

# Thermo Scientific AuditCheck metal detection performance verification system technology backgrounder

## Key Words

Metal detector, performance verification, contaminants.



## Automatic performance verification to improve the audit process

The Thermo Scientific™ AuditCheck metal detection performance verification system is a unique system which utilizes an automated test shuttle that moves through the metal detector's field at user-specified points in time. During this process, the primary metal detector signals are precisely measured and compared to expected values. Unlike the traditional and manual 'three metal pass/fail' system auditing, the AuditCheck performance verification system can detect potential problems before there is a failure during a manual audit, thus limiting expensive downtime and repair costs. Since the AuditCheck performance verification system is automatic, it can decrease or even eliminate the time and energy spent manually auditing a metal detector and recording the results—thus improving overall production efficiency. Moreover, the AuditCheck performance verification system can help you achieve the highest possible food safety standards. This paper explains how the Thermo Scientific AuditCheck performance verification system option works; why it can augment or replace manual auditing; and, finally, why the overly simplified arguments competitors use against it, are usually not true.

## Overview

Metal detectors are a necessary part of today's food, pharmaceutical and personal care product production processes. They protect many types of products from metal contaminants and generally assist in public safety. Every year there are high profile cases of metallic foreign objects in consumer products resulting in expensive recalls and lingering brand damage. In many cases, metal detectors were present in these production lines, but they were either not being used or not being maintained correctly. Even when applied correctly events can occur over time that may compromise a metal detector's performance. These events can range from component failure to water leaks affecting the electromagnetic field, to temperature shocks stressing the complete system, or many other changes in the state of the metal detector caused by the environment or use. To detect these problems as well as potential application issues it is customary to run manual test audits every several hours (see figure 1).

During a manual audit, a production worker will run the product through the metal detector along with three samples of metal (ferrous, nonferrous and stainless steel). If the metals do not trigger the rejecter or an alarm, all products that have gone through the machine since the last audit are potentially hazardous and must be quarantined. To meet internal HACCP policies, this process is performed on a regular basis.

We created the AuditCheck performance verification system to reduce or eliminate the need for manual tests by automating a more precise self-check process. Additionally, the AuditCheck performance verification system has particular benefits in pipeline and drop-through metal detectors, which are very difficult or impossible to test with traditional methods. Because the AuditCheck performance verification system is internal to the metal detector it can audit performance without placing a metal sample in the product flow.

## How the AuditCheck Performance Verification System Works

The AuditCheck performance verification system utilizes a plastic tube that runs through the magnetic field of the metal detector. (See figures 2 and 3.) This tube contains a sample of metal selected to generate both magnetic and conductive signals to replicate the range of metals used in the three sample audit.

The system is calibrated to run as the product passes through the metal detector – just like the manual audit process. (See figure 4.) This assures the audit is performed during product inspection – not during production shutdown.

When it comes time for the AuditCheck performance verification system to run, (this can be programmed to occur at a user designated frequency or via a manual button push) a solenoid directs air pressure to force the metal sample through the AuditCheck performance verification system tube. Once the check is done and the product has passed through the aperture, air pressure is applied in the opposite direction to return the metal sample to its original position.

In addition to being automatic, another benefit of this design is that it is fail safe. If a malfunction occurs in the air or electronics system, the metal will not travel through the tube and the signal will not be detected which then sets off an alarm.

Upon completing each test, the AuditCheck performance verification system records and displays the results on the metal detector front panel. These results also are available for retrieval over a network too. Finally, the AuditCheck performance verification system can be programmed to print out the results for easy record keeping.



Figure 1 — Manual metal detector audit using sample test card

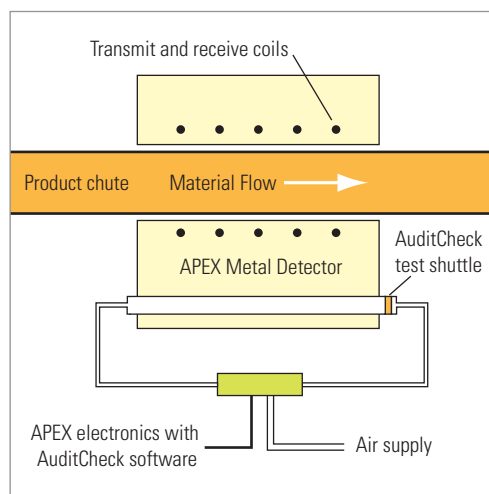


Figure 2 — AuditCheck performance verification system installed in a Thermo Scientific APEX metal detector system

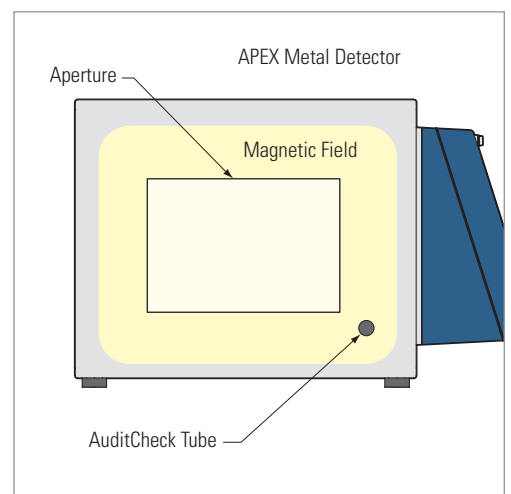


Figure 3 — AuditCheck performance verification system placement within the magnetic field of the Thermo Scientific APEX metal detector

## Why the AuditCheck Metal Detection Performance Verification System is Essential

Many aspects of the AuditCheck performance verification system make it a useful tool for any company deploying metal detectors.

