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# Common Metric-English Conversion Factors

## Conversion Factors

### Metric/English Conversion Chart

| Measurement       | Multiply  | by      | to get:                                       |
|-------------------|---|---------|---|
| Linear            | millimeters (mm)  | 0.03937 | inches  |
|                   | inches  | 25.4    | millimeters (mm)                              |
|                   | kilometers (km)   | 0.6214  | miles   |
|                   | miles   | 1.6093  | kilometers (km)                               |
| Area              | millimeters <sup>2</sup> (mm <sup>2</sup> )               | 0.00155 | inches <sup>2</sup>                           |
|                   | inches <sup>2</sup>                                       | 645016  | millimeters <sup>2</sup> (mm <sup>2</sup> )   |
| Volume            | centimeters <sup>3</sup> (cm <sup>3</sup> )               | 0.06102 | inches <sup>3</sup>                           |
|                   | inches <sup>3</sup>                                       | 16.387  | centimeters <sup>3</sup> (cm <sup>3</sup> )   |
|                   | 1 cm <sup>3</sup> = 1 milliliter (mL) , 1000 mL = 1 Liter |         |   |
| Acceleration      | meter/second <sup>2</sup> (m/s <sup>2</sup> )             | 39.37   | inch/second <sup>2</sup>                      |
|                   | inch/second <sup>2</sup>                                  | 0.0254  | meter/second <sup>2</sup> (m/s <sup>2</sup> ) |
| Velocity          | meter/second (m/s)  | 3.281   | feet/second                                   |
|                   | feet/second   | 0.3048  | meter/second (m/s)                            |
| Mass              | kilogram (kg)   | 2.2046  | pounds  |
|                   | pounds  | 0.4536  | kilogram (kg)                                 |
| Force             | kilograms-f (kgf)   | 9.807   | Newtons (N)                                   |
|                   | Newtons (N)   | 0.10194 | kilograms-f (kgf)                             |
|                   | pounds-f  | 4.448   | Newtons (N)                                   |
| Pressure          | Newtons (N)   | 0.2248  | pounds-f                                      |
|                   | bar   | 14.5    | PSI   |
|                   | PSI   | 0.069   | bar   |
| Torque            | Newton-Meters (Nm)  | 8.851   | pound-inches                                  |
|                   | pound-inches  | 0.11298 | Newton-Meters (Nm)                            |
| Moment of Inertia | centimeters <sup>4</sup> (cm <sup>4</sup> )               | 0.02403 | inches <sup>4</sup>                           |
|                   | inches <sup>4</sup>                                       | 41.623  | centimeters <sup>4</sup> (cm <sup>4</sup> )   |

### Metric Tap/Drill Specifications

| Tap | Tap        | Drill Size |
|-----|------------|------------|
| M4  | M4 x .7    | 3.3mm      |
| M5  | M5 x .8    | 4.2mm      |
| M6  | M6 x 1     | 5.0mm      |
| M8  | M8 x 1.25  | 6.8mm      |
| M12 | M12 x 1.75 | 10.2mm     |
| M16 | M16 x 2    | 14.0mm     |

### Quick Conversion Chart

| Millimeters | Inches | Feet  |
|-------------|--------|-------|
| 20          | .79    |       |
| 30          | 1.18   |       |
| 45          | 1.77   |       |
| 60          | 2.36   |       |
| 90          | 3.54   |       |
| 180         | 7.09   |       |
| 5600        | 220.47 | 18.37 |
| 6000        | 236.22 | 19.68 |

# Temperature Properties for Key Materials

## Aluminum 6063-T6 Alloy Temperature Characteristics

| Characteristic              | Temperature Range | Observed Events  |
|-----------------------------|-------------------|--|
| creep/elongation            | less than 100° C  | No observed increase in the amount of creep. Creep, or plastic elongation, is typically observed at prolonged exposure to temperatures in excess of 100°C. |
| ultimate and yield strength | up to 100° C      | Metal retains approximately 95% of its original and ultimate yield strength.   |
|                             | down to -100° C   | Metal typically undergoes an approximately 10% increase in both ultimate and yield strength.   |

**NOTE:** Repeated cycling of metal through this type of thermal cycle can lead to eventual fatigue and subsequent failure.

