

# GENERAL INFORMATION INDEX

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# REFERENCE PUBLICATIONS

## **PUBLICATIONS FOR DRAFTING AND COMPONENT STANDARDS**

- Metric Dimensioning and Tolerances – ANSI Y14.5 1988
- Drafting Practices – ANSI Y14.5M-1982 (Reaffirmed 1988)
- Metric Limits and Fits – ANSI B4.2 1978
- Units and Metric/U.S. Customary Conversion – NAAMS, Pages GEN-4, 5, 6 and 7
- DIN 74 Form K SCR.: C' BORE
- Dowels – ISO-8735 1987
- Preferred Numbers – ISO 497 1973 R'10 Series
- Letter and Geometric Symbol References – ANSI Y10, Y32 Series
- Single Rod Cylinders – ISO 6431, ISO 3320 1992
- Cylinder Rod Envelope and Mounting Specifications – VDMA 24 562 1992
- Cylinder Rod Thread Specifications – DIN ISO 4395 1985
- Wire Die Springs – ISO 10243:1991 (E)

# CONTACTS FOR STANDARDS

Copies of referenced standards are available from the following sources:

## **ANSI**

American National Standards Institute  
11 West 42nd Street  
New York, NY 10036

Phone: (212) 642-4900

FAX: (212) 302-1286

## **ISO**

Global Engineering Documents  
7730 Carondelet Avenue  
Suite 407  
St. Louis, MO 63105

Phone: 1-800-854-7179

FAX: (314) 726-6418

## **DIN**

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D-50672 Koln, Germany  
Attn.: Mr Claus Schiefer

Phone: 011-49-221-571-3406

FAX: 001-49-221-571-3414

## **VDMA**

VDMA  
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D-60498 Frankfurt, Germany  
Attn.: Mr Brodmann

Phone: 011-49-69-660-3252

FAX: 001-49-69-660-3816

# METRIC EQUIVALENT CHART (1 OF 2)

## METRIC/U.S. CUSTOMARY UNIT EQUIVALENTS

Multiply: by: to get: | Multiply: by: to get:

### LINEAR

inches	X 25.40	= millimetres (mm)	X 0.03937	= inches
feet	X 0.3048	= metres (m)	X 3.281	= feet
yards	X 0.9144	= metres (m)	X 1.0936	= yards
miles	X 1.6093	= kilometres (km)	X 0.6214	= miles
inches	X 2.540	= centimetres (cm)	X 0.3937	= inches
microinches	X 0.0254	= micrometres (µm)	X 39.37	= microinches

### AREA

inches <sup>2</sup>	X 645.16	= millimetres <sup>2</sup> (mm <sup>2</sup> )	X 0.00155	= inches <sup>2</sup>
inches <sup>2</sup>	X 6.452	= centimetres <sup>2</sup> (cm <sup>2</sup> )	X 0.155	= inches <sup>2</sup>
feet <sup>2</sup>	X 0.0929	= metres <sup>2</sup> (m <sup>2</sup> )	X 10.764	= feet <sup>2</sup>
yards <sup>2</sup>	X 0.8361	= metres <sup>2</sup> (m <sup>2</sup> )	X 1.196	= yards <sup>2</sup>
acres	X 0.4047	= hectares (10 <sup>4</sup> m <sup>2</sup> ) or (ha)	X 2.471	= acres
miles <sup>2</sup>	X 2.590	= kilometres <sup>2</sup> (km <sup>2</sup> )	X 0.3861	= miles <sup>2</sup>

### VOLUME

inches <sup>3</sup>	X 16387	= millimetres <sup>3</sup> (mm <sup>3</sup> )	X 0.000061	= inches <sup>3</sup>
inches <sup>3</sup>	X 16.387	= centimetres <sup>3</sup> (cm <sup>3</sup> )	X 0.06102	= inches <sup>3</sup>
inches <sup>3</sup>	X 0.01639	= litres (L)	X 61.024	= inches <sup>3</sup>
quarts	X 0.94635	= litres (L)	X 1.0567	= quarts
gallons	X 3.7854	= litres (L)	X 0.2642	= gallons
feet <sup>3</sup>	X 28.317	= litres (L)	X 0.03531	= feet <sup>3</sup>
feet <sup>3</sup>	X 0.02832	= metres <sup>3</sup> (m <sup>3</sup> )	X 35.315	= feet <sup>3</sup>
fluid oz	X 29.57	= millilitres (mL)	X 0.03381	= fluid oz
yards <sup>3</sup>	X 0.7646	= metres <sup>3</sup> (m <sup>3</sup> )	X 1.3080	= yards <sup>3</sup>
teaspoons	X 4.929	= millilitres (mL)	X 0.2029	= teaspoons
cups	X 0.2366	= litres (L)	X 4.227	= cups

