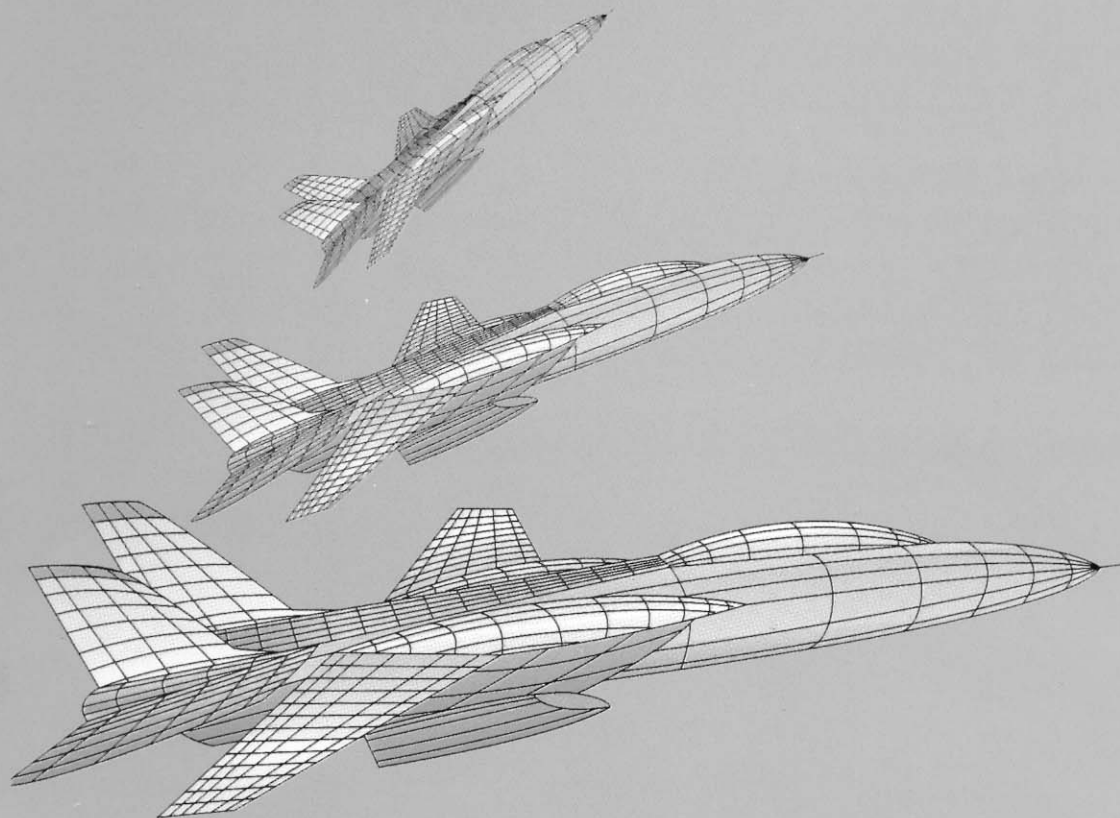


# ASP

AEROSPACE SPECIALTY PRODUCTS



**ASP** IS A KEY METALS SUPPLIER TO THE AIRCRAFT INDUSTRY.

OUR CUSTOMERS ARE COMPONENT AND ENGINE MANUFACTURERS AND SUBCONTRACTORS AS WELL AS MACHINE SHOPS AND RESEARCH AND DEVELOPMENT CENTERS REQUIRING THE HIGHEST QUALITY STANDARDS.

WE HAVE A RECORD OF OUTSTANDING SERVICE IN SUPPLYING AEROSPACE METALS INCLUDING ALUMINUM ALLOYS, ALLOY STEELS AND STAINLESS STEEL, NICKEL ALLOYS, TITANIUM AND ALUMINUM NICKEL BRONZE AMONG OTHERS.

ALL MATERIALS ARE FULLY MILL SOURCE TRACEABLE AND ARE CERTIFIED TO CURRENT AMS-QQ-A OR MIL-STANDARDS AND IN MANY CASES TO SPECIFIC AIRCRAFT MANUFACTURER SPECIFICATIONS.

### **SERVICE AND QUALITY**

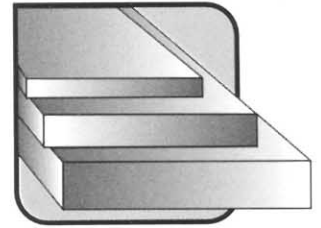
WE ARE DEDICATED TO MEETING OUR CUSTOMER EXPECTATIONS. OUR CUSTOMERS RELY ON US FOR THE PROCUREMENT OF THEIR METALS ON A 'JUST-IN-TIME' BASIS. WE HELP TO INCREASE YOUR PRODUCTIVITY AND LOWER YOUR COSTS BY MEETING YOUR TIGHT PRODUCTION SCHEDULE REQUIREMENTS.

### **ASP SUPPLIES QUALITY**

WE SUPPLY QUALITY METALS COMING FROM PRIME SOURCES ONLY, SUCH AS ALCOA, KAISER AND CORUS FOR ALUMINUM PRODUCTS OR ALLEGHENY, ALTECH AND REPUBLIC FOR STAINLESS AND HIGH TEMPERATURE ALLOYS TO NAME BUT A FEW.

