The Geneva International Centre for Humanitarian Demining (GICHD) strives for a world free of anti-personnel mines and from the threat of other landmines and explosive remnants of war, and where the suffering and concerns of populations living in affected areas are addressed. The Centre is active in research, provides operational assistance and supports the implementation of the Anti-Personnel Mine Ban Convention.


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The descriptions of the detectors and personal protection equipment in this catalogue are those of the manufacturers. Test results mentioned in this catalogue are extracts or quotations of test reports provided either by the manufacturers or published at the International Test and Evaluation Programme (ITEP) website www.itep.ws. The sources are given. They do not necessarily represent the views of the Geneva International Centre for Humanitarian Demining or the Government of Germany. The views expressed in this publication are otherwise those of the GICHD and do not necessarily represent those of the Government of Germany. The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Government of Germany or the GICHD concerning the legal status of any country, territory or area, or of its authorities or armed groups, or concerning the delimitation of its frontiers or boundaries.

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The report was edited by Jack Glattbach and laid out for publication by Karma Al Azmeh Valluy.

All photographs have been provided by the respective manufacturers.
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The metal detector remains the standard tool for detection of mines and other explosive remnants of war (ERW). But the development and recent deployment of dual sensor systems has the potential to revolutionise humanitarian demining.

First results show that combining metal detection with ground penetrating radar leads to improvements in both the capability to detect minimum-metal mines and the ability to reduce false alarm rates. This is a major advance given that these two problems have been major constraints to efficiency since humanitarian demining started.

The application and availability of new technology in the humanitarian demining sector is often dependant on cost and the relaxation of possible military restrictions. These issues will undoubtedly play a role in widely deploying dual sensor technology. Unfortunately only one manufacturer of this ground-breaking technology has provided information for the catalogue. Nevertheless the GICHD provides the information on both dual sensor detectors, the Vallon VMR2 and the CyTerra AN/PSS-14 (HSTAMID)/AMD-14, using the information which was given for the Guidebook on Detection Technologies and Systems for Humanitarian Demining.

The interested reader can find further general information on detection technologies and systems in the GICHD’s 2006 publication Guidebook on Detection Technologies and Systems for Humanitarian Demining.

The aim of the GICHD Metal Detectors and PPE Catalogue 2007 is to provide a comprehensive directory of detectors and personal protective equipment (PPE) under one cover. Unfortunately there are some omissions because not all major manufacturers contributed information. Therefore, a number of metal detectors and PPE being used in the field are not featured.

There are relatively few independent performance tests on metal detectors, dual sensors and PPE but those interested in detectors and PPE that have undergone tests should either contact manufacturers directly, or refer to the ITEP website: www.itep.ws. A brief summary of the “Results of STEMD trials” (conducted in Laos 2004, Mozambique 2005 and Croatia 2006) is included as Annex 1. Also included as Annex 2 is an article on guidelines for purchasing a detector.

Currently, no standard test system exists for demonstrating the effectiveness of particular items of PPE. To address this issue, a European Standards Committee (CEN) Workshop of implementer and manufacturer representatives was due to publish an industry workshop agreement in late 2006. An article about the workshop agreement process is included as Annex 3.

The term explosive remnants of war (ERW) is used instead of unexploded ordnance (UXO) in the catalogue except when the term UXO is a part of a product name.

The Catalogue is available in hard copy, CD-ROM, or can be viewed by visiting the GICHD website at www.gichd.ch. The information provided is accurate as of the end of November 2006.

The GICHD would like to thank the Government of the Federal Republic of Germany for its continuing generous financial support to this project.

Ambassador Stephan Nellen
Director
Geneva International Centre for Humanitarian Demining
GENERAL DESCRIPTION
The Beijing Geological Instrument Factory (BGIF) has manufactured precision instruments for use in detection and in laboratories for more than 40 years.

The *GTL115-2 Metal Detector* is designed to locate a wide variety of mines or buried exploded remnants of war (ERW) with minimum-metal content even under difficult soil conditions. Working on the electromagnetic induction principle, the detector employs dynamic detecting technologies and has an automatic low battery alarm and magnetic soil interference rejection. The detector is highly sensitive, lightweight, portable, easy to assemble and operate, with a low power requirement and reliable performance.

The GTL115-2 consists of a search head, a search pole and an earphone. The electronics and batteries are fixed inside the search pole. The operator can choose from two types of search heads according to the surroundings. The device also has a screw-in extension pole with an arm support as an accessory: in operation, the search head is mounted on the pole with the search head plugged into a three-pinned socket on the front of the pole. The plug and socket have a protective cover against dirt to ensure a reliable connection. For transport or storage the search head and the pole are packed in an aluminium case to protect against damage, moisture and mildew.

Search head A is circular, 200mm in diameter: Search head B is oval and narrow (300 x 68mm). The angle between either of the two types of search heads and the pole can be adjusted.

Both the electronics and the batteries are installed inside the pole, which makes the detector portable and easy to operate. The detector can be used from a kneeling position and, with the extension pole, from a standing position. The design of the three-pin connector on the pole facilitates use of the two different search heads, which improves detection efficiency. A power/sensitivity knob on the side of the search pole provides protection and is easy to operate.

**Earphone**
- The single-piece earphone enables the operator to be aware of the surroundings while detecting mines.
- With a spiral cable which can extend to 4 metres, the earphone is flexible and convenient to use, even with the extension pole.

The detector’s power is off as long as the operator removes the earphone, even if he forgets to turn the detector off.

WORKING METHODOLOGY
According to electromagnetic theory, metal objects will generate eddy currents in an electromagnetic field and these eddy currents generate a secondary field. When a metal object is within range of the search head coil, the secondary field generated by the eddy currents will be distort the original electromagnetic field and cause changes in the equivalent impedance in the circuit. The alarm sent through the earphone after demodulation and signal processing indicates the existence of a metal object.
POWER SUPPLY

> 8 common AA-size R6 batteries can continuously work for more than 20 hours.
> 8 Ni-MH AA-size batteries (1600mAh) can continuously work for more than 60 hours.

DETECTORS IN USE TO DATE

No detailed information was provided by the manufacturer but the detector is known to be in current service in Angola, Cambodia, Ethiopia, Eritrea, Lebanon, Mozambique, Namibia and Rwanda.

FACTORY SUPPORT

> Spare parts can be delivered to the customer.
> Operation and maintenance training can be offered at BGIF facilities or at a location chosen by the customer and at their own expense.
> The manual includes instructions on operation and maintenance and is available in English and other languages on request.
> The manufacturer provides a warranty of 24 months.

MAINTENANCE AND SUPPORT

> There are no special requirements for technicians or workshop facilities.
> For each detector, a user’s manual is offered with detailed instructions for operation and maintenance.

TEST AND EVALUATION

> The GTL115-2 has been field-tested in all climates by the manufacturer and all detector specifications are fully proven.
> Currently under testing and evaluation by the European Commission Joint Research Centre (JRC), the reports will soon be published on the JRC website.

REPORTED LIMITATIONS AND STRENGTHS

No information is available at this time.
GENERAL DESCRIPTION
The MIL-D1 is a portable, high-sensitivity metal detector designed to detect all metals in conductive and non-conductive soils, including laterite. The metal detector consists of a detection head, a telescopic handle, an electronics unit, a canvas carry-bag and a high-impact polypropylene case. The detection head is light, and the wiring is protected from damage. The electronic unit can be carried over the shoulder, attached to the belt, or as an integral part of the telescopic handle. The manufacturer says that the MIL-D1 does not require any daily manual calibration; optimum sensitivity is ensured over all types of terrain due to CEIA’s Automated Soil Compensation System. The detector is manufactured in compliance with the ISO-9001 standard and has been designed to satisfy the most stringent operational requirements for both humanitarian and military demining.

CEIA offers a single, proven state-of-the-art model (MIL-D1) optimised to provide comprehensive detection capability across the entire spectrum of metals and soil types. A backlit LCD display on the control panel is available as an option. A hand-held remote programmer allows for MIL-D1 flash memory upgrades under any conditions. MD Scope software for PCs is available for troubleshooting and annual verification of MIL-D1 calibration.

WORKING METHODOLOGY
Location of metal objects is optimised by a two-tone audible pinpointing system, which allows the position of the detected mass to be identified accurately. When the metal detector approaches a metal mass, the system produces a signal of acoustic intensity proportional to the metal mass. The metal mass is pinpointed at the position of the centre of the search head at the moment in which the audible signal tone changes. An audible signal is transmitted either through an internal speaker or external monaural headphone.

CEIA’s Automated Soil Compensation System ensures an above-average sensitivity in all types of soil. The detector, during soil compensation (conducted prior to the search operation), uses digital processing of the electromagnetic response from the target soil to determine the most effective strategy. The presence of water does not affect detector performance. Soil compensation capability covers all different soils.

POWER SUPPLY
> 4 x 1.5V alkaline batteries or 4 x 1.2V Ni-MH rechargeable batteries (available on request).
> 65 hours with alkaline batteries at 20°C. ¹
> 50 hours with alkaline batteries at 5°C. ¹
> 40 hours with Ni-MH rechargeable batteries (7000 mA) at 20°C.

DETECTORS IN USE TO DATE
About 9,000 detectors are in service with various humanitarian aid organisations, commercial mine clearance organisations and armed forces in the following countries: Afghanistan, Austria, Bosnia and Herzegovina, Burundi, Colombia, Croatia, Denmark, Djibouti, Egypt, Eritrea, Ethiopia, Finland, France, India, Indonesia, Iraq, Italy, Jordan, Kyrgyzstan, Laos, Lebanon, Mozambique, Namibia, Pakistan, Spain, Sudan, Sweden, Switzerland, Thailand, Turkey, the U.S., Venezuela and Yemen.

¹ Gruppe Rüstung, Technische Erprobung von Minensuchgeräten, Pieren Jakob, FS 263, Beilage 1, p. 2.
FACTORY SUPPORT

- The proposed spare parts package is arranged in accordance with a life cycle management study by the manufacturer, CEIA.
- Spare parts are available from either the manufacturer or from local representatives.
- An extensive programme is available for both operators and maintenance personnel.
- Factory based training is included in the purchasing package.
- Instruction manuals and documentation are provided in Arabic, English, French, Italian, Portuguese and Spanish. Other languages available on request.
- The standard warranty is two years. Extended warranty periods can be arranged on request.
- Comprehensive factory follow-up includes services via Internet contact, mail and personal contact.
- On-site training, supply of training aids, diagnostic software, portable remote programmer are available as accessories.
- Other services by the manufacturer include software upgrading, comprehensive technical assistance, mine simulant study and manufacturing, availability of factory test lanes.

MAINTENANCE AND SUPPORT

The detector is considered user-friendly and the customer can completely maintain the equipment. It is not necessary to return the unit to the factory for troubleshooting or verification of calibration. The MIL-D1 electronics board is based on full digital technology, which means there is no requirement to trim or refine the performance using laboratory equipment.

TEST AND EVALUATION

- The MIL-D1 has been subjected to extensive testing (in terms of reliability and capability of detection) by UNOPS, Departments of Defence and humanitarian demining organisations.
- The detector went through comparative trials for UNDP/UNOCHA in Afghanistan from September 1999 to March 2000 and for Gruppe Rüstung (Swiss Army) in August 2001.
- The detector was tested by the EC’s Joint Research Centre in Laos in 2004 and in a comparative field trial by JRC in Mozambique in 2005 as well as in a laboratory test trial by JRC, Institute for the Protection and Security of the Citizen, in Italy from November 2003 to January 2006.

Test following test results are available at the ITEP website: www.itep.ws

3. Metal Detector Trial - Colombia: Results from 2002; published 2003.
REPORTED LIMITATIONS AND STRENGTHS

Limitations “The loss of sensitivity with the increasing electromagnetic properties of the ground was substantial, especially in the area of low metal content mines.”

Strengths “During the two weeks of the trial, no difficulties in use or technical questions arose. The detector had no problems in completing its automatic soil compensation process in all lanes…”

GENERAL DESCRIPTION

The hand-held mine detector EBEX 420 H-Solar is an evolution of the EBEX 420 and was designed to support one-man-one-lane mine clearance drills. It is a single-piece tool without external boxes or cables.

Main characteristics

1. The equipment is designed for easy assembly and operation.
2. It is highly sensitive to minimum-metal mines such as the MAI 75 and R2M2.
3. Little user maintenance is required.
4. It is powered by solar panel.

WORKING METHODOLOGY

The EBEX 420 H-Solar uses the very sensitive Ebinger sine wave system and detects metal components including wires by an electromagnetic field of low frequency. The product’s designers made special efforts to achieve a good resolution of several mines buried close together, either to each other or to other interfering metal.

The EBEX 420 H-Solar detector was also designed to locate landmines or ERW containing only a minimum amount of metal. The detector electronics are fully integrated into the handle. It can be used in a short mode (approximately 0.6m) for searching in the prone position. In the standing position an extension rod takes the detector length to 1.2m. Its simplicity in operation and the absence of cable-linked components make it ideal for the single-operator clearance drill.

DETECTORS IN USE

The EBEX 420 H-Solar is in service in 26 nations including: Afghanistan, Angola, Cambodia, El Salvador, Guatemala, Kuwait, Lebanon, Mozambique, Nicaragua and Somalia.

Since 1998, more than 2,100 units have been sold to various humanitarian demining organisations, the United Nations and many other commercial companies.

3. Ibid, p. 47.
POWER SUPPLY

- The EBEX 420 H is powered by 1 x 9V U9VL LR61 or alternative; rechargeable battery 9V LR61.
- Operational life of battery (1 x 9V alkaline 600mA/h): approx. 45 hours (without solar radiation).
- Operational life of battery pack (9V 110mA/h): approximately 20 hours (without solar radiation).

FACTORY SUPPORT

- All detectors are covered by a 24-month warranty. The worldwide service network ensures permanent availability of spare parts.
- Operation and maintenance training is provided at Ebinger facilities or on site.
- Additional factory support by specially trained staff is provided on request.
- Instruction and maintenance manuals are available in Arabic, English, French, German, Italian and Russian, and other languages on request.

MAINTENANCE AND SUPPORT

- There are no special requirements for the technicians or workshop facilities. Most repairs can be carried out by Ebinger-trained staff on site.
- The step-by-step explanations in the manuals help to ensure easy maintenance.

TEST AND EVALUATION

The detector went through comprehensive internal tests. Reports displaying the performance can be provided by the manufacturer on request. The detector was also tested in a comparative test trial (Systematic Test and Evaluation of Metal Detectors. Interim Report Field Trial Mozambique, 12 April - 5 May 2005) by the European Commission, Join Research Centre, in Mozambique in 2005 as well as in a laboratory test trial by JRC, Institute for the Protection and Security of the Citizen, in Italy from November 2003 to January 2006.

The comparative test report is available at the ITEP website: www.itep.ws.

REPORTED LIMITATIONS AND STRENGTHS

Limitations “The absence of ground compensation made the use of the detector quite dependent on the individual abilities of the operator. The detector could be used in the different lanes by reducing the sensitivity so that the ground did not create a signal … The loss of sensitivity with the increasing electromagnetic properties of the ground was significant and depends strongly on the type of the target. We do not recommend use of this detector for finding minimum-metal mines when the ground conditions are similar to L3 or worse. The simple construction and low power consumption may make it valuable in less severe ground conditions.”

Strengths

- Easy set-up and operation.
- Ease of maintenance.

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GENERAL DESCRIPTION
The EBEX 420 PBD is a modular, easy-to-use piece of equipment, which is in daily use in Afghanistan, Angola, Bosnia and Herzegovina, Cambodia, El Salvador, Georgia, Mozambique, Viet Nam and Zimbabwe, as well as other mine-affected countries. The detector design eases logistics and maintenance, allowing fault identification and remedy without tools and advanced training.

Main characteristics

1. The equipment is designed for easy assembly and operation.
2. High sensitivity enables detection of low-metal-content mines.
3. Good adaptation to conductive soil, good pinpointing and fast work progress.
4. The equipment’s large dynamics in the audio alarm system helps operators to discriminate small from large metal items.
5. The equipment’s audio control pulses indicate the battery condition. Audible confidence clicks inform operators that equipment is functioning correctly.
6. The equipment operates on a dynamic search mode.
7. The equipment widely filters interference from conductive ground or salt water.
8. Little user maintenance is required, saving time and expense.

WORKING METHODOLOGY
The EBEX 420 PBD hand-held mine detector is the pulse induction version of the EB 420. It was developed in cooperation with military personnel serving in the United Nations and humanitarian mine clearance operations around the world. It is intended to suit large-scale mine and battle area clearance in adverse conditions and requires only minimal training and logistic support.

The detector operates with the dynamic Ebinger pulse induction system. Its search head sends out short magnetic pulses which cause conductive targets to respond with an electromagnetic echo field which is detected and transduced into an audible signal. The intensity and characteristics of the signals depend on the size and distance of the detected target. The dynamic search mode adapts the detector to homogene soil interference and provides a good resolution between several targets buried at close distance.

The EBEX 420 PBD was designed to locate low-metal-content mines and to detect ERW hidden in undergrowth or buried underground. Its simplicity of use by one adjuster makes it ideal for deployment in adverse conditions or in difficult operations. It is lightweight with the electronics integrated into the handle. This negates the need for cables and additional control boxes or a battery compartment and the detector can even be operated with a loudspeaker.

The EBEX 420 PBD can be operated in a short mode of approximately 1m for search in the prone position or in the extended version of 1.6m when used in the standing position. Its large dynamics and wide adjustability facilitate the suppression of interference from conductive ground.
DETECTORS IN USE TO DATE
Since 1995, more than 5,000 EBEX 420 PBD detectors have been sold. They are in use with various humanitarian demining organisations, the United Nations and many commercial companies.

POWER SUPPLY
- The EBEX 420 PBD is powered by 6 x 1.5V C cell or alternative; rechargeable battery pack 3.8 A/h, 12V.
- Operational life of battery (6 x 1.5V alkaline 8A/h) approximately 50 hours.
- Operational life of battery pack (12V 3.8A/h) approximately 35 hours.

FACTORY SUPPORT
- All detectors are covered by a 24-month warranty. The worldwide service network ensures permanent availability of spare part.
- Operation and maintenance training is provided at Ebinger facilities or on site.
- Additional factory support by specially trained staff is provided on request.
- Instruction and maintenance manuals are available in Arabic, English, French, German, Italian, Russian and other languages on request.

MAINTENANCE AND SUPPORT
- There are no special requirements for the technicians or the workshop facilities. Most repairs can be carried out by Ebinger-trained staff on site.
- The step-by-step explanations in the manuals help to ensure easy maintenance of the system.

TEST AND EVALUATION
The detector has had several tests:
UNAVEM III Demining School – Commander (Memorandum) 1996;
International Detector Test UNADP Mozambique, December 2000;
Reports of the last two tests are available at the ITEP website, www.itep.ws

REPORTED LIMITATIONS AND STRENGTHS
Despite the number of tests and trials of the detector, no general scientific evidence is available regarding detection performance under different soil conditions or other key qualities. But it has shown the capability to detect a VPROM1 with a sufficient safety margin at all angles.\(^1\)

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\(^1\) M. Fernandez, A. Lewis, F. Littmann, PROM 1 Anti-personnel landmines - Probability of activation by physical contact with a metal detector, Special publication No. I.01.29, European Commission Directorate General JRC Joint Research Centre Institute for Systems, Informatics & Safety, Ispra, March 2001
GENERAL DESCRIPTION
The EBEX 421 GC is a modular, compact, lightweight, battery-operated, hand-held metal detector which is suitable for all kinds of demining operations. The modular design ensures that each component is interchangeable with other detectors of the same “family”. Each component can be ordered individually. The EBEX 421 GC is the enhanced version of the EBEX 420 GC. The system is able to detect mines with minimum metal content to a high level of reliability and can be used in both shallow fresh or salt water. Enlarged search heads can also be used to clear battle areas of deeply buried ordnance.

The rugged design qualifies the detector to be used under all climatic conditions.

Main characteristics
1. The equipment is simple to set up and easy to operate.
2. The equipment can compensate for unhomogeneous laterite or mineralisation maintaining high detection sensitivity.
3. The equipment’s large dynamics in the audio alarm system helps operators to discriminate small from large metal items.
4. The equipment’s audio control pulses indicate the battery condition. Available confidence clicks inform operators that equipment is functioning correctly.
5. The equipment operates on a dynamic search mode.
6. The equipment widely filters interference from conductive ground or salt water.
7. Little user maintenance is required, thereby saving time and expense.

As optional accessories the manufacturer offers
1. Probe sensor 30 x 290 mm;
2. Enlarged search head 280 x 400 mm (for deep search);
3. Enlarged head 450 x 630 mm (for deep search);
4. Handgrip and armrest;
5. Rechargeable battery pack 12V / 2.0 Ah; and

WORKING METHODOLOGY
The EBEX 421 GC uses bipolar pulse induction for detection and is designed to operate in high metallic soils by including a soil compensation feature. No further detailed information is given by the manufacturer.

DETECTORS IN USE TO DATE
Since 1998, more than 2,500 EBEX 420 GC detectors have been bought. They are in use with various humanitarian demining organisations, the United Nations and many commercial mine clearance companies.

For the 421 GC version no figures are available.

POWER SUPPLY
> The EBEX 421 GC is powered by 8 x 1.5V C-cell or alternative; rechargeable battery pack 3.8 A/h, 12V.
> Operational life of battery (8 x 1.5V alkaline 8A/h) approximately 20 hours.
> Operational life of battery pack (12V, 3.8A/h) approximately 10 hours.
FACTORY SUPPORT

> All detectors are covered by a 24-month warranty. The worldwide service network ensures permanent availability of spare parts.
> Operation and maintenance training is provided at Ebinger facilities or on site.
> Additional factory support by specially trained staff is provided on request.
> Instruction and maintenance manuals are available in Arabic, English, French, German, Italian, Russian and other languages on request.

MAINTENANCE AND SUPPORT

There are no special requirements for the technicians or the workshop facilities. Most repairs can be carried out by Ebinger-trained staff on site. The step-by-step explanations in the manuals help to ensure easy maintenance of the system.

TEST AND EVALUATION

The detector went through comprehensive internal and comparative tests (in terms of reliability and capability of detection).

Tests conducted on the EBEX 420 GC include:

> Nicaraguan Field Test Report, 2001 (EBEX 420 GC);
> International Pilot Project for Technology Cooperation (IPPTC), 2001 (EBEX 420 GC);
> International Detector Test, UNDP Yemen, 2002;
> UN Mine Action Programme Afghanistan, February-March 2002 (EBEX® 420 GC);

The EBEX 421 GC was tested by the EC's Joint Research Centre in Laos in 2004 and in a comparative field trail in Mozambique in 2005 as well as in a laboratory test trail by JRC, Institute for the Protection and Security of the Citizen, in Italy from November 2003 to January 2006.

The following test results are available at the ITEP website: www.itep.ws.


REPORTED LIMITATIONS AND STRENGTHS

Limitations No significant limitations reported to date.

Strengths “During the two weeks of the training and trial, no difficulties in use or technical questions arose. The detector had no problems in compensating the ground influence in all lanes and could well cope with the physically different structures of the soils i.e. the stones as well as with the magnetic properties. The signal interpretation is easy because there is little background noise. ...”

GENERAL DESCRIPTION
The MINEX 2FD 4.530 metal detector works on the continuous-wave EMI principle with two parallel frequencies. It is an improved version of the MINEX 2FD available as an off-the-shelf product since November 2005.

The one-piece design aims to make the machine fast to put into operation, low in weight and precisely balanced, mechanically durable and with as few mechanically "weak points" like cables or plugs as possible. A drillsafe telescopic bar with improved fast-lock clips keeps the searchhead in the chosen position.

The MINEX 2FD 4.530 is equipped with an easy-to-use, push-button, ground-learn procedure to adapt to all soil conditions. A digital data interface downloads ground condition data, which are used for further software improvement. The same data interface is to update software, which can be done by the customer: a terminal programme and software updates are supplied free.

Safety considerations strongly influenced the MINEX development. An audible alarm informs the operator about malfunctions. Low battery levels are indicated by a red LED, while still ensuring hours of safe work without any loss of sensitivity. When the battery level is critically low, an additional audible alarm is activated. Extra safety is ensured by a steady ticking-sound during operation. The searchhead does not need to be moved to indicate a signal: keeping the head stationary over an object will not lead to a drop in signal level.

By covering different frequencies, all metals can be found with approximately the same sensitivity setting.

WORKING METHODOLOGY
By using a non-dynamic principle, there is no minimum speed for the movement of the coil. The gradiometric arrangement of the search coil indicates metallic objects with a switching sound when the centre of the coil passes over them. Thus it is possible to pinpoint objects exactly, to separate objects close to each other and to work alongside big metal objects such as fences, railways and gates.

As an example, minimum metal mines in a horizontal distance of about 10-15cm from each other can be separated and localized. The only steady background noise is an unobtrusive control-tick.

Salt and fresh water does not influence the MINEX’s detection capabilities. Different soil types identified on site with the simple push-button ground-learning device. This ensures that the detector is adapted to particular soils without choosing and using preset soil types. The MINEX 2FD 4.530 offers five possible sensitivity settings, by a switch on the back of the detector, thus enabling clear identification of the chosen setting by a supervisor from the rear. The “optimised” sensitivity step offers maximum sensitivity for the “learned” soil type at full ground compensation. One higher and three lower sensitivity settings are available.

POWER SUPPLY
As standard, the MINEX 2FD 4.530 is powered by three 1.5 V D cells. Rechargeable batteries can be used, varying the indicated operating-times depending on their quality and age. Battery charge status is indicated (low-medium-high) when switching on the detector.
Under all circumstances the sensitivity and detection quality is not influenced by the battery conditions.

At 20°C approximately 30 hours of continuous operation are generated. With a normal operating schedule (four hours twice a day) a total operating time of approximately 50h can be achieved.

Under most circumstances, one set of batteries ensures sufficient supply for one working week.

**DETECTORS IN USE TO DATE**

- The MINEX 2FD 4.530 has been in service with demining forces in Africa and Asia since early 2006.
- The MINEX 2FD 4.500 has been in service since 2000, mainly in Afghanistan, Australia, Austria, Croatia, Denmark, Egypt, France, Guinea Bissau, India, Mozambique, Oman, Portugal, Spain, Switzerland, Tunisia, the U.S. and Viet Nam.
- The previous version, MINEX 2FD 4.400 with identical features to the 4.500 version, has been in field use since 1991.
- The MINEX 2 FD series is in service with humanitarian deming and military forces in more than 30 countries.

**FACTORY SUPPORT**

Spare parts are available exclusively from Foerster. Rechargeable batteries similar to those used for the MINEX can be purchased on the free market.

Besides Foerster’s direct support, the company is represented in more than 40 countries, most of them offering complete after-sales service. They can also provide on-site training and have modern test and training areas at their facilities in Reutlingen, Germany. These areas offer excellent training conditions for mine/ERW search under various scenarios. A full training programme for trainers – including lessons on background knowledge and various training materials – is available in German and English. Training can be requested as part of the purchase package. Manuals and service documentation are available in German, English, French, Portuguese and Spanish as standard, plus other languages on request.

**MAINTENANCE AND SUPPORT**

MINEX maintenance is at two levels: basic field maintenance and workshop maintenance. Personnel handling a workshop must have some basic knowledge of mechanical and electronic repairs. Foerster can supply complete tool sets and testing equipment as well as service training. Fully equipped workshops with trained personnel can handle all repairs to factory final assembly level.

**TEST AND EVALUATION**

Foerster tests its equipment within its own facilities, mainly for research and quality control, for the most part and as far as possible under “real” conditions. This includes the targets (mines and ERW) as well as the circumstances (soil, disturbing influences, etc.). The results are not available publicly but the Foerster training site allows interested customers to see the equipment working under these conditions.
The MINEX 2FD 4.500 was tested by the EC’s Joint Research Centre in Laos in 2004 and in a comparative field trial in Mozambique in 2005 as well as in a laboratory test trial by JRC, Institute for the Protection and Security of the Citizen, in Italy from November 2003 to January 2006.

The following test results are available at the ITEP website: www.itep.ws


The MINEX FD 4.550 prototype was tested in May 2005 by BAM-Berlin at the Benkovac test site in Croatia. Test results are available from BAM; (see also http://www.bam.de/de/aktuell/presse/newsletter/newsletter_medien/newsletter_7_2005.pdf).

REPORTED LIMITATIONS AND STRENGTHS

As the MINEX FD 4530 is new no independent test reports are yet available.

Limitations
No significant limitations reported to date.

Strengths
- One-piece design.
- Ease of operation.
- Easy ground-learn-procedure for adapting to all soil conditions.
GENERAL DESCRIPTION

The *Minelab F1A4* metal mine detector was designed and developed in 1996 for use by the Cambodian Mine Action Centre to detect minimum-metal mines in all ground conditions but particularly in heavily mineralised soils. Following comprehensive comparative trials in 1998, CMAC announced the F1A4 was its “detector of choice”.

The F1A4 has undergone continuous design improvement. It now includes an RS232 output for computer logging of target responses which, when coupled to a GPS facility, makes it ideal for ERW detection and mapping. The F1A4 UXO version includes an interchangeable large coil (450mm diameter) for deeper detection against large targets.

Using a constant “threshold tone”, the operator can easily discern the sound of a deeply buried target. Also, the mono-loop design of the search coil ensures that sensitivity is consistent across the entire surface of the coil producing no blind spots. Consequently, the risk of missing targets is reduced and pinpointing is enhanced.

WORKING METHODOLOGY

The F1A4 is a pulse induction detector (time domain) incorporating Minelab’s unique and patented Multi-Period-Sensing (MPS) technology that permits detection in the heaviest of mineralised soils. This is achieved via the F1A4 electronics that produce two target channels and one ground channel. Using MPS to identify interference from the ground, complex algorithms remove the interference while maintaining appropriate sensitivity in the target channels.

The F1A4 also incorporates a “noise cancel” feature, a simple procedure allowing an operator to reduce or eliminate any environmental interference resulting from, for example, other detectors nearby or overhead power lines.

The detector’s battery power supply is constantly monitored by its electronics to ensure that detection sensitivity does not decrease as battery voltage reduces.

DETECTORS IN USE TO DATE

The F1A4 Version 1 was issued in 1998 and is now available in Version 8. It has been bought by the UN, US Department of State, Japanese International Cooperation Agency and various NGO, commercial demining companies and militaries.

In the past five years the F1A4 has been supplied to more than 200 customers in more than 50 countries – with a total of more than 10,000 units in operation around the world.

The F1A4 is designed for countermine as well as humanitarian demining operations and has been bought by the militaries of Australia, Canada, Sri Lanka, Sudan, Viet Nam and the U.S.

In 2006 the F1A4 was selected to replace the in-service fleet of detectors with the Ethiopian Mine Action Office.

POWER SUPPLY

The F1A4 uses commercially available 4 x D cell alkaline and rechargeable batteries.

The operating period for alkaline batteries is 24 hours, for rechargeables 12 hours. Minelab’s F Series Battery Charger provides automatic, intelligent and fast charging capability to complement the use of rechargeable batteries.
FACTORY SUPPORT

- Customer support is provided from Minelab facilities in Australia, the US or Ireland.
- Minelab offers comprehensive “train the trainer” operator and technical maintenance training which can be done in the classroom or in the field.
- All training documentation is provided free as part of a training management plan. The principal language is English with other languages provided on request.
- All Minelab trainers are experienced instructors qualified in adult education techniques.
- Where required, Minelab establishes in-country technical repair and maintenance for all warranty and non-warranty repairs. This provides timely access to spare parts.
- Where applicable, routine customer visits to provide on-going advice on training and maintenance are provided free by Minelab.
- Manufacturer’s warranty is for 15 months, with extended warranty provided on a case-by-case basis.

