

# Powder Cores

- Molypermalloy
- High Flux
- Kool M $\mu$



**MAGNETICS**<sup>®</sup>

The image features four toroidal magnetic cores of different sizes and orientations. The largest core is in the foreground, appearing as a thick, dark ring with a metallic sheen. Behind it, three smaller cores are arranged in a descending pattern towards the top right. The background is a gradient of blue and purple, with dramatic lighting that creates bright highlights and deep shadows on the curved surfaces of the rings.

Since 1949, **MAGNETICS**, a division of Spang & Company, has been a leading world supplier of precision, high quality, magnetic components and materials to the electronics industry. Applications for these products range from simple chokes and transformers used in telephone equipment to sophisticated devices for aerospace electronics. Staffed with a high degree of technical talent coupled with modern research facilities, **MAGNETICS** has followed a carefully charted course to find and fill specialized industrial needs while pioneering new designs, product developments, and innovations in manufacturing methods. Many of these developments have resulted in acceptance of **MAGNETICS** products as industry standards in tape wound cores, powder cores, and ferrite cores.

## LITERATURE AVAILABLE AT www.mag-inc.com

### PRODUCT LITERATURE AND DESIGN SOFTWARE CD

#### CONTAINS

- All Product Literature
- Common Mode Filter Design Software
- Current Transformer Design Software
- Inductor Design Software
- Mag Amp Design Software

### POWDER CORE LITERATURE

- MPP-Q1 Q-Curves for MPP Cores
- MPP-T1 MPP THINZ Technical Bulletin
- KMC-S1 Kool Mu Application Notes
- KMC-E1 Kool Mu E Core Technical Bulletin
- CG-03 Cores For Flybacks

### FERRITE LITERATURE

- FC-601 Design Manual
- FC-S1 Ferrite Material Selection Guide
- FC-S2 EMI/RFI Common Mode Filters
- FC-S3 Q Curves for Ferrite Cores
- FC-S4 Step Gap E-cores, Swinging Chokes
- FC-S5 Common Mode Inductors for EMI
- FC-S7 Curve Fit Equations for Ferrite Materials
- FC-S8 Designing with Planar Ferrite Cores
- CG-01 A Critical Comparison of Ferrites with other Magnetic Materials

### TAPE WOUND CORE LITERATURE

- TWC-500 Design Manual
- TWC-S1 Fundamentals of Tape Wound Core Design
- TWC-S2 How to Select the Proper Core for Saturating Transformers
- TWC-S3 Inverter Transformer Core Design and Material Selection
- SR-4 Mag Amp Control in SMPS
- SR-6 Reduction of Control-loop Interactions in Mag Amps

### CUT CORE LITERATURE

- MCC-100T Design Manual

### BOBBIN CORE LITERATURE

- BCC-1.1 Design manual

### GENERAL INFORMATION

- APB-2 All Products Bulletin
- CG-04 Testing Magnetic Cores
- CG-02 Material Selection Charts for Frequency, Temperature, Geometry, Stability
- CG-05 Frequently Asked Questions About MAGNETICS Materials
- CG-06 Designing With Magnetic Cores at High Temperature
- TID-100 Power Transformer and Inductor Design
- SR-1A Inductor Design in Switching Regulators
- PS-01 Cores for SMPS
- PS-02 Magnetic Cores for Switching Power Supplies
- HED-01 Cores for Hall Effect Devices
- RC-1 Cores for Ground Fault Interrupters
- MPB-1 Spang Metals All Product Bulletin
- SSM-6 Permalloy 80
- SSM-7 MuMetal
- SSM-8 Alloy 48
- SSM-9 Magnetic Shielding Materials
- SSM-10 Magnesil-N "Thin Gauge" Non-Oriented Silicon Steel



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# MPP Core Locator & Unit Pack Quantity

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# High Flux Core Locator & Unit Pack Quantity

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# Kool M $\mu$ <sup>®</sup> Core Locator & Unit Pack Quantity

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77090-A7	4-25	120	77271-A7	4-6	2500	77586-A7	4-21	300
77091-A7	4-25	120	77280-A7	4-9	2500	77587-A7	4-21	300
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77154-AY	4-2	750	77334-A7	4-12	2500	77848-A7	4-16	1000
77155-AY	4-2	750	77335-A7	4-12	2500	77868-A7	4-29	27
77180-AY	4-3	600	77350-A7	4-18	500	77874-A7	4-6	2500
77181-AY	4-3	600	77351-A7	4-18	500	77875-A7	4-6	2500
77184-AY	4-3	600	77352-A7	4-18	500	77884-A7	4-6	2500
77185-AY	4-3	600	77354-A7	4-18	500	77885-A7	4-6	2500
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77192-A7	4-27	100	77380-A7	4-15	2500	77908-A7	4-30	27
77193-A7	4-27	100	77381-A7	4-15	2500	77930-A7	4-19	500
77194-A7	4-27	100	77384-A7	4-15	2500	77932-A7	4-19	500
77195-A7	4-27	100	77385-A7	4-15	2500	77934-A7	4-19	500
77206-A7	4-16	1000	77410-A7	4-7	2500	77935-A7	4-19	500

# Introduction

**MAGNETICS Molypermalloy Powder (MPP)** cores are distributed air gap toroidal cores made from a 79% nickel, 17% iron, and 4% molybdenum alloy powder for the lowest core losses of any powder core material.

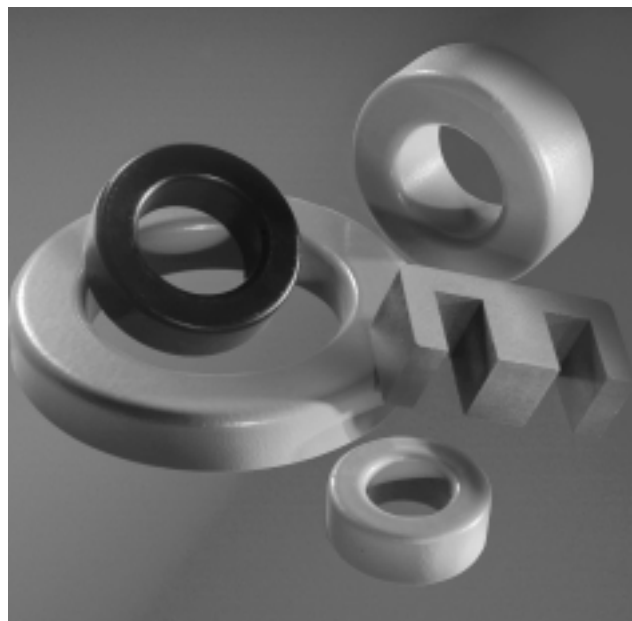
MPP cores possess many outstanding magnetic characteristics, such as high resistivity, low hysteresis and eddy current losses, excellent inductance stability after high DC magnetization or under high DC bias conditions and minimal inductance shift up to 2000 gauss under AC conditions.

**MAGNETICS High Flux** powder cores are distributed air gap toroidal cores made from a 50% nickel - 50% iron alloy powder for the highest available biasing capability of any powder core material.

High Flux cores have certain advantages that make them quite useful for applications involving high power, high dc bias, or high ac bias at high power frequencies. High Flux cores have a saturation flux density of 15000 gauss, as compared to 7500 gauss for standard MPP cores or 4500 gauss for ferrites. The core loss of High Flux powder cores is significantly lower than that of powdered iron cores. It is possible that High Flux cores will offer a reduction in core size over powdered iron cores in most applications.

**MAGNETICS Kool M $\mu$** <sup>®</sup> powder cores are distributed air gap cores made from a ferrous alloy powder for low losses at elevated frequencies. The near zero magnetostriction alloy makes Kool M $\mu$  ideal for eliminating audible frequency noise in filter inductors.

In high frequency applications, core losses of powdered iron, for instance, can be a major factor in contributing to undesirable temperature rises. Hence, Kool M $\mu$  cores are ideal because their losses are significantly less, resulting in lower temperature rises. It is possible that Kool M $\mu$  cores will offer a reduction in core size over powdered iron cores in a similar application.



**Kool M $\mu$  E Cores** have a distributed air gap which makes them ideally suited for switching regulator inductors, flyback transformers, and power factor correction (PFC) inductors. The 10,500 gauss saturation level of Kool M $\mu$  provides a higher energy storage capability than can be obtained with gapped ferrite E cores, resulting in smaller core size. Kool M $\mu$  E cores are competitively priced against gapped ferrite E cores and their distributed air gap eliminates gap loss problems associated with ferrites. Kool M $\mu$  E cores have significantly lower losses and substantially better thermal properties when compared to powdered iron E cores.

**MPP THINZ™**, or Molypermalloy Powder washer cores, are distributed air gapped toroidal cores made from a 79% nickel, 17% iron, and 4% molybdenum alloy powder having the highest permeability of any powder core material and significantly higher saturation flux density compared to discrete gapped ferrite. THINZ™ offer an extremely low height self shielded power inductor core allowing finished inductor heights in the 1.5 mm to 2 mm range. Excellent temperature stability, superior inductance under DC bias, and low core losses highlight this product line's outstanding magnetic properties.

# Applications

MAGNETICS powder cores are primarily used in power inductor applications, specifically in switch-mode power supply (SMPS) output filters, also known as DC Inductors. Other power applications include differential inductors, boost inductors, buck inductors, and flyback transformers.

While all three materials are used in these applications, each has its own advantage. For the lowest loss inductor, MPP material should be used

since it has the lowest core loss. For the smallest core size in a dc bias dominated design, High Flux material should be used since it has the highest flux capacity. For reasonably low losses and reasonably high saturation at a low cost, Kool M $\mu$ <sup>®</sup> should be used since it has the lowest material costs.

Other specialty applications, such as High Q low level filters, load coils, and temperature stabilized inductors, MPP material is used.

	<b>MPP</b>	<b>High Flux</b>	<b>Kool M<math>\mu</math></b>
<b>Core Loss</b>	Lowest	Moderate	Low
<b>Perm vs. DC Bias</b>	Better	Best	Good
<b>Flux Density (Gauss)</b>	7,500	15,000	10,500
<b>Nickel Content</b>	80%	50%	0%
<b>Relative Cost</b>	High	Medium	Low

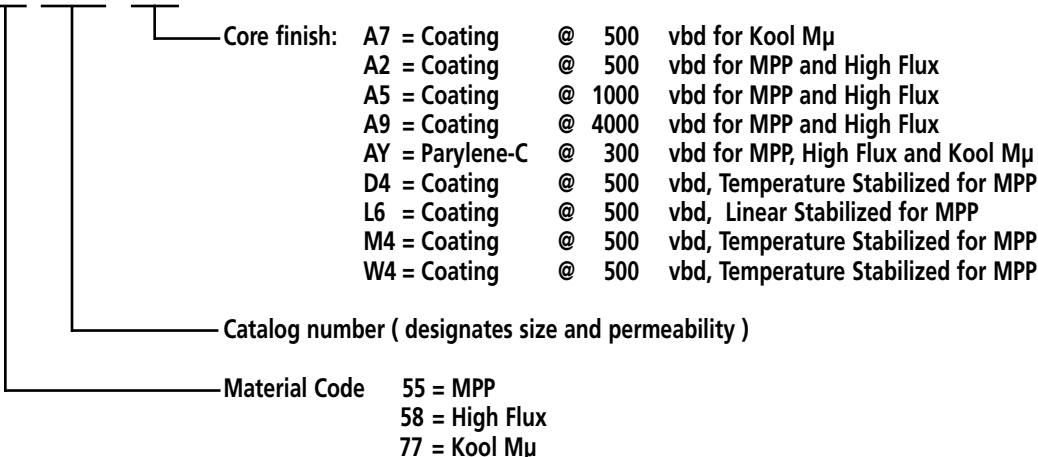


# Core Identification

MAGNETICS powder cores are marked with a part number which identifies its properties and core finish. The cores are also stamped with a date code, ensuring traceability of core history and performance characteristics. Cores smaller than 0.250" OD are not stamped. Cores with an OD between .250" and .310" are stamped with the catalog number (three digits).

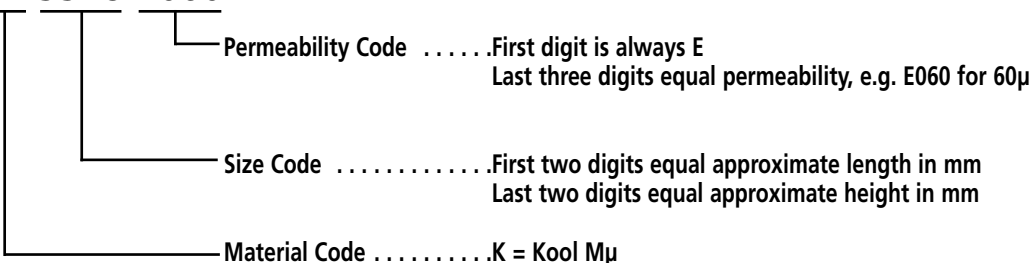
## TOROIDS

55 206- A2



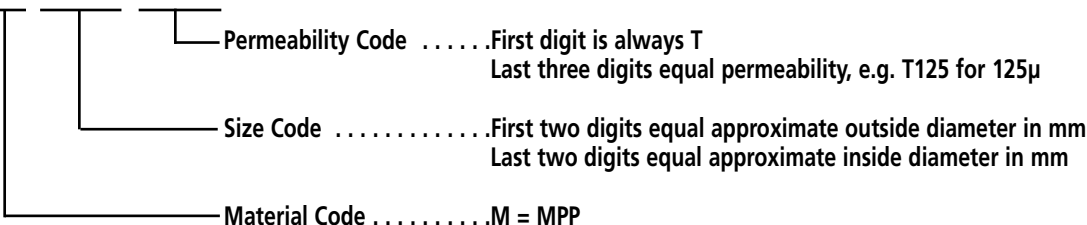
## E CORES

K- 5528-E060



## THINZ

M-0301-T125



# Core Inductance Tolerance/Grading

MAGNETICS powder cores are precision manufactured to an inductance tolerance of  $\pm 8\%$ \*, using standards obtained from Kelsall Permeameter Cup measurements and a precision series inductance bridge.

Except where noted on specific part numbers, MPP and High Flux Cores are graded into 2% inductance bands as a standard practice at no additional charge. Grading into 1% bands is available on certain sizes by special request. Core grading minimizes winding adjustments, and thus reduces coil costs. When 1% bands are required, the wound cores must be processed for inductance stability (see Page 1-8).

Graded MAGNETICS MPP and High Flux cores are also available with tolerances less than the standard  $\pm 8\%$ . Please contact the plant for special pricing.

\* Kool  $\mu$  cores with outside diameters less than 12mm have wider tolerances.

GRADE Stamped on Core OD	INDUCTANCE % Deviation from Nominal		TURNS % Deviation from Nominal	
	From	To	From	To
+8	+8	+7	-4.0	-3.5
+6	+7	+5	-3.5	-2.5
+4	+5	+3	-3.5	-1.5
+2	+3	+1	-0.5	+0.5
+0	+1	-1	-0.5	+0.5
-2	-1	-3	+0.5	+1.5
-4	-3	-5	+1.5	+2.5
-6	-5	-7	+2.5	+3.5
-8	-7	-8	+3.5	+4.0

## Core Finish

MAGNETICS powder cores are coated with a special finish that provides a tough, wax tight, moisture and chemical resistant barrier having excellent dielectric properties. Each material has a unique color coating:

- MPP – Gray
- High Flux – Khaki
- Kool  $\mu$  – Black

The finish is tested for voltage breakdown by inserting the core between two weighted wire mesh pads. Force is adjusted to produce a uniform pressure of 10 psi, simulating winding pressure. The test condition to guarantee the minimum breakdown voltage (500 volts rms from wire to core) is a 60 Hz voltage equal to 2.5 times the minimum (or 1250 volts rms wire to wire). Higher minimum voltage breakdown finishes can be provided upon request.

Cores as large as 0.650" OD can be coated with parylene to minimize the constriction of the inside diameter dimensions. The parylene coating has a minimum breakdown voltage guarantee of 300 volts rms from wire to core (tested at 750 volts rms wire to wire at 60 Hz). All finished dimensions in this catalog are for the color coating. When choosing a parylene coated core, the maximum OD and HT are reduced by 0.18 mm (0.007"), and the minimum ID may be increased by 0.18 mm (0.007").

The maximum steady-state operating temperature for the coating is 200°C. The maximum steady-state operating temperature for the parylene coating is 130°C, but can be used as high as 200°C for short periods, such as during infrared solder reflow. High temperature operation of the cores does not affect the magnetic properties.

# Inductance versus Turns

MAGNETICS inductance standards are measured in a Kelsall Permeameter Cup. Actual wound inductance measured outside a Kelsall Cup is greater than the calculated value due to leakage flux and flux developed by the current in the winding. The difference depends on many variables — core size, permeability, core finish thickness, wire size, and number of turns, in addition to the way in which the windings are put on the core. This difference is negligible for permeabilities above 125 and turns greater than 500. However, the lower the permeability and/or number of turns, the more pronounced this deviation becomes.

The following table is presented as a guide to the differences that may be experienced with various numbers of turns on a 1-inch O.D. 125μ core:

Number of Turns	Actual Inductance
1000	+0.0%
500	+0.5%
300	+1.0%
100	+3.0%
50	+5.0%
25	+8.5%

The following formula can be used to approximate the leakage flux to add to the expected inductance. This formula was developed from historical data of cores tested at MAGNETICS. Be aware that this will only give an approximation based on evenly spaced windings. You may expect as much as a ±50% deviation from this result.

$$L_{LK} = \frac{292 N^{1.065} A_e}{l_e \times 10^5}$$

where :  $L_{LK}$  = leakage inductance (mH)  
 $N$  = number of turns  
 $A_e$  = core cross-section (cm<sup>2</sup>)  
 $l_e$  = core magnetic path length (cm)

# $A_L$ and Inductance Considerations

The inductance of a wound core can be calculated from the core geometry by using the following equation:

$$L = \frac{.4 \pi \mu N^2 A_e}{l_e \times 10^8}$$

where :  $L$  = inductance (Henries)  
 $\mu$  = core permeability  
 $N$  = number of turns  
 $A_e$  = core cross section (cm<sup>2</sup>)  
 $l_e$  = core magnetic path length (cm)

The inductance for a given number of turns is related to the nominal inductance (as listed in the catalog as mH/1000 turns) by the following:

$$L_n = \frac{L_{1000} N^2}{10^6}$$

where :  $L_n$  = inductance for N turns (mH)  
 $L_{1000}$  = nominal inductance (mH/1000 turns)



# Temperature & Linear Stabilization

(Only applies to MPP cores)

MAGNETICS MPP cores are provided in three basic temperature stabilizations; Standard, Controlled, and Linear. Typical and guaranteed inductance limits for these temperature stabilizations are illustrated on the following pages.

Standard cores are offered with three different finishes (2, 5, or 9). Controlled and Linear cores are offered with a 4 and 6 finish, respectively. See page 1-7 for further finish information.

The inductance of MPP cores is affected by temperature changes, which cause variations in the amount of distributed air gap (insulating material). The expansion characteristics of powdered metal, insulating material, and core finish all contribute to the inductance change arising from temperature changes.

The temperature coefficient of inductance can be controlled by the addition of a small percentage of special compensating alloys, which have curie points within the temperature range being controlled. When each curie point is exceeded, these particles become non-magnetic and act as additional air gaps; thus the change in inductance is minimized over a predetermined temperature range. MPP cores can thus be utilized in precision circuits requiring extremely high inductance stability over wide temperature ranges.

MAGNETICS standard cores (-A Stabilization) offer the expected temperature performance shown on page 1-7. If guaranteed temperature performance is necessary, Controlled or Linear cores are recommended. MAGNETICS 550 $\mu$  cores are available only as standard cores.

MAGNETICS MPP cores are offered in three controlled stabilizations, D, W, and M to provide high levels of inductance stability over temperature per the chart listed below. Stabilization is effective only to initial permeability or when cores are driven at low induction (<100 gauss).

MPP cores are also offered with linear temperature characteristics, type L6. Linear cores provide a temperature coefficient, from -55°C to +85°C, which can be matched with a 100ppm polystyrene capacitor to yield extremely stable tuned circuits. Temperature coefficient values are referenced to 25°C.

The temperature stability of MPP cores can be affected by external factors such as moisture, winding stresses and potting compounds. These effects can be minimized by using suitable stability procedures during the coil fabrication process. Please see inductance stability considerations on page 1-8.

STABILIZATION CODE	INDUCTANCE STABILITY LIMITS Below 100 Gauss	INDUCTANCE STABILITY TEMPERATURE RANGE
M*	± 0.25%	-65°C to +125°C
W	± 0.25%	-55°C to +85°C
D	± 0.10%	0°C to +55°C

\* M cores meet the W core limits and may be substituted in place of W.

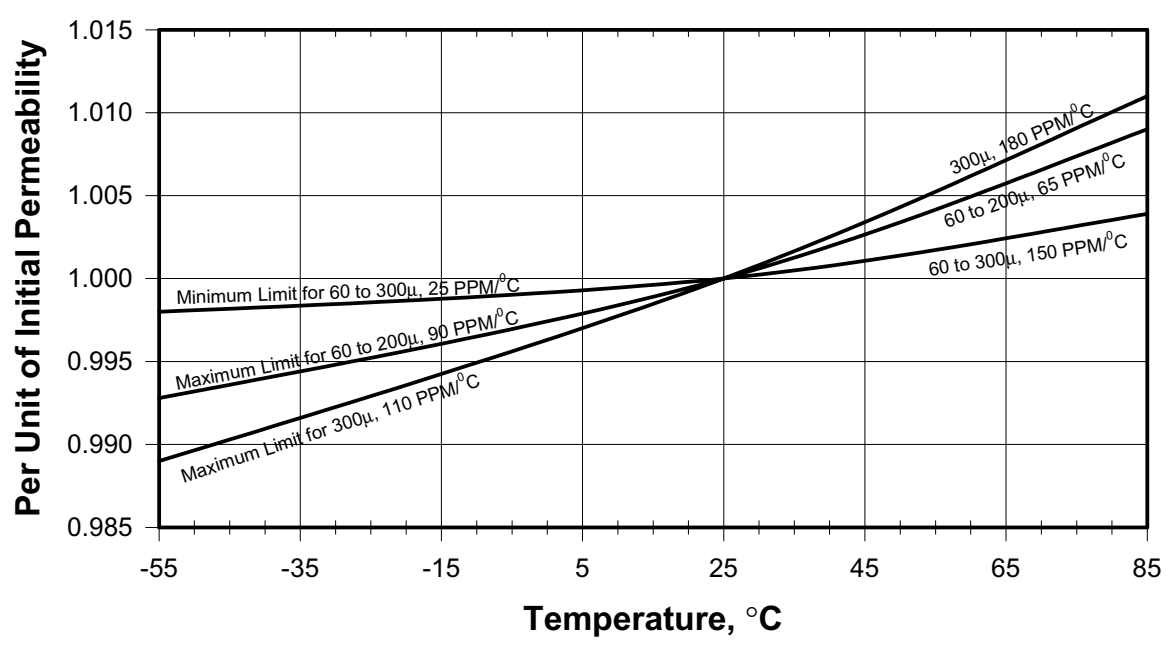
# Temperature and Linear Stabilization

(Only applies to MPP cores)

Part No. Suffix	Stabilization Type	Inductance Stability Limits	Stabilized Temperature Range	Guaranteed Minimum Breakdown*
-A2	Standard	See Page 3-12	-	500 volts**
-AY	Standard	See Page 3-12	-	300 volts
-A5	Standard	See Page 3-12	-	1000 volts
-A9	Standard	See Page 3-12	-	4000 volts***
-D4	Controlled	+0.1%	0°C to +55°C +32°F to 130°F	500 volts
-W4	Controlled	+.25%	-55°C to +85°C -67°F to +185°F	500 volts
-M4	Controlled	+.25%	-65°C to +125°C -85°F to +257°F	500 volts
-L6	Linear	See Below	-55°C to +85°C -67°F to 185°F	500 volts

\*From wire to bare core    \*\*except on cores smaller than .200" OD    \*\*\*Add .015" to OD, HT and subtract .015" from ID to finished core dimensions chart shown on core data pages.

## MPP Linear Cores Guaranteed Limits



# Inductor Stabilization Procedure

(Only applies to MPP cores)

MAGNETICS MPP cores possess excellent inductance/time stability. Under typical shelf life conditions the inductance of an unpotted core will shift less than 0.5%.

If maximum stability is desired, the following precautions and procedures will remove winding stresses and core moisture and provide inductance stabilities better than 0.05%.

1. Wind cores to the approximate specified inductance (slightly over the desired value).
2. Cool wound cores to -60°C. Maintain at temperature for 20 minutes to help relieve winding stresses caused by high winding tension, large wire, or many turns.
3. Heat cores slowly (<2°C/minute) to 115°C. Maintain at temperature for 20 minutes.
4. Steps 2 and 3 should be repeated twice.
5. Bake at 115°C for 16 hours.
6. Cool to room temperature and adjust turns to obtain specified inductance.
7. Cores must be kept dry until potted or hermetically sealed.
8. If the cores are to be potted, they should be covered first with a cushioning material, such as silicone rubber. This material minimizes the possibility of the potting compound stressing the core and changing the inductance value.
9. Potting compounds should be chosen with care, as even semi-flexible resins can cause core stresses and reduce stability. Selection should be based on minimum shrinkage and minimum moisture absorption.

## Winding Considerations

### Winding Factors

MAGNETICS core winding factors can vary from 20% to 60%, a typical value in many applications being 40%.

MAGNETICS has chosen to normalize winding data by basing  $R_{dc}$ , ohm/mh, and winding-turn-length on unity winding factor. This approach provides the coil designer with a means of calculating realistic design parameters for his choice of winding factor.

Please note that unity values are theoretical values, not attainable in practice. The highest winding factor possible, even with hand winding, is 65% - 75%, due to the spacing between the turns of wire.

### Winding Turn Length

Winding turn lengths have been computed, using empirical relationships, for five winding factors. This permits an estimate of the actual length/turn for any winding factor.

### Wound Coil Dimensions

Wound coil dimensions are listed for unity winding factor, as these are the largest dimensions necessary for packaging the wound coil. These dimensions are attainable, as a 70% winding factor (no residual hole) yields the same overall coil dimensions as a 100% (unity) winding factor (no interstices).

Coil dimensions for coils wound to 40% winding factor can be estimated as follows:

$$OD_{40\%} = .5 (OD_{core} + OD_{unity})$$

where :  $OD_{core}$  = core OD after finish

$OD_{unity}$  = wound coil OD

$$Hgt_{40\%} = .45 (Hgt_{core} + Hgt_{unity})$$

where :  $Hgt_{core}$  = core OD after finish

$Hgt_{unity}$  = wound coil OD

# Nominal DC Resistance

Nominal DC Resistance, in ohms/millihenry (listed on core size pages), is useful in calculating DC winding resistance ( $R_{dc}$ ) for any value of inductance. The value of nominal DC Resistance is essentially independent of wire size and the number of turns of wire. The value of Nominal DC Resistance for any given winding factor can be computed as follows:

$$\Omega/mh_{wf} = \frac{\Omega/mh_u}{wf} \times \frac{K_{wf}}{K_u}$$

where :  $\Omega/mh_{wf}$  =  $\Omega/mh$  for chosen winding factor  
 $\Omega/mh_u$  = unity value, listed for each core size  
 $wf$  = chosen winding factor  
 $K_{wf}$  = length/turn for chosen wf\*  
 $K_u$  = length/turn for unity (100%) wf\*  
 \*see "Winding Turn Length" on core size pages

The value of  $R_{dc}$  for any given winding factor can be computed as follows:

$$R_{dcwf} = R_{dcu} \times wf \times \frac{K_{wf}}{K_u}$$

where :  $R_{dcwf}$  =  $R_{dc}$  for chosen winding factor  
 $R_{dcu}$  = unity value, listed for each size (ohms)  
 $wf$  = chosen winding factor  
 $K_{wf}$  = length/turn for chosen wf\*  
 $K_u$  = length/turn for unity (100%) wf\*

## Sample Calculation

Using a 55930 core, we can calculate the value of  $R_{dc}$  for 50 mh and 40% winding factors as follows, using parameter values listed on page 4-19:

$$\Omega/mh_{40\%} = \frac{\Omega/mh_u}{wf} \times \frac{K_{40\%}}{K_u} = \frac{.0524}{.40} \times \frac{.1344}{.1714} = .103 \Omega/mh$$

The value of ohms/mh yields a value of  $R_{dc}$  at 50 mh, of 5.1 ohms (50mh x .103)

The value  $R_{dc}$  for the 55930 core can also be obtained by noting the unity values for No. 28 wire (i.e. 1400 turns and 15.67 ohms) can be converted to 40% winding factor values as follows:

$$\begin{aligned} N_{40\%} &= N_{unity} \times wf \\ &= 1400 \times .40 \\ &= 560 \text{ turns} \end{aligned}$$

$$\begin{aligned} R_{dc40\%} &= R_{dcu} \times wf \times \frac{K_{40\%}}{K_u} \\ &= 15.67 \times .40 \times \frac{.1344}{.1714} \\ &= 4.9 \text{ ohms} \end{aligned}$$

# Core Selector Charts

The core selector charts will quickly yield optimum permeability and smallest core size for dc bias applications. These charts are based on a permeability reduction of not more than 50% with dc bias, typical winding factors of 25% to 40%, and an ac current, which is small relative to the dc current. These charts are based on the minimum inductance tolerance of the chosen core size and permeability.

If a core is being chosen for use with a large ac current relative to any dc current, such as a flyback inductor or

buck/boost inductor, select a core that is one or two sizes larger than indicated by the selector charts. This will assist in reducing the operating flux density of the ac current that generates core loss.

For additional power handling capability,  $LI^2$ , multiple stacking of cores will yield an equivalent multiple power handling for a given core size. For example, double stacking of the 55908-A2 core will result in a doubling of its power handling capability to about 1000 mH-amperes<sup>2</sup>.

## Core Selection Procedure

Only two parameters of the design application must be known: inductance required with dc bias and the dc current. Use the following procedure to determine the core size and number of turns.

1. Compute the product of  $LI^2$  where:  
 $L$  = inductance required with dc bias (millihenrys)  
 $I$  = dc current (amperes)
2. Locate the  $LI^2$  value on the Core Selector Chart (page 2-3 & 2-4). Follow this coordinate to the intersection with the first core size that lies above the diagonal permeability line. (Small core sizes are at the bottom; large core sizes are at the top.) This is the smallest core size that can be used.
3. The permeability line is sectioned into standard available core permeabilities. Selecting the permeability indicated will yield the smallest core that can be used. Lower or higher permeabilities can be used, but the resulting core size will be larger.
4. Inductance, core size, and permeability are now known. Calculate the number of turns by using the following procedure:
  - (a) The nominal inductance ( $AL$  in mH / 1000 turns) for the core is obtained from the core data sheet. Determine the minimum nominal inductance by using the worst case negative tolerance (-8%, -12%, or -15%, depending on the core size). With this information, calculate the number of turns needed to obtain the required inductance (see  $A_L$  and Inductance Considerations, page 1-5).
  - (b) Calculate the bias in oersteds from:  
 $H = 0.4\pi NI/l_e$
  - (c) From the Permeability vs. DC Bias curves (page 3-15, 3-16, 4-33, & 4-35), determine the rolloff in per unit of initial permeability ( $\mu_p$ ) for the previously calculated bias level.
  - (d) Increase the number of turns by dividing the initial number of turns (from step 4a) by the per unit value of initial permeability. This will yield an inductance close to the required value. A final adjustment of turns may be necessary if a specific inductance is required.
5. Choose the correct wire size using the Wire Table (page 3-21). Duty cycles below 100% allow smaller wire sizes and lower winding factors, but do not allow smaller core sizes.
6. The core chosen will have an inductance equal to or greater than that required when biased with the specified dc current. The resulting winding factor will be between 25% and 45%.



# Core Selection Example and Analysis

Choose a core with the following requirements:

- (a) minimum inductance with dc bias of 1.0 mH
- (b) dc current of 3.0 amperes

1. The product of  $LI^2 = 1.0 \times 3.0^2 = 9.00$
2. This coordinate passes through the  $60\mu$  section of the permeability line and, proceeding upwards, intersects the horizontal 55586 core line. The part number for a  $60\mu$  core of this size is 55586-A2.
3. The 55586 core data sheet shows the nominal inductance of this core to be 38 mH / 1000 turns,  $\pm 8\%$ . Therefore, the minimum inductance of this core is 34.96 mH / 1000 turns.
4. The number of turns needed to obtain 1.0 mH is 169.1 turns. The magnetizing force (dc bias) is 71.2 oersteds, yielding 68% of initial permeability. The adjusted turns are 249.
5. The wire table indicates that #20 wire is needed for 3.0 amperes. Therefore, a 55586-A2 core with 249 turns of #20 wire will meet the requirements.

An analysis of the preceding result yields the following:

1. Calculate the dc bias level in oersteds:  
 $H = 0.4\pi NI/le = 104.9$  oersteds
2. The permeability versus DC Bias curve shows a 48% initial permeability at 104.9 oersteds for  $60\mu$  material.
3. Multiply the minimum  $A_L$  34.96 mH by 0.48 yields 16.78 mH.
4. The inductance of this core with 249 turns and with 104.9 oersteds of dc bias will be 1.04 mH. The minimum inductance requirement of 1.0 mH has been achieved with the dc bias.
5. 249 turns of #20 wire ( $0.00634 \text{ cm}^2$ ) equals  $1.579 \text{ cm}^2$ , which is 39% winding factor on this core (total window area of  $4.01 \text{ cm}^2$ ).

## Temperature Rise Calculations

Temperature rise in a wound core depends on (1) wire resistance and current through the coil ( $P_{cu}$ , copper losses), and (2) core excitation ( $P_{fe}$ , core losses). Total power loss, defined as  $P_{fe} + P_{cu}$  (milliwatts), is in the form of heat and is dissipated from exposed surfaces of a wound core.