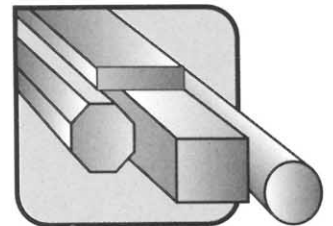


# TITANIUM



## SHEET & PLATE

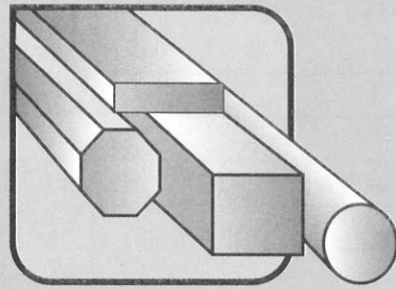
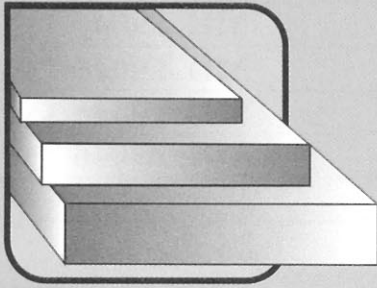
<u>GRADE</u>	<u>SPECIFICATION</u>	
TI – 35A		MILT9046
TI – 50A	AMS 4902	MILT9046 TY1 COMP A
TI – 65A	AMS 4900	MILT9046 TY1 COMP C
TI – 75A	AMS 4901	MILT9046 TY1 COMP B
5AL-2.5SN	AMS 4910	MILT9046
6AL – 4V	AMS 4911	MILT9046 TY3 COMP C
6AL-2SN-4ZR-2MO	AMS 4919	MILT9046 TY3 COMP G
6AL-6V-2SN	AMS 4918	MILT9046 TY3 COMP E
8AL-1MO-1V (SA)	AMS 4915	MILT9046 TY2 COMP F
8AL-1MO-1V (DA)	AMS 4916	MILT9046 TY2 COMP F



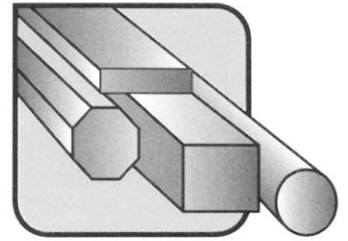
## ROD & BAR

<u>GRADE</u>	<u>SPECIFICATION</u>	
CP-COMMERCIAL PURE	ASTMB438 GRADE 2	
5AL-2.5SN	AMS 4926	MILT9047 COMP 3
6AL – 4V	AMS 4928	MILT9047
6AL-2SN-4ZR-2MO	AMS 4975	MILT9047
6AL-6V-2SN	AMS 4978	MILT9047 COMP 8
8AL-1MO-1V	AMS 4972	MILT9047 COMP 5

# TITANIUM



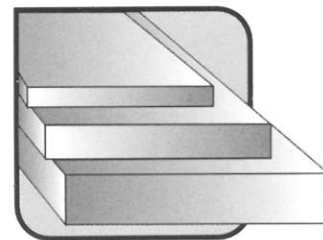
# HIGH TEMPERATURE



## ROD & BAR

<u>GRADE</u>	<u>SPECIFICATION</u>	
A-286	AMS 5731, 5732, 5737	
HASTELLOY C *	AMS 5750	
HASTELLOY X *	AMS 5754	
INCONEL 600 *	AMS 5665	
INCONEL 625 *	AMS 5666	ASTMB 446
INCONEL 718 *	AMS 5662, 5664, 5663	
INCONEL X-750 *	AMS 5667	
INCONEL 800 *	-	ASTMB 408
NICKEL 200 *	-	ASTMB 160
MONEL 400 *	-	ASTMB 164-81T
MONEL K500 *	AMS 4676	DDN286
L-605 *	AMS 5759	-
RENE 41 *	AMS 5712	-
WASPALLOY *	AMS 5708	-

\* REGISTERED TRADE NAME



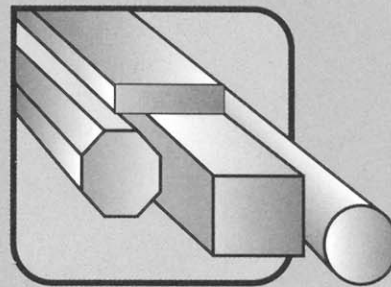
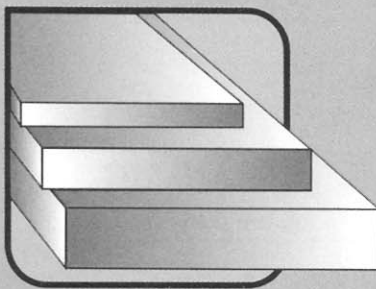
# HIGH TEMPERATURE

## SHEET & PLATE

<u>GRADE</u>	<u>SPECIFICATION</u>	
A-286	AMS 5525	-
HASTELLOY C *	AMS 5530	-
HASTELLOY W *	-	-
HASTELLOY X *	AMS 5536	-
INCONEL 600 *	AMS 5540	ASTMB 168
INCONEL 625 *	AMS 5599	ASTMB 443-72
INCONEL 718 *	AMS 5596, 5597	-
INCONEL X-750 *	AMS 5542, 5598	-
INCOLOY 800 *	AMS 5871	-
NICKEL 200 *	-	ASTMB 162
MONEL 400 *	AMS 4544	ASTMB 127
L-605 *	AMS 5537	-
N-155	AMS 5532	-
RENE 41 *	AMS 5545	-
WASPALOY *	AMS 5544	-