MAINTENANCE AND SUPPORT

- All F1A4 components are interchangeable and require no routine calibration.
- Diagnostics, fault finding and component replacement can occur in the field as part of Minelab’s Level 1 repair and maintenance.
- Level 2 maintenance requires basic soldiering skills with minimal workshop facilities.

TEST AND EVALUATION

The following trials have been conducted on the F1A4:

- UNMAC, Bosnia and Herzegovina, 1997.
- JUXOCO, USA, 2002.
- Canadian Forces, 2002.

Copies of the evaluations are available from Minelab on request.

The detector was tested by the EC’s Joint Research Centre in Laos in 2004 and in a comparative field trial in Mozambique in 2005 as well as in a laboratory test trial by JRC, Institute for the Protection and Security of the Citizen, in Italy from November 2003 to January 2006.

The following test results are available at the ITEP website: www.itep.ws

REPORTED LIMITATIONS AND STRENGTHS

Limitations  "The loss of sensitivity with the increasing electromagnetic properties of the ground was significant but most of the used targets i.e. mines and simulants of mines could be detected in all lanes to 130mm depth." 1

Strengths

- Simple to use.
- Lightweight.
- Speed of pinpointing.
- All-round sensitivity of mono-loop coil.

"During the two weeks of the training and trial, no difficulties in use or technical questions arose. The detector had no problems in completing its automatic soil compensation process in all lanes and could well cope with the physically different structures of the soils i.e. the stones as well as with the magnetic properties. The signal interpretation is easy because of the relatively low background noise. The detector kept a good level of sensitivity to all lanes." 1

GENERAL DESCRIPTION

The Minelab F3 metal mine detector was designed in consultation with many of Minelab’s clients. Building on the technology of the Minelab F1A4 detector, the F3 entered into production in July 2005.

Although the F3 shares many technological features with the F1A4, including its ability to remove the effects of mineralised soils, it also includes several new features. For example, the F3 introduces the concept of a Sensitivity End Cap, which permits an operator to reduce the sensitivity of the detector in situations where maximum sensitivity is not required. By using End Caps it is impossible for an operator to accidentally reduce the sensitivity of the detector – unlike a detector that uses knobs, dials or switches.

The F3 also uses bipolar technology which minimises the threat posed by magnetic-influence mines. It is a “static” detector that emits an alarm tone when a target is present regardless of the relative motion of the search coil.

Using a constant “threshold tone”, the operator can easily discern the sound of a deeply buried target. Also, the mono-loop design of the search coil ensures that sensitivity is consistent across the entire surface of the coil producing no blind spots. Consequently, the risk of missing targets is reduced and pinpointing is enhanced.

WORKING METHODOLOGY
The F3 is a pulse induction detector (time domain - bipolar) that incorporates Minelab’s unique and patented Multi-Period-Sensing (MPS) technology which permits detection in the heaviest of mineralised soils. Its mechanical design allows the detector to be adjusted to suit various demining positions adopted by an operator. The F3 has no exposed cables and is robust, having been manufactured from high impact plastics, aluminium and carbon fibre.

A recent option for the F3 is a LED display and volume / sensitivity controls located on the hand assembly. The display provides a visual indication of the size and depth of a target and increases pinpointing accuracy.

The F3 also incorporates a “noise cancel” feature, a simple procedure which allows an operator to reduce or eliminate any environmental interference resulting from, for example, other detectors nearby or overhead power lines.

DETECTORS IN USE TO DATE
Introduced in 2003, there are now more than 3,000 F3 Version 1 detectors in use around the world. In 2003, the F3 was selected by the Sri Lanka national demining operation sponsored by the US Department of State.

As it is designed for countermine as well as humanitarian demining operations, the F3 detector has also been bought by the militaries of Australia, the Netherlands New Zealand, Sri Lanka, Sudan, Thailand, the US and Viet Nam.

The F3 electronics and coil are also incorporated into the US HSTAMIDS detector, which combines metal detection with ground penetrating radar. In August 2006, the U.S. issued a multi-year contract for the manufacture of up to 17,000 units.

POWER SUPPLY

- Operates with commercially available 4 x D cell alkaline and rechargeable batteries.
- Operating period: alkaline – 27 hours; rechargeable – 15 hours.
- Minelab’s F Series Battery Charger provides automatic, intelligent and fast charging capability to complement the use of rechargeable batteries.

FACTORY SUPPORT

- Customer support is provided from Minelab facilities in Australia, the US or Ireland.
- Minelab offers comprehensive “train the trainer” operator and technical maintenance training, which can be done in the classroom or in the field.
- All training documentation is provided free as part of a training management plan. The principal language is English with other languages provided on request.
- All Minelab trainers are experienced instructors qualified in adult education techniques.
- Where required, Minelab establishes in-country technical repair and maintenance for all warranty and non-warranty repairs. This also provides timely access to spare parts.
Where applicable, routine customer visits to provide on-going advice on training and maintenance are provided free by Minelab.

Manufacturer’s warranty is for 15 months with extended warranty provided on a case-by-case basis.

MAINTENANCE AND SUPPORT

- All F3 components are interchangeable and require no routine calibration.
- Diagnostics, fault finding and component replacement can occur in the field as part of Minelab’s Level 1 repair and maintenance.
- Level 2 maintenance requires basic soldiering skills with minimal workshop facilities.

TEST AND EVALUATION

The following trials have been conducted on the F3:

- Joint Unexploded Ordnance Coordination Office, USA, 2002.
- Joint Research Centre, ISPRA, 2002.

Copies of the evaluations are available from Minelab on request.

The detector was tested by the EC’s Joint Research Centre in Laos in 2004 and in a comparative field trial in Mozambique in 2005 as well as in a laboratory test trial by JRC, Institute for the Protection and Security of the Citizen, in Italy from November 2005 to January 2006.

The following test results are available at the ITEP website: www.itep.ws


REPORTED LIMITATIONS AND STRENGTHS

Limitations

No significant limitations reported to date.

Strengths “During the two weeks of the training and trial, no difficulties in use or technical questions arose. The detector had no problems in completing its automatic soil compensation process in all lanes and could well cope with the physically different structures of the soils i.e. the stones as well as with the magnetic properties. The signal interpretation is easy because of the low background noise. The detector kept a good level of sensitivity to all lanes and targets.”

GENERAL DESCRIPTION

The *AN-19/2 Mine Detecting Set* is one of the most widely-used and easily-recognisable mine detectors in the world. It is built to military standards to meet the requirements for mine clearance on the battlefield and is now also used for humanitarian demining. It has been in daily use for the last 11 years in the world’s most mine-affected countries and is the standard detector for many NATO countries, including the US Army (designated as the AN/PSS-12).

Because of its ease of use, low power requirement, lightweight design and the low mutual interference, the AN-19/2 is mission-suited for all kinds of demining activities. The equipment is able to detect mines with minimum metallic content and can be used in shallow fresh or salt water. Unaffected by ambient temperature, the detection characteristics of the AN-19/2 qualify the equipment for use in all climates. It is a reliable, long-life product based on rigorous quality control standards during manufacture. Although there have been several modifications to the original AN-19/2 pulse detector, culminating in the current Modification 7, the method of operation has remained the same. Since many Schiebel detectors have been in operation for more than ten years, the company offers a kit that upgrades older detectors to the latest technology. This allows the user to retain the trusted and proven design of the AN-19/2 while increasing sensitivity and allowing operation of the detector in mineralised soils such as laterite and magnetite.

The upgrade consists of a new search head and a new electronics card which allow the detector to act either as an AN-19/2 or an All Terrain Mine Detector (ATMID) depending on which search head is used. In the pulse, or AN-19/2 mode, the detector operates in the same way as the original detector, yet with increased capacity in normal soils. In the continuous wave (ATMID) mode, the detector uses new technology and a new search head to detect minimum-metal mines in even the most difficult mineralised soils. The upgrade combines both technologies in one detector, providing versatility in varied operating conditions.

WORKING METHODOLOGY

The search head emits an electromagnetic pulse, which induces eddy currents in nearby metal objects. These eddy currents give rise to a secondary field, which is detected by the search head receiving coil. The detected signal is processed in the electronics unit. The presence of a metal object is indicated by a tone in the headphone and by an optional LED visual signal, if fitted. The AN-19/2 detects mines at their operational depth (or deeper). Schiebel’s own testing uses a 0.15g steel pin (approximately the same signature as the Chinese Type 72A anti-personnel mine) that can be detected when buried at 17cm. (or only 12cm in light magnetic soil: for heavier magnetic soil the ATMID should be used). This is maintained in fresh/salt water (down to 2m). For large magnetic signature mines/ERW, the detector gives an over edge of target indication enabling the same precise location as for smaller targets.

POWER SUPPLY

AN-19/2 is powered by four standard D cell batteries. The recommended alkaline cells provide approximately 70 hours operation. Similar rechargeable nickel-cadmium cells provide approximately 35 hours. All recommended cells are available worldwide as are suitable automatic chargers.

Rechargeable cells last for at least one year if correctly used/charged.
DETECTORS IN USE TO DATE
The manufacturer says that more than 40,000 AN-19/2s have been sold in four versions (Modification 2, 5 and 7) since 1990. It is impossible to say how many of each are in service as many have been upgraded.

Different versions are in use in mine-affected regions all over the world, including in Afghanistan, Angola, Bosnia and Herzegovina, Croatia, Cambodia, Iraq, Kosovo and Mozambique. Clients include the UN, Mines Advisory Group, Cambodian Mine Action Centre, Handicap International, most NATO countries and many other armed forces (including Colombia, India and Sweden).

FACTORY SUPPORT
> All detectors are covered by a 12-month, no-cost warranty and operator / maintenance training is provided (on site or at the factory, as requested) as part of the procurement package. Further training can be provided at cost.
> Spare parts, all interchangeable (regardless of detector version), are available for ten years after purchase. These can be obtained directly from the factory or from the worldwide network of Schiebel agents.
> Operator and maintenance manuals are provided in most major languages (e.g. English, French, German, Spanish).
> Schiebel technicians/factory repairs are available worldwide to provide additional support whenever required.

MAINTENANCE AND SUPPORT
The AN-19/2 requires little maintenance and can be upgraded to the latest modification state. Most repairs can be carried out, at field level, by Schiebel trained personnel. Workshop repairs can be carried out by Schiebel trained technicians, using the recommended tools and test equipment (digital multi-meter and oscilloscope).

TEST AND EVALUATION
The AN-19/2 has been comprehensively field-tested in all climates by the manufacturer and all detector specifications are fully proven. It has also been evaluated and selected by a wide range of operators, including the US Army and Mines Advisory Group. Additional test reports are available on request from the manufacturer.

The EC’s Joint Research Centre says the Schiebel AN-19/2 detects a VPROM 1 with a sufficient safety margin at all angles.1

The detector performed above average in all types of soil (sand, clay, peat, and ferruginous).2

The most significant tests passed by the detector are:
> International Detector Test UNADP Mozambique, December 2000.

REPORTED LIMITATIONS AND STRENGTHS

Limitations

- No external speaker.
- Exposed cable.
- Lack of standard bracket to mount electronics box on detector shaft.

Strengths

- Lightweight.
- Rugged and weatherproof.
- Easy to use.

GENERAL DESCRIPTION

The AT MID (All Terrain Mine Detector) is the latest improvement of the AN-19/2 using the continuous wave mode combined with ground-compensating technology. The AT MID is a military standard detector that is unaffected by climatic variations and has been optimised to detect landmines with minimum-metal content in all types of soil, including laterite terrain, and in fresh or salt water. The manufacturer states that its sensitivity in ferromagnetic soils remains at the same level. The detector, including all accessories, is packed in a rucksack-style bag.

When fitted with the standard AN-19/2 search head, the ATMID will function in pulse mode with the same performance as the AN-19/2. Because of its ease of use, low power requirement, lightweight design, environmental stability and automatic ground compensation, the ATMID is suitable for use anywhere in the world, in any terrain.

The ATMID is also available as an upgrade to the AN-19/2. The upgrade consists of a new search head and a new electronics card which allow the detector to act either as an AN-19/2 or an ATMID depending on which search head is used. In the pulse (AN-19/2) mode, the detector operates the same way as the original detector, yet with increased capacity in normal soils. In ATMID mode, the detector uses new technology and a new search head to detect minimum-metal mines in even the most difficult mineralised soils.
WORKING METHODOLOGY
The ATMID transmitting coil transmits a continuous wave that creates a magnetic field and which is able to compensate for magnetic soil. The sweeping movement of the search head over the ground induces eddy currents in any nearby metallic objects, which affect the created magnetic field. The receiver coil detects the resultant changes in magnetic field and produces a signal that is processed in the electronics unit to provide an audio tone indicating the presence of metal. ATMID detects nearly all mines at deeper than operational depth in any/all soils. Schiebel’s test piece incorporates a 0.15g steel pin (approximately the same signature as the Chinese Type 72A anti-personnel mine) that can be detected at 18cm when buried in the ground, including under surface fresh/salt water.

For large magnetic-signature mines or ERW, the ATMID gives an edge-of-target indication enabling the same precise location as for smaller targets.

POWER SUPPLY
The ATMID is powered by four standard D cell batteries. The recommended alkaline cells provide approximately 70 hours operation (in most conditions). Similar rechargeable nickel-cadmium cells provide approximately 55 hours operation. All recommended cells are available worldwide, as are suitable automatic chargers. Rechargeable cells last for at least one year if correctly used/charged.

DETECTORS IN USE TO DATE
The ATMID has been in service for more than two years and there are now more than 1,000 in use worldwide. They are being deployed in many regions, including Cambodia, Croatia, Ecuador, Laos, Lebanon, Mozambique, Peru, Slovakia, Taiwan, the U.S. and Viet Nam. They are being used by armed forces from a number of countries (Cambodia, Sweden, US, etc.), humanitarian demining organisations (CMAC, CROMAC, MAG, etc.) and commercial demining companies (Specialist Ghurkha Services [SGS], RONCO, Milsearch, TADS, etc.).

FACTORY SUPPORT
- All detectors are covered by a 12-month, no-cost warranty and operator / maintenance training is provided (on site or at the factory as requested), as part of the procurement package. Further training can be provided at cost.
- Spare parts, all interchangeable, are available for ten years after purchase. These can be obtained directly from the factory or from the worldwide network of Schiebel agents. Operator and maintenance manuals are provided in most major languages (e.g. English, German, Spanish).
- Schiebel technicians/factory repairs are available worldwide to provide additional support whenever required.

MAINTENANCE AND SUPPORT
The ATMID requires little maintenance. Most repairs can be carried out in the field by Schiebel-trained personnel. Limited workshop repairs can be carried out by Schiebel-trained technicians, using the recommended tools and test equipment (digital multi-meter and oscilloscope).
TEST AND EVALUATION

The detector was tested by the EC’s Joint Research Centre in Laos in 2004 and in a comparative field trial in Mozambique in 2005 as well as in a laboratory test trial by JRC, Institute for the Protection and Security of the Citizen, in Italy from November 2003 to January 2006.

The following test results are available at the ITEP website: www.itep.ws


REPORTED LIMITATIONS AND STRENGTHS

Limitations

- No external speaker.  
- Exposed cable.
- Lack of documentation for search head use.
- “The detector had a substantial loss of sensitivity from L1 to L7.”

Strengths

- Lightweight and easy to use.
- Rugged and weatherproof.
- Versatile.

“During the two weeks of the training and trial, no difficulties in use or technical questions arose. The detector had no problems in completing its automatic soil compensation process in all lanes and could well cope with the physically different structures of the soils i.e. the stones as well as with the magnetic properties. The signal interpretation is easy because of the low background noise.”

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**GENERAL DESCRIPTION**

The **MIMID** (Miniature Mine Detector) is based on the pulse mode technology of the AN-19/2 mine detector that has been the worldwide standard for minimal-metal-mine detection in both military and humanitarian demining for the past ten years. It was developed to meet the specific operational requirements of the US Army Humanitarian Demining Team. It is waterproof to 30m and is suitable for use both on land and by divers for underwater operations. The detector has been in service since 1997.

The lightweight, one-piece, foldable design makes it suitable for use by Special Forces or anyone likely to come into contact with mines. The folded unit can be carried on a belt, in a trouser pocket or in a rucksack, a unique feature allowing operators immediate access to the unit.

The MIMID can be set up for operation in 30 seconds. Controls are within easy reach of the operator and are identical to those of the AN-19/2. The length of its telescopic pole can be quickly adjusted for operation in the upright, kneeling or prone positions.

**WORKING METHODOLOGY**

The transmitting coil of the search head emits an electromagnetic pulse, which induces an eddy current in metal objects in the vicinity of the search head. These eddy currents give rise to a secondary field, which is picked up by the receiving coil. The signal from this coil is processed in the electronics unit. The operator is alerted to the presence of a metal object by a sound in the headphone and a light signal on the visual indicator.

Schiebel’s test piece incorporates a 0.15g steel pin (approximately the same signature as the Chinese Type 72A anti-personnel mine) that can be detected at a depth of 15cm when buried in the ground. This performance is maintained in underwater depths of some 30m.

For large-magnetic-signature mines/UXO, the detector gives an over edge of target indication enabling the same precise location as for smaller targets.

**POWER SUPPLY**

The MIMID is powered by four standard AA-size cells. The recommended alkaline cells provide around 7 hours operation. Similar rechargeable nickel-cadmium cells provide approximately 4 hours. All recommended cells are available worldwide as are suitable automatic chargers. Rechargeable cells last for at least one year if correctly used/charged.

**DETECTORS IN USE TO DATE**

More than 1,500 MIMID detectors have been sold since 1997. They have been used by a number of armed forces, for example Israel and the U.S.

**FACTORY SUPPORT**

> All detectors are covered by a 12-month, no-cost warranty, and operator / maintenance training is provided, (on site or at the factory as requested), as part of the procurement package. Further training can be provided at cost.
Spare parts, all interchangeable, are available for ten years after purchase. These can be obtained directly from the factory or from the worldwide network of Schiebel agents.

Operator and maintenance manuals are provided in English, German, and Spanish. Schiebel technicians / factory repairs are available worldwide to provide additional support on request.

**MAINTENANCE AND SUPPORT**

The MIMID requires little maintenance due to its high reliability. Most repairs can be carried out at a workshop by Schiebel-trained technicians, using the recommended tools and test equipment (digital multi-meter and oscilloscope).

**TEST AND EVALUATION**

The MIMID has been comprehensively field-tested in all climates by the manufacturer, including underwater trials to 30m, and all detector specifications are fully proven. It has also been evaluated by Ecuador and the U.S. Test reports are available on request from the manufacturer. The detector scored well in all kinds of soil type. The results achieved in ferruginous soil were above average.

Tests passed by the detector include:


Test reports were partially published and the first is available at the ITEP website: www.itep.ws.

**REPORTED LIMITATIONS AND STRENGTHS**

**Limitations**

- No transit case.
- Handle does not lock down.
- Elbow restraints and shaft latches are weak.

**Strengths**

- Lightweight and compact.
- Weatherproof.
- Pre-assembled.

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GENERAL DESCRIPTION

The VMC1 Metal Mine Detector has been designed for highly accurate detection of all types of metallic mines as well as plastic mines with minimal metal content, bombs, ammunition and other metallic objects in the ground or in shallow water.

It is a one-piece retractable detector supplied in a soft carrying bag with a carrying belt housing the complete mine detecting set and an optional non-magnetic prodder. Due to its small size it is easily transported and stored. Ergonomic operation and indication elements integrated in the detector housing ensure easy operation and minimum operator training. Metal alarm is by audio signal, visual bargraph and vibration alarm.

Operator controls are limited to one mode selector with two soil programmes and three push-buttons for setting sensitivity level, volume of the audio signal and compensation/ground balance. Another push-button integrated in the handle is used to activate the pinpoint mode. Data input allows for further upgrade of the detector’s firmware.

Along with its digital signal processor, the VMC1 uses an advanced pulse-field function specially improved by Vallon. It can work in mineralised soils, such as laterite, magnetite and magmatite, as well as in shallow salt and fresh water, and under the electromagnetic influence of main power lines without greatly affecting sensitivity.

Main components of the VMC1 are

1. Oval search head with telescopic carrying bar. Detector electronics with integrated non-magnetic loudspeaker, power supply and battery compartment. LED bargraph with 14 elements and a vibrator. Three robust push-buttons for sensitivity control, volume control and ground compensation on the front of the housing. ON/OFF switch for two different ground conditions. Push-button integrated in the handle to activate the pinpoint mode.

2. Non-magnetic test piece.

3. 1 set (3 EA) round cells 1.5 V IEC R 14 Alkaline C-size, 7.8 Ah each.


5. Field manual.

6. Field backpack for storing the complete detector with all accessories.

Optional accessories (available on request)

1. Headset.

2. Hard case for storing the complete detector with all accessories.

3. Non-magnetic prodding needle.

The detector complies to environmental conditions according to MIL STD 810F, 501.4-II, 502.4-I, 502.4-II, 503.4, 506.4-III, 514.5 C1.
WORKING METHODOLOGY
The search head continuously emits electromagnetic pulses as the operator sweeps close to the surface.

The search head acts as both an emitter and a receiver sensing the pulsed field. If there is a metal object in the magnetic field, the following happens:

> The electronics unit detects a deviation from the previous state; thus an alarm signal is produced depending on the size of the metal target.
> The shape of the pulse in the VMC1 is bipolar to reduce the effect on magnetically fuzed mines.

To ensure optimal use worldwide under different soil conditions, the VMC1 is provided with a programme switch to set the optimum detection features.

The correct programme setting and the wide range of detection sensitivity allow detection of even plastic mines with minimum metal content in mineralized soil and also near to 50-Hz-power lines or 60-Hz-power lines.

The detector has a built-in-test procedure continuously checking reliability and proper function during operation. The pulse signal generation, signal processing, battery voltage, external connections and – most important – the internal operation voltages are constantly monitored. Visual and acoustic alarms are produced when a fault is found. With such reliability, the user can operate the VMC1 easily and concentrate fully on the detection tasks.

DETECTORS IN USE
The detectors are in service with various humanitarian aid organisations, NGOs, commercial mine clearance organisations and several armed forces.

Under all circumstances the sensitivity and detection quality is not influenced by the battery-conditions.

POWER SUPPLY
VMC1 is powered by three round 1.5V IEC R 14 alkaline C cell batteries or rechargeable 1.2V C cells. The operational life of batteries is said to be approximately 8 hours, depending on the age, quality and the capacity of the batteries.

FACTORY SUPPORT
> Vallon runs a worldwide servicing network with all current spare parts in stock. Spare parts can be delivered with a corresponding maintenance manual directly to the customer for on-site repair.
> Operation and maintenance training are offered at the Vallon facilities or at the customer’s location.
> Operation and maintenance manuals are available in English, French and German. Other languages on request.
> Warranty 24 months.
MAINTENANCE SUPPORT
There are no special requirements for technicians or workshop facilities. All tools needed are standard and available in most workshops. A maintenance manual is available for each detector, with step-by-step explanations.

TEST AND EVALUATION
The manufacturer allows access to several of its own test reports. No test report is available on the ITEP website.

REPORTED LIMITATIONS AND STRENGTHS
Vallon says there are no limitations on the detector’s use for terrain, soil or vegetation.

VALLON VMH3
Vallon | Germany

GENERAL DESCRIPTION
The one-piece VMH3 metal mine detector has been designed for highly accurate detection of all types of metallic mines as well as plastic mines with minimal metal content, bombs, ammunition and other metallic objects in the ground or in shallow water.

Ease of operation and a robust mechanical design ensure reliable operation for professional ordnance clearing in battlefield operations, military training programmes and humanitarian demining.

Metal alarm is by audio signal, visual bargraph and vibration alarm.

Along with its digital signal processor the VMH3 uses an advanced pulse-field function specially improved by Vallon. It works in mineralized soils, such as laterite, magnetite and magmatite, as well as in shallow salt and fresh water and under the electromagnetic influence of main power lines without greatly affecting sensitivity.

Data input allows for further upgrade of the detector firmware, and data output enables measured data to be evaluated using VALLON EVA2000 software, running on a laptop or personal computer. The detector can also be connected to the Vallon data loggers.

Main components of the VMH3 are
1. Watertight oval search head with telescopic carrying bar (two sections) and an internally run connection cable with integrated electronics unit, non-magnetic loudspeaker, power supply, ON/OFF switch for two different ground conditions and vibrator, arm-rest and battery compartment, hand grip with bargraph (14 LEDs), four robust push-buttons for sensitivity control, volume control, ground compensation and pinpointing.
2 Non-magnetic test piece.
3 One set (3 EA) single cell batteries.
4 Operation manual.
5 Field manual
6 Field backpack for storing the detector set with all accessories.

Optional accessories *(available on request)*
1 Headset.
2 Data recording and software.

The detector complies to environmental conditions according to MIL STD 810F, 501.4-II, 502.4-I, 502.4-II, 503.4, 506.4-III, 514.5 C1.

WORKING METHODOLOGY
The search head acts as both an emitter of electromagnetic pulses and a receiver sensing the pulsed field. If there is a metal object in the magnetic field, the following happens:

> The electronics unit detects a deviation from the previous state; thus an alarm signal is produced depending on the size of the metal target.
> The shape of the pulse in the VMH3 is bipolar to reduce the effect on magnetically fuzed mines.

To ensure worldwide use under different soil conditions, the VMH3, has a programme switch to set the optimal detection features.

The correct programme setting and the wide range of detection sensitivity allows detection of plastic mines with minimum metal content in mineralized soil, even near to 50-60-Hz-power lines.

The detector has a built-in test procedure continuously checking the reliability and proper function of the detector. The pulse signal generation, signal processing, battery voltage, external connections and – most important – the internal operation voltages are constantly monitored. Visual and acoustic alarms are produced when a fault is found.

With such reliability the user can operate the VMH3 easily and concentrate on detection tasks.

DETECTORS IN USE
The detectors are in service with various humanitarian aid organisations, commercial mine clearance organisations and several armed forces.

POWER SUPPLY
VMH3 is powered by three 1.5V mono-cells IEC R20 (ANSI std. D) or rechargeable RSH 4 KR 35/62. The operational life of batteries is said to be as approximately 18 to 25 hours depending on the age, quality and the capacity of the batteries.
FACTORY SUPPORT

> Vallon runs a worldwide servicing network with all current spare parts in stock. 
Spare parts can be delivered with a corresponding maintenance manual 
directly to the customer for on-site repair.
>
> Operation and maintenance training are offered at the Vallon facilities or at 
the customer’s location.
>
> Operation and maintenance manuals are available in English, French and 
German. Other languages on request.
>
> Warranty 24 months.

MAINTENANCE SUPPORT

There are no special requirements for technicians or workshop facilities. All tools nee-
ded are standard and available in most workshops. A maintenance manual is availa-
ble for each detector, with step-by-step explanations.

TEST AND EVALUATION

The detector was tested by the EC’s Joint Research Centre in Laos in 2004 and in a 
comparative field trail in Mozambique in 2005 as well as in a laboratory test trail by 
JRC, Institute for the Protection and Security of the Citizen, in Italy from November 
2003 to January 2006.

The following test results are available at the ITEP website: www.itep.ws

1. Systematic Test and Evaluation of Metal Detectors. Interim Report Field 
Trial Mozambique, 12 April - 5 May 2005; published in 2005 (see also: 

2. Systematic Test and Evaluation of Metal Detectors. Interim Report Field 
Trial Lao, 27h September - 5 November 2004; published in 2005.

REPORTED LIMITATIONS AND STRENGTHS

Limitations

A loss of sensitivity to smaller targets.¹

Strengths

“During the two weeks of the training and trial, no difficulties in use or technical 
questions arose. The detector had no problems in completing its automatic soil com-
pensation process in all lanes.”²


GENERAL DESCRIPTION
The VMH3CS Metal Mine Detector has been designed for the highly accurate detection of all types of metallic mines as well as plastic mines with minimal metal content, bombs, ammunition and other metallic objects in the ground or in shallow water. A 60cm search head can additionally be used to locate metal-cased mines and unexploded ordnance at larger depths.

Ease of operation and a robust mechanical design ensure reliable operation for professional clearing in battlefield operations, military training programmes and humanitarian demining. Metal alarm is by audio signal, visual bargraph and vibration alarm.

Along with its digital signal processor the VMH3CS uses an advanced pulse-field function specially improved by Vallon. It works in mineralized soils, such as laterite, magnetite and magmatite, as well as in shallow salt and fresh water and under the electromagnetic influence of main power lines without greatly affecting sensitivity.

Data input allows for further upgrades of the detector firmware, and data output enables measured data to be evaluated using Vallon EVA2000 software, running on a laptop or personal computer. The detector can also be connected to the Vallon data loggers.

Main components of the VMH3CS are

1. Detector electronics with integrated arm-rest, non-magnetic loudspeaker, power supply, battery compartment, ON/OFF switch for two different ground conditions and vibrator. Hand grip with visual bargraph (14 elements), four robust push-buttons for sensitivity control, volume control, ground compensation and pinpointing. Two-piece telescopic carrying bar with plug-in connection for search head.
2. Watertight oval search head with carrying bar and plug-in connection to the electronics unit.
3. Non-magnetic test piece.
4. One set (3 EA) single D cell batteries.
7. Field backpack for storing the detector set with all accessories.

Optional accessories (available on request)

1. Headset.
2. Hard case for storing the complete detector set VMH3CS with all accessories.
3. UXO search head (search head with 60 cm diameter).
5. Data recording and software.

The detector complies to environmental conditions according to MIL STD 810F, 501.4-II, 502.4-I, 502.4-II, 503.4, 506.4-III, 514.5 C1.

WORKING METHODOLOGY
The search head acts as both an emitter of electromagnetic pulses and a receiver sensing the pulsed field. If there is a metal object in the magnetic field, the following happens:

> The electronics unit detects a deviation from the previous state; thus an alarm signal is produced depending on the size of the metal target.
The shape of the pulse in the VMH3CS is bipolar to reduce the effect on magnetically fuzed mines.

For use worldwide under different soil conditions, the VMH3CS can be switched to set optimal detection features.

The correct programme setting and the wide range of detection sensitivity allow detection of plastic mines with minimum metal content in mineralized soil even to 50 or 60-Hz-power lines.

The detector has a built-in-test procedure continuously checking the reliability and proper function of the detector. The pulse signal generation, signal processing, battery voltage, external connections, and – most important – the internal operation voltages are constantly monitored. Visual and acoustic alarms are produced when a fault is found.

With such reliability, the user can operate the VMH3CS easily and concentrate fully on detection tasks.

DETECTORS IN USE
The detectors are in service with various humanitarian aid organisations, commercial mine clearance organisations and several armed forces.

POWER SUPPLY
VMH3CS is powered by three 1.5V mono-cells IEC R20 (ANSI std. D) or rechargeable RSH 4 KR 35/62. The operational life of batteries is said to be approximately 18 to 25 hours depending on the age, quality and capacity of the batteries.

FACTORY SUPPORT
> Vallon runs a worldwide servicing network with all current spare parts in stock. Spare parts can be delivered with a corresponding maintenance manual directly to the customer for on-site repair.
> Operation and maintenance training are offered either in the Vallon facilities or at the customer’s location.
> Operation and maintenance manuals are available in English, French, German and Spanish. Other languages on request.
> Warranty 24 months.

