



$$A = \frac{L_1}{L_2}$$

# AccuracyRatio 1.6

The Industry's Leading Tool for Measurement Decision Risk Analysis and Guardbanding

If you make decisions based on measurements, then you need to analyze and **control measurement decision risk**. Measurement decision risk comes in two forms. First, there's **false accept risk**. This is the risk of mistakenly perceiving an out-of-tolerance parameter to be in-tolerance. Second, there's **false reject risk**. This is the risk of perceiving an in-tolerance parameter to be out-of-tolerance.

## Why Analyze Risks?

Since the 1960s, controlling false accept and false reject risks has been accomplished by striving to reach high **nominal accuracy ratios** (e.g., 4:1). An accuracy ratio is usually thought of as the ratio between the tolerance limits of a parameter being measured and the tolerance limits of another parameter being used as a reference. Another view is that it is the ratio of a tolerance limit of a parameter being measured to the uncertainty of the measuring process. These ratios are important control variables, but there are other important variables as well  $\frac{3}{4}$  variables such as in-tolerance percentage, guardband limits, single-sided vs. two-sided specs, parameter distributions, ancillary uncertainties, and more. By analyzing how these variables impact risks, you can see what changes are needed to **meet quality objectives, keep assessors and customers happy and ensure your own peace of mind**.

## Why Control False Accept Risk?

False accept risk is what motivates the requirements in ANSI/NCSL Z540.3 and ISO 10012-2003-04-15 and is the driving force behind the uncertainty analysis requirements of ISO/IEC 17025. It's the risk that threatens to compromise the accuracy of calibrated test systems, the quality of products and the reputation of calibrating and testing organizations. Simply put, if you estimate and evaluate false accept risk, you can **control the quality of your measurements**.

## Why Control False Reject Risk?

False reject risk, leads to discarding, reworking, repairing, servicing, etc. of perfectly acceptable items. In other words, false reject risk costs you money. If you estimate and evaluate false reject risk, you can **reduce operating costs**.

## Setting Guardbands

You want to control risks to reassure your customers or to conform to standards while keeping costs at a minimum. Reassuring customers and conforming to standards means controlling false accept risk. One way to reduce false accept risk is to apply guardband limits that make test tolerances smaller than design tolerances. **The tighter the test tolerances, the lower the false accept risk**.

But tightening test tolerances **increases false reject risk and increases operating costs**. So, what do you do? The smart answer is to first establish maximum allowable false accept risks and then adjust guardbands to achieve them. With **AccuracyRatio**, this is a snap. Just enter the desired level of false accept risk and compute guardbands with the click of a button.

## With AccuracyRatio You Can...

- Determine whether measurement accuracies are sufficient by calculating false accept risk and false reject risk.
- Define baseline risks for a given application, corporate policy requirement, contract requirement or quality objective.
- Compute risks and accuracy ratios for two-sided or single-sided tolerances
- Apply real-world parameter bias distributions to estimate bias uncertainty.
- Estimate measurement process uncertainty and factor it into false accept risk and false reject risk analyses.
- Establish guardbands consistent with risk requirements.
- Estimate true % in-tolerance from observed % in-tolerance.
- Print comprehensive analysis reports.

## Features...

### Measurement Decision Risk Analysis

- The main functions and features for estimating risks and computing an equivalent accuracy ratio are accessed from AccuracyRatio's **Main Screen**.
- Maximum allowable false accept and false reject risks and corresponding accuracy ratio are defined on the **Baseline Risk Analysis Worksheet**.
- A plot of baseline false accept risk and false reject risk versus accuracy ratio can also be displayed.

### Parameter Bias Uncertainty Analysis

- The **Parameter Bias Uncertainty Worksheet** is a useful tool for entering specifications and estimating bias uncertainties for subject (SU) and measuring (MTE) parameters.
- Plots of the statistical distributions for the parameter biases can also be displayed.
- The change in parameter in-tolerance probability with time since calibration can be modeled using the **Reliability Model Worksheet**.
- Once the parameter reliability behavior has been modeled, the in-tolerance probability at any time elapsed since calibration can be calculated in the **% In-Tolerance Reference** dialog.
- The **% In-Tolerance Worksheet** can be used to estimate the true in-tolerance percentage from an observed in-tolerance percentage, or the observed in-tolerance percentage from a presumed true in-tolerance percentage.
- AccuracyRatio also features a Bayesian analysis method called **Statistical Measurement Process Control (SMPC)** to obtain best estimates of both subject parameter and measuring parameter values and bias uncertainties.

### Guardband Analysis

- The **Guardband Analysis Worksheet** is used to compute guardbands to achieve a desired level of false accept risk or false reject risk.
- Guardband calculation can be keyed on false accept risk, false reject risk or to equalize risks.
- Corresponding guardband multipliers and k-factors are also computed. The k-factor is the number of multiples of the total process uncertainty (sigma) used to adjust the guardband limit relative to the parameter's tolerance limit.
- Guardbands can also be determined graphically on the **Risk vs. Guardband Multiplier Plot**.