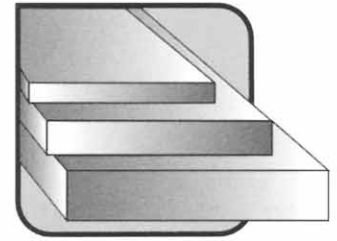
\* REGISTERED TRADE NAME

# HIGH TEMPERATURE



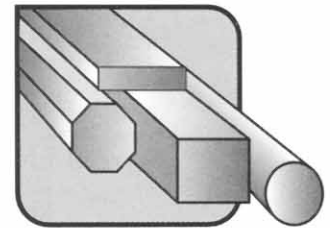
# ALLOY STEEL

## SHEET & PLATE



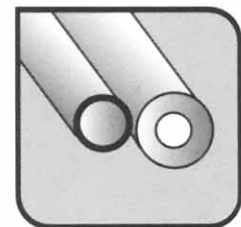
<u>ALLOY</u>	<u>CONDITION</u>	<u>SPECIFICATION</u>	
4130	A, N	MILS 18729	AMS 6350
4340	A, N&T	-	AMS 6359

SHEET THICKNESSES .020" TO .187"  
 PLATE THICKNESSES .187" TO 6"



## ROD & BAR

<u>ALLOY</u>		<u>SPECIFICATION</u>	
4130		MILS 6758	AMS 6370
4140		MILS 5626	AMS 6382
4330 / 4330 MODIFIED		MILS 8699	AMS 6427
4340 / 4340 MODIFIED		MILS 5000	AMS 6415, 6417
6150		MILS 8503	AMS 6488
8620		-	-
8740		MILS 6049	AMS 6322
9310 / 9310 VACUUM MELTED		MILS 7393	AMS 6250, 6265
52100		MILS 7420	AMS 6440, 6444
D6AC	VACUUM MELTED	MILS 8949	AMS 6431



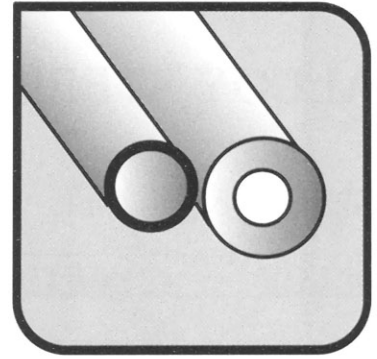
## TUBE & PIPE

<u>ALLOY</u>	<u>CONDITION</u>	<u>SPECIFICATION</u>	
4130	A, N, F-4	MILT 6736	AMS 6360
4135	A, N	MILT 6735	AMS 6365
4140	A, N, &T	-	AMS 6381
4340	A, N, &T	-	AMS 6415



# STAINLESS STEEL

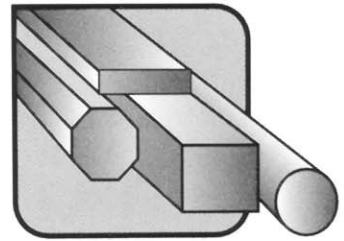
## TUBE & PIPE



<u>GRADE</u>	<u>CONDITION</u>	<u>SPECIFICATION</u>
304	A, 1/8 HD	AMS 5565, 5566, 5560, 5567 MILT 8504, 6845, 8506
321	A, 1/8 HD	AMS 5559, 5570, 5557, 5576 MILT 8606, 8808, 6737, 8973
347	A, 1/8 HD	AMS 5558, 5571, 5556, 5575 MILT 8606, 8808, 6737, 8973
21-6-9	A, 1/8 HD 1/4 HD	AMS 5561, 5562 -

# STAINLESS STEEL

## ROD & BAR



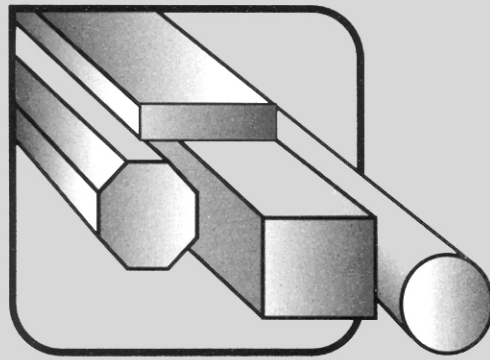
<u>GRADE</u>	<u>CONDITION</u>	<u>SPECIFICATION</u>		
302	A	QQS 763	MILS 7720	AMS 5636
303/303 SE	A, B	QQS 763	MILS 7720	AMS 5640, 5641
304/304 L	A	QQS 763	-	AMS 5639, 5647
316/316 L	A	QQS 763	MILS 7720	AMS 5648, 5653
321	A	QQS 763	-	AMS 5645
347	A	QQS 763	-	AMS 5646
410	A	QQS 763	-	AMS 5613
416	A	QQS 763	-	AMS 5610
440	A	QQS 763	-	AMS 5630, 5631
13-8 MO	A	-	-	AMS 5629
15-5 PH	A	-	-	AMS 5659
17-4 PH	A	-	-	AMS 5643