MAINTENANCE SUPPORT
There are no special requirements for technicians or workshop facilities. All tools needed are standard and available in most workshops. For each detector a maintenance manual is available, with step-by-step explanations.

TEST AND EVALUATION
The manufacturer allows access to several available test reports.

The detector was tested by the EC’s Joint Research Centre in Laos in 2004. The following test result is available at the ITEP website: www.itep.ws


REPORTED LIMITATIONS AND STRENGTHS
Vallon says there are no limitations on the detector’s use for terrain, soil and vegetation.
GENERAL DESCRIPTION

The Valon VMM3 Metal Mine Detector has been designed for accurate detection of all types of metallic mines as well as plastic mines with minimal metal content, bombs, ammunition and other metallic objects in the ground or in shallow water.

A 60 cm search head can be added to locate buried metal-cased mines and unexploded ordnance in greater depths. Ease of operation and a robust mechanical design ensure reliable operation for professional ordnance clearing in battlefield operations military training programmes.

Along with its digital signal processor the VMM3 uses an advanced pulse-field function specially improved by Valon. It works also in mineralised soils, such as laterite, magnetite and magmatite as well as in shallow salt and fresh water and under the electromagnetic influence of main power lines without greatly affecting sensitivity.

Data input allows upgrades of the detector firmware, and data output enables data to be evaluated by the Valon EVA2000 software on a laptop. The detector can also be connected to Valon data loggers.

Main components of the VMM3 are

1. Watertight oval search head with telescopic carrying bar (three sections) with internally running connection cable and an electronics unit consisting of:
   - Integrated non-magnetic loudspeaker;
   - Four batteries (alkaline D cells, or rechargeable);
   - Operating controls, all on the front panel and protected against mechanical damage or unintentional changes;
   - Programme selector with integrated on/off switch; “COMP” button for automatic fine adaptation to mineralised soil;
   - Data connector (with protective cap) for data input for upgrading the firmware, data output for computer-aided detection and headset connection.

2. Detection test piece (non-magnetic).

3. Non-magnetic, watertight headset;

4. Carrying belt for the electronics unit, handle, armrest and supplementary arm-belt;

5. Operation and field manuals.

6. Aluminum carrying case and backpack.

Optional accessories (available on request)

Optional accessories are the 60cm diameter search head and a stick probe.

The detector complies to environmental conditions according to MIL STD 810F, 501.4-II, 502.4-I, 502.4-II, 503.4, 506.4-III, 514.5 C1.
WORKING METHODOLOGY

The search head acts as both an emitter and a receiver sensing the pulsed field. If a metal object is in the magnetic field, the unit detects a deviation from the previous state producing an alarm signal, depending on the size of the metal target. The VMM3’s pulse is bipolar to reduce the effect on magnetically fuzed mines.

For worldwide use under different soil conditions, VMM3 has a programme to set optimal detection features. With the correct programme setting and the wide range of detection sensitivity it can detect even plastic mines with minimum metal content in mineralised, and operate to 50-60 Hz -power lines.

The detector has a built-in test procedure for reliability and proper functioning. The pulse signal generation, signal processing, battery voltage, external connections, and – most important – the internal operation voltages are constantly monitored. Visual and acoustic alarms are produced when a fault is found.

The VMM3 is reliable and easy to use, allowing the operator to concentrate fully on detection tasks.

DETECTORS IN USE

The detectors are in service with commercial mine clearance organisations and several armed forces (including NATO members).

POWER SUPPLY

Four 4 x 1.5V monocell IECLR 20 (ANSI STD. D cell) or rechargeable KR35/62. Battery operational life is 30 to 40 hours depending on age, quality and the of the batteries.

FACTORY SUPPORT

- Vallon runs a worldwide servicing network with all current spare parts in stock. Spare parts can be delivered with a corresponding maintenance manual directly to the customer for on-site repair.
- Operation and maintenance training are offered either in the Vallon facilities or at a location required by the customer.
- Operation and maintenance manuals are available in English, French, German and Spanish. Other languages on request.
- Warranty for 24 months.

MAINTENANCE SUPPORT

There are no special requirements for technicians or workshop facilities. All tools needed are standard and available in most workshops. The maintenance manual has step-by-step explanations for repairs.

TEST AND EVALUATION

The manufacturer allows access to several test reports.

REPORTED LIMITATIONS AND STRENGTHS

The manufacturer says there are no limitations for terrain, soil and vegetation.
GENERAL DESCRIPTION
The Vallon VMW1 Underwater Metal Detector is a retractable detector for demining foreshores and rivers. It is supplied with a hard case housing the complete mine detecting set. Its small size and light weight facilitate underwater as well as onshore operations.

The rugged search head contains the Digital Pulse Induction Sensor with integrated noise reduction features. Its shape facilitates operation in difficult and dense vegetation ashore as well as in shallow or deep water and mud. The unique design allows precise pinpointing and an excellent recognition of targets close to each other without loss of detection speed.

The telescopic pole consists of three tubes. Length is easily adjusted even during operation so that detection work can be done in standing, kneeling or swimming positions. The detected metals are clearly indicated by the pluggable non-magnetic headset and LED bargraph.

Automatic continuous self-check and automatic detection level controls maintain sensitivity over hours of continuous operation and independently of battery level, temperature and other environmental conditions. System failures are immediately indicated by a special audio alarm. The VMW1 requires only minimal operator training.

Main components of the VMW1 are
1. Complete detector with electronics unit and battery compartment, operation elements, visual indication, watertight socket for headset, integrated telescopic carrying bar with oval search head.
2. Headset.
3. Non-magnetic test piece.
4. One set (3 EA) Round cells 1.5V IEC R 14 alkaline C cell batteries, 7.8 Ah each;
5. Safety belt.
7. Hard case for storing the complete detector set with all accessories.

The detector complies to environmental conditions according to MIL STD 810F, 501.4-II, 502.4-I, 502.4-II, 508.4, 506.4-III, 514.5 C1.

WORKING METHODOLOGY
The search head acts as both an emitter and a receiver sensing the pulsed field.

If a metal object is in the magnetic field, the unit detects a deviation from the previous state producing an alarm signal, depending on the size of the metal target.

The detector has a built-in test procedure for reliability and proper functioning. The pulse signal generation, signal processing, battery voltage, external connections, and – most important – the internal operation voltages are constantly monitored. Visual and acoustic alarms are produced when a fault is found.

The bipolar pulse of the VMW1 reduces the effect on magnetically fuzed mines.

The VMM1 is reliable and easy to use, allowing the operator to concentrate fully on detection tasks.
POWER SUPPLY
Powered by three round cells 1.5V IEC R 14 alkaline C cell batteries or rechargeable 1.2V C cells. Operational life of the batteries is said to be approximately 9 hours depending on age, quality and capacity.

DETECTORS IN USE
The detectors are in service in several countries.

FACTORY SUPPORT
- Vallon runs a worldwide servicing network with all current spare parts in stock. Spare parts can be delivered with a corresponding maintenance manual directly to the customer for on-site repair.
- Operation and maintenance training are offered either in the Vallon facilities or at a location required by the customer.
- Operation and maintenance manuals are available in English, French and German. Other languages on request.
- Warranty for 24 months.

MAINTENANCE SUPPORT
There are no special requirements for technicians or workshop facilities. All tools needed are standard and available in most workshops. The maintenance manual has step-by-step explanations for repairs.

TEST AND EVALUATION
The manufacturer allows access to several test reports.

REPORTED LIMITATIONS AND STRENGTHS
The manufacturer says there are no limitations for terrain, soil and vegetation, and up to a water depth of 50m.
## TECHNICAL SPECIFICATIONS

### DETECTOR
1. Brand
   - BGIF
2. Model
   - GTL115-2
3. Version
   - 01 | 2005
4. Used detection technology
   - Metal mine detector | pulse induction

### DIMENSIONAL DATA
5. Working length
   - min. length: 750 mm (basic)
   - max. length: 1340 mm (with extension pole)
6. Search head
   - Size
     - Search head A: Ø 200 mm
     - Search head B: 300 x 68 mm
   - Weight
     - Search head A: 0.43 kg
     - Search head B: 0.55 kg
   - Shape
     - Search head A: Circular
     - Search head B: Oval
7. Transport case
   - Weight: 4.9 kg
   - With equipment (full): 11 kg
   - Dimensions:
     - Hard | Soft case (material)
     - Hard case | aluminum
8. Weight, hand-held unit
   - —
9. Weight, carrying (operational detection set)
   - —
10. Weight, additional equipment
    - 0.5 kg
11. Weight distribution | Balance
    - —
12. Other specifications
    - —

### SYSTEM STATUS AND DEPLOYMENT
13. Status
    - In production
14. Detectors | Systems in use to date
    - —
15. Other types
    - No
16. Location of use
    - Worldwide

### ENVIRONMENTAL INFLUENCE
17. Humidity (limitations)
    - MIL STD
18. Temperature (limitations)
    - Storage: - 50°C to + 70°C
    - Operational: - 20°C to + 50°C
19. Water resistant
    - Yes, in shallow water and up to 2/3 of the first section of the search pole
20. Shock | Vibration resistant
    - Yes
21. Environmental Compensation
    - Automatically
22. Operational hours | Operating endurance
    - low temperature (around 0°C): Up to 40h depending on battery type and capacity
    - medium temperature (around 20°C): Up to 60h depending on battery type and capacity
    - high temperature (higher than 30°C): Up to 60h depending on battery type and capacity
### DETECTION OPERATION

23. Calibration | Set-up
   - Auto | Manual  
   - Duration  
   Manual or automatic  
   Continual

24. Detection range | Sensitivity details | Working depth
   - Low-metal-content mines
     - Search head A  
     - Search head B  
     08 cm  
     12 cm
   - Anti-vehicle mines
     - Search head A  
     - Plastic AT mine  
     - Ferrous cased AT mine  
     12 cm  
     70 cm
   - Search head B  
     - Plastic AT mine  
     - Ferrous cased AT mine  
     12 cm  
     75 cm
   - ERW (please specify)  
     Depending on their size, material and the local interference

25. Output indicator  
   Sound

26. Pinpointing feature  
   Yes

27. Adjustment of search head angle  
   Yes

28. Soil influence  
   Can be compensated

29. Best use in
   - Sand  
   - Peat  
   - Clay  
   - Ferruginous soil (laterite)  
   Yes

30. Optimal sweep speed  
   0.2-1.5 m/s

31. Search coil | Antenna
   - Search head A  
   Circular, ø 200 mm
   - Search head B  
   Oval, 300 X 68 mm

32. Limitations  
   No

33. Interference (with other detectors)  
   Two detectors in use should have a distance of 1m between each other

### POWER

34. Power supply | Source  
   Battery

35. Operating time  
   See item 22

36. Power supply
   - weight  
   —
   - no. of batteries | size | type  
   8 x common AA size R6 battery, or  
   8 x Ni-MH AA size battery  
   rechargeable (Ni-MH AA size battery)
   - rechargeable
   —
   - other
   —

### COSTS

37. Price
   - for one detector  
   1100 USD
   - reduction for higher quantity  
   Yes

38. System price
   - with training  
   Upon request
   - spare parts  
   Not given
   - extended warranty  
   —

39. Total  
   Not given

40. Possibility to rent/lease  
   —

### OTHERS

41. Duration of warranty  
   24 months

42. Additional equipment  
   —

43. Additional technical data | information  
   —

44. Compliant standards  
   ISO-9001
## TECHNICAL SPECIFICATIONS

### DETECTOR

<table>
<thead>
<tr>
<th>1. Brand</th>
<th>CEIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Model</td>
<td>MIL-D1</td>
</tr>
<tr>
<td>3. Version</td>
<td>3.3</td>
</tr>
<tr>
<td>4. Used detection technology</td>
<td>Electromagnetic induction</td>
</tr>
</tbody>
</table>

### DIMENSIONAL DATA

<table>
<thead>
<tr>
<th>5. Working length</th>
<th>1000 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; min. length</td>
<td></td>
</tr>
<tr>
<td>&gt; max. length</td>
<td>1620 mm</td>
</tr>
<tr>
<td>6. Search head</td>
<td>Ø 280 mm (external diameter)</td>
</tr>
<tr>
<td>&gt; Size</td>
<td></td>
</tr>
<tr>
<td>&gt; Weight</td>
<td>0.645 kg</td>
</tr>
<tr>
<td>&gt; Shape</td>
<td>Circular</td>
</tr>
<tr>
<td>7. Transport case</td>
<td>7 kg</td>
</tr>
<tr>
<td>&gt; Weight</td>
<td></td>
</tr>
<tr>
<td>&gt; With equipment (full)</td>
<td>12.5 kg</td>
</tr>
<tr>
<td>&gt; Dimensions</td>
<td>950 x 440 x 155 mm</td>
</tr>
<tr>
<td>&gt; Hard</td>
<td>Soft case (material)</td>
</tr>
<tr>
<td>8. Weight, hand-held unit</td>
<td>—</td>
</tr>
<tr>
<td>9. Weight, carrying (operational detection set)</td>
<td>3.2 kg</td>
</tr>
<tr>
<td>10. Weight, additional equipment</td>
<td>0.5 kg</td>
</tr>
<tr>
<td>11. Weight distribution</td>
<td>Balance</td>
</tr>
<tr>
<td>&gt; Control of working depth</td>
<td>Well balanced</td>
</tr>
</tbody>
</table>

### SYSTEM STATUS AND DEPLOYMENT

<table>
<thead>
<tr>
<th>13. Status (Development</th>
<th>In production)</th>
<th>In production</th>
</tr>
</thead>
<tbody>
<tr>
<td>14. Detectors</td>
<td>Systems in use to date</td>
<td>9000</td>
</tr>
<tr>
<td>15. Other types</td>
<td>Models</td>
<td>No</td>
</tr>
<tr>
<td>16. Location of use</td>
<td>Afghanistan, Egypt, Finland, Sweden, Lebanon Ethiopia, Thailand, etc...</td>
<td></td>
</tr>
</tbody>
</table>

### ENVIRONMENTAL INFLUENCE

<table>
<thead>
<tr>
<th>17. Humidity (limitations)</th>
<th>No influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. Temperature (limitations)</td>
<td>-55°C to +75°C</td>
</tr>
<tr>
<td>&gt; Storage</td>
<td>-46°C to +65°C</td>
</tr>
<tr>
<td>&gt; Operational</td>
<td>-46°C to +65°C</td>
</tr>
<tr>
<td>19. Water resistant (Yes / No)</td>
<td>Yes</td>
</tr>
<tr>
<td>20. Shock</td>
<td>Vibration resistant</td>
</tr>
<tr>
<td>21. Environmental Compensation</td>
<td>Automatically</td>
</tr>
<tr>
<td>22. Operational hours</td>
<td>Operating endurance</td>
</tr>
<tr>
<td>&gt; low temperature (around 0°C)</td>
<td>MTBF = 22500 according to MIL-HDBK 217</td>
</tr>
<tr>
<td>&gt; medium temperature (around 20°C)</td>
<td>At 35°C MTBF = 18000 according to MIL-HDBK 217</td>
</tr>
<tr>
<td>&gt; high temperature (higher than 30°C)</td>
<td></td>
</tr>
</tbody>
</table>
## DETECTION OPERATION

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>23. Calibration</td>
<td>Set-up</td>
</tr>
<tr>
<td>24. Detection range</td>
<td>Sensitivity details</td>
</tr>
<tr>
<td>&gt; Small metal content mines (type of mine)</td>
<td>Optimized according to the mines and soils</td>
</tr>
<tr>
<td>&gt; Anti-tank mines (type of mine)</td>
<td>Optimized according to the mines and soils</td>
</tr>
<tr>
<td>&gt; ERW (please specify)</td>
<td>Optimized according to the mines and soils</td>
</tr>
<tr>
<td>25. Output indicator</td>
<td>Sound</td>
</tr>
<tr>
<td>26. Pinpointing feature</td>
<td>Dual tone</td>
</tr>
<tr>
<td>27. Adjustment of search head angle</td>
<td>0° up to 97°</td>
</tr>
<tr>
<td>28. Soil influence</td>
<td>—</td>
</tr>
<tr>
<td>29. Best use in</td>
<td></td>
</tr>
<tr>
<td>&gt; Sand</td>
<td>Yes</td>
</tr>
<tr>
<td>&gt; Peat</td>
<td>Yes</td>
</tr>
<tr>
<td>&gt; Clay</td>
<td>Yes</td>
</tr>
<tr>
<td>&gt; Ferruginous soil (laterite)</td>
<td>Yes</td>
</tr>
<tr>
<td>30. Optimal sweep speed</td>
<td>From 0cm/s to the maximum human operator sweep</td>
</tr>
<tr>
<td>31. Search coil</td>
<td>Antenna</td>
</tr>
<tr>
<td>32. Limitations</td>
<td>—</td>
</tr>
<tr>
<td>33. Interference (with other detectors)</td>
<td>—</td>
</tr>
</tbody>
</table>

## POWER

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>34. Power supply</td>
<td>Source</td>
</tr>
<tr>
<td>35. Operating time</td>
<td>&gt; 65 hours with alkaline batteries; &gt; 35 hours with rechargeables batteries</td>
</tr>
</tbody>
</table>
| 36. Power supply | weight | Total for 4 batteries
| > no. of batteries | size | type |
| > rechargeable | — |
| > other | — |
| 45. Cost | — |

## COSTS

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>37. Price</td>
<td>for one detector on request</td>
</tr>
<tr>
<td>&gt; reduction for higher quantity</td>
<td>—</td>
</tr>
<tr>
<td>38. System price</td>
<td>with training</td>
</tr>
<tr>
<td>&gt; spare parts</td>
<td>—</td>
</tr>
<tr>
<td>&gt; extended warranty</td>
<td>—</td>
</tr>
<tr>
<td>39. Total</td>
<td>—</td>
</tr>
<tr>
<td>40. Possibility to rent/lease</td>
<td>—</td>
</tr>
</tbody>
</table>

## OTHERS

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>41. Duration of warranty</td>
<td>—</td>
</tr>
<tr>
<td>42. Additional equipment</td>
<td>Battery charger MIL-D1/BC</td>
</tr>
<tr>
<td>43. Additional technical data</td>
<td>information On request</td>
</tr>
<tr>
<td>44. Compliant standards</td>
<td>MIL-STD 810 E and others on requests</td>
</tr>
</tbody>
</table>

45
<table>
<thead>
<tr>
<th>DETECTOR</th>
<th>EBINGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Brand</td>
<td>EBINGER</td>
</tr>
<tr>
<td>2. Model</td>
<td>EBEX® 420 H</td>
</tr>
<tr>
<td>3. Version</td>
<td>01</td>
</tr>
<tr>
<td>4. Used detection technology</td>
<td>Metal detector</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DIMENSIONAL DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Working length</td>
</tr>
<tr>
<td>&gt; min. length</td>
</tr>
<tr>
<td>&gt; max. length</td>
</tr>
<tr>
<td>6. Search head</td>
</tr>
<tr>
<td>&gt; Size</td>
</tr>
<tr>
<td>&gt; Weight</td>
</tr>
<tr>
<td>&gt; Shape</td>
</tr>
<tr>
<td>7. Transport case</td>
</tr>
<tr>
<td>&gt; Weight</td>
</tr>
<tr>
<td>&gt; With equipment (full)</td>
</tr>
<tr>
<td>&gt; Dimensions</td>
</tr>
<tr>
<td>&gt; Hard</td>
</tr>
<tr>
<td>8. Weight, hand-held unit</td>
</tr>
<tr>
<td>9. Weight, carrying (operational detection set)</td>
</tr>
<tr>
<td>10. Weight, additional equipment</td>
</tr>
<tr>
<td>11. Weight distribution</td>
</tr>
<tr>
<td>12. Other specifications</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SYSTEM STATUS AND DEPLOYMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. Status (Development</td>
</tr>
<tr>
<td>14. Detectors</td>
</tr>
<tr>
<td>15. Other types</td>
</tr>
<tr>
<td>16. Location of use</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>ENVIRONMENTAL INFLUENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. Humidity (limitations)</td>
</tr>
<tr>
<td>18. Temperature (limitations)</td>
</tr>
<tr>
<td>&gt; Storage</td>
</tr>
<tr>
<td>&gt; Operational</td>
</tr>
<tr>
<td>19. Water resistant (Yes / No)</td>
</tr>
<tr>
<td>20. Shock</td>
</tr>
<tr>
<td>22. Operational hours</td>
</tr>
<tr>
<td>&gt; low temperature (around 0°C)</td>
</tr>
<tr>
<td>&gt; medium temperature (around 20°C)</td>
</tr>
<tr>
<td>&gt; high temperature (higher than 30°C)</td>
</tr>
</tbody>
</table>
## DETECTION OPERATION

23. Calibration | Set-up
   - Auto | Manual
   - Duration

24. Detection range | Sensitivity details | Detection performance | Working depth
   - Control of working depth
   - Low-metal-content mines
   - Anti-tank mines (type of mine)
   - ERW (please specify)

25. Output indicator
   - Sound

26. Pinpointing feature
   - Yes

27. Adjustment of search head angle
   - Yes

28. Soil influence
   - No

29. Best use in
   - Sand
   - Peat
   - Clay
   - Ferruginous soil (laterite)

30. Optimal sweep speed
   - 0.2 - 1.5m per second

31. Search coil | Antenna
   - Ø 200mm circular

32. Limitations
   - No

33. Interference (with other detectors)
   - < Safety distance

## POWER

34. Power supply | Source
   - Battery

35. Operating time
   - See point 23

36. Power supply
   - weight
   - no. of batteries | size | type
   - rechargeable
   - other

37. Price
   - for one detector on request
   - reduction for higher quantity

38. System price
   - with training
   - spare parts
   - extended warranty

39. Total

40. Possibility to rent/lease
   - On request

## COSTS

37. Price
   - for one detector on request
   - reduction for higher quantity

38. System price
   - with training
   - spare parts
   - extended warranty

39. Total

40. Possibility to rent/lease

## OTHERS

41. Duration of warranty
   - 24 months

42. Additional equipment
   - Extension rod

43. Additional technical data | information
   - —

44. Compliant standards
   - MIL-STD 461, MIL-STD 810,
   - DIN EN ISO 900: 2000

---

**DETECTION OPERA**

<table>
<thead>
<tr>
<th>Calibration</th>
<th>Set-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto</td>
<td>Manual</td>
</tr>
<tr>
<td>Duration</td>
<td></td>
</tr>
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<thead>
<tr>
<th>Detection range</th>
<th>Sensitivity details</th>
<th>Detection performance</th>
<th>Working depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control of working depth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-metal-content mines</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-tank mines (type of mine)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERW (please specify)</td>
<td></td>
<td></td>
<td></td>
</tr>
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<table>
<thead>
<tr>
<th>Output indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound</td>
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</table>

<table>
<thead>
<tr>
<th>Pinpointing feature</th>
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</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adjustment of search head angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Soil influence</th>
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<tbody>
<tr>
<td>No</td>
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<table>
<thead>
<tr>
<th>Best use in</th>
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<tbody>
<tr>
<td>Sand</td>
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<tr>
<td>Peat</td>
</tr>
<tr>
<td>Clay</td>
</tr>
<tr>
<td>Ferruginous soil (laterite)</td>
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<table>
<thead>
<tr>
<th>Optimal sweep speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2 - 1.5m per second</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Search coil</th>
<th>Antenna</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø 200mm circular</td>
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<thead>
<tr>
<th>Limitations</th>
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<table>
<thead>
<tr>
<th>Interference (with other detectors)</th>
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<tbody>
<tr>
<td>&lt; Safety distance</td>
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<table>
<thead>
<tr>
<th>Power supply</th>
<th>Source</th>
</tr>
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<tbody>
<tr>
<td>Battery</td>
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<table>
<thead>
<tr>
<th>Operating time</th>
</tr>
</thead>
<tbody>
<tr>
<td>See point 23</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>weight</td>
</tr>
<tr>
<td>no. of batteries</td>
</tr>
<tr>
<td>rechargeable</td>
</tr>
<tr>
<td>other</td>
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<table>
<thead>
<tr>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>for one detector on request</td>
</tr>
<tr>
<td>reduction for higher quantity</td>
</tr>
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<table>
<thead>
<tr>
<th>System price</th>
</tr>
</thead>
<tbody>
<tr>
<td>with training</td>
</tr>
<tr>
<td>spare parts</td>
</tr>
<tr>
<td>extended warranty</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Total</th>
</tr>
</thead>
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<td>—</td>
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<table>
<thead>
<tr>
<th>Possibility to rent/lease</th>
</tr>
</thead>
<tbody>
<tr>
<td>On request</td>
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<table>
<thead>
<tr>
<th>Duration of warranty</th>
</tr>
</thead>
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<tr>
<td>24 months</td>
</tr>
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<table>
<thead>
<tr>
<th>Additional equipment</th>
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<tbody>
<tr>
<td>Extension rod</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Additional technical data</th>
<th>information</th>
</tr>
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<tbody>
<tr>
<td>—</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Compliant standards</th>
</tr>
</thead>
</table>
TECHNICAL SPECIFICATIONS

1. Brand
   - EBINGER
2. Model
   - EBEX® PBD (stands for Pulse Bipolar Dynamic)
3. Version
   - 11 | 1996
4. Used detection technology
   - Metal detector | pulse induction

DIMENSIONAL DATA

5. Working length
   - min. length: 1,080 mm (short version)
   - max. length: 1,650 mm (long version)
6. Search head
   - Size: Ø 260 x 156 mm
   - Weight: 0.5 kg
   - Shape: Oval
7. Transport case
   - Weight: 2 kg
   - With equipment (full): 8.5 kg
   - Dimensions: Hard plastic | canvas satchel
8. Weight, hand-held unit
   - 2.2 kg (short) | 2.4 kg (long)
9. Weight, carrying (operational detection set)
   - 2.2 kg (short) | 2.4 kg (long)
10. Weight, additional equipment
    - —
11. Weight distribution | Balance
    - —
12. Other specifications
    - Modular systems without any cables

SYSTEM STATUS AND DEPLOYMENT

13. Status (Development | In production)
    - In production
14. Detectors | Systems in use to date
    - Approx. 5,000
15. Other types | Models
    - —
16. Location of use
    - Worldwide

ENVIRONMENTAL INFLUENCE

17. Humidity (limitations)
    - 0 - 95%
18. Temperature (limitations)
    - Storage: -53°C to +70°C
    - Operational: -30°C to +55°C
19. Water resistant (Yes / No)
    - Yes | up to 1.3m
20. Shock | Vibration resistant
    - Yes
21. Environmental Compensation
    - Auto | Manual
22. Operational hours | Operating endurance
    - low temperature (around 0°C): Up to 50h, depends on type of battery
    - medium temperature (around 20°C): Up to 50h, depends on type of battery
    - high temperature (higher than 30°C): Up to 50h, depends on type of battery
DETECTION OPERATION

23. Calibration | Set-up
   > Auto | Manual
   > Duration
   Manual or Automatic
   Continual

24. Detection range | Sensitivity details | Detection performance | Working depth
   > Control of working depth
   Sensitivity adjustment manual
   > Low-metal-content mines
   Depending on their size, material and the local interference
   > Anti-tank mines (type of mine)
   Depending on their size, material and the local interference
   > ERW (please specify)
   Depending on their size, material and the local interference

25. Output indicator
   Sound

26. Pinpointing feature
   Yes

27. Adjustment of search head angle
   Yes

28. Soil influence
   —

29. Best use in
   > Sand
   Yes
   > Peat
   Yes
   > Clay
   Yes
   > Ferruginous soil (laterite)
   Under certain circumstances

30. Optimal sweep speed
   0.2 - 1.5 m per second

31. Search coil | Antenna
   Ø 260 x 156 mm oval

32. Limitations
   No

33. Interference (with other detectors)
   < Safety distance

POWER

34. Power supply | Source
   Battery

35. Operating time
   See point 23

36. Power supply
   > weight
   —
   > no. of batteries | size | type
   6 x 1.5V dry batteries C-cell
   6 x 1.2V rechargeable batteries
   1 x 12V battery pack

COSTS

37. Price
   > for one detector on request
   US$2,000 - US$3,000
   > reduction for higher quantity
   Yes

38. System price
   > with training
   On request
   > spare parts
   On request
   > extended warranty
   On request

39. Total
   —

40. Possibility to rent/lease
   On request

OTHERS

41. Duration of warranty
   24 months

42. Additional equipment
   UXO head 45 cm, cylinder probe

43. Additional technical data | information
   MIL-STD 461, MIL-STD 810,
   DIN EN ISO 9001:2000

44. Compliant standards
   —
## TECHNICAL SPECIFICATIONS

### DETECTOR

1. **Brand**: EBINGER
2. **Model**: EBEX® 421 GC (stands for Ground Compensation)
3. **Version**: 11 | 2002
4. **Used detection technology**: Metal detector | pulse induction

### DIMENSIONAL DATA

5. **Working length**
   - min. length: 1,000 mm (short version)
   - max. length: 1,700 mm (long version)
6. **Search head**
   - Size: Ø 230 mm (300 x 170 mm)
   - Weight: 0.5 kg
   - Shape: Circular, oval
7. **Transport case**
   - Weight: 2 kg
   - With equipment (full): 3.8 | 8.5 kg
   - Dimensions: Hard | Soft case (material)
   - Hard plastic | canvas satchel
8. **Weight, hand-held unit**: 2.2 kg (short) | 2.4 kg (long)
9. **Weight, carrying (operational detection set)**: 2.2 kg (short) | 2.4 kg (long)
10. **Weight, additional equipment**: —
11. **Weight distribution | Balance**: —
12. **Other specifications**: Modular systems without any cables

### SYSTEM STATUS AND DEPLOYMENT

13. **Status (Development | In production)**: In production
14. **Detectors | Systems in use to date**: Approx. 2,000
15. **Other types | Models**: —
16. **Location of use**: Worldwide

### ENVIRONMENTAL INFLUENCE

17. **Humidity (limitations)**: 0 - 95%
18. **Temperature (limitations)**
   - Storage: -53°C to +70°C
   - Operational: -30°C to +55°C
19. **Water resistant (Yes / No)**: Yes | up to 1.3m
20. **Shock | Vibration resistant**: Yes
22. **Operational hours | Operating endurance**
   - low temperature (around 0°C): Up to 75h, GC mode up to 25h, depends on type of battery
   - medium temperature (around 20°C): Up to 75h, GC mode up to 25h, depends on type of battery
   - high temperature (higher than 30°C): Up to 75h, GC mode up to 25h, depends on type of battery 50h
## DETECTION OPERATION

23. Calibration | Set-up
- Auto | Manual
- Duration

24. Detection range | Sensitivity details | Detection performance | Working depth
- Control of working depth
- Low-metal-content mines
- Anti-tank mines (type of mine)
- ERW (please specify)

25. Output indicator

26. Pinpointing feature

27. Adjustment of search head angle

28. Soil influence

29. Best use in
- Sand
- Peat
- Clay
- Ferruginous soil (laterite)

30. Optimal sweep speed

31. Search coil | Antenna

32. Limitations

33. Interference (with other detectors)

## POWER

34. Power supply | Source

35. Operating time

36. Power supply
- weight
- no. of batteries | size | type
- rechargeable
- other

37. Price
- for one detector on request
- reduction for higher quantity

38. System price
- with training
- spare parts
- extended warranty

39. Total

40. Possibility to rent/lease

## COSTS

41. Duration of warranty

42. Additional equipment

43. Additional technical data | information

44. Compliant standards

---

### DETECTION OPERATION

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calibration</td>
<td>Manual or Automatic</td>
</tr>
<tr>
<td>Set-up</td>
<td>Continual</td>
</tr>
<tr>
<td>Duration</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Detection range</th>
<th>Sensitivity details</th>
<th>Detection performance</th>
<th>Working depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control of working depth</td>
<td>Sensitivity adjustment manual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-metal-content mines</td>
<td>Depending on their size, material and the local interference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-tank mines (type of mine)</td>
<td>Depending on their size, material and the local interference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERW (please specify)</td>
<td>Depending on their size, material and the local interference</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Output indicator | Sound |
| Pinpointing feature | Yes |
| Adjustment of search head angle | Yes |
| Soil influence | Specially developed for laterite soil |

