

COMPOSITE ERROR CHECK

5.00 PIC Gears are inspected on variable center distance equipment where they are meshed with a master gear under light checking pressure (tabulated below). As the gears rotate, center distance changes are greatly amplified and recorded on PIC "TRUE BLUE" Gear Tapes as shown in Figure 5.1

5.01 Refer to Gear Tolerance Tables 5.2 and 5.3 for detailed gear tolerances. Individual "True Blue" tapes are available with PIC spur and bevel gears for a nominal additional charge based on the quantity involved.

GEAR TESTING RADIUS

5.02 Gear Size is controlled by specifying a maximum and a minimum gear testing radius. The inspection trace must lie between these limits. The maximum limit for PIC stock gears is set at the theoretical pitch radius. The minimum limit is determined by the class of gear being cut.

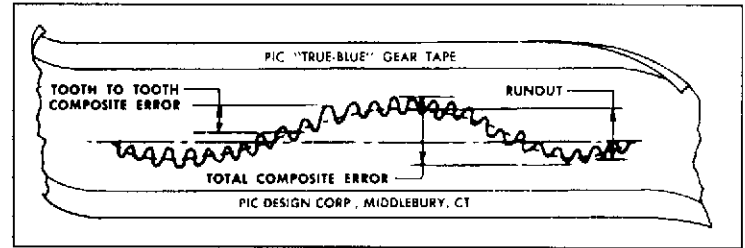


FIGURE 5.1 — "TRUE BLUE" GEAR TAPE

TABLE 5.1
AGMA FINE-PITCH GEAR TOLERANCES

AGMA Quality No.	No. of Teeth and Pitch Diameter	Diametral Pitch Range	Tooth-to-Tooth Composite Tolerance	Total Composite Tolerance
10*	Up to 20 Teeth Incl.	20 to 200	.0007	.0010
	Over 20 Teeth Up to 1.999"	20 to 200	.0005	.0010
	Over 20 Teeth 2" to 3.999"	20 to 200	.0005	.0012
	Over 20 Teeth 4" and over	20 to 200	.0005	.0014
11	Up to 20 Teeth Incl.	20 to 200	.0005	.0007
	Over 20 Teeth Up to 1.999"	20 to 200	.0004	.0007
	Over 20 Teeth 2" to 3.999"	20 to 200	.0004	.0009
	Over 20 Teeth 4" and over	20 to 200	.0004	.0010
12**	Up to 20 Teeth Incl.	20 to 200	.0004	.0005
	Over 20 Teeth Up to 1.999"	20 to 200	.0003	.0005
	Over 20 Teeth 2" to 3.999"	20 to 200	.0003	.0006
	Over 20 Teeth 4" and over	20 to 200	.0003	.0007
13	Up to 20 Teeth Incl.	20 to 200	.0003	.0004
	Over 20 Teeth Up to 1.999"	20 to 200	.0002	.0004
	Over 20 Teeth 2" to 3.999"	20 to 200	.0002	.0004
	Over 20 Teeth 4" and over	20 to 200	.0002	.0005
14***	Up to 20 Teeth Incl.	20 to 200	.00019	.00027
	Over 20 Teeth Up to 1.999"	20 to 200	.00014	.00027
	Over 20 Teeth 2" to 3.999"	20 to 200	.00014	.00032
	Over 20 Teeth 4" and over	20 to 200	.00014	.00037
15	Up to 20 Teeth Incl.	20 to 200	.00014	.00019
	Over 20 Teeth Up to 1.999"	20 to 200	.00010	.00019
	Over 20 Teeth 2" to 3.999"	20 to 200	.00010	.00023
	Over 20 Teeth 4" and over	20 to 200	.00010	.00027

TABLE 5.2
GEAR TOLERANCES

AGMA Class Gear	P.D. Tol.	O.D. Tol.	Bore Tol.	C.D. Fixed Centers	C.D. Adjustable Centers
Q-10	-.001	-.002	+.0005	+.0005	+.002
Q-12	-.0007	-.0015	+.0003	+.0003	+.0015
Q-14	-.0005	-.001	+.0002	+.0002	+.0012

TABLE 5.3
FINE-PITCH GEAR TOLERANCES TABLE
(All dimensions in millimeters)

Pitch Diameter	Metric Module Range	Tooth-to-Tooth Composite Tolerance μm	Total Composite Tolerance μm
Up to 12mm	Up to 0.6 Module	7	20
Over 12 to 50mm		9	25
Over 50 to 100mm		10	28
Over 100mm		11	32
Up to 12mm	Over 0.6 Module	8	22
Over 12 to 50mm		10	28
Over 50 to 100mm		11	32
Over 100mm		12	36
Up to 12mm	Up to 0.6 Module	5	14
Over 12 to 50mm		5.5	16
Over 50 to 100mm		6	18
Over 100mm		7	20
Up to 12mm	Over 0.6 Module	5.5	16
Over 12 to 50mm		6	18
Over 50 to 100mm		7	20
Over 100mm		8	22
Over 50 to 100mm	Up to 0.8 Module	3.5	10
Up to 12mm		4	11
Over 12 to 50mm		4.5	12
Over 100mm		5	14
Up to 12mm	Over 0.6 Module	3.5	11
Over 12 to 50mm		4.5	12
Over 50 to 100mm		5	14
Over 100mm		5	16

*Extracted from AGMA Gear Classification Manual for Spur, Helical and Herringbone Gears (AGMA 390.02), with the permission of the publisher, The American Gear Manufacturers Association, 1330 Massachusetts Avenue, N.W., Washington, D.C. 20005.