## Why AccuracyRatio?

Using AccuracyRatio does not require knowing advanced statistics or probability. Just enter technical and measurement data and AccuracyRatio handles the math. You can **analyze measurement process uncertainty, determine tolerance guardbands, develop equipment tolerances, establish measurement reliability targets, and compute “effective” accuracy ratios** simply by entering specifications or other technical data and clicking buttons on screen templates.

The return on investment with AccuracyRatio can be surprising. If you're performing on a Government contract or trying to satisfy ANSI, ISO or other requirements, AccuracyRatio can literally help keep you in business! For instance, if you need to meet a 4:1 accuracy ratio, and the best available is 2:1, you could find your contract suspended or your order canceled. But, with AccuracyRatio, you can demonstrate that, by controlling other variables in addition to equipment tolerances, you are holding risks to below maximum allowable levels. Since controlling risks is the reason for the 4:1 requirement in the first place, **you can prove that your measurement accuracy is acceptable.**

## Control Support Costs

You can also use AccuracyRatio to minimize test or calibration costs. By analyzing a sample of your workload, you may find that risks are so low in some cases that you are calibrating or testing too often. If so, you can extend calibration intervals without compromising measurement assurance. You may also identify cases where risks are too high. In these cases, you may need to shorten intervals to ensure product quality. The thing to remember is that AccuracyRatio gives you the diagnostics you need to **put your support investment where it will do the most good.**

## Validate R&D

The same is true for investments based on the results of scientific research. Sometimes, experimental “significance” is assumed when a measured value falls within certain limits. With AccuracyRatio, you can evaluate the risk that the *actual* value lies outside significance limits when the *measured* value falls within them. Knowing this risk can **prevent premature investment in results that later turn out to be nothing more than measurement errors.**

## Account for Measurement Uncertainty

AccuracyRatio features a measurement uncertainty analysis capability patterned after **UncertaintyAnalyzer**, our powerful uncertainty analysis workstation tool. Both AccuracyRatio and UncertaintyAnalyzer compute and combine uncertainties in accordance with **ISO/TAG4/WG3 Guide to the Expression of Uncertainty in Measurement**. They make a dynamite one-two punch for managing uncertainty and controlling risks. This is especially so, since, with just a few mouse clicks, you can seamlessly **exchange information between UncertaintyAnalyzer and AccuracyRatio**. No manual data entry or copying and pasting are required.

## An Affordable Solution

Even though AccuracyRatio is a "niche" technology product it won't cost you a niche technology price. AccuracyRatio comes with a **30-day money back guarantee** and three free technical support calls. We accept Visa, MasterCard, American Express and Discover Card. Purchase orders are accepted from established firms and Government organizations.

## More Features...

### Measurement Process Uncertainty Analysis

- The uncertainties due to various measurement process error sources can be estimated using the **Measurement Process Uncertainty Worksheet**.
- The random uncertainty in measurements made using a measurement reference and/or subject parameter can be calculated statistically by entering measurement results in the built-in **Parameter Data Entry Worksheets**.
- SMPC analysis results for the subject and measuring parameters are displayed on the Measurement Process Uncertainty Worksheet.
- Calculation of the total process uncertainty includes any correlations that have been established between error sources using the **Correlation Coefficients List**.
- **Total process uncertainty can be included in all risk and accuracy ratio calculations.**

### Importing from UncertaintyAnalyzer

- AccuracyRatio is designed to import data and results directly from ISG's **UncertaintyAnalyzer**, the world's most powerful and versatile uncertainty analysis application.

### Running External Applications

- The **Run External Application Launcher** can be used to launch external applications from within AccuracyRatio for off-line processing.

### Analysis Reports

- Hardcopy reports of risk analysis and uncertainty analysis results can be generated from the **Print Analysis Screen**. Parameter bias and process error distribution plots can be included for reference.
- Options for specifying report header information and Summary File format are available on the **Report Options Screen**.

### AccuracyRatio Pricing

<b>AccuracyRatio 1.6</b>	\$795.00 + TX and S & H (USD)
<b>Upgrade from Version 1.5</b>	\$495.00 + TX and S & H (USD)
<b>Network License</b>	See Our Web Site for Network Options
<b>UncertaintyAnalyzer + AccuracyRatio Combo</b>	\$1690.00 + TX and S & H (USD)

### For More Information

Call **1-800-400-7866**  
Visit our Web Site **www.isgmax.com**  
Contact us by E-mail **sales@isgmax.com**

AccuracyRatio runs on Windows  
**95, 98, NT, 2000, ME and XP.**

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