<table>
<thead>
<tr>
<th>Best use in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
</tr>
<tr>
<td>Peat</td>
</tr>
<tr>
<td>Clay</td>
</tr>
<tr>
<td>Ferruginous soil (laterite)</td>
</tr>
</tbody>
</table>

| Optimal sweep speed | 0.2 - 1.5 m per second |
| Search coil | Ø 230 mm circular, (300 x 170 mm oval) |
| Limitations | No |
| Interference (with other detectors) | < Safety distance |

| Power supply | Battery |
| Operating time | See point 23 |

<table>
<thead>
<tr>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>weight</td>
</tr>
<tr>
<td>no. of batteries</td>
</tr>
<tr>
<td>size</td>
</tr>
<tr>
<td>type</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>for one detector on request</td>
</tr>
<tr>
<td>reduction for higher quantity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System price</th>
</tr>
</thead>
<tbody>
<tr>
<td>with training</td>
</tr>
<tr>
<td>spare parts</td>
</tr>
<tr>
<td>extended warranty</td>
</tr>
</tbody>
</table>

| Total | |
| Possibility to rent/lease | On request |

| Other equipment |
| UXO head 45 cm |
## TECHNICAL SPECIFICATIONS

### DETECTOR

<table>
<thead>
<tr>
<th>1. Brand</th>
<th>FOERSTER</th>
</tr>
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<tbody>
<tr>
<td>2. Model</td>
<td>MINEX 2FD</td>
</tr>
<tr>
<td>3. Version</td>
<td>4.530</td>
</tr>
<tr>
<td>4. Used detection technology</td>
<td>Continuous - wave emi with two parallel frequencies in combination with gradiometric receiving coil system</td>
</tr>
</tbody>
</table>

### DIMENSIONAL DATA

| 5. Working length | 930 mm | 1,660 mm |
| 6. Search head | 210 x 285 mm | N/A due to one-piece design |
| 7. Transport case | 5.7 kg | Approx. 8 kg |
| 8. Weight, hand-held unit | 2.2 kg | 97 x 24 x 37 cm |
| 9. Weight, carrying (operational detection set) | 2.6 kg incl batteries | Plastic hardcase | backpack optional |
| 10. Weight, additional equipment | Backpack 0.8 kg | headphone 0.1 kg |
| 11. Weight distribution | Balanced around the handgrip | |
| 12. Other specifications | — | |

### SYSTEM STATUS AND DEPLOYMENT

| 13. Status (Development | In production) | In production |
| 14. Detectors | Systems in use to date | — |
| 15. Other types | Models | Previous versions MINEX 2FD 4.500 and 4.400 |
| 16. Location of use | | Humanitarian and military demining forces in more than 30 countries worldwide |

### ENVIRONMENTAL INFLUENCE

| 17. Humidity (limitations) | No limitations |
| 18. Temperature (limitations) | -57°C to +71°C (-135°F to +160°F) |
| 19. Water resistant (Yes / No) | Search head waterproof, control unit splash water proof acc. MIL STD 810E |
| 20. Shock | Acc. MIL STD 810E |
| 21. Environmental Compensation | Automatic very aggressive soil compensated by automatic learning sequence |
| 22. Operational hours | Operating endurance |
| 23. Calibration | Set-up |
| Manual or Automatic |
| Continual |

### DETECTION OPERATION

| 23. Calibration | Set-up | Manual or Automatic |
| Manual or Automatic |
| Continual |
24. Detection range | Sensitivity details |
   Detection performance | Working depth
   > Small metal content mines (type of mine)
   > Anti-tank mines (type of mine)
   > ERW (please specify)

25. Output indicator
26. Pinpointing feature
27. Adjustment of search head angle
28. Soil influence
29. Best use in
   > Sand
   > Peat
   > Clay
   > Ferruginous soil (laterite)
30. Optimal sweep speed
31. Search coil | Antenna
32. Limitations
33. Interference (with other detectors)

POWER
34. Power supply | Source
   3 x 1.5V mono-cell IECLR 20 (ANSI Std. size D)
35. Operating time
   25 | 50 hrs with alkaline batteries
36. Power supply
   > weight
   > no. of batteries | size | type
   > rechargeable
   > other
37. Price
   > for one detector on request
   US$2,000 - US$3,000
   > reduction for higher quantity
   —
38. System price
   > with training
   Depending on quantity
   > spare parts
   Depending on quantity
   > extended warranty
   Available on request
39. Total
   T.B.D.
40. Possibility to rent/lease
   Available

COSTS
41. Duration of warranty
   24 months
42. Additional equipment
   Headphones, backpack, workshop equipment & tools
43. Additional technical data | information
   Service manuals, training program
MIL-STD 810E 514.4-1 Random vibration
MIL-STD 810E 516.4 Procedure I Mechanical Shock
MIL-STD 810E 516.4 Procedure IV Drop Test
MIL-STD 810E 501.3 High Temperatures
MIL-STD 810E 502.3 Low Temperatures
MIL-STD 810E 506.3-1 Blowing Rain
MIL-STD 810E 503.3 Temperature Shock
MIL-STD 810E 512.2 Leakage Test
MIL-STD 810E 505.3 Procedure I Solar Radiation (Sunshine)

Mission MTBF = 24 760h (in accordance to MIL-STD-217F)

EMC according to EN 55022:1998(ClassB) and
## TECHNICAL SPECIFICATIONS

### DETECTOR

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<th></th>
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<td>Version</td>
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### DIMENSIONAL DATA

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<th></th>
<th></th>
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<tbody>
<tr>
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<td>Working length</td>
</tr>
<tr>
<td></td>
<td>min. length</td>
</tr>
<tr>
<td></td>
<td>max. length</td>
</tr>
<tr>
<td></td>
<td>1,200 mm</td>
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<tr>
<td></td>
<td>1,450 mm</td>
</tr>
<tr>
<td>6.</td>
<td>Search head</td>
</tr>
<tr>
<td></td>
<td>Size</td>
</tr>
<tr>
<td></td>
<td>Weight</td>
</tr>
<tr>
<td></td>
<td>Shape</td>
</tr>
<tr>
<td></td>
<td>Ø 200 mm</td>
</tr>
<tr>
<td></td>
<td>Circular with protective skid plate</td>
</tr>
<tr>
<td>7.</td>
<td>Transport case</td>
</tr>
<tr>
<td></td>
<td>Weight</td>
</tr>
<tr>
<td></td>
<td>With equipment (full)</td>
</tr>
<tr>
<td></td>
<td>Dimensions</td>
</tr>
<tr>
<td></td>
<td>Hard</td>
</tr>
<tr>
<td></td>
<td>4 kg</td>
</tr>
<tr>
<td></td>
<td>8 kg</td>
</tr>
<tr>
<td></td>
<td>320 mm x 840 mm x 180 mm</td>
</tr>
<tr>
<td></td>
<td>Impact plastic/cordura</td>
</tr>
<tr>
<td>8.</td>
<td>Weight, hand-held unit</td>
</tr>
<tr>
<td></td>
<td>1.5 kg (control box detached)</td>
</tr>
<tr>
<td>9.</td>
<td>Weight, carrying (operational detection set)</td>
</tr>
<tr>
<td></td>
<td>3.1 kg</td>
</tr>
<tr>
<td>10.</td>
<td>Weight, additional equipment</td>
</tr>
<tr>
<td></td>
<td>—</td>
</tr>
<tr>
<td>11.</td>
<td>Weight distribution</td>
</tr>
<tr>
<td></td>
<td>Adjustable</td>
</tr>
<tr>
<td>12.</td>
<td>Other specifications</td>
</tr>
<tr>
<td></td>
<td>Internal speaker and external earset</td>
</tr>
</tbody>
</table>

### SYSTEM STATUS AND DEPLOYMENT

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>13.</td>
<td>Status (Development</td>
</tr>
<tr>
<td></td>
<td>In production</td>
</tr>
<tr>
<td>14.</td>
<td>Detectors</td>
</tr>
<tr>
<td></td>
<td>10,000 plus</td>
</tr>
<tr>
<td>15.</td>
<td>Other types</td>
</tr>
<tr>
<td></td>
<td>F1A4 UXO version</td>
</tr>
<tr>
<td>16.</td>
<td>Location of use</td>
</tr>
<tr>
<td></td>
<td>50+ countries</td>
</tr>
</tbody>
</table>

### ENVIRONMENTAL INFLUENCE

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>17.</td>
<td>Humidity (limitations)</td>
</tr>
<tr>
<td></td>
<td>Nil</td>
</tr>
<tr>
<td>18.</td>
<td>Temperature (limitations)</td>
</tr>
<tr>
<td></td>
<td>Storage</td>
</tr>
<tr>
<td></td>
<td>-55°C to +75°C</td>
</tr>
<tr>
<td></td>
<td>Operational</td>
</tr>
<tr>
<td></td>
<td>-30°C to +60°C</td>
</tr>
<tr>
<td>19.</td>
<td>Water resistant (Yes / No)</td>
</tr>
<tr>
<td></td>
<td>Yes (control box IP 65)</td>
</tr>
<tr>
<td>20.</td>
<td>Shock</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>21.</td>
<td>Environmental Compensation</td>
</tr>
<tr>
<td></td>
<td>Auto</td>
</tr>
<tr>
<td>22.</td>
<td>Operational hours</td>
</tr>
<tr>
<td></td>
<td>low temperature (around 0°C)</td>
</tr>
<tr>
<td></td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>medium temperature (around 20°C)</td>
</tr>
<tr>
<td></td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>high temperature (higher than 30°C)</td>
</tr>
<tr>
<td></td>
<td>—</td>
</tr>
</tbody>
</table>
DETECTION OPERATION

23. Calibration | Set-up
> Auto | Manual
> Duration Auto
2 min assembly | 10 sec. switch and go

24. Detection range | Sensitivity details | Detection performance | Working depth
> Small metal content mines (type of mine) Type 72 at 15-19 cm
> Anti-tank mines (type of mine) Metal mine at 1.0 m
> ERW (please specify) 500 lb bomb at 1.8 m

25. Output indicator Audio
26. Pinpointing feature Edge detection
27. Adjustment of search head angle Yes
28. Soil influence Automatic rejection and compensation

29. Best use in
> Sand Yes
> Peat Yes
> Clay Yes
> Ferruginous soil (laterite) Yes

30. Optimal sweep speed 0.6 m per second
31. Search coil | Antenna enclosed circular
32. Limitations –
33. Interference (with other detectors) 2 m

POWER

34. Power supply | Source 4 x D cell alkaline or rechargeable
35. Operating time Alkaline 24 hrs rechargeable 12 hrs

36. Power supply
> weight 800 gm
> no. of batteries | size | type 4 x D cell 1.5V LR20
> rechargeable 4 x D cell 4.5 Ahnicad
> other –

COSTS

37. Price
> for one detector on request US$1,000 - US$2,000
> reduction for higher quantity Yes
38. System price
> with training Subject to location and quantity purchased
> spare parts On minelab recommendation
> extended warranty Yes
39. Total Subject to quantity purchased
40. Possibility to rent/lease On request

OTHERS

41. Duration of warranty 15 months (extendable on request)
42. Additional equipment F Series battery charger
43. Additional technical data | information On request
44. Compliant standards Designed to MIL STD 810 F
# TECHNICAL SPECIFICATIONS

## DETECTOR

1. Brand | MINELAB
2. Model | F3
3. Version | 1
4. Used detection technology | Pulse induction | multi-period-sensing

## DIMENSIONAL DATA

5. Working length
   - min. length | 760 mm
   - max. length | 1,500 mm

6. Search head
   - Size | Ø 200 mm
   - Weight | —
   - Shape | Circular with protective skid plate

7. Transport case
   - Weight | 6.5 kg
   - With equipment (full) | 10.5 kg
   - Dimensions | 1,600 mm x 1,200 mm x 180 mm
   - Hard | Soft case (material) | Impact plastic/cordura

8. Weight, hand-held unit | 2.3 kg (battery pack detached)
9. Weight, carrying (operational detection set) | 3.2 kg
10. Weight, additional equipment | —
11. Weight distribution | Balance | Adjustable
12. Other specifications | Internal speaker and external earset sensitivity end caps

## SYSTEM STATUS AND DEPLOYMENT

13. Status (Development | In production) | In production
14. Detectors | Systems in use to date | 3,000 plus
15. Other types | Models | —
16. Location of use | 25+ countries

## ENVIRONMENTAL INFLUENCE

17. Humidity (limitations) | Nil
18. Temperature (limitations)
   - Storage | -55°C to +75°C
   - Operational | -30°C to +60°C
19. Water resistant (Yes / No) | Yes IP 65
20. Shock | Vibration resistant | Yes
21. Environmental Compensation | Auto
22. Operational hours | Operating endurance
   - low temperature (around 0°C) | —
   - medium temperature (around 20°C) | —
   - high temperature (higher than 30°C) | —
DETECTION OPERATION

23. Calibration | Set-up
   > Auto | Manual
   > Duration

24. Detection range | Sensitivity details | Detection performance | Working depth
   > Small metal content mines (type of mine) Type 72 at 15-19 cm
   > Anti-tank mines (type of mine) Metal mine at 1.0 m
   > ERW (please specify) 500 lb bomb > 1.0 m

25. Output indicator
26. Pinpointing feature
27. Adjustment of search head angle
28. Soil influence

29. Best use in
   > Sand
   > Peat
   > Clay
   > Ferruginous soil (laterite)

30. Optimal sweep speed
31. Search coil | Antenna
32. Limitations

33. Interference (with other detectors) 2 m

POWER

34. Power supply | Source
35. Operating time
36. Power supply
   > weight
   > no. of batteries | size | type
   > rechargeable
   > other

COSTS

37. Price
   > for one detector on request US$2,000 - US$3,000
   > reduction for higher quantity

38. System price
   > with training Subject to location and quantity purchased
   > spare parts On minelab recommendation
   > extended warranty Yes

39. Total
40. Possibility to rent/lease

OTHERS

41. Duration of warranty 15 months (extendable on request)
42. Additional equipment
43. Additional technical data | information
44. Compliant standards

On request
Design to MIL STD 810 F
### DETECTOR

1. **Brand**: SCHIEBEL  
2. **Model**: AN-19/2 Mine Detecting Set  
3. **Version**: Mod 7  
4. **Used detection technology**: Electromagnetic pulse induction

### DIMENSIONAL DATA

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Data</th>
</tr>
</thead>
</table>
| Working length       | 1,400 mm  
|                      | 1,600 mm  
| Search head          | Ø 267 mm  
| Weight               | 0.6 kg  
| Shape                | Round  
| Transport case       | 2.2 kg  
| Weight               | 6.02 kg  
| Dimensions           | 802 mm x 315 mm x 125 mm  
| Hard | Soft case (material) | Metal  
| Weight, hand-held unit | Search head with telescopic pole 1.22 kg |  
| Weight, carrying (operational detection set) | 2.41 kg + set of batteries 0.58 kg |  
| Weight, additional equipment | — |  
| Weight distribution | Electronic unit is shoulder-strap mounted, headphone on head, and hand-held item is balanced by the armrest |  
| Other specifications | — |  

### SYSTEM STATUS AND DEPLOYMENT

13. **Status (Development | In production)**: In production  
14. **Detectors | Systems in use to date**: 40,000 plus  
15. **Other types | Models**: —  
16. **Location of use**: Worldwide

### ENVIRONMENTAL INFLUENCE

17. **Humidity (limitations)**: No  
18. **Temperature (limitations)**:  
   - Storage: -55°C to +85°C (-67°F to +185°F)  
   - Operational: -40°C to +70°C (-40°F to +158°F)  
19. **Water resistant (Yes / No)**: Yes  
20. **Shock | Vibration resistant**: Yes  
21. **Environmental Compensation**: Auto  
22. **Operational hours | Operating endurance**  
   - low temperature (around 0°C): Approx. 65 h  
   - medium temperature (around 20°C): Approx. 70 h  
   - high temperature (higher than 30°C): 75 h or more
DETECTION OPERATION

23. Calibration | Set-up
   - Auto | Manual
   - Duration

24. Detection range | Sensitivity details | Detection performance | Working depth
   - Small metal content mines (type of mine)
   - Anti-tank mines (type of mine)
   - ERW (please specify)

25. Output indicator
26. Pinpointing feature
27. Adjustment of search head angle
28. Soil influence
29. Best use in
   - Sand
   - Peat
   - Clay
   - Ferruginous soil (laterite)
30. Optimal sweep speed
31. Search coil | Antenna
32. Limitations
33. Interference (with other detectors)

POWER

34. Power supply | Source
   - Standard D size alkaline cells
35. Operating time
   - Approx. 70h
36. Power supply
   - weight
   - no. of batteries | size | type
   - rechargeable
   - other

COSTS

37. Price
   - for one detector on request
   - reduction for higher quantity
38. System price
   - with training
   - spare parts
   - extended warranty
39. Total
40. Possibility to rent/lease

OTHERS

41. Duration of warranty
42. Additional equipment
43. Additional technical data | information
44. Compliant standards
   - ISO-9001, AQA P4
## TECHNICAL SPECIFICATIONS

### DETECTOR

1. **Brand**
   - SCHIEBEL

2. **Model**
   - ATMID™ All Terrain Mine Detector

3. **Version**
   - –

4. **Used detection technology**
   - Electromagnetic pulse induction and continuous wave induction

### DIMENSIONAL DATA

5. **Working length**
   - **> min. length**
   - 1,400 mm
   - **> max. length**
   - 1,600 mm

6. **Search head**
   - **> Size**
   - Ø 267 mm
   - **> Weight**
   - 0.82 kg
   - **> Shape**
   - Round

7. **Transport case**
   - **> Weight**
   - 2.2 kg
   - **> With equipment (full)**
   - 6.36 kg
   - **> Dimensions**
   - 802 mm x 315 mm x 125 mm
   - **> Hard | Soft case (material)**
   - Metal

8. **Weight, hand-held unit**
   - 1.61 kg

9. **Weight, carrying (operational detection set)**
   - 3.27 kg including set of batteries

10. **Weight, additional equipment**
    - Headphone 0.17 kg

11. **Weight distribution | Balance**
    - Electronic unit is shoulder-strap mounted, headphone on head, and hand-held item is balanced by the armrest

12. **Other specifications**
    - –

### SYSTEM STATUS AND DEPLOYMENT

13. **Status (Development | In production)**
    - In production

14. **Detectors | Systems in use to date**
    - 900 plus

15. **Other types | Models**
    - AN-19/2 VARIOUS, MIMID

16. **Location of use**
    - Worldwide

### ENVIRONMENTAL INFLUENCE

17. **Humidity (limitations)**
    - No

18. **Temperature (limitations)**
    - **> Storage**
      - -55°C to +85°C
    - **> Operational**
      - -40°C to +70°C

19. **Water resistant (Yes / No)**
    - Yes

20. **Shock | Vibration resistant**
    - Yes

21. **Environmental Compensation**
    - Auto

22. **Operational hours | Operating endurance**
    - **> low temperature (around 0°C)**
      - Approx. 65 h
    - **> medium temperature (around 20°C)**
      - Approx. 70 h
    - **> high temperature (higher than 30°C)**
      - Approx. 75 h
DETECTION OPERATION

23. Calibration | Set-up
- Auto | Manual
- Duration

24. Detection range | Sensitivity details | Working depth
- Small metal content mines (type of mine)
- Anti-tank mines (type of mine)
- ERW (please specify)

25. Output indicator
26. Pinpointing feature
27. Adjustment of search head angle

28. Soil influence
29. Best use in
- Sand
- Peat
- Clay
- Ferruginous soil (laterite)

30. Optimal sweep speed
31. Search coil | Antenna
32. Limitations
33. Interference (with other detectors)

POWER

34. Power supply | Source
35. Operating time
36. Power supply
- weight
- no. of batteries | size | type
- rechargeable
- other

COSTS

37. Price
- for one detector on request
- reduction for higher quantity
38. System price
- with training
- spare parts
- extended warranty
39. Total
40. Possibility to rent/lease

OTHERS

41. Duration of warranty
42. Additional equipment
43. Additional technical data | information
44. Compliant standards

Automatic ground balance; manually initiated and sensitivity then manually adjusted by a single control
Approx. 30 s

72A – 20 cm | M14 – 14 cm
Metal anti-vehicle at 1m; plastic anti-vehicle: nearly all types at operational threat depth
NATO standard 7.62 rounds, at 40+cm, larger items down to 1 m in depth
Audio tone
Yes
Easily adjusted by angel wingnut to cover all necessary operational situations (more than 180 degrees)
Automatically balanced out

0.25 - 0.7 metres per second
Yes
Proximity to high power rf/radar transmitters

Battery DC voltage
Approx. 70h
580 gm
4 x 1.5V R20 ANSI size D
Ni/Cad 1.5V
–

US$2,000 - US$3,000
Yes
–
–
–
–

12 months
–
–

ISO-9001, AQA P4
## TECHNICAL SPECIFICATIONS

### DETECTOR

| 1. Brand | SCHIEBEL |
| 2. Model | MIMID™ Miniature Mine Detector |
| 3. Version | – |
| 4. Used detection technology | Electromagnetic pulse induction |

### DIMENSIONAL DATA

| 5. Working length | 656 mm |
| 6. Search head | 328 mm |
| 7. Transport case | 0.64 kg |
| 8. Weight, hand-held unit | 1.36 kg |
| 9. Weight, carrying (operational detection set) | 1.36 kg + set of batteries 0.1 kg |
| 10. Weight, additional equipment | Mine prodder |
| 11. Weight distribution | Various. All of the weight is hand-held but the unit is counterbalanced at the handle by the entire armrest |

### SYSTEM STATUS AND DEPLOYMENT

| 13. Status (Development | In production) | In production |
| 14. Detectors | Systems in use to date | 1,500 plus |
| 15. Other types | Models | – |
| 16. Location of use | Worldwide |

### ENVIRONMENTAL INFLUENCE

| 17. Humidity (limitations) | No |
| 18. Temperature (limitations) | -55°C to +85°C |
| 19. Water resistant (Yes / No) | Waterproof to 30m |
| 20. Shock | Yes |
| 21. Environmental Compensation | Auto |
| 22. Operational hours | Operating endurance |
| 23. low temperature (around 0°C) | Approx. 6.5 h |
| 24. medium temperature (around 20°C) | Approx. 7 h |
| 25. high temperature (higher than 30°C) | Approx. 7.5 h |
**DETECTION OPERATION**

23. Calibration | Set-up  
   > Auto | Manual  
   > Duration  

Calibration not required. Manual set-up using single control for sensitivity. Sound may also be adjusted to suit local conditions.  

Less than 30s

24. Detection range | Sensitivity details | Detection performance | Working depth  
   > Small metal content mines (type of mine)  
   > Anti-tank mines (type of mine)  
   > ERW (please specify)  

Type 72 A - 14 cm; M14 – 12 cm  
Metallic mines down to 80cm - plastic mines at threat depth  
NATO standard 7.62 round - 32cm. Larger items down to 80cm

25. Output indicator  
26. Pinpointing feature  
27. Adjustment of search head angle  
28. Soil influence  
29. Best use in  
   > Sand  
   > Peat  
   > Clay  
   > Ferruginous soil (laterite)  

Audio tone and visual LED display  
Yes  
Yes  
Yes  
Light laterite with reduced sensitivity

Easily adjusted to cover all necessary operational situations (more than 180 degrees)  

30. Optimal sweep speed  
31. Search coil | Antenna  
32. Limitations  
33. Interference (with other detectors)  

0.2 metres per second  
Search coil  
–  
None above 2 m separation

**POWER**

34. Power supply | Source  
35. Operating time  
36. Power supply  
   > weight  
   > no. of batteries | size | type  
   > rechargeable  
   > other  

Battery DC voltage  
Approx. 7 h  
0.1 kg  
4 x 1.5V LR6 ANSI size AA  
Yes, but operating time is reduced to 4h  
–

**COSTS**

37. Price  
   > for one detector on request  
   > reduction for higher quantity  

US$3,000 - US$4,000  
Yes

38. System price  
   > with training  
   > spare parts  
   > extended warranty  

–  
–  
–

39. Total  
40. Possibility to rent/lease  

–  
–

**OTHERS**

41. Duration of warranty  
42. Additional equipment  
43. Additional technical data | information  
44. Compliant standards  

12 months  
Titanium mine prodder, test piece. Carry bag available in green, camouflage or black  
–  
ISO-9001, AQA P4
# TECHNICAL SPECIFICATIONS

## DETECTOR

| 1. Brand | VALLON |
| 2. Model | VMC1 |
| 3. Version | – |
| 4. Used detection technology | Metal detector | Pulse induction |

## DIMENSIONAL DATA

| 5. Working length | 300 mm (from grip to search head) |
| 6. Search head | 1,240 mm (long version) |
| 7. Transport case | 138 x 325 mm |
| 8. Weight, hand-held unit | 2.3 kg |
| 9. Weight, carrying (operational detection set) | Approx. 2.3 kg |
| 10. Weight, additional equipment | Head set 110 g |
| 11. Weight distribution | – |
| 12. Other specifications | – |

## SYSTEM STATUS AND DEPLOYMENT

| 13. Status (Development | In production) | In production |
| 14. Detectors | Systems in use to date | Not given |
| 15. Other types | Models | VMH3CS | VMM3 | VMH3 |
| 16. Location of use | Worldwide |

## ENVIRONMENTAL INFLUENCE

| 17. Humidity (limitations) | According to MIL STD 810F |
| 18. Temperature (limitations) | -57°C to +71°C |
| 19. Water resistant (Yes / No) | Yes up to 1.5 m |
| 20. Shock | Vibration resistant | Yes |
| 21. Environmental Compensation | Auto |
| 22. Operational hours | Operating endurance | Up to 8 hours depending on battery type and capacity |

---

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DETECTION OPERATION

23. Calibration | Set-up
   - Auto | Manual
   - Duration

24. Detection range | Sensitivity details | Detection performance | Working depth
   - Small metal content mines (type of mine) Depending on their size, material and the local interference
   - Anti-tank mines (type of mine) Depending on their size, material and the local interference
   - ERW (please specify) Depending on their size, material and the local interference

25. Output indicator
   - Sound, visual bargraph, vibration

26. Pinpointing feature
   - Yes

27. Adjustment of search head angle
   - With a joint

28. Soil influence
   - Yes

29. Best use in
   - Sand
   - Peat
   - Clay
   - Ferruginous soil (laterite)

30. Optimal sweep speed
   - 0,2 – 1,5 m/sec, pinpoint mode: 0-0.2 m/sec

31. Search coil | Antenna
   - Oval shape with 138 x 325 mm

32. Limitations
   - No

33. Interference (with other detectors)
   - 2 detectors should have a distance of 2 meter to each other

POWER

34. Power supply | Source
   - Battery

35. Operating time
   - See point 22

36. Power supply
   - weight
   - no. of batteries | size | type
     - 3 ea. 1,5 V standard batteries C-size
   - rechargeable
     - 3 ea. 1,2 V rechargeable battery C-size
   - other

COSTS

37. Price
   - for one detector on request
     - Upon request
   - reduction for higher quantity
     - Yes

38. System price
   - with training
     - Upon request worldwide
   - spare parts
     - Upon request
   - extended warranty
     - Upon request

39. Total
   - –

40. Possibility to rent/lease
   - Upon request

OTHERS

41. Duration of warranty
   - 24 months

42. Additional equipment
   - Headset, hard case, non-magnetic prodder, data recording

43. Additional technical data | information
   - –

44. Compliant standards
   - DIN EN ISO 9001:2000
   - MIL STD 810F, 501.4-11, 502.4-1, 502.4-II, 503.4, 506.4-III, 514.5 C1
## TECHNICAL SPECIFICATIONS

### DETECTOR

| 1. Brand | VALLON |
| 2. Model | VMH3 |
| 3. Version | – |
| 4. Used detection technology | Metal detector | Pulse induction |

### DIMENSIONAL DATA

| 5. Working length | 793 mm (short version, 100 mm from grip to search head) |
| > min. length | |
| > max. length | 1,386 mm (long version) |
| 6. Search head | 170 x 308 mm |
| > Size | |
| > Weight | 0.63 kg |
| > Shape | Oval |
| 7. Transport case | Approx. 1 kg |
| > Weight | |
| > With equipment (full) | Approx. 4.8 kg |
| > Dimensions | 845 x 260 x 325 mm |
| > Hard | Soft case (material) |
| > Soft case (material) | |
| 8. Weight, hand-held unit | 2.5 kg (with oval search head) |
| 9. Weight, carrying (operational detection set) | 2.5 kg |
| 10. Weight, additional equipment | Head set 110 g |
| 11. Weight distribution | – |
| 12. Other specifications | – |

### SYSTEM STATUS AND DEPLOYMENT

| 13. Status (Development | In production) | In production |
| 14. Detectors | Systems in use to date | Not given |
| 15. Other types | Models | VMH3CS | VMC1 | VMM3 |
| 16. Location of use | Worldwide |

### ENVIRONMENTAL INFLUENCE

| 17. Humidity (limitations) | According to MIL STD 810F |
| 18. Temperature (limitations) | |
| > Storage | -57°C to +71°C |
| > Operational | -32°C to +55°C |
| 19. Water resistant (Yes / No) | Yes up to 1,5 m |
| 20. Shock | Vibration resistant |
| > Yes | Auto |
| 21. Environmental Compensation | |
| 22. Operational hours | Up to 20 hours depending on battery type and capacity |
| > Operating endurance | Up to 25 hours depending on battery type and capacity |
| > low temperature (around 0°C) | |
| > medium temperature (around 20°C) | |
| > high temperature (higher than 30°C) | |
### DETECTION OPERATION

23. Calibration | Set-up
- **Auto** | Manual
- **Duration**

24. Detection range | Sensitivity details | Detection performance | Working depth
- Small metal content mines (type of mine)
- Anti-tank mines (type of mine)
- ERW (please specify)

25. Output indicator
26. Pinpointing feature
27. Adjustment of search head angle
28. Soil influence
29. Best use in
- Sand
- Peat
- Clay
- Ferruginous soil (laterite)

30. Optimal sweep speed
31. Search coil | Antenna

32. Limitations
33. Interference (with other detectors)

### POWER

34. Power supply | Source
35. Operating time
36. Power supply
- **weight**
- **no. of batteries | size | type**
- Rechargeable battery KR35/62
- **other**

### COSTS

37. Price
- for one detector on request
- reduction for higher quantity
38. System price
- with training
- spare parts
- extended warranty

39. Total
40. Possibility to rent/lease

### OTHERS

41. Duration of warranty
42. Additional equipment
- Headset, hard case, data recording and software
43. Additional technical data | information
44. Compliant standards
- DIN EN ISO 9001:2000
- MIL STD 810F, 501.4-II, 502.4-I, 502.4-II, 503.4, 506.4-III, 514.5 C1
### TECHNICAL SPECIFICATIONS