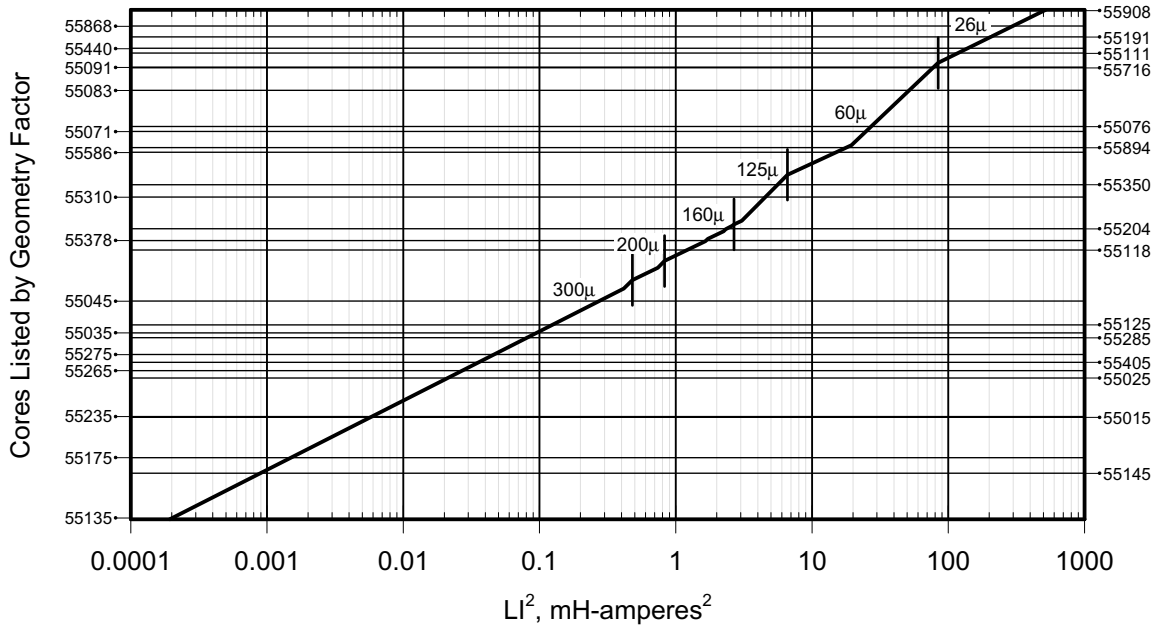
The heat dissipated depends on the total exposed surface of the wound unit. Temperature rise cannot be predicted precisely, but can be approximated by the following formula:

$$\text{Temperature Rise } (^{\circ}\text{C}) = \left[ \frac{\text{Total Power Loss (milliwatts)}}{\text{Surface Area (cm}^2\text{)}} \right]^{.833}$$

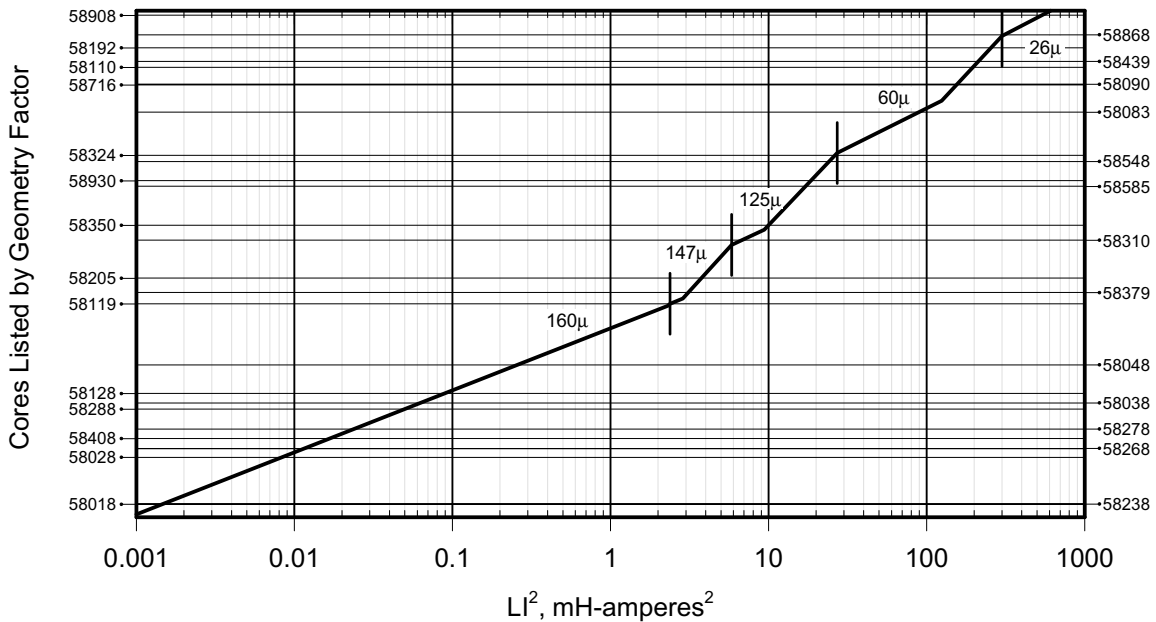
In this catalog, surface area is presented in two ways:

1. Unwound core (after insulation is added)
2. Wound core, assuming 40% winding factor

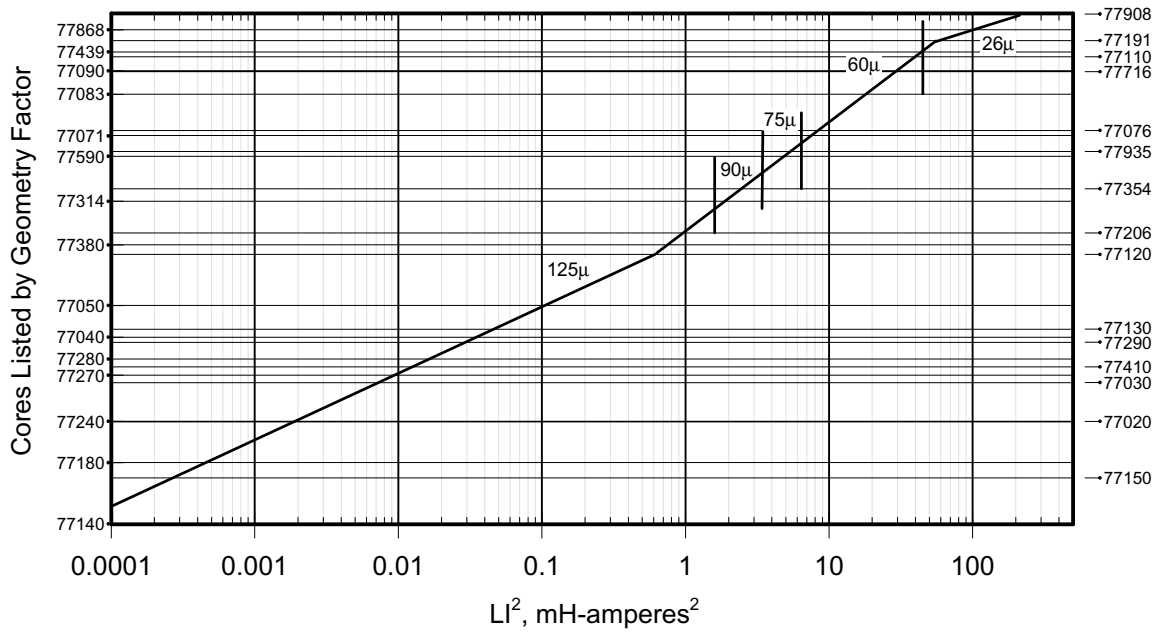
# MPP Core Selector Chart



# High Flux Core Selector Chart

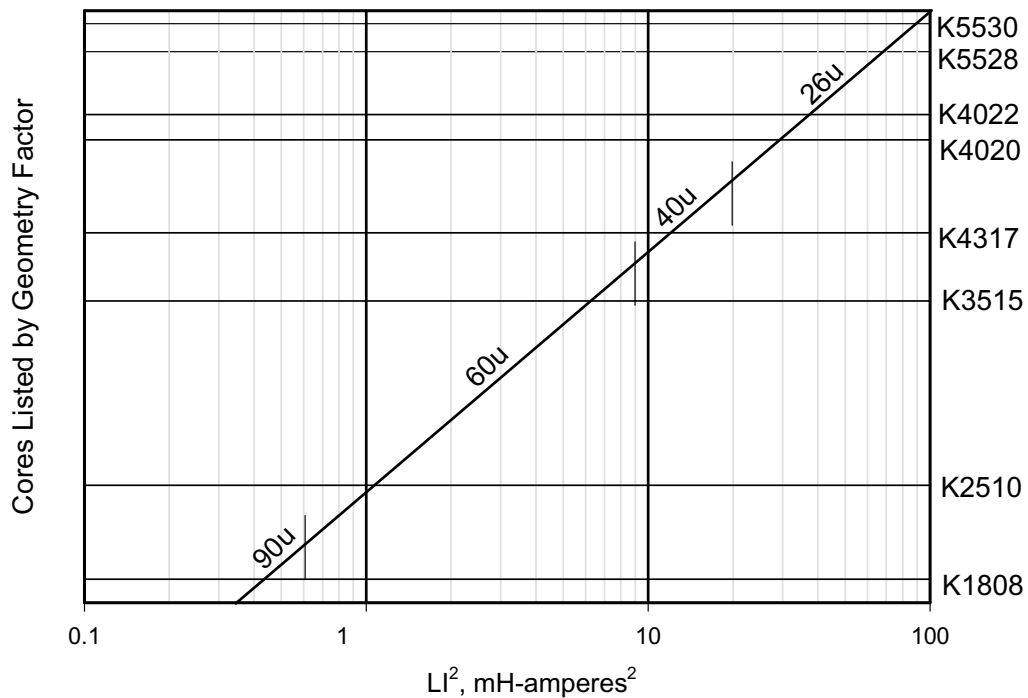


# Kool M $\mu$ <sup>®</sup> Core Selector Chart



Core Selection

# Kool M $\mu$ <sup>®</sup> E Core Selector Chart



# Material Properties

	PERMEABILITY VS. T, B, & F - TYPICAL			
	Permeability ( $\mu$ )	$\mu$ vs. T dynamic range (-50° C to +100° C) Painted cores usable to 200° C	$\mu$ vs. B dynamic range 50 to 4000gauss (peak at 1000 gauss)	$\mu$ vs. F. flat to...
<b>MPP Cores</b>	14 $\mu$	0.6%	+0.4%	9 MHz
	26 $\mu$	0.6%	+0.4%	5 MHz
	60 $\mu$	0.6%	+0.8%	2.7 MHz
	125 $\mu$	0.6%	+1.4%	1 MHz
	147 $\mu$	0.6%	+1.9%	700 kHz
	160 $\mu$	0.6%	+1.9%	700 kHz
	173 $\mu$	0.6%	+1.9%	700 kHz
	200 $\mu$	0.6%	+2.5%	500 kHz
	300 $\mu$	0.6%	+4.0%	150 kHz
	550 $\mu$	7.0%	+20.0%	90 kHz
<b>High Flux Cores</b>	14 $\mu$	0.8%	+5.0%	8 MHz
	26 $\mu$	1.0%	+9.0%	2.5 MHz
	60 $\mu$	1.4%	+13.5%	1.2 MHz
	125 $\mu$	1.8%	+19.0%	600 kHz
	147 $\mu$	2.5%	+22.5%	400 kHz
	160 $\mu$	2.8%	+25.5%	350 kHz
<b>Kool M<math>\mu</math> Cores</b>	26 $\mu$	4.0%	+1.0%	20 MHz
	60 $\mu$	8.0%	+1.5%	8 MHz
	75 $\mu$	10.0%	+2.0%	3 MHz
	90 $\mu$	12.0%	+3.0%	2 MHz
	125 $\mu$	15.0%	+3.5%	1 MHz

Material properties above only apply to toroids, not THINZ or E cores.

	Curie Temperature	Density	Coefficient of Thermal Expansion	Thermal Conductivity
MPP Cores	460° C	8.7 grams/cm <sup>3</sup>	12.9 x 10 <sup>-6</sup> /° C	0.8 Watts/(cm x °K)
High Flux Cores	500° C	8.2 grams/cm <sup>3</sup>	5.8 x 10 <sup>-6</sup> /° C	0.8 Watts/(cm x °K)
Kool M $\mu$ Cores	500° C	7.0 grams/cm <sup>3</sup>	10.8 x 10 <sup>-6</sup> /° C	0.8 Watts/(cm x °K)

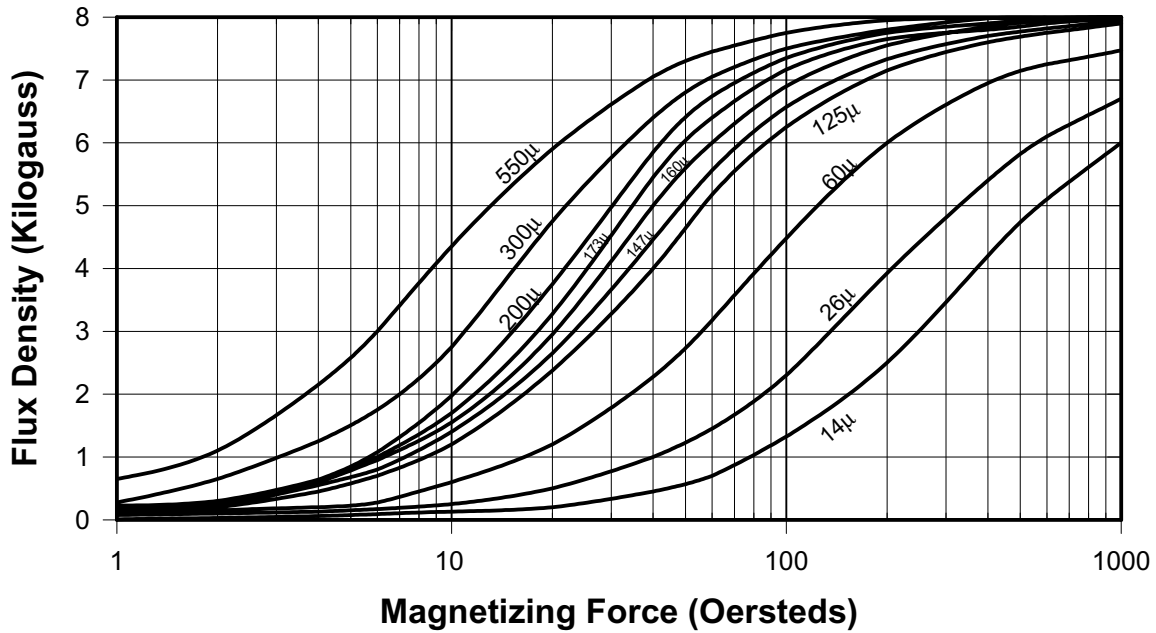
# Conversion Tables

	Multiply number of	by	to obtain number of
MPP, High Flux, Kool M $\mu$	oersteds	.795	amp-turns / cm
MPP, High Flux, Kool M $\mu$	gauss	.0001	tesla
MPP, High Flux, Kool M $\mu$	in <sup>2</sup>	6.425	cm <sup>2</sup>
MPP, High Flux, Kool M $\mu$	circular mils	5.07 x 10 <sup>-6</sup>	cm <sup>2</sup>
MPP	watts / lb.	19.17	mWatts / cm <sup>3</sup>
High Flux	watts / lb.	18.07	mWatts / cm <sup>3</sup>
Kool Mu	watts / lb.	15.42	mWatts / cm <sup>3</sup>

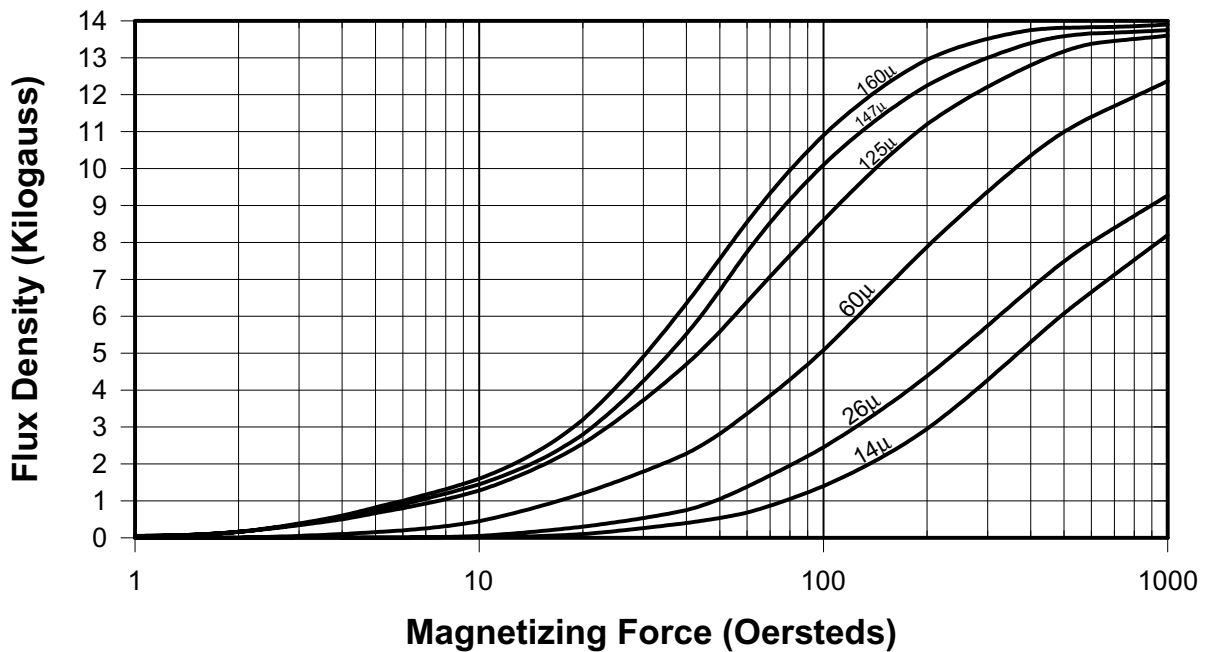
Core weights listed in this catalog are for 125 $\mu$  cores. To determine weights for other permeabilities, multiply the 125 $\mu$  weight by the following factors:

Permeability	14 $\mu$	26 $\mu$	60 $\mu$	75 $\mu$	90 $\mu$	125 $\mu$	147 $\mu$ 160 $\mu$ 173 $\mu$	200 $\mu$ 300 $\mu$	550 $\mu$
x Factor	0.80	0.86	0.94	0.96	0.97	1.00	1.02	1.03	1.04

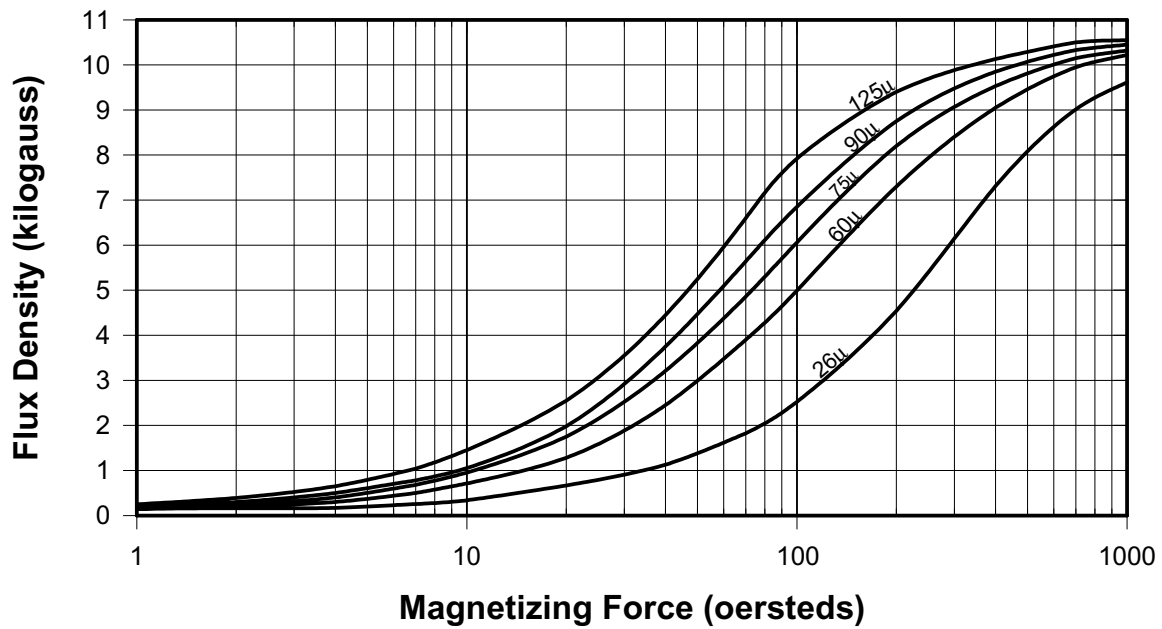
# Normal Magnetization Curves, MPP



# Normal Magnetization Curves, High Flux



# Normal Magnetization Curves, Kool M $\mu$ <sup>®</sup>



## Normal Magnetization Curve Fit Formula

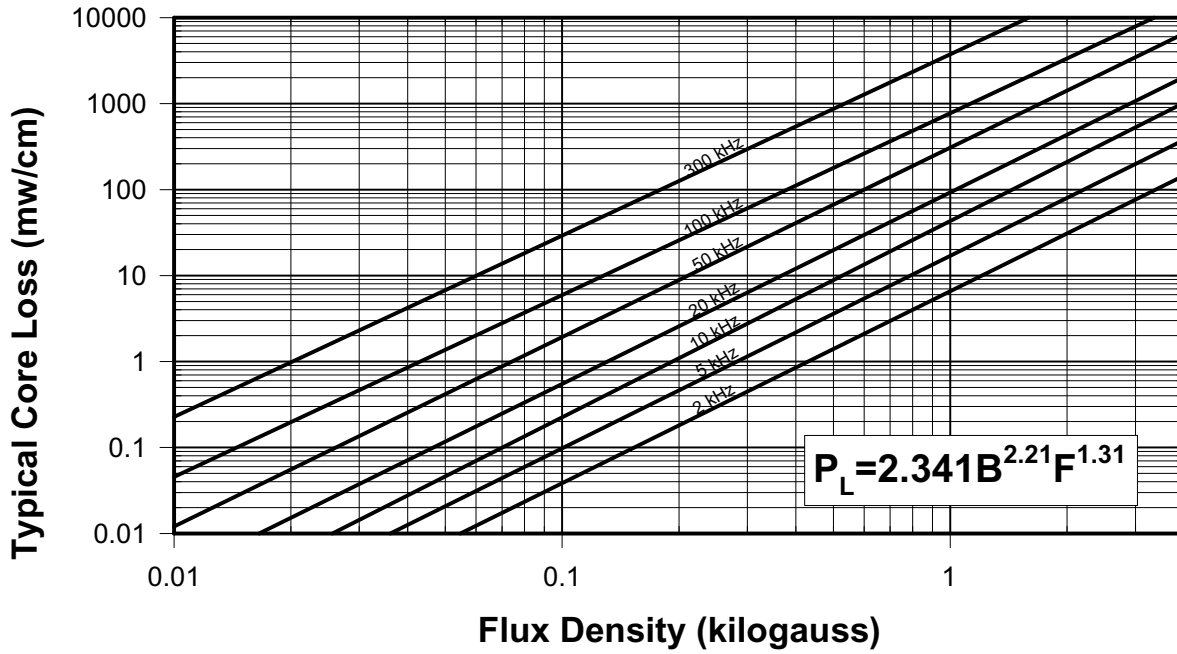
(refer to curves for units)

$$B = \left[ \frac{a + bH + cH^2}{a + dH + eH^2} \right]^x$$

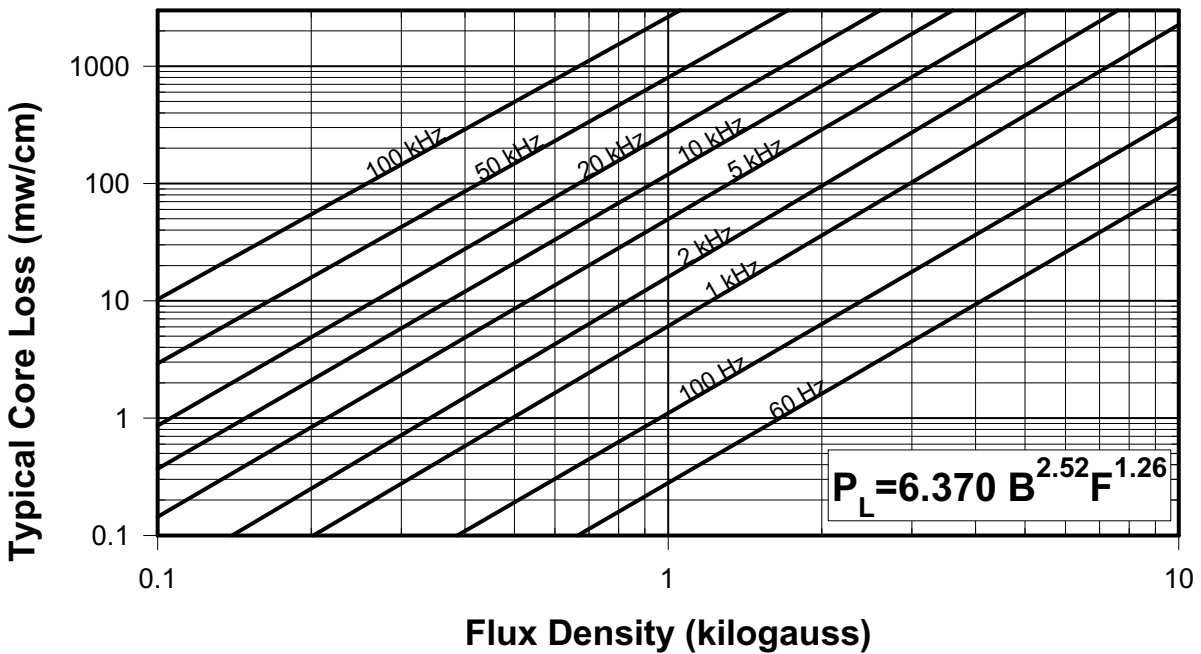
where:

		a	b	c	d	e	x
<b>MPP</b>	14 $\mu$	-23.740	1.654E1	9.249E-1	6.189E1	3.158E-1	2
	26 $\mu$	0.2112	2.780E-2	-2.274E-5	8.849E-3	-7.810E-6	2
	60 $\mu$	0.2576	5.900E-2	1.208E-4	1.970E-2	4.780E-5	2
	125 $\mu$	0.0642	-4.990E-2	2.060E-2	7.879E-3	3.398E-4	0.5
	147 $\mu$	0.0653	-5.810E-2	2.860E-2	1.260E-2	4.533E-4	0.5
	160 $\mu$	0.0447	-4.440E-2	3.300E-2	7.975E-3	5.170E-4	0.5
	173 $\mu$	0.0545	-6.140E-2	4.120E-2	5.471E-3	6.450E-4	0.5
	200 $\mu$	0.1001	-1.154E-1	5.780E-2	4.820E-3	9.043E-4	0.5
	300 $\mu$	0.0940	-1.228E-1	1.260E-1	1.910E-2	1.946E-3	0.5
	550 $\mu$	0.0730	-1.201E-1	4.105E-1	5.070E-2	6.290E-3	0.5
<b>High Flux</b>	14 $\mu$	-1.880E-1	2.190E-2	7.255E-4	4.210E-2	2.200E-4	2
	26 $\mu$	-1.286E-1	4.120E-2	7.493E-4	4.230E-2	2.161E-4	2
	60 $\mu$	-5.360E-1	3.058E-1	2.430E-2	5.521E-4	6.434E-3	2
	125 $\mu$	5.320E-2	-5.420E-2	2.220E-2	8.372E-3	1.073E-4	0.5
	147 $\mu$	7.740E-2	-7.760E-2	2.700E-2	1.565E-3	1.403E-4	0.5
	160 $\mu$	2.670E-2	-4.230E-2	2.980E-2	1.763E-3	1.556E-4	0.5
<b>Kool M<math>\mu</math></b>	26 $\mu$	5.868E-3	7.450E-3	5.706E-4	-2.930E-4	5.539E-6	0.5
	60 $\mu$	1.658E-2	1.831E-3	4.621E-3	4.700E-3	3.833E-5	0.5
	75 $\mu$	1.433E-2	7.738E-3	8.376E-3	5.773E-3	7.159E-5	0.5
	90 $\mu$	5.660E-2	-9.675E-3	1.250E-2	5.792E-3	1.075E-4	0.5
	125 $\mu$	7.808E-3	4.049E-2	1.643E-2	3.121E-3	1.447E-4	0.5

# Core Loss Density Curves, MPP 14 $\mu$

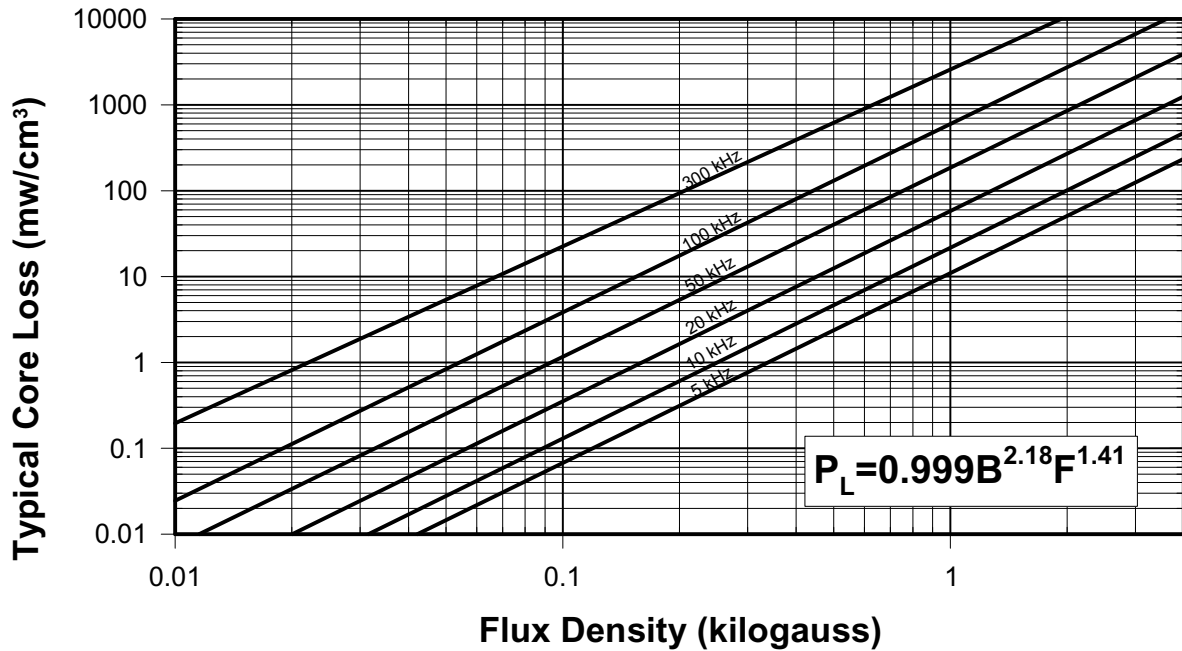


# Core Loss Density Curves, High Flux 14 $\mu$

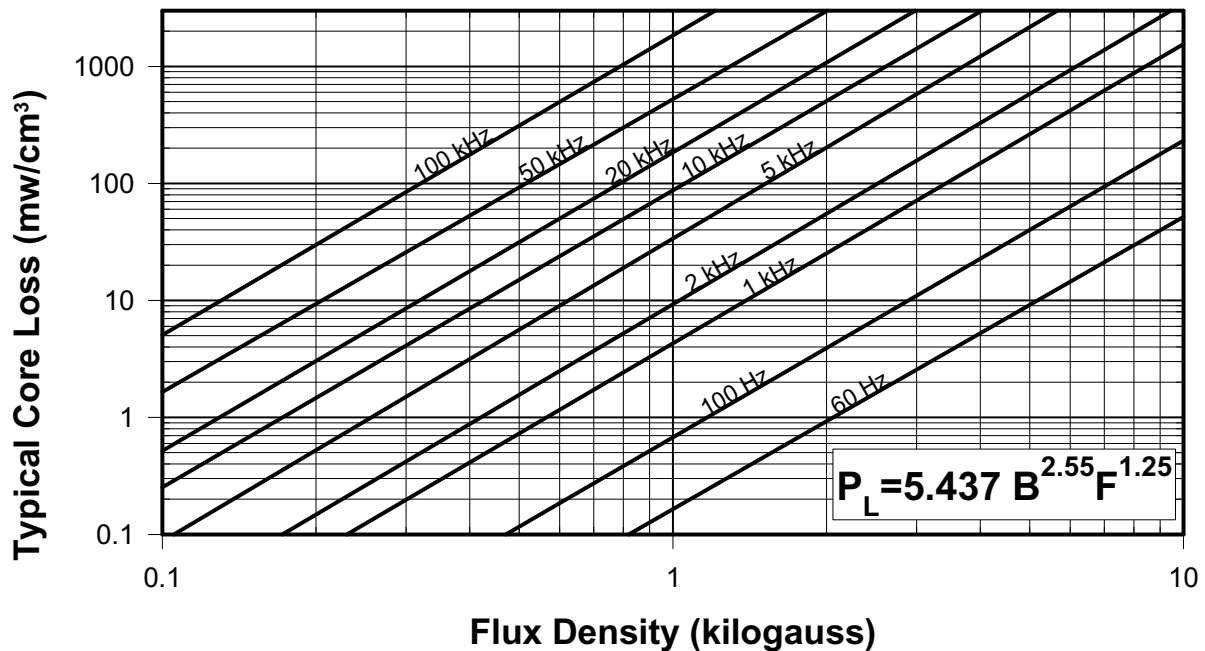




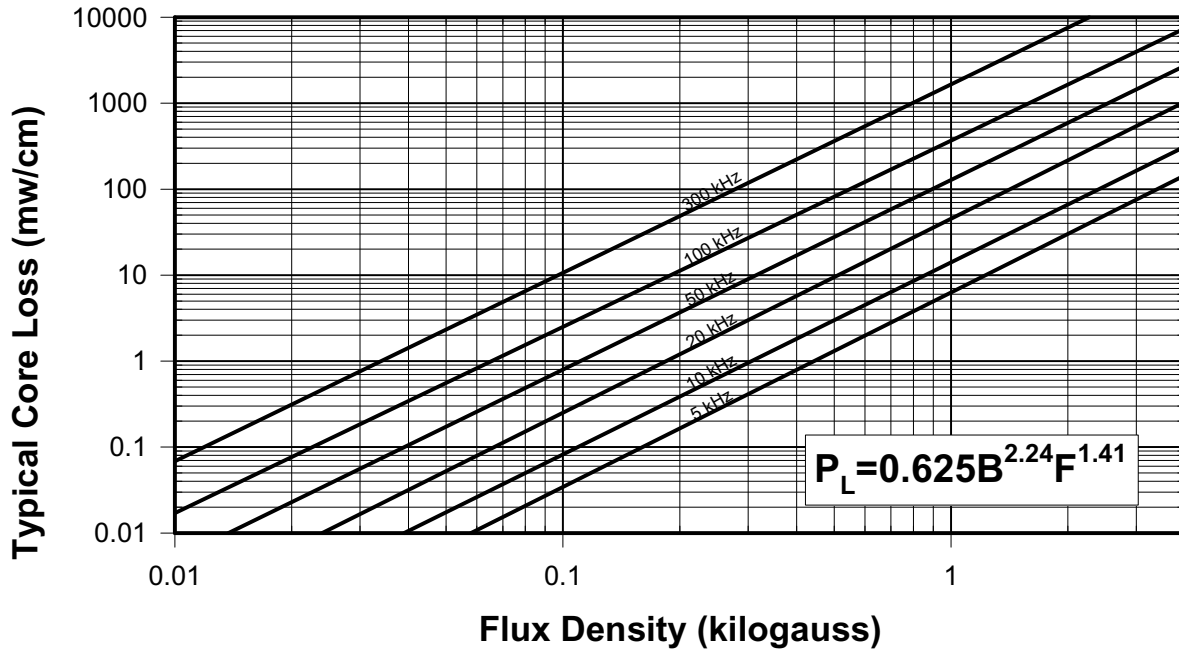
# Core Loss Density Curves, MPP 26 $\mu$