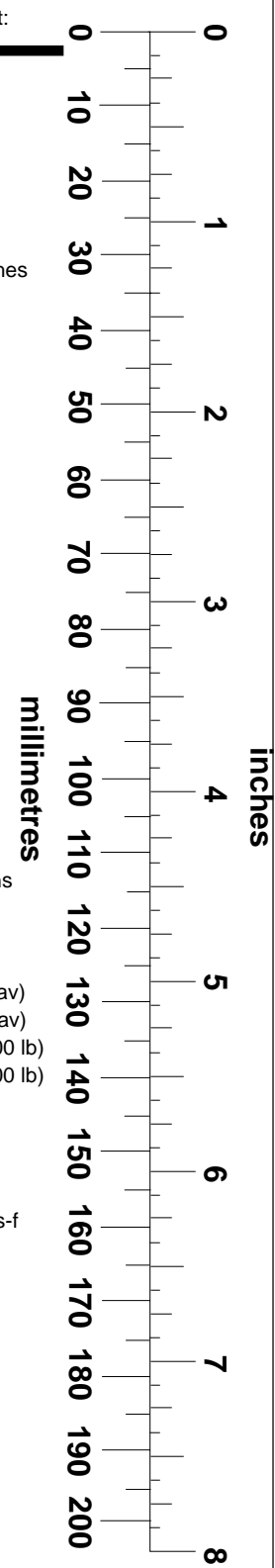
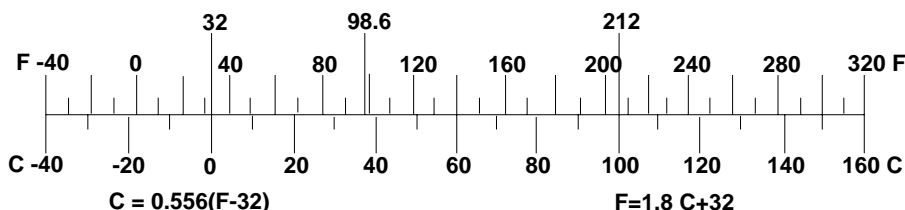
### MASS

ounces (av)	X 28.35	= grams (g)	X 0.03527	= ounces (av)
pounds (av)	X 0.4536	= kilograms (kg)	X 2.2046	= pounds (av)
tons (2000 lb)	X 907.18	= kilograms (kg)	X 0.001102	= tons (2000 lb)
tons (2000 lb)	X 0.90718	= metric tons (t)	X 1.1023	= tons (2000 lb)

### FORCE

ounces-f	X 0.278	= newtons (N)	X 3.597	= ounces-f
pounds-f	X 4.448	= newtons (N)	X 0.2248	= pounds-f
kilograms-f	X 9.807	= newtons (N)	X 0.10197	= kilograms-f

### TEMPERATURE



# METRIC EQUIVALENT CHART (2 OF 2)

## METRIC/U.S. CUSTOMARY UNIT EQUIVALENTS

Multiply: \_\_\_\_\_ by: \_\_\_\_\_ to get: \_\_\_\_\_ | Multiply: \_\_\_\_\_ by: \_\_\_\_\_ to get: \_\_\_\_\_

### ACCELERATION (Standard gravity = 9.807 m/s<sup>2</sup>)

feet/sec <sup>2</sup>	X 0.3048	= metres/sec <sup>2</sup> (m/s <sup>2</sup> )	X 3.281	= feet/sec <sup>2</sup>
inches/sec <sup>2</sup>	X 0.0254	= metres/sec <sup>2</sup> (m/s <sup>2</sup> )	X 39.37	= inches/sec <sup>2</sup>

### ENERGY OR WORK (watt-second = joule = newton-metre)

foot-pounds	X 1.3558	= joules (J)	X 0.7376	= foot-pounds
calories (heat)	X 4.187	= joules (J)	X 0.2388	= calories (int'l)
Btu (int'l)	X 1055	= joules (J)	X 0.000948	= Btu (int'l)
watt-hours	X 3600	= joules (J)	X 0.0002778	= watt-hours
kilowatt-hours	X 3.600	= megajoules (MJ)	X 0.2778	= kilowatt-hours

### PRESSURE OR STRESS (newton/sq metre = pascal)

inches Hg(60°F)	X 3.377	= kilopascals (kPa)	X 0.2961	= inches Hg
pounds/sq in	X 6.895	= kilopascals (kPa)	X 0.145	= pounds/sq in
pounds/sq in	X .06895	= Bars	X 14.504	= pounds/sq in
inches H <sub>2</sub> O(60°F)	X 0.2488	= kilopascals (kPa)	X 4.0193	= inches H <sub>2</sub> O
bars	X 100	= kilopascals (kPa)	X 0.01	= bars
pounds/sq ft	X 47.88	= pascals (Pa)	X 0.02088	= pounds/sq ft
kgf/cm <sup>2</sup>	X 98.07	= kilopascals (kPa)	X 0.010197	= kgf/cm <sup>2</sup>