#### DETECTOR

<table>
<thead>
<tr>
<th>1. Brand</th>
<th>VALLON</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Model</td>
<td>VMH3CS</td>
</tr>
<tr>
<td>3. Version</td>
<td>–</td>
</tr>
<tr>
<td>4. Used detection technology</td>
<td>Metal detector</td>
</tr>
</tbody>
</table>

#### DIMENSIONAL DATA

| 5. Working length | 920 mm (short version | with oval search head) |
|-------------------|-----------------------|
|                   | 220 mm from Grip to Search Head |
|                   | 984 mm (short version | with UXO search head) |
|                   | 935 mm (short version | with stick probe) |
| 6. Search head    | 1,260 mm (long version | with oval search head) |
|                   | 1,324 mm (long version | with UXO search head) |
|                   | 1,278 mm (long version | with stick probe) |
| 7. Transport case | 170 x 308 mm (oval search head) |
|                   | Ø 615 mm (UXO search head) |
|                   | Ø 40 mm x 445 mm long (Stick Probe) |
| 8. Weight, hand-held unit | 0.63 kg (oval search head) |
|                   | 1.1 kg (UXO search head) |
|                   | 0.5 kg (Stick Probe) |
| 9. Weight, carrying (operational detection set) | Oval |

#### SYSTEM STATUS AND DEPLOYMENT

| 13. Status (Development | In production) | In production |
| 14. Detectors | Systems in use to date | Not given |
| 15. Other types | Models | VMH3 | VMC1 | VMM3 |
| 16. Location of use | Worldwide |

#### ENVIRONMENTAL INFLUENCE

| 17. Humidity (limitations) | According to MIL STD 810F |
| 18. Temperature (limitations) | - 57°C to + 71°C |
|                           | - 32°C to + 55°C |
| 19. Water resistant (Yes / No) | Yes up to 1,5 m |
| 20. Shock | Vibration resistant | Yes |
| 21. Environmental Compensation | Auto |
| 22. Operational hours | Operating endurance |
|                           | Up to 20 hours depending on battery type and capacity |
|                           | Up to 25 hours depending on battery type and capacity |
|                           | Up to 25 hours depending on battery type and capacity |
DETECTION OPERATION

23. Calibration | Set-up
   > Auto | Manual
   > Duration
   Auto
   A few seconds

24. Detection range | Sensitivity details | Detection performance | Working depth
   > Small metal content mines (type of mine)
   Depending on their size, material and the local interference
   > Anti-tank mines (type of mine)
   Depending on their size, material and the local interference
   > ERW (please specify)
   Depending on their size, material and the local interference

25. Output indicator
   Sound, visual bargraph, vibration

26. Pinpointing feature
   Yes

27. Adjustment of search head angle
   With a joint

28. Soil influence
   Adjustable

29. Best use in
   > Sand
   Yes
   > Peat
   Yes
   > Clay
   Yes
   > Ferruginous soil (laterite)
   Yes

30. Optimal sweep speed
   0,2 – 1,5 m/sec, pinpoint mode: 0-0.2 m/sec

31. Search coil | Antenna
   Oval shape with 170 x 308 mm
   Round shape with Ø 615 mm
   Stick Probe with Ø 40 mm and 445 mm length

32. Limitations
   No

33. Interference (with other detectors)
   2 detectors should have a distance of 2 meter to each other

POWER

34. Power supply | Source
   Battery

35. Operating time
   See point 22

36. Power supply
   > weight
   –
   > no. of batteries | size | type
   3 ea. 1,5 V standard batteries D-size
   3 ea. 1,24 V rechargeable batteries KR35/62
   –

37. Price
   for one detector on request
   Upon request
   > reduction for higher quantity
   Yes

38. System price
   with training
   Upon request worldwide
   spare parts
   Upon request
   extended warranty
   Upon request

39. Total
   –

40. Possibility to rent/lease
   Upon request

OTHERS

41. Duration of warranty
   24 months

42. Additional equipment
   Headset, hard case, UXO search head, stick probe, data recording and software

43. Additional technical data | information
   –

44. Compliant standards
   DIN EN ISO 9001:2000
   MIL STD 810F, 501.4-II, 502.4-I, 502.4-II, 503.4, 506.4-III, 514.5 C1
### DETECTOR

1. **Brand**  
   VALLON

2. **Model**  
   VMM3

3. **Version**  
   –

4. **Used detection technology**  
   Metal detector | Pulse induction

### DIMENSIONAL DATA

5. **Working length**  
   - **min. length**: 995 mm (short version)  
   - **max. length**: 1,924 mm (long version)

6. **Search head**  
   - **Size**: 170 x 24 x 305 mm  
   - **Weight**: With telescopic pole 1.3 kg  
   - **Shape**: Oval

7. **Transport case**  
   - **Weight**: 5.6 kg  
   - **With equipment (full)**: 11.5 kg  
   - **Dimensions**: 782 x 300 x 142 mm  
   - **Hard | Soft case (material)**: Hard case | Aluminium

8. **Weight, hand-held unit**  
   1.7 kg

9. **Weight, carrying (operational detection set)**  
   3.2 kg

10. **Weight, additional equipment**  
    Head set 100 g

11. **Weight distribution | Balance**  
    –

12. **Other specifications**  
    –

### SYSTEM STATUS AND DEPLOYMENT

13. **Status (Development | In production)**  
    In production

14. **Detectors | Systems in use to date**  
    Not given

15. **Other types | Models**  
    VMH3 | VMH3CS | VMC1

16. **Location of use**  
    Worldwide

### ENVIRONMENTAL INFLUENCE

17. **Humidity (limitations)**  
   According to MIL STD 810F

18. **Temperature (limitations)**  
   - **Storage**: -57°C to +71°C  
   - **Operational**: -32°C to +55°C

19. **Water resistant (Yes / No)**  
    Yes up to 1,5 m

20. **Shock | Vibration resistant**  
    Yes

21. **Environmental Compensation**  
    Auto

22. **Operational hours | Operating endurance**  
    - **low temperature (around 0°C)**: Up to 30 hours depending on battery type and capacity  
    - **medium temperature (around 20°C)**: Up to 40 hours depending on battery type and capacity  
    - **high temperature (higher than 30°C)**: Up to 40 hours depending on battery type and capacity
### DETECTION OPERATION

23. Calibration | Set-up
   - Auto | Manual
   - Duration: A few seconds

24. Detection range | Sensitivity details | Detection performance | Working depth
   - Small metal content mines (type of mine)
     - Depending on their size, material and the local interference
   - Anti-tank mines (type of mine)
     - Depending on their size, material and the local interference
   - ERW (please specify)
     - Depending on their size, material and the local interference

25. Output indicator
   - Sound (loudspeaker or headset)
26. Pinpointing feature
   - Yes
27. Adjustment of search head angle
   - Adjustable
29. Best use in
   - Sand: Yes
   - Peat: Yes
   - Clay: Yes
   - Ferruginous soil (laterite): Yes

30. Optimal sweep speed
   - 0.2 – 1.5 m/sec
31. Search coil | Antenna
   - Oval shape with 170 x 305 mm
   - Round shape with Ø 615 mm (UXO search head as optional accessory). Stick Probe with Ø 40 mm (option)

32. Limitations
   - No
33. Interference (with other detectors)
   - 2 detectors should have a distance of 2 meter to each other

### POWER

34. Power supply | Source
   - Battery
35. Operating time
   - See point 22
36. Power supply
   - weight
   - no. of batteries | size | type
     - 4 ea. 1,5 V standard batteries D-size
     - 4 ea. 1,24 V rechargeable batteries KR35/62
   - rechargeable
   - other

### COSTS

37. Price
   - for one detector on request
     - Upon request
   - reduction for higher quantity
     - Yes
38. System price
   - with training
     - Upon request worldwide
   - spare parts
     - Upon request
   - extended warranty
     - Upon request
39. Total
   - –
40. Possibility to rent/lease
   - Upon request

### OTHERS

41. Duration of warranty
   - 24 months
42. Additional equipment
   - UXO search head, stick probe
43. Additional technical data | information
   - –
44. Compliant standards
   - DIN EN ISO 9001:2000
   - MIL STD 810F, 501.4-II, 502.4-I, 502.4-II, 503.4, 506.4-III, 514.5 C1
### DETECTOR
1. **Brand** | VALLON
2. **Model** | VMW1
3. **Version** | –
4. **Used detection technology** | Metal detector | Pulse induction

### DIMENSIONAL DATA
5. **Working length**
   - min. length | 300 mm (From grip to search head)
   - max. length | 1,240 mm (long version)
6. **Search head**
   - Size | 138 x 325 mm
   - Weight | –
   - Shape | Oval
7. **Transport case**
   - Weight | Approx. 2.3 kg
   - With equipment (full) | Approx. 5.3 kg
   - Dimensions | 410 x 310 x 170 mm
   - Hard | Soft case (material) | Hard case | Plastic
8. **Weight, hand-held unit** | Approx. 2.3 kg ashore, approx. 0.5 kg in the water
9. **Weight, carrying (operational detection set)** | Approx. 2.3 kg ashore, approx. 0.5 kg in the water
10. **Weight, additional equipment** | Head set 230 g
11. **Weight distribution | Balance** | –
12. **Other specifications** | –

### SYSTEM STATUS AND DEPLOYMENT
13. **Status (Development | In production)** | In production
14. **Detectors | Systems in use to date** | Not given
15. **Other types | Models** | MW1630B
16. **Location of use** | Worldwide underwater or on land

### ENVIRONMENTAL INFLUENCE
17. **Humidity (limitations)** | According to MIL STD 810F
18. **Temperature (limitations)**
   - Storage | -57°C to +71°C
   - Operational | -32°C to +55°C
19. **Water resistant (Yes / No)** | Yes up to 50 m
20. **Shock | Vibration resistant** | Yes
21. **Environmental Compensation** | Auto
22. **Operational hours | Operating endurance** | Up to 9 hours depending on battery type and capacity
DETECTION OPERATION

23. Calibration | Set-up
   - Auto | Manual
   - Duration: Auto
   - Duration: A few seconds

24. Detection range | Sensitivity details | Detection performance | Working depth
   - Small metal content mines (type of mine)
   - Anti-tank mines (type of mine)
   - ERW (please specify)
   - Depending on their size, material and the local interference
   - Depending on their size, material and the local interference
   - Depending on their size, material and the local interference

25. Output indicator
   - Sound, visual bargraph

26. Pinpointing feature
   - Yes

27. Adjustment of search head angle
   - Yes

28. Soil influence
   - Yes

29. Best use in
   - Sand
   - Peat
   - Clay
   - Ferruginous soil (laterite)
   - Yes

30. Optimal sweep speed
   - 0,2 – 1,5 m/sec

31. Search coil | Antenna
   - Oval shape with 138 x 325 mm

32. Limitations
   - No

33. Interference (with other detectors)
   - 2 detectors should have a distance of 2 meter to each other

POWER

34. Power supply | Source
   - Battery

35. Operating time
   - See point 22

36. Power supply
   - weight: –
   - no. of batteries | size | type
     - 3 ea. 1,5 V standard batteries D-size
     - 3 ea. 1,2 V rechargeable battery C-size
   - rechargeable: –
   - other: –

COSTS

37. Price
   - for one detector on request: Upon request
   - reduction for higher quantity: Upon request

38. System price
   - with training: Upon request worldwide
   - spare parts: Upon request
   - extended warranty: Upon request

39. Total
   - –

40. Possibility to rent/lease
   - Upon request

OTHERS

41. Duration of warranty
   - 24 months

42. Additional equipment
   - –

43. Additional technical data | Information
   - –

44. Compliant standards
   - DIN EN ISO 9001:2000
   - MIL STD 810F, 501.4-II, 502.4-I, 502.4-II, 503.4, 506.4-III, 514.5 C1
SECTION 2

LARGE-LOOP DETECTORS
GENERAL DESCRIPTION

The Ebinger Large Loop Technology UPEX 740 M is a valuable asset in the field of explosive remnants of war. It has been used for humanitarian and commercial battle area clearance operations in Afghanistan, Angola, Cambodia, France, Kosovo, Laos, the UK and Viet Nam.

Due to its size, large areas can be inspected and cleared of ammunition in a short time. A vehicle-mounted configuration has been developed which is applicable for route clearance/verification, area reduction or quality assurance. It can be mounted on virtually any heavy-duty vehicle and can provide an efficient and cost-effective detection system.

The system can be supplied with two different loop configurations. The number of channels can be varied between two and eight. The search process can be optimised by combining the system with a GPS to precisely locate the potential target. Colour-coded maps can be generated to facilitate the follow-on demining operation.

Main characteristics

1. The sturdy electronics unit is compact, lightweight and splash-proof.
2. Target acquisition is indicated by audio alarm and by galvanometer reading.
3. Detection results can be stored in a data logger for plotting or further processing by software.
4. Different indication characteristics can be selected to suit adverse working conditions.
5. The equipment’s audio control pulses indicate the battery condition. Audible confidence clicks inform operators that equipment is functioning correctly.
6. UPEX is also available for underwater or vehicle-mounted use.

WORKING METHODOLOGY

UPEX 740 M is as easy to use as a conventional mine detector. Detection signals are easy to interpret and no advanced training is required for the operators. The UPEX detector applies the eddy current pulse induction principle for the detection of metal components in ERW. The device can be adjusted to various types of non-cooperative soils and to suppress surface-bound small fragmentation.

No further technical information is given by the manufacturer.

DETECTORS IN USE

Since 1993, more than 500 UPEX 740 M units have been purchased. The detector is in service with various humanitarian demining organisations, the UN and many commercial companies.
POWER SUPPLY
The UPEX 740 M is powered by 8 x 1.5V C cell or alternatives; rechargeable battery pack 3.8A/h, 12V.
  > Operational life of battery (8x1.5V alkaline 8A/h): 55 hours in Low, 25 hours in High.
  > Operational life of rechargeable batteries (8x1.2V 3.5A/h): 38 hours in Low, 19 hours in High.

FACTORY SUPPORT
  > All detectors are covered by a 24-month warranty. A worldwide service network ensures permanent availability of spare parts.
  > Operation and maintenance training is provided at Ebinger facilities or on site.
  > Additional factory support by specially trained staff is provided on request.
  > Instruction and maintenance manuals are available in Arabic, English, French, German, Italian and Russian; other languages available on request.

MAINTENANCE SUPPORT
  > There are no special requirements for technicians or workshop facilities. Most repairs can be carried out by Ebinger-trained staff on site.
  > Step-by-step explanations in the manuals help to ensure easy maintenance.

TEST AND EVALUATION
The detector went through comprehensive internal tests. Reports displaying the performance can be provided by the manufacturer on request.

REPORTED LIMITATIONS AND STRENGTHS
The system has been in service for several years, but has not been tested in comparative trials. Therefore no statement of known limitations and strengths can be made.
DETECTOR

1. Brand: EBINGER
2. Model: UPEX® 740M-V and UPEX® MM (vehicle)
3. Version: —
4. Used detection technology: AEM-PI

DIMENSIONAL DATA

5. Working length
   - min. length: Depending on construction on vehicle
   - max. length: Depending on construction on vehicle

6. Search head
   - size: 1,000 x 2,000 mm or multiple
   - weight: Approx. 3kg including support frame
   - shape: Rectangular

7. Transport case
   - weight: —
   - with equipment (full): —
   - dimensions: —
   - hard | soft case (material): —

8. Weight, hand-held unit: —

9. Weight, carrying (operational detection set): —

10. Weight, additional equipment: —

11. Weight distribution | balance: —

12. Other specifications: Alarm and reset device inside the cabin

DETECTION SYSTEM SPECIFICATIONS

13. Status: In production

14. Detectors | systems in use to date: 50

15. Other types: —

16. Location of use: Angola, Cambodia, Eritrea, Mozambique, Sudan

ENVIRONMENTAL INFLUENCE

17. Humidity (limitations): None

18. Temperature (limitations)
   - storage: None
   - operational: None

19. Water resistant: Yes

20. Shock | vibration resistant: Yes


22. Operational hours | operating endurance: Unlimited (car battery)
### DETECTION OPERATION

23. Calibration | set-up  
   - auto | manual: Manual

24. Detection range | sensitivity details | detection performance | working depth  
   - Control of working depth: Test piece  
   - low-metal-content mines: Not suitable  
   - anti-vehicle mines: Designed for  
   - ERW: Designed for

25. Output indicator: Acoustical, optical, analogic output for data recording

26. Pinpointing feature: Yes

27. Adjustment of search head angle: Not necessary

28. Soil influence: Adjustable

29. Best use in  
   - sand: Yes  
   - peat: Yes  
   - clay: Yes  
   - ferruginous soil (laterite): Yes

30. Optimal sweep speed: —

31. Search coil | antenna: Rectangular

32. Limitations: —

33. Interference (with other detectors): 12m

### POWER

34. Power supply | source: Car battery

35. Operating time: Unlimited

36. Power supply  
   - weight: —  
   - no. of batteries | size | type: —  
   - other: System supplied with power cables

### COSTS

37. Price  
   - for one detector: More than US$5,000  
   - reduction for higher quantity: Yes

38. System price  
   - with training: Included  
   - spare parts: Included  
   - extended warranty: On request

39. Total: —

40. Possibility to rent | lease: Yes

### OTHERS

41. Duration of warranty: 24 months

42. Additional equipment: Support frame for vehicle on request

43. Additional technical data | information: Available on request

44. Compliant standards: MIL-STD
SECTION 3

ERW DETECTORS
GENERAL DESCRIPTION

The CCT-2 Magnetic Detector is a highly sensitive differential magnetometer used for the detection of bombs, shells, anti-tank mines and underground pipeline with ferrous content buried in earth or water, working on a fluxgate principle.

A 192 x 64 dots liquid crystal display (LCD) on the front panel of the CCT-2 displays the set parameters in operation. The real-time detecting result appears either in the form of digits or in the form of curves. Simultaneously, the detector saves the result in a storage system with the capacity of 8,000 detecting points. When the operation in the whole detecting area is complete, the results can be transferred to a computer and, with a special software, output as a result chart. The pinpoint of the object can be easily decided by analysing the chart.

Detection can be performed in two ways: stationary operation and continuous operation. The former is used to circle the range of the object while the latter is used to pinpoint the object.

The detector has a keyboard on the panel to set various parameters of the unit and to control the operation.

Operation is simple, with only a short training period required before operation.

When detection is performed over large areas, several detectors can be used at the same time without any interference.

The main components of the CCT-2 are the working unit, the sensor, the charger, a set of adjusting tools, the carrying belt, an aluminium shipping and storage case, and the operation and maintenance manual.

WORKING METHODOLOGY

The CCT-2 works on the principle of measuring the distortion of the earth’s magnetic field. Two magnetic sensors are vertically mounted in a tube 50cm apart to measure the magnetic field. When no ferromagnetic target exists between the sensors, both values are subtracted and result in zero. When a ferromagnetic target is disturbing the homogenous field the result is two different values so the difference is not zero. Depending on the signal amplitude and polarity, the alarm signal is computed.

DETECTORS IN USE

No detailed information was provided by the manufacturer.
FACTORY SUPPORT

> The manufacturer assures supply period and product quality.
> Spare parts can be delivered to the customer.
> Operation and maintenance training can be offered at BGIF facilities or at a customer’s location at their expense.
> The operation and maintenance manual is available in English, other languages on request.
> The manufacturer provides a warranty of 24 months.

MAINTENANCE SUPPORT

> There are no special requirements for technicians or workshop facilities.
> A special tool is offered with the unit. Others needed are standard ones available in the market.
> The user’s manual has detailed explanations of operation and maintenance.

TEST AND EVALUATION

The manufacturer provides several available test reports on request.

REPORTED LIMITATIONS AND STRENGTHS

The CCT-2 detects ferrous targets only. No additional information is available.
CEIA MIL-D1/DS

GENERAL DESCRIPTION

The CEIA MIL-D1/DS UXO Metal Detector is an active EMI device based on transmission of an alternating, low-frequency magnetic field and on the variations introduced into this field by buried metal masses.

The detector consists of a telescopic pole with a central section in aluminium and fibreglass extensions. The two-probe antennae which act as transmitter and receiver of the magnetic field are mounted at the ends of the extensions. Detection signals are provided by an audible tone and an LCD on the front panel of the control unit.

The most significant features of the MIL D1/DS are:

- High sensitivity.
- Useful for detecting metal masses at depth.
- Capacity for discrimination between surface metal masses and those of interest.
- Compensation for mineralised soils and total immunity to the effects of the terrestrial magnetic field.
- High stability of its detection system, which shows no drift over time or with variations in environmental conditions.
- Intrinsic reliability and high resistance to shock and mechanical stress, essential for a long operating life.

CEIA offers a single, proven state-of-the-art model (MIL-D1/DS) optimised to provide comprehensive detection capability across the entire spectrum of metals and soil types.

A hand-held remote programmer allows for MIL-D1/DS flash memory upgrades under any conditions. MD Scope software for PCs is available for troubleshooting and annual verification of MIL-D1/DS calibration.

WORKING METHODOLOGY

Localisation of metal objects is optimised by a two-tone audible pinpointing system, which allows the position of the detected mass to be identified accurately. When the metal detector approaches a metal mass, the system produces a signal of acoustic intensity and a visual bar reading proportional to the metal mass. The metal mass is pin-pointed by scanning the soil transversally and getting the maximum bar display reading. Audible signal is transmitted either through an internal speaker or external monaural headphone.

CEIA’s Automated Soil Compensation System ensures an above-average sensitivity in all types of soil. During the completely automated soil compensation, the detector uses digital processing of the electromagnetic response from the target soil to determine the most effective strategy. The presence of water does not affect the performance of the detector. Soil compensation capability covers all different soils.

POWER SUPPLY

- 4 x 1.5V alkaline batteries or 4 x 1.2V Ni-MH rechargeable batteries (available on request).
- Operation time: 18 hours with alkaline batteries at 20°C, 16 hours with Ni-MH rechargeable batteries (8000 mA) at 20°C.
DETECTORS IN USE
The detector is in service with various humanitarian aid organisations, commercial mine clearance organisations and armed forces in Denmark, Egypt, France, Italy, Laos, Lebanon, Sudan, Switzerland, the U.S. and Yemen.

FACTORY SUPPORT
> The proposed spare parts package is arranged in accordance with a life cycle management study by the manufacturer.
> Spare parts are available from either the manufacturer or local representatives.
> An extensive programme is available for both operators and maintenance personnel.
> Factory-based training is included in the purchasing package.
> Instruction manuals and documentation are provided in Arabic, English, French, Italian, Portuguese and Spanish. Other languages available on request.
> The standard warranty is two years. Extended warranty periods can be arranged.
> Comprehensive factory follow-up includes services via internet contact, mail and personal contact.
> On-site training, training aids, diagnostic software, portable remote programmer are available as accessories.
> Other services by the manufacturer include software upgrading, comprehensive technical assistance, mine simulant study and manufacturing, and the availability of factory test lanes.

MAINTENANCE SUPPORT
The detector is considered user-friendly and the customer can easily maintain the equipment. It is not necessary to return the unit to the factory for troubleshooting or verification of calibration. MIL-D1/DS electronics board is based on full digital technology, which means there is no requirement to trim or refine the performance using laboratory equipment.

TEST AND EVALUATION
The MIL-D1 was subjected to extensive testing (in terms of reliability and capability of detection) by the EC’s Joint Research Centre in Laos in 2004. The MIL-D1/Ds was tested in a laboratory test trial by JRC, Institute for the Protection and Security of the Citizen, in Italy from November 2003 to January 2006.

The following test result is available at the ITEP website: www.itep.ws: Systematic Test and Evaluation of Metal Detectors. Interim Report Field Trial Lao, 27 September - 5 November 2004; published 2005.

REPORTED LIMITATIONS AND STRENGTHS
Limitations “It should also be mentioned that this detector ignored small targets: …”

Strengths “The results of the ground compensation test clearly show that the detector could cope with the known complicated ground conditions in Lao. At all points, on all three sites, it was able to achieve compensation. …The test pit results indicate that the detector satisfies the requirements of UXO Lao to detect both targets to the required 300mm.”

2 Ibid, p. 35.
EBINGER MAGNEX 120 LW

Ebinger | Germany

GENERAL DESCRIPTION

The MAGNEX 120 LW metal detector has been developed particularly for the detection of ferromagnetic ammunition in the ground or in shallow water. The locator is designed for borehole use to indicate deeply buried UXO/ERW, or for operation in areas with substantial interference from surface fragments.

The pinpoint location with audio signal and the digital multi-channel system ensure a high level of reliability and user-friendliness.

WORKING METHODOLOGY

The MAGNEX 120 LW works on the gradiometer principle, which detects geomagnetic field interference. Objects made from ferromagnetic material can show a magnetic field which superimposes on the natural terrestrial field. Amplitude and polarity of the local anomaly are used to indicate the position of the ERW.

Digital measurement data logging

To ease data collection and storage the MAGNEX locators and the MAGNETO system suit each other well and increase productivity in bomb disposal substantially. A high degree of field input makes the system very user-friendly. Its functionality facilitates its use when investigating the extent of pollution or when processing detection data from ammunition. In conjunction with the DLM datalogger, the system can be used as a man-portable single-channel or triple-channel system.

The detector is equipped with a new Ebinger-developed inductor system which ensures a base clearance of 430mm.

Ease of operation and a rigid mechanical design facilitate reliable operation for professional clearing tasks. The stepping switch offers the following sensitivity ranges:

- Level 1: 3,000 nT/m;
- Level 2: 1,000 nT/m;
- Level 3: 300 nT/m;
- Level 4: 100 nT/m;
- Level 5: 30 nT/m;
- Level 6: 10 nT/m.

No further information is given by the manufacturer.

POWER SUPPLY

- The MAGNEX 120 LW is powered by 6 x 1.5V round cell LR20 batteries.
- Operational life of battery is approximately 40 hours.

DETECTORS IN USE

Since 1993, more than 1,200 units of MAGNEX 120 have been purchased. The detector is in service with various NGOs and commercial companies worldwide.
FACTORY SUPPORT

> All detectors are covered by a 24-month warranty. A worldwide service network ensures permanent availability of spare parts.
> Operation and maintenance training is provided at Ebinger facilities or on site.
> Additional factory support by specially trained staff is provided on request.
> Instruction and maintenance manuals are available in Arabic, English, French, German, Italian and Russian; other languages available on request.

MAINTENANCE SUPPORT

> There are no special requirements for technicians or workshop facilities. Most repairs can be carried out by Ebinger-trained staff on site.
> Step-by-step explanations in the manuals ensure easy maintenance of the system.

TEST AND EVALUATION

The detector went through comprehensive internal tests: reports can be provided by the manufacturer on request.

REPORTED LIMITATIONS AND STRENGTHS

No information available at this time.

FOERSTER FEREX 4.032

Institut Dr. Foerster | Germany

GENERAL DESCRIPTION

The FEREX 4.032 metal detector using the fluxgate magnetometer principle to detect magnetic anomalies caused by ferromagnetic objects. Its primary use is to search for ERW to depths of approximately 8m. Under certain circumstances (for example, anti-vehicle mines covered by up to 2m of desert sand), the FEREX can successfully be used for mine detection.

The detector replaces the FEREX 4.021, which was introduced on the market in the mid-1990s. Due to the tension band technology inside the Foerster magnetometer, the system is known as one of the most sensitive fluxgate magnetometers available. These probes are lifetime-calibrated – even if used within a rough environment or within an extreme climate. The standard hand-held version “FEREX 4.032 API” indicates ferromagnetic objects by a pointer instrument and sound.

As it is a modular system, a simple exchange of the control box upgrades the unit to a FEREX 4.032 DLG (data logger). This detector combines the API features with an integrated four-channel data logger for scanning fields in order to evaluate the resulting map of magnetic anomalies, on a standard PC.
The FEREX Dataline software calculates, among other data, the exact position, depth or orientation of the scanned objects. The system is capable of fulfilling tasks such as underwater or borehole search. The high-end solution within this instrument family is a vehicle-based multichannel system (Foerster Multicat), supported by a differential Global Positioning System (GPS). In 2002, following customer feedback, the FEREX 4.032 was modified to minimise its length. Some smaller mechanical modifications have been undertaken to optimise handling. At the same time, the Dataline software was equipped with a bundle of optional features. New types of multi-probe-holder have been introduced.

FOERSTER supplies FEREX in three versions: the FEREX API (with a classic pointer instrument) and the two data logger versions, FEREX DLG STD and FEREX DLG GPS Cartograph. The FEREX DLG GPS Cartograph is designed for connection to all conventional GPS with RTK (Real Time Kinematic) operational mode and laser positioning systems (Tachymeter Total Station).

WORKING METHODOLOGY
By detecting variations within the earth’s magnetic field, the FEREX indicates plus and minus poles of ferromagnetic objects. Geometry and strength of the detected poles enable the user to determine the location, depth and size of the object. In general, problematic soil types do not influence the results gained from this working principle.

POWER SUPPLY
As standard, the FEREX 4.032 is powered by four 1.5V D cells. Rechargeable batteries are available on the open market.

Sensitivity and detection quality are never influenced by battery condition. Operating time with one set of alkaline batteries reaches 60 hours (in intermittent operation) or 36 hours (data logger).

DETECTORS IN USE TO DATE
The FEREX 4.032 has been in service since 2000 and has been used in Afghanistan, Australia, Austria, Bulgaria, Canada, Croatia, Denmark, Egypt, Finland, France, Germany, Indonesia, Iran, Ireland, Italy, Japan, the Netherlands, Portugal, Poland, Russia, Spain, Tunisia, UK, Uruguay, the US and Viet Nam.

FACTORY SUPPORT
- Spare parts are available exclusively from Foerster which has a network of representatives in more than 40 countries. Most offer complete after-sales service.
- Besides offering training on the customer’s site, Foerster provides modern test and training facilities in Reutlingen, Germany. A full training programme for trainers, including lessons on background knowledge and using a variety of training materials, is available in English and German. On request, training forms part of a purchasing package.
- Standard manuals and service documentation are available in English, French, German and Spanish. Other languages available on request.
MAINTENANCE AND SUPPORT

> The FEREX maintenance system is on two levels: basic field maintenance and workshop maintenance.

> The recommended number of workshops depends on the logistical set-up. The personnel for handling a workshop must have basic knowledge of mechanical and electronic repairs.

> Foerster offers supply of complete tool sets and testing equipment as well as service training. Fully equipped workshops with trained personnel can handle all repairs down to factory final assembly level.

TEST AND EVALUATION

Foerster performs tests within its own facilities mainly for research and quality control. The manufacturer states that tests are largely carried out under “real” conditions.

REPORTED LIMITATIONS AND STRENGTHS

No information is available at this time.

GEOMETRICS G-858

Geometrics | US

GENERAL DESCRIPTION

Geometrics designs and manufactures high-sensitivity total field magnetometers for locating ferrous objects underground. The primary tool for this application is the G-858 Cesium Vapor MagMapper system. The Geometrics G-858 is a portable caesium vapour magnetometer system for demining and ERW detection. The main components are the sensor, belt-mounted display/logging console and a hand-held counterbalanced staff.

The G-858 can be configured with one or two sensors, allowing for gradient measurements as well as logging of GPS for positioning. The system samples at ten times per second at noise levels of about 0.05nT thus providing extremely rapid survey of large areas of land, up to 2 acres (1 hectare) per hour. “A basic software package MagMapTM is supplied as an integral part of the G-858 system and provides:

> Transfer of the raw magnetometer, base station and other survey data to the client PC;

> Standard corrections for position errors, transients, and time varying errors (diurnal);

> Repositioning, linear interpolation and format of corrected data into X,Y, Z ASCII columnar values for use with Surfer for Windows, Geosoft or other client-supplied contouring programs. Surfer for Windows by Golden Software can be employed to grid the data and to generate 2D and 3D color contour maps with full text annotations.”