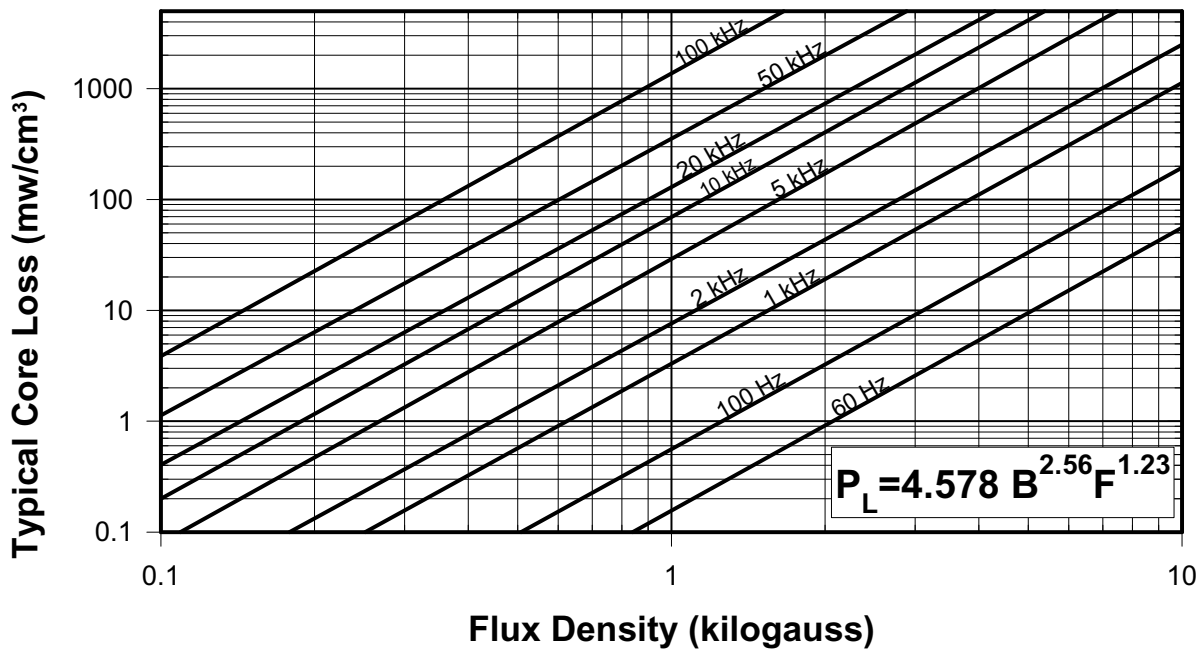
# Core Loss Density Curves, High Flux 26 $\mu$



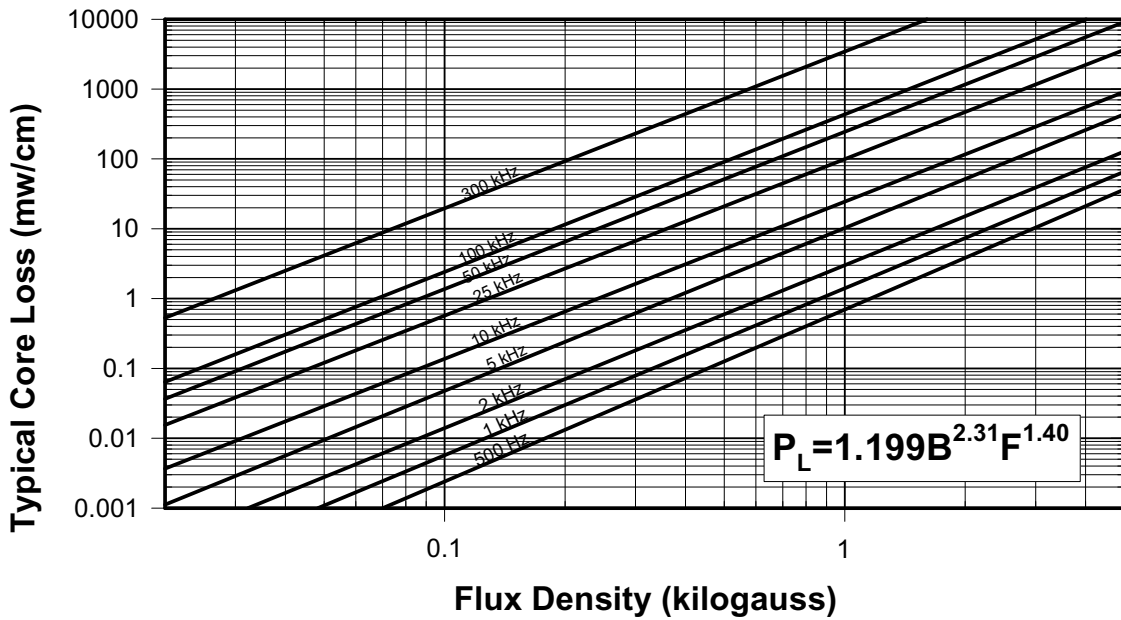
# Core Loss Density Curves, MPP 60μ



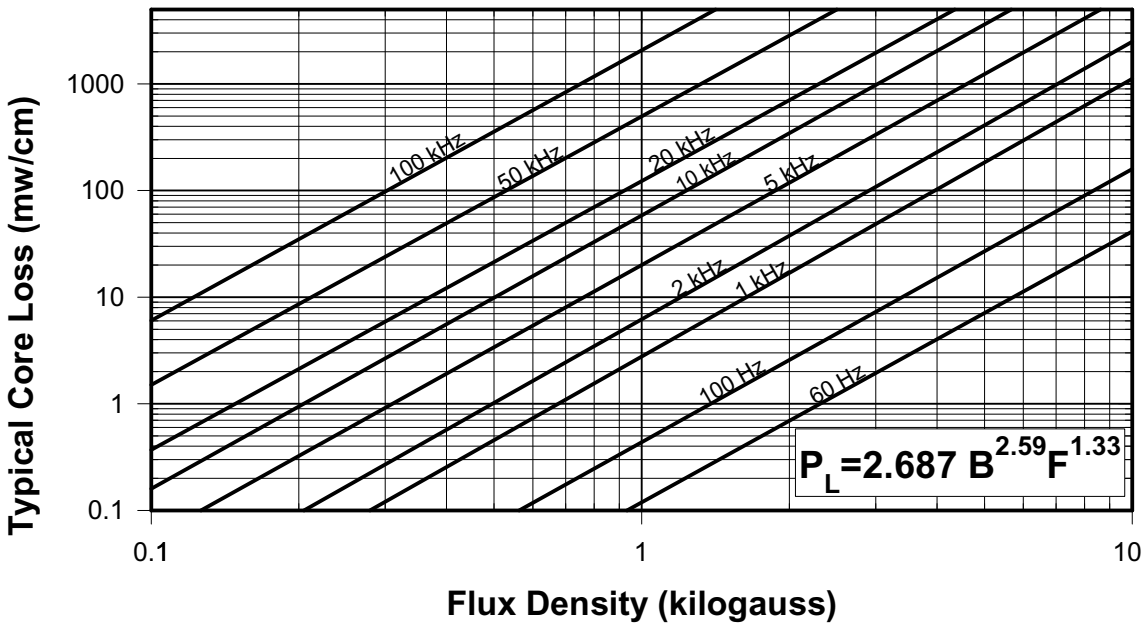
# Core Loss Density Curves, High Flux 60μ



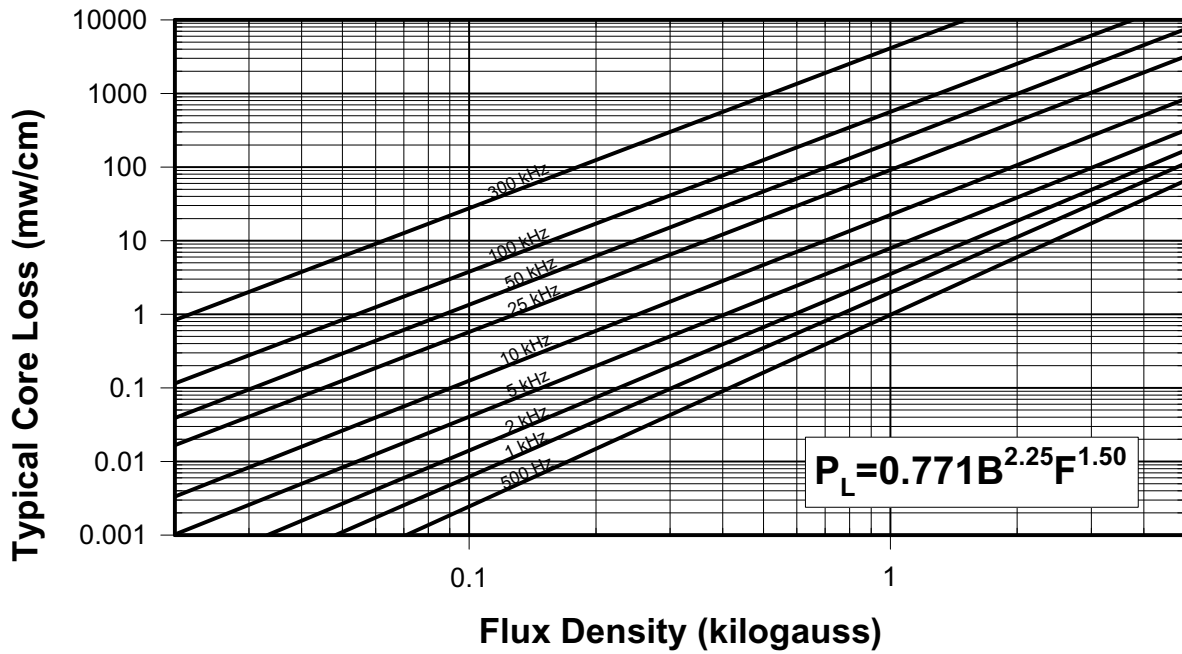
# Core Loss Density Curves, MPP 125 $\mu$



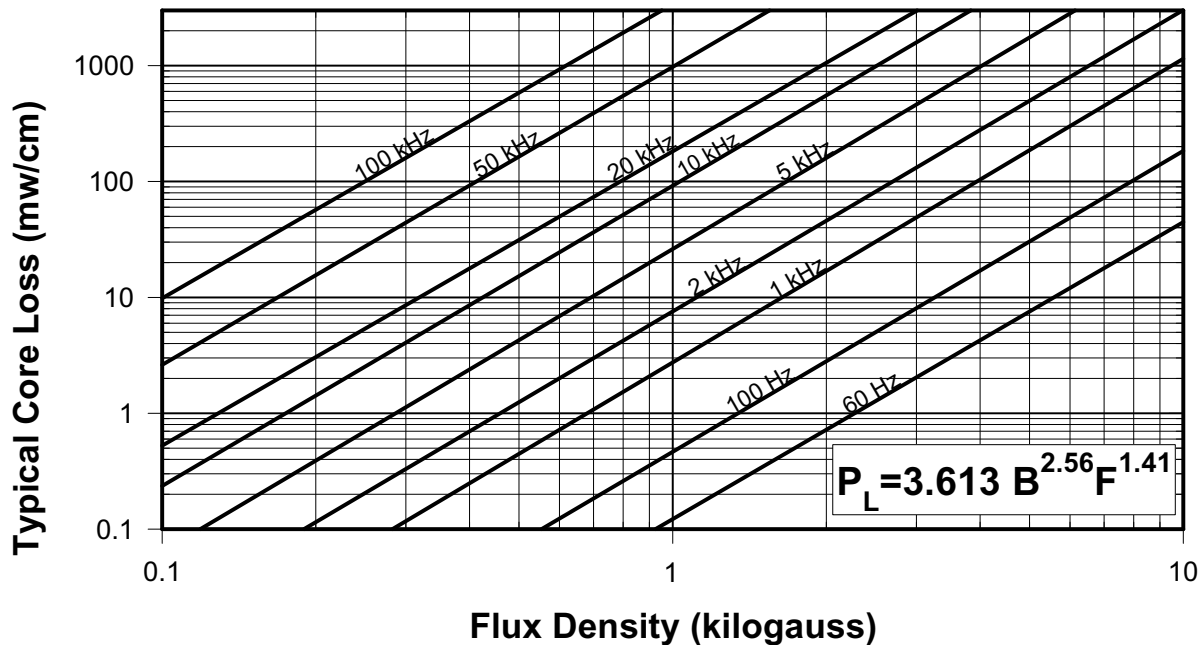
# Core Loss Density Curves, High Flux 125 $\mu$



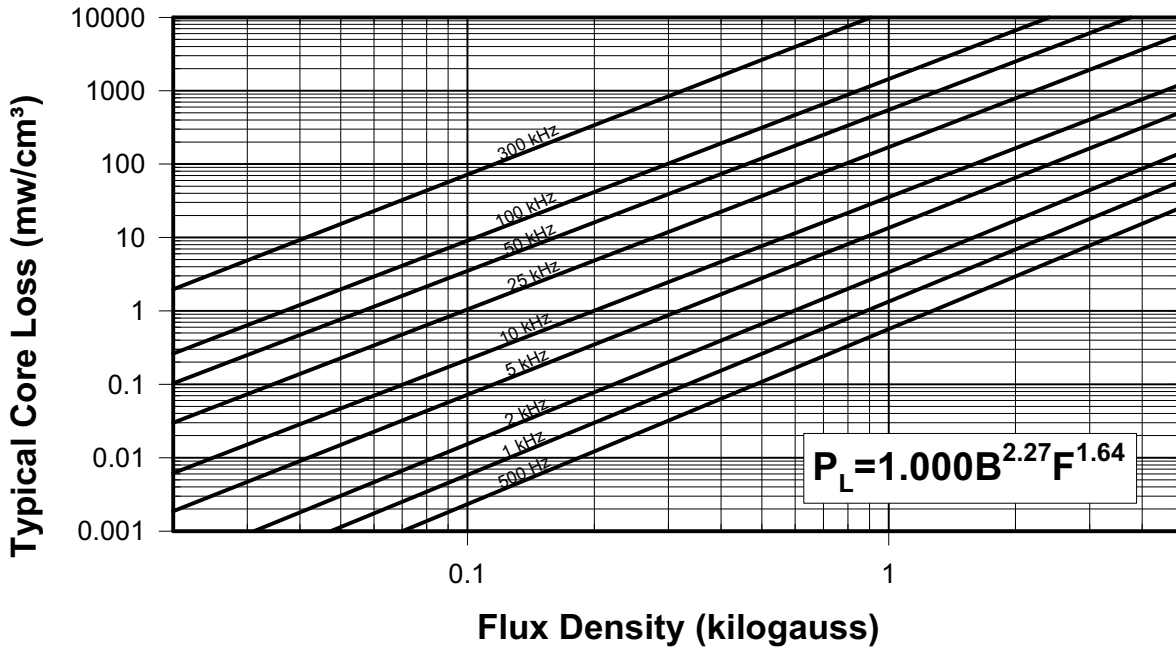
# Core Loss Density Curves, MPP 147μ/160μ/173μ



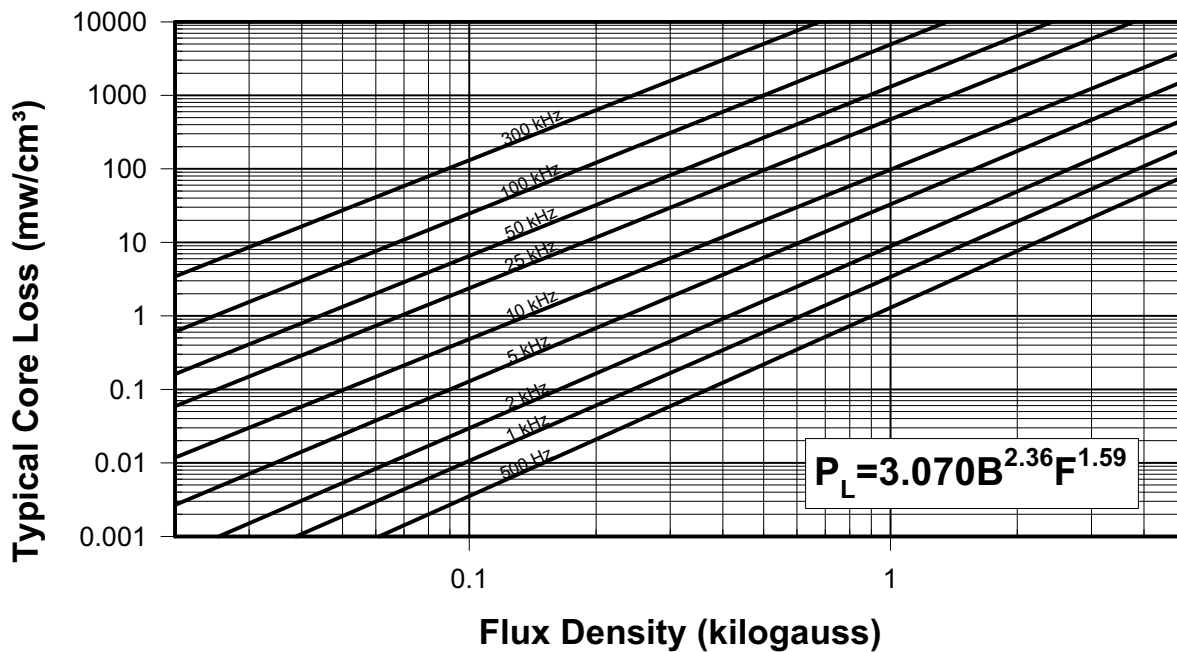
# Core Loss Density Curves, High Flux 147μ/160μ



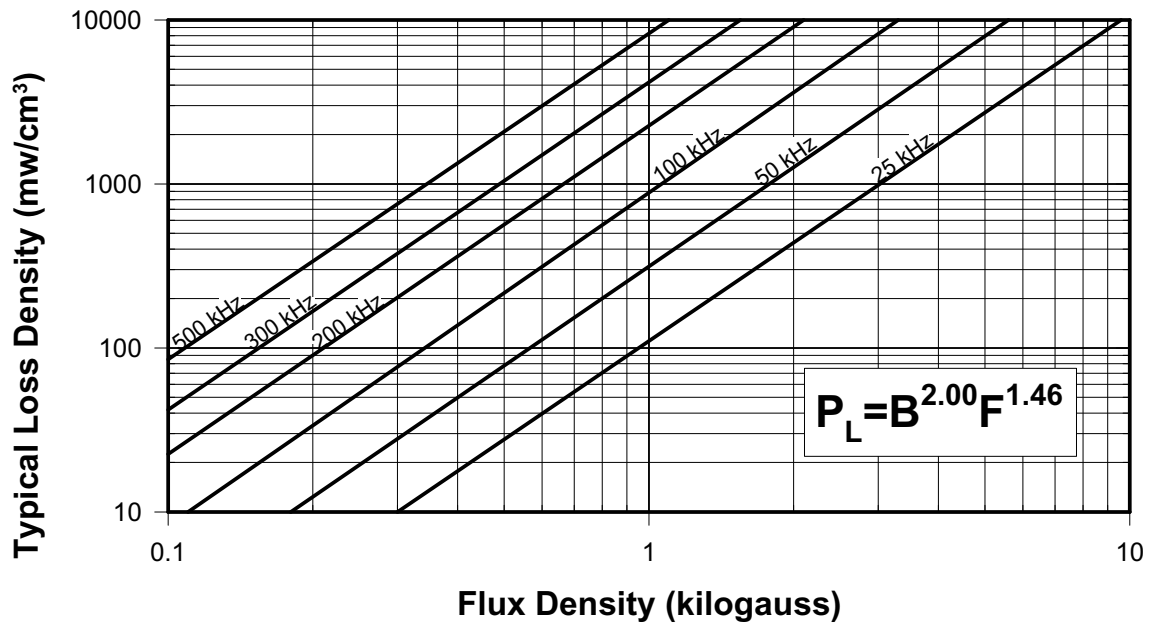
# Core Loss Density Curves, MPP 200μ/300μ



# Core Loss Density Curves, MPP 550μ

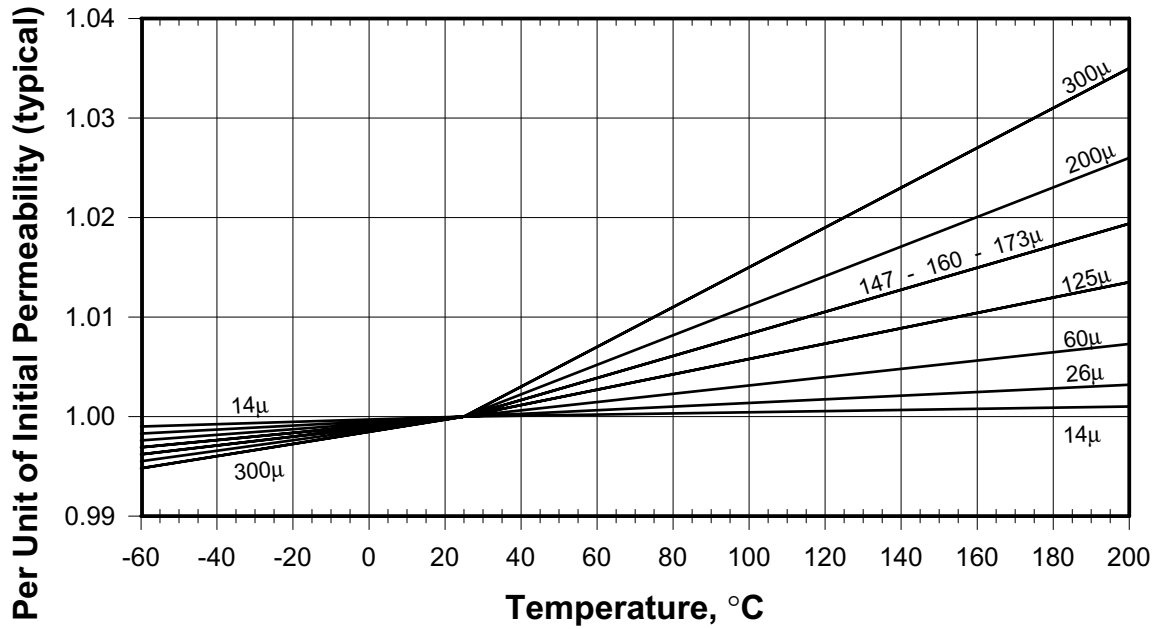


# Core Loss Density Curves, Kool M $\mu$ <sup>®</sup>



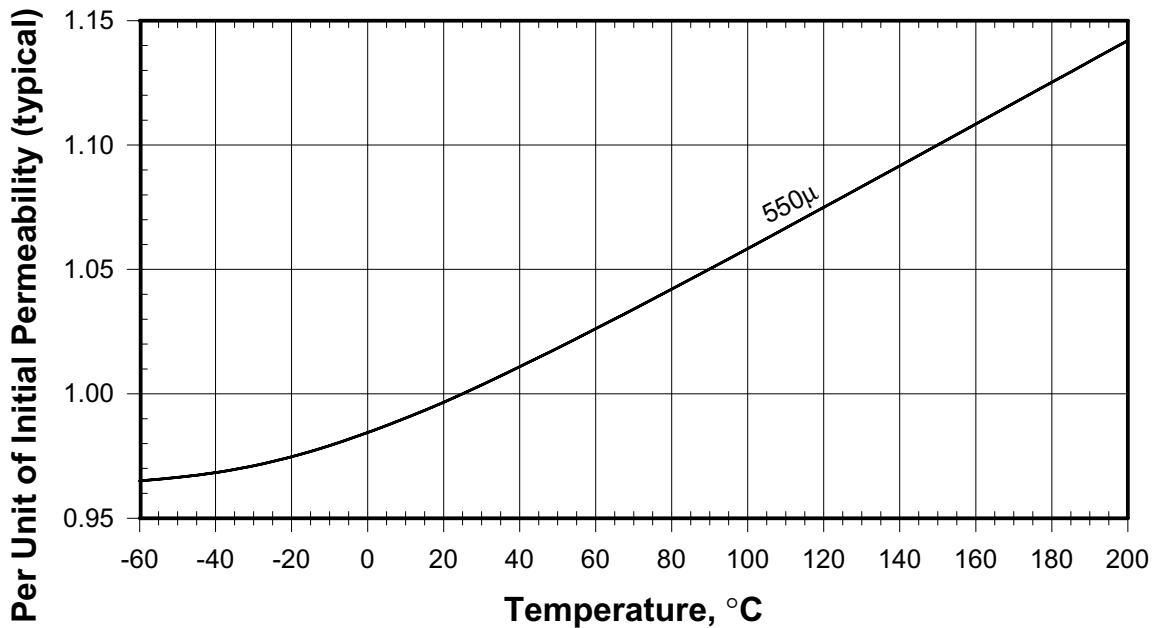
Unlike MPP and High Flux, the typical loss density of Kool M $\mu$  does not vary significantly with permeability; therefore, only one material curve is shown.

# Permeability versus Temperature Curves, MPP (A2, AY, A5, A9)



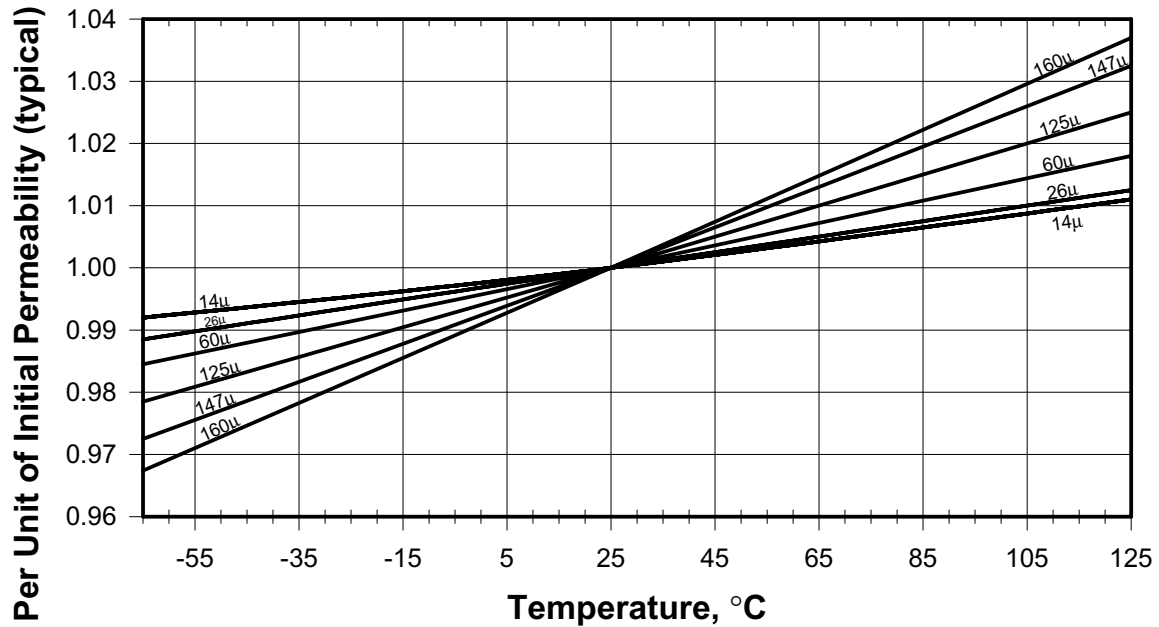
AY coating maximum steady-state operating temperature is 130° C.

# Permeability versus Temperature Curves, MPP (A2, AY, A5, A9)



AY coating maximum steady-state operating temperature is 130° C.

# Permeability versus Temperature Curves, High Flux



## Permeability versus Temperature Curve Fit Formula (refer to curves for units)

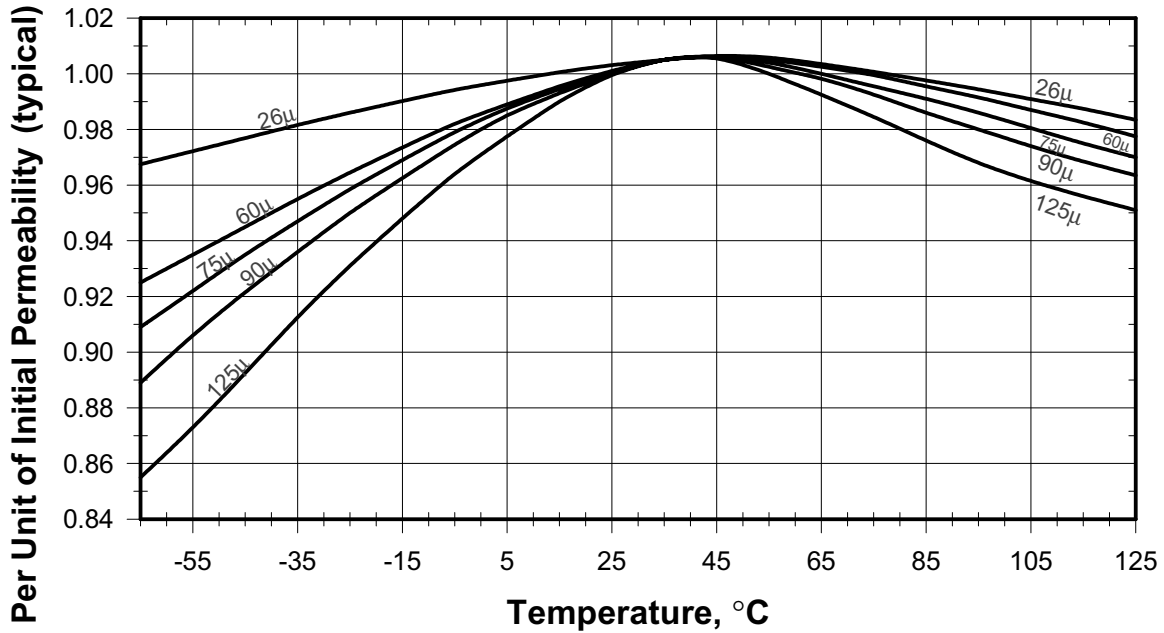
$$\% \Delta \mu = a + bT + cT^2$$

where:

		<b>a</b>	<b>b</b>	<b>c</b>
<b>High Flux</b>	14μ:	0.9975	9.667E-5	5.556E-8
	26μ:	0.9967	1.293E-4	3.802E-8
	60μ:	0.9956	1.739E-4	4.094E-8
	125μ:	0.9940	2.402E-4	3.216E-8
	147μ:	0.9921	3.140E-4	7.310E-8
	160μ:	0.9908	3.674E-4	1.754E-8



# Permeability versus Temperature Curves, Kool M $\mu$



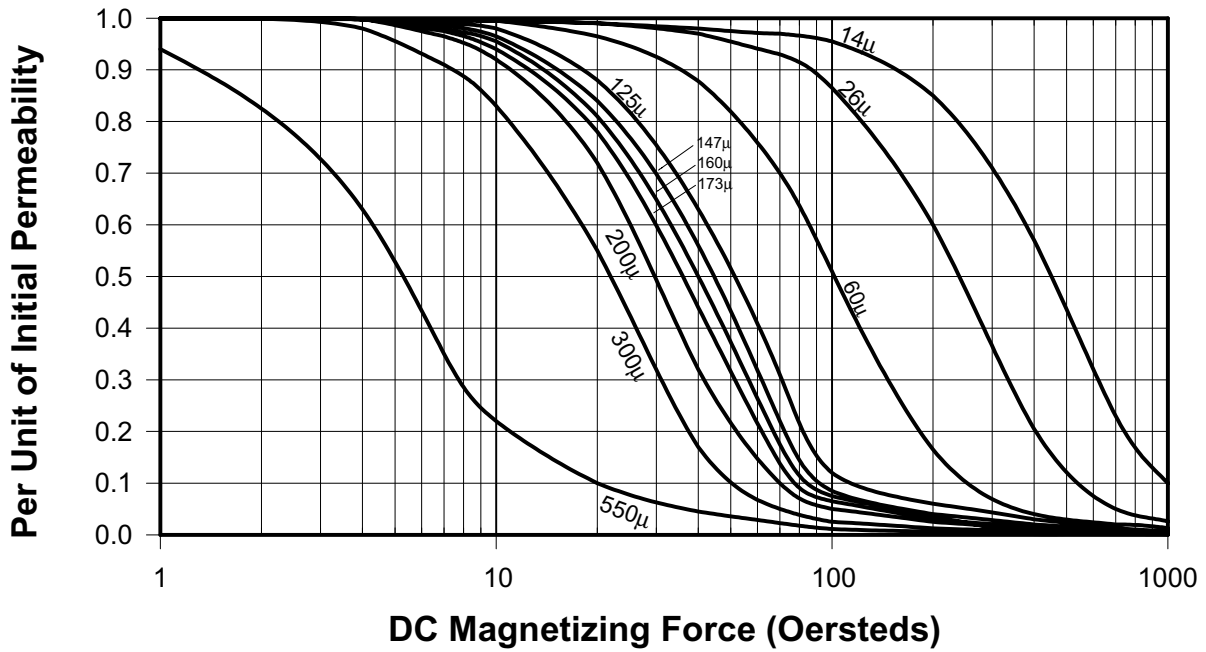
## Permeability versus Temperature Curve Fit Formula (refer to curves for units)

$$\% \Delta \mu = a + bT + cT^2 + dT^3 + eT^4$$

where:

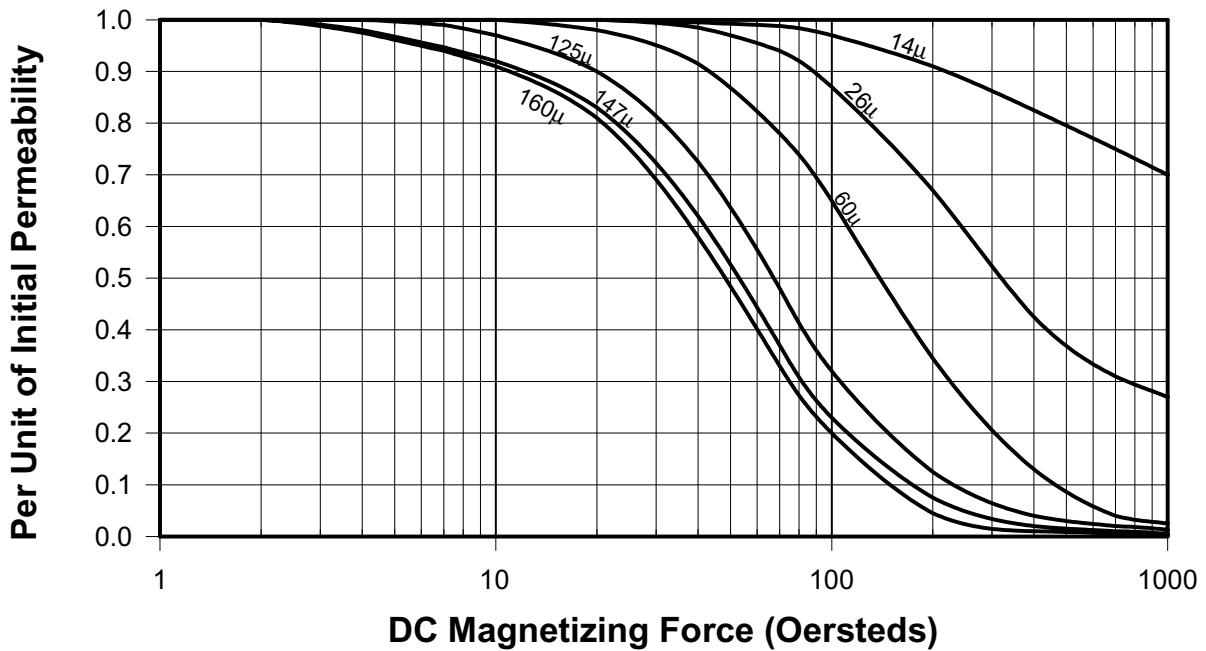
		a	b	c	d	e
<b>Kool M<math>\mu</math></b>	26 $\mu$ :	-0.3676	3.398E-2	-2.976E-4	-1.803E-6	1.079E-8
	60 $\mu$ :	-1.450	7.691E-2	-6.177E-4	-4.263E-6	3.108E-8
	75 $\mu$ :	-1.578	8.729E-2	-8.392E-4	-4.235E-6	3.749E-8
	90 $\mu$ :	-1.854	1.033E-1	-1.063E-3	-4.720E-6	4.539E-8
	125 $\mu$ :	-2.710	1.408E-1	-1.455E-3	-8.167E-6	7.764E-8

# Permeability versus DC Bias Curves, MPP

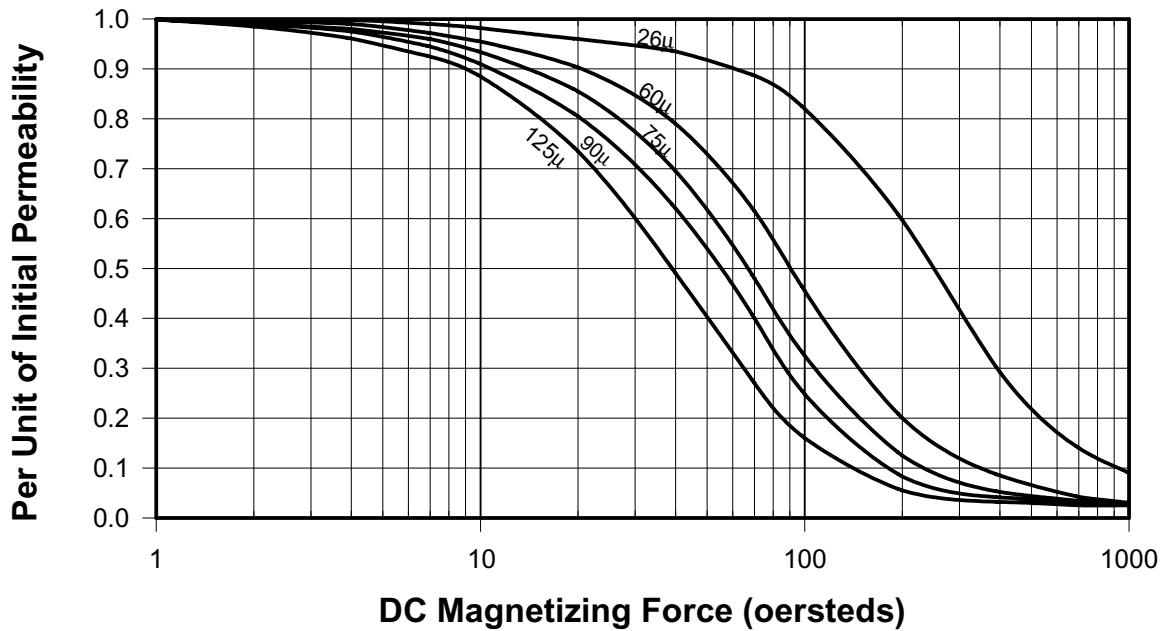


This curve only applies to MPP toroids. The MPP THINZ™ DC Bias curve can be found on page (4-35).

# Permeability versus DC Bias Curves, High Flux



# Permeability versus DC Bias Curves, Kool M $\mu$ <sup>®</sup>



This curve only applies to Kool M $\mu$  toroids. The Kool M $\mu$  E core DC Bias curve can be found on page (4-33).

## Permeability versus DC Bias Curve Fit Formula

(refer to curves for units)

### MPP

$$\mu_{\text{eff}} = \sqrt{\frac{\mu_i^2 - 1.505 \times 10^{-4} \mu_i^3 H + 6.100 \times 10^{-9} \mu_i^4 H^2}{1 - 1.277 \times 10^{-4} \mu_i H + 2.740 \times 10^{-8} \mu_i^2 H^2}}$$

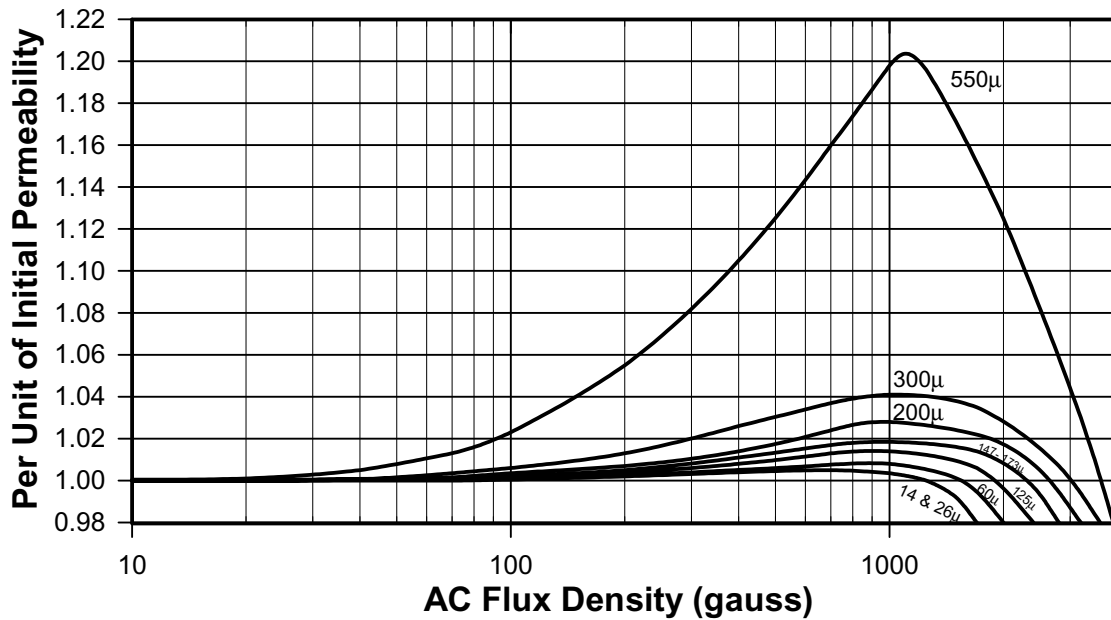
### High Flux

$$\mu_{\text{eff}} = \sqrt{\frac{\mu_i^2 - 6.300 \times 10^{-5} \mu_i^3 H + 1.069 \times 10^{-9} \mu_i^4 H^2}{1 - 4.345 \times 10^{-6} \mu_i H + 1.922 \times 10^{-8} \mu_i^2 H^2}}$$

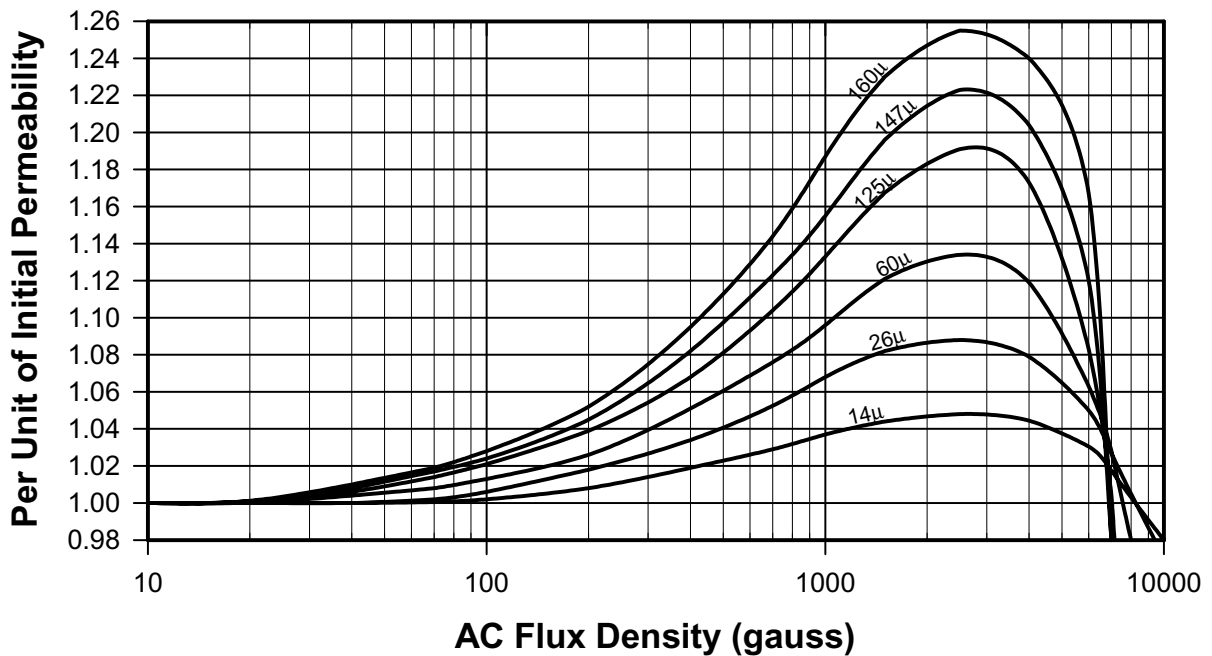
### Kool M $\mu$

$$\mu_{\text{eff}} = \sqrt{\frac{\mu_i^2 - 5.618 \times 10^{-5} \mu_i^3 H + 1.043 \times 10^{-10} \mu_i^4 H^2}{1 + 6.742 \times 10^{-5} \mu_i H + 6.210 \times 10^{-8} \mu_i^2 H^2}}$$

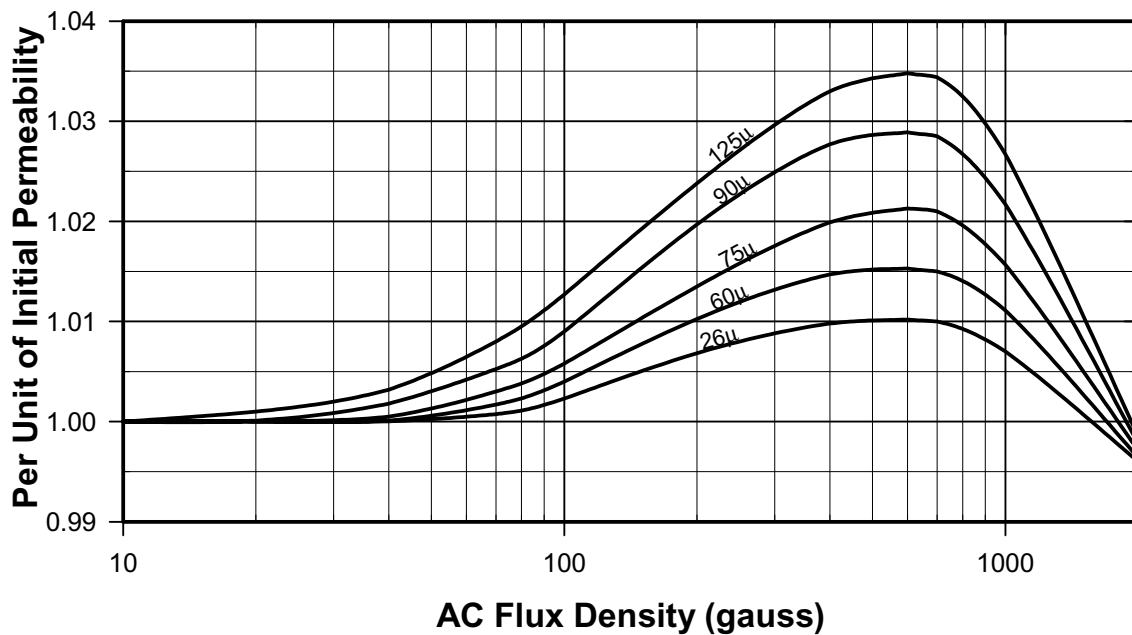
# Permeability versus AC Flux Curves, MPP



# Permeability versus AC Flux Curves, High Flux



# Permeability versus AC Flux Curves, Kool M $\mu$ <sup>®</sup>



## Permeability versus AC Flux Curve Fit Formula

(refer to curves for units)

### MPP :

$$\mu_{\text{eff}} = \mu_i = (a + bB + cB^2 + dB^3)$$

where:

		a	b	c	d	e
<b>MPP</b>	14 $\mu$ :	0.9995	1.186E-5	-5.096E-9	-2.727E-12	
	26 $\mu$ :	0.9995	1.186E-5	-5.096E-9	-2.727E-12	
	60 $\mu$ :	0.9990	1.708E-5	-6.675E-9	-1.792E-12	
	125 $\mu$ :	0.9990	2.960E-5	-1.561E-8	8.254E-13	
	147 $\mu$ :	0.9980	4.393E-5	-2.591E-8	3.446E-12	
	160 $\mu$ :	0.9980	4.393E-5	-2.591E-8	3.446E-12	
	173 $\mu$ :	0.9980	4.393E-5	-2.591E-8	3.446E-12	
	200 $\mu$ :	0.9990	5.145E-5	-2.688E-8	3.308E-12	
	300 $\mu$ :	0.9980	9.038E-5	-5.112E-8	7.055E-12	
	550 $\mu$ :	0.9910	4.042E-4	-2.240E-7	3.123E-11	
<b>High Flux</b>	14 $\mu$ :	0.999	5.458E-5	-1.930E-8	2.598E-12	-1.228E-16
	26 $\mu$ :	0.998	1.020E-4	-3.696E-8	5.099E-12	-2.529E-16
	60 $\mu$ :	1.000	1.476E-4	-5.695E-8	9.395E-12	-6.182E-16
	125 $\mu$ :	1.000	1.934E-4	-6.792E-8	1.014E-11	-6.347E-16
	147 $\mu$ :	1.000	2.350E-4	-8.895E-8	1.465E-11	-9.716E-16
	160 $\mu$ :	0.998	2.910E-4	-1.224E-7	2.263E-11	-1.590E-15
<b>Kool M<math>\mu</math></b>	26 $\mu$ :	-1.291E-3	4.711E-5	-5.779E-8	2.102E-11	-2.121E-15
	60 $\mu$ :	-1.850E-3	7.340E-5	-9.824E-8	4.486E-11	-7.157E-15
	75 $\mu$ :	-2.135E-3	9.533E-5	-1.189E-7	4.847E-11	-6.242E-15
	90 $\mu$ :	-2.769E-3	1.430E-4	-2.092E-7	1.115E-10	-2.135E-14
	125 $\mu$ :	-2.421E-3	1.740E-4	-2.662E-7	1.531E-10	-3.170E-14

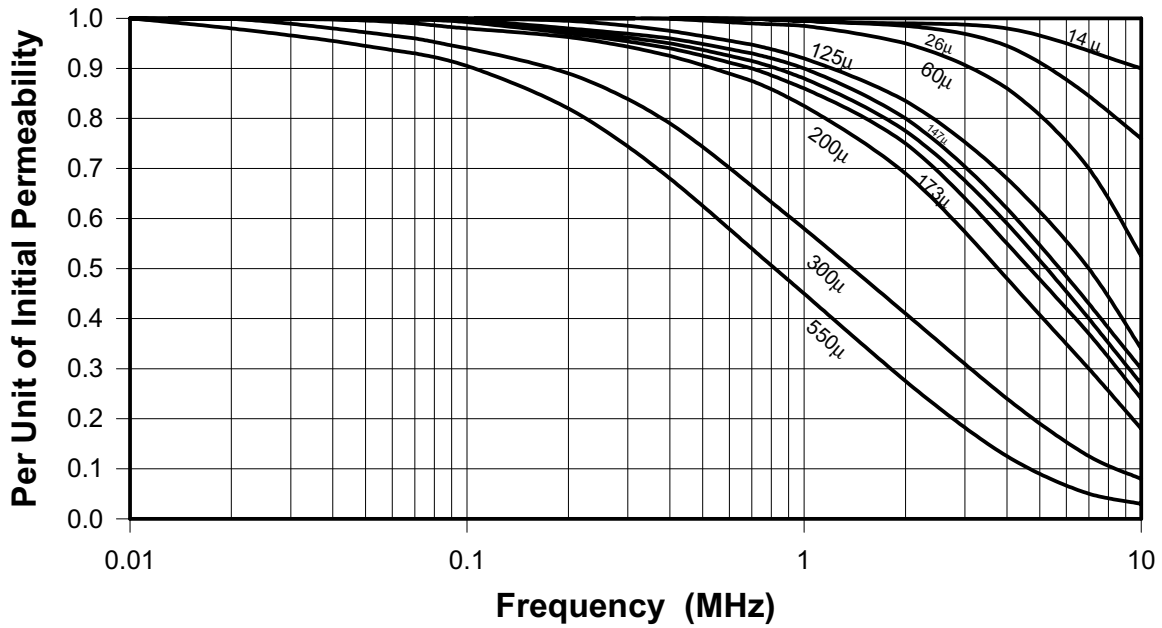
### High Flux and Kool M $\mu$ :

$$\mu_{\text{eff}} = \mu_i (a + bB + cB^2 + dB^3 + eB^4)$$

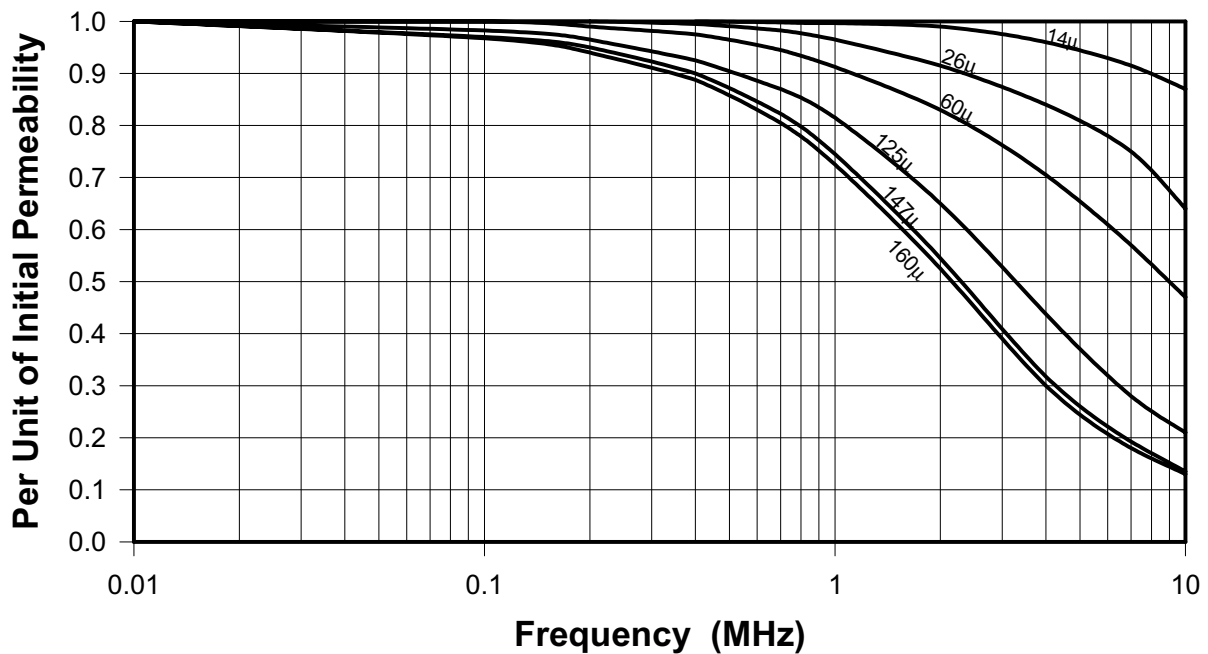
where:



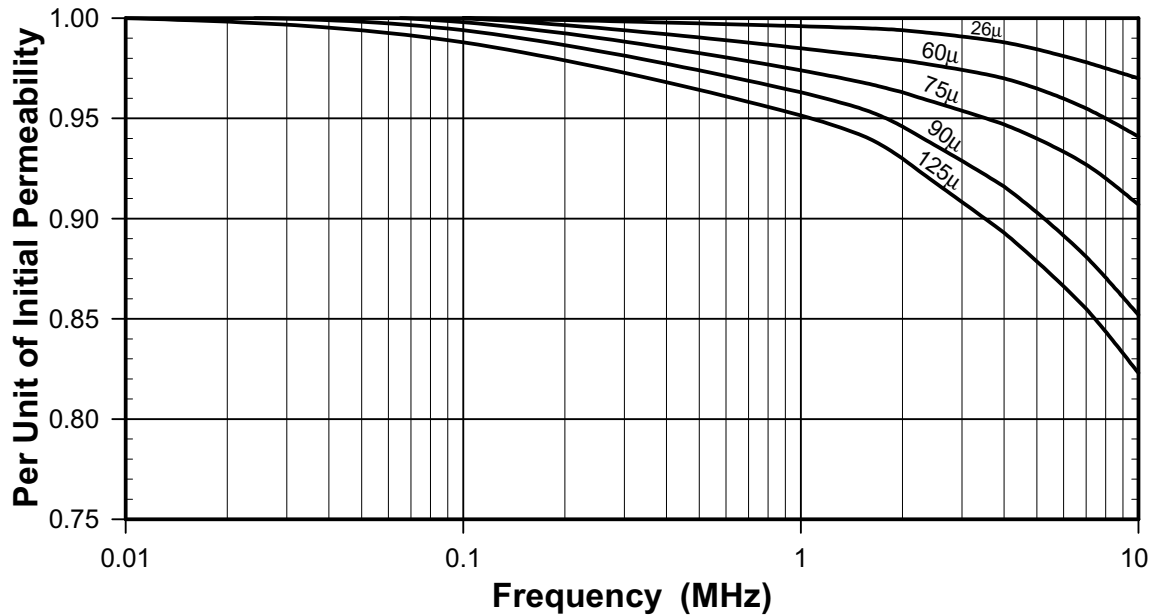
# Permeability versus Frequency Curves, MPP



# Permeability versus Frequency Curves, High Flux



# Permeability versus Frequency Curves, Kool M $\mu$ <sup>®</sup>



## Permeability versus Frequency Curve Fit Formula

(refer to curves for units)

$$\mu_{\text{eff}} = \mu_i = \left[ \frac{a + bf + cf^2}{a + df + ef^2} \right]^2$$

where:

		a	b	c	d	e
<b>MPP</b>	14 $\mu$ :	-3.288	1.793E2	-9.742E-3	1.790E2	-9.218E-3
	26 $\mu$ :	-7.930	1.823E2	-7.285E-3	1.817E2	-5.719E-3
	60 $\mu$ :	-6.583	1.805E2	-1.010E-2	1.799E2	-6.944E-3
	125 $\mu$ :	-3.676	1.818E2	-6.429E-3	1.812E2	2.624E-3
	147 $\mu$ :	-10.544	1.816E2	7.382E-5	1.805E2	1.510E-2
	160 $\mu$ :	-10.544	1.816E2	7.382E-5	1.805E2	1.510E-2
	173 $\mu$ :	-10.544	1.816E2	7.382E-5	1.805E2	1.510E-2
	200 $\mu$ :	5.551	1.809E2	-4.943E-3	1.810E2	1.400E-2
<b>High Flux</b>	300 $\mu$ :	19.705	1.786E2	4.958E-3	1.794E2	6.160E-2
	550 $\mu$ :	31.318	1.773E2	2.649E-3	1.792E2	9.260E-2
	14 $\mu$ :	-3.514	180.3	-0.008689	180.0	-0.008005
	26 $\mu$ :	-5.340	183.0	-0.003220	182.4	3.455E-4
	60 $\mu$ :	-9.438	182.6	-4.248E-4	181.7	0.009010
	125 $\mu$ :	-22.76	181.6	-0.001246	179.5	0.01970
<b>Kool M<math>\mu</math></b>	147 $\mu$ :	-12.87	180.951	-0.001167	179.4	0.03110
	160 $\mu$ :	-12.87	180.951	-0.001167	179.4	0.03110
	26 $\mu$ :	0.03919	180.6	0.01116	180.5	0.01159
	60 $\mu$ :	4.182	180.4	0.01099	180.6	0.01183
	75 $\mu$ :	7.559	177.4	0.01724	177.9	0.01890
90 $\mu$ :	12.80	181.2	0.008411	181.9	0.01048	
125 $\mu$ :	19.18	179.2	0.01379	180.4	0.01677	

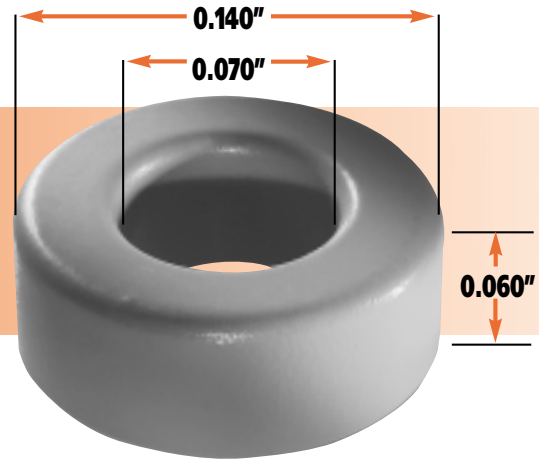
# Wire Table

AWG Wire Size	Resistance Ω/meter (x.305=Ω/ft)	Wire OD (cm) Heavy Build	Wire Area		Current Capacity, Amps (listed by columns of amps/sq.cm.)			
			Circ. Mils	sq. cm (x0.001)	200	400	600	800
8	.00207	.334	18,000	91.2	16.5	33.0	49.5	66.0
9	.00259	.298	14,350	72.7	13.1	26.2	39.3	52.4
10	.00328	.267	11,500	58.2	10.4	20.8	31.2	41.6
11	.00413	.238	9,160	46.4	8.23	16.4	24.6	32.8
12	.00522	.213	7,310	37.0	6.53	13.1	19.6	26.1
13	.00656	.1902	5,850	29.6	5.18	10.4	15.5	20.8
14	.00827	.1714	4,680	23.7	4.11	8.22	12.3	16.4
15	.01043	.1529	3,760	19.1	3.26	6.52	9.78	13.0
16	.01319	.1369	3,000	15.2	2.58	5.16	7.74	10.3
17	.01657	.1224	2,420	12.2	2.05	4.10	6.15	8.20
18	.0210	.1095	1,940	9.83	1.62	3.25	4.88	6.50
19	.0264	.0980	1,560	7.91	1.29	2.58	3.87	5.16
20	.0332	.0879	1,250	6.34	1.02	2.05	3.08	4.10
21	.0420	.0785	1,000	5.07	.812	1.63	2.44	3.25
22	.0531	.0701	810	4.11	.640	1.28	1.92	2.56
23	.0666	.0632	650	3.29	.511	1.02	1.53	2.04
24	.0843	.0566	525	2.66	.404	.808	1.21	1.62
25	.1063	.0505	425	2.15	.320	.641	.962	1.28
26	.1345	.0452	340	1.72	.253	.506	.759	1.01
27	.1686	.0409	270	1.37	.202	.403	.604	.806
28	.214	.0366	220	1.11	.159	.318	.477	.636
29	.266	.0330	180	.912	.128	.255	.382	.510
30	.341	.0295	144	.730	.100	.200	.300	.400
31	.430	.0267	117	.593	.0792	.158	.237	.316
32	.531	.0241	96.0	.487	.0640	.128	.192	.256
33	.676	.0216	77.4	.392	.0504	.101	.152	.202
34	.856	.01905	60.8	.308	.0397	.0794	.119	.159
35	1.086	.01702	49.0	.248	.0314	.0627	.0940	.125
36	1.362	.01524	39.7	.201	.0250	.0500	.0750	.100
37	1.680	.01397	32.5	.165	.0203	.0405	.0608	.0810
38	2.13	.01245	26.0	.132	.0160	.0320	.0480	.0640
39	2.78	.01092	20.2	.102	.0123	.0245	.0368	.0490
40	3.51	.00965	16.0	.081	.00961	.0192	.0288	.0384
41	4.33	.00864	13.0	.066	.00785	.0157	.0236	.0314
42	5.45	.00762	10.2	.052	.00625	.0125	.0188	.0250
43	7.02	.00686	8.40	.043	.00484	.00968	.0145	.0194
44	8.50	.00635	7.30	.037	.00400	.00800	.0120	.0160
45	10.99	.00546	5.30	.027	.00309	.00618	.00927	.0124
46	13.81	.00498	4.40	.022	.00248	.00496	.00744	.00992
47	17.36	.00452	3.60	.018	.00194	.00388	.00582	.00776
48	22.1	.00394	2.90	.015	.00175	.00350	.00525	.00700
49	27.6	.00353	2.25	.011	.00150	.00300	.00450	.00600



# 3.56mm OD

## 1.78mm ID x 1.52mm HT



### Core Dimensions (after finish)

O.D. (max.)	4.19 mm	0.165 in
I.D. (min)	1.27 mm	0.050 in
HT. (max.)	2.16 mm	0.085 in

Permeability ( $\mu$ )	$A_L \pm 8\%$ Kool M $\mu$ $A_L \pm 15\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
60	13	-	-	77141-AY
75	16	-	-	77445-AY
90	19	-	-	77444-AY
125	26	55140-AY	-	77140-AY
147	31	55139-AY	-	-
160	33	55138-AY	-	-
173	36	55134-AY	-	-
200	42	55137-AY	-	-
300	62	55135-AY	-	-

### Physical Characteristics

Window Area	0.018 cm <sup>2</sup>	3,600 c.mils
Cross Section	0.0137 cm <sup>2</sup>	0.0021 in <sup>2</sup>
Path Length	0.817 cm	0.317 in
Volume	0.0112 cm <sup>3</sup>	0.00067 in <sup>3</sup>
Weight- MPP	0.094 gm	0.00019 lb
Weight- High Flux	-	-
Weight- Kool M $\mu$	0.069 gm	0.00014 lb
Area Product	0.0002 cm <sup>4</sup>	0.000006 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	0.698 cm	0.0229 ft
60%	0.658 cm	0.0216 ft
40%	0.619 cm	0.0203 ft
20%	0.600 cm	0.0197 ft
0%	0.594 cm	0.0195 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	4.95 mm	0.195 in
Max. HT. (u.w.f.)	2.74 mm	0.108 in

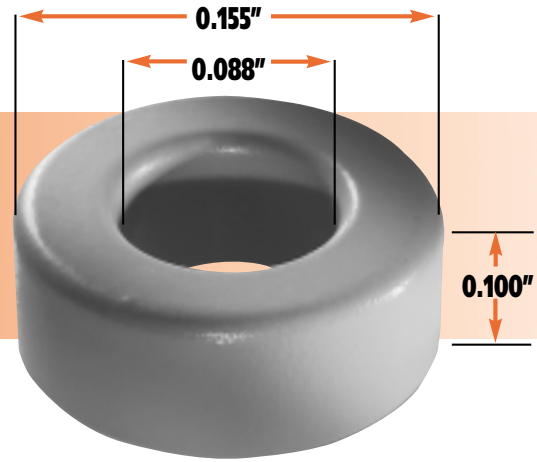
### Surface Area

Unwound Core	0.482 cm <sup>2</sup>	0.075 in <sup>2</sup>
40% Winding Factor	0.65 cm <sup>2</sup>	0.101 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
29	20	0.0373	11	0.0174
30	25	0.0595	13	0.0263
31	31	0.093	14	0.0357
32	37	0.137	16	0.0506
33	46	0.217	18	0.0723
34	59	0.353	21	0.107
35	73	0.553	24	0.155
36	91	0.865	28	0.227
37	111	1.3	31	0.31
38	138	2.05	35	0.442
39	178	3.45	40	0.661
40	225	5.51	46	0.96
41	277	8.37	52	1.34
42	353	13.4	59	1.91
43	428	21	66	2.76
44	493	29.2	72	3.64
45	679	52.1	84	4.78
46	818	78.9	92	7.55
47	947	114.7	102	10.5
48	1241	191.8	117	15.4

# 3.94mm OD

## 2.24mm ID x 2.54mm HT



### Core Dimensions (after finish)

O.D. (max.)	4.57 mm	0.180 in
I.D. (min)	1.73 mm	0.068 in
HT. (max.)	3.18 mm	0.125 in

Permeability ( $\mu$ )	$A_L \pm 8\%$ Kool M $\mu$ $A_L \pm 15\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
60	17	-	-	77151-AY
75	21	-	-	77155-AY
90	25	-	-	77154-AY
125	35	55150-AY	-	77150-AY
147	41	55149-AY	-	-
160	45	55148-AY	-	-
173	48	55144-AY	-	-
200	56	55147-AY	-	-
300	84	55145-AY	-	-