## Plastic Temperature Ranges

| Material                             | Temperature Range |       |
|--------------------------------------|-------------------|-------|
|                                      | Low               | High  |
| <b>Delrin® 100</b>                   | NA                | 90 C  |
| <b>PA66</b><br>PA = Polyamide        | -40 C             | 80 C  |
| <b>PA12</b><br>PA = Polyamide        | -40 C             | 80 C  |
| <b>NBR</b><br>Buna N Nitrile         | -40 C             | 120 C |
| <b>PUR</b><br>Polyurethane elastomer | -25 C             | 80 C  |
| <b>PVC</b><br>Polyvinyl Chloride     | NA                | 60 C  |
| <b>POM</b><br>Polyacetal             | -40 C             | 100 C |

## Temperature Conversion Factors

|                           |  |
|---------------------------|--|
| <b>Degrees Celsius</b>    | $\frac{5 \times (\text{degrees F} - 32)}{9}$ |
| <b>Degrees Fahrenheit</b> | $\frac{(9 \times \text{degrees C}) + 32}{5}$ |

## Toothed Belt for Dynamic Linear Elements Temperature Ranges

| Material  | Temperature Range |      |
|---|-------------------|------|
|   | Low               | High |
| <b>Steel Wire Mesh coated with Polyurethane</b> | -30 C             | 80 C |

# Technical Specifications for Key Materials

## Delrin® 100 Technical Specifications

| Characteristic                 | Units | Specifications       |
|--------------------------------|-------|----------------------|
| Specific Gravity               | g/cm  | 1.41 - 1.42          |
| Rockwell Hardness              |       | R119 - 112           |
| Water Absorption               | %     | 0.25                 |
| Shear Strength                 | psi   | 9,500                |
| Compressive Strength           | psi   | 18,000               |
| Tensile Strength               | psi   | 10,000               |
| Dielectric Strength            | v/mm  | 380 - 500            |
| Flexural Modulus of Elasticity |       | 375,000              |
| Flexural Yield Strength        | psi   | 14,300               |
| Elongation                     | %     | 12 - 75              |
| Max. Continuous Temp.          | C (F) | 90° (195°)           |
| Melting Point                  | C (F) | 175° (347°)          |
| Density                        |       | 88.6                 |
| Coefficient of Friction        | %     | 0.12                 |
| Effect of Weak Acids           |       | Resistant to Some    |
| Effect of Strong Acids         |       | Attacked             |
| Effect of Weak Alkalies        |       | Resistant to Some    |
| Effect of Strong Alkalies      |       | Attacked             |
| Effect of Organic Solvents     |       | Excellent Resistance |
| Key Words                      |       | Impact Resistant     |
| Machinability                  |       | Excellent            |
| Compliances                    |       | FDA and USDA         |



# Application Notes:



# Application Notes:

# MGEsoft...

...powerful, parametric design software for the framing system that offers everything

MGEsoft is part of the FMSsoft family of CAD software modules. It helps you design Bosch structures quickly, easily and accurately, making Bosch framing the smart choice for:

- *Reduced Engineering Costs*
- *Faster Project Completion*
- *Better Design, Fewer Errors*
- *Easy to Use, Easy Ordering*

The parametric CAD design capabilities of FMSsoft are based on professional AutoCAD® so you get many automatic features that speed your work. For example, the table at the top was custom designed with a macro that prompts you for the height, width and length. It then instantly generates the completed assembly in 3D with multiple views, with an accurate parts list, even small hardware and pricing.

- *No design errors or forgotten parts!*

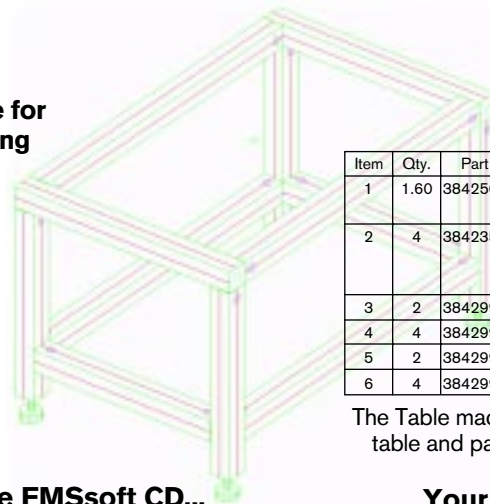
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1. CD-ROM
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[www.fmssoft.com](http://www.fmssoft.com)