Since its design in 1996, Geometrics has supplied this equipment to Naval Research Labs, the Army Corps of Engineers, UXB, Parsons and most other large ERW detection companies and institutes.

**WORKING METHODOLOGY**

The basic operating principle of the optically pumped cesium vapour magnetometer is described at the website http://en.wikipedia.org/wiki/Magnetometer. Basically it is an atomic clock which oscillates at a frequency dependent on the ambient magnetic field. It is a passive device, measuring distortion in the earth’s magnetic field, thus allowing much greater range than that typically associated with metal detectors. The rule of thumb is that 250lb (110kg) of iron or steel can be detected at 50ft (15m); 30lb (13kg) at 25 ft (7m); and 4lbs (2kg) at 9 ft (3m). Output is visual and audio. The most powerful feature is its mapping ability, which can detect small ferrous objects or deeper objects not detectable with metal detectors or in search mode. This is especially useful in initial reconnaissance and certifying site clearance. The magnetometer only senses ferrous material (containing iron or steel) and thus soil conditions, types, presence of water, etc., do not impact performance. However, the magnetometer cannot detect the presence of gold, aluminium, brass or plastic. It is sensitive to excavation where normal soil magnetisation has been disturbed.

**POWER SUPPLY**

The battery is a rechargeable lead acid gel cell, 24V, magnetically compensated, giving 3 to 4 hours of use per charge for gradiometer, 8 hours for single sensor operation. The battery is worn as a belt.

**DETECTORS IN USE TO DATE**

There are more than 500 G-858 systems operational worldwide and the system has been in service for 10 years. The G-858 can be used for ERW detection, mining/oil/gas survey, environmental assessment, utility location, forensics and archaeology.

**FACTORY SUPPORT**

- Spares are available from the Geometrics factory in San Jose, California.
- Lifetime telephone applications assistance and technical support is offered.
- Instruction manuals are available in English or Spanish.
- The manufacturer offers factory training at its facility in California or at the customer’s site. The system price includes one day of training.
- The detector is available for hire.
- Two-year warranty for parts and labour is provided by the manufacturer.

**MAINTENANCE AND SUPPORT**

- Geometrics say that no maintenance is required on the G-858 other than cleaning of connectors.
- The system can be operated by one person. The company recommends two operators per system to maximise productivity and to assist in positioning of survey lines.
TEST AND EVALUATION
Internal test reports can be provided by the manufacturer.

REPORTED LIMITATIONS AND STRENGTHS
The magnetometer does not perform well in highly magnetic volcanic soils (such as those in Hawaii) which mask buried object signatures near the detector.

GEONICS EM 61-Mk2

Geonics Ltd. | Canada

GENERAL DESCRIPTION
The EM 61-Mk2 Metal Detector is a high-power, high-sensitivity metal detector suitable for applications in the detection of both ferrous and non-ferrous metal. Each system includes a coincident transmitter/receiver coil (1 x 0.5m); a second receiver coil (1 x 0.5m); backpack-mounted system electronics and power supply; and a GPS-compatible data acquisition system with supporting software.

Since the introduction of the original EM 61 Metal Detector in 1994, advances in design and application have provided greater functionality and enhanced detection capabilities within a wider range of operating environments. In addition to the current EM 61-Mk2 model, several modifications and variations are available to address specific targets and/or operating conditions. Options include: a hand-held coil system for increased lateral target resolution; a submersible coil for use in both fresh and salt water environments; and a high power modification to increase detection limits associated with all targets.

For a substantial increase in productivity, particularly over larger survey areas, multiple systems can be configured as a single array to be towed behind a vehicle. The EM 61 series of metal detectors is recognised within the North American defence community as a standard application technology for the detection of unexploded ordnance. Complementary applications include the delineation of environmental hazards, utilities and infrastructure at both active and inactive military installations.

WORKING METHODOLOGY
Operating on the principles of time domain electromagnetics, the EM 61-MK2 generates a primary magnetic field that induces electrical eddy currents in nearby metallic objects. The receiver coils measure the strength of secondary magnetic fields associated with the induced eddy current flow.

The standard EM61-MK2 will detect metallic objects to a depth of 5m maximum. The maximum depth at which any individual object can be detected is determined uniquely by its size, composition and orientation of the object. Increased detection depths for all objects can be achieved with a high-power modification to the system.

The EM 61-MK2 provides both audio and visual anomaly indicators. The visual indicator can be presented in both graphical and text formats. Designed to be relatively insensitive to natural conditions of the subsurface, the EM 61-MK 2 can be operated in most environments without geologic interference. A simple nulling procedure establishes the zero/reference level at each site.
**DETECTORS IN USE TO DATE**

Since the introduction of the original EM 61 in 1994, total sales have exceeded 350 units worldwide. Customer groups are varied and include consultants to the defence/environmental/engineering/industries, military agencies, government research institutes and universities.

For applications in ordnance detection specifically, operations have been concentrated geographically within the United States and Canada, primarily at military installations and unpopulated target ranges.

Outside of North America, the EM 61 series has been applied to ordnance detection in several countries, including Australia, England, Germany, Poland, Spain and Malaysia.

**POWER SUPPLY**

Power is supplied from a self-contained, rechargeable 12V gel cell battery mounted on an operator-carried backpack. Two batteries, with chargers, are supplied with each system. Average battery life during continuous operation is 4 hours; optional high power batteries are available for extended applications.

**FACTORY SUPPORT**

> Technical support is provided by Geonics Ltd. directly. Assistance is also available from an extensive network of representatives worldwide.

> An inventory of spare parts is maintained at the factory. The standard warranty provides coverage of coils and cables for six months, and one year on all other components.

> Introductory (half day) training at the factory is included with purchase. Extended training, at the factory or on-site, is available; additional cost is associated with any extended training programme.

> Technical notes, case studies and instruction manuals, included with purchase, are available in English; limited documentation in other languages can be made available on request.
MAINTENANCE AND SUPPORT

> Geometrics say that no maintenance is required on the G-858 other than cleaning of connectors.

> The system can be operated by one person. The company recommends two operators per system to maximise productivity and to assist in positioning of survey lines.

TEST AND EVALUATION

Several models of the EM 61 series have been tested and evaluated through government-sponsored projects for applications in the detection of ERW. Many papers/reports associated with such tests, beyond those cited below, are published and available for distribution on request.1, 2

Applications in landmine detection have received only limited consideration. Preliminary indications suggest that the EM 61-Mk2 would be sensitive to larger (e.g. anti-tank) targets only.

REPORTED LIMITATIONS AND STRENGTHS

The manufacturer says that specific applications can be limited by available coil configurations. For example, the standard configuration can be difficult to operate in vegetative overgrowth. Modified operating procedures or application-specific configurations can address most limitations.

Soils with a very high magnetic susceptibility response can present some noise in the data. A recently patented technique should reduce the effect of such noise.

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GENERAL DESCRIPTION

The Minelab F1A4 UXO detector is derived from the F1A4 metal mine detector and incorporates all of the advantages provided through Minelab’s patented Multi-Period-Sensing technology. The detector is particularly useful for “mag and flag” operations in areas of high mineralisation where magnetometers are of little use.

Using the major components of the F1A4 metal mine detector, the F1A4 UXO includes a large (450mm diameter) mono-loop search coil. It also includes an RS232 output for computer logging of target responses which, when coupled to a GPS facility, makes it ideal for ERW detection and mapping.

Using a constant threshold tone, the operator can easily discern the sound of a deeply buried target. Also, the mono-loop design of the search coil ensures sensitivity is consistent across the entire surface of the coil producing no blind spots. Consequently, the risk of missing ERW targets is reduced and pinpointing is enhanced.

WORKING METHODOLOGY

The F1A4 UXO is a pulse induction detector (time domain) that can be effectively used in all soil conditions. This is achieved via the F1A4 UXO electronics that produce two target channels and one ground channel. Using Multi-Period-Sensing to identify interference from the ground, complex algorithms remove the interference while maintaining appropriate sensitivity in the target channels.

The F1A4 UXO also incorporates a “noise cancel” feature, which allows an operator to conduct a simple procedure to reduce or eliminate any environmental interference resulting from, for example, other detectors in close proximity or overhead power lines.

DETECTORS IN USE

The F1A4 UXO is currently in service with the Cambodia Mine Action Centre, the US Army and a variety of other NGOs, commercial demining companies and militaries.

POWER SUPPLY

- Operates with 4 x D cell commercially available alkaline and rechargeable batteries.
- Operating periods: alkaline – 24 hours, rechargeable – 12 hours.
- Minelab’s F Series Battery Charger provides automatic, intelligent and fast charging capability as a cost-effective power supply solution.

FACTORY SUPPORT

- Customer support is provided from Minelab’s facilities in Australia, the US or Ireland.
- Minelab offers “train the trainer” operator and technical maintenance training, in the field or in a classroom.
> All training documentation is provided free as part of a training management plan. The principal language is English with other languages provided on request.

> Minelab trainers are experienced instructors qualified in adult education techniques.

> Where required, Minelab establishes in-country technical repair and maintenance for all warranty and non-warranty repairs. This provides timely access to spare parts.

> Where applicable, routine customer visits to provide on-going advice on training and maintenance are provided free of charge as part of Minelab’s global travel plans.

> Manufacturer’s warranty is for 15 months with extended warranty provided on a case-by-case basis.

**MAINTENANCE SUPPORT**

> All F1A4 UXO components are interchangeable and require no routine calibration.

> Diagnostics, fault finding and component replacement can occur in the field as part of Minelab’s Level 1 repair and maintenance philosophy.

> Level 2 maintenance requires basic soldiering skills with minimal workshop facilities.

**TEST AND EVALUATION**

The following trials have been conducted on the F1A4 UXO:

> Internal Minelab trials.

> Cambodian Mine Action Centre.


The 2004 report is available at the ITEP website: [www.itep.ws](http://www.itep.ws).

**REPORTED LIMITATIONS AND STRENGTHS**

**Limitations**

Did not ground compensate effectively in very difficult soil. 1

**Strengths**

> Simple to use.

> Lightweight.

> Speed of pinpointing.

> All-round sensitivity of mono-loop coil.

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GENERAL DESCRIPTION

The 3D Borehole Radar (3D BHR) is a ground penetrating radar system that is operated from a borehole. It is a directional system (in contrast to omni directional borehole radar systems) which enables 3D localisation of detected objects. Detection targets of interest include explosives, underground infrastructure, oil and gas reservoirs and geology. For humanitarian demining, targets of interest are deep-lying (> 3m below surface) bombs.

The 3D BHR system’s geophysical technique, applied in a single borehole, combines all the advantages of ground-penetrating-radar tools in one piece of equipment: it provides high-resolution data with directional information up to 1 degree accuracy in angular direction and with a penetration range up to 15m. This is a particularly promising technology as it allows ERW survey to greater depths with very high accuracy and in difficult circumstances.

The Borehole Radar has four main parts

- Positioning unit,
- Radar unit,
- Cable (power supply and data transmission), and
- Operating and processing software.

The whole system is pulled or pushed through a non-metallic cased and water-filled borehole. It was developed by T&A Survey in cooperation with TNO-FEL, the National Air and Space Travel laboratory and the Dutch Department of Defence. The technology is patented.

WORKING METHODOLOGY

The 3D BoreHole Radar system transmits electromagnetic pulses with a centre frequency of around 100MHz. During measurements, radar waves are emitted into the subsurface by means of a transmitter antenna situated in the borehole. When the transmitted wave meets a contrast in material parameters (caused by an object or geological boundary), part of the wave is reflected and received by the receiver antenna, situated in the same borehole. The remaining part of the wave travels further away from the borehole and reflects on the next material boundary. By rotating the antenna system and moving the system vertically in the borehole a continuous 3D image of the subsurface is obtained. The travel time of the radar wave between the moment of sending, reflecting and receiving is measured. When information about the speed of the radar waves in the subsurface is available, the travel times can be converted to determine the distance and direction of the reflector.

The detection range of the 3D BHR is up to 15m in every direction, depending on electric conductivity and permittivity of the soil. The resolution is high (objects up to 200mm can be detected).
DETECTORS IN USE
At the moment there is one field system in use. An industrial series is in progress.

POWER SUPPLY
The 3D Borehole Radar relies on an external power supply of 230V AC/50Hz (at least 3kW; the power consumption per hour – 40 to 100 W – depends on the type of operation;) or on a 24V DC battery (operational life of battery is about 12 hours). Rechargeable batteries can be used.

FACTORY SUPPORT
> The system is covered by a 12-month-warranty. A worldwide service network ensures quick availability of spare parts.
> Operation and maintenance training can be provided at the manufacturer’s facilities or on site.
> Instruction and maintenance manuals are available in English.

MAINTENANCE SUPPORT
The 3D Borehole Radar requires a crew of two operators.

TEST AND EVALUATION
The 3D Borehole Radar has extensively tested for ERW detection. Test reports are available on request.

REPORTED LIMITATIONS AND STRENGTHS
The system works best in sandy soils and non-conductive (fresh) water.
Due to a lack of independent test reports no further information can be provided.
GENERAL DESCRIPTION

The Vallon EL1302 D2 ferrous locator is a highly sensitive difference magnetometer used for the detection of bombs, shells, mortar projectiles and other unexploded ordnance. It indicates any disturbance caused in the earth’s magnetic field by buried ferrous objects, providing indications to the operator both acoustically and visually. The EL1302 D2 is used for land-based detection while the EL1303 D2 is used for detection under water and in boreholes. The locators in both models have an interface for Vallon data loggers.

The detectors are designed for all-weather use, using glass fibre and carbon fibre materials to reduce its weight. It is equipped with a digital signal output for direct connection of all Vallon data loggers and for direct data recording in conjunction with a commercial laptop computer running the Vallon EVA2000 software. To relate the exact X-Y coordinates to the measuring data, the Vallon sensor positioning system (SEPOS) or a global positioning system (GPS) receiver with antenna and a GPS reference station receiver can be connected.

Operation is simple, with only a short training period required.

Main components are

- Electronics unit with battery compartment.
- Sensor part with carrying bar and control unit.
- Non-magnetic headset.
- Carrying belt.
- One set (6 EA) Round cells 1.5V IEC R 14 Alkaline C cell, 7.8 Ah each.
- Operation manual.
- Aluminium shipping and storage case.

The detector complies to environmental conditions according to MIL STD 810E 501.3, 502.3, 503.3, 506.3, 514.4.

WORKING METHODOLOGY

The Vallon differential magnetometers work on the principle of measuring the distortion of the earth magnetic field. Two sensors for the magnetic field, which are adjusted for the machine's lifetime, are vertically mounted in a tube 50cm apart to measure the earth’s magnetic field. Both values are subtracted and result in zero. A ferromagnetic target disturbs the homogenous field and results in two different values so that the difference is not zero. Depending on the signal amplitude and polarity the alarm signal is computed.

DETECTORS IN USE

The locators are in service with many commercial ordnance disposal organisations, several NATO partners and other armed forces.
POWER SUPPLY
The two models are powered by six 1.5V round cells IECR14 alkaline or rechargeable 1.2V Ni-MH-Batteries RSH 1.8. The operational life of batteries is said to be approximately 20 hours with alkaline batteries without the data logger and depending on age, quality and capacity of the batteries.

FACTORY SUPPORT
- Vallon runs a worldwide servicing network with all current spare parts in stock. Spare parts can be delivered with a corresponding maintenance manual directly to the customer for on-site repair.
- Operation and maintenance training are offered either in the Vallon facilities or at a location required by the customer.
- Operation and maintenance manuals are available in German and English. Other languages on request.
- Warranty of 24 months.

MAINTENANCE SUPPORT
There are no special requirements for technicians or workshop facilities. All tools needed are standard and available in most workshops. The sensors do not need any adjustment.

TEST AND EVALUATION
The manufacturer allows access to several test reports.

REPORTED LIMITATIONS AND STRENGTHS
Detection of ferrous targets only.
GENERAL DESCRIPTION

The Vallon VMX3 Metal and UXO Detector has been designed for the detection of buried metal-cased mines and non exploded ordnance in larger depths. The special UXO firmware ignores small metal parts. Ease of operation and a robust mechanical design ensure very reliable operation for professional ordnance clearing in battlefield operations, in military training programmes and in humanitarian demining.

Along with its digital signal processor the VMX3 uses an advanced pulse-field function specially improved by Vallon. It can also work in mineralized soils, such as laterite, magnetite and magmatite as well as in shallow salt and fresh water and under the electromagnetic influence of main power lines without greatly affecting sensitivity. The VMX3 is specially recommended in strong ferruginous soils where the standard ferrous locators (fluxgate sensors) are not working.

Data input allows for further upgrades of the detector firmware, and data output enables measured data to be evaluated using Vallon EVA2000 software, running on a laptop or personal computer. The detector can also be connected to Vallon data loggers.

Main components are

- Large search head with telescopic pole.
- Detector electronics with integrated non-magnetic loudspeaker, power supply and battery compartment. Watertight sockets for the search head and headset/data in- and output RS 232 on the front panel of the housing as well as visual indication of operational readiness, programme selector with integrated ON/OFF switch, “COMP” key for automatic fine adaptation to mineralised soil and control knob for setting the volume and detection sensitivity.
- Non-magnetic test piece.
- Carrying bag for electronics unit.
- Carrying belt for electronics unit.
- Handle, armrest and supplementary arm-belt.
- Headset.
- One set (4 EA) single cell batteries 1.5V IEC R 20/D cell alkaline.
- Operation and field manuals.
- Soft case, which can be used as backpack.

The detector complies to environmental conditions according to MIL STD 810F, 501.4-II, 502.4-I, 502.4-II, 505.4, 506.4-III, 514.5 C1.

WORKING METHODOLOGY

The search head continuously emits electromagnetic pulses as the operator sweeps close to the surface.

The search head acts as both an emitter and a receiver sensing the pulsed field. If there is a metal object in the magnetic field, the following happens:

- The electronics unit detects a deviation from the previous state: thus an alarm signal is produced depending on the size of the metal target.
The shape of the pulse in the VMX3 is bipolar to reduce the effect on magnetically fuzed mines.

For use worldwide under different soil conditions, the VMX3 is provided with a programme to set the optimal detection features. The correct programme setting and the wide range of detection sensitivity allow detection of plastic mines with big metal content in mineralised soil and also near to 50-60Hz-power lines.

The detector has a built-in test procedure to continuously check reliability and functioning during operation. The pulse signal generation, signal processing, battery voltage, external connections and – most important – the internal operation voltages are constantly monitored. Visual and acoustic alarms are produced when a fault is found. The detector’s high reliability allows the user to operate the VMX3 easily and concentrate fully on detection tasks.

DETECTORS IN USE
The detectors are in service with commercial mine clearance organisations and several armed forces (including NATO members).

POWER SUPPLY
> VMX3 is powered by four 4 x 1.5V mono-cell IECLR 20 (ANSI STD. D cell) or rechargeable KR35/62.
> Operational life of battery is 8 to 30 hours depending on age, quality and capacity of the batteries.

FACTORY SUPPORT
> Vallon runs a worldwide servicing network with all current spare parts in stock. Spare parts can be delivered with a corresponding maintenance manual directly to the customer for on-site repair.
> Operation and maintenance training are offered either in the Vallon facilities or at a location required by the customer.
> Operation and maintenance manuals are available in German and English. Other languages on request.
> Warranty for 24 months.

MAINTENANCE SUPPORT
There are no special requirements for technicians or workshop facilities. All tools needed are standard and available in most workshops. For each detector a maintenance manual is available, with step-by-step explanations for repairs.

TEST AND EVALUATION
The manufacturer allows access to several test reports.

REPORTED LIMITATIONS AND STRENGTHS
There are no limitations for terrain, soil and vegetation.
GENERAL DESCRIPTION

The Vallon VXC1 differential magnetometer is a very compact portable and robust instrument for explosive ordnance detection on land and in shallow waters. Due to its compact and lightweight construction it is highly recommended for detection work in dense vegetation and during digging activities.

The modern electronics are designed to withstand all typical environmental and vibration requirements and meet MIL STD 810F. Detected objects are clearly indicated by audio signal and the LED-bar graph in the hand grip.

Operator controls are limited to a mode selector and three push-buttons for sensitivity level, audio signal volume and compensation/ground balance. The detector can be used with minimal operator training.

Main components are
- Locator VXC1.
- One set (2 EA) single-cell batteries IEC R20/D cell.
- Operation manual.
- Field backpack.

Optional accessories (available on request) include a headset and a hard case.

The detector complies to environmental conditions according to MIL STD 810F, 501.4-II, 502.4-I, 502.4-II, 503.4, 506.4-III, 514.5 C1.

WORKING METHODOLOGY

The Vallon differential magnetometer measures the distortion of the earth’s magnetic field by ferromagnetic items through two sensors – adjusted for machine’s lifetime – vertically mounted in a tube 25cm apart. Normally both values are subtracted and result in zero. When a ferromagnetic target disturbs the homogenous field the difference in two values is not zero. Depending on the signal amplitude and polarity the alarm signal is computed.

DETECTORS IN USE

The locators are in service with various humanitarian and commercial mine clearance organisations.

POWER SUPPLY
- VXC1 is powered by two 1.5V single-cells IECR20 or rechargeable 1.24 V Ni-MH-batteries RSH 4KR.
- The operational life of batteries is said to be approximately 120 hours with alkaline batteries depending on age, quality and capacity of the batteries.
FACTORY SUPPORT

> Vallon runs a worldwide servicing network with all current spare parts in stock. Spare parts can be delivered with a corresponding maintenance manual directly to the customer for on-site repair.

> Operation and maintenance training are offered either in the Vallon facilities or at a location required by the customer.

> Operation and maintenance manuals are available in German and English. Other languages on request.

> Warranty for 24 months.

MAINTENANCE SUPPORT

There are no special requirements for technicians or workshop facilities. All tools needed are standard and available in most workshops. The sensors do not need any adjustment.

TEST AND EVALUATION

The manufacturer allows access to several test reports.

REPORTED LIMITATIONS AND STRENGTHS

Detection of ferrous targets only.
## Technical Specifications

### Detector

1. **Brand**
   - BGIF
2. **Model**
   - CCT-2
3. **Version**
   - 01 | 2005
4. **Used detection technology**
   - Difference magnetometer working on fluxgate principle

### Dimensional Data

5. **Working length**
   - > min. length
   - > max. length
   - 1100 mm (search pole)
6. **Search head**
   - > Size
   - > Weight
   - > Shape
   - Ø 40 x 750 mm
   - 2.23 kg
   - Tube
7. **Transport case**
   - > Weight
   - > With equipment (full)
   - > Dimensions
   - > Hard | Soft case (material)
   - 6.2 kg
   - 12.5 kg
   - 820 x 380 x 170 mm
   - Hard case | aluminum
8. **Weight, hand-held unit**
   - —
9. **Weight, carrying (operational detection set)**
   - —
10. **Weight, additional equipment**
    - —
11. **Weight distribution | Balance**
    - —
12. **Other specifications**
    - —

### System Status and Deployment

13. **Status**
    - In production
14. **Detectors | Systems in use to date**
    - Not given
15. **Other types**
    - —
16. **Location of use**
    - Worldwide

### Environmental Influence

17. **Humidity (limitations)**
    - MIL STD
18. **Temperature (limitations)**
    - > Storage
    - > Operational
    - - 50°C to + 70°C
    - - 20°C to + 50°C
19. **Water resistant**
    - Yes
20. **Shock | Vibration resistant**
    - Yes
21. **Environmental Compensation**
    - Manual, cannot be used in magnetic soil
22. **Operational hours | Operating endurance**
    - Over 8 hours
DETECTION OPERATION

23. Calibration | Set-up
   - Auto | Manual
   - Duration

24. Detection range | Sensitivity details | Detection performance | Working depth
   - Control of working depth
   - Low-metal-content mines
   - Anti-vehicle mines
   - ERW (please specify)

25. Output indicator
   Visual by real-time display on LCD screen

26. Pinpointing feature
   Yes

27. Adjustment of search head angle
   Yes

28. Soil influence
   See item 29

29. Best use in
   - Sand
   - Peat
   - Clay
   - Ferruginous soil (laterite)

30. Optimal sweep speed
   0.2 - 1 m/s

31. Search coil | Antenna
   Tube

32. Limitations
   Only ferromagnetic targets

33. Interference (with other detectors)
   Same detector type no

POWER

34. Power supply | Source
   4.4 Ah rechargeable Lithium battery pack (over 2y)

35. Operating time
   Over 8 hours

36. Power supply
   - weight
   - no. of batteries | size | type
   - rechargeable
   - other

37. Price
   - for one detector
   - reduction for higher quantity
   Not given
   Yes

38. System price
   - with training
   - spare parts
   - software
   - extended warranty
   - extended warranty
   Upon request
   Upon request
   Upon request
   Upon request

39. Total
   —

40. Possibility to rent/lease
   Upon request

OTHERS

41. Duration of warranty
   24 months

42. Additional equipment
   —

43. Additional technical data | information
   —

44. Compliant standards
   ISO-9001
TECHNICAL SPECIFICATIONS

DETECTOR

1. Brand
   CEIA
2. Model
   MIL-D1 / DS
3. Version
   6.0
4. Used detection technology
   Electromagnetic induction | CW (Continuous Wave)

DIMENSIONAL DATA

5. Working length
   > min. length
   Telescopic pole 1120 mm
   > max. length
   Telescopic pole 1620 mm
6. Search head
   > Size
   Ø 280 mm (external diameter)
   > Weight
   —
   > Shape
   2 x Circular
7. Transport case
   > Weight
   7.8 kg
   > With equipment (full)
   14 kg
   > Dimensions
   950 x 440 x 155 mm
   > Hard | Soft case (material)
   High impact polypropylene / synthetic canvas
8. Weight, hand-held unit
   —
9. Weight, carrying (operational detection set)
   5.5 kg
10. Weight, additional equipment
    —
11. Weight distribution | Balance
    Well balanced | Optimized for continuous operation
12. Other specifications
    Knob sensitivity adjustment

SYSTEM STATUS AND DEPLOYMENT

13. Status (Development | In production)
    In production
14. Detectors | Systems in use to date
    —
15. Other types | Models
    —
16. Location of use
    Lao, Sudan, Denmark, Egypt, France, Italy, Switzerland, USA, Yemen

ENVIRONMENTAL INFLUENCE

17. Humidity (limitations)
    No influence
18. Temperature (limitations)
   > Storage
   -55°C to +75°C
   > Operational
   -46°C to +65°C
19. Water resistant (Yes / No)
    Yes | IP68 (IEC 529)
20. Shock | Vibration resistant
    Yes exceeding | MIL STD 810 E
21. Environmental Compensation
    Auto
22. Operational hours | Operating endurance
   > low temperature (around 0°C)
   MTBF = 27500 according to MIL-HDBK 217
   > medium temperature (around 20°C)
   MTBF = 22500 according to MIL-HDBK 217
   > high temperature (higher than 30°C)
   At 35°C MTBF = 18000 according to MIL-HDBK 217
## DETECTION OPERATION

23. Calibration | Set-up
   - Auto | Manual: Automatic
   - Duration: No limit

24. Detection range | Sensitivity details | Detection performance | Working depth
   - Small metal content mines (type of mine): Optimized according to the UXOs and soils
   - Anti-tank mines (type of mine): Optimized according to the mines and soils
   - ERW (please specify): Optimized according to the mines and soils

25. Output indicator: Sound and bar display

26. Pinpointing feature: Bar display and pulsing tone

27. Adjustment of search head angle: 0° front | 90° rear

28. Soil influence: Automatically compensated

29. Best use in
   - Sand: Yes
   - Peat: Yes
   - Clay: Yes
   - Ferruginous soil (laterite): Yes

30. Optimal sweep speed: From 0cm/s to the maximum human operator walking speed

31. Search coil | Antenna: Circular

32. Limitations: —

33. Interference (with other detectors): —

## POWER

34. Power supply | Source: 4x1.5 V alkaline batteries or 4x1.2 V NI-MH rechargeable batteries

35. Operating time
   - > 18 hours with alkaline batteries;
   - > 16 hours with rechargeables batteries

36. Power supply | weight
   - > no. of batteries | size | type: Total for 4 batteries
     - = 0.580 kg (alkaline batteries)
     - = 0.61 kg (rechargeables batteries)
   - 4 ANSI Std D | IEC Std LR20, alkaline or rechargeable

37. Price
   - for one detector on request: —
   - reduction for higher quantity: —

38. System price
   - with training: —
   - spare parts: —
   - extended warranty: —

39. Total: —

40. Possibility to rent/lease: —

## COSTS

41. Duration of warranty: —

42. Additional equipment: Battery charger MIL-D1/BC

43. Additional technical data | information: On request

44. Compliant standards: MIL-STD 810 E and others on requests

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### DETECTOR

1. **Brand**: EBINGER
2. **Model**: MAGNEX® 120 LW MAGNETOMETER
3. **Version**: 05 | 2001
4. **Used detection technology**: Difference magnometer using fluxgate principle

### DIMENSIONAL DATA

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; Length</td>
<td>&gt; Size</td>
<td>&gt; Weight</td>
</tr>
<tr>
<td>1'280 mm (complete)</td>
<td>600 x 43 mm</td>
<td>3 kg</td>
</tr>
<tr>
<td>&gt; Probe</td>
<td>&gt; Weight</td>
<td>4.2 kg</td>
</tr>
<tr>
<td>600 mm</td>
<td>&gt; Shape</td>
<td>800 x 280 x 180 mm</td>
</tr>
<tr>
<td></td>
<td>&gt; With equipment (full)</td>
<td>Hard plastic</td>
</tr>
<tr>
<td></td>
<td>&gt; Dimensions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; Hard</td>
<td>Soft case (material)</td>
</tr>
<tr>
<td></td>
<td>&gt; Shape</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.5 kg</td>
<td></td>
</tr>
</tbody>
</table>

### SYSTEM STATUS AND DEPLOYMENT

<table>
<thead>
<tr>
<th>13. Status (Development</th>
<th>In production)</th>
<th>14. Detectors</th>
<th>Systems in use to date</th>
</tr>
</thead>
<tbody>
<tr>
<td>In production</td>
<td>More than 1,200</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### ENVIRONMENTAL INFLUENCE

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 95%</td>
<td>-53°C to +70°C</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>-30°C to +55°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>21. Environmental Compensation</th>
<th>22. Operational hours</th>
<th>Operating endurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto</td>
<td>Manual</td>
<td>Up to 75h, depends on type of battery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Up to 75h, depends on type of battery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Up to 75h, depends on type of battery</td>
</tr>
</tbody>
</table>
## DETECTION OPERATION

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>24. Detection range</td>
<td>Sensitivity details</td>
<td>Detection performance</td>
<td>Working depth</td>
<td>Sensitivity adjustment manual</td>
<td>auto</td>
<td>Depending on their size, material and the local interference</td>
</tr>
<tr>
<td>25. Output indicator</td>
<td>Optical, sound and data output</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. Pinpointing feature</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Adjustment of search head angle</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Soil influence</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. Best use in</td>
<td>Sand</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. Optimal sweep speed</td>
<td>0.2 - 1.5m per second</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. Search coil</td>
<td>Probe 600 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. Limitations</td>
<td>Only ferromagnetic material</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. Interference (with other detectors)</td>
<td>&lt; Safety distance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## POWER

<table>
<thead>
<tr>
<th>34. Power supply</th>
<th>Battery</th>
</tr>
</thead>
<tbody>
<tr>
<td>35. Operating time</td>
<td>See point 23</td>
</tr>
<tr>
<td>36. Power supply</td>
<td></td>
</tr>
<tr>
<td>37. Price</td>
<td>US$4,000 - US$5,000</td>
</tr>
<tr>
<td>38. System price</td>
<td>On request</td>
</tr>
<tr>
<td>39. Total</td>
<td>—</td>
</tr>
<tr>
<td>40. Possibility to rent/lease</td>
<td>On request</td>
</tr>
</tbody>
</table>

## COSTS

| 41. Duration of warranty | 24 months |
| 42. Additional equipment | Borehole cable |
| 43. Additional technical data | — |
| 44. Compliant standards | EMC tests according to MIL-STD 461 D, DIN EN ISO 9001:2000 |
# Technical Specifications

## Detector

<table>
<thead>
<tr>
<th>1. Brand</th>
<th>FOERSTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Model</td>
<td>FEREX 4.032</td>
</tr>
<tr>
<td>3. Version</td>
<td>API, DLG, DLG Kartograph</td>
</tr>
<tr>
<td>4. Used detection technology</td>
<td>Metal detector working by fluxgate magnetometers</td>
</tr>
</tbody>
</table>

## Dimensional Data

| 5. Working length | Approx. 1.4 m |
| 6. Search sensor  | Length 853 x 1.800 mm | Ø 35 mm |
|                   | 0.55 - 1 kg |
| 7. Transport case | Approx. 4 kg |
|                   | Length 995 x 265 x 335 mm |
|                   | Hardcase | plastics |
| 8. Weight, hand-held unit | Approx. 4 kg |
| 9. Weight, carrying (operational detection set) | Approx. 4 kg |
| 10. Weight, additional equipment | Headphone 0.1 kg |
| 11. Weight distribution | Balanced around the handgrip |

## System Status and Deployment

| 13. Status (Development | In production) | In production |
| 14. Detectors | Systems in use to date | — |
| 15. Other types | Models | — |
| 16. Location of use | — |

## Environmental Influence

| 17. Humidity (limitations) | No limitations |
| 18. Temperature (limitations) | -57°C to +70°C |
|                            | -37°C to +70°C |
| 19. Water resistant (Yes / No) | Sensor is 100m sea-waterproof. Electronics unit is highly splash-proof. See MIL-STD specs. |
| 21. Environmental Compensation | 6 operation modes for suppression of electromagnetic influences and filter for big/small objects. |
| 22. Operational hours | Operating endurance | Depending on working rhythm and instrument type: approx. 35 - 80h with alkaline batteries. |

## Detection Operation

| 23. Calibration | Set-up | — |
| 24. Detection range | Sensitivity details | No |
| Detection performance | Working depth | Full metal case (ferromagnetic) approx. 2m |
| Low-metal-content (type of mine) | | Hand grenade: approx. 50cm; 500lbs bomb (Mk 82): 4-6m max.; |
| Anti-vehicle mines (type of mine) | | 1,000lb bomb: 5-8m. max. |
25. Output indicator
Audio by inbuilt speaker or headphones, visible by pointer instrument and on screen via evaluation software Dataline.

