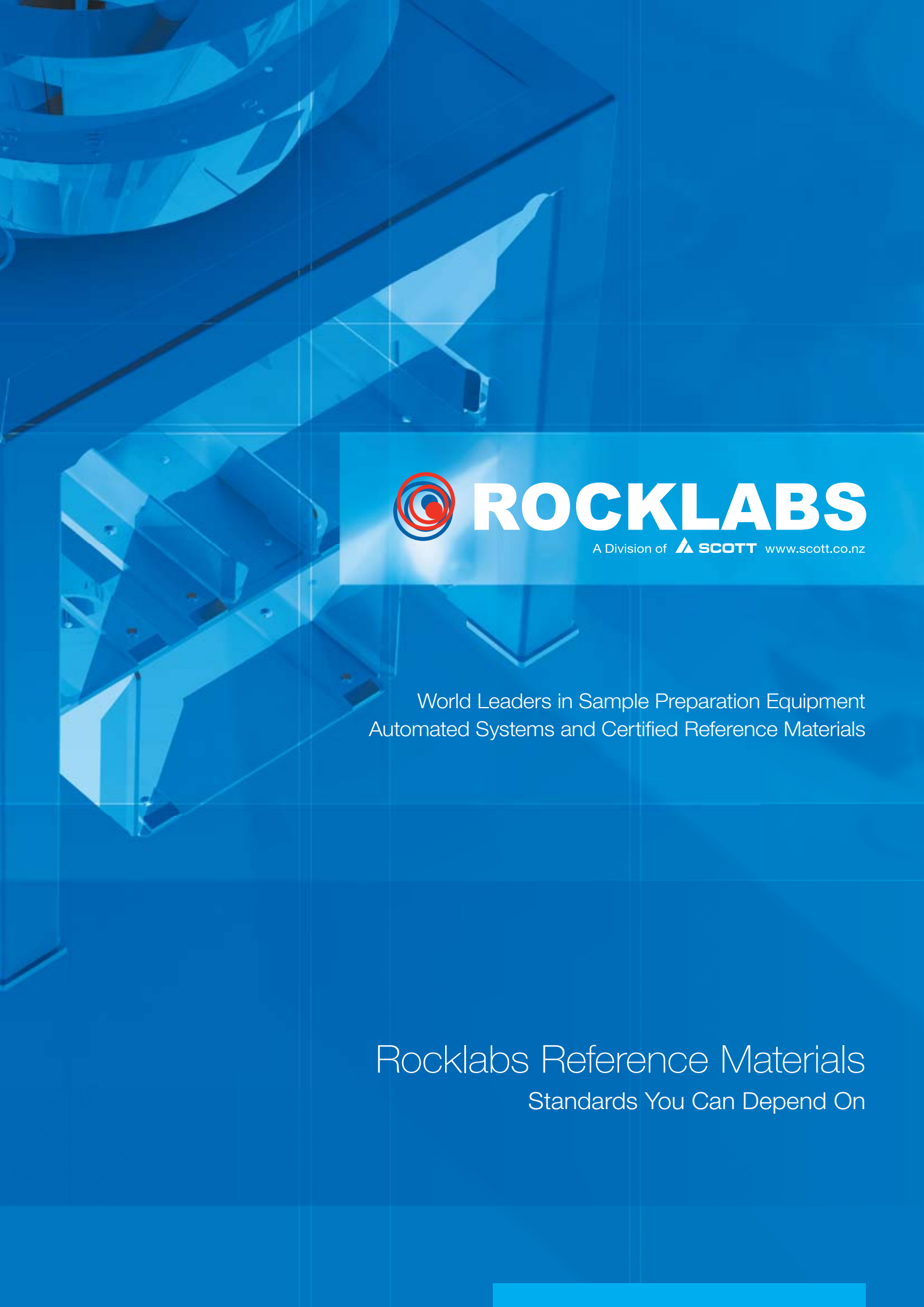


ROCKLABS

A Division of SCOTT www.scott.co.nz

World Leaders in Sample Preparation Equipment
Automated Systems and Certified Reference Materials

Rocklabs Reference Materials

Standards You Can Depend On

Reference Materials for the Gold Mining and Exploration Industry

What Are Gold Mining and Exploration Reference Materials?

Reference Materials have at least one property which is known with a defined degree of accuracy.

The three main properties of a Reference Material (RM) are:

- Accuracy of assigned value
- Homogeneity of final packaged product and
- Long term stability.

Accuracy

Rocklabs Reference Materials have their gold concentrations assigned by taking the average of approximately 30 laboratories from around the world that have provided a consensus of results. The laboratories used are monitored for their performance. Because of the relatively large number of laboratories and their good quality, our RMs (apart from the two lowest gold concentration RMs) have a 95% confidence interval that is about 1% of the assigned value.