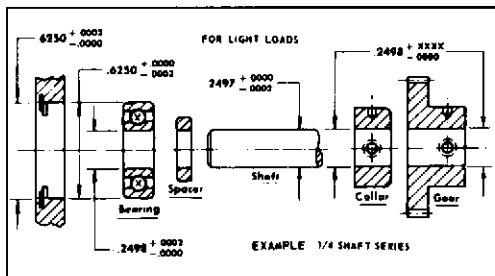
* AGMA 10 Similar to Old PIC Standard Prec. 1

** AGMA 12 Similar to Old PIC Standard Prec. 2

*** AGMA 14 Similar to Old PIC Standard Prec. 3

TECHNICAL SECTION

SECTION 5. Military Specifications — Shaft and Bearing Fits



STANDARD TOLERANCES

Inch

Unless otherwise specified, tolerances are as follows:

Two (2) place decimals	$\pm .016$
Three (3) place decimals	$\pm .005$
Fractional	$\pm 1/32$
Angles	$\pm 1^\circ$

Metric

(All dimensions in millimeters)

Unless otherwise specified, tolerances are as follows:

One (1) place decimals	± 0.8
Two (2) place decimals	± 0.13
Angles	$\pm 1^\circ$

TABLE 6.1
MILITARY CROSS REFERENCES

Materials			Finishes		Used On
PIC Catalog Designation	UNS Designation	Mil. or Fed. Specification	PIC Catalog Designation	Mil. or Fed. Specification	PIC Products
#303 Stainless St. (Bar)	S30300	ASTM-A-582	**	**	Gears ⁽²⁾ Shafts, Couplings
#303 Stainless St. (Sheet)	S30300	ASTM-A-666	**	**	Gears ⁽²⁾
#302 Stainless St. (Spring Temper)	S30200	ASTM-A-666	**	**	Springs, Washers
#416 Stainless Steel	S41600	ASTM-A-582	**	**	Racks, Gears Shafts
#440 Stainless Steel	S44004	QQ-S-763 Class 10 Type A	**	**	Ball Bearings
#420 Stainless Steel	S42000	QQ-S-763	**	**	Retainer Rings
2024-T4/T351 Alum (Bar)	A92024	QQ-A-225/6	Chromic Acid Anodized	MIL-A-8625	Gears ⁽²⁾ Spacer Posts
2024-T3 Alum (Sheet)	A92024	QQ-A-250/4	Chromic Acid Anodized	MIL-A-8625	Gears ⁽²⁾
2024-T4/T351 Alum (Bar)	A92024	QQ-A-225/6	Black Anodized	MIL-A-8625	Dials, Drum
2024-T3 Alum (Sheet)	A92024	QQ-A-250/4	Black Anodized	MIL-A-8625	Dials, Disc
#108 Cast Aluminum	—	QQ-A-601A Comp. 8 Cond. T55	Chromic Acid Anodized	MIL-A-8625	Hangers, Breadboards
Bronze (Tobin)	C46400	ASTM-B-21 Alloy 464	—	—	Worm Wheels
Oil-Less Bronze	—	MIL-B-5687 Type I Comp. A	Lubricated With SAE 30 Oil	—	Bearings Thrust Washers
Brass (Laminated)	—	MIL-S-22499B Comp. 2 Class 1	—	—	Shims
Beryllium Copper	—	MIL-C-6942	—	—	Retainer Rings
Nylon	—	ASTM-D-4066 Comp. A Type1	—	—	Gears
Phenolic	—	MIL-P-15035B Type FBE	Fungus-Proofed	JAN-T-152	Gears
Neoprene (Molded)	—	MIL-R-6855 Class II	—	—	Flex. Couplings Pulley Belts
Grease	—	MIL-G-23827A	—	—	Gears, Bearings -100°F to +250°F
Oil	—	MIL-L-6085A	—	—	Gears, Bearings -65°F to +250°F
A2 Stainless Steel (Type #304)	S30400	DIN 267 (QQ-S-763)	**	**	Fasteners
A4 Stainless Steel (Type #316)	S31600	DIN 267 (QQ-S-763)	**	**	Fasteners

NOTES:

1. Brief Description of the UNIFIED NUMBERING SYSTEM

The unified numbering system (UNS) provides a means of correlating many nationally used numbering systems currently administered by societies, trade associations, and individual users and producers of metals and alloys, thereby avoiding confusion caused by use of more than one identification number for the same material—and by the opposite situation of having the same number assigned to two or more entirely different materials.

2. Refer to page 12-4 for gear material specifications by product series.

**Clear Passivate Finish to Military or Federal Specification QQ-P-35 Available upon Request.