# STAINLESS STEEL

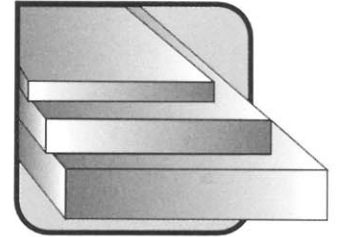
## ROD & BAR

# STAINLESS STEEL

## Rod & Bar



# STAINLESS STEEL SHEET & PLATE



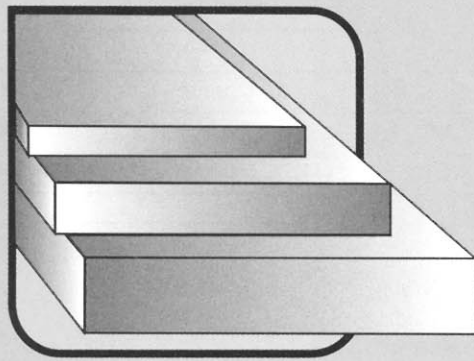
<u>GRADE</u>	<u>CONDITION</u>	<u>FINISH</u>	<u>SPECIFICATION</u>			
301	A HD, HD HD, FULL	2B	QQS 766	MILS 5059	AMS 5515, 5517 AMS 5518, 5519	
302	A	2B & No.4	QQS 766	MILS 5059	AMS 5516	
304/304L	A	2B	QQS 766	MILS 5059	AMS 5513, 5511	
309	A	2D	QQS 766	-	AMS 5523	
310	A	2D	QQS 766	-	AMS 5521	
316/316L	A	2B	QQS 766	MILS 5059	AMS 5524	
321	A	2D	QQS 766	MILS 6721	AMS 5510	
330	A	2D	-	ASTMB 536	AMS 5592	
347	A	2D	QQS 766	MILS 6721	AMS 5512	
410	A	2D	QQS 766	-	AMS 5504	
418	A	2D	-	-	AMS 5508	
15-5 PH	A	2D	-	-	AMS 5862	
15-7 PH	A	2D	-	-	AMS 5520	
17-4 PH	A	2B	QQS 766	-	AMS 5604	
17-7 PH	A	2D	QQS 766	MILS 25043	AMS 5528	
AM 350	A	2D	-	-	AMS 5546, 5548	
AM 355	A	2D	-	-	AMS 5547, 5594	

## CURRENT SHEET SIZES

<u>GAUCHE</u>	<u>SHEET SIZE</u>	<u>WEIGHT PER SHEET</u>	<u>ANNEALED</u>	<u>1/4 HARD</u>	<u>1/2 HARD</u>	<u>3/4 HARD FULL HARD</u>
		IN KG				
.012"	36" X 120"	6.8	*			
.015"	36" X 120"	8.4				
.016"	36" X 120"	9.2	*	*	*	
.018"	36" X 120"	10.4		*	*	
.020"	36" X 120"	11.4	*	*	*	
.025"	36" X 120"	14.1	*	*	*	
.032"	36" X 120"	18.2	*	*	*	*
.040"	36" X 120"	22.8	*	*	*	*
.050"	36" X 120"	28.5	*	*	*	*
.054"	36" X 120"	32.3		*	*	
.063"	36" X 120"	36.0	*	*	*	
.080"	36" X 120"	45.7	*	*	*	
.090"	36" X 96"	42.9		*	*	
.090"	36" X 120"	51.4	*	*	*	
.125"	36" X 120"	71.5	*	*	*	

# STAINLESS STEEL

## Sheet & Plate

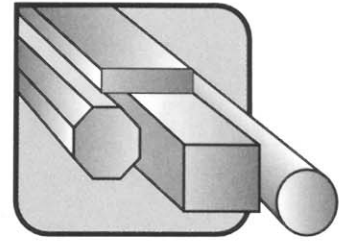


# ALUMINUM

<u>ALLOY</u>	<u>TEMPER</u>	<u>SPECIFICATION</u>		
1100	0, H14	WWT700/1	-	AMS 4062
2024	0, T3, T8, HYD	WWT700/3	QQA200/3	AMS 4087, 4088
3003	0, H14	WWT700/2	QQA200/1	AMS 4065, 4067
5052	0, H32, HYD	WWT700/4	-	AMS 4070, 4071
5086	0, H32, H34, H111	WWT700/5	QQA200/5	-
6061	0, T4, T6, HYD	WWT700/6	QQA200/8	AMS 4080, 4083
7075	0, T6, T73	WWT700/7	QQA200/11	AMS 4154, 4166

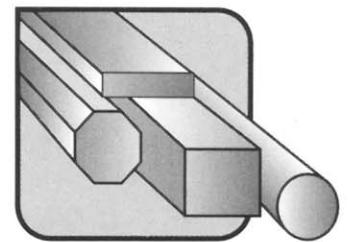
## TUBE & PIPE

# ALUMINUM



## COLD FINISH ROD & BAR ASTMB-211

<u>ALLOY</u>	<u>TEMPER</u>	<u>SPECIFICATION</u>	
2011	T3	AMS-QQ-A 225/3	-
2014	0, T6	AMS-QQ-A 225/4	AMS 4121
2024	0, T3, T4, T8	AMS-QQ-A 225/6	AMS 4119, 4120
6061	0, T4, T6	AMS-QQ-A 225/8	AMS 4115, 4116, 4117
7075	0, T6, T73, T76	AMS-QQ-A 225/9	AMS 4187, 4122, 4124



## EXTRUDED ROD & BAR ASTMB-221

<u>ALLOY</u>	<u>TEMPER</u>	<u>SPECIFICATION</u>	
2014	0, T6	AMS-QQ-A 200/2	AMS 4153
2024	0, T3, T4	AMS-QQ-A 200/3	AMS 4165
6061	0, T4, T6	AMS-QQ-A 200/8	AMS 4160, 4161, 4150
7050	T73, T74, T76	-	AMS 4340, 4341, 4342
7075	0, T6, T73, T76	AMS-QQ-A 200/11	AMS 4154, 4166

