

New UXO detector with metal discrimination option

by

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Abstract – In many regions the dominant problem with explosive remnants of war (ERW) are cluster munitions. They can be detected easily by conventional metal detectors, but only with a high false alarm rate due to numerous metallic clutter objects. Consequently, the clearance work is very tedious, frustrating, and time-consuming. To facilitate the work in these regions, Vallon developed a new UXO detector, the VMXC1, especially for the efficient detection of cluster munitions, e.g., the BLU's.

Introduction

Vallon has been working in the field of metal detection since 1965, manufacturing metal detectors using the continuous wave principle and later metal detectors using the EMI principle with advanced pulse technology. In 2003, Vallon introduced the very successful VMH3 and VMH3CS with digital magnetic pulse induction (DMPI) technology, which is the base for the new UXO detector, the VMXC1. The search head of the VMXC1 sends out a bipolar pulse train, which influences eddy currents in any metal objects in the vicinity. The return signal from these metal objects is picked up by the search head of the VMXC1. Subsequent digital signal processing allows for the detailed analysis of the received signals. As a result, when metal is present, alarms are given as an audible signal, LED bar graph, or vibrator in the handle bar. The VMXC1 has a built-in data output, which can be used for data recording and documentation of the areas searched (free of sub munitions and mines). As well, the VMXC1 has a built-in connector for firmware uploads. The firmware is the operating system of the detector and can be adapted to the type of ammunition being searched for in a particular surrounding. The firmware can be uploaded to the detector from a laptop without the need for the operator to receive special training.

The operator can select between two different operation modes.

Working principle mode 1 – detection of larger metal objects

Like a conventional metal detector, the VMXC1 can be set to trigger off alarms when metal is close to the search head. The VMXC1 is designed to neglect alarms from smaller objects because the desired alarms are only reacting to larger metal objects, namely UXO or especially

cluster munitions / sub munitions. As smaller metal objects, e.g., nails, screws, pieces of wire mostly do not trigger an alarm in this operation mode, the working efficiency is already increased in comparison to our standard mine detector with high sensitivity.

Working principle mode 2 – detection of larger metal objects and metal discrimination

In addition to the above-described mode of neglecting small metal objects, the VMXC1 has another mode with additional metal discrimination. The digital signal processing allows the detector to analyze the received signals and to identify the metallic nature of the object from which the signal was picked up. In this mode, the VMXC1 distinguishes between the alarms from ferrous (Fig. 1) or non-ferrous (Fig. 2) metal objects. Without an object, no acoustic alarm is given and the LED is in the neutral position in the middle of the LED bar graph. Depending on the object, the detector gives different visual and acoustic alarms. For ferrous objects, a continuous alarm tone is audible and the activated LED is further right from the center, whereas a chopped alarm tone (a series of beeps) is audible for non-ferrous objects and the activated LED is further left from the center. The deviation from the center is an indication for the magnitude of the alarm. The customized firmware can be optimized also for ammunition with different kind of metals like the BLU-63. Hence, the operator has the option to neglect alarms from e.g. aluminum cans and bottle caps, but to concentrate on the alarms from ferrous objects and the selected cluster munitions.



FIGURE 1 Visual alarm indication on the right side of the bar graph of a ferrous object, a BLU-26



Figure 2: Visual alarm indication on the left side of the bar graph of an aluminium object, 16 mm diameter and 50 mm long.

As a result, the search speed for the cluster munitions is substantially increased in comparison to working with a standard metal mine detector.

Three versions of the VMXC1 are offered (see Fig. 3):

- VMXC1-1 with slim search head (31 x 17 cm)
- VMXC1-3 with 30 cm round search head
- VMXC1-6 with 60 cm round search head



FIG. 3 VMXC1-1, VMXC1-3, AND VMXC1-6

Field results

The VMXC1 was first trialed successfully in Laos and Lebanon, where it was fielded later due to the efficient detection of UXO's.

In Laos, in the region of Pakse, the BLU-26 is found reliably and efficiently with the VMXC1-3.

In Southern Lebanon, the VMXC1-1 is used to search the BLU-63. It is found very efficiently neglecting the alarms from metallic clutter.

With the highly effective automatic ground compensation, the VMXC1 is also recommended if the use of magnetometers is limited by ferrous soils.

Summary

The Vallon VMXC1 is based on the well-known metal mine detectors VMH3 and VMH3CS. Different search heads for the VMXC1 offer a reliable and efficient detection of ordnance, cluster munitions, and metal cased mines with fewer false alarms by other metallic waste as small objects are neglected. In the mode "metal discrimination", the detector differentiates between ferrous and non-ferrous metals. Therefore, clearance work in areas with metal contamination can be performed with a significantly increased efficiency.

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