### POWER

horsepower	X 0.746	= kilowatts (kW)	X 1.34	= horsepower
ft-lbf/min	X 0.0226	= watts (W)	X 44.25	= ft-lbf/min

### TORQUE

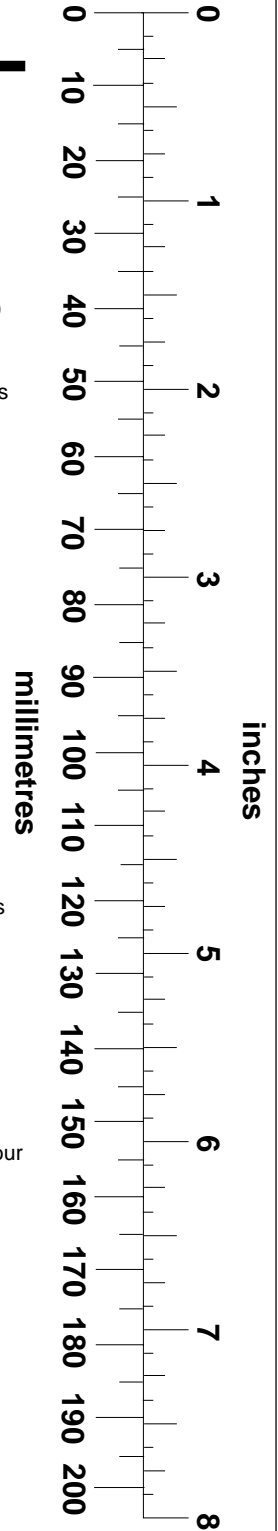
pound-inches	X 0.11298	= newton-metres (Nm)	X 8.851	= pound-inches
pound-feet	X 1.3558	= newton-metres (Nm)	X 0.7376	= pound-feet
kgf-cm	X 0.09807	= newton-metres (Nm)	X 10.197	= kgf-cm
kgf-m	X 9.807	= newton-metres (Nm)	X 0.10197	= kgf-m

### VELOCITY

miles/hour	X 1.6093	= kilometres/hour (km/h)	X 0.6214	= miles/hour
feet/sec	X 0.3048	= metres/sec (m/s)	X 3.281	= feet/sec
kilometres/hour	X 0.27778	= metres/sec (m/s)	X 3.600	= kilometres/hour
miles/hour	X 0.4470	= metres/sec (m/s)	X 2.237	= miles/hour

### COMMON METRIC PREFIXES

mega	(M) = 1,000,000	or 10 <sup>6</sup>	centi	(c) = 0.01	or 10 <sup>-2</sup>
kilo	(k) = 1,000	or 10 <sup>3</sup>	milli	(m) = 0.001	or 10 <sup>-3</sup>
hecto	(h) = 100	or 10 <sup>2</sup>	micro	(μ) = 0.000,001	or 10 <sup>-6</sup>



# SELECTED RULES FOR COMMUNICATING IN THE SI METRIC SYSTEM

## APPLICATION OF PREFIXES

1. Approved prefixes (instead of powers of ten) should be used to indicate orders of magnitude.
2. Prefixes must be combined with units and not used alone
3. Avoid using multiple prefixes.
4. Avoid mixing prefixes within a text of drawing.
5. Choose prefixes representing steps of 1000.
6. Choose prefixes giving numerical values of 0.1 through 1000.

<u>Examples:</u>	
<u>CORRECT</u>	<u>INCORRECT</u>
12.3 km	12.3x10 <sup>3</sup> m
kilogram	kilo
pF	μμF
10mm <input type="text" value="1000 mm"/>	10mm <input type="text" value="100 cm"/>
mN,N,kN	
3.94 mm	0.003 94 m

## PUNCTUATION

1. The decimal sign is the dot on the line.
2. Periods should not be used after symbols for SI units except at the end of a sentence.
3. Separate symbols from numerical values by a space

25.26	25,26 or 25 26
ms	m.s or ms.
21 m	21m

## SPELLING AND CAPITALIZATION

1. Names of SI units and prefixes are not capitalized except at the beginning of a sentence.  
(Exceptions: See items 2 and 3 below.)
2. Symbols for SI units derived from proper names have the first letter capitalized; symbols for other units are lower case  
(Except L for litre).
3. Symbols for prefixes are not capitalized except for T, G and M.
4. Symbols for units and prefixes are always written in singular form.
5. Place the symbol for a prefix immediately before the unit which it modifies.
6. Avoid hand-drawn Greek letters ( Ω , μ , etc.); Spell out words where possible.

