5/64	.0781	9	.1960	Y	.4040	+32th	
47	.0785	8	.1990	13/32	.4062	increments	
46	.0810	7	.2010	Z	.4130	up to 2-1/4"	
45	.0820	13/64	.2031	27/64	.4219		
44	.0860	6	.2040	**7/16**	**.4375**	+16th	
43	.0890	5	.2055	29/64	.4531	increments	
42	.0935	4	.2090	15/32	.4688	up to 4-1/4"	
3/32	.0938	3	.2130	31/64	.4844		
41	.0960	7/32	.2188	**1/2**	**.5000**		

DRILL TIP HEIGHTS

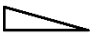
Drill Diameter	Decimal	118°	135°
1/16	.0625	.019	.013
3/32	.0938	.028	.019
1/8	.1250	.038	.026
5/32	.1563	.047	.032
3/16	.1875	.056	.039
7/32	.2188	.066	.045
1/4	.2500	.075	.052
9/32	.2813	.084	.058
5/16	.3125	.094	.065
11/32	.3438	.103	.071
3/8	.3750	.113	.078
13/32	.4063	.122	.084
7/16	.4375	.131	.091
15/32	.4688	.141	.097
1/2	.5000	.150	.104
17/32	.5313	.160	.110
9/16	.5625	.169	.116
19/32	.5938	.178	.123
5/8	.6250	.188	.129
21/32	.6563	.197	.136
11/16	.6875	.207	.142
23/32	.7188	.216	.149
3/4	.7500	.225	.155
25/32	.7813	.235	.162
13/16	.8125	.244	.168
27/32	.8438	.253	.175
7/8	.8750	.263	.181
29/32	.9063	.272	.188
15/16	.9375	.282	.194
31/32	.9688	.291	.201
1.00	.10000	.300	.207

GD&T SYMBOLS REFERENCE

GD&T Symbol	Control Type	Name	Summary Description
—	Form	Straightness	Controls the straightness of a feature in relation to its own perfect form
▱	Form	Flatness	Controls the flatness of a surface in relation to its own perfect form
○	Form	Circularity	Controls the form of a revolved surface in relation to its own perfect form by independent cross sections
⌭	Form	Cylindricity	Like circularity, but applies simultaneously to entire surface
⌓	Profile	Profile of a Surface	Controls size and form of a feature. In addition it controls the location and orientation when a datum reference frame is used.
⌒	Profile	Profile of a Line	Similar to profile of a surface, applies to cross sections of a feature
⊥	Orientation	Perpendicularity	Controls the orientation of a feature which is nominally perpendicular to the primary datum of its datum reference frame
∠	Orientation	Angularity	Controls orientation of a feature at a specific angle in relation to the primary datum of its datum reference frame
//	Orientation	Parallelism	Controls orientation of a feature which is nominally parallel to the primary datum of its datum reference frame
⌖	Location	Position	Controls the location and orientation of a feature in relation to its datum reference frame
◎	Location	Concentricity	Controls concentricity of a surface of revolution to a central datum
⌯	Location	Symmetry	Controls the symmetry of two surfaces about a central datum
↗	Runout	Circular runout	Controls circularity and coaxiality of each circular segment of a surface independently about a coaxial datum
⌰	Runout	Total runout	Controls circularity, straightness, coaxiality, and taper of a cylindrical surface about a coaxial datum

GD&T SYMBOLS REFERENCE

Symbol	Meaning
Ⓛ	LMC – Least Material Condition
Ⓜ	MMC – Maximum Material Condition
Ⓣ	Tangent Plane
Ⓟ	Projected Tolerance Zone
Ⓕ	Free State
Ø	Diameter
R	Radius
SR	Spherical Radius
S Ø	Spherical Diameter
CR	Controlled Radius
⟨ST⟩	Statistical Tolerance
□	Basic Dimension
( )	Reference Dimension
5X	Places

Symbol	Meaning
	Dimension Origin
	Counterbore
	Countersink
	Depth
	All Around
	Between
	Target Point
	Conical Taper
	Slope
	Square

MACHINABILITY RATINGS

These machinability ratios are based on high speed tooling and must be recognized as approximate values.