26. Pinpointing feature
—

27. Adjustment of search head angle
Manual

28. Soil influence
—

29. Best use in
> Sand
> Yes
> Peat
> Yes
> Clay
> Yes
> Ferruginous soil (laterite)
> Yes

30. Optimal sweep speed
—

31. Search coil | Antenna
—

32. Limitations
—

33. Interference (with other detectors)
No

### POWER

34. Power supply | Source
Battery

35. Operating time
35 | 80 hrs with alkaline batteries

36. Power supply
< weight
Not applicable since forming part of the unit
< no. of batteries | size | type
4 x 1.5V mono-cell IECLR (ANSI standard size D)
< rechargeable
Possible
< other
—

### COSTS

37. Price
> for one detector on request
More than US$5,000
> reduction for higher quantity
Yes

38. System price
> with training
Depending on quantity
> spare parts
Depending on quantity
> extended warranty
Available on request

39. Total
T.B.D.

40. Possibility to rent/lease
Available

### OTHERS

41. Duration of warranty
24 months

42. Additional equipment
Headphones, workshop equipment and tools, GPS, multiprobe-holders (hand-held and vehicle-based), underwater cables, borehole equipment

43. Additional technical data | information
Service manuals, training programme

44. Compliant standards
Military standards
- MIL-STD 810E 514.4-1 Vibration
- MIL-STD 810E 516.4 Mechanical shock, Procedure I
- MIL-STD 810E 516.4 Drop test, Procedure IV
- MIL-STD 810E 501.3 High temperatures
- MIL-STD 810E 502.3 Low temperatures
- MIL-STD 810E 506.3-1 Rain
- MIL-STD 810E 503.3 Temperature shock (transport)
- MIL-STD 810E 512.2 Leak test
- MIL-STD 810E 505.3 Solar radiation (sunshine), Procedure I

- MIL-STD 461DRE 102 5.3.13.1 Radiation
- MIL-STD 461DRS 103 Irradiation

- EMC according to MIL-STD 461D
## DETECTOR

1. **Brand**: GEOMETRICS
2. **Model**: G-858
3. **Version**: Man carry and tiwable version (back pack and non-magnetic cart versoins are available)
4. **Used detection technology**: Self oscillationg split-beam cesium vapor (non-radioactive)

## DIMENSIONAL DATA

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; Min. Length</td>
<td>&gt; Size</td>
<td>&gt; Weight</td>
<td></td>
<td>Sensor + staff + counter balance = 3 kg (6.5 lbs)</td>
<td>—</td>
<td>Balanced</td>
<td>—</td>
</tr>
<tr>
<td>&gt; Max. Length</td>
<td>&gt; Weight</td>
<td>&gt; With equipment (full)</td>
<td></td>
<td>Waist console + battery belt = 5.9 kg (13 lbs)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>2.4 m (6 feet)</td>
<td>Ø 60.32 mm</td>
<td>0.34 kg (12 ounces)</td>
<td>Hard case</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

## SYSTEM STATUS AND DEPLOYMENT

13. **Status (Development | In production)**: In production
14. **Detectors | Systems in use to date**: > 2,000 sensors | > 500 of model G-858
15. **Other types | Models**: Airborne and marine magnetometer types
16. **Location of use**: US and Hawaii, Japan, China, Europe, Cambodia, Vietnam and all theaters of war

## ENVIRONMENTAL INFLUENCE

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>-35°C to +60°C</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>3 foot drop</td>
<td>None</td>
<td>Unaffected</td>
</tr>
<tr>
<td>-15°C to +50°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### DETECTION OPERATION

23. Calibration | Set-up
   - Auto | Manual
   - Duration
   - The sensors never need calibration or alignment

24. Detection range | Sensitivity details | Detection performance | Working depth
   - Small metal content (type of mine)
   - Anti-tank mines (type of mine)
   - ERW (please specify)
   - Depends on the size and the material of the object being detected, typically 2 kg at 3 m

25. Output indicator
   - Daylight readable LCD display and audio tone

26. Pinpointing feature
   - The LCD displays the peak amplitude over the target

27. Adjustment of search head angle
   - Fully adjustable

28. Soil influence
   - Highly magnetic soils cause field distortion (Kaulave)

29. Best use in
   - Sand
   - Peat
   - Clay
   - Ferruginous soil (laterite)
   - Any sweep speed is ok

30. Optimal sweep speed
   - None known, certain EM gear (EM-61 will interfere with magnetometer)

31. Search coil | Antenna
   - Omnidirectional sensor head

32. Limitations
   - —

33. Interference (with other detectors)
   - —

### POWER

34. Power supply | Source
   - Rechargeable battery

35. Operating time
   - 8 hours for single sensor model
   - 3 | 4 hours for 2 sensors gradiometer version

36. Power supply
   - weight
   - no. of batteries | size | type
   - rechargeable
   - other
   - 1.4 kg (9 lbs) (worn around waist)
   - Dual 12V Gel Cell, magnetically compensated Yes

### COSTS

37. Price
   - for one detector on request
   - other information regarding price
   - reduction for higher quantity
   - More than US$5,000
   - Approximately $18K
   - Yes

38. System price
   - with training
   - spare parts
   - extended warranty
   - 1 day training included
   - Prices on request
   - Available

39. Total
   - Contact factory www.geometrics.com

40. Possibility to rent/lease
   - Yes

### OTHERS

41. Duration of warranty
   - One year parts and labor

42. Additional equipment
   - Non-magnetic carts, GPS, steering, data processing, OXO characterization software

43. Additional technical data | information
   - Contact factory

44. Compliant standards
   - Civil
<table>
<thead>
<tr>
<th>DETECTOR</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Brand</td>
<td>GEONICS</td>
</tr>
<tr>
<td>2. Model</td>
<td>EM 61HH - Mk2</td>
</tr>
<tr>
<td>3. Version</td>
<td>—</td>
</tr>
<tr>
<td>4. Used detection technology</td>
<td>Time domain electromagnetic induction</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DIMENSIONAL DATA</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Working length</td>
<td></td>
</tr>
<tr>
<td>&gt; Min. Length</td>
<td>1 m</td>
</tr>
<tr>
<td>&gt; Max. Length</td>
<td>1.5 m</td>
</tr>
<tr>
<td>6. Search head</td>
<td></td>
</tr>
<tr>
<td>&gt; Size</td>
<td>33 x 20 cm</td>
</tr>
<tr>
<td>&gt; Weight</td>
<td>2.8 kg</td>
</tr>
<tr>
<td>&gt; Shape</td>
<td>Elliptical</td>
</tr>
<tr>
<td>7. Transport case</td>
<td></td>
</tr>
<tr>
<td>&gt; Weight</td>
<td>—</td>
</tr>
<tr>
<td>&gt; With equipment (full)</td>
<td>50 kg</td>
</tr>
<tr>
<td>&gt; Dimensions</td>
<td>117 x 50 x 54 cm</td>
</tr>
<tr>
<td>&gt; Hard</td>
<td>Soft case (material)</td>
</tr>
<tr>
<td>8. Weight, hand-held unit</td>
<td>—</td>
</tr>
<tr>
<td>9. Weight, carrying (operational detection set)</td>
<td>4 kg</td>
</tr>
<tr>
<td>10. Weight, additional equipment</td>
<td>7.5 kg with optional wheels</td>
</tr>
<tr>
<td>11. Weight distribution</td>
<td>Balance</td>
</tr>
<tr>
<td>12. Other specifications</td>
<td>—</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>SYSTEM STATUS AND DEPLOYMENT</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>13. Status (Development</td>
<td>In production)</td>
</tr>
<tr>
<td>14. Detectors</td>
<td>Systems in use to date</td>
</tr>
<tr>
<td>15. Other types</td>
<td>Models</td>
</tr>
<tr>
<td>16. Location of use</td>
<td>Worldwide</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENVIRONMENTAL INFLUENCE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>17. Humidity (limitations)</td>
<td>100%</td>
</tr>
<tr>
<td>18. Temperature (limitations)</td>
<td></td>
</tr>
<tr>
<td>&gt; Storage</td>
<td>-40°C to +50°C</td>
</tr>
<tr>
<td>&gt; Operational</td>
<td>-30°C to +50°C</td>
</tr>
<tr>
<td>19. Water resistant (Yes / No)</td>
<td>Yes</td>
</tr>
<tr>
<td>20. Shock</td>
<td>Vibration resistant</td>
</tr>
<tr>
<td>21. Environmental Compensation</td>
<td>Auto</td>
</tr>
<tr>
<td>22. Operational hours</td>
<td>Operating endurance</td>
</tr>
<tr>
<td>&gt; low temperature (around 0°C)</td>
<td>3.5h</td>
</tr>
<tr>
<td>&gt; medium temperature (around 20°C)</td>
<td>4h</td>
</tr>
<tr>
<td>&gt; high temperature (higher than 30°C)</td>
<td>4h</td>
</tr>
</tbody>
</table>
DETECTION OPERATION

23. Calibration | Set-up
   > Auto | Manual  Auto
   > Duration  10s

24. Detection range | Sensitivity details |
    Detection performance | Working depth
   > Low metal content mines (type of mine)  No
   > Anti-tank mines (type of mine)  Yes
   > ERW (please specify)  20 mm cartridge to 0.7m,
                          103 mm projectile to 1.3m

25. Output indicator  Sound, graphic display

26. Pinpointing feature  Yes

27. Adjustment of search head angle  Yes

28. Soil influence  Extreme magnetic susceptibility

29. Best use in
   > Sand  Yes
   > Peat  Yes
   > Clay  Yes
   > Ferruginous soil (laterite)  Yes

30. Optimal sweep speed  1 m/s

31. Search coil | Antenna
   —

32. Limitations
   —

33. Interference (with other detectors)  Variable, depending on detector type

POWER

34. Power supply | Source  12V rechargeable gel cell battery

35. Operating time  4 hours

36. Power supply
   > weight  4.5 kg
   > no. of batteries | size | type  1
   > rechargeable  Yes
   > other  Optional high power battery

COSTS

37. Price
   > for one detector on request  More than US$5,000
   > reduction for higher quantity
   —

38. System price
   > with training  Additional US$600 per day
   > spare parts  Available upon request
   > extended warranty  N/A

39. Total  US$19,375

40. Possibility to rent/lease  Yes

OTHERS

41. Duration of warranty  6 months on coils, cables and batteries
   12 months on other components

42. Additional equipment  Includes hand-held PC for data storage and GPS capabilities

43. Additional technical data | information
   —

44. Compliant standards  Hazards of electromagnetic radiation on ordnance
## DETECTOR

<table>
<thead>
<tr>
<th>1. Brand</th>
<th>MINELAB</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Model</td>
<td>F1A4 UXO</td>
</tr>
<tr>
<td>3. Version</td>
<td>8</td>
</tr>
<tr>
<td>4. Used detection technology</td>
<td>Pulse induction</td>
</tr>
</tbody>
</table>

## DIMENSIONAL DATA

| 5. Working length | 1,200 mm |
| 6. Search head | Ø 450 mm |
| | Circular with protective skid plate |
| 7. Transport case | |
| | Cordura |
| 8. Weight, hand-held unit | 2.4 kg (control box detached) |
| 9. Weight, carrying (operational detection set) | 4 kg |
| 10. Weight, additional equipment | — |
| 11. Weight distribution | Adjustable |
| 12. Other specifications | Internal speaker and external earset |

## SYSTEM STATUS AND DEPLOYMENT

| 13. Status (Development | In production) | In production |
| 14. Detectors | — |
| 15. Other types | — |
| 16. Location of use | Cambodia, USA, Laos, Iraq, Afghanistan |

## ENVIRONMENTAL INFLUENCE

| 17. Humidity (limitations) | Nil |
| 18. Temperature (limitations) | |
| | Storage -55°C to +75°C |
| | Operational -30°C to +60°C |
| 19. Water resistant (Yes / No) | Yes (control box IP 65) |
| 20. Shock | Yes |
| 21. Environmental Compensation | Auto |
| 22. Operational hours | — |
| | low temperature (around 0°C) 24 hours |
| | medium temperature (around 20°C) — |
| | high temperature (higher than 30°C) — |
DETECTION OPERATION

23. Calibration | Set-up
   > Auto | Manual
   > Duration
      Auto
      2 min assembly | 10 sec. switch and go

24. Detection range | Sensitivity details | Detection performance | Working depth
   > Small metal content mines (type of mine)
      –
   > Anti-tank mines (type of mine)
      Metal mine at 1.0 m
   > ERW (please specify)
      500 lb bomb at 1.8 m

25. Output indicator
   Audio

26. Pinpointing feature
   Edge detection

27. Adjustment of search head angle
   Yes

28. Soil influence
   Automatic rejection and compensation

29. Best use in
   > Sand
      Yes
   > Peat
      Yes
   > Clay
      Yes
   > Ferruginous soil (laterite)
      Yes

30. Optimal sweep speed
   0.6 m per second

31. Search coil | Antenna
   enclosed circular

32. Limitations
   –

33. Interference (with other detectors)
   2 m

POWER

34. Power supply | Source
   4 x D cell alkaline or rechargeable

35. Operating time
   Alkaline 24 hrs rechargeable 12 hrs

36. Power supply
   > weight
      800 gm
   > no. of batteries | size | type
      4 x D cell 1.5V LR20
   > rechargeable
      4 x D cell 4.5 Ahnicad
   > other
      –

COSTS

37. Price
   > for one detector on request
      US$2,000 - US$3,000
   > reduction for higher quantity
      Yes

38. System price
   > with training
      Subject to location and quantity purchased
   > spare parts
      On minelab recommendation
   > extended warranty
      Yes

39. Total
   Subject to quantity purchased

40. Possibility to rent/lease
   On request

OTHERS

41. Duration of warranty
   15 months (extendable on request)

42. Additional equipment
   F Series battery charger

43. Additional technical data | information
   On request

44. Compliant standards
   Designed to MIL STD 810 F
**TECHNICAL SPECIFICATIONS**

**DETECTOR**

<table>
<thead>
<tr>
<th>1. Brand</th>
<th>T&amp;A SURVEY BV</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Model</td>
<td>3D BHR</td>
</tr>
<tr>
<td>3. Version</td>
<td>1</td>
</tr>
<tr>
<td>4. Used detection technology</td>
<td>Directional borehole radar</td>
</tr>
</tbody>
</table>

**DIMENSIONAL DATA**

<table>
<thead>
<tr>
<th>5. Working length</th>
<th>2 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; min. length</td>
<td></td>
</tr>
<tr>
<td>&gt; max. length</td>
<td>4.42 m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6. Search head</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; Size</td>
</tr>
<tr>
<td>&gt; Weight</td>
</tr>
<tr>
<td>&gt; Shape</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7. Transport case</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; Weight</td>
</tr>
<tr>
<td>&gt; With equipment (full)</td>
</tr>
<tr>
<td>&gt; Dimensions</td>
</tr>
<tr>
<td>&gt; Hard</td>
</tr>
</tbody>
</table>

| 8. Weight, hand-held unit | No handheld operation |

| 9. Weight, carrying (operational detection set) | 250 kg |

| 10. Weight, additional equipment | Uphole console | 10 kg |

| 11. Weight distribution | Uniform |

| 12. Other specifications | Cylinder Ø 159 mm |

**SYSTEM STATUS AND DEPLOYMENT**

<table>
<thead>
<tr>
<th>13. Status (Development</th>
<th>In production)</th>
<th>In production</th>
</tr>
</thead>
<tbody>
<tr>
<td>14. Detectors</td>
<td>Systems in use to date</td>
<td>1</td>
</tr>
<tr>
<td>15. Other types</td>
<td>Models</td>
<td>–</td>
</tr>
<tr>
<td>16. Location of use</td>
<td>Worldwide</td>
<td></td>
</tr>
</tbody>
</table>

**ENVIRONMENTAL INFLUENCE**

<table>
<thead>
<tr>
<th>17. Humidity (limitations)</th>
<th>No limitations (operated in water-filled borehole)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. Temperature (limitations)</td>
<td>-30°C to +50°C</td>
</tr>
<tr>
<td>&gt; Storage</td>
<td>0°C to +40°C</td>
</tr>
<tr>
<td>&gt; Operational</td>
<td>–</td>
</tr>
<tr>
<td>19. Water resistant (Yes / No)</td>
<td>Yes</td>
</tr>
<tr>
<td>20. Shock</td>
<td>Vibration resistant</td>
</tr>
<tr>
<td>21. Environmental Compensation</td>
<td>Auto</td>
</tr>
<tr>
<td>22. Operational hours</td>
<td>Operating endurance</td>
</tr>
<tr>
<td>&gt; low temperature (around 0°C)</td>
<td>–</td>
</tr>
<tr>
<td>&gt; medium temperature (around 20°C)</td>
<td>–</td>
</tr>
<tr>
<td>&gt; high temperature (higher than 30°C)</td>
<td>–</td>
</tr>
</tbody>
</table>
DETECTION OPERATION

23. Calibration | Set-up
   > Auto | Manual
   > Duration

24. Detection range | Sensitivity details | Detection performance | Working depth
   > Small metal content mines (type of mine)
   > Anti-tank mines (type of mine)
   > ERW (please specify)

25. Output indicator
26. Pinpointing feature
27. Adjustment of search head angle
28. Soil influence

29. Best use in
   > Sand
   > Peat
   > Clay
   > Ferruginous soil (laterite)

30. Optimal sweep speed

31. Search coil | Antenna
32. Limitations
33. Interference (with other detectors)

POWER

34. Power supply | Source
35. Operating time
36. Power supply
   > weight
   > no. of batteries | size | type
   > rechargeable

37. Price
   > for one detector on request
   > reduction for higher quantity

38. System price
   > with training
   > spare parts
   > extended warranty

39. Total
40. Possibility to rent/lease

COSTS

41. Duration of warranty
42. Additional equipment
43. Additional technical data | information
44. Compliant standards

119
## DETECTOR

1. **Brand**  
   VALLON
2. **Model**  
   EL 1302D2
3. **Version**  
   D2
4. **Used detection technology**  
   Difference magnetometer using fluxgate principle

## DIMENSIONAL DATA

5. **Working length**  
   Approx. 1350 mm
6. **Search head**  
   > **Size**  
     Length approx. 600 mm | Ø approx. 42 mm  
   > **Weight**  
     Approx. 4 kg  
   > **Shape**  
     Tube
7. **Transport case**  
   > **Weight**  
     Approx. 6.3 kg  
   > **With equipment (full)**  
     Approx. 11 kg  
   > **Dimensions**  
     785 x 285 x 140 mm  
   > **Hard | Soft case (material)**  
     Hard case | aluminium
8. **Weight, hand-held unit**  
   Approx. 4 kg (with batteries)
9. **Weight, carrying (operational detection set)**  
   Approx. 4 kg (with batteries)
10. **Weight, additional equipment**  
    Head set 110 g
11. **Weight distribution | Balance**  
    Balanced around the hand grip
12. **Other specifications**  
    –

## SYSTEM STATUS AND DEPLOYMENT

13. **Status (Development | In production)**  
    In production
14. **Detectors | Systems in use to date**  
    Not given
15. **Other types | Models**  
    EL 1303D2 | VET1 | VXC1
16. **Location of use**  
    Worldwide

## ENVIRONMENTAL INFLUENCE

17. **Humidity (limitations)**  
    According to MIN STD 810E
18. **Temperature (limitations)**  
    > **Storage**  
      -57°C to +71°C
    > **Operational**  
      -32°C to +55°C
19. **Water resistant (Yes / No)**  
    Yes
20. **Shock | Vibration resistant**  
    Yes
21. **Environmental Compensation**  
    Auto, cannot be used in magnetic soil
22. **Operational hours | Operating endurance**  
    > **low temperature (around 0°C)**  
      Approx. 20 hours with alkaline batteries depending on operation periods
    > **medium temperature (around 20°C)**  
      –
    > **high temperature (higher than 30°C)**  
      –
## DETECTION OPERATION

### 23. Calibration | Set-up
- **Manual | Automatic**
- **Duration**: A few seconds

### 24. Detection range | Sensitivity details | Detection performance | Working depth
- **Control of working depth**: Sensitivity switch
- **Small metal content mines (type of mine)**: No
- **Anti-tank mines (type of mine)**: Depending on their size, material and the local interference
- **ERW (please specify)**: Depending on their size, material and the local interference

#### 25. Output indicator
- Audio by inbuilt loudspeaker or headset, visual by indication meter, optional real-time-display on screen of data logger or PC with evaluation software VALLO\N EVA 2000®

#### 26. Pinpointing feature
- Yes

#### 27. Adjustment of search head angle
- **Yes**

#### 28. Soil influence
- **Yes**

#### 29. Best use in
- **Sand**: Yes
- **Peat**: Yes
- **Clay**: Yes
- **Ferruginous soil (laterite)**: Limited

#### 30. Optimal sweep speed
- 0 – 1 m/sec

#### 31. Search coil | Antenna
- **tube with Ø 42 mm**

#### 32. Limitations
- **Only ferromagnetic targets**

#### 33. Interference (with other detectors)
- **Same detector type no**

## POWER

### 34. Power supply | Source
- **Battery**

#### 35. Operating time
- See point 22

#### 36. Power supply
- **weight**: 6 batteries approx. 400 g
- **no. of batteries | size | type**: 6 ea. 1,5 V round cells (IEC R 14) C-size
- **rechargeable**: 6 ea. 1,2 V NI-MH-batteries RSH 1.8
- **other**

## COSTS

### 37. Price
- **for one detector on request**: Upon request
- **reduction for higher quantity**: Upon request

### 38. System price
- **with training**: Upon request worldwide
- **spare parts**: Upon request
- **extended warranty**: Upon request

### 39. Total
- –

### 40. Possibility to rent/lease
- Upon request

## OTHERS

### 41. Duration of warranty
- 24 months

### 42. Additional equipment
- Data logger, evaluation software, DGPS, sensor positioning system SEPOS®, multisensor platform

### 43. Additional technical data | information
- DIN EN ISO 9001:2000
- MIL STD 810E, 501.3, 502.3, 503.3, 506.3, 514.4
- MIL STD 461D
## TECHNICAL SPECIFICATIONS

### VALLON

#### DETECTOR

<table>
<thead>
<tr>
<th>1. Brand</th>
<th>VALLON</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Model</td>
<td>EL 1303D2</td>
</tr>
<tr>
<td>3. Version</td>
<td>–</td>
</tr>
<tr>
<td>4. Used detection technology</td>
<td>Difference magnetometer using fluxgate principle</td>
</tr>
</tbody>
</table>

#### DIMENSIONAL DATA

<table>
<thead>
<tr>
<th>5. Working length</th>
<th>Approx. 1350 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Search head</td>
<td>Length approx. 600 mm</td>
</tr>
<tr>
<td></td>
<td>Approx. 0.6 kg</td>
</tr>
<tr>
<td>7. Transport case</td>
<td>Approx. 6.3 kg</td>
</tr>
<tr>
<td></td>
<td>Approx. 12 kg</td>
</tr>
<tr>
<td></td>
<td>785 x 285 x 140 mm</td>
</tr>
<tr>
<td></td>
<td>Hard case</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8. Weight, hand-held unit</th>
<th>Approx. 4 kg (with batteries)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Weight, carrying (operational detection set)</td>
<td>Approx. 4 kg (with batteries)</td>
</tr>
<tr>
<td>10. Weight, additional equipment</td>
<td>Head set 110 g</td>
</tr>
<tr>
<td>11. Weight distribution</td>
<td>Balanced around the hand grip</td>
</tr>
<tr>
<td>12. Other specifications</td>
<td>–</td>
</tr>
</tbody>
</table>

#### SYSTEM STATUS AND DEPLOYMENT

<table>
<thead>
<tr>
<th>13. Status (Development</th>
<th>In production</th>
</tr>
</thead>
<tbody>
<tr>
<td>14. Detectors</td>
<td>Systems in use to date</td>
</tr>
<tr>
<td>15. Other types</td>
<td>Models</td>
</tr>
<tr>
<td>16. Location of use</td>
<td>Worldwide</td>
</tr>
</tbody>
</table>

#### ENVIRONMENTAL INFLUENCE

<table>
<thead>
<tr>
<th>17. Humidity (limitations)</th>
<th>According to MIN STD 810E</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. Temperature (limitations)</td>
<td>-57°C to +71°C</td>
</tr>
<tr>
<td></td>
<td>-32°C to +55°C</td>
</tr>
<tr>
<td>19. Water resistant (Yes / No)</td>
<td>Yes, sensor tube 200 m</td>
</tr>
<tr>
<td>20. Shock</td>
<td>Vibration resistant</td>
</tr>
<tr>
<td>21. Environmental Compensation</td>
<td>Auto, cannot be used in magnetic soil</td>
</tr>
<tr>
<td>22. Operational hours</td>
<td>Operating endurance</td>
</tr>
<tr>
<td></td>
<td>low temperature (around 0°C)</td>
</tr>
<tr>
<td></td>
<td>medium temperature (around 20°C)</td>
</tr>
<tr>
<td></td>
<td>high temperature (higher than 30°C)</td>
</tr>
</tbody>
</table>
DETECTION OPERATION

23. Calibration | Set-up
   - Auto | Manual
   - Duration Manual | Automatic
   - A few seconds

24. Detection range | Sensitivity details | Detection performance | Working depth
   - Control of working depth Sensitivity switch
   - Small metal content mines (type of mine) No
   - Anti-tank mines (type of mine) Depending on their size, material and the local interference
   - ERW (please specify) Depending on their size, material and the local interference

25. Output indicator
   - Audio by inbuilt loudspeaker or headset, visual by indication meter, optional real-time-display on screen of data logger or PC with evaluation software VALLON EVA 2000®

26. Pinpointing feature
   - Yes

27. Adjustment of search head angle
   - See item 29

28. Soil influence
   - Yes

29. Best use in
   - Sand Yes
   - Peat Yes
   - Clay Yes
   - Ferruginous soil (laterite) Limited

30. Optimal sweep speed
   - 0 – 1 m/sec

31. Search coil | Antenna
   - Tube with Ø 32 mm

32. Limitations
   - Only ferromagnetic targets

33. Interference (with other detectors)
   - Same detector type no

POWER

34. Power supply | Source
   - Battery

35. Operating time
   - See point 22

36. Power supply
   - weight
   - no. of batteries | size | type
   - rechargeable
   - other

37. Price
   - for one detector on request Upon request
   - reduction for higher quantity Upon request

38. System price
   - with training Upon request worldwide
   - spare parts Upon request
   - extended warranty Upon request

39. Total
   - –

40. Possibility to rent/lease
   - Upon request

COSTS

41. Duration of warranty
   - 24 months

42. Additional equipment
   - Data logger, evaluation software, DGPS, sensor positioning system SEPOS®, multisensor platform, cable for deep underwater detection

43. Additional technical data | information
   - –

44. Compliant standards
   - DIN EN ISO 9001:2000
   - MIL STD 810E, 501.3, 502.3, 503.3, 506.3, 514.4
   - MIL STD 461D
## TECHNICAL SPECIFICATIONS

### DETECTOR

| 1. Brand | VALLON |
| 2. Model | VMX3 |
| 3. Version | – |
| 4. Used detection technology | Metal detector | Pulse induction |

### DIMENSIONAL DATA

| 5. Working length |
| > min. length | 920 mm (short version) |
| > max. length | 1370 mm (long version) |
| 6. Search head |
| > Size | Ø 615 mm |
| > Weight | With telescopic pole 1.9 kg |
| > Shape | Round |
| 7. Transport case |
| > Weight | Approx 3.5 kg |
| > With equipment (full) | 7.6 kg |
| > Dimensions | 820 x 720 x 165 mm |
| > Hard | Soft case |
| > Soft case (material) | Textile |
| 8. Weight, hand-held unit | 1.9 kg (weight of search head with rod) |
| 9. Weight, carrying (operational detection set) | 1.7 kg (weight of electronics with batteries) |
| 10. Weight, additional equipment | Head set 110 g |
| 11. Weight distribution | – |
| 12. Other specifications | – |

### SYSTEM STATUS AND DEPLOYMENT

| 13. Status (Development | In production) | In production |
| 14. Detectors | Systems in use to date | Not given |
| 15. Other types | Models |
| VMH3CS with UXO search head |
| VMM3 with UXO search head |
| 16. Location of use | Worldwide |