### Physical Characteristics

Window Area	0.0308 cm <sup>2</sup>	6,080 c.mils
Cross Section	0.0211 cm <sup>2</sup>	0.00327 in
Path Length	0.942 cm	0.371 in
Volume	0.0199 cm <sup>3</sup>	0.00121 in <sup>3</sup>
Weight- MPP	0.172 gm	0.00038 lb
Weight- High Flux	-	-
Weight- Kool M $\mu$	0.122 gm	0.00027 lb
Area Product	0.0006 cm <sup>4</sup>	0.000015 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	1.049 cm	0.0344 ft
60%	0.989 cm	0.0324 ft
40%	0.929 cm	0.0305 ft
20%	0.903 cm	0.0296 ft
0%	0.894 cm	0.0293 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	5.77 mm	0.227 in
Max. HT. (u.w.f.)	4.75 mm	0.187 in

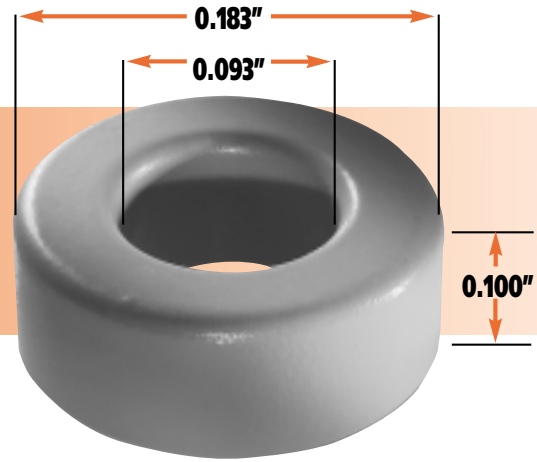
### Surface Area

Unwound Core	0.76 cm <sup>2</sup>	0.118 in <sup>2</sup>
40% Winding Factor	1.2 cm <sup>2</sup>	0.186 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
28	24	0.0544	13	0.0249
29	30	0.0837	15	0.0357
30	37	0.1324	17	0.0518
31	46	0.205	20	0.0768
32	56	0.309	22	0.104
33	69	0.488	25	0.151
34	88	0.787	29	0.222
35	109	1.229	33	0.32
36	134	1.916	37	0.45
37	164	2.89	41	0.615
38	205	4.57	46	0.873
39	264	7.69	53	1.32
40	333	12.31	61	1.91
41	410	18.61	68	2.63
42	522	29.8	78	3.79
43	634	46.7	87	5.46
44	730	65	94	7.13
45	1005	115.9	110	10.8
46	1221	175.4	121	14.9
47	1480	269	134	20.8

# 4.65mm OD

## 2.36mm ID x 2.54mm HT



### Core Dimensions (after finish)

O.D. (max.)	5.28 mm	0.208 in
I.D. (min)	1.85 mm	0.073 in
HT. (max.)	3.18 mm	0.125 in

Permeability ( $\mu$ )	$A_L \pm 8\%$ Kool M $\mu$ $A_L \pm 15\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
60	20	55181-AY	-	77181-AY
75	25	-	-	77185-AY
90	30	-	-	77184-AY
125	42	55180-AY	-	77180-AY
147	49	55179-AY	-	-
160	53	55178-AY	-	-
173	57	55174-AY	-	-
200	67	55177-AY	-	-
300	99	55175-AY	-	-

### Physical Characteristics

Window Area	0.029 cm <sup>2</sup>	5,780 c.mils
Cross Section	0.0285 cm <sup>2</sup>	0.00442 in <sup>2</sup>
Path Length	1.062 cm	0.418 in
Volume	0.0303 cm <sup>3</sup>	0.00185 in <sup>3</sup>
Weight- MPP	0.25 gm	0.00056 lb
Weight- High Flux	-	-
Weight- Kool M $\mu$	0.18 gm	0.00041 lb
Area Product	0.0008 cm <sup>4</sup>	0.000020 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	1.143 cm	0.0375 ft
60%	1.083 cm	0.0355 ft
40%	1.024 cm	0.0336 ft
20%	0.998 cm	0.0327 ft
0%	0.988 cm	0.0324 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	6.65 mm	0.262 in
Max. HT. (u.w.f.)	4.94 mm	0.195 in

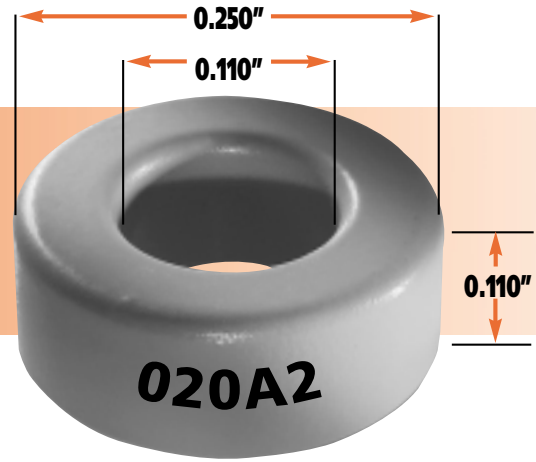
### Surface Area

Unwound Core	1.108 cm <sup>2</sup>	0.172 in <sup>2</sup>
40% Winding Factor	1.50 cm <sup>2</sup>	0.233 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
27	21	0.0412	11	0.0183
28	26	0.0643	13	0.0275
29	32	0.0989	15	0.0395
30	40	0.156	17	0.0572
31	49	0.243	19	0.0807
32	60	0.366	22	0.115
33	75	0.577	24	0.16
34	95	0.93	28	0.237
35	118	1.46	32	0.343
36	145	2.26	36	0.484
37	178	3.41	40	0.664
38	222	5.4	45	0.944
39	286	9.08	52	1.43
40	361	14.5	59	2.05
41	444	22	67	2.86
42	566	35.3	76	4.08
43	688	55.2	85	5.9
44	791	76.8	92	7.72
45	1090	137	107	11.6
46	1313	207	118	16.1

# 6.35mm OD

## 2.79mm ID x 2.79mm HT



### Core Dimensions (after finish)

O.D. (max.)	6.99 mm	0.275 in
I.D. (min)	2.29 mm	0.090 in
HT. (max.)	3.43 mm	0.135 in

Permeability ( $\mu$ )	$A_L \pm 8\%$ Kool M $\mu$ $A_L \pm 12\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	6	55023-A2	58023-A2	-
26	10	55022-A2	58022-A2	-
60	24	55021-A2	58021-A2	77021-A7
75	30	-	-	77825-A7
90	36	-	-	77824-A7
125	50	55020-A2	58020-A2	77020-A7
147	59	55019-A2	58019-A2	-
160	64	55018-A2	58018-A2	-
173	69	55014-A2	-	-
200	80	55017-A2	-	-
300	120	55015-A2	-	-
550	220	55016-A2	-	-

### Physical Characteristics

Window Area	0.0412 cm <sup>2</sup>	8,100 c.mils
Cross Section	0.0470 cm <sup>2</sup>	0.00729 in <sup>2</sup>
Path Length	1.361 cm	0.536 in
Volume	0.0640 cm <sup>3</sup>	0.00391 in <sup>3</sup>
Weight- MPP	0.588 gm	0.0013 lb
Weight- High Flux	0.553 gm	0.0012 lb
Weight- Kool M $\mu$	0.393 gm	0.0009 lb
Area Product	0.0019 cm <sup>4</sup>	0.000046 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	1.348 cm	0.0442 ft
60%	1.273 cm	0.0417 ft
40%	1.200 cm	0.0394 ft
20%	1.168 cm	0.0383 ft
0%	1.156 cm	0.0379 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	8.81 mm	0.347 in
Max. HT. (u.w.f.)	5.38 mm	0.212 in

### Surface Area

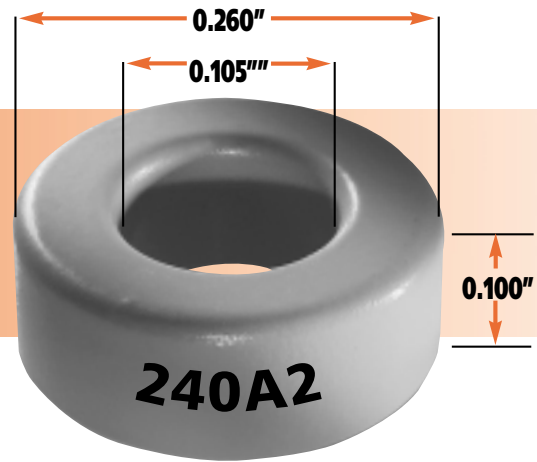
Unwound Core	1.68 cm <sup>2</sup>	0.260 in <sup>2</sup>
40% Winding Factor	2.2 cm <sup>2</sup>	0.341 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
26	24	0.0432	12	0.0186
27	30	0.0682	14	0.0273
28	37	0.1063	16	0.0395
29	45	0.1635	18	0.0554
30	56	0.259	21	0.0828
31	69	0.401	23	0.114
32	84	0.604	26	0.16
33	105	0.953	30	0.235
34	133	1.54	34	0.336
35	165	2.42	38	0.477
36	204	3.74	44	0.691
37	249	5.64	48	0.931
38	312	8.92	54	1.33
39	401	15.01	62	1.99
40	506	24	71	2.87
41	623	36.4	80	4
42	794	58.3	91	5.72
43	964	91.2	101	8.19
44	1110	127	110	10.8
45	1528	226	128	16.2



# 6.60mm OD

## 2.67mm ID x 2.54mm HT



### Core Dimensions (after finish)

O.D. (max.)	7.24 mm	0.285 in
I.D. (min)	2.16 mm	0.085 in
HT. (max.)	3.18 mm	0.125 in

Permeability ( $\mu$ )	$A_L \pm 8\%$ Kool M $\mu$ $A_L \pm 12\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	6	55243-A2	58243-A2	-
26	11	55242-A2	58242-A2	-
60	26	55241-A2	58241-A2	77241-A7
75	32	-	-	77245-A7
90	39	-	-	77244-A7
125	54	55240-A2	58240-A2	77240-A7
147	64	55239-A2	58239-A2	-
160	69	55238-A2	58238-A2	-
173	75	55234-A2	-	-
200	86	55237-A2	-	-
300	130	55235-A2	-	-
550	242	55236-A2	-	-

### Physical Characteristics

Window Area	0.0412 cm <sup>2</sup>	8,100 c.mils
Cross Section	0.0476 cm <sup>2</sup>	0.00738 in <sup>2</sup>
Path Length	1.363 cm	0.537 in
Volume	0.0649 cm <sup>3</sup>	0.00396 in <sup>3</sup>
Weight- MPP	0.58 gm	0.0013 lb
Weight- High Flux	0.55 gm	0.0012 lb
Weight- Kool M $\mu$	0.399 gm	0.00088 lb
Area Product	0.0020 cm <sup>4</sup>	0.000047 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	1.327 cm	0.0435 ft
60%	1.251 cm	0.0410 ft
40%	1.176 cm	0.0386 ft
20%	1.144 cm	0.0375 ft
0%	1.132 cm	0.0371 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	9.12 mm	0.359 in
Max. HT. (u.w.f.)	5.13 mm	0.202 in

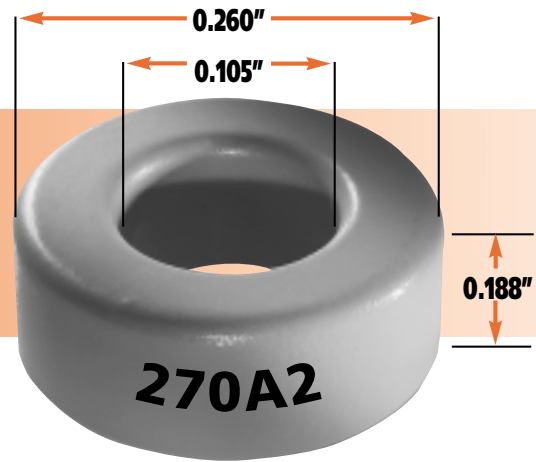
### Surface Area

Unwound Core	0.264 in <sup>2</sup>	1.70 cm <sup>2</sup>
40% Winding Factor	0.357 in <sup>2</sup>	2.3 cm <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
26	24	0.0425	12	0.0183
27	30	0.0671	14	0.0267
28	37	0.1046	16	0.0388
29	45	0.1609	18	0.0542
30	56	0.255	21	0.81
31	69	0.395	23	0.112
32	84	0.595	26	0.156
33	105	0.938	30	0.229
34	133	1.513	34	0.329
35	165	2.38	39	0.479
36	204	3.68	44	0.677
37	249	5.55	48	0.912
38	312	8.78	54	1.3
39	401	14.8	62	1.95
40	506	23.7	71	2.82
41	623	35.8	80	3.92
42	794	57.3	91	5.6
43	964	89.8	101	8.02
44	1110	125	110	10.6
45	1528	223	128	15.9

# 6.60mm OD

## 2.67mm ID x 4.78mm HT



### Core Dimensions (after finish)

O.D. (max.)	7.24 mm	0.285 in
I.D. (min)	2.16 mm	0.085 in
HT. (max.)	5.54 mm	0.213 in

Permeability ( $\mu$ )	$A_L \pm 8\%$ Kool M $\mu$ $A_L \pm 12\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	12	55273-A2	58273-A2	-
26	21	55272-A2	58272-A2	-
60	50	55271-A2	58271-A2	77271-A7
75	62	-	-	77875-A7
90	74	-	-	77874-A7
125	103	55270-A2	58270-A2	77270-A7
147	122	55269-A2	58269-A2	-
160	132	55268-A2	58268-A2	-
173	144	55264-A2	-	-
200	165	55267-A2	-	-
300	247	55265-A2	-	-
550	466	55266-A2	-	-

### Physical Characteristics

Window Area	0.0384 cm <sup>2</sup>	7,570 c.mils
Cross Section	0.0920 cm <sup>2</sup>	0.01426 in <sup>2</sup>
Path Length	1.363 cm	0.537 in
Volume	0.1254 cm <sup>3</sup>	0.00765 in <sup>3</sup>
Weight- MPP	1.09 gm	0.0024 lb
Weight- High Flux	1.03 gm	0.0023 lb
Weight- Kool M $\mu$	0.771 gm	0.0017 lb
Area Product	0.0035 cm <sup>4</sup>	0.000085 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	1.754 cm	0.0575 ft
60%	1.701 cm	0.0558 ft
40%	1.650 cm	0.0541 ft
20%	1.628 cm	0.0534 ft
0%	1.620 cm	0.0531 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	9.17 mm	0.361 in
Max. HT. (u.w.f.)	7.42 mm	0.292 in

### Surface Area

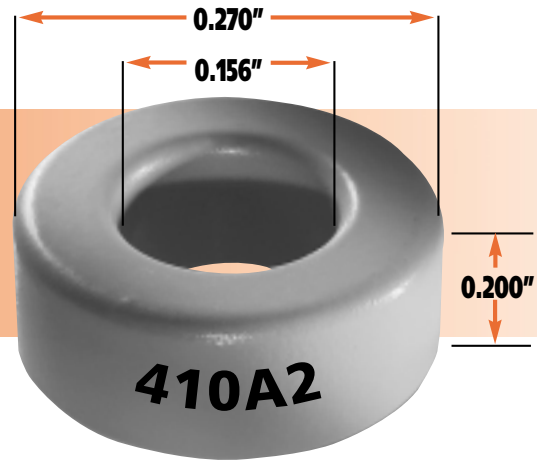
Unwound Core	2.41 cm <sup>2</sup>	0.375 in <sup>2</sup>
40% Winding Factor	2.9 cm <sup>2</sup>	0.450 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
26	22	0.0525	12	0.0262
27	28	0.0828	13	0.0355
28	34	0.1292	16	0.0555
29	42	0.1988	17	0.0733
30	53	0.314	20	0.11
31	65	0.487	22	0.153
32	79	0.734	25	0.215
33	98	1.158	28	0.307
34	124	1.868	33	0.457
35	154	2.94	37	0.651
36	191	4.55	42	0.925
37	233	6.86	46	1.25
38	291	10.85	52	1.78
39	375	18.25	60	2.69
40	473	29.2	68	3.86
41	582	44.2	77	5.4
42	742	70.8	87	7.67
43	901	110.9	98	11.1
44	1037	154.4	106	14.6
45	1428	275	123	21.9



# 6.86mm OD

## 3.96mm ID x 5.08mm HT



### Core Dimensions (after finish)

O.D. (max.)	7.49 mm	0.295 in
I.D. (min)	3.45 mm	0.136 in
HT. (max.)	5.71 mm	0.225 in

Permeability ( $\mu$ )	$A_L \pm 8\%$ Kool M $\mu$ $A_L \pm 12\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	8	55413-A2	58413-A2	-
26	14	55412-A2	58412-A2	-
60	33	55411-A2	58411-A2	77411-A7
75	42	-	-	77415-A7
90	50	-	-	77414-A7
125	70	55410-A2	58410-A2	77410-A7
147	81	55409-A2	58409-A2	-
160	89	55408-A2	58408-A2	-
173	95	55404-A2	-	-
200	112	55407-A2	-	-
300	166	55405-A2	-	-

### Physical Characteristics

Window Area	0.0934 cm <sup>2</sup>	18,500 c.mils
Cross Section	0.0725 cm <sup>2</sup>	0.01124 in <sup>2</sup>
Path Length	1.65 cm	0.650 in
Volume	0.1196 cm <sup>3</sup>	0.00731 in <sup>3</sup>
Weight- MPP	1.0 gm	0.0022 lb
Weight- High Flux	0.94 gm	0.0021 lb
Weight- Kool M $\mu$	0.736 gm	0.0016 lb
Area Product	0.0067 cm <sup>4</sup>	0.000161 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
	100% (Unity)	1.786 cm
60%	1.698 cm	0.0557 ft
40%	1.612 cm	0.0529 ft
20%	1.579 cm	0.0518 ft
0%	1.561 cm	0.0512 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	9.60 mm	0.378 in
Max. HT. (u.w.f.)	10.0 mm	0.394 in

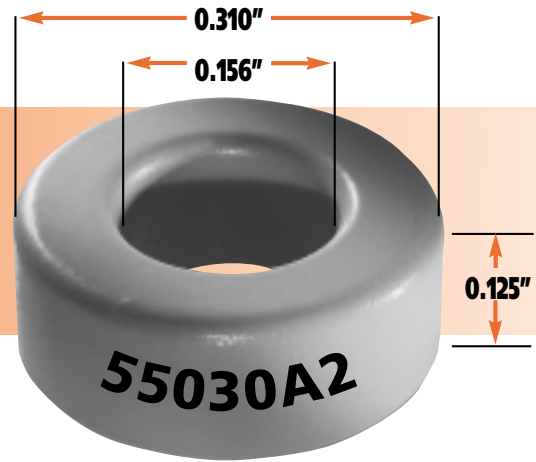
### Surface Area

Unwound Core	2.7 cm <sup>2</sup>	0.419 in <sup>2</sup>
40% Winding Factor	3.2 cm <sup>2</sup>	0.496 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
26	55	0.1321	20	0.042
27	69	0.208	23	0.0605
28	85	0.325	26	0.0869
29	103	0.49	29	0.121
30	129	0.786	33	0.176
31	159	1.221	37	0.248
32	193	1.832	41	0.34
33	239	2.89	46	0.485
34	305	4.66	53	0.708
35	378	7.33	60	1.02
36	466	11.33	67	1.42
37	570	17.1	73	1.91
38	712	27	83	2.75
39	916	45.5	95	4.12
40	1157	72.5	108	5.92
41	1424	110.1	121	8.18
42	1814	176.5	138	11.7
43	2203	276	153	16.8
44	2535	385	166	22
45	3491	685	195	33.4

# 7.87mm OD

## 3.96mm ID x 3.18mm HT



### Core Dimensions (after finish)

O.D. (max.)	8.51 mm	0.335 in
I.D. (min)	3.45 mm	0.136 in
HT. (max.)	3.81 mm	0.150 in

Permeability ( $\mu$ )	$A_L \pm 8\%$ Kool M $\mu$ $A_L \pm 12\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	6	55033-A2	58033-A2	-
26	11	55032-A2	58032-A2	-
60	25	55031-A2	58031-A2	77031-A7
75	31	-	-	77835-A7
90	37	-	-	77834-A7
125	52	55030-A2	58030-A2	77030-A7
147	62	55029-A2	58029-A2	-
160	66	55028-A2	58028-A2	-
173	73	55024-A2	-	-
200	83	55027-A2	-	-
300	124	55025-A2	-	-
550	229	55026-A2	-	-

### Physical Characteristics

Window Area	0.0922 cm <sup>2</sup>	18,200 c.mils
Cross Section	0.0615 cm <sup>2</sup>	0.00953 in <sup>2</sup>
Path Length	1.787 cm	0.704 in
Volume	0.1099 cm <sup>3</sup>	0.00671 in <sup>3</sup>
Weight- MPP	0.92 gm	0.0020 lb
Weight- High Flux	0.87 gm	0.0019 lb
Weight- Kool M $\mu$	0.676 gm	0.0015 lb
Area Product	0.0057 cm <sup>4</sup>	0.000136 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	1.598 cm	0.0524 ft
60%	1.471 cm	0.0482 ft
40%	1.347 cm	0.0442 ft
20%	1.292 cm	0.0424 ft
0%	1.272 cm	0.0417 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	11.0 mm	0.433 in
Max. HT. (u.w.f.)	6.73 mm	0.265 in

### Surface Area

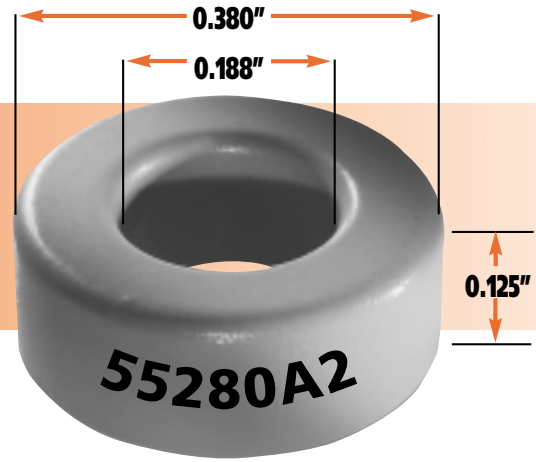
Unwound Core	2.38 cm <sup>2</sup>	0.369 in <sup>2</sup>
40% Winding Factor	3.2 cm <sup>2</sup>	0.496 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
22	23	0.0191	12	0.0082
23	28	0.0298	13	0.0109
24	35	0.0467	15	0.016
25	43	0.0728	18	0.0243
26	54	0.1152	20	0.0342
27	68	0.1818	23	0.0493
28	83	0.284	26	0.0707
29	101	0.436	29	0.0982
30	127	0.69	33	0.143
31	156	1.069	37	0.202
32	190	1.612	41	0.277
33	235	2.54	46	0.395
34	300	4.1	53	0.577
35	372	6.45	60	0.828
36	459	9.98	67	1.16
37	561	15.04	73	1.56
38	701	23.8	83	2.24
39	902	40	95	3.79
40	1139	64.1	108	4.82
41	1402	97	121	6.65



# 9.65mm OD

## 4.78mm ID x 3.18mm HT



### Core Dimensions (after finish)

O.D. (max.)	10.29 mm	0.405 in
I.D. (min)	4.27 mm	0.168 in
HT. (max.)	3.81 mm	0.150 in

Permeability ( $\mu$ )	$A_L \pm 8\%$ Kool M $\mu$ $A_L \pm 12\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	6	55283-A2	58283-A2	-
26	11	55282-A2	58282-A2	-
60	25	55281-A2	58281-A2	77281-A7
75	32	-	-	77885-A7
90	38	-	-	77884-A7
125	53	55280-A2	58280-A2	77280-A7
147	63	55279-A2	58279-A2	-
160	68	55278-A2	58278-A2	-
173	74	55274-A2	-	-
200	84	55277-A2	-	-
300	128	55275-A2	-	-
550	232	55276-A2	-	-

### Physical Characteristics

Window Area	0.1429 cm <sup>2</sup>	28,200 c.mils
Cross Section	0.0752 cm <sup>2</sup>	0.01166 in <sup>2</sup>
Path Length	2.18 cm	0.858 in
Volume	0.1639 cm <sup>3</sup>	0.0100 in <sup>3</sup>
Weight- MPP	1.4 gm	0.0030 lb
Weight- High Flux	1.3 gm	0.0028 lb
Weight- Kool M $\mu$	1.008 gm	0.00222 lb
Area Product	0.0107 cm <sup>4</sup>	0.000258 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	1.793 cm	0.0588 ft
60%	1.627 cm	0.0533 ft
40%	1.465 cm	0.0480 ft
20%	1.393 cm	0.0457 ft
0%	1.366 cm	0.0448 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	13.4 mm	0.526 in
Max. HT. (u.w.f.)	7.44 mm	0.293 in

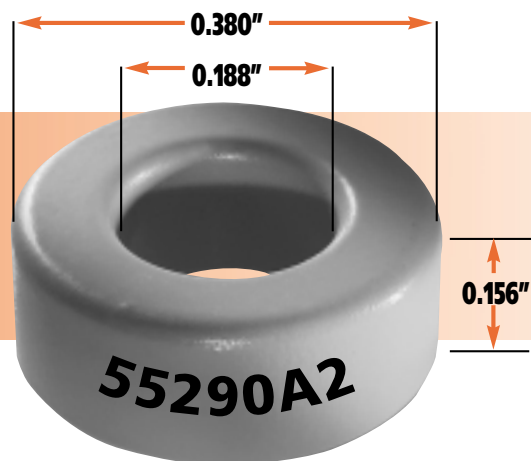
### Surface Area

Unwound Core	3.12 cm <sup>2</sup>	0.483 in <sup>2</sup>
40% Winding Factor	4.4 cm <sup>2</sup>	0.682 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
20	23	0.01345	12	0.0054
21	28	0.0212	13	0.0074
22	35	0.0332	15	0.0108
23	43	0.0518	18	0.0164
24	54	0.0812	20	0.0231
25	66	0.1265	23	0.0334
26	83	0.2	26	0.0478
27	105	0.316	29	0.0668
28	128	0.493	33	0.0966
29	157	0.758	37	0.135
30	196	1.199	42	0.195
31	241	1.858	47	0.276
32	294	2.8	52	0.377
33	365	4.42	58	0.535
34	464	7.12	67	0.783
35	576	11.21	75	1.11
36	711	17.3	84	1.57
37	868	26.1	92	2.11
38	1086	41.4	104	3.02
39	1397	69.6	119	4.52

# 9.65mm OD

## 4.78mm ID x 3.96mm HT



### Core Dimensions (after finish)

O.D. (max.)	10.29 mm	0.405 in
I.D. (min)	4.27 mm	0.168 in
HT. (max.)	4.60 mm	0.181 in

Permeability ( $\mu$ )	$A_L \pm 8\%$ Kool M $\mu$ $A_L \pm 12\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	7	55293-A2	58293-A2	-
26	14	55292-A2	58292-A2	-
60	32	55291-A2	58291-A2	77291-A7
75	40	-	-	77295-A7
90	48	-	-	77294-A7
125	66	55290-A2	58290-A2	77290-A7
147	78	55289-A2	58289-A2	-
160	84	55288-A2	58288-A2	-
173	92	55284-A2	-	-
200	105	55287-A2	-	-
300	159	55285-A2	-	-
550	290	55286-A2	-	-

### Physical Characteristics

Window Area	0.1429 cm <sup>2</sup>	28,200 c.mils
Cross Section	0.0945 cm <sup>2</sup>	0.01465 in <sup>2</sup>
Path Length	2.18 cm	0.859 in
Volume	0.206 cm <sup>3</sup>	0.0126 in <sup>3</sup>
Weight- MPP	1.8 gm	0.0039 lb
Weight- High Flux	1.7 gm	0.0037 lb
Weight- Kool M $\mu$	1.44 gm	0.0032 lb
Area Product	0.0135 cm <sup>4</sup>	0.000325 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	1.928 cm	0.0632 ft
60%	1.768 cm	0.0580 ft
40%	1.613 cm	0.0529 ft
20%	1.545 cm	0.0506 ft
0%	1.519 cm	0.0498 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	13.4 mm	0.526 in
Max. HT. (u.w.f.)	8.20 mm	0.323 in

### Surface Area

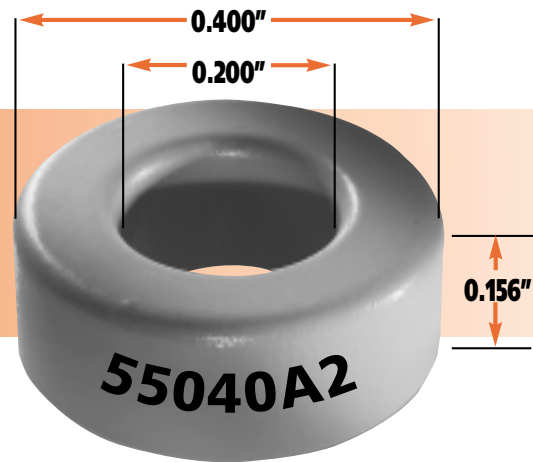
Unwound Core	3.46 cm <sup>2</sup>	0.537 in <sup>2</sup>
40% Winding Factor	4.7 cm <sup>2</sup>	0.729 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
20	23	0.01446	12	0.00605
21	28	0.0228	13	0.00826
22	35	0.0357	15	0.012
23	43	0.0557	18	0.0182
24	54	0.0873	20	0.0256
25	66	0.136	23	0.0371
26	83	0.215	26	0.0531
27	105	0.34	29	0.0743
28	128	0.529	33	0.107
29	157	0.815	37	0.15
30	196	1.288	42	0.217
31	241	1.997	47	0.307
32	294	3.01	52	0.42
33	365	4.75	58	0.594
34	464	7.66	67	0.871
35	576	12.05	75	1.24
36	711	18.65	84	1.74
37	868	28.1	92	2.34
38	1086	44.5	104	3.35
39	1397	74.8	119	5.02



# 10.2mm OD

## 5.08mm ID x 3.96mm HT



### Core Dimensions (after finish)

O.D. (max.)	10.80 mm	0.425 in
I.D. (min)	4.57 mm	0.180 in
HT. (max.)	4.60 mm	0.181 in

Permeability ( $\mu$ )	$A_L \pm 8\%$ Kool M $\mu$ $A_L \pm 12\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	7	55043-A2	58043-A2	-
26	14	55042-A2	58042-A2	-
60	32	55041-A2	58041-A2	77041-A7
75	40	-	-	77845-A7
90	48	-	-	77844-A7
125	66	55040-A2	58040-A2	77040-A7
147	78	55039-A2	58039-A2	-
160	84	55038-A2	58038-A2	-
173	92	55034-A2	-	-
200	105	55037-A2	-	-
300	159	55035-A2	-	-
550	290	55036-A2	-	-

### Physical Characteristics

Window Area	0.164 cm <sup>2</sup>	32,400 c.mils
Cross Section	0.1000 cm <sup>2</sup>	0.01550 in <sup>2</sup>
Path Length	2.38 cm	0.906 in
Volume	0.238 cm <sup>3</sup>	0.014 in <sup>3</sup>
Weight- MPP	1.91 gm.	0.0041 lb
Weight- High Flux	1.80 gm	0.0039 lb
Weight- Kool M $\mu$	1.46 gm	0.0032 lb
Area Product	0.0164 cm <sup>4</sup>	0.000395 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	1.986 cm	0.0651 ft
60%	1.811 cm	0.0594 ft
40%	1.640 cm	0.0538 ft
20%	1.566 cm	0.0513 ft
0%	1.537 cm	0.0504 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	14.1 mm	0.554 in
Max. HT. (u.w.f.)	8.46 mm	0.333 in

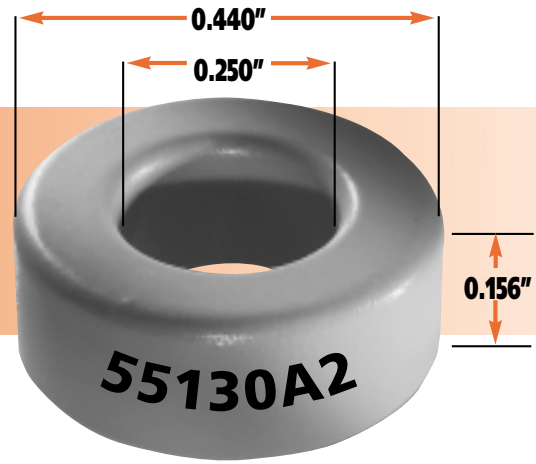
### Surface Area

Unwound Core	3.703 cm <sup>2</sup>	0.574 in <sup>2</sup>
40% Winding Factor	5.1 cm <sup>2</sup>	0.791 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
20	26	0.01709	13	0.00663
21	32	0.0267	15	0.00968
22	40	0.0422	17	0.0139
23	50	0.0659	19	0.0195
24	62	0.1032	22	0.0285
25	76	0.1608	25	0.0408
26	95	0.254	28	0.0579
27	120	0.402	31	0.0804
28	147	0.626	36	0.119
29	180	0.963	40	0.164
30	225	1.523	45	0.236
31	277	2.36	50	0.33
32	338	3.56	56	0.457
33	419	5.61	63	0.654
34	533	9.05	72	0.947
35	661	14.25	81	1.35
36	816	22	91	1.9
37	1000	33.3	99	2.56
38	1246	52.6	112	3.66
39	1604	88.4	128	5.46

# 11.2mm OD

## 6.35mm ID x 3.96mm HT



### Core Dimensions (after finish)

O.D. (max.)	11.81 mm	0.465 in
I.D. (min)	5.84 mm	0.230 in
HT. (max.)	4.60 mm	0.181 in

Permeability ( $\mu$ )	$A_L \pm 8\%$ Kool M $\mu$ $A_L \pm 12\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	6	55133-A2	58133-A2	-
26	11	55132-A2	58132-A2	-
60	26	55131-A2	58131-A2	77131-A7
75	32	-	-	77335-A7
90	38	-	-	77334-A7
125	53	55130-A2	58130-A2	77130-A7
147	63	55129-A2	58129-A2	-
160	68	55128-A2	58128-A2	-
173	74	55124-A2	-	-
200	85	55127-A2	-	-
300	127	55125-A2	-	-

### Physical Characteristics

Window Area	0.273 cm <sup>2</sup>	53,800 c.mils
Cross Section	0.0906 cm <sup>2</sup>	0.0140 in <sup>2</sup>
Path Length	2.69 cm	1.08 in
Volume	0.2437 cm <sup>3</sup>	0.01487 in <sup>3</sup>
Weight- MPP	2.12 gm	0.0046 lb
Weight- High Flux	1.99 gm	0.0043 lb
Weight- Kool M $\mu$	1.499 gm	0.0033 lb
Area Product	0.0247 cm <sup>4</sup>	0.000592 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	2.195 cm	0.0720 ft
60%	1.942 cm	0.0637 ft
40%	1.695 cm	0.0556 ft
20%	1.585 cm	0.0520 ft
0%	1.545 cm	0.0507 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	15.7 mm	0.618 in
Max. HT. (u.w.f.)	9.0 mm	0.353 in