STAINLESS STEEL		
GRADE	**APPROXIMATE SURFACE FEET PER MINUTE**	**RELATIVE SPEED BASED ON C-1212 as 100%**
302	70	40
302/304/304 L “B”	55	28
303	150	75
303 “B”	80	43
304	70	40
304 L	70	40
309	60	36
310	60	36
316	60	36
316/316 L “B”	50	22
316 L	60	36
317/317 L	60	36
321	60	36
330	45	20
347	60	36
403	95	54
410	95	54
416 Ann	150	75
416 H.T.	85	50
418 (Greek Ascoloy®)	96	50
420	85	50
420 F	125	68
422	85	50
430	110	66
430 F	150	75
431	80	48
440 A	65	40
440 C	65	40
440 F Se	80	48
446	60	36
PH 13-8 MO	60	36
15-5 PH	75	45
17-4 PH	75	45
17-4 PH “H1150”	85	50
17-7 PH	75	45
AM 355	72	42

MACHINABILITY RATINGS

All figures are based on cold drawn bars in as-drawn condition, except where noted.

CARBON STEELS			
GRADE	**RELATIVE SPEED BASED ON C-1212 as 100%**	**GRADE**	**RELATIVE SPEED BASED ON C-1212 as 100%**
1015	72%	1137	72%
1018	78%	1141	70%
1020	72%	1141 Annealed	81%
1022	78%	1144	76%
1030	70%	1144 Annealed	85%
1040	64%	1144 Stress proof	83%
1042	64%	1212	100%
1050	54%	1213	136%
1095	42%	12L14	170%
1117	91%	1215	136%
Alloy Steels			
2355 Annealed	70%	4620	66%
4130 Annealed	72%	4820 Annealed	49%
4140 Annealed	66%	52100 Annealed	40%
4142 Annealed	66%	6150 Annealed	60%
41L42 Ann.	77%	8620	66%
4150 Annealed	60%	86L20	77%
4340 Annealed	57%	9310 Annealed	51%
Tool Steels			
A-2	42%	M-2	39%
A-6	33%	O-1	42%
D-2	27%	O-2	42%
D-3	27%		
Gray Cast Iron			
ASTM Class 20 Annealed	73%	ASTM Class 40	48%
ASTM Class 25	55%	ASTM Class 45	36%
ASTM Class 30	48%	ASTM Class 50	36%
ASTM Class 35	48%		

