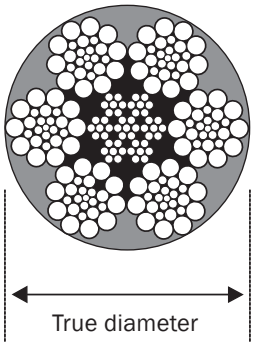
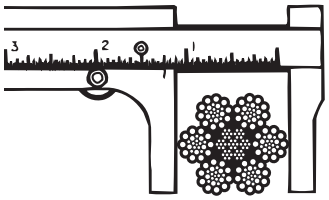
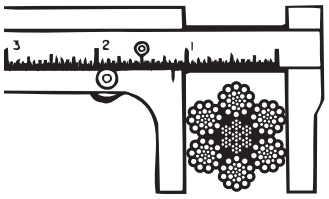
How to measure wire rope diameter



The actual diameter of a wire rope is the diameter of a circumscribed circle that will enclose all the strands. It's the largest cross-sectional measurement as shown here. You should make the measurement carefully with calipers. The illustrations at left show the correct and incorrect methods of measuring wire ropes with even numbers of outer strands.



Correct



Incorrect

Metric conversion and equivalents

As we move toward metric measurements, it will become increasingly necessary to convert English units into SI – International System of Units – (or metrics), and vice versa. The following table and conversion factors are included in this handbook to help you.

ROPE DIAMETER

For standard, general purpose wire ropes, in measuring diameter, the industry is leaning toward a "soft" conversion to metric during the transition period. For example, a 1" diameter rope converts to 25.4 mm in metrics. Using the soft conversion, this is changed to the whole metric size that most nearly parallels the 1" size range, or 26 mm. In sizes smaller than 5/8", the rope diameter is rounded to the nearest 0.5 mm.

STRENGTHS AND WEIGHTS

The following table gives the closest equivalent metric diameters for rope sizes up through 5 inches. Again, these metric sizes are based on the industry's "soft" conversion. Your application may have tighter tolerances that require a hard conversion. Therefore, the values in the table would not apply.

Since rope minimum breaking force and weight per unit of length vary for different types and grade of ropes, the following conversion factors are given to help you convert the figures you need:

> To convert rope weight in pounds per foot (lb/ft) to kilograms per meter (kg/m), multiply by 1.488.

Nominal wire rope diameter			
Inches	Millimeters	Inches	Millimeters
1/4	6.5	2 1/8	54
5/16	8	2 1/4	58
3/8	9.5	2 3/8	60
7/16	11.5	2 1/2	64
1/2	13	2 5/8	67
9/16	14.5	2 3/4	71
5/8	16	2 7/8	74
3/4	19	3	77
7/8	22	3 1/8	80
1	26	3 1/4	83
1 1/8	29	3 3/8	87
1 1/4	32	3 1/2	90
1 3/8	35	3 3/4	96
1 1/2	38	4	103
1 5/8	42	4 1/4	109
1 3/4	45	4 1/2	115
1 7/8	48	4 3/4	122
2	52	5	128

> To convert rope minimum breaking force in tons (T) to kilonewtons (kN), multiply by 8.897; 1 lb equals 4.448 newtons (N).

> To convert rope minimum breaking force in tons (T) to kilograms (kg), multiply by 907.2.

Note: The newton (a unit of force) is the correct unit for measurement of minimum breaking force in the SI system of units. We have included a conversion factor from tons to kilograms because a rope's minimum breaking force is often referred to in terms of kilograms (a unit of mass).

ALLOWABLE TOLERANCE IN WIRE ROPE DIAMETER

Wire rope is normally made slightly larger than its catalog (or nominal) size. The following chart lists the size tolerances of standard wire rope.

Nominal Diameter (in)	Tolerance		Nominal Diameter (mm)
	Under	Over	
Through 1/8	-0	+ 8%	From 2 to <4
Over 1/8 through 3/16	-0	+ 7%	From 4 to <6
Over 3/16 through 5/16	-0	+ 6%	From 6 to < 8
Over 5/16 and larger	-0	+ 5%	8 and greater

Design factors

The design factor is defined as the ratio of the minimum breaking force of a wire rope to the total load it is expected to carry.

Use of design factors provides rope installations with reasonable assurance of adequate capacity for the work to be done throughout a rope's service life. Considerations in establishing design factors include the type of service, design of equipment and consequences of failure.

In most applications, the selection of a rope based on the proper design factor has been made by the equipment manufacturer. In an application where a different rope is to be used, or in a new application, check government and industry regulations for the required design factor. Different rope types on the same application may have different design factor requirements.

HOW TO USE DESIGN FACTORS

Standards and regulations require that design factors be applied to the rope's minimum breaking force to determine the maximum working load. To determine the maximum working load for which an operating rope may be used, divide the rope's minimum breaking force by the required design factor. This is the rope's maximum working load. There may be other limiting factors in an application that make the maximum load the equipment can handle less than the rope's maximum working load.*

Remember, an installation is only at the prescribed design factor when the rope is new. As a rope is used, it loses strength and literally is "used up."

***NOTE**

> The rated capacity of a wire rope sling incorporates both a design factor and a splicing or attachment efficiency.