### Surface Area

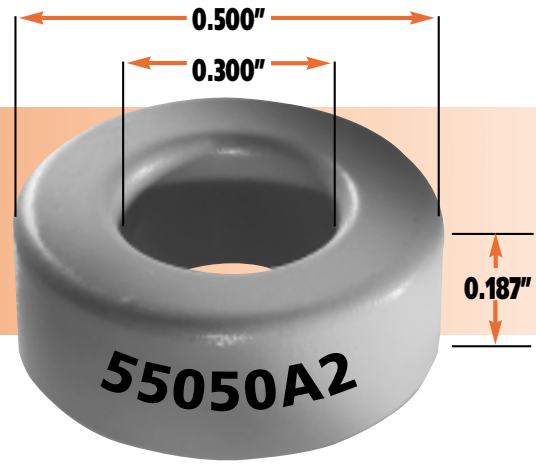
Unwound Core	4.31 cm <sup>2</sup>	0.669 in <sup>2</sup>
40% Winding Factor	6.0 cm <sup>2</sup>	0.936 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
16	17	0.00533	10	0.00203
17	22	0.00808	11	0.00282
18	28	0.01276	13	0.00422
19	34	0.02	15	0.00612
20	43	0.03192	17	0.00873
21	54	0.04958	20	0.013
22	66	0.07747	23	0.0188
23	83	0.121	26	0.0268
24	102	0.1896	29	0.0378
25	127	0.295	33	0.0543
26	158	0.467	37	0.077
27	199	0.737	42	0.109
28	245	1.15	47	0.155
29	299	1.747	52	0.214
30	374	2.8	59	0.311
31	460	4.34	66	0.438
32	560	6.54	73	0.6
33	695	10.31	82	0.856
34	885	16.63	93	1.23
35	1098	26.2	105	1.76



# 12.7mm OD

## 7.62mm ID x 4.75mm HT



### Core Dimensions (after finish)

O.D. (max.)	13.46 mm	0.530 in
I.D. (min)	6.99 mm	0.275 in
HT. (max.)	5.51 mm	0.217 in

Permeability ( $\mu$ )	$A_L \pm 8\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	6.4	55053-A2	58053-A2	-
26	12	55052-A2	58052-A2	-
60	27	55051-A2	58051-A2	77051-A7
75	34	-	-	77055-A7
90	40	-	-	77054-A7
125	56	55050-A2	58050-A2	77050-A7
147	67	55049-A2	58049-A2	-
160	72	55048-A2	58048-A2	-
173	79	55044-A2	-	-
200	90	55047-A2	-	-
300	134	55045-A2	-	-
550	255	55046-A2	-	-

### Physical Characteristics

Window Area	0.383 cm <sup>2</sup>	75,600 c.mils
Cross Section	0.1140 cm <sup>2</sup>	0.01767 in <sup>2</sup>
Path Length	3.12 cm	1.229 in
Volume	0.356 cm <sup>3</sup>	0.0217 in <sup>3</sup>
Weight- MPP	3.07 gm	0.0064 lb
Weight- High Flux	2.90 gm	0.0060 lb
Weight- Kool M $\mu$	2.20 gm.	0.0049 lb
Area Product	0.0437 cm <sup>4</sup>	0.001049 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	2.49 cm	0.0815 ft
60%	2.20 cm	0.0721 ft
40%	1.920 cm	0.0629 ft
20%	1.797 cm	0.0589 ft
0%	1.751 cm	0.0574 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	18.2 mm	0.717 in
Max. HT. (u.w.f.)	11.5 mm	0.451 in

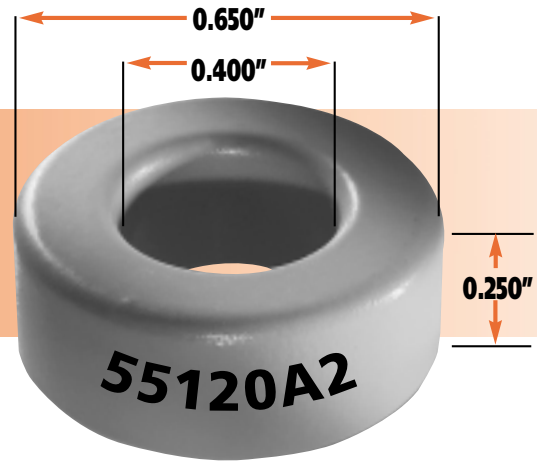
### Surface Area

Unwound Core	5.60 cm <sup>2</sup>	0.870 in <sup>2</sup>
40% Winding Factor	8.1 cm <sup>2</sup>	1.26 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
16	25	0.00826	12	0.00276
17	31	0.0129	14	0.00406
18	39	0.0203	16	0.00587
19	48	0.0318	19	0.00877
20	61	0.05	21	0.0122
21	76	0.0789	24	0.0176
22	93	0.1233	28	0.026
23	116	0.1925	31	0.0362
24	144	0.302	35	0.0516
25	178	0.47	40	0.0744
26	222	0.743	45	0.106
27	280	1.173	50	0.148
28	344	1.829	56	0.21
29	420	2.81	63	0.293
30	525	4.45	71	0.434
31	646	6.9	79	0.594
32	788	10.4	87	0.809
33	977	16.4	98	1.16
34	1244	26.5	112	1.68
35	1543	41.6	125	2.37

# 16.5mm OD

## 10.2mm ID x 6.35mm HT



### Core Dimensions (after finish)

O.D. (max.)	17.40 mm	0.680 in
I.D. (min)	9.53 mm	0.375 in
HT. (max.)	7.11 mm	0.280 in

Permeability ( $\mu$ )	$A_L \pm 8\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	8	55123-A2	58123-A2	-
26	15	55122-A2	58122-A2	-
60	35	55121-A2	58121-A2	77121-A7
75	43	-	-	77225-A7
90	52	-	-	77224-A7
125	72	55120-A2	58120-A2	77120-A7
147	88	55119-A2	58119-A2	-
160	92	55118-A2	58118-A2	-
173	104	55114-A2	-	-
200	115	55117-A2	-	-
300	173	55115-A2	-	-
550	317	55116-A2	-	-

### Physical Characteristics

Window Area	0.713 cm <sup>2</sup>	140,600 c.mils
Cross Section	0.1920 cm <sup>2</sup>	0.0298 in <sup>2</sup>
Path Length	4.11 cm	1.619 in
Volume	0.789 cm <sup>3</sup>	0.048 in <sup>3</sup>
Weight- MPP	6.78 gm	0.015 lb
Weight- High Flux	6.34 gm	0.014 lb
Weight- Kool M $\mu$	4.98 gm	0.011 lb
Area Product	0.1369 cm <sup>4</sup>	0.0029 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	3.22 cm	0.1057 ft
60%	2.82 cm	0.0926 ft
40%	2.44 cm	0.0798 ft
20%	2.26 cm	0.0742 ft
0%	2.20 cm	0.0721 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	23.7 mm	0.932 in
Max. HT. (u.w.f.)	15.2 mm	0.599 in

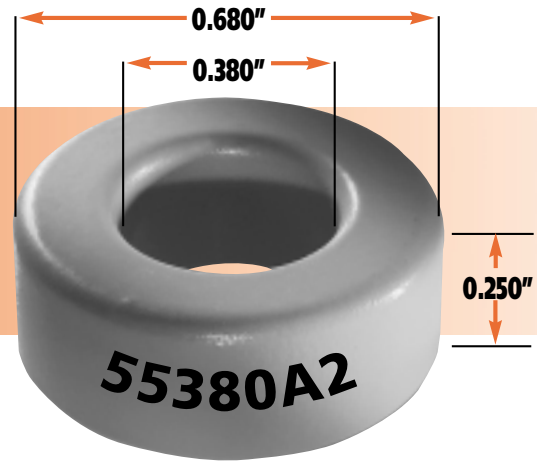
### Surface Area

Unwound Core	9.2 cm <sup>2</sup>	1.43 in <sup>2</sup>
40% Winding Factor	13.6 cm <sup>2</sup>	2.11 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
13	24	0.00508	12	0.00174
14	30	0.008	14	0.00254
15	37	0.01257	16	0.00366
16	47	0.01992	18	0.00522
17	58	0.031	21	0.00765
18	72	0.049	24	0.0111
19	90	0.0767	27	0.0157
20	113	0.1205	30	0.0219
21	141	0.1903	34	0.0314
22	174	0.297	39	0.0455
23	216	0.464	44	0.0644
24	268	0.728	49	0.0906
25	331	1.133	56	0.131
26	414	1.792	63	0.189
27	521	2.83	70	0.26
28	639	4.41	78	0.368
29	781	6.79	87	0.51
30	977	10.74	98	0.735
31	1202	16.64	108	1.02
32	1465	25.1	121	1.41

# 17.3mm OD

## 9.65mm ID x 6.35mm HT



### Core Dimensions (after finish)

O.D. (max.)	18.03 mm	0.710 in
I.D. (min)	9.02 mm	0.355 in
HT. (max.)	7.11 mm	0.280 in

Permeability ( $\mu$ )	$A_L \pm 8\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	10	55383-A2	58383-A2	-
26	19	55382-A2	58382-A2	-
60	43	55381-A2	58381-A2	77381-A7
75	53	-	-	77385-A7
90	64	-	-	77384-A7
125	89	55380-A2	58380-A2	77380-A7
147	105	55379-A2	58379-A2	-
160	114	55378-A2	58378-A2	-
173	123	55374-A2	-	-
200	142	55377-A2	-	-
300	214	55375-A2	-	-

### Physical Characteristics

Window Area	0.576 cm <sup>2</sup>	126,000 c.mils
Cross Section	0.232 cm <sup>2</sup>	0.0360 in <sup>2</sup>
Path Length	4.14 cm	1.63 in
Volume	0.960 cm <sup>3</sup>	0.059 in <sup>3</sup>
Weight- MPP	8.16 gm	0.018 lb
Weight- High Flux	7.7 gm	0.017 lb
Weight- Kool M $\mu$	5.9 gm	0.013 lb
Area Product	0.134 cm <sup>4</sup>	0.00321 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	3.67 cm	0.1204 ft
60%	3.15 cm	0.1032 ft
40%	2.64 cm	0.0864 ft
20%	2.41 cm	0.0791 ft
0%	2.33 cm	0.0763 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	24.9 mm	0.980 in
Max. HT. (u.w.f.)	16.3 mm	0.641 in

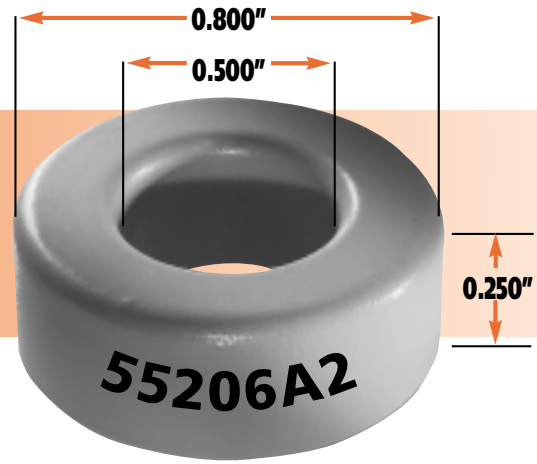
### Surface Area

Unwound Core	9.9 cm <sup>2</sup>	1.53 in <sup>2</sup>
40% Winding Factor	14.7 cm <sup>2</sup>	2.28 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
13	21	0.00506	11	0.00167
14	26	0.00789	13	0.0025
15	33	0.0126	15	0.00364
16	42	0.0203	17	0.00521
17	52	0.0316	19	0.00732
18	64	0.0492	22	0.0107
19	80	0.0775	25	0.0154
20	100	0.122	29	0.0224
21	126	0.194	32	0.0215
22	155	0.302	37	0.0313
23	193	0.472	41	0.0457
24	240	0.743	46	0.0635
25	296	1.15	52	0.0902
26	370	1.83	59	0.129
27	466	2.88	66	0.185
28	572	4.49	74	0.259
29	700	6.84	82	0.369
30	875	10.96	92	0.508
31	1076	16.97	102	0.73
32	1312	25.6	114	1.02

# 20.3mm OD

## 12.7mm ID x 6.35mm HT



### Core Dimensions (after finish)

O.D. (max.)	21.1 mm	0.830 in
I.D. (min)	12.07 mm	0.475 in
HT. (max.)	7.11 mm	0.280 in

Permeability ( $\mu$ )	$A_L \pm 8\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	7.8	55209-A2	58209-A2	-
26	14	55208-A2	58208-A2	-
60	32	55848-A2	58848-A2	77848-A7
75	41	-	-	77211-A7
90	49	-	-	77210-A7
125	68	55206-A2	58206-A2	77206-A7
147	81	55205-A2	58205-A2	-
160	87	55204-A2	58204-A2	-
173	96	55200-A2	-	-
200	109	55203-A2	-	-
300	163	55201-A2	-	-
550	320	55202-A2	-	-

### Physical Characteristics

Window Area	1.14 cm <sup>2</sup>	225,600 c.mils
Cross Section	0.226 cm <sup>2</sup>	0.0350 in <sup>2</sup>
Path Length	5.09 cm	2.01 in
Volume	1.15 cm <sup>3</sup>	0.0703 in <sup>3</sup>
Weight- MPP	9.4 gm	0.023 lb
Weight- High Flux	8.9 gm	0.022 lb
Weight- Kool M $\mu$	7.1 gm	0.016 lb
Area Product	0.258 cm <sup>4</sup>	0.00620 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	3.67 cm	0.1204 ft
60%	3.15 cm	0.1032 ft
40%	2.64 cm	0.0864 ft
20%	2.41 cm	0.0791 ft
0%	2.33 cm	0.0763 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	29.2 mm	1.148 in
Max. HT. (u.w.f.)	17.4 mm	0.648 in

### Surface Area

Unwound Core	12.1 cm <sup>2</sup>	1.88 in <sup>2</sup>
40% Winding Factor	18.9 cm <sup>2</sup>	2.93 in <sup>2</sup>

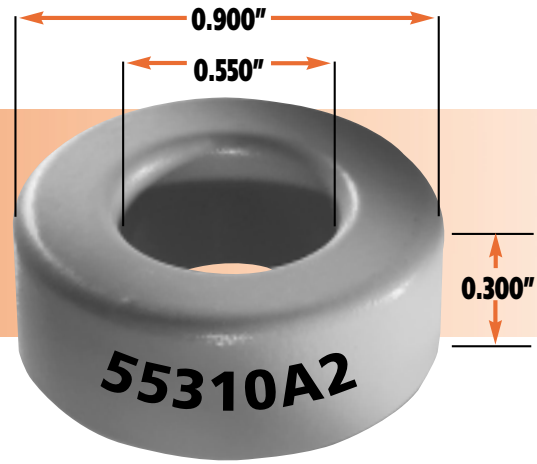
AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
11	25	0.00374	12	0.001354
12	31	0.00591	14	0.0017
13	39	0.00929	16	0.00245
14	48	0.01463	18	0.00347
15	60	0.023	21	0.0051
16	75	0.0364	24	0.00736
17	93	0.0567	27	0.0104
18	116	0.0895	31	0.0151
19	145	0.1402	35	0.0215
20	181	0.22	39	0.0301
21	226	0.348	45	0.0439
22	279	0.543	50	0.0618
23	347	0.848	56	0.0867
24	430	1.33	63	0.124
25	531	2.07	71	0.176
26	664	3.28	80	0.25
27	836	5.17	89	0.349
28	1026	8.06	100	0.498
29	1253	12.41	111	0.688
30	1567	19.62	125	0.992





# 22.9mm OD

## 14.0mm ID x 7.62mm HT



### Core Dimensions (after finish)

O.D. (max.)	23.6 mm	0.930 in
I.D. (min)	13.34 mm	0.525 in
HT. (max.)	8.38 mm	0.330 in

Permeability ( $\mu$ )	$A_L \pm 8\%$	Part Number		
		MPP	High Flux	Kool $\mu\mu$
14	9.9	55313-A2	58313-A2	-
26	19	55312-A2	58312-A2	77312-A7
60	43	55059-A2	58059-A2	77059-A7
75	54	-	-	77315-A7
90	65	-	-	77314-A7
125	90	55310-A2	58310-A2	77310-A7
147	106	55309-A2	58309-A2	-
160	115	55308-A2	58308-A2	-
173	124	55304-A2	-	-
200	144	55307-A2	-	-
300	216	55305-A2	-	-
550	396	55306-A2	-	-

### Physical Characteristics

Window Area	1.41 cm <sup>2</sup>	277,700 c.mils
Cross Section	0.331 cm <sup>2</sup>	0.0513 in <sup>2</sup>
Path Length	5.67 cm	2.23 in
Volume	1.88 cm <sup>3</sup>	0.114 in <sup>3</sup>
Weight- MPP	15.9 gm	0.034 lb
Weight- High Flux	15.0 gm	0.032 lb
Weight- Kool $\mu\mu$	11.5 gm	0.025 lb
Area Product	0.467 cm <sup>4</sup>	0.01119 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	4.29 cm	0.1405 ft
60%	3.67 cm	0.1203 ft
40%	3.07 cm	0.1005 ft
20%	2.80 cm	0.0919 ft
0%	2.70 cm	0.0886 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	32.6 mm	1.283 in
Max. HT. (u.w.f.)	19.8 mm	0.778 in

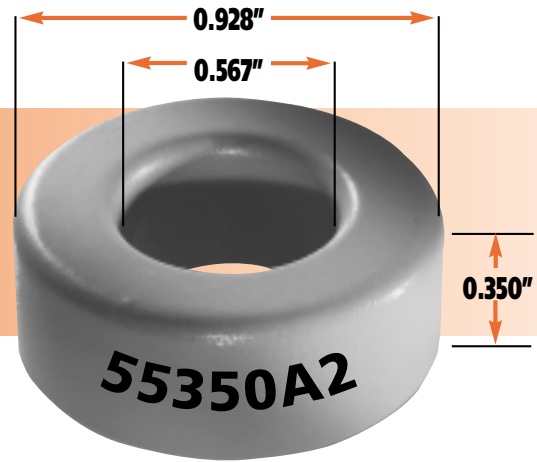
### Surface Area

Unwound Core	15.7 cm <sup>2</sup>	2.43 in <sup>2</sup>
40% Winding Factor	23.8 cm <sup>2</sup>	3.69 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
10	24	0.00339	12	0.00106
11	30	0.00537	14	0.00156
12	38	0.00849	16	0.00226
13	47	0.01334	18	0.0032
14	59	0.0211	21	0.0047
15	74	0.033	24	0.00676
16	93	0.0523	27	0.00961
17	115	0.0814	31	0.0138
18	143	0.1285	35	0.0198
19	178	0.201	39	0.0278
20	222	0.316	44	0.0395
21	278	0.499	50	0.0565
22	343	0.78	56	0.0804
23	427	1.219	63	0.113
24	529	1.91	71	0.161
25	653	2.97	80	0.229
26	817	4.71	89	0.324
27	1029	7.43	99	0.45
28	1262	11.58	111	0.642
29	1543	17.82	124	0.892

# 23.6mm OD

## 14.4mm ID x 8.89mm HT



### Core Dimensions (after finish)

O.D. (max.)	24.3 mm	0.958 in
I.D. (min)	13.77 mm	0.542 in
HT. (max.)	9.65 mm	0.380 in

Permeability ( $\mu$ )	$A_L \pm 8\%$	Part Number		
		MPP	High Flux	Kool $\mu$
14	12	55353-A2	58353-A2	-
26	22	55352-A2	58352-A2	77352-A7
60	51	55351-A2	58351-A2	77351-A7
75	63	-	-	77355-A7
90	76	-	-	77354-A7
125	105	55350-A2	58350-A2	77350-A7
147	124	55349-A2	58349-A2	-
160	135	55348-A2	58348-A2	-
173	146	55344-A2	-	-
200	169	55347-A2	-	-
300	253	55345-A2	-	-

### Physical Characteristics

Window Area	1.49 cm <sup>2</sup>	293,800 c.mils
Cross Section	0.388 cm <sup>2</sup>	0.061 in <sup>2</sup>
Path Length	5.88 cm	2.32 in
Volume	2.28 cm <sup>3</sup>	0.142 in <sup>3</sup>
Weight- MPP	19.9 gm	0.042 lb
Weight- High Flux	18.8 gm	0.040 lb
Weight- Kool $\mu$	14.0 gm	0.031 lb
Area Product	0.578 cm <sup>4</sup>	0.0139 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	4.49 cm	0.1473 ft
60%	3.91 cm	0.1282 ft
40%	3.34 cm	0.1095 ft
20%	3.09 cm	0.1013 ft
0%	3.00 cm	0.0982 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	33.5 mm	1.319 in
Max. HT. (u.w.f.)	21.4 mm	0.843 in

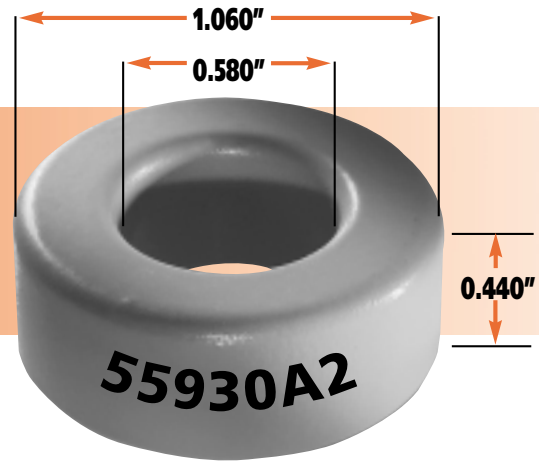
### Surface Area

Unwound Core	17.9 cm <sup>2</sup>	2.78 in <sup>2</sup>
40% Winding Factor	26.3 cm <sup>2</sup>	4.08 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
9	20	0.00238	11	0.000853
10	26	0.00376	13	0.00127
11	32	0.00595	15	0.00186
12	40	0.00941	17	0.00265
13	50	0.0148	19	0.00373
14	63	0.0233	22	0.00544
15	78	0.0366	25	0.00781
16	98	0.058	28	0.0111
17	121	0.0903	32	0.0159
18	157	0.1425	36	0.0226
19	188	0.223	40	0.0316
20	235	0.351	46	0.0458
21	294	0.554	51	0.0691
22	363	0.865	58	0.0923
23	452	1.351	65	0.13
24	560	2.12	73	0.184
25	691	3.3	82	0.261
26	864	5.22	92	0.37
27	1088	8.24	102	0.515
28	1335	12.84	114	0.731

# 26.9mm OD

## 14.7mm ID x 11.2mm HT



### Core Dimensions (after finish)

O.D. (max.)	27.7 mm	1.090 in
I.D. (min)	14.10 mm	0.555 in
HT. (max.)	11.94 mm	0.470 in

Permeability ( $\mu$ )	$A_L \pm 8\%$	Part Number		
		MPP	High Flux	Kool $\mu$
14	18	55933-A2	58933-A2	-
26	32	55932-A2	58932-A2	77932-A7
60	75	55894-A2	58894-A2	77894-A7
75	94	-	-	77935-A7
90	113	-	-	77934-A7
125	157	55930-A2	58930-A2	77930-A7
147	185	55929-A2	58929-A2	-
160	201	55928-A2	58928-A2	-
173	217	55924-A2	-	-
200	251	55927-A2	-	-
300	377	55925-A2	-	-
550	740	55926-A2	-	-

### Physical Characteristics

Window Area	1.56 cm <sup>2</sup>	308,000 c.mils
Cross Section	0.654 cm <sup>2</sup>	0.1014 in <sup>2</sup>
Path Length	6.35 cm	2.50 in
Volume	4.15 cm <sup>3</sup>	0.254 in <sup>3</sup>
Weight- MPP	35.8 gm	0.080 lb
Weight- High Flux	33.8 gm	0.075 lb
Weight- Kool $\mu$	25.5 gm	0.056 lb
Area Product	1.020 cm <sup>4</sup>	0.0245 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	5.23 cm	0.1714 ft
60%	4.66 cm	0.1526 ft
40%	4.10 cm	0.1344 ft
20%	3.85 cm	0.1263 ft
0%	3.76 cm	0.1233 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	37.3 mm	1.468 in
Max. HT. (u.w.f.)	24.0 mm	0.944 in

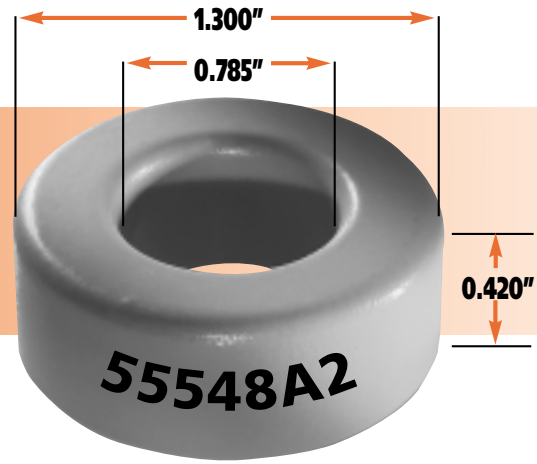
### Surface Area

Uwound Core	24.7 cm <sup>2</sup>	3.83 in <sup>2</sup>
40% Winding Factor	33.8 cm <sup>2</sup>	5.24 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
9	21	0.00291	11	0.00107
10	27	0.00459	13	0.0016
11	34	0.00726	15	0.00233
12	42	0.01148	17	0.00333
13	53	0.01805	20	0.00494
14	66	0.0284	22	0.00685
15	82	0.0447	25	0.0098
16	103	0.0707	29	0.0144
17	127	0.1102	33	0.0203
18	159	0.1739	37	0.0291
19	197	0.272	42	0.0416
20	246	0.428	47	0.0587
21	308	0.676	53	0.0835
22	380	1.056	60	0.12
23	474	1.649	66	0.165
24	587	2.58	75	0.237
25	725	4.02	84	0.335
26	906	6.37	94	0.476
27	1141	10.05	105	0.744
28	1400	15.67	117	0.942

# 33.0mm OD

## 19.9mm ID x 10.7mm HT



### Core Dimensions (after finish)

O.D. (max.)	33.8 mm	1.330 in
I.D. (min)	19.30 mm	0.760 in
HT. (max.)	11.43 mm	0.450 in

Permeability ( $\mu$ )	$A_L \pm 8\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	14	55551-A2	58551-A2	-
26	28	55550-A2	58550-A2	77550-A7
60	61	55071-A2	58071-A2	77071-A7
75	76	-	-	77553-A7
90	91	-	-	77552-A7
125	127	55548-A2	58548-A2	77548-A7
147	150	55547-A2	58547-A2	-
160	163	55546-A2	58546-A2	-
173	176	55542-A2	-	-
200	203	55545-A2	-	-
300	305	55543-A2	-	-
550	559	55544-A2	-	-

### Physical Characteristics

Window Area	2.93 cm <sup>2</sup>	577,600 c.mils
Cross Section	0.672 cm <sup>2</sup>	0.1042 in <sup>2</sup>
Path Length	8.15 cm	3.21 in
Volume	5.48 cm <sup>3</sup>	0.334 in <sup>3</sup>
Weight- MPP	46.9 gm	0.106 lb
Weight- High Flux	44.2 gm	0.100 lb
Weight- Kool M $\mu$	33.7 gm	0.074 lb
Area Product	1.969 cm <sup>4</sup>	0.0473 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	5.93 cm	0.1943 ft
60%	5.09 cm	0.1668 ft
40%	4.27 cm	0.1400 ft
20%	3.91 cm	0.1282 ft
0%	3.78 cm	0.1238 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	46.7 mm	1.840 in
Max. HT. (u.w.f.)	28.0 mm	1.103 in

### Surface Area

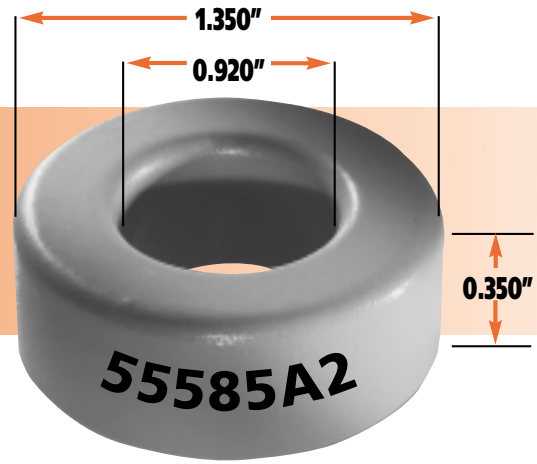
Unwound Core	31.5 cm <sup>2</sup>	4.88 in <sup>2</sup>
40% Winding Factor	48.0 cm <sup>2</sup>	7.44 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
8	32	0.00393	15	0.00117
9	40	0.00618	17	0.00166
10	50	0.00976	19	0.00236
11	63	0.01544	22	0.00343
12	79	0.0244	25	0.0055
13	99	0.0384	28	0.00693
14	123	0.0604	32	0.00999
15	154	0.0949	36	0.0142
16	193	0.1504	41	0.0204
17	239	0.234	46	0.0288
18	298	0.37	52	0.0411
19	370	0.579	58	0.0578
20	462	0.909	65	0.0815
21	578	1.437	74	0.118
22	713	2.24	83	0.166
23	889	3.5	92	0.231
24	1100	5.49	103	0.328
25	1359	8.56	116	0.465
26	1699	13.53	130	0.66
27	2139	21.4	145	0.922



# 34.3mm OD

## 23.4mm ID x 8.89mm HT



### Core Dimensions (after finish)

O.D. (max.)	35.2 mm	1.385 in
I.D. (min)	22.6 mm	0.888 in
HT. (max.)	9.78 mm	0.385 in

Permeability ( $\mu$ )	$A_L \pm 8\%$	Part Number		
		MPP	High Flux	Kool $\mu\mu$
14	9	55588-A2	58588-A2	-
26	16	55587-A2	58587-A2	77587-A7
60	38	55586-A2	58586-A2	77586-A7
75	47	-	-	77590-A7
90	57	-	-	77589-A7
125	79	55585-A2	58585-A2	77585-A7
147	93	55584-A2	58584-A2	-
160	101	55583-A2	58583-A2	-
173	109	55579-A2	-	-
200	126	55582-A2	-	-
300	190	55580-A2	-	-
550	348	55581-A2	-	-

### Physical Characteristics

Window Area	4.01 cm <sup>2</sup>	788,500 c.mils
Cross Section	0.454 cm <sup>2</sup>	0.0704 in <sup>2</sup>
Path Length	8.95 cm	3.53 in
Volume	4.06 cm <sup>3</sup>	0.249 in <sup>3</sup>
Weight- MPP	34.9 gm	0.081 lb
Weight- High Flux	32.9 gm	0.076 lb
Weight- Kool $\mu\mu$	25.0 gm	0.055 lb
Area Product	1.821 cm <sup>4</sup>	0.0436 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	5.87 cm	0.1923 ft
60%	4.84 cm	0.1586 ft
40%	3.84 cm	0.1258 ft
20%	3.39 cm	0.1113 ft
0%	3.23 cm	0.1059 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	50.1 mm	1.974 in
Max. HT. (u.w.f.)	29.0 mm	1.142 in

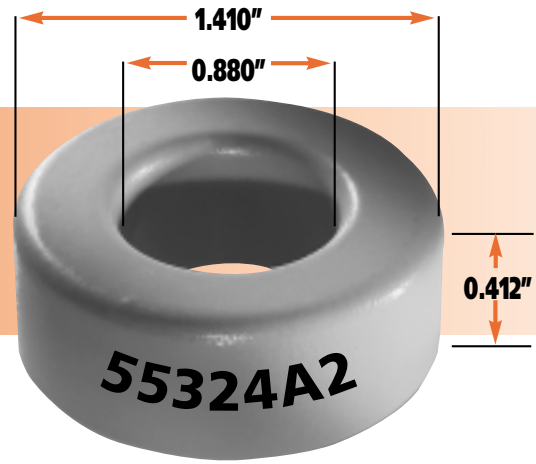
### Surface Area

Unwound Core	29.3 cm <sup>2</sup>	4.537 in <sup>2</sup>
40% Winding Factor	51.3 cm <sup>2</sup>	7.95 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
8	44	0.00531	18	0.0012
9	55	0.00835	20	0.00168
10	69	0.01319	23	0.00243
11	86	0.0209	26	0.00348
12	108	0.033	30	0.00505
13	135	0.0518	34	0.0072
14	168	0.0817	38	0.0101
15	210	0.1283	43	0.0145
16	263	0.203	48	0.0205
17	326	0.316	54	0.0288
18	406	0.499	61	0.0413
19	505	0.782	69	0.0665
20	631	1.229	77	0.0826
21	789	1.941	87	0.118
22	974	3.03	98	0.168
23	1213	4.74	109	0.234
24	1502	7.43	122	0.322
25	1855	11.56	137	0.47
26	2319	18.29	153	0.665
27	2921	28.9	170	0.925

# 35.8mm OD

## 22.4mm ID x 10.5mm HT



### Core Dimensions (after finish)

O.D. (max.)	36.7 mm	1.445 in
I.D. (min)	21.5 mm	0.848 in
HT. (max.)	11.35 mm	0.447 in

Permeability ( $\mu$ )	$A_L \pm 8\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	13	55327-A2	58327-A2	-
26	24	55326-A2	58326-A2	77326-A7
60	56	55076-A2	58076-A2	77076-A7
75	70	-	-	77329-A7
90	84	-	-	77328-A7
125	117	55324-A2	58324-A2	77324-A7
147	138	55323-A2	58323-A2	-
160	150	55322-A2	58322-A2	-
173	162	55318-A2	-	-
200	187	55321-A2	-	-
300	281	55319-A2	-	-
550	515	55320-A2	-	-

### Physical Characteristics

Window Area	3.64 cm <sup>2</sup>	719,100 c.mils
Cross Section	0.678 cm <sup>2</sup>	0.1051 in <sup>2</sup>
Path Length	8.98 cm	3.54 in
Volume	6.088 cm <sup>3</sup>	0.372 in <sup>3</sup>
Weight- MPP	51.8 gm	0.112 lb
Weight- High Flux	48.9 gm	0.106 lb
Weight- Kool M $\mu$	37.4 gm	0.082 lb
Area Product	2.47 cm <sup>4</sup>	0.0594 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	6.22 cm	0.2040 ft
60%	5.27 cm	0.1727 ft
40%	4.34 cm	0.1422 ft
20%	3.93 cm	0.1288 ft
0%	3.78 cm	0.1238 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	51.1 mm	2.01 in
Max. HT. (u.w.f.)	29.6 mm	1.165 in

