Facts at a Glance

From: Vishay Foil Resistors
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Obtaining Precision Foil Resistors in Samples and Small Prototype Runs with No Minimum Order Quantity within Five Working Days from Vishay Foil Resistors' Precision Centers

The exact values you need. In the exact quantities you need. When you need them!

Do you want to save money for R&D? Why order whole reels to get just the few resistors you need when you aren't even sure about the final values?

Did you ask how to minimize your R&D expenses for resistors? Would you like to know how you can avoid Minimum Order Quantities (MOQ's) without being limited to so-called "standard" values? Especially when no one knows for sure if the resistance values to be chosen for production will be the same as used at the prototype stage?

A few pieces are generally considered a sample, but a few pieces are not the custom among resistor manufacturers. If the sample must be a specific value, you cannot get it and must use standard values. You might have to take a full reel for each value (multiple reels for multiple values). Not so with Bulk Metal® Foil resistors. Through a system of precision centers strategically located around the world, any value from 5Ω and tolerances to 0.001% in small quantities are available in five working days or less. Today, you might have to pay $10 or more for a few pieces of metal film with 5 ppm/ºC TCR for standard values of lower performance resistors (thin film, thick film).

Prototype Runs
Speed to market, and design work in general, have a short time frame within which the equipment must be designed, built, and performance checked. Should there be any expectation that a second iteration of resistor selections might be necessary; the Vishay Foil Resistors Precision Center concept is the ideal solution for small prototype runs and quick changes prior to full production.

Vishay Foil Resistors (VFR) announces today that it extended the number of precision centers from which it ships custom resistance values in five days or less. As with all Vishay Foil resistors, specific "as required values" (e.g. 998.995 Ω vs. 1 kΩ) cost no more and require no longer delivery time than standard values.

The precision centers, as part of the VFR Division of Vishay Precision Group (VPG), are dedicated to the development, manufacture, and marketing of high precision resistors for use in diverse precision applications. All VFR Precision Centers offer a full complement of resistors needed in accurate, precise and high power circuits.

Generally, the resistor industry will supply samples of a few pieces but such samples must be standard values. And, when just a slightly higher quantity is required for prototypes, the customer must buy a full reel of resistors for each value. Conversely, the VFR Precision Center ships the exact number of resistors needed of the precise resistance value and tolerance required, and does so within just a few days. For prototype systems where the exact final resistance value has not yet been determined, engineers are provided additional flexibility in that they may order just a few pieces of specific values in close proximity for final evaluation without having to stock up reels of unnecessary, eventually useless, values. Through the VFR Precision Center, any value from 5-ohms and up at any tolerance to 0.001% are available in small quantities within a few working days.

The competitive pressures imposed upon equipment manufacturers demand speed to market and, in turn, this demands a very short time frame for design, component acquisition, assembly, and performance evaluation. Should a second iteration require a second round of component selection, the time to market is further delayed, with possibly detrimental effects to the company's market position. The VFR Precision Center is the ideal source for the small quantity prototype runs and quick changes prior to full production.

VFR's Bulk Metal® Foil resistors are the most accurate and stable among all resistor technologies. Vishay Foil resistors are the best choice for use in prototype runs even if another lower-performing resistor is planned for the full production, and here's why:

(1) The Bulk Metal® Foil resistor is the most cost-effective route to quick delivery of small quantities of any ohmic value.
(2) The Bulk Metal® Foil resistors are more precise in all respects than other precision resistor technologies and therefore meet or exceed all performance levels required by the application.
(3) Bulk Metal® Foil resistors in the prototypes will permit evaluation of the equipment's full performance capability not just room-temperature, benign-environment, limited evaluation.
(4) Bulk Metal® Foil resistors might point the way to an improved-performance second-generation instrument.

The VFR Precision Center is open to messenger pick-up and other time-saving strategies as required by the user. Particularly when time is an important factor, resistors made in this fashion are a decided cost advantage for the designer.

