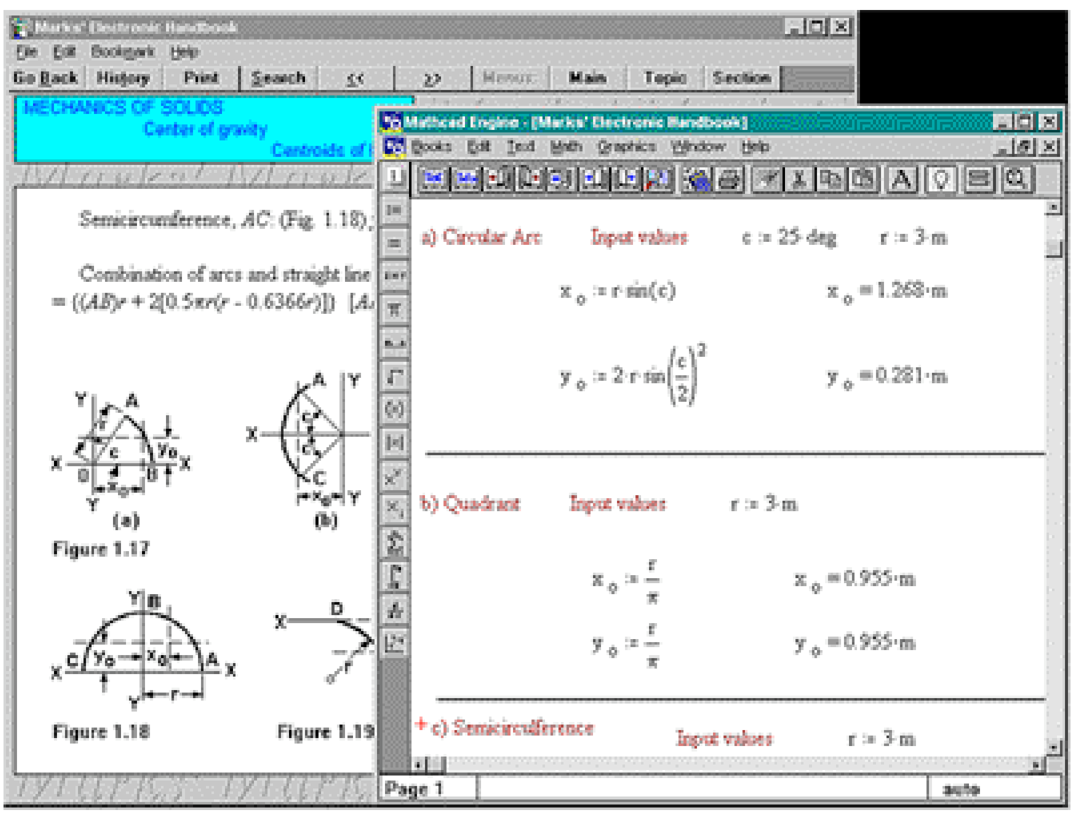
Marks' Electronic Handbook for Mechanical Engineers

Platform: Windows
Includes the Mathcad Engine
Available on CD-ROM only
Available for ground shipment

McGraw-Hill's well-known text, *Marks' Standard Handbook for Mechanical Engineers*, is now an Electronic Book powered by the interactive Mathcad engine. A standard since 1916, Marks' offers students and professionals standard engineering references, up-to-date bibliographies, and authoritative solutions to practically any mechanical engineering problem. Access hundreds of relevant concepts and definitions from the *McGraw-Hill Encyclopedia of Science & Technology, Seventh Edition* and the *McGraw-Hill Dictionary of Scientific and Technical Terms, Fifth Edition*. The Mathcad engine gives you instant retrieval of information through full-text searching and hypertext linking, plus a "live" math environment where you plug in values and the calculation is automatically, reliably, and quickly solved -- whether in a formula, table, or graph.

Table of Contents | Product Sample | Back to Product List



Explore the mechanics of solids by finding the center of gravity. All your calculations are 'live', so you can change a variable and watch Mathcad calculate the results automatically.

Topics include: Mechanics, Heat Strength of Materials, Gearing, Engines, Turbines, Pumps, Compressors, and more. Sections within each chapter cover Process and Operation, Principles and Theory, Formulas and Tables, Definitions, Tables, and more.

Marks' Electronic Handbook for Mechanical Engineers

Product Sample
Back to Product List

Marks' Electronic Handbook for Mechanical Engineers

TABLE OF CONTENTS *(page 2 of 28)*

Product Sample
Back to Product List

Marks' Electronic Handbook for Mechanical Engineers

TABLE OF CONTENTS (page 3 of 28)

Marks' Electronic Handbook for Mechanical Engineers

TABLE OF CONTENTS (page 4 of 28)

Marks' Electronic Handbook for Mechanical Engineers

TABLE OF CONTENTS (page 5 of 28)

Marks' Electronic Handbook for Mechanical Engineers

TABLE OF CONTENTS (page 6 of 28)

Marks' Electronic Handbook for Mechanical Engineers

TABLE OF CONTENTS (page 7 of 28)

Marks' Electronic Handbook for Mechanical Engineers

TABLE OF CONTENTS (page 8 of 28)

Marks' Electronic Handbook for Mechanical Engineers

TABLE OF CONTENTS (page 9 of 28)