### Surface Area

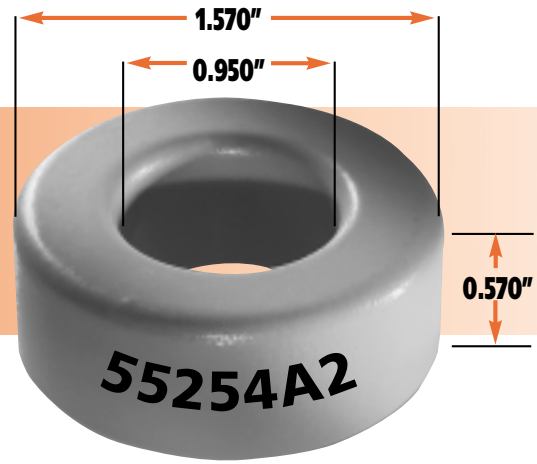
Unwound Core	34.5 cm <sup>2</sup>	5.35 in <sup>2</sup>
40% Winding Factor	55.1 cm <sup>2</sup>	8.54 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
8	40	0.00513	17	0.00133
9	50	0.00807	19	0.00185
10	63	0.01275	22	0.00273
11	79	0.0202	25	0.0039
12	98	0.0319	28	0.00551
13	123	0.0501	32	0.00792
14	154	0.079	36	0.0112
15	191	0.124	41	0.0162
16	240	0.1965	46	0.0229
17	297	0.306	52	0.0325
18	371	0.483	58	0.0458
19	461	0.757	65	0.0648
20	575	1.188	73	0.0915
21	719	1.877	82	0.13
22	888	2.93	93	0.187
23	1106	4.58	103	0.259
24	1370	7.18	116	0.368
25	1692	11.18	130	0.521
26	2115	17.68	146	0.741
27	2663	27.9	161	1.02



# 39.9mm OD

## 24.1mm ID x 14.5mm HT



### Core Dimensions (after finish)

O.D. (max.)	40.8 mm	1.605 in
I.D. (min)	23.3 mm	0.918 in
HT. (max.)	15.37 mm	0.605 in

Permeability ( $\mu$ )	$A_L \pm 8\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	19	55257-A2	58257-A2	-
26	35	55256-A2	58256-A2	77256-A7
60	81	55083-A2	58083-A2	77083-A7
75	101	-	-	77259-A7
90	121	-	-	77258-A7
125	168	55254-A2	58254-A2	77254-A7
147	198	55253-A2	58253-A2	-
160	215	55252-A2	58252-A2	-
173	233	55248-A2	-	-
200	269	55251-A2	-	-
300	403	55249-A2	-	-
550	740	55250-A2	-	-

### Physical Characteristics

Window Area	4.27 cm <sup>2</sup>	842,700 c.mils
Cross Section	1.072 cm <sup>2</sup>	0.1662 in <sup>2</sup>
Path Length	9.84 cm	3.88 in
Volume	10.5 cm <sup>3</sup>	0.645 in <sup>3</sup>
Weight- MPP	91.7 gm	0.206 lb
Weight- High Flux	86.5 gm	0.194 lb
Weight- Kool M $\mu$	64.9 gm	0.143 lb
Area Product	4.58 cm <sup>4</sup>	0.1100 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	7.38 cm	0.242 ft
60%	6.38 cm	0.209 ft
40%	5.40 cm	0.1772 ft
20%	4.97 cm	0.1631 ft
0%	4.81 cm	0.1578 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	56.4 mm	2.22 in
Max. HT. (u.w.f.)	35.2 mm	1.385 in

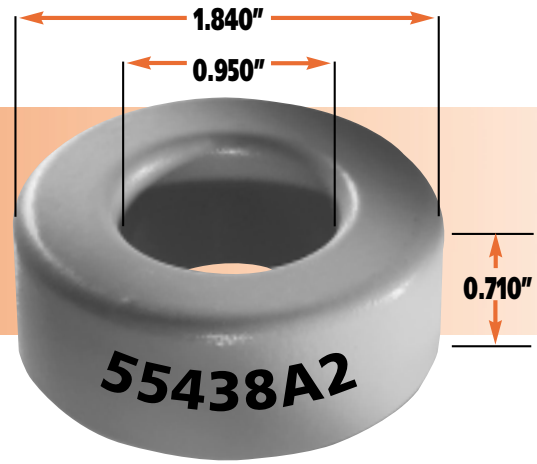
### Surface Area

Unwound Core	48.4 cm <sup>2</sup>	7.5 in <sup>2</sup>
40% Winding Factor	71.7 cm <sup>2</sup>	11.1 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
8	47	0.00714	18	0.00179
9	59	0.01123	21	0.00263
10	73	0.01774	24	0.00378
11	92	0.0281	27	0.00537
12	115	0.0444	31	0.00778
13	144	0.0698	35	0.0111
14	180	0.1099	39	0.0155
15	224	0.1726	44	0.0221
16	281	0.273	50	0.0317
17	348	0.426	56	0.0446
18	434	0.672	63	0.0636
19	540	1.053	71	0.0902
20	674	1.653	80	0.128
21	843	2.61	90	0.182
22	1040	4.08	101	0.259
23	1297	6.37	112	0.359
24	1605	9.99	126	0.511
25	1983	15.55	141	0.721
26	2479	24.6	158	1.02
27	3121	38.8	175	1.42

# 46.7mm OD

## 24.1mm ID x 18.0mm HT



### Core Dimensions (after finish)

O.D. (max.)	47.6 mm	1.875 in
I.D. (min)	23.3 mm	0.918 in
HT. (max.)	18.92 mm	0.745 in

Permeability ( $\mu$ )	$A_L \pm 8\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	32	55441-A2	58441-A2	-
26	59	55440-A2	58440-A2	77440-A7
60	135	55439-A2	58439-A2	77439-A7
75	169	-	-	77443-A7
90	202	-	-	77442-A7
125	281	55438-A2	58438-A2	77438-A7
147	330	55437-A2	-	-
160	360	55436-A2	-	-
173	390	55432-A2	-	-
200	450	55435-A2	-	-
300	674	55433-A2	-	-

### Physical Characteristics

Window Area	4.27 cm <sup>2</sup>	842,700 c.mils
Cross Section	1.990 cm <sup>2</sup>	0.308 in <sup>2</sup>
Path Length	10.74 cm	4.23 in
Volume	21.3 cm <sup>3</sup>	1.30 in <sup>3</sup>
Weight- MPP	181 gm	0.399 lb
Weight- High Flux	171 gm	0.378 lb
Weight- Kool M $\mu$	131.4 gm	0.29 lb
Area Product	8.50 cm <sup>4</sup>	0.204 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	8.66 cm	0.284 ft
60%	7.71 cm	0.253 ft
40%	6.78 cm	0.222 ft
20%	6.37 cm	0.209 ft
0%	6.22 cm	0.204 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	63.8 mm	2.51 in
Max. HT. (u.w.f.)	38.7 mm	1.525 in

### Surface Area

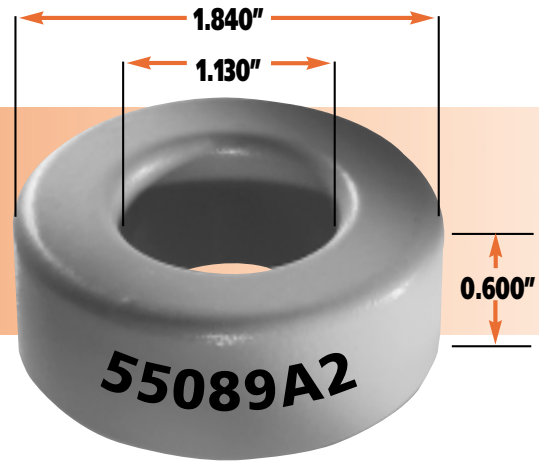
Unwound Core	69.3 cm <sup>2</sup>	10.7 in <sup>2</sup>
40% Winding Factor	94.3 cm <sup>2</sup>	14.6 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
8	47	0.00837	18	0.00231
9	59	0.01317	21	0.00339
10	73	0.0208	24	0.0049
11	92	0.0329	27	0.00694
12	115	0.052	31	0.01
13	144	0.0818	35	0.0143
14	180	0.1288	39	0.0201
15	224	0.202	44	0.0285
16	281	0.32	50	0.041
17	348	0.499	56	0.0577
18	434	0.788	63	0.0821
19	540	1.234	71	0.116
20	674	1.938	80	0.166
21	843	3.06	90	0.236
22	1040	4.78	101	0.334
23	1297	7.47	112	0.464
24	1605	11.71	126	0.66
25	1983	18.23	141	0.932
26	2479	28.8	158	1.32
27	3121	45.5	175	1.83



# 46.7mm OD

## 28.7mm ID x 15.2mm HT



### Core Dimensions (after finish)

O.D. (max.)	47.6 mm	1.875 in
I.D. (min)	27.9 mm	1.098 in
HT. (max.)	16.13 mm	0.635 in

Permeability ( $\mu$ )	$A_L \pm 8\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	20	55092-A2	58092-A2	-
26	37	55091-A2	58091-A2	77091-A7
60	86	55090-A2	58090-A2	77090-A7
75	107	-	-	77094-A7
90	128	-	-	77093-A7
125	178	55089-A2	58089-A2	77089-A7
147	210	55088-A2	-	-
160	228	55087-A2	-	-
173	246	55082-A2	-	-
200	285	55086-A2	-	-
300	427	55084-A2	-	-

### Physical Characteristics

Window Area	6.11 cm <sup>2</sup>	1,206,000 c.mils
Cross Section	1.340 cm <sup>2</sup>	0.208 in <sup>2</sup>
Path Length	11.63 cm	4.58 in
Volume	15.58 cm <sup>3</sup>	0.953 in <sup>3</sup>
Weight- MPP	130.4 gm	0.287 lb
Weight- High Flux	123 gm	0.271 lb
Weight- Kool M $\mu$	95.8 gm	0.211 lb
Area Product	8.19 cm <sup>4</sup>	0.1971 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	8.34 cm	0.273 ft
60%	7.12 cm	0.233 ft
40%	5.92 cm	0.194 ft
20%	5.40 cm	0.177 ft
0%	5.20 cm	0.171 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	66.3 mm	2.61 in
Max. HT. (u.w.f.)	39.8 mm	1.568 in

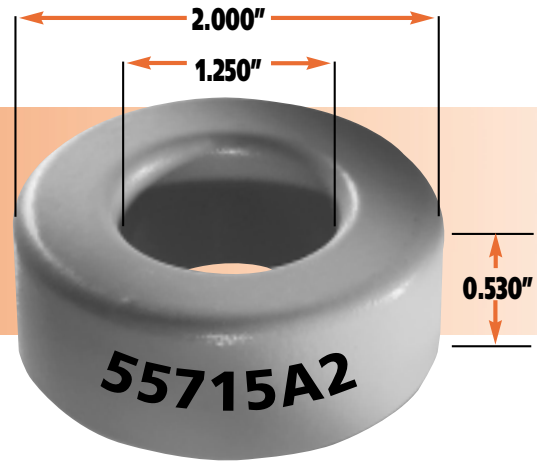
### Surface Area

Unwound Core	61.7 cm <sup>2</sup>	9.56 in <sup>2</sup>
40% Winding Factor	95.1 cm <sup>2</sup>	14.74 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
8	67	0.01153	23	0.00247
9	84	0.01814	26	0.0035
10	105	0.0287	29	0.00494
11	132	0.0453	33	0.00709
12	165	0.0717	37	0.01
13	206	0.1127	42	0.0143
14	258	0.1774	47	0.0202
15	321	0.279	54	0.0293
16	402	0.442	60	0.0411
17	498	0.688	68	0.0664
18	621	1.085	76	0.0828
19	773	1.7	86	0.118
20	964	2.67	96	0.166
21	1206	4.22	108	0.236
22	1488	6.59	121	0.335
23	1855	10.29	135	0.468
24	2296	16.13	152	0.666
25	2837	25.1	170	0.939
26	3546	39.7	190	1.33
27	4465	62.7	211	1.86

# 50.8mm OD

## 31.8mm ID x 13.5mm HT



### Core Dimensions (after finish)

O.D. (max.)	51.7 mm	2.035 in
I.D. (min)	30.9 mm	1.218 in
HT. (max.)	14.35 mm	0.565 in

Permeability ( $\mu$ )	$A_L \pm 8\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	17	55718-A2	58718-A2	-
26	32	55717-A2	58717-A2	77717-A7
60	73	55716-A2	58716-A2	77716-A7
75	91	-	-	77720-A7
90	109	-	-	77719-A7
125	152	55715-A2	58715-A2	77715-A7
147	179	55714-A2	-	-
160	195	55713-A2	-	-
173	210	55709-A2	-	-
200	243	55712-A2	-	-
300	365	55710-A2	-	-

### Physical Characteristics

Window Area	7.50 cm <sup>2</sup>	1,484,000 c.mils
Cross Section	1.251 cm <sup>2</sup>	0.194 in <sup>2</sup>
Path Length	12.73 cm	5.02 in
Volume	15.93 cm <sup>3</sup>	0.974 in <sup>3</sup>
Weight- MPP	141 gm	0.312 lb
Weight- High Flux	133 gm	0.294 lb
Weight- Kool M $\mu$	98.1 gm	0.216 lb
Area Product	9.38 cm <sup>4</sup>	0.226 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	8.51 cm	0.279 ft
60%	7.12 cm	0.234 ft
40%	5.77 cm	0.189 ft
20%	5.18 cm	0.170 ft
0%	4.95 cm	0.162 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	72.4 mm	2.85 in
Max. HT. (u.w.f.)	40.6 mm	1.600 in

### Surface Area

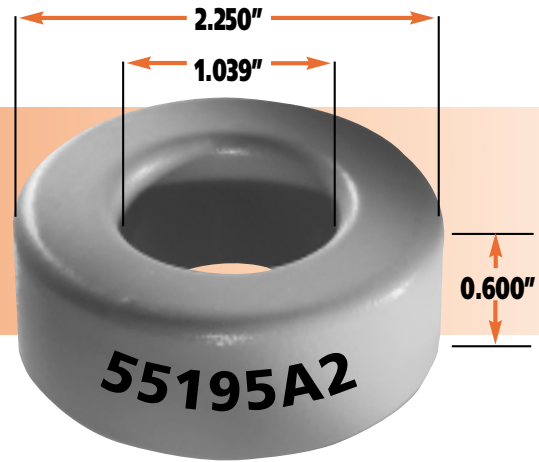
Unwound Core	64.2 cm <sup>2</sup>	9.95 in <sup>2</sup>
40% Winding Factor	106.3 cm <sup>2</sup>	16.48 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
8	82	0.0144	25	0.0025
9	103	0.0228	29	0.00369
10	129	0.036	33	0.00533
11	162	0.0569	37	0.00752
12	203	0.09	42	0.0108
13	254	0.1415	47	0.0153
14	317	0.223	53	0.0217
15	395	0.35	60	0.031
16	495	0.555	67	0.0437
17	613	0.864	76	0.0622
18	765	1.363	85	0.0882
19	951	2.14	95	0.121
20	1187	3.35	107	0.176
21	1484	5.3	120	0.25
22	1832	8.28	135	0.354
23	2282	12.93	150	0.494
24	2826	20.3	168	0.701
25	3491	31.6	188	0.989
26	4363	49.9	211	1.4
27	5495	78.8	234	1.95



# 57.2mm OD

## 26.4mm ID x 15.2mm HT



### Core Dimensions (after finish)

O.D. (max.)	58.0 mm	2.285 in
I.D. (min)	25.6 mm	1.007 in
HT. (max.)	16.1 mm	0.635 in

Permeability ( $\mu$ )	$A_L \pm 8\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	32	55190-A2	58190-A2	-
26	60	55191-A2	58191-A2	77191-A7
60	138	55192-A2	58192-A2	77192-A7
75	172	-	-	77193-A7
90	207	-	-	77194-A7
125	287	55195-A2	58195-A2	77195-A7
147	306	55196-A2	-	-
160	333	55197-A2	-	-
173	360	55198-A2	-	-
200	417	55199-A2	-	-

### Physical Characteristics

Window Area	5.14 cm <sup>2</sup>	1,014,049 c.mils
Cross Section	2.29 cm <sup>2</sup>	0.355 in <sup>2</sup>
Path Length	12.5 cm	4.93 in
Volume	28.6 cm <sup>3</sup>	1.75 in <sup>3</sup>
Weight- MPP	240 gm	0.527 lb
Weight- High Flux	226 gm	0.497 lb
Weight- Kool M $\mu$	176 gm	0.388 lb
Area Product	11.8 cm <sup>4</sup>	0.283 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	9.02 cm	0.296 ft
60%	8.35 cm	0.274 ft
40%	7.62 cm	0.250 ft
20%	7.01 cm	0.230 ft
0%	6.46 cm	0.212 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	75.7 mm	2.98 in
Max. HT. (u.w.f.)	34.0 mm	1.34 in

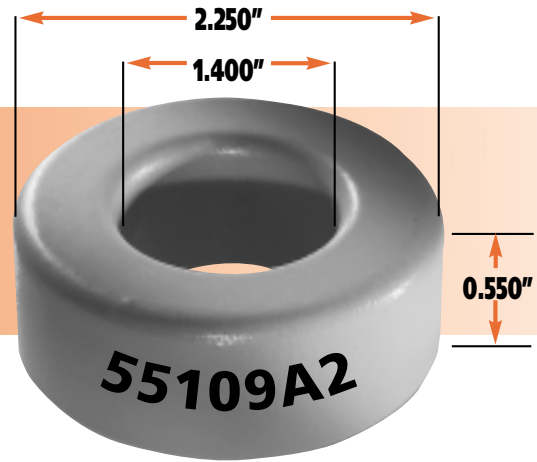
### Surface Area

Unwound Core	91.0 cm <sup>2</sup>	14.1 in <sup>2</sup>
40% Winding Factor	115 cm <sup>2</sup>	17.8 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
8	56	0.00967	20	0.00267
9	70	0.0151	23	0.00385
10	88	0.0241	26	0.00551
11	110	0.0379	30	0.00801
12	138	0.0601	34	0.0115
13	173	0.0948	39	0.0165
14	216	0.149	43	0.023
15	269	0.234	49	0.033
16	338	0.372	55	0.0469
17	419	0.58	62	0.0664
18	522	0.914	70	0.0948
19	650	1.43	78	0.133
20	811	2.25	88	0.189
21	1014	3.55	99	0.269
22	1252	5.55	111	0.381
23	1560	8.67	124	0.534
24	1931	13.6	138	0.752
25	2386	21.2	156	1.07
26	2982	33.5	174	1.51
27	3755	52.9	193	2.10

# 57.2mm OD

## 35.6mm ID x 14.0mm HT



### Core Dimensions (after finish)

O.D. (max.)	58.0 mm	2.285 in
I.D. (min)	34.7 mm	1.368 in
HT. (max.)	14.86 mm	0.585 in

Permeability ( $\mu$ )	$A_L \pm 8\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	18	55112-A2	58112-A2	-
26	33	55111-A2	58111-A2	77111-A7
60	75	55110-A2	58110-A2	77110-A7
75	94	-	-	77214-A7
90	112	-	-	77213-A7
125	156	55109-A2	58109-A2	77109-A7
147	185	55108-A2	-	-
160	200	55107-A2	-	-
173	218	55103-A2	-	-
200	250	55106-A2	-	-
300	374	55104-A2	-	-

### Physical Characteristics

Window Area	9.48 cm <sup>2</sup>	1,871,000 c.mils
Cross Section	1.444 cm <sup>2</sup>	0.224 in <sup>2</sup>
Path Length	14.30 cm	5.63 in
Volume	20.65 cm <sup>3</sup>	1.260 in <sup>3</sup>
Weight- MPP	175 gm	0.387 lb
Weight- High Flux	165 gm	0.365 lb
Weight- Kool M $\mu$	127 gm	0.280 lb
Area Product	13.69 cm <sup>4</sup>	0.329 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	9.33 cm	0.306 ft
60%	7.76 cm	0.254 ft
40%	6.23 cm	0.204 ft
20%	5.56 cm	0.182 ft
0%	5.30 cm	0.174 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	81.3 mm	3.20 in
Max. HT. (u.w.f.)	44.4 mm	1.748 in

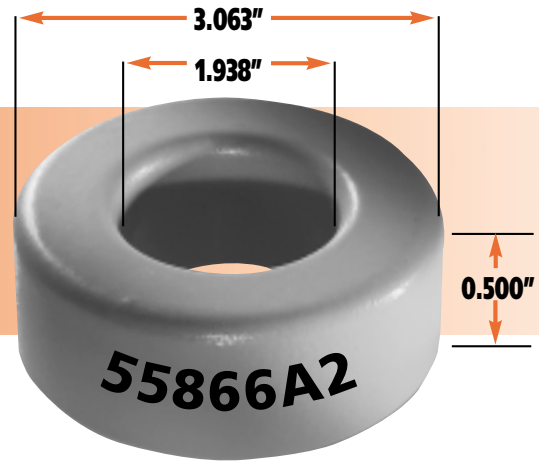
### Surface Area

Unwound Core	76.8 cm <sup>2</sup>	11.9 in <sup>2</sup>
40% Winding Factor	130.7 cm <sup>2</sup>	20.26 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
8	104	0.02	29	0.00318
9	130	0.0315	33	0.00453
10	163	0.0498	37	0.00644
11	204	0.0787	42	0.0092
12	256	0.1245	48	0.0133
13	320	0.1957	54	0.0188
14	400	0.308	60	0.0263
15	498	0.484	68	0.0376
16	624	0.767	76	0.0531
17	773	1.195	85	0.0746
18	965	1.886	96	0.107
19	1200	2.95	108	0.152
20	1497	4.64	120	0.211
21	1871	7.33	135	0.3
22	2310	11.45	152	0.428
23	2879	17.88	169	0.596
24	3565	28	189	0.845
25	4403	43.6	212	1.19
26	5504	69	237	1.69
27	6931	109	263	2.35

# 77.8mm OD

## 49.2mm ID x 12.7mm HT



### Core Dimensions (after finish)

O.D. (max.)	78.9 mm	3.108 in
I.D. (min)	48.2 mm	1.898 in
HT. (max.)	13.84 mm	0.545 in

Permeability ( $\mu$ )	$A_L \pm 8\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	16	55869-A2	58869-A2	-
26	30	55868-A2	58868-A2	77868-A7
60	68	55867-A2	58867-A2	-
125	142	55866-A2	58866-A2	-

### Physical Characteristics

Window Area	17.99 cm <sup>2</sup>	3,550,000 c.mils
Cross Section	1.77 cm <sup>2</sup>	0.274 in <sup>2</sup>
Path Length	20.0 cm	7.72 in
Volume	34.7 cm <sup>3</sup>	2.115 in <sup>3</sup>
Weight- MPP	288 gm	0.635 lb
Weight- High Flux	272 gm	0.599 lb
Weight- Kool M $\mu$	213 gm	0.467 lb
Area Product	31.8 cm <sup>4</sup>	0.765 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	10.40 cm	0.340 ft
60%	8.60 cm	0.282 ft
40%	6.90 cm	0.226 ft
20%	6.15 cm	0.202 ft
0%	5.90 cm	0.193 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	112 mm	4.40 in
Max. HT. (u.w.f.)	54.3 mm	2.14 in

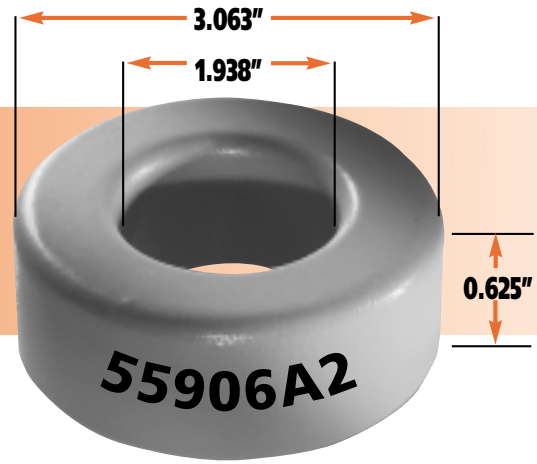
### Surface Area

Unwound Core	117.5 cm <sup>2</sup>	18.2 in <sup>2</sup>
40% Winding Factor	203.1 cm <sup>2</sup>	31.49 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
8	197	0.0422	41	0.00552
9	248	0.0664	47	0.00794
10	309	0.105	53	0.0113
11	388	0.1663	60	0.0162
12	486	0.262	67	0.0228
13	608	0.412	76	0.0325
14	760	0.65	84	0.0454
15	944	1.022	95	0.0646
16	1182	1.616	106	0.0912
17	1465	2.52	119	0.129
18	1830	3.98	134	0.183
19	2275	6.23	150	0.258
20	2840	9.8	168	0.364
21	3550	15.45	188	0.514
22	4390	24.2	211	0.732
23	5470	37.4	235	1.02
24	6770	59.2	263	1.3
25	8350	92	295	1.84
26	10450	145.8	330	2.61
27	13150	229	365	3.62

# 77.8mm OD

## 49.2mm ID x 15.9mm HT



### Core Dimensions (after finish)

O.D. (max.)	78.9 mm	3.108 in
I.D. (min)	48.2 mm	1.898 in
HT. (max.)	17.02 mm	0.670 in

Permeability ( $\mu$ )	$A_L \pm 8\%$	Part Number		
		MPP	High Flux	Kool M $\mu$
14	20	55909-A2	58909-A2	-
26	37	55908-A2	58908-A2	77908-A7
60	85	55907-A2	58907-A2	-
125	178	55906-A2	58906-A2	-

### Physical Characteristics

Window Area	17.99 cm <sup>2</sup>	3,550,000 c.mils
Cross Section	2.27 cm <sup>2</sup>	0.352 in <sup>2</sup>
Path Length	19.95 cm	7.86 in
Volume	45.3 cm <sup>3</sup>	2.77 in <sup>3</sup>
Weight- MPP	377 gm	0.832 lb
Weight- High Flux	356 gm	0.785 lb
Weight- Kool M $\mu$	279 gm	0.615 lb
Area Product	40.8 cm <sup>4</sup>	0.982 in <sup>4</sup>

### Winding Turn Length

WINDING FACTOR	LENGTH/TURN	
100% (Unity)	11.00 cm	0.361 ft
60%	9.24 cm	0.303 ft
40%	7.53 cm	0.247 ft
20%	6.80 cm	0.223 ft
0%	6.52 cm	0.214 ft

### Wound Coil Dimensions

Max. O.D. (u.w.f.)	113 mm	4.45 in
Max. HT. (u.w.f.)	57.7 mm	2.27 in

### Surface Area

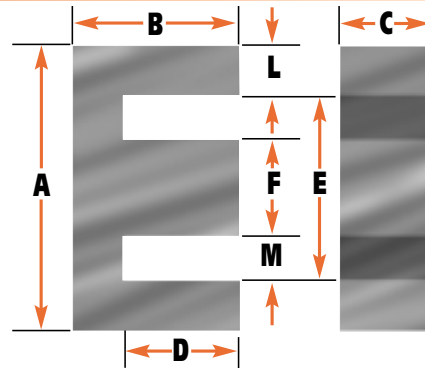
Unwound Core	130 cm <sup>2</sup>	20.1 in <sup>2</sup>
40% Winding Factor	225.2 cm <sup>2</sup>	34.90 in <sup>2</sup>

AWG Wire Size	Turns (u.w.f.)	Rdc (Ohms, $\Omega$ ) (u.w.f.)	Single Layer Turns	Single Layer Rdc. (Ohms, $\Omega$ )
8	197	0.0418	41	0.00612
9	248	0.0705	47	0.0088
10	309	0.1115	53	0.0125
11	388	0.1766	60	0.018
12	486	0.278	67	0.0253
13	608	0.437	76	0.036
14	760	0.69	84	0.0503
15	944	1.085	95	0.0716
16	1182	1.716	106	0.101
17	1465	2.67	119	0.143
18	1830	4.23	134	0.203
19	2275	6.61	150	0.286
20	2840	10.4	168	0.404
21	3550	16.4	188	0.57
22	4390	25.7	211	0.812
23	5470	39.7	235	1.13
24	6770	62.9	263	1.44
25	8350	97.7	295	2.04
26	10450	154.8	330	2.89
27	13150	243.1	365	4.01

# Kool M $\mu$ <sup>®</sup> E Core Data

Additional Kool M $\mu$  E Core sizes being tooled:

- K1207-E (EF12.6)
- K3007-E (DIN 30/7)
- K7228-E (F11)
- K8020-E (Metric E80)



PART NO.		A	B	C	D (min)	E (min)	F	L (nom)	M (min)
K1808-E (EI-187)	in. (mm)	.760±.012 (19.30)	.319±.007 (8.10)	.188±.006 (4.78)	.218 (5.54)	.548 (13.9)	.188±.005 (4.78)	.094 (2.39)	.183 (4.65)
K2510-E (E-2425)	in. (mm)	1.000±.010 (25.40)	.375±.005 (9.53)	.250±.004 (6.53)	.245 (6.22)	.740 (18.8)	.250±.005 (6.22)	.125 (3.17)	.246 (6.25)
K3515-E (EI-375)	in. (mm)	1.360±.015 (34.54)	.557±.005 (14.10)	.368±.007 (9.35)	.380 (9.65)	.995 (25.3)	.367±.008 (9.32)	.175 (4.45)	.310 (7.87)
K4017-E (EE 42/11)	in. (mm)	1.687±.025 (42.8)	.830±.007 (21.1)	.424±.010 (10.8)	.587 (15.0)	1.195 (30.4)	.468±.010 (11.9)	.234 (5.95)	.365 (9.27)
K4020-E (DIN 42/15)	in. (mm)	1.687±.025 (42.8)	.830±.007 (21.1)	.608±.010 (15.4)	.587 (15.0)	1.195 (30.4)	.468±.010 (11.9)	.234 (5.95)	.365 (9.27)
K4022-E (DIN 42/20)	in. (mm)	1.687±.025 (42.8)	.830±.007 (21.1)	.788±.010 (20.0)	.587 (15.0)	1.195 (30.4)	.468±.010 (11.9)	.234 (5.95)	.365 (9.27)
K4317-E (EI-21)	in. (mm)	1.609±.015 (40.9)	.650±.006 (16.5)	.493±.007 (12.5)	.410 (10.4)	1.115 (28.3)	.493±.007 (12.5)	.238 (6.0)	.310 (7.9)
K5528-E (DIN 55/21)	in. (mm)	2.16±.025 (54.90)	1.085±.016 (27.60)	.812±.015 (20.6)	.730 (18.5)	1.476 (37.5)	.660±.015 (16.8)	.330 (8.38)	.405 (10.30)
K5530-E (DIN 55/21)	in. (mm)	2.16±.025 (54.90)	1.085±.016 (27.60)	.969±.015 (24.61)	.730 (18.5)	1.476 (37.5)	.660±.015 (16.8)	.330 (8.38)	.405 (10.30)

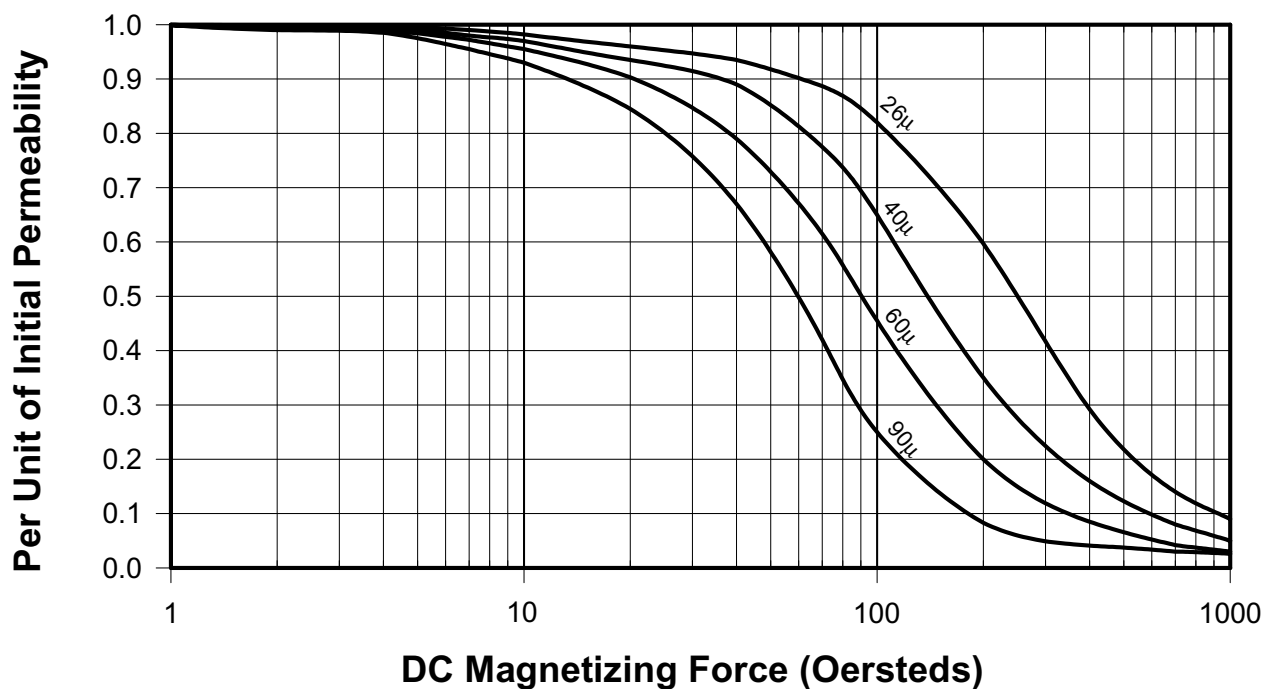
PART NO.	AL MH/100 TURNS±8%				Path Length Le (cm)	Cross Section AE (cm <sup>2</sup> )	Volume Ve (cm <sup>3</sup> )
	26 $\mu$	40 $\mu$	60 $\mu$	90 $\mu$			
K1808-E***	26	35	48	69	4.01	0.228	0.914
K2510-E***	39	52	70	100	4.85	0.385	1.87
K3515-E***	56	75	102	146	6.94	0.840	5.83
K4017-E***	56	76	105	151	9.84	1.28	12.6
K4020-E***	80	108	150	217	9.84	1.83	18.0
K4022-E***	104	140	194	281	9.84	2.37	23.3
K4317-E***	88	119	163	234	7.75	1.52	11.8
K5528-E***	116	157	219	-	12.3	3.50	43.1
K5530-E***	138	187	261	-	12.3	4.17	51.4

\*\*\* Add material code to part number, e.g., for 60 $\mu$  the complete part number is K1808-E060

# Kool M $\mu$ <sup>®</sup> E Core DC Bias

Kool M $\mu$  E cores are available in four permeabilities, 26 $\mu$ , 40 $\mu$ , 60 $\mu$ , and 90 $\mu$ . The magnetic data for each core is shown in the table below. The most critical parameter of a switching regulator inductor material is its ability to provide inductance, or permeability, under DC bias. The graph below shows the reduction of permeability as a function of DC bias. The distributed air gap of Kool M $\mu$  results in a soft inductance versus DC bias curve. In most

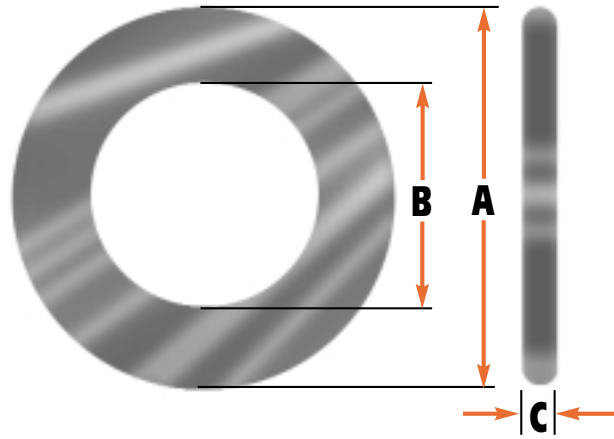
applications, this swinging inductance is desirable since it improves efficiency and accommodates a wide operating range. With a fixed current requirement, the soft inductance versus DC bias curve provides added protection against overload conditions. The chart below is plotted on a semi-log scale to show the DC bias characteristics at high currents.