| Item | Qty. | Part No.   | Designation    | Features                                |
|------|------|------------|----------------|---|
| 1    | 1.60 | 3842500924 | BOLT CONNECTOR | D=17;GROOVE= 10->10;L= 45 MM;PE 10      |
| 2    | 4    | 3842352061 | LEVELING FOOT  | D=44MM; M12;V= 30MM; NATURAL GALVANIZED |
| 3    | 2    | 3842990520 | PROFILE 45X45H | L=500.0 MM;-/-                          |
| 4    | 4    | 3842990640 | PROFILE 45X45H | L=405.0 MM;M12/D17                      |
| 5    | 2    | 3842990644 | PROFILE 45X45H | L=410.0 MM;D17/D17                      |
| 6    | 4    | 3842990644 | PROFILE 45X45H | L=710.0 MM;D17/D17                      |

The Table macro created this custom table and parts list in 90 seconds

## The FMSsoft CD...

FMSsoft CD is the best choice for information and convenience. You get all CAD design software offered by Bosch (including MGEsoft), plus:

- MASsoft for Ergonomic workstations
- TSsoft and TS Designer for Flexible Assembly Conveyors
- Other FMSsoft modules, CAD drawings, 2D IGES and DXF files
- Software tutorials and manuals
- Electronic catalogs
- The Bosch CD Sampler with an introduction to Bosch Automation Products
- Product service bulletins and product application guides
- Relevant shareware

## Your Next Steps...

1. To receive MGEsoft, contact your local Bosch Distributor or visit the FMSsoft downloads site on the Internet at [www.fmssoft.com](http://www.fmssoft.com).
2. Register the software.
3. Complete the detailed step-by-step software tutorials.
4. Need software or application help? Just call your distributor's MGEsoft trained specialist.
5. Polish your product knowledge, 3D, and MGEsoft skills with Bosch's free training for qualified customers. Contact your distributor for details.

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# For aluminum framing structures that won't wait, your local Bosch distributor is an on-line service.

Three steps get you from concept to completion fast.



## 1. We'll help you imagine it

Start with a rough sketch or a telephone "brain storming" session and you'll see your aluminum framing structure take shape quickly with Bosch. During the concept stage your Bosch distributor will make application recommendations and give you ideas on how to get the smartest design solution for the money. To get the process started simply contact your distributor by phone, FAX or mail and we'll take it from there.

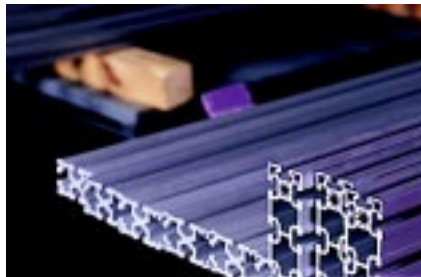


## 2. We'll help you design it

Design assistance from trained, certified distributors using CAD (MGESoft) provides structure layout, load calculations, and an analysis of the most cost effective

connectors to use at junction points in your structure. You get detailed dimensioned drawings and a complete bill of materials. It's fast and accurate.

## 3. And, we'll deliver it anyway you want it



In bulk as raw material.



As a kit ready to assemble.



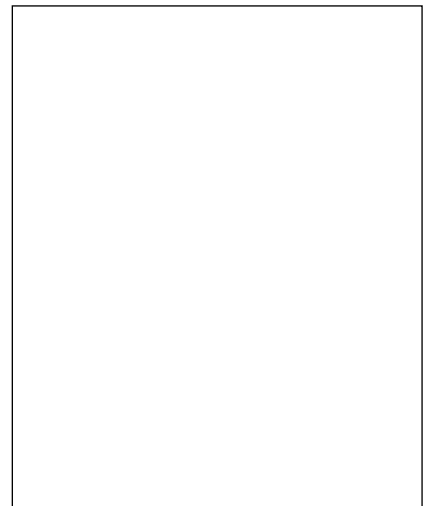
Completely assembled.

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Your Bosch distributor has complete inventories of all popular strut sizes, connectors and accessories.

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Bosch Automation Products  
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Buchanan, MI 49107  
Hot Line (800) 32-BOSCH  
In Canada (800) 88-BOSCH  
Telephone (616) 695-0151  
FAX (616) 695-5363

### EUROPE

Robert Bosch GmbH  
Geschäftsbereich  
Automationstechnik  
Montagetechnik  
Postfach 30 02 07  
D-70442 Stuttgart  
Telefax (0711) 811-7712



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