metre kilo-----	Metre Kilo-----
Pa, J cd	pa, j Cd
m (for milli) M (for mega)	
10 metres=10 m	10 metres=10 ms
km	k m
microsecond for μs ohm for Ω	

## OTHER USAGE CONVENTIONS

1. Express metric figures with one digit on either side of the decimal point.
  - a. For whole numbers, where a decimal is used it should be followed by a zero.
  - b. When the value is less than unity, the decimal should be preceded by a zero.
2. Numbers having four or more digits should be placed in groups of three separated by a space; do not use commas (some countries use a comma for the decimal point). For four digits, the space is optional.
3. Avoid mixing customary units and SI units.
4. When expressing compound units in symbolic form, use nothing between the units or a raised dot to indicate the product. Do not use an "x".

25.0 kg or 25 kg	25. kg
0.25 kg	.25 kg
11 532	11,532
1532	1,532
kg/m <sup>3</sup>	kg/ft <sup>3</sup>
mkg/m•kg	m x kg

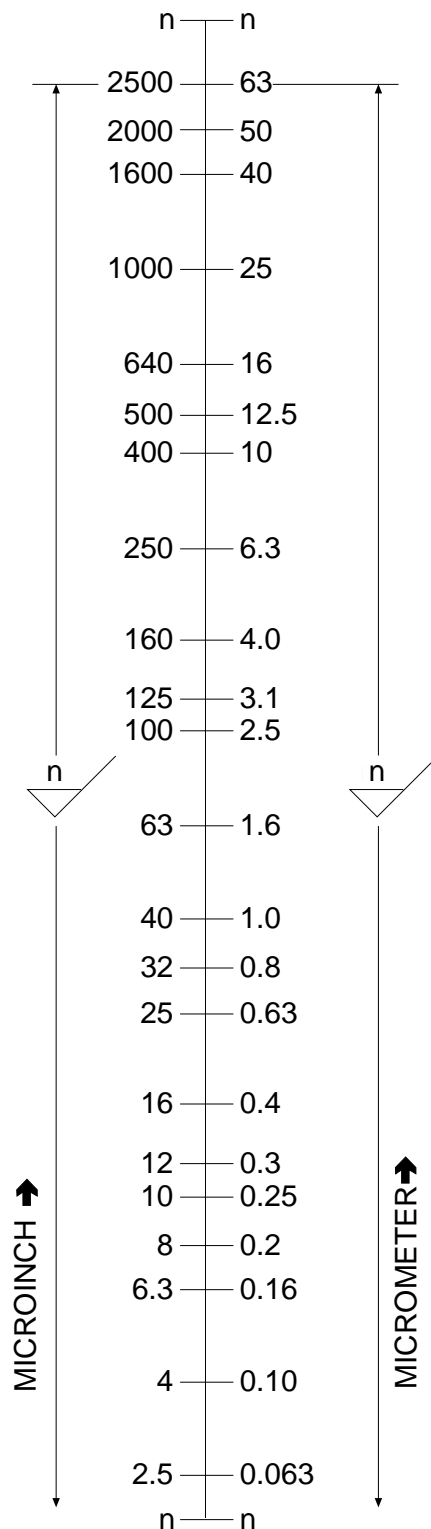
# SURFACE ROUGHNESS CONVERSION

Absolute surface roughness is indefinite; therefore surface roughness, whether measured by the method of arithmetic average or by root mean squared average (RMS), will be considered equivalent.

1 micrometer ( $\mu\text{m}$ )  $\cong$  40 microinches ( $\mu\text{ in.}$ )

1 microinch = 0.000 001 in

1 micrometer = 0.001mm





## **COMPONENT IDENTIFICATION**

Each part to be marked with the manufacturers identification and NAAMS code where possible.

## **PAGE FORMATTING**

In the previous published version of these standards, odd numbered (right hand) pages were offset to the right and even numbered (left hand) pages offset to the left to allow for binding. The pages are now centered. This format allows the pages to be punched in the left margin for insertion into a ring binder. The latest revision date is indicated in the title block of each page.

## **LOGSHEET**

The logsheet allows the user to determine the latest change to any standard by referring to the date in the last column. Individual pages are accessed by clicking onto the page number in the first column.

## **TOLERANCE INFORMATION**

Tolerances unless otherwise noted are as follows:

No decimal =  $\pm 0.25$

One decimal =  $\pm 0.1$

Two decimal =  $\pm 0.01$

Exception: Rough casting =  $\pm 2.5$