This represents a tight value and therefore can be used, for example, to identify a bias of 2% when used by an individual laboratory.

Homogeneity

Rocklabs Reference Materials are made from concentrates that have been screened to remove all coarse gold particles that could lead to an anomalous result. The size of the screen used depends on the target gold concentration of the finished product. The finest screen used has an aperture size of 23µm and the largest (for high gold concentration RMs only) has an aperture size of 70µm.

A formal homogeneity test is carried out on every candidate RM produced after blending and packaging into jars and is carried out before samples are sent out for consensus analysis. Samples in the homogeneity test includes ones taken sequentially from top to bottom of jars that have been tapped and vibrated in order to examine whether any gold settling occurs.

The samples are sent to an independent laboratory and are analysed together in such a way as to keep all method variability to a minimum in order to detect any variation between the samples.

We provide a brief description of our homogeneity assessment in the RM certificates and are available to provide full details to customers on request. We state in the RM Certificate of Analysis the actual relative standard deviation obtained in the homogeneity assessment.

Stability

Rocklabs Reference Materials use pulverized rock, made up primarily of feldspars and basalt as the background matrix for all products. This rock does not contain any significant quantity of clay and is extremely stable in all environments. Numerous tests have shown that the steady state moisture content of this material is 0.3%. This is the state in which the material was analysed for certification purposes and we do not recommend any drying before use.

Another reason we use a combination of feldspars and basalt is that it provides reasonably typical levels of SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, Na_2O, K_2O and MnO found in many rock types that are analysed for gold.

How Should Reference Materials be Used?

In the gold mining and exploration industry Reference Materials are used to monitor the analytical procedure used to determine the gold content of a rock or ore sample. There are many steps in the analysis process and lots of opportunities for things to go wrong. When a Reference Material is included in a batch of mineral samples being analysed, the result obtained should be compared with the certificate value.

If there is a significant difference, then a problem has occurred which may have also occurred with all accompanying samples. The analytical process used for this batch needs to be examined to establish the cause of the poor result and corrective action taken. If results of successive analyses of Reference Materials are charted, a lot more information can be gained. Rocklabs provide a free template for plotting Reference Material results. The following information can be easily seen from a statistical summary that appears on each plot:

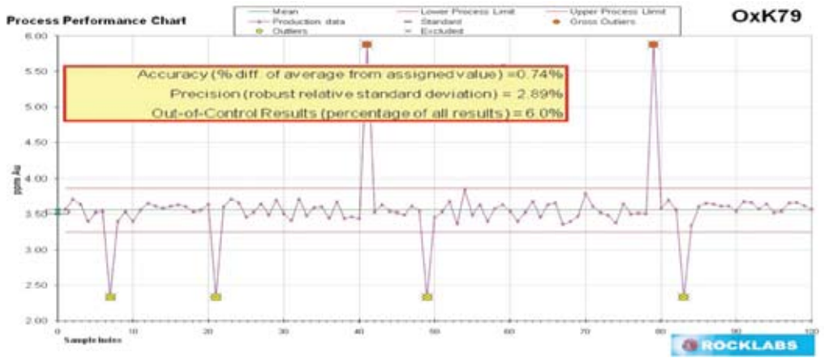
- The size of bias that is being produced by the laboratory.
- The base line precision of the laboratory method.
- The percentage of Out-of-Control results.

Visual examination of the plots can also reveal trends, shifts and patterns. It is important to plot the result in strict chronological order so that anything that needs investigation can be carried out on the analytical batch (or batches) where the issues arose.

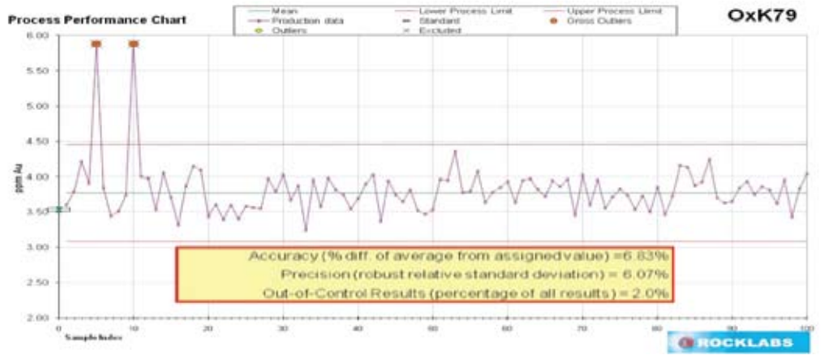
The key consideration is for the Reference Materials to be treated in exactly the same way as the accompanying geological samples (i.e. the same weight should be taken for analysis, no double reading and no extra care of any sort). The assigned value of the Reference Material should preferably be unknown to the technicians carrying out the analysis.