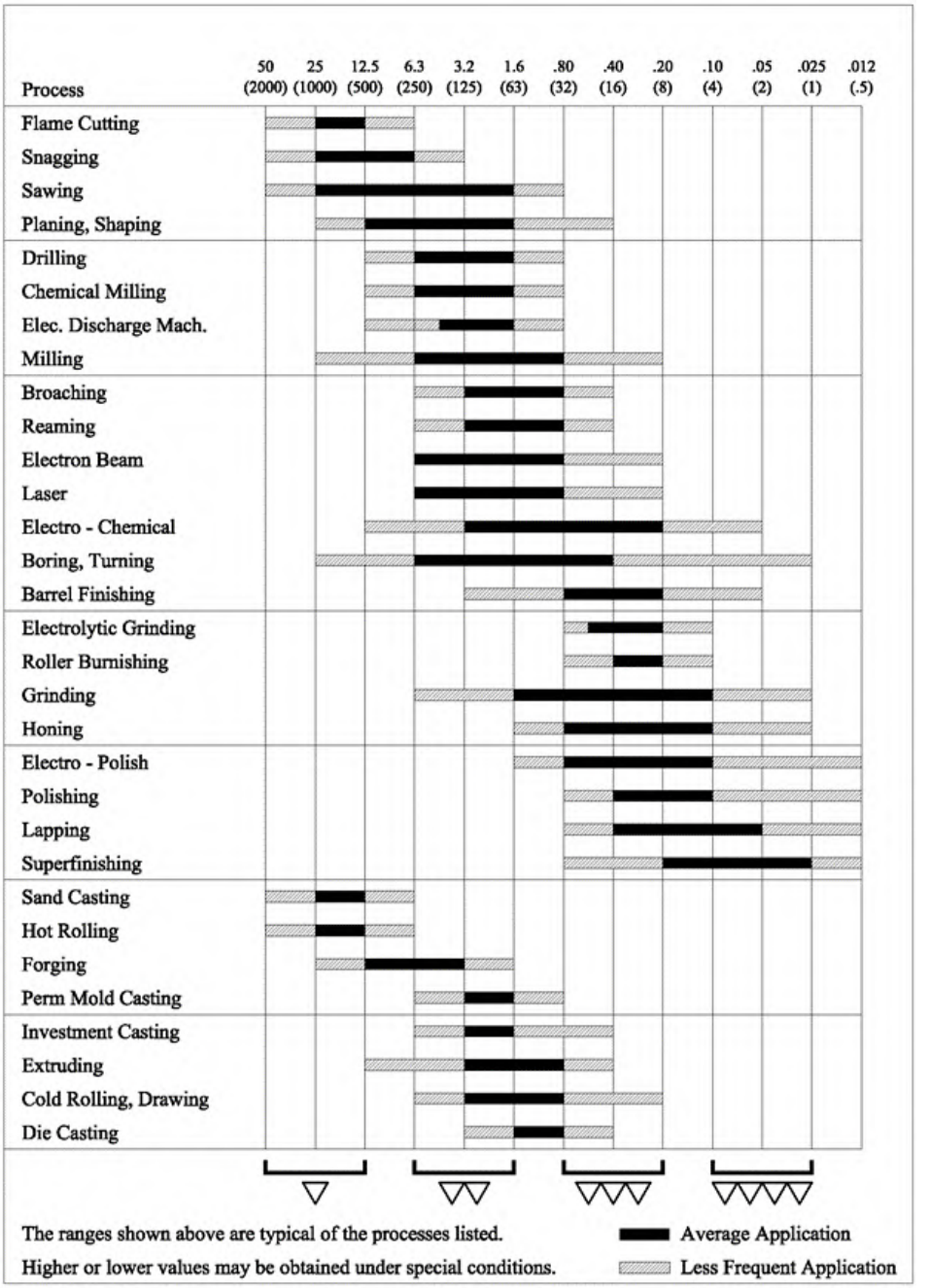
MACHINABILITY RATINGS

All figures are based on cold drawn bars in as-drawn condition, except where noted.

Nodular Iron			
GRADE	**RELATIVE SPEED BASED ON C-1212 as 100%**	**GRADE**	**RELATIVE SPEED BASED ON C-1212 as 100%**
60-40-18 Annealed	61%	80-55-06	39%
65-45-12 Annealed	61%		
Aluminum and Magnesium Alloys			
Aluminum, Cold Drawn	360%	Magnesium, Cold Drawn	480%
Aluminum, Cast	450%	Magnesium, Cast	480%
Aluminum, Die Cast	76%		

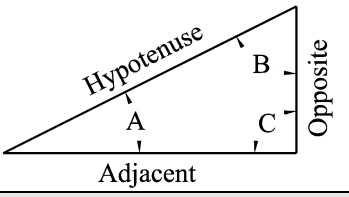
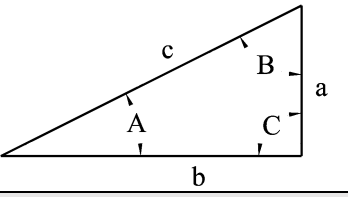
SURFACE ROUGHNESS

Produced by common production methods
Roughness Average, Ra – Micrometers µm (Micro inches µin.)

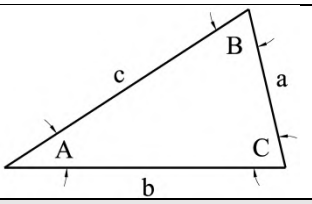
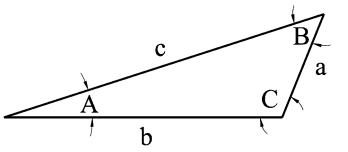


TRIGONOMETRY FUNCTIONS

RIGHT TRIANGLE

	
$\sin A = \frac{Opposite}{Hypotenuse}$	$\sin A = \frac{a}{c}$
$\cos A = \frac{Ajacent}{Hypotenuse}$	$\cos A = \frac{b}{c}$
$\tan A = \frac{Opposite}{Ajacent}$	$\tan A = \frac{a}{b}$
$\cot A = \frac{Ajacent}{Opposite}$	$\cot A = \frac{b}{a}$
$\sec A = \frac{Hypotenuse}{Ajacent}$	$\sec A = \frac{c}{b}$
$\csc A = \frac{Hypotenuse}{Opposite}$	$\csc A = \frac{c}{a}$
Pythagorean Theorem $a^2+b^2= c^2$	

OBLIQUE TRIANGLE

	
Low of sin	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
Low of cos	$a^2+b^2+c^2-(2bc\cos A)$

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