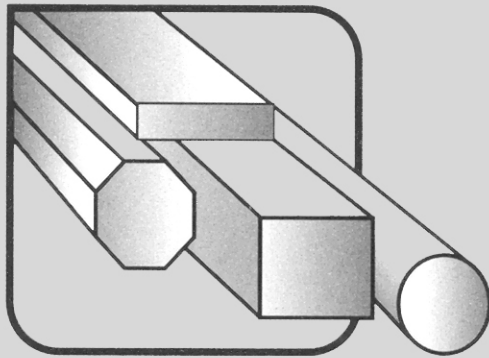


## CURRENT ROD & BAR SIZES

<u>DIAMETER IN INCHES</u>	<u>POUNDS PER FOOT</u>	<u>DIAMETER IN INCHES</u>	<u>POUNDS PER FOOT</u>
1/8	.0147	2	3.7680
3/16	.0331	2-1/8	4.2537
1/4	.0589	2-1/4	4.7689
5/16	.0920	2-5/16	5.0376
3/8	.1325	2-3/8	5.3135
7/16	.1803	2-1/2	5.8875
1/2	.2355	2-5/8	6.4910
9/16	.2981	2-3/4	7.1239
5/8	.3680	2-7/8	7.7862
11/16	.4452	3	8.4780
3/4	.5299	3-1/8	9.1992
13/16	.6219	3-1/4	9.9499
7/8	.7212	3-3/8	10.7300
15/16	.8279	3-1/2	11.5395
1	.9420	3-5/8	12.3785
1-1/16	1.0634	3-3/4	13.2469
1-1/8	1.1922	3-7/8	14.1447
1-3/16	1.3284	4	15.0720
1-1/4	1.4719	4-1/8	16.0287
1-5/16	1.6227	4-1/4	17.0149
1-3/8	1.7813	4-1/2	19.0755
1-7/16	1.9466	4-3/4	21.2539
1-1/2	2.1195	5	23.5500
1-9/16	2.2998	5-1/4	25.9639
1-5/8	2.4875	5-1/2	28.4955
1-3/4	2.8849	5-7/8	32.5137
1-7/8	3.3117	6	33.9120
		6-1/4	36.7969
		6-1/2	39.7995
		7	46.1580
		8	60.2880

**ALUMINUM**

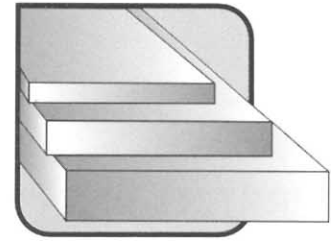
**ROD & BAR**



CURRENT PLATE SIZES

<u>THICKNESS</u> <u>IN</u> <u>INCHES</u>	<u>WIDTH</u> <u>IN</u> <u>INCHES</u>	<u>LENGTH</u> <u>IN</u> <u>INCHES</u>	<u>KG PER</u> <u>SQUARE</u> <u>METER</u>
.250	48	144	17.57
.313	48	144	22.00
.375	48	144	26.36
.500	48	144	35.15
.625	48	144	43.94
.750	48	144	52.73
.875	48	144	61.52
1	48	144	70.31
1.125	48	144	79.10
1.250	48	144	87.89
1.500	48	144	105.47
1.750	48	144	123.05
2	48	144	140.63
2.25	48	144	158.21
2.50	48	144	175.79
3	48	144	210.94
3.50	48	144	246.10
4	48	144	281.26

# ALUMINUM SHEET & PLATE



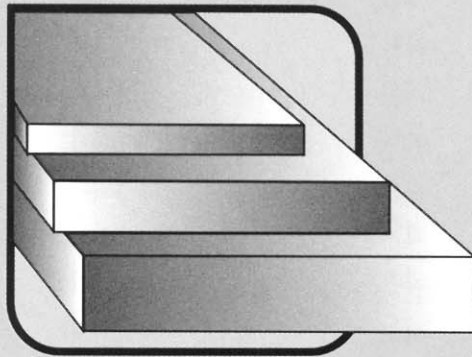
<u>ALLOY</u>	<u>FINISH</u>	<u>TEMPER</u>	<u>SPECIFICATION</u>	
1100	BARE	0, H14	AMS-QQ-A 250/1	AMS 4001, 4003
2014	BARE	0, T3, T6	-	AMS 4028, 4029
2014	ALCLAD	0, T3, T6	AMS-QQ-A 250/3	-
2024	BARE	0, T3, T8	AMS-QQ-A 250/4	AMS 4035, 4037, 4028
2024	ALCLAD	0, T3, T8	AMS-QQ-A 250/5	AMS 4040, 4041, 4195
2124	BARE	T3, T8	AMS-QQ-A 250/29	AMS 4101
2219	BARE	0, T3, T8	AMS-QQ-A 250/30	AMS 4031
2219	ALCLAD	0, T3, T8	AMS-QQ-A 250/30	AMS 4096, 4095, 4094
3003	BARE	0, H14	AMS-QQ-A 250/2	AMS 4006, 4008
5052	BARE	0, H32, H34	AMS-QQ-A 250/8	AMS 4015, 4016, 4017
5083	BARE	0, H323, H321, H116	AMS-QQ-A 250/6	AMS 4056, 4057
5086	BARE	0, H32, H34	AMS-QQ-A 250/7	-
5456	BARE	0, H116	AMS-QQ-A 250/9	-
6061	BARE	0, T4, T6	AMS-QQ-A 250/11	AMS 4025, 4026, 4027
7050	BARE	0, T74, T76	-	AMS 4201, 4050
7075	BARE	0, T6, T73, T76	AMS-QQ-A 250/12, 24	AMS 4044, 4045
7075	ALCLAD	0, T6, T73, T76	AMS-QQ-A 250/13, 25	AMS 4048, 4049
7178	BARE	0, T6	AMS-QQ-A 250/14	-
7178	ALCLAD	0, T6	AMS-QQ-A 250/15	AMS 4051
7475	BARE	T6, T73, T76	-	AMS 4090, 4202, 4089
7475	ALCLAD	T6, T73, T76	-	AMS 4100, 4207