- **Convenience.** For many, the best part about the AuditCheck performance verification system is the convenience it offers. With the AuditCheck performance verification system, employees don't have to manually test the sensitivity of metal detectors. Instead, the automated system can run hourly tests while the employees who previously tested the sensitivity can focus their attention on other tasks.
- **Capability.** Since the system is installed directly inside the metal detector, it is now possible to easily test metal detectors that are inconvenient or impossible to audit using manual means. For example, the traditional method of running small metal spheres through the metal detector becomes a daunting task when the metal detector has a gravity-fed tube or pipeline running through it with bulk flow products inside.
- **Consistency.** The AuditCheck performance verification system eliminates human labor and therefore the possibility of human error. Everyone tests metal detectors differently, even if the difference is something small like the location of the test sphere on the conveyor system. The AuditCheck performance verification system runs the exact same test in the exact same location every time, which makes for a more consistent and reliable test.
- **Accuracy.** The AuditCheck performance verification system can also discover if a metal detector is losing sensitivity earlier than traditional testing methods allow. Unlike most pass/fail systems where the test sample either sets off the alarm or it doesn't, the AuditCheck performance verification system compares each test pass with the baseline result expected. This baseline is learned during the calibration process. If the result is outside the limit for the upper or lower warning, an alarm signal will be sent to the operator to take action.

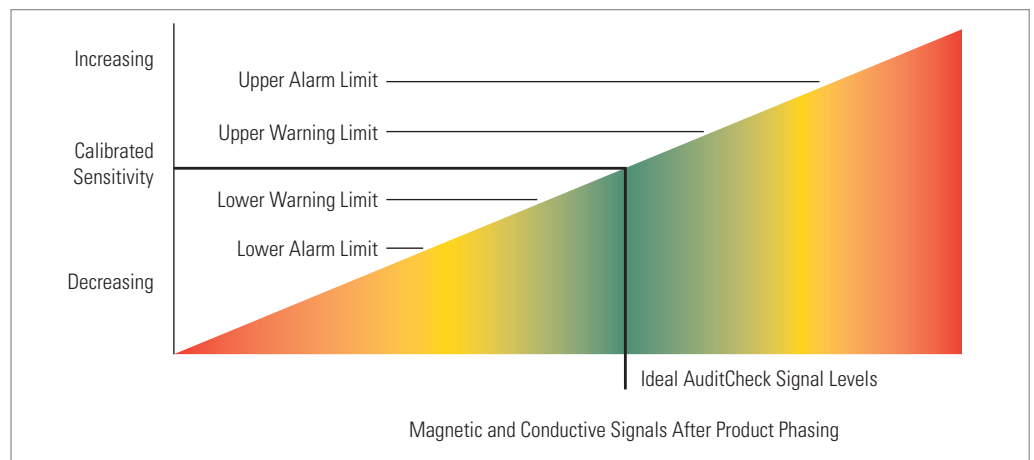


Figure 4 — AuditCheck performance verification system principle of operation (calibration with warnings and alarms)

## Why Wouldn't Everyone Use the AuditCheck?

Some metal detector vendors argue that faults exist in the AuditCheck performance verification system approach that should dissuade customers from considering the system. When you fully understand the AuditCheck performance verification system, you will realize that most of these arguments are over simplifications and are clearly not valid.

- The AuditCheck performance verification system does not replace manual testing. A common assumption about the AuditCheck performance verification system is that the system entirely removes the need for an employee to do a traditional audit. In fact in many cases, the AuditCheck performance verification system is not meant to be a complete replacement, only a tool to decrease the frequency of testing to perhaps once a day. This way the performance of the metal detector is monitored precisely by the AuditCheck performance verification system and the traditional audit assures the customer specified metal samples are detected.
- The AuditCheck performance verification system uses only one type of metal. On the surface it is true that the AuditCheck performance verification system only utilizes one piece of metal in the magnetic field of the metal detector, rather than the customary three. That one metal, however, is selected to generate signals found in ferrous, nonferrous, and stainless steel metals. This assures the metal detector is performing optimally for any type of metal.
- The AuditCheck performance verification system does not pass the metal through the aperture. Casual inspection reveals that the tube of the AuditCheck performance verification system does not run through the metal detector aperture like the product and test cards do during a manual audit. This is true, however, the tube does enter the metal detector's electromagnetic field, thus generating signals that can be analyzed. Also, the AuditCheck performance verification system is calibrated to detect any change in signal generated by the test shuttle, rather than simply the appearance of metal so the location of the tube is irrelevant.
- Unnecessary product rejection occurs. The point of an AuditCheck performance verification system test is to trigger the metal detector's alarm; therefore rejected product is to be expected. This is a natural side effect that can be turned off at the user's preference. Unnecessary rejection is also an effect that arises with any manual audit run during production.
- A metal detector electronics self-test is just as good as the AuditCheck performance verification system. It is true you can design a metal detector to run detailed electronics self-tests periodically. Most complex electrical systems have this capability designed in. The difference between a self-test and the AuditCheck is important to note performance verification system. With the AuditCheck performance verification system, you are exercising all the metal detection functions needed to detect contaminants just like a self-test, and you are precisely measuring the response to an actual piece of metal passing through the system. This will assure correct operation in the real world application.

## Conclusion

When fully understood and correctly applied, the AuditCheck performance verification system provides unique value in almost any metal detector installation. It reduces or eliminates the need for production operators to manually test metal detectors—making the overall operation more efficient. It also detects small changes before they surface as big problems—creating a type of early warning system. It keeps electronic or paper records that can be managed for traceability. And finally, in applications where it is difficult or impossible to insert test pieces in the production flow, it provides a non-intrusive way to audit a metal detector. With all these benefits, the AuditCheck performance verification system can quickly pay for itself and free the user to focus on the job at hand—shipping safe, high quality products to customers around the world.

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