Reference Material results can be used to take actions that will lead to more accurate analysis of future geological samples.

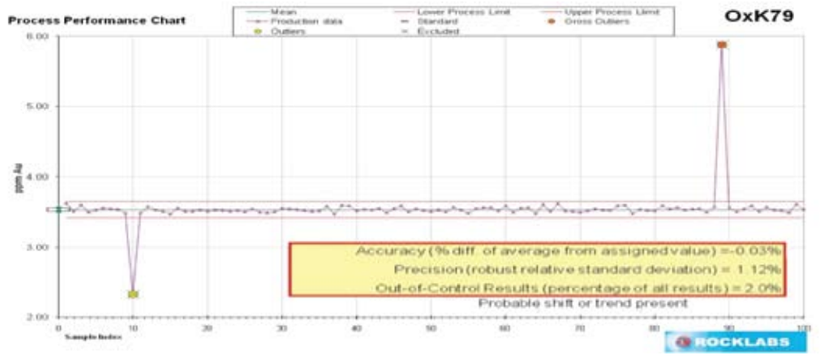
Interpreting the results



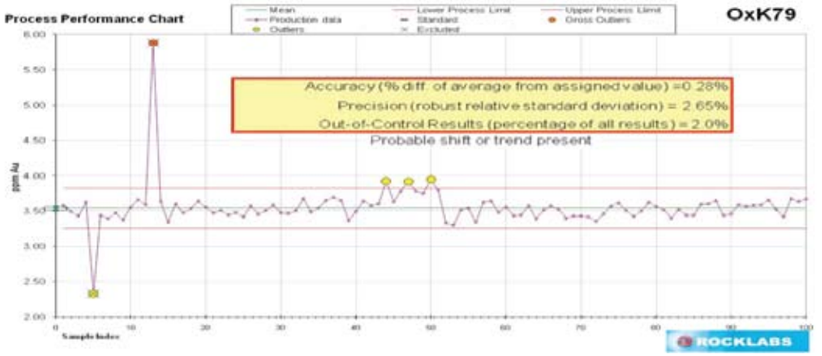
Example 1
Accuracy and precision are good, but too many out-of-control results. These may be caused by sample mix-ups. Sample handling and procedures should be reviewed to minimize this. Problem could also be caused by sample submitter.



Example 2
There is a significantly high bias. This needs to be addressed. It could be due to something simple such as instrument calibration standards being low. All accompanying exploration/mine samples are likely to be high by a similar amount. Precision is somewhat variable. It is probably a function of instrument finish and may not be easily improved. The laboratory and/or their customers have to decide whether it is good enough for their purposes. Typical percentage of out-of-control results.



Example 3
Typical percentage of out-of-control results. Accuracy is good, however the exceptional precision result is highly unlikely, which would warrant further investigation. The laboratory is either exceptionally good, or is taking special care over the Reference Material analysis.



Example 4
Accuracy, overall precision and percentage of out-of-control results are all good. It looks like the laboratory investigated the cause of the out-of-control results early on and have taken steps to prevent them occurring again. Note the trending in the middle of the chart. Again, it looks like the laboratory has spotted this and taken corrective action to get analyses back on track fairly quickly.

Rocklabs Reference Materials

Standards You Can Depend On

Rocklabs Reference Materials

- Gold values with 95% confidence interval are assigned by round robin consensus analysis using over 30 reputable laboratories from around the world
- Gre homogeneous. To confirm the homogeneity, we undertake robust assessment, of which the methodology and results are published in the certificate
- Do not segregate during transportation and handling and therefore do not require mixing prior to analysis
- Are extremely stable due to no clay being present, ensuring minimal moisture uptake in humid environments
- Come in a broad range of gold concentrations. From 0,08ppm to 50ppm
- Are available in three matrices: oxide, sulphide & siliceous
- Are valid for cyanide dissolution, aqua regia digests and fire assay analysis
- Are screened using appropriately sized screens to ensure that no gold nuggets are present
- Results can be plotted and interpreted with assistance by our statistician
- Are supplied with formal certificates that comply with ASTME1831-96
- Can be supplied in sachets to any weight

How to get maximum value from your Rocklabs Reference Materials

- Always use the same weight of reference material for analysis and treat in the same way as the accompanying geological/mine samples
- Use at least one reference material for every batch of samples analysed
- Plot the reference material result on a chart as soon as the result becomes available
- Use appropriate control limits and take action if they are breached

*For more information please contact us on the details below or visit the website for a list of international agents.

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