CURRENT SHEET SIZES

<u>THICKNESS</u> <u>IN</u> <u>INCHES</u>	<u>WIDTH</u> <u>IN</u> <u>INCHES</u>	<u>LENGTH</u> <u>IN</u> <u>INCHES</u>	<u>KG PER</u> <u>SQUARE</u> <u>METER</u>
.012	48	144	0.84
.016	48	144	1.12
.020	48	144	1.40
.025	48	144	1.75
.032	48	144	2.25
.040	48	144	2.81
.050	48	144	3.51
.063	48	144	4.42
.071	48	144	4.99
.080	48	144	5.62
.090	48	144	6.32
.100	48	144	7.03
.125	48	144	8.78
.160	48	144	11.25
.190	48	144	13.36

**ALUMINUM**

**SHEET & PLATE**



# TEMPER DESIGNATION

## SUBDIVISION OF T TEMPER : THERMALLY TREATED

- T3 SOLUTION HEAT-TREATED, COLD WORKED, AND NATURALLY AGED TO A SUBSTANTIALLY STABLE CONDITION.**  
APPLIES TO PRODUCTS THAT ARE COLD WORKED TO IMPROVE STRENGTH AFTER SOLUTION HEAT-TREATMENT, OR IN WHICH THE EFFECT OF COLD WORK IN FLATTENING OR STRAIGHTENING IS RECOGNIZED IN MECHANICAL PROPERTY LIMITS.
- T4 SOLUTION HEAT-TREATED AND NATURALLY AGED TO A SUBSTANTIALLY STABLE CONDITION.**  
APPLIES TO PRODUCTS THAT ARE NOT COLD WORKED AFTER SOLUTION HEAT-TREATMENT, OR IN WHICH THE EFFECT OF COLD WORK IN FLATTENING OR STRAIGHTENING MAY NOT BE RECOGNIZED IN MECHANICAL PROPERTY LIMITS.
- T6 SOLUTION HEAT-TREATED AND THEN ARTIFICIALLY AGED.**  
APPLIES TO PRODUCTS THAT ARE NOT COLD WORKED AFTER SOLUTION HEAT-TREATMENT, OR IN WHICH THE EFFECT OF COLD WORK IN FLATTENING OR STRAIGHTENING MAY NOT BE RECOGNIZED IN MECHANICAL PROPERTY LIMITS.
- T7 SOLUTION HEAT-TREATED AND OVERAGED/STABILIZED.**  
APPLIES TO WROUGHT PRODUCTS THAT ARE ARTIFICIALLY AGED AFTER SOLUTION HEAT-TREATMENT TO CARRY THEM BEYOND A POINT OF MAXIMUM STRENGTH TO PROVIDE CONTROL OF SOME SIGNIFICANT CHARACTERISTIC.  
APPLIES TO CAST PRODUCTS THAT ARE ARTIFICIALLY AGED AFTER SOLUTION HEAT-TREATMENT TO PROVIDE DIMENSIONAL AND STRENGTH STABILITY.
- T8 SOLUTION HEAT-TREATED, COLD WORKED, AND THEN ARTIFICIALLY AGED.**  
APPLIES TO PRODUCTS THAT ARE COLD WORKED TO IMPROVE STRENGTH, OR IN WHICH THE EFFECT OF COLD WORK IN FLATTENING OR STRAIGHTENING IS RECOGNIZED IN MECHANICAL PROPERTY LIMITS.

## BASIC TEMPER DESIGNATIONS

- F AS FABRICATED.**  
APPLIES TO THE PRODUCTS OF SHAPING PROCESSES IN WHICH NO SPECIAL CONTROL OVER THERMAL CONDITIONS OR STRAIN HARDENING IS EMPLOYED. FOR WROUGHT PRODUCTS, THERE ARE NO MECHANICAL PROPERTY LIMITS.
- O ANNEALED.**  
APPLIES TO WROUGHT PRODUCTS THAT ARE ANNEALED TO OBTAIN THE LOWEST STRENGTH TEMPER, AND TO CAST PRODUCTS THAT ARE ANNEALED TO IMPROVE DUCTILITY AND DIMENSIONAL STABILITY. THE O MAY BE FOLLOWED BY A DIGIT OTHER THAN ZERO.
- H STRAIN-HARDENED (WROUGHT PRODUCTS ONLY).**  
APPLIES TO PRODUCTS THAT HAVE THEIR STRENGTH INCREASED BY STRAIN-HARDENING, WITH OR WITHOUT SUPPLEMENTARY THERMAL TREATMENTS TO PRODUCE SOME REDUCTION IN STRENGTH. THE H IS ALWAYS FOLLOWED BY TWO OR MORE DIGITS.
- W SOLUTION HEAT-TREATED.**  
AN UNSTABLE TEMPER APPLICABLE ONLY TO ALLOYS THAT SPONTANEOUSLY AGE AT ROOM TEMPERATURE AFTER SOLUTION HEAT-TREATMENT. THIS DESIGNATION IS SPECIFIC ONLY WHEN THE PERIOD OF NATURAL AGING IS INDICATED. FOR EXAMPLE: W \_ hr.
- T THERMALLY TREATED TO PRODUCE STABLE TEMPER OTHER THAN F, O, OR H.**  
APPLIES TO PRODUCTS THAT ARE THERMALLY TREATED, WITH OR WITHOUT SUPPLEMENTARY STRAIN-HARDENING, TO PRODUCE STABLE TEMPER.  
THE T IS ALWAYS FOLLOWED BY ONE OR MORE DIGITS.