# MPP THINZ™ Core Data

Special core heights are available, consult factory.



PART NO.		A nom.	B nom.	C nom.	A max.	B min.	C max.
M-0301-T	in. (mm)	.120 (3.05)	.070 (1.78)	.032 (.81)	.123 (3.12)	.067 (1.70)	.035 (.89)
M-0302-T	in. (mm)	.140 (3.55)	.070 (1.78)	.032 (.81)	.143 (3.63)	.067 (1.70)	.035 (.89)
M-0402-T	in. (mm)	.155 (3.94)	.088 (2.23)	.032 (.81)	.159 (4.04)	.084 (2.13)	.035 (.89)
M-0502-T	in. (mm)	.181 (4.60)	.093 (2.36)	.032 (.81)	.185 (4.70)	.089 (2.26)	.035 (.89)
M-0603-T	in. (mm)	.250 (6.35)	.110 (2.79)	.032 (.81)	.255 (6.47)	.105 (2.67)	.035 (.89)
M-0804-T	in. (mm)	.310 (7.87)	.156 (3.96)	.032 (.81)	.315 (8.00)	.151 (3.83)	.035 (.89)

PART NO.	A, MH/1000 TURNS±15%				Path Length Le (cm)	Cross Section AE (cm²)	Volume Ve (cm³)
	125μ	160μ	200μ	250μ			
M0301-T***	8.4	10.8	13.5	16.9	.704	.0040	.0028
M0302-T***	11.6	14.8	18.7	23.4	.806	.0060	.0048
M0402-T***	9.6	12.3	15.4	19.3	.944	.0058	.0055
M0502-T***	11.7	15.0	18.7	23.4	1.058	.0079	.0083
M0603-T***	14.9	19.1	24.0	30.0	1.361	.0130	.0177
M0804-T***	12.6	16.2	20.2	25.3	1.789	.0145	.0259

\*\*\* Add material code to part number, e.g., for 125μ the complete part number is M0502-T125

# MPP THINZ™ DC Bias

THINZ™ are available in four permeabilities, 125 $\mu$ , 160 $\mu$ , 200 $\mu$ , and 250 $\mu$ . The most critical parameter of a power inductor material is its ability to provide inductance, or permeability, under DC bias. The distributed air gap of MPP results in a soft inductance versus DC bias curve. This swinging inductance is often desirable since it improves efficiency and accommodates a wide operating range. With a fixed current requirement, the soft

inductance versus DC bias curve provides added protection against overload conditions. With a variable current requirement a more efficient inductor is achieved. The graph below shows the reduction of permeability as a function of DC bias. This graph is plotted on a semi-log scale to show the DC bias characteristics at high DC magnetizing forces. The following equation can be used to relate current to magnetizing force, or H.

$$H = .4 \pi N I / L_e$$

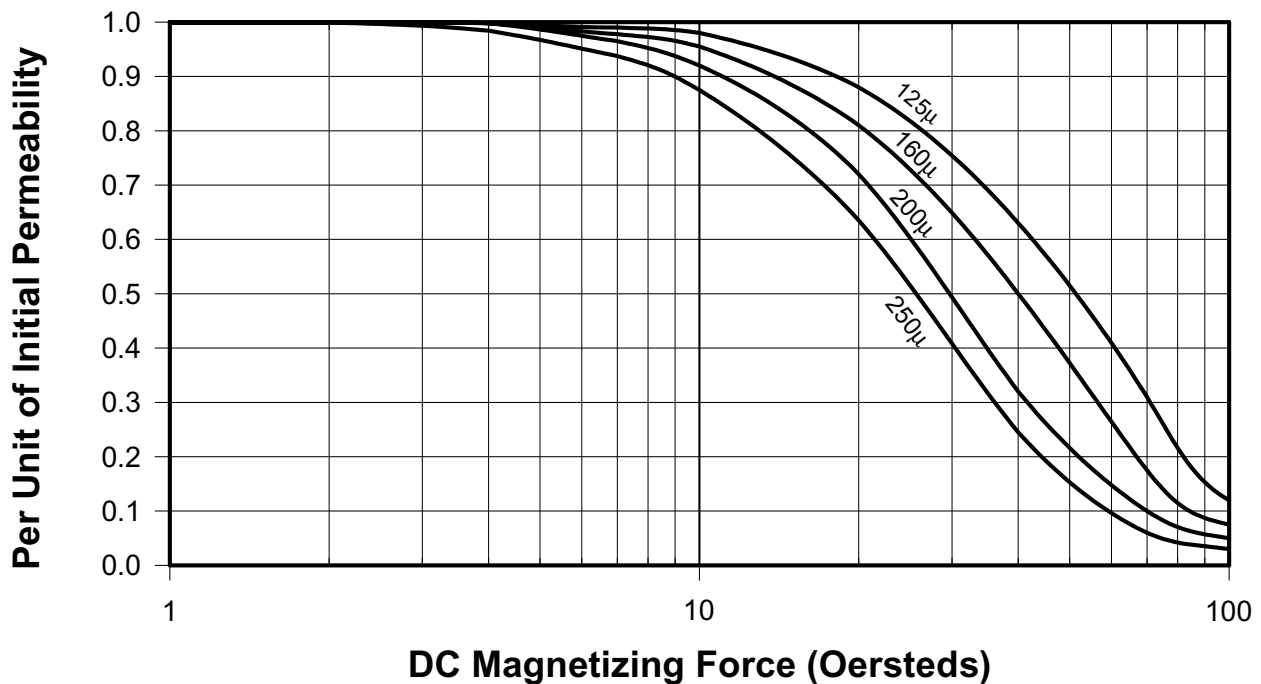
where:

H = DC Magnetizing force in Oersteds

N = number of turns

I = current in amps

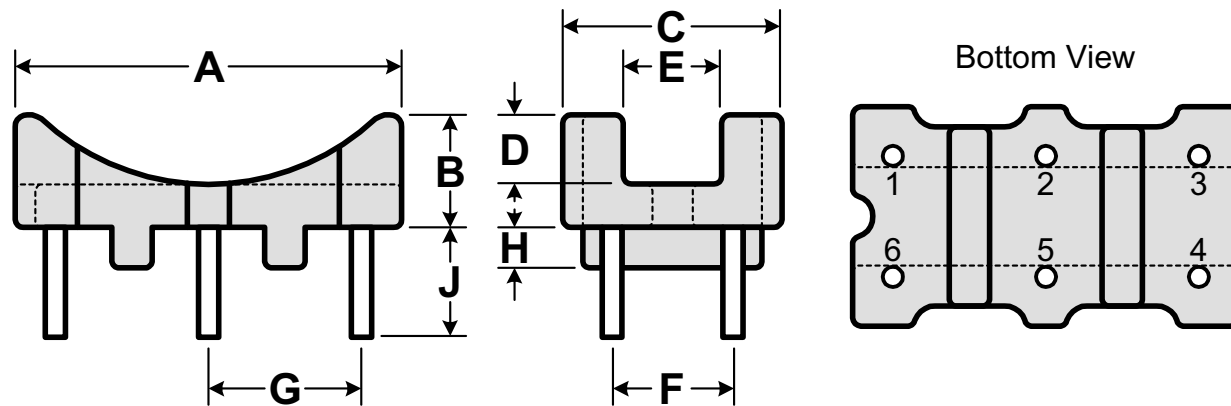
$L_e$  = magnetic path length in cm<sup>2</sup>



# Hardware

## TV-B2206-6A

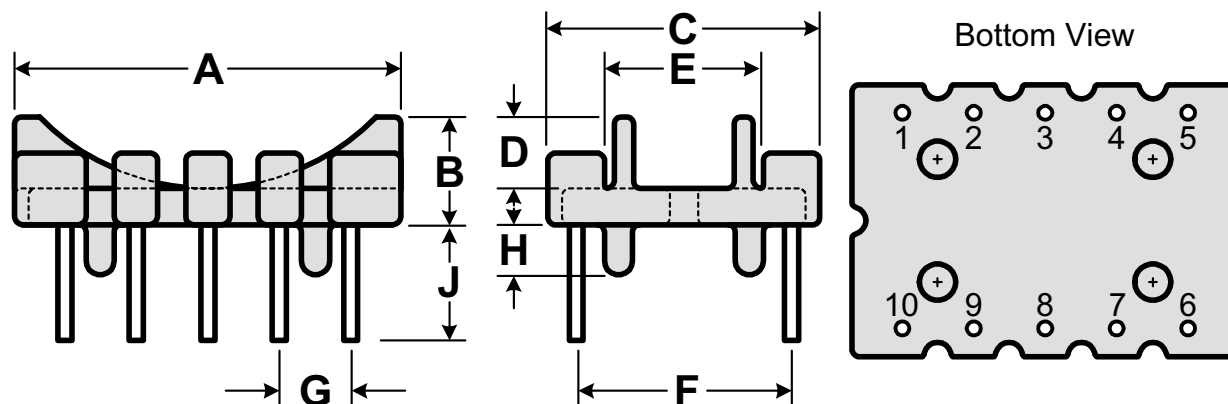
Usable with toroids from 12.7mm (0.500") through 22.2mm (0.875")



Material	6 Pins	A Nom.	B Nom.	C Nom.	D Nom.	E Ref.	F Typ.	G Typ.	H Ref.	J Ref.
Phenolic rated UL94V0	1.0mm CP wire	19.0mm 0.748"	5.5mm 0.216"	10.8mm 0.425"	3.5mm 0.138"	4.8mm 0.189"	6.0mm 0.236"	7.5mm 0.295"	2.0mm 0.079"	5.5mm 0.216"

## TV-B2908-TA

Usable with toroids from 20.5mm (0.810") through 31.8mm (1.250")

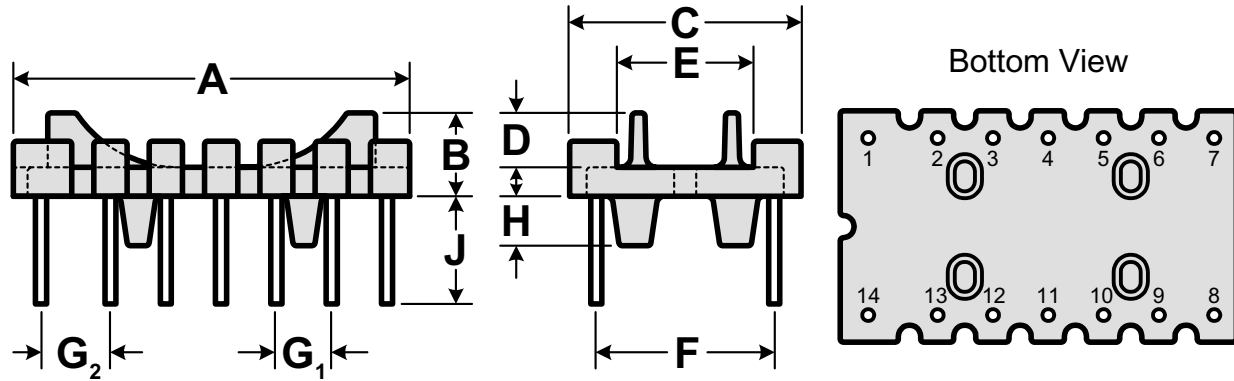


Material	10 Pins	A Nom.	B Nom.	C Nom.	D Nom.	E Ref.	F Typ.	G Typ.	H Ref.	J Ref.
Phenolic rated UL94V0	1.0mm CP wire	27.0mm 1.063"	7.5mm 0.295"	19.0mm 0.748"	5.0mm 0.197"	11.0mm 0.432"	15.0mm 0.590"	5.0mm 0.197"	3.5mm 0.138"	8.13mm 0.320"

# Hardware

## TV-B3610-FA

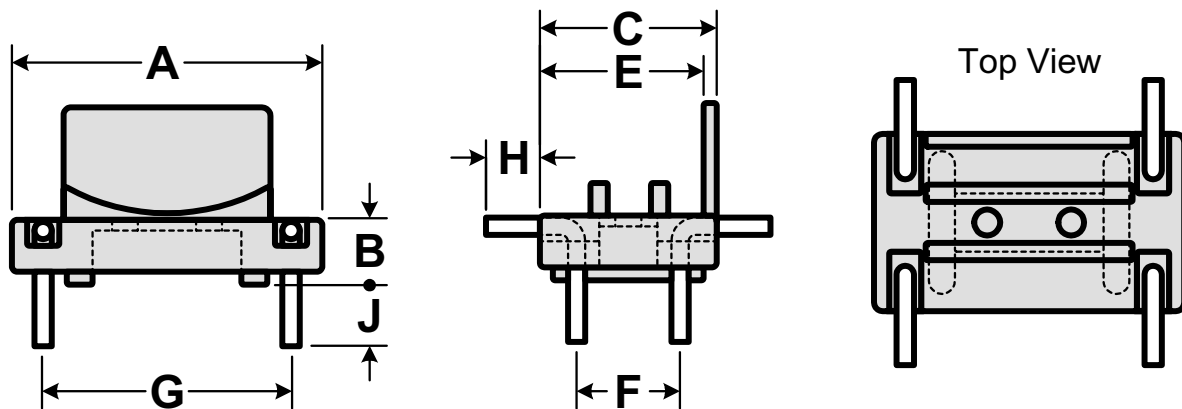
Usable with toroids from 28.6mm (1.125") through 38.1mm (1.500")



Material	14 Pins	A Nom.	B Nom.	C Nom.	D Nom.	E Ref.	F Typ.	G <sub>1</sub> Typ.	G <sub>2</sub> Typ.	H Ref.	J Ref.
Phenolic rated UL94V0	1.0mm CP wire	35.8mm 1.409"	7.6mm 0.299"	20.8mm 0.819"	5.0mm 0.197"	12.3mm 0.484"	16.0mm 0.630"	5.0mm 0.197"	6.3mm 0.248"	4.5mm 0.177"	9.75mm 0.384"

## TV-H2206-4A

Usable with toroids from 12.7mm (0.500") through 25.4mm (1.000")

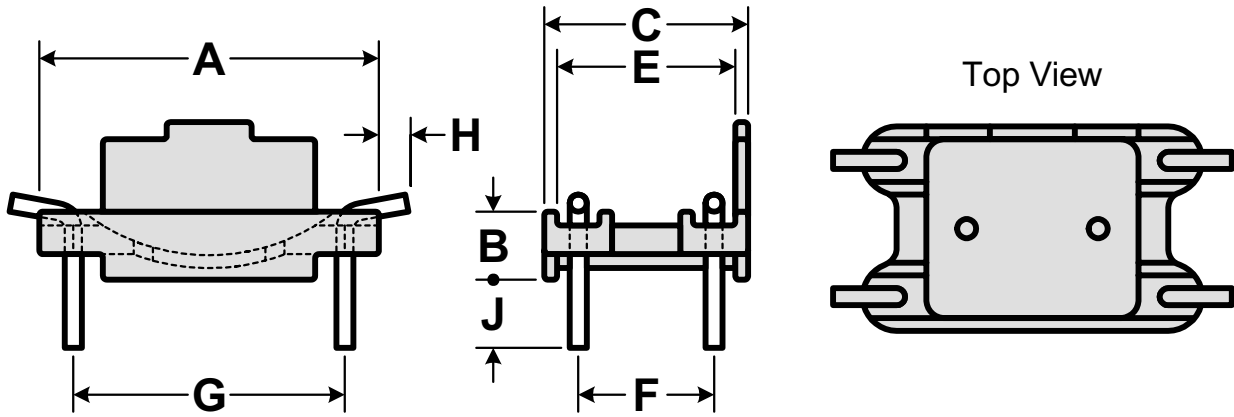


Material	4 Pins	A Nom.	B Nom.	C Nom.	E Ref.	F Typ.	G Typ.	H Typ.	J Typ.
Nylon rated UL94V0	0.040" CP wire	19.0mm 0.750"	3.9mm 0.155"	10.8mm 0.425"	9.8mm 0.385"	6.4mm 0.250"	15.2mm 0.600"	3.3mm 0.130"	3.8mm 0.150"

# Hardware

## TV-H2507-4A

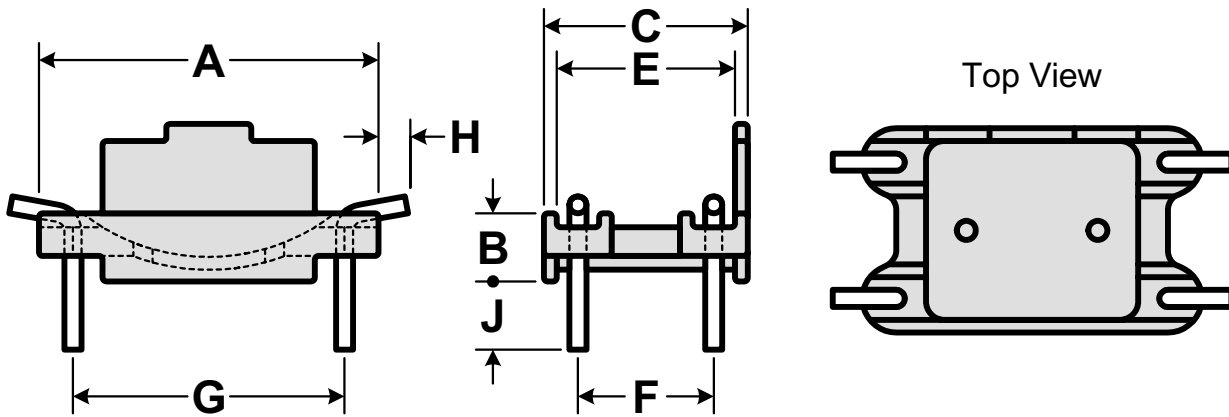
Usable with toroids from 20.5mm (0.810") through 30.5mm (1.200")



Material	4 Pins	A Nom.	B Nom.	C Nom.	E Ref.	F Typ.	G Typ.	H Typ.	J Typ.
Nylon rated UL94V0	CP wire 0.050"	25.4mm 1.000"	5.1mm 0.200"	15.2mm 0.600"	13.0mm 0.510"	10.2mm 0.400"	20.33mm 0.800"	2.3mm 0.090"	5.1mm 0.200"

## TV-H3813-4A

Usable with toroids from 25.4mm (1.000") through 40.6mm (1.600")

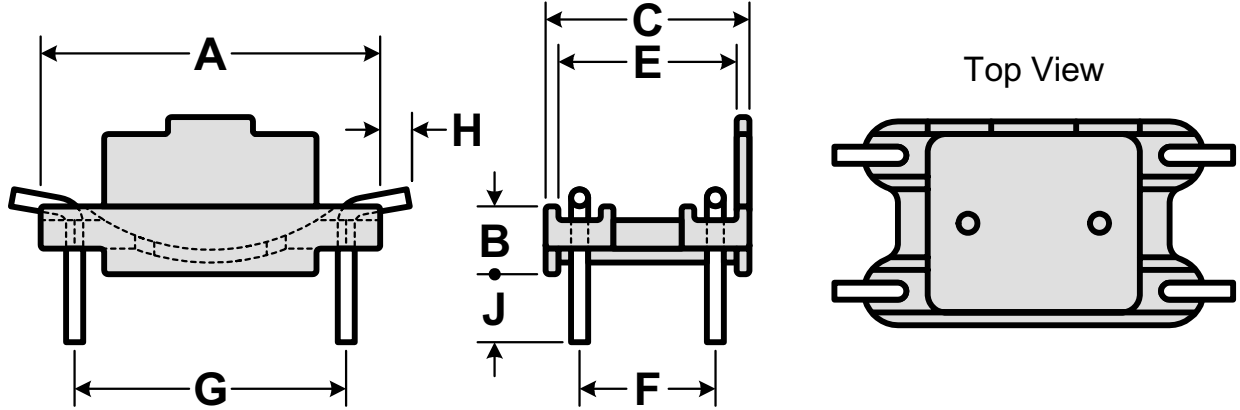


Material	4 Pins	A Nom.	B Nom.	C Nom.	E Ref.	F Typ.	G Typ.	H Typ.	J Typ.
Nylon rated UL94V0	CP wire 0.050"	27.9mm 1.100"	5.1mm 0.200"	20.3mm 0.800"	18.0mm 0.710"	15.2mm 0.600"	22.9mm 0.900"	2.3mm 0.090"	5.1mm 0.200"

# Hardware

## TV-H4196-4A

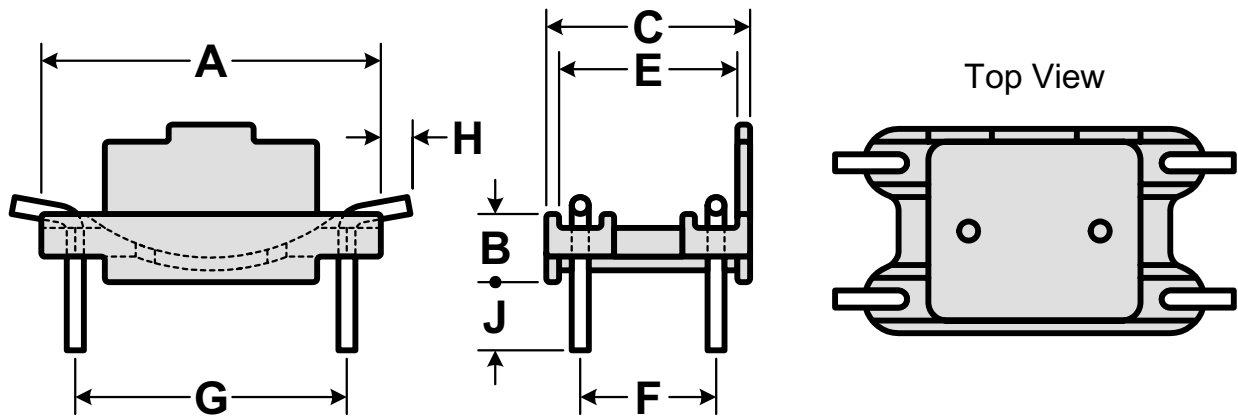
Usable with toroids from 38.1mm (1.500") through 63.5mm (2.500")



Material	4 Pins	A Nom.	B Nom.	C Nom.	E Ref.	F Typ.	G Typ.	H Typ.	J Typ.
Nylon rated UL94V0	CP wire 0.050"	35.6mm 1.400"	5.1mm 0.200"	22.9mm 0.900"	20.6mm 0.810"	17.8mm 0.700"	30.5mm 1.200"	2.3mm 0.090"	5.1mm 0.200"

## TV-H6113-4A

Usable with toroids from 44.4mm (1.750") through 71.1mm (2.800")



Material	4 Pins	A Nom.	B Nom.	C Nom.	E Ref.	F Typ.	G Typ.	H Typ.	J Typ.
Nylon rated UL94V0	CP wire 0.050"	43.2mm 1.700"	5.1mm 0.200"	27.9mm 1.100"	25.7mm 1.010"	22.9mm 0.900"	38.1mm 1.500"	2.3mm 0.090"	5.1mm 0.200"

# Kool M $\mu$ <sup>®</sup> E Core Hardware

A horizontal mount printed circuit bobbin is available for each Kool M $\mu$  E-core size. Plain or un-pinned, bobbins are also available for most sizes. Refer to Magnetics Ferrite Cores catalog FC-601, section 11 for details.

The cores are standard industry sizes that will fit standard bobbins available from many sources. Core pieces can be assembled by bonding the mating surfaces and taping around the perimeter of the core set.

Core Number	Bobbin Number	Number of Pins	Winding Area		Length Per Turn	
			Winding Area (cm <sup>2</sup> )	Winding Area (in <sup>2</sup> )	Length per Turn (cm)	Length per Turn (ft)
K1808-E (EI-187)	PC-B1808-81	8	0.316	0.049	4.05	0.133
K2510-E (E-2425)	PC-B2510-T1	10	0.406	0.063	5.42	0.178
K3515-E (EI-375)	PC-B3515-L1	12	0.948	0.147	7.34	0.241
K4020-E (DIN 42/15)	PC-B4020-L1	12	1.94	0.300	9.14	0.300
K4022-E (DIN 42/20)	PC-B4022-L1	12	1.94	0.300	10.21	0.335
K4317-E (EI-21)	PC-B4317-L1	12	1.01	0.156	8.56	0.281
K5528-E (DIN 55/21)	PC-B5528-WA	20	3.02	0.468	10.73	0.352
K5530-E (DIN 55/25)	PC-B5530-FA	14	2.89	0.448	13.38	0.439





# Other Products From Magnetics

## Ferrite Cores

For telecommunications and high Q filter inductors, high purity manganese-zinc ferrite pot cores exhibit low loss characteristics and exceptionally low disaccommodation. They are available with linear temperature characteristics (-30°C to +70°C) in permeabilities of 750 and 2000, or flat temperature characteristics (+20° to +70°C) in a 2300 permeability material. For transformer applications, the inductance of ungapped pot cores in the above materials are guaranteed to ±25%. For filters, cores can be gapped to standard inductance factors guaranteed to ±3%. Twenty-three physical sizes (3 x 2 mm to 45 x 29 mm) are stocked; each size offers a variety of standard inductance values.

Toroids, E-cores, U-I cores, pot cores, and other shapes are also available for high frequency inductor and power transformers. For these applications, four low loss power materials with permeabilities of 1500, 2300, 2500, and 3000 are available.

Many of these same shapes are also available in high permeability materials of 5,000 $\mu$ , 10,000 $\mu$ , and 15,000 $\mu$  for EMI/RFI filters and broadband transformers.

For further information view Ferrite Cores Catalog (FC-601) at [www.mag-inc.com](http://www.mag-inc.com).

**SHAPES:** Pot cores, Toroids, E, I, U Cores, and Other Shapes

**APPLICATIONS:** Inductors, Filters, Delay Lines, Transformers, etc.

## Tape Wound Cores

Tape Wound Cores are made from high permeability alloys of nickel-iron, grain oriented silicon-iron, and cobalt-iron. The alloys are known as Orthonol<sup>®</sup>, Alloy 48, Square Permalloy 80, Round Permalloy, Supermalloy, Magnesil<sup>®</sup>, Supermendur, and amorphous alloys. Cores are available in all IEEE standard sizes and over 1,400 special sizes.

For a wide range of frequency applications, materials are produced in thicknesses from 1/2 mil (0.013mm) through 14 mils (0.356mm). All core sizes can be provided in non-metallic (phenolic or plastic), aluminum, or GVB (Guaranteed Voltage Breakdown) coated aluminum boxes. Magnesil<sup>®</sup> material, being less sensitive to external stresses, is also available unboxed or epoxy encapsulated. Commonly used sizes are in stock for immediate shipment.

For further information view the Tape Wound Core Catalog (TWC-500) [www.mag-inc.com](http://www.mag-inc.com).

**APPLICATIONS:** Magnetic Amplifiers, Converters, Inverters, Reactors, Regulators, Static Magnetic Devices

## Bobbin Cores

Miniature Tape Wound Bobbin Cores are manufactured from Permalloy 80, Orthonol, and amorphous alloy 2714A ultra-thin tape (0.000125" to 0.001" thick). They are available in widths from 0.023" to 0.250" (wider on special request). Wound on non-magnetic stainless steel bobbins, core diameters are available down to 0.050", with flux capacities as low as several maxwells.

MAGNETICS sophisticated pulse test equipment reproduces most test programs and can measure accurately in the millivolt-microsecond region. Standard sizes are available from stock.

For further information view the Bobbin Core Catalog (BCC-1.1) at [www.mag-inc.com](http://www.mag-inc.com).

**APPLICATIONS:** Magnetometers, Flux Gates, High Frequency Counters, Timers, Oscillators, Inverters, Magnetic Amplifiers.

## Cut Cores

SUPERMENDUR C-cores and E-cores are used in power transformers at frequencies up to 1500 Hz where minimum weight and size are required.

PERMALLOY 80 C-cores are ideal for the output transformer of high frequency, high power inverters. The low core loss of these cores makes them suitable up to 5000 gauss, at frequencies up to 25 kHz. Other uses: high power pulse transformers, high frequency inductors, and low loss current transformers.

ORTHONOL<sup>®</sup> C-cores have a saturation flux density of 15,000 gauss, and a core loss approximately one-half that of a silicon-iron C-core of the same material thickness. These cores are suitable for power transformers operating at flux densities to 10,000 gauss, and frequencies to 8 kHz.

Amorphous alloy cores offer low losses up to 100 kHz at flux densities comparable to 50 Ni / 50 Fe cores. These alloys are attractive for magnetic core devices where ruggedness and low weight are important.

For further information view the Cut Core Catalog (MCC-100) at [www.mag-inc.com](http://www.mag-inc.com).



[www.mag-inc.com](http://www.mag-inc.com)

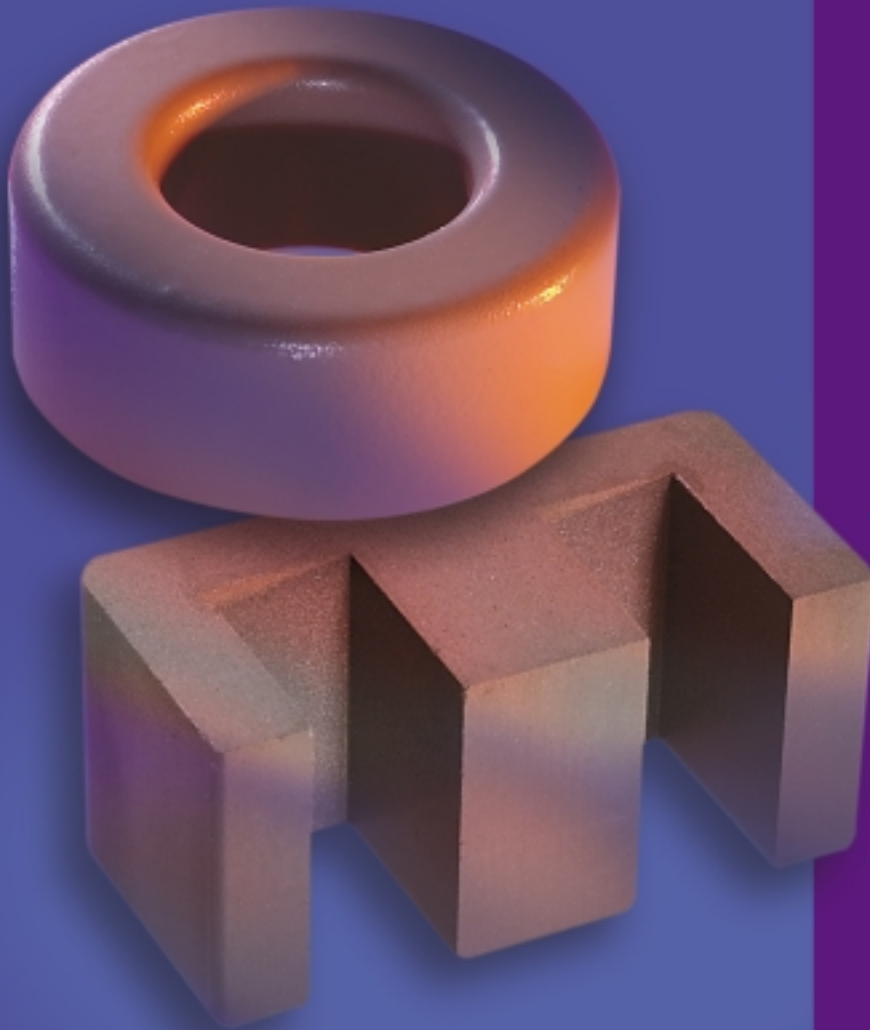
## Website Enhanced

The newly redesigned MAGNETICS website contains a wealth of easy to access information on soft magnetic cores and materials. Some of the most important features of the new website are:

- The MAGNETICS Digital Library contains all of the company's technical bulletins, white papers, and design manuals, which can be viewed on-screen or downloaded.
- The Software section of the website provides access to the MAGNETICS software design aids for designing Common Mode Filters, Current Transformers, Inductors, and MagAmps.
- All of the product specifications for ferrite cores, powder cores, strip wound products, and specialty metals can be quickly found by using the menu driven product locator.
- The Contact Application Engineering page allows users to quickly contact our Application Engineering staff for assistance.
- The News section of the website keeps users up to date on the latest product introductions and developments.

## CD Now Available

MAGNETICS has just developed an interactive CD that contains all of the company's publicly available design manuals, technical literature, and design software. The CD is a small 3-inch format for easy portability and is PC and Mac compatible. It allows the user to view, print, and run the software design aids directly from the CD. This CD is free and available from MAGNETICS or any of the company's distributors or agents. To request a free CD, visit the MAGNETICS website at [www.mag-inc.com](http://www.mag-inc.com).



HOME OFFICE AND FACTORY  
P.O. Box 11422  
Pittsburgh, PA 15238-0422  
PHONE: 1.800.245.3984  
FAX: 412.696.0333

[www.mag-inc.com](http://www.mag-inc.com)

[magnetics@spang.com](mailto:magnetics@spang.com)