Given the breadth of products available today with Bulk Metal® Foil resistor elements, it is not possible for the VFR Precision Centers to do the finishing stages of all models. However, with factory assistance, samples and prototypes of all models can be expedited as required by the user. The VFR Precision Center stocks certain types but manufactures the most widely used models on site.

It is important to note that Bulk Metal® Foil resistors are not of restricted to standard values and can be supplied at "any value to any tolerance."

Products of the VFR Precision Centers: VSMP Series, VSM Series, S Series and Z201 Series.

VISHAY PRECISION GROUP

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Summary:

(1) Bulk Metal® Foil resistors can be obtained from Vishay Foil Resistors as well as other VFR Precision Centers around the world for any value, any tolerance, and quick delivery of samples and prototypes.
(2) VFR Precision Center production can be customer-operated inside the customer's own factory for on-going applications requiring made-to-order, select-at-manufacture values with delivery as short as one day.
(3) Bulk Metal® Foil resistors performance exceeds the performance of all other types of resistors
(4) Using Bulk Metal® Foil resistors as prototypes is a cost-effective way to bring new designs to market.
(5) Guarantee cost savings in the long-term and not just in unit price.
(6) The Bulk Metal® Foil resistor is the only resistor that comes with a life insurance certificate for guaranteed performance. Vishay Foil stands behind any and all maximum performance figures in its datasheets; no hidden small print is used to equivocate on the expected performance.

Bulk Metal® Foil Resistors

For those not familiar with Bulk Metal® Foil resistors from the Vishay Foil Resistors Company, they are the best performing devices among all resistor technologies. They are the best choice for use in prototype runs even if another lower-performing resistor is planned for the full production. Here's why:

(1) The Bulk Metal® Foil resistor is the low-cost route to quick delivery of small quantities of any ohmic value.
(2) Bulk Metal® Foil resistors will permit full performance capability to be evaluated, not just the static un-stressed, room-temperature performance.
(3) Bulk Metal® Foil resistors might just point the way to a second-generation instrument.

If you are not satisfied with the lead-time you've received from your purchasing channels, it will be worthwhile to drop us an email with your details so we can provide quick support. In many cases, our original lead-times are much less than you currently receive due to middlemen and lack of understanding of our production capabilities, especially for prototype orders. It is generally not well known that Vishay Foil Resistors Company ships custom-made resistors to the exact required value and tolerance in five days or less. Contact us at Foil@vishaypg.com.

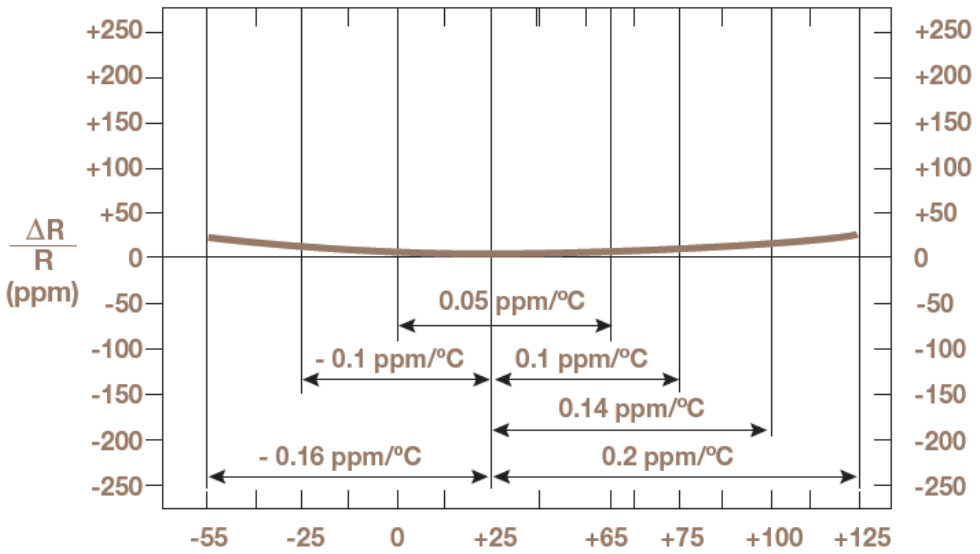

Figure 1. Z-Foil TCR Curve - Ambient temperature coefficient and TCR chord slopes for different temperature ranges (note: the TCR slopes for <100 Ω are influenced by the termination composition and result in deviation from this curve).