# CHEMICAL PROPERTIES

## NOMINAL CHEMICAL COMPOSITION – WROUGHT ALLOYS

THE FOLLOWING VALUES ARE SHOWN AS A BASIS FOR GENERAL COMPARISON OF ALLOYS AND ARE NOT GUARANTEED.

### PERCENT OF ALLOYING ELEMENTS

ALLOY	SILICON	COPPER	MANGANESE	MAGNESIUM	CHROMIUM	NICKEL	ZINC	TITANIUM
1050								
1060								
1100		0.12						
1145								
1175								
1200								
1230								
1235								
1345								
1350								
		0.12						
2011		5.5						
2014	0.8	4.4	0.8	0.50				
2017	0.50	4.0	0.7	0.6				
2018		4.0		0.7		2.0		
2024		4.4	0.6	1.5				
2124		4.4	0.6	1.5				
2219		6.3	0.30					0.06
2618	0.18	2.3		1.6		1.0		0.07
3003		0.12	1.2					
5052				2.5	0.25			
5056			0.12	5.0	0.12			
5083			0.7	4.4	0.15			
5456			0.8	5.1	0.12			
6003	0.7			1.2				
6061	0.6	0.28		1.0	0.20			
6063	0.40			0.7				
7005			0.45	1.4	0.13		4.5	0.04
7050		2.3		2.2			6.2	
7075		1.6		2.5	0.23		5.6	
7175		1.6		2.5	0.23		5.6	
7178		2.0		2.8	0.23		6.8	
7475		1.6		2.2	0.22		5.7	

THE ABOVE VALUES ARE SHOWN AS A BASIS FOR GENERAL COMPARISON OF ALLOYS AND ARE NOT GUARANTEED



## TYPICAL MECHANICAL PROPERTIES

THE FOLLOWING TYPICAL PROPERTIES ARE NOT GUARANTEED, SINCE IN MOST CASES THEY ARE AVERAGES FOR VARIOUS SIZES, PRODUCT FORMS AND METHODS OF MANUFACTURE AND MAY NOT BE EXACTLY REPRESENTATIVE OF ANY PARTICULAR PRODUCT OR SIZE. THESE DATA ARE INTENDED ONLY AS A BASIS FOR COMPARING ALLOYS AND TEMPERS AND SHOULD NOT BE SPECIFIED AS ENGINEERING REQUIREMENTS OR USED FOR DESIGN PURPOSES.

ALLOY AND TEMPER	TENSION				HARDNESS	SHEAR	FATIGUE	MODULUS
	STRENGTH	KSI	ELONGATION	PERCENT	BRINNELL NUMBER	ULTIMATE SHEARING STRENGTH	ENDURANCE LIMIT	MODULUS OF ELASTICITY
	ULTIMATE	YIELD	IN 2	IN.				
			1/16 IN. THICK SPECIMEN	IN. DIAMETER SPECIMEN	500 KG LOAD 10 MM BALL	KSI	KSI	KSI X 10
1100 - 0	13	5	35	45	23	9	5	10.0
2014 - 0	27	14		18	45	18	13	10.6
2014 - T4, T451	62	42		20	105	38	20	10.6
2014 - T6, T651	70	60		13	135	42	18	10.6
2024 - 0	27	11	20	22	47	18	13	10.6
2024 - T3	70	50	18		120	41	20	10.6
2024 - T4, T351	68	47	20	19	120	41	20	10.6
2024 - T361	72	57	13		130	42	18	10.6
2024 - 0	26	11	20			18		10.6
2024 - T3	65	45	18			40		10.6
2024 - T4, T351	64	42	19			40		10.6
2219 - 0	25	11	18					10.6
2219 - T31, T351	52	36	17					10.6
2219 - T61, T651	66	51	10				15	10.6
2618 - T61	64	54		10	115	38	18	10.8
3003 - 0	16	6	30	40	28	11	7	10.0
3003 - H12	19	18	10	20	35	12	8	10.0
3003 - H14	22	21	8	16	40	14	9	10.0
5052 - 0	28	13	25	30	47	18	16	10.2
5052 - H32	33	28	12	18	60	20	17	10.2
5052 - H34	38	31	10	14	68	21	18	10.2
6061 - 0	18	8	25	30	30	12	9	10.0
6061 - T4, T451	35	21	22	25	65	24	14	10.0
6061 - T6, T651	45	40	12	17	95	30	14	10.0
6063 - 0	13	7			25	10	8	10.0
6063 - T6	35	31	12		73	22	10	10.0
7050-T73510, T73511	72	63		12				10.4
7050-T7451	76	68		11		44		10.4
7075 - 0	33	15	17	16	60	22		10.4
7075 - T6, T651	83	73	11	11	150	48	23	10.4
7178 - 0	33	15	15	16				10.4
7178 - T6, T651	88	78	10	11				10.4
7475 - T651	85	74		13				10.4
7475-T7351	72	61		13				10.4
7475-T7651	77	67		12				10.4

THE ABOVE VALUES ARE SHOWN AS A BASIS FOR GENERAL COMPARISON OF ALLOYS AND ARE NOT GUARANTEED

# TYPICAL PROPERTIES

## METALLURGICAL ASPECTS

IN HIGH-PURITY FORM ALUMINUM IS SOFT AND DUCTILE.