Marks' Electronic Handbook for Mechanical Engineers

Product Sample
Back to Product List

Marks' Electronic Handbook for Mechanical Engineers

TABLE OF CONTENTS (page 11 of 28)

Marks' Electronic Handbook for Mechanical Engineers

TABLE OF CONTENTS (page 12 of 28)

Product Sample
Back to Product List

Marks' Electronic Handbook for Mechanical Engineers

Product Sample

Back to Product List

Marks' Electronic Handbook for Mechanical Engineers

TABLE OF CONTENTS (page 14 of 28)

Marks' Electronic Handbook for Mechanical Engineers

Marks' Electronic Handbook for Mechanical Engineers

Marks' Electronic Handbook for Mechanical Engineers

TABLE OF CONTENTS (page 17 of 28)

Product Sample
Back to Product List

Marks' Electronic Handbook for Mechanical Engineers

TABLE OF CONTENTS (page 18 of 28)

Product Sample

Back to Product List

Marks' Electronic Handbook for Mechanical Engineers

TABLE OF CONTENTS (page 19 of 28)

Marks' Electronic Handbook for Mechanical Engineers

Product Sample

Back to Product List

Marks' Electronic Handbook for Mechanical Engineers

TABLE OF CONTENTS (page 21 of 28)

Marks' Electronic Handbook for Mechanical Engineers

Marks' Electronic Handbook for Mechanical Engineers

Product Sample

Back to Product List

Marks' Electronic Handbook for Mechanical Engineers

Marks' Electronic Handbook for Mechanical Engineers

TABLE OF CONTENTS

Product Sample
Back to Product List

Marks' Electronic Handbook for Mechanical Engineers

Marks' Electronic Handbook for Mechanical Engineers

Marks' Electronic Handbook for Mechanical Engineers

TABLE OF CONTENTS (page 28 of 28)

HIGH-VACUUM PUMPS

Pipe flow of gases for high-vacuum systems

Knudsen number for high-vacuum systems

The conductance of a pipe depends on the geometry and the Knudsen number K (defined as the ratio of the mean free path of the gas molecules to the mean diameter of the cross section) as well as the direction and velocity of the molecules entering the pipe. For $K > 1$ the conductance for air in liters per second at 25°C of a circular pipe of length L (feet) and inside diameter D (inches) connecting a high-vacuum pump to a chamber of diameter greater than 3D, including the "entrance correction" at the chamber, but neglecting the "exit correction" at the pump which depends on the inlet diameter and other factors, may be calculated from $U = 6.6D^3/(L + 0.11D)$. The effect of right-angle bends in the pipe for "molecular flow" $K > 1$ and for $L > D/3$ may be approximated by adding 0.05D to L for each bend (where L is in feet and D in inches). A single right-angle bend in a short pipe ($L < D/3$) has practically no effect on the conductance as computed for a straight pipe of the same length along the centerline

When $K < 0.01$, the conductance in liters per second for air at 20°C of a long circular pipe length L (feet) and diameter D (inches) may be calculated from $U = 0.25D^4P/L$, where P is the mean pressure in the pipe in millitorr (micrometers of Hg). For $0.01 < K < 1$ the conductance for air at 20°C of a long tube can be estimated from the following equation:

Marks' Electronic Handbook for Mechanical Engineers

(17.1)

Marks' Handbook

Input values

$D := 50 \cdot mm \qquad L := 2 \cdot m$

$P' := .0020 \cdot torr$

$$U := \frac{0.25 \cdot D^4 \cdot P'}{L} + \left[\left(\frac{1 + 0.65 \cdot D \cdot P' \cdot \frac{1}{mm \cdot torr}}{1 + 0.80 \cdot D \cdot P' \cdot \frac{1}{mm \cdot torr}} \right) \cdot mm \cdot torr \right] \cdot \left(\frac{6.6 \cdot D^3}{L} \right)$$

$$U = 54.44 \cdot \frac{kg \cdot mm^2}{sec^2}$$

The size of the primary pump, which acts as a "roughing pump" to pump the chamber down from atmospheric pressure to a pressure at which a diffusion pump or other high-vacuum pump can operate, may depend on the peak gas load during the process as well as the desired pump-down time. However, the size indicated by the peak load condition is frequently much smaller than the size required to meet the specified pump-down or roughing time. In this case, if the process cycle is much longer than the pump-down time, it is advisable to use two forepumps (primary pumps), a large one for roughing down and a smaller one for holding the vapor pumps during the roughing period and backing them during the processing period. Roots-type blowers are useful for shortening the roughing time for large chambers in the range below 20 torr and for handling unusually large bursts of gas which occur in some processes.

Table of Contents

Back to Product List

Marks' Electronic Handbook for Mechanical Engineers

An oil-sealed rotary mechanical pump is normally used as the primary pump. The roughing time tr (in minutes) required to evacuate a chamber of volume V (cubic feet) from atmospheric pressure to about 0.7 torr at which high-vacuum pumps begin to operate can be estimated from tr = 10VC, where C is the rated speed (cubic feet per minute) at atmospheric pressure of the rotary pump. Since the speed of the high-vacuum pumps is usually of the order of 100 times that of the forepump, the pressure should drop quickly as soon as the high-vacuum pumps "take hold," but below 10^-4 torr the pressure may begin to decrease more slowly because of the outgassing of the materials exposed inside the vacuum system.

Table of Contents

Back to Product List