Products of VFR Precision Centers:

1. VSMP Series http://www.vishaypg.com/foil-resistors/list/product-63060/
2. VSM Series http://www.vishaypg.com/foil-resistors/list/product-63070/
3. S Series http://www.vishaypg.com/foil-resistors/list/product-63001/
4. Z201 http://www.vishaypg.com/foil-resistors/list/product-63113/
5. 300144 (Z) http://www.vishaypg.com/foil-resistors/list/product-63115/

Hybrid Applications http://www.vishaypg.com/docs/63189/v5x5zv15.pdf
For hybrid applications and *in situ*, you can use the Vishay Foil Resistor unadjusted chip. Wire connect to the circuit and adjust the desired resistance value of the chip by cutting certain resistance lines by laser or otherwise. This unique system solves two basic problems common to the electronics industry. First is the problem of operationally trimming a circuit with a potentiometer limited by resolution, drift and setting stability in addition to the electrical characteristics of temperature drift, etc. The Vishay Foil Resistor chip can be operationally trimmed after installation, while monitoring the important output parameters of the circuit. Once calibrated, the value is permanently set and remains unaffected by shock and vibration.

Foil Resistor Performance
The final design may not initially require all the performance of VFR's foil resistors. However, since Vishay Foil Resistors outperform all other resistor technologies, designers can be confident that Foil resistors will meet all the circuit requirements that any other technology will meet. The Foil resistor's performance attributes are listed in Table 1.

Table 1. Performance of Foil Resistors with Comparison to Other Technologies

Technology	Z-Foil	Classic Foil	Precision Thin Film	Thick Film
Typical TCR	0.05 ppm/º C (0º C to +60º C) 0.2 ppm/º C (-55º C to +125º C, +25º C ref.)	< 2 ppm/º C (-55º C to +125º C, +25º C ref.)	10 - 25 ppm/º C* (-55º C to +125º C, +25º C ref.)	100 - 300 ppm/º C (-55º C to +125º C, +25º C ref.)
Load-life stability (> 2000 h at +70º C)	0.005% (rated power)	0.005% (rated power)	0.1%	1% - 3%
PCR at rated power	5 ppm	20 ppm	> 200 ppm	> 1000 ppm
ESD withstanding	> 25,000 V	> 25,000 V	3000 V	< 2000 V

*** 5 ppm is available but is very expensive and requires special screening**

Other Technologies
From all the different ways of making a resistor, the precision end of the spectrum is defined as end-of-life tolerance (not just the initial tolerance), low absolute TCR and long-term stability. With this in mind, Bulk Metal® Foil resistors comply fully while wirewounds and thin film resistors are runners-up. Some insight into how resistors are made will give credence to the preference for Foil.

Conclusions:

(1) Bulk Metal® Foil resistors can be obtained from VFR Precision Centers around the world in any value, any tolerance, with quick delivery of samples and prototypes.
(2) Bulk Metal® Foil performance exceeds the performance of all other resistor technologies.
(3) Using Bulk Metal® Foil resistors as prototypes is a cost-effective way to bring new designs to the market.
(4) Vishay Foil guarantees that you should see cost savings in the long-term and not just in unit price.
(5) The Bulk Metal® Foil resistor is the only resistor that comes with a life insurance certificate for guaranteed performance. Vishay Foil stands behind any and all maximum figures in its datasheets; no fine print is used to equivocate on the expected performance.

Foil products:
http://www.vishaypg.com/foil-resistors/

New Products:
http://www.vishaypg.com/foil-resistors/press/

For more information about this product group, please contact us at: **Foil@vishaypg.com**

Follow Vishay Foil Resistors on Twitter: **@FoilResistor** or “Like” our Vishay Precision Group fan page on **Facebook**.