MOST COMMERCIAL USES, HOWEVER, REQUIRE GREATER STRENGTH THAN PURE ALUMINUM AFFORDS.

THIS IS ACHIEVED IN ALUMINUM FIRST BY THE ADDITION OF OTHER ELEMENTS TO PRODUCE VARIOUS ALLOYS, WHICH SINGLY OR IN COMBINATION, IMPART STRENGTH TO THE METAL. FURTHER STRENGTHENING IS POSSIBLE BY MEANS THAT CLASSIFY THE ALLOYS ROUGHLY INTO TWO CATEGORIES, NAMELY NON-HEAT-TREATABLE AND HEAT-TREATABLE.

## NON-HEAT-TREATABLE ALLOYS

THE INITIAL STRENGTH OF ALLOYS IN THIS GROUP DEPENDS UPON THE HARDENING EFFECT OF ELEMENTS SUCH AS MANGANESE, SILICON, IRON AND MAGNESIUM, SINGLY OR IN VARIOUS COMBINATIONS.

THE NON-HEAT-TREATABLE ALLOYS ARE USUALLY DESIGNATED, THEREFORE, IN THE 1xxx, 3xxx, 4xxx, OR 5xxx SERIES.

SINCE THESE ALLOYS ARE WORK-HARDENABLE, FURTHER STRENGTHENING IS MADE POSSIBLE BY VARIOUS DEGREES OF COLD WORKING, DENOTED BY THE "H" SERIES OF TEMPERS.

ALLOYS CONTAINING APPRECIABLE AMOUNTS OF MAGNESIUM WHEN SUPPLIED IN STRAIN-HARDENED TEMPERS ARE USUALLY GIVEN A FINAL ELEVATED-TEMPERATURE TREATMENT CALLED STABILIZING TO ENSURE STABILITY OF PROPERTIES.

## HEAT-TREATABLE ALLOYS

THE INITIAL STRENGTH OF ALLOYS IN THIS GROUP IS ENHANCED BY THE ADDITION OF ALLOYING ELEMENTS SUCH AS COPPER, MAGNESIUM, ZINC, AND SILICON.

SINCE THESE ELEMENTS SINGLY OR IN VARIOUS COMBINATIONS SHOW INCREASING SOLID SOLUBILITY IN ALUMINUM WITH INCREASING TEMPERATURE, IT IS POSSIBLE TO SUBJECT THEM TO THERMAL TREATMENTS THAT WILL IMPART PRONOUNCED STRENGTHENING.

THE FIRST STEP, CALLED HEAT TREATMENT OR SOLUTION HEAT TREATMENT, IS AN ELEVATED-TEMPERATURE PROCESS DESIGNED TO PUT THE SOLUBLE ELEMENT OR ELEMENTS IN SOLID SOLUTION.

THIS IS FOLLOWED BY RAPID QUENCHING, USUALLY IN WATER, WHICH MOMENTARILY "FREEZES" THE STRUCTURE AND FOR A SHORT TIME RENDERS THE ALLOY VERY WORKABLE. IT IS AT THIS STAGE THAT SOME FABRICATORS RETAIN THIS MORE WORKABLE STRUCTURE BY STORING THE ALLOYS AT BELOW FREEZING TEMPERATURES UNTIL THEY ARE READY TO FORM THEM.

AT ROOM OR ELEVATED TEMPERATURES THE ALLOYS ARE NOT STABLE AFTER QUENCHING, HOWEVER, AND PRECIPITATION OF THE CONSTITUENTS FROM THE SUPER-SATURATED SOLUTION BEGINS.

AFTER A PERIOD OF SEVERAL DAYS AT ROOM TEMPERATURE, TERMED AGING OR ROOM-TEMPERATURE PRECIPITATION, THE ALLOY IS CONSIDERABLY STRONGER.

MANY ALLOYS APPROACH A STABLE CONDITION AT ROOM TEMPERATURE, BUT SOME ALLOYS, PARTICULARLY THOSE CONTAINING MAGNESIUM AND SILICON OR MAGNESIUM AND ZINC, CONTINUE TO AGE-HARDEN FOR LONG PERIODS OF TIME AT ROOM TEMPERATURE. BY HEATING FOR A CONTROLLED TIME AT SLIGHTLY ELEVATED TEMPERATURES, EVEN FURTHER STRENGTHENING IS POSSIBLE AND PROPERTIES ARE STABILIZED.

THIS PROCESS IS CALLED ARTIFICIAL AGING OR PRECIPITATION HARDENING.

BY THE PROPER COMBINATION OF SOLUTION HEAT TREATMENT, QUENCHING, COLD WORKING AND ARTIFICIAL AGING, THE HIGHEST STRENGTHS ARE OBTAINED.

