

Measuring ID Surface Finish

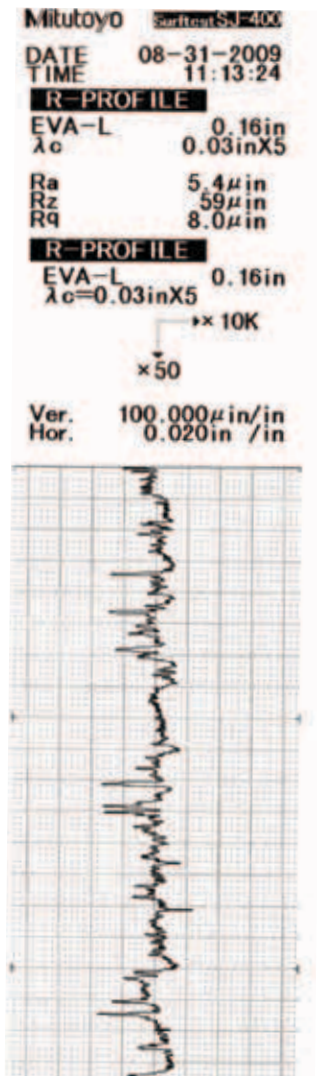
What you need to know about tube ID surface finish

Surface finish issue

Inside diameter (ID) surface finish has a profound effect on the functionality of stainless steel tubing and its suitability for a particular application.

Historically, surface finish measurement technology has been costly and difficult to find, causing frustration for those involved with specifying it as a requirement. In the miniature stainless tubing industry, this situation has existed for years, only to be further confused by the following:

- Conflicting standards
- Using conversion factors to estimate finish
- Lack of understanding regarding the relationship of surface finish to product/device functionality
- Inability to accurately measure surface finish



What is surface finish?

In the American Society of Metals Handbook, surface finish is defined as the “condition of a surface as the result of a final treatment and measured surface profile characteristics with the preferred term being roughness.” For tubing, the two parameters typically used are Ra and Rq (RMS). Ra is the arithmetical mean of the absolute values of the profile departures within the evaluation length. Rq is the root mean square value corresponding to the Ra.

The importance of specifying the desired surface finish

It is essential to understand that ideal surface finish specifications are application dependent. Engineering staffs can help you decide how to specify the proper surface finish. The miniature stainless tubing industry can produce surface finishes that range from as low as 4 Rq to greater than 100 Rq. The most important goal is to provide a cost-effective solution that achieves the surface finish you require.

For example, in biomedical applications involving the extraction of delicate body fluids or tissues samples, unimpeded flow is a critical characteristic. In this instance, the surface finish should be as smooth as possible to prevent possible damage to the sample. When long miniature tubes are required to accommodate single- or multiple-use devices simultaneously, a very clean, smooth surface finish can help decrease insertion resistance, provide a uniform feel for the operator/practitioner and reduce the potential for damage to any fluid carried inside the tube itself.

Surface finish for applications such as injection needles, IV drops and veterinary products are not as critical and, therefore, do not require an extremely smooth finish. In these types of applications, it may be unnecessary to incorporate additional and typically more costly finishing processes.

The appropriate surface finish will benefit customers and end users by providing a product that functions as intended, thus preventing or significantly reducing the potential for assembly and/or field failures. Specifying, measuring and reporting the desired surface finish can also help overcome any customer or end user perceptions of low quality.

Determining the appropriate surface finish specifications for your application

Customers attempt to communicate their surface finish needs to tubing manufacturers in a variety of well-intentioned but ultimately vague ways. For example, needs are often expressed as a visual requirement, such as how bright or how smooth the finish appears to the naked eye. Surface finish requirements are often either overstated or understated by the designer, which can lead to dissatisfaction with the delivered product. There are also customers who perform internal testing in an effort to determine their specifications but do not share their test methods with the tube manufacturer, making it impossible to correlate results.

When you are specifying tubing requirements for your application, K-Tube strongly recommends that the intended application and your product performance expectations be thoroughly discussed. This will give us a clear understanding of your needs and ensure that the product you receive meets your requirements.

The best practice is to provide us with a range or maximum for Ra or Rq that is appropriate for your intended application. Surface finish specifications using Ra and Rq become increasingly critical as the ability to use visual standards diminishes. From a measurement point of view, the instrument, filter, tooling (stylus) and procedure need to be identified, or the resultant value has no context. In many instances, changing manufacturers or models of test equipment will lead to different results, as will changing the stylus, or the procedure for measurement of length or speed. Correlation can be performed to ensure your surface finish requirements are met.

The K-Tube surface finish solution

One of the tubing industry's most important objectives has been to provide its customers and end users with a consistent surface finish. Until recently, the industry was forced to rely on visual inspections and/or verification standards that were far from ideal. Because of ongoing process improvements and advances in micro-measurement technology, K-Tube is able to determine and verify ID surface finish values with impressive accuracy, consistency and confidence.

K-Tube offers a variety of ID surface finishes that enable designers to make choices about surface finish that are both cost-effective and application driven.