### ENVIRONMENTAL INFLUENCE

| 17. Humidity (limitations) | According to MIL STD 810F |
| 18. Temperature (limitations) |
| > Storage | -57°C to +71°C |
| > Operational | -32°C to +55°C |
| 19. Water resistant (Yes / No) | Yes up to 1,5 m |
| 20. Shock | Vibration resistant |
| > Yes |
| 21. Environmental Compensation | Auto |
| 22. Operational hours | Operating endurance |
| > low temperature (around 0°C) | Up to 40 hours depending on battery type and capacity |
| > medium temperature (around 20°C) | Up to 40 hours depending on battery type and capacity |
| > high temperature (higher than 30°C) | Up to 30 hours depending on battery type and capacity |
DETECTION OPERATION

23. Calibration | Set-up
   - Auto | Manual
   - Duration

24. Detection range | Sensitivity details | Detection performance | Working depth
   - Control of working depth
   - Small metal content mines (type of mine)
   - Anti-tank mines (type of mine)
   - ERW (please specify)

25. Output indicator
26. Pinpointing feature
27. Adjustment of search head angle
28. Soil influence
29. Best use in
   - Sand
   - Peat
   - Clay
   - Ferruginous soil (laterite)
30. Optimal sweep speed
31. Search coil | Antenna

POWER

34. Power supply | Source
35. Operating time
36. Power supply
   - weight
   - no. of batteries | size | type
   - rechargeable
   - other

COSTS

37. Price
   - for one detector on request
   - reduction for higher quantity
38. System price
   - with training
   - spare parts
   - extended warranty
39. Total
40. Possibility to rent/lease

OTHERS

41. Duration of warranty
42. Additional equipment
43. Additional technical data | information
44. Compliant standards

Automatic
A few seconds

Sensitivity adjustment
Designed for UXO, only plastic mines with big metal content or mines with metal case depending on their size, material and the local interference
Designed for UXO, only plastic mines with big metal content or mines with metal case depending on their size, material and the local interference
Depending on their size, material and the local interference

Sound (loudspeaker or headset)
Yes
With a joint
Adjustable

Battery
See point 22

4 ea. 1,5 V standard batteries D-size
4 ea. 1,24 V rechargeable batteries KR35/62

Upon request
Yes

Upon request worldwide
Upon request
Upon request

24 months
Headset, data recording, software

DIN EN ISO 9001:2000
MIL STD 810F, 501.4-II, 502.4-I, 502.4-II, 503.4, 506.4-III, 514.5 C1
### TECHNICAL SPECIFICATIONS

#### DETECTOR

1. **Brand**
   - VALLON
2. **Model**
   - VXC1
3. **Version**
   - –
4. **Used detection technology**
   - Difference magnetometer using fluxgate principle

#### DIMENSIONAL DATA

| 5. Working length | Adjustable from 56 to 88 cm |
| 6. Search head | Length approx. 441 mm | approx. Ø 38 mm |
| | Approx. 2.4 kg |
| > Size | |
| > Weight | |
| > Shape | Tube |
| 7. Transport case | Hard Case: approx. 4.9 kg (optional accessory) |
| > Weight | Field backpack: approx. 1 kg (standard accessory) |
| > With equipment (full) | Hard case With equipment (full): approx. 7.3 kg (optional accessory) |
| | Field backpack: approx. 3.4 kg (standard accessory) |
| > Dimensions | Hard case (optional accessory): |
| | 560 x 350 x 230 mm |
| | Field backpack (standard accessory): |
| | 530 x 290 x 120 mm |
| > Hard | Plastic |
| > Soft case (material) | Field backpack | Textile |
| 8. Weight, hand-held unit | Approx. 2.4 kg (with batteries) |
| 9. Weight, carrying (operational detection set) | Approx. 2.4 kg (with batteries) |
| 10. Weight, additional equipment | Head set 110 g |
| 11. Weight distribution | Balanced around the hand grip |
| > Balance | – |

#### SYSTEM STATUS AND DEPLOYMENT

| 13. Status (Development | In production) | In production |
| 14. Detectors | Systems in use to date | Not given |
| 15. Other types | Models | EL1302D2 | EL1303D2 | VET1 |
| 16. Location of use | Worldwide |

#### ENVIRONMENTAL INFLUENCE

| 17. Humidity (limitations) | According to MIL STD 810F |
| 18. Temperature (limitations) | -57°C to +71°C |
| | -32°C to +55°C |
| > Storage | |
| > Operational | Yes |
| 19. Water resistant (Yes / No) | Yes |
| 20. Shock | Vibration resistant |
| Manual, cannot be used in magnetic soil |
| 21. Environmental Compensation | Medium temperature (around 20°C) |
| 22. Operational hours | Operating endurance |
| Approx. 120 hours with alkaline batteries depending on operation periods |
DETECTION OPERATION

<table>
<thead>
<tr>
<th>23. Calibration</th>
<th>Set-up</th>
<th>Manual</th>
<th>Automatic</th>
<th>A few seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; Auto</td>
<td>Manual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; Duration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>24. Detection range</th>
<th>Sensitivity details</th>
<th>Detection performance</th>
<th>Working depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; Control of working depth</td>
<td>Sensitivity switch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; Small metal content mines (type of mine)</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; Anti-tank mines (type of mine)</td>
<td>Depending on their size, material and the local interference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; ERW (please specify)</td>
<td>Depending on their size, material and the local interference</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 25. Output indicator |
|----------------------|------------------|
| Audio by inbuilt loudspeaker or headset, visual by LED-bargraph |

| 26. Pinpointing feature |
|-------------------------|------------------|
| Yes |

| 27. Adjustment of search head angle |
|-----------------------------------|------------------|
| Yes |

| 28. Soil influence |
|--------------------|------------------|
| See item 29 |

| 29. Best use in |
|-----------------|------------------|
| > Sand | Yes |
| > Peat | Yes |
| > Clay | Yes |
| > Ferruginous soil (laterite) | Limited |

| 30. Optimal sweep speed |
|-------------------------|------------------|
| 0 – 1 m/sec |

<table>
<thead>
<tr>
<th>31. Search coil</th>
<th>Antenna</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube with Ø 38 mm</td>
<td></td>
</tr>
</tbody>
</table>

| 32. Limitations |
|-----------------|------------------|
| Only ferromagnetic targets |

<table>
<thead>
<tr>
<th>33. Interference (with other detectors)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same detector type no</td>
</tr>
</tbody>
</table>

POWER

<table>
<thead>
<tr>
<th>34. Power supply</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery</td>
<td></td>
</tr>
</tbody>
</table>

| 35. Operating time |
|-------------------|------------------|
| See point 22 |

| 36. Power supply |
|------------------|------------------|
| > weight |
| > no. of batteries | size | type |
| > rechargeable |
| > other |

| 37. Price |
|-----------|---------|
| > for one detector on request | Upon request |
| > reduction for higher quantity | Yes |

| 38. System price |
|------------------|------------------|
| > with training | Upon request worldwide |
| > spare parts | Upon request |
| > extended warranty | Upon request |

| 39. Total |
|-----------|---------|
| – |

| 40. Possibility to rent/lease |
|-------------------------------|------------------|
| – |

COSTS

| 37. Price |
|-----------|---------|
| > for one detector on request | Upon request |
| > reduction for higher quantity | Yes |

| 38. System price |
|------------------|------------------|
| > with training | Upon request worldwide |
| > spare parts | Upon request |
| > extended warranty | Upon request |

| 39. Total |
|-----------|---------|
| – |

| 40. Possibility to rent/lease |
|-------------------------------|------------------|
| – |

OTHERS

| 41. Duration of warranty |
|--------------------------|---------|
| 24 months |

| 42. Additional equipment |
|--------------------------|---------|
| Hard case, headset |

<table>
<thead>
<tr>
<th>43. Additional technical data</th>
<th>information</th>
</tr>
</thead>
<tbody>
<tr>
<td>–</td>
<td></td>
</tr>
</tbody>
</table>

| 44. Compliant standards |
|-------------------------|------------------|
| DIN EN ISO 9001:2000 |
| MIL STD 810F, 501.4-II, 502.4-I, 502.4-II, 503.4, 506.4-III, 514.5 C1 |
| MIL STD 461D |

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VALLON VMR2

Vallon | Germany

GENERAL DESCRIPTION

The Vallon VMR2 Dual-Sensor-Detector (called Minehound) is a combined metal detector (MD) and ground penetrating radar (GPR) system designed specifically for use in humanitarian demining operations and military operations using advanced technology.

Vallon has built the VMR2 by combining the techniques of its VMH3 metal detector with a custom-designed 1 GHz GPR designed by ERA Technology Ltd. The GPR is a time-domain radar transmitting 1 ns duration impulses at a repetition frequency of 1 MHz. A dedicated state-of-the-art DSP processor is used to provide all control and signal processing functions.

The VMR2 is simple to use, providing the operator with clear audio signals of the potential mine threat. When a threat is located, the detector provides both position information and mass of metal indication. The GPR audio provides additional position and depth information, and identifies the radar cross-section of the target. Both detectors can be used separately or together. The GPR responds to even the smallest flush buried mine (diam. > 5 cm), but not to small metal fragments. This means that metallic clutter (such as bullet casings, small arms rounds and shrapnel, which commonly cause false alarms) is rejected by the system.

The GPR also detects zero or minimum-metal mines which are normally difficult to locate using metal detection techniques alone.

The VMR2 is switched on by a rotary control, which also has switch positions for the metal detector programmes (normal soil and conductive soil) as well as MD and GPR volume. A headset is provided and an internal speaker, which can be muted, is also used. Mode control is provided by a push button mounted on the control handle, which allows the operator to select MD or GPR or both functions. LEDs indicate which function is operating.

The MD function is the prime search capability and offers a highly sensitive technology to locate even minimum-metal mines (such as PMA3). The operator can set the MD sensitivity, which is observed by a LED bar graph display.

The GPR is self-calibrating and gives an audio confidence tick every 7.5 sec. to indicate correct operation. If a serious error occurs in the GPR, the LED bar displays flashes.

The VMR2 is a new technology which requires special training of the operating team before working in a live minefield situation.

DETECTORS IN USE

In use for field trials in several countries.

POWER SUPPLY

The operator can choose whether to operate from 4 standard D cells or a separate lithium polymer rechargeable battery pack. The operational life of batteries is said to be up to 8 hours depending on age, quality and capacity of the batteries.
FACTORY SUPPORT

> Vallon runs a worldwide servicing network with all current spare parts in stock. Spare parts can be delivered with a corresponding maintenance manual directly to the customer for on-site repair.

> Operation and maintenance training are offered either in the Vallon facilities or at a location required by the customer.

> Operation and maintenance manuals are available in German and English. Other languages on request.

> Warranty for 24 months.

MAINTENANCE SUPPORT

There are no special requirements for technicians or workshop facilities. All tools needed are standard and available in most workshops. The maintenance manual has step-by-step explanations for repairs.

TEST AND EVALUATION

The manufacturer allows access to several test reports.

Three reports about field trails in Cambodia, Bosnia and Angola are available at the ITEP website: www.itep.ws

3. Dibsdall I., MINEHOUND tests underway in Cambodia and Bosnia, September 2005.

REPORTED LIMITATIONS AND STRENGTHS

The performance of all GPR systems decreases if they are operated in heavy clay soil conditions or the soil is saturated with standing or salt water.

The GPR system can discriminate between metallic clutter and low metal content mines, so the false alarm rate should decrease.

ACKNOWLEDGEMENT

The company CyTerra did not provide a contribution to this catalogue. However, the GICHD decided the information for the Guidebook on Detection Technologies and Systems for Humanitarian Demining can be included in this catalogue. An interested reader will have the opportunity to compare both the AN/PSS-14 (HSTAMIDS)/AMD-14 and the VMR 2. The company Vallon provided the related information.

GENERAL DESCRIPTION

CyTerra describes the AN/PSS-14 as revolutionizing landmine detection by combining ground penetrating radar (GPR), highly sensitive metal detector (MD) technology and advanced data fusion algorithms in a unique manner that enables the system to reliably and consistently detect low-metallic anti-personnel (AP) and anti-tank (AT) mines.

The manufacturer also claims that AN/PSS-14 offers the highest probability of detection (PD) of any hand-held system along with an extremely low-level false alarm rate (FAR). This high level of performance is also claimed to be maintained across all soil types, including wet, dry, frozen, laterite (iron-rich), clay and sand.

The data fusion algorithms allow the operator to effectively discriminate between clutter and mines. CyTerra notes that the algorithms are based on terrain modelling using a real time novelty (RTN) methodology and that, as the operator advances, the terrain model is continuously updated, enabling the system to automatically adapt to varying soil conditions. Potential mine detection alerts are provided to the operator via audio alert signals.

WORKING METHODOLOGY

The system combines a GPR and a highly sensitive MD. Two different audio signals are provided simultaneously to the operator. The MD signal is provided in the traditional format of a metal detector in which the signal varies in volume and pitch depending on the metal type, size and depth. The other audio signal is the output of the data fusion algorithms, also known as Aided Target Recognition (ATR) algorithms, and is a sharp beep. This beep is generated only when the ATR processing determines that both the GPR and MD data indicates a “mine-like” object. Because the MD and ATR sounds are distinctly different they can be present together without distracting the operator as two continuously varying audio signals might. Situation awareness is therefore maintained while allowing full operation of the GPR and MD sub-systems.

The operator cannot turn off (accidentally or deliberately) either the MD or GPR subsystems. However, audio muting on a temporary basis to allow the operator to better focus on one of the audio signals is available. This feature is particularly helpful when investigating high metal anti-tank mines where the constant high volume of the MD can be distracting to the operator.

DETECTORS IN USE

The AMD-14A is a variant of the AN/PSS-14 oriented to humanitarian demining, and is expected to be available in 2007 with a significantly reduced list price. The new system will incorporate the same AN/PSS-14 electronics and sensor elements so detection performance will be unchanged.
POWER SUPPLY
To power the AN/PSS-14 (HSTAMIDS)/AMD-14 a 12V battery with a power consumption of 50W is required. The operational life of a Nickel Metal Hydride battery (required for the AN/PSS-14, and for the AMD-14 powered by the NP-Fx70 series Li-ion) is said to be 4hrs in both cases.

AN/PSS-14 Battery is mounted externally on an operator’s hip belt, therefore the system can be adapted to use other batteries, provided basic V/ahr ratings are met. AMD 14: battery pack is mounted on a handheld system on a belt with optional cable.

FACTORY SUPPORT
No information can be provided.

MAINTENANCE SUPPORT
No information can be provided.

TEST AND EVALUATION
The US Army conducted extensive evaluations of the AN/PSS-14 as part of its type classification process prior to moving to full production. Tests ranged from basic environmental style testing to full operational evaluation including comparison with current industry metal detectors. System was deemed to meet or exceed the US Army Operational Requirements for all designated tests.

Operational tests were conducted by US Army Operational Test Command. They compared the performances of AN/PSS-14, AN/PSS-12 (Schiebel AN-19 and the current US Army mine detector) and F1A4 (Minelab) using blind lane testing of new operators.

Systems in the evaluation were assigned to a platoon of combat engineers with operators given the appropriate specified training course. The AN/PSS-14 standard training class is a 40-hour course and was provided by Contractor/US Army Engineer School.

Test environment comprised 106 mine lanes (1.5m x 25m) with a total of 514 missions (1,096 encounters) performed. Mine types included AT, AP and mixed (AT/AP) of both high metal (M) and low metal (LM) types. Developmental testing results are as follows:

Table 1 Comparative probability of detection (PD) between three detectors

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>AP - LM</th>
<th>AP - M</th>
<th>AT - LM</th>
<th>AT - M</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>AN / PSS - 14</td>
<td>98</td>
<td>99</td>
<td>94</td>
<td>99</td>
<td>97</td>
</tr>
<tr>
<td>F1A4</td>
<td>95</td>
<td>96</td>
<td>79</td>
<td>91</td>
<td>89</td>
</tr>
<tr>
<td>AN / PSS - 12</td>
<td>80</td>
<td>99</td>
<td>64</td>
<td>99</td>
<td>81</td>
</tr>
</tbody>
</table>
Initial operational test results are described as follows:

### Table 2: Initial operational test results

<table>
<thead>
<tr>
<th>AN / PSS - 14 PERFORMANCE SUMMARY</th>
<th>STANDING</th>
<th>KNEELING</th>
<th>PRONE</th>
<th>NIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PARAMETER</strong></td>
<td><strong>AP-LM</strong></td>
<td><strong>AP-M</strong></td>
<td><strong>AT-LM</strong></td>
<td><strong>AT-M</strong></td>
</tr>
<tr>
<td><strong>97</strong></td>
<td><strong>99</strong></td>
<td><strong>99</strong></td>
<td><strong>100</strong></td>
<td></td>
</tr>
<tr>
<td><strong>PD %</strong></td>
<td>98.7</td>
<td>100</td>
<td>96.2</td>
<td>100</td>
</tr>
<tr>
<td><strong>FAR</strong></td>
<td>0.008</td>
<td>0.009</td>
<td>0.03</td>
<td>0.004</td>
</tr>
<tr>
<td><strong>SCAN RATE</strong></td>
<td>3.2</td>
<td>1.9</td>
<td>1.1</td>
<td>—</td>
</tr>
</tbody>
</table>

Systems are available for individual country or organisation evaluation (subject to a suitable US Export License being obtained).

HSTAMIDS has also been undergoing the following operational field trials and demonstration under the ITEP banner, supported by local Mine Action Centres and/or NGOs:

- Thailand, September/December 2004, finalised,
- Namibia, March 2005, finalised,
- Afghanistan, late 2005, finalised.

The following test results are available at the ITEP website: [www.itep.ws](http://www.itep.ws).


The Thailand trials are fully detailed in [2] and can be summarised as follows. Participants included the US Humanitarian Demining Team of NVESD (Night Vision and Electronic Sensors Directorate), ITEP personnel, Thailand Mine Action Centre (TMAC), HALO Trust from Cambodia and CyTerra Corporation. The evaluation was conducted near the minefields at the TMAC Humanitarian Demining Action Unit (HMAU) #1.

The test target set was composed of mines that are found in the area of HMAU #1 and mines that are typically used for US Army testing. All mines, detonators, and fuzes were free from explosive. The main charges were replaced with RTV Silicone Rubber 3110. The metal components and characteristics of the mines remained intact. To get statistically significant results, the test was designed so that most mine types were encountered 36 times.

Site setup: brush and vegetation were removed and the ground was levelled to facilitate water drainage. A vehicle-borne magnet was used to remove significant
amounts of surface metallic clutter. The test area consisted of ten 1mx25m blind lanes and one 1mx30m calibration lane. All anti-personnel mines were buried 5cm deep, and all anti-tank mines were buried 10cm deep.

Metal detectors were used to locate all indigenous metallic clutter in the lanes. The test targets were then arranged throughout the lane so that they had sufficient separation between them and the clutter. No indigenous clutter was removed from the lanes after being located by the metal detectors. Operators were credited with a detection if they marked a detection within 15cm of the edge of a target, as in all US Army testing of the HSTAMIDS.

According to the authors, the resulting overall detection probability (PD) and False Alarm Rate (FAR) show a reduction in FAR by a factor of five, with increased detection probability with respect to the locally used metal detector. Up to 77 percent of false alarms were rejected, with an estimated improvement of up to five times in clearance time.

Table 3  Potential reduction of effort

<table>
<thead>
<tr>
<th>METAL DETECTOR (VALLON) OPERATORS</th>
<th>HSTAMIDS EXPERIENCED OPERATORS</th>
<th>HSTAMIDS TRAINEE OPERATORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD%</td>
<td>76</td>
<td>94</td>
</tr>
<tr>
<td>FAR (m²)</td>
<td>1.02</td>
<td>0.201</td>
</tr>
<tr>
<td>TOTAL CLUTTER MARKED</td>
<td>956</td>
<td>806</td>
</tr>
<tr>
<td>CLUTTER CALLED MINE</td>
<td>956</td>
<td>183</td>
</tr>
<tr>
<td>CLUTTER REJECTED</td>
<td>0 (0%)</td>
<td>623 (77%)</td>
</tr>
<tr>
<td>TIME SCANNING</td>
<td>17 hours at 1.01 min/m²</td>
<td>21 hours at 1.25 min/m²</td>
</tr>
<tr>
<td>TIME DIGGING CLUTTER CALLED MINE (HOURS)</td>
<td>319</td>
<td>61</td>
</tr>
<tr>
<td>TIME SAVED a)</td>
<td>0</td>
<td>254</td>
</tr>
</tbody>
</table>

a) Average time saved based on 20 minutes per investigation, using TMAC data for operations in the same area.

The performance of all GPR systems decreases if they are operated in heavy clay soil conditions or the soil is saturated with standing or salt water.

The GPR system can discriminate between metallic clutter and low metal content mines, so the false alarm rate should decrease.

TECHNICAL SPECIFICATIONS

DETECTOR

1. Brand
   VALLON
2. Model
   VMR2
3. Version
   –
4. Used detection technology
   Metal detector with ground penetrating radar

DIMENSIONAL DATA

5. Working length
   > min. length
   240 mm from grip to search head
   > max. length
   1020 mm
6. Search head
   > Size
   210 x 335 mm
   > Weight
   –
   > Shape
   Oval
7. Transport case
   > Weight
   –
   > With equipment (full)
   Approx. 14 kg
   > Dimensions
   1020 x 430 x 170 mm
   > Hard | Soft case (material)
   Hard
8. Weight, hand-held unit
   < 4 kg
9. Weight, carrying (operational detection set)
   < 4 kg
10. Weight, additional equipment
    Head set 110 g
11. Weight distribution | Balance
    –
12. Other specifications
    –

SYSTEM STATUS AND DEPLOYMENT

13. Status (Development | In production)
    Development, production starts in Sept. 2006
14. Detectors | Systems in use to date
    –
15. Other types | Models
    –
16. Location of use
    –

ENVIRONMENTAL INFLUENCE

17. Humidity (limitations)
   According to MIL STD 810F
18. Temperature (limitations)
   > Storage
   -57°C to +71°C
   > Operational
   -32°C to +55°C
19. Water resistant (Yes / No)
    Yes
20. Shock | Vibration resistant
    Yes
21. Environmental Compensation
    Auto
22. Operational hours | Operating endurance
    Up to 8 hours depending on battery type and capacity
DETECTION OPERATION

23. Calibration | Set-up
   > Auto | Manual
   > Duration
   Automatic
   A few seconds

24. Detection range | Sensitivity details | Detection performance | Working depth
   > Control of working depth
   > Small metal content mines (type of mine)
   > Anti-tank mines (type of mine)
   Sensitivity adjustment
   Depending on their size, material and the local interference
   Depending on their size, material and the local interference

25. Output indicator
   Sound, visual bargraph

26. Pinpointing feature
   Yes

27. Adjustment of search head angle
   With a joint

28. Soil influence
   Adjustable

29. Best use in
   > Sand
   > Peat
   > Clay
   > Ferruginous soil (laterite)
   Yes
   Yes
   Yes, but GPR limited
   Yes

30. Optimal sweep speed
   < 1,5 m/sec

31. Search coil | Antenna
   Oval shape with 210 x 335 mm
   Excluding salt water and heavy clay for GPR only

32. Limitations
   –

33. Interference (with other detectors)
   –

POWER

34. Power supply | Source
   Battery

35. Operating time
   See point 23

36. Power supply
   > weight
   > no. of batteries | size | type
   –
   4 ea. 1,5 V standard batteries D-size
   Rechargeable lithium polymer battery set
   Belt battery

COSTS

37. Price
   > for one detector on request
   > reduction for higher quantity
   Upon request
   Upon request

38. System price
   > with training
   > spare parts
   > extended warranty
   Upon request worldwide
   Upon request
   Upon request

39. Total
   –

40. Possibility to rent/lease
   Upon request

OTHERS

41. Duration of warranty
   24 months

42. Additional equipment
   –

43. Additional technical data | information
   –

44. Compliant standards
   DIN EN ISO 9001:2000
   MIL STD 810F, 501.4-II, 502.4-I, 502.4-II, 503.4, 506.4-III, 514.5 C1
## DETECTOR

1. **Brand**
   - CYTERRA

2. **Model**
   - AN / PSS - 14 (HSTAMIDS) / AMD - 14
     - Humanitarian demining model
     - MD: similar to MINELAB F3

3. **Version**
   - 

4. **Used detection technology**
   - MD, GPR

## DIMENSIONAL DATA

5. **Working length**
   - AN / PSS - 14: 96 cm | AMD - 14: 93 cm
   - AN / PSS - 14: 147 cm | AMD - 14: 166 cm

6. **Search head**
   - Size:
     - AN / PSS - 14: width 21 cm
     - AMD - 14: width 21 cm | height 10 cm
   - Shape:
     - Circular, closed style

7. **Transport case**
   - Weight:
     - AN / PSS - 14: 20 kg | AMD - 14: 20 kg
   - With equipment (full):
     - AN / PSS - 14: hardcase 64 x 53 x 36 cm
     - AMD - 14: hardcase 95 x 45 x 25 cm

8. **Weight, hand-held unit**
   - AN / PSS - 14: 4.9 kg | AMD - 14: 4.3 kg
   - (both excluding batteries)

9. **Weight, carrying (operational detection set)**
   - AN / PSS - 14: 4 kg | AMD - 14: 4.3 kg

10. **Weight, additional equipment**
    - AMD - 14: batteries 0.6 kg

11. **Weight distribution | Balance**
    - Counterbalanced for easy use

12. **Other specifications**
    - 

## SYSTEM STATUS AND DEPLOYMENT

13. **Status (Development | In production)**
    - Continuous improvement process

14. **Detectors | Systems in use to date**
    - AN / PSS - 14 > 2000

15. **Other types | Models**
    - US and non US military

16. **Location of use**

## ENVIRONMENTAL INFLUENCE

17. **Humidity (limitations)**

18. **Temperature (limitations)**
   - **Storage**
     - AN / PSS - 14: -46°C to +73°C
     - AMD - 14: -46°C to +73°C
   - **Operational**
     - AN / PSS - 14: -32°C to +49°C
     - AMD - 14: -32°C to +49°C

19. **Water resistant (Yes / No)**
    - HSTAMIDS / AMD - 14: 1 m

20. **Shock | Vibration resistant**
    - 

21. **Environmental Compensation**
    - 

22. **Operational hours | Operating endurance**
   - **low temperature (around 0°C)**
     - 
   - **medium temperature (around 20°C)**
     - 
   - **high temperature (higher than 30°C)**
     - 

---

AN / PSS - 14 meets and exceeds all US Army Requirements except overall -32°C to +49°C, 0 – 100% humidity. AMD-14 STANAG 2895 A1 (dry desert), B1 (tropical), C1 (cold) and B3 (hot and humid) overall -32°C to +49°C, 0 – 100% humidity.
DETECTION OPERATION

23. Calibration | Set-up
   - Auto | Manual
   - Duration

24. Detection range | Sensitivity details | Detection performance | Working depth
   - Small metal content mines (type of mine)
     AN/PSS-14 & AMD-14: Will detect mines presenting an operational threat (PD, PFA: a).
   - Anti-tank mines (type of mine)
     AN/PSS-14 & AMD-14: Will detect mines presenting an operational threat (PD, PFA: a).
   - ERW

25. Output indicator
   AN/PSS-14 & AMD-14
   Audio, external speaker or headphones.

26. Pinpointing feature
   Combination of MD and ATR signals

27. Adjustment of search head angle
   -

28. Soil influence
   Usable in all soils

29. Best use in
   - Sand
   - Peat
   - Clay
   - Ferruginous soil (laterite)
   Yes

30. Optimal sweep speed
   0.3 to 0.75 m/sec

31. Search coil | Antenna
   -

32. Limitations
   Power line suppression: Not available.

33. Interference (with other detectors)
   -

POWER

34. Power supply | Source
   30 W

35. Operating time
   AN/PSS-14: 4h (Nickel Metal Hydride)
   AMD-14: 4h (NP-Fx70 series Li-ion)

36. Power supply
   - weight
   - no. of batteries | size | type
   - rechargeable
   - other
   AMD - 14: 0.6 kg (li-ion pair) rechargeable
   AN/PSS-14: NiMH rechargeable battery
   -
   AN/PSS-14 Battery is mounted externally on operators’ hip belt, therefore system can be adapted to use other batteries, provided basic V/Ahr ratings are met.
   AMD - 14 battery pack mounted on handheld system or on belt with optional cable.

COSTS

37. Price
   - for one detector on request
     More than US$5,000
     AN/PSS-14 US$23,500 AMD-14: US$12,000 (estimate)
   - other information regarding price
   - reduction for higher quantity
   -

38. System price
   - with training
   - spare parts
   - extended warranty
   -

39. Total
   -

40. Possibility to rent/lease
   None

OTHERS

41. Duration of warranty
   -

42. Additional equipment
   -

43. Additional technical data | information
   -

44. Compliant standards
   -

* detailed disclosure requires US export license
SECTION 5

VEHICLE-MOUNTED DETECTORS
MINELAB STMR ARRAY

Minelab Electronics Pty Ltd. | Australia

GENERAL DESCRIPTION
The Minelab STMR (Single Transmit Multiple Receive) Array was designed and developed for the Australian Department of Defence’s successful Rapid Route and Area Mine Neutralisation System (RRAMNS) Concept Technology Demonstrator in 2005. Due to its proven capability, it was subsequently selected for further development in the current US Force Protection Demining System.

STMR comprises a sensor head containing a single large transmit coil and multiple receive coils, and an electronics enclosure that contains the power supply and electronics. The advantage of the STMR system is the uniform transmit field that is produced. Signal-to-noise ratios are reduced thereby increasing depth of detection and sensitivity to large and small targets typical of ERW and landmine characteristics.

STMR is ideal for route and area clearance operations and can be combined with other sensors such as GPR and Thermal Imagery. Minelab’s Windows-based software permits an operator to view a real-time display of the target information as the vehicle moves.

The sensor head can be located in front, to the side or towed behind a vehicle and can be dragged along or lifted above the surface depending on the requirements of the customer. An optional marking system can also be fitted to the system.

The development of STMR is ongoing but it has already been supplied to commercial demining companies and militaries.

WORKING CHARACTERISTICS
STMR incorporates Minelab’s renowned and proven Multi-Period-Sensing technology also contained in the F1A4 and F3 hand-held detectors. Using pulse induction, three target channels and one ground channel allow the system to automatically compensate for mineralised ground.

Selectable digital low-pass filters allow the system to operate at speeds up to 15 km/h although higher speeds of operation can be achieved if required.

The system operates on vehicle power and a data link is achieved via 100 MB/s Ethernet to a host PC or any system capable of TCP/IP communications.

The sensor head can be manufactured to either a 1.8m or 3.2m width and cable length from sensor head to electronics enclosure can reach up to 6m.

Through a GPS interface, target locations can be logged and investigated later if required.

DETECTORS IN USE
STMR has been supplied to several militaries and commercial demining companies.

POWER SUPPLY
STMR operates on a 24VDC power supply (5A max).
FACTORY SUPPORT

> Customer support is provided from either Minelab facilities in Australia, the US or Ireland.
> Minelab offers comprehensive “train the trainer” operator and technical maintenance training in the field or in classroom facilities.
> All training documentation is provided free as part of a training management plan. The principal language is English with other languages provided on request.
> All Minelab trainers are experienced instructors qualified in adult education techniques.
> Where required, Minelab establishes in-country technical repair and maintenance for all warranty and non-warranty repairs. This provides timely access to spare parts.
> Where applicable, routine customer visits to provide advice on training and maintenance are provided free as part of Minelab’s global travel commitments.
> Manufacturers warranty is for 12 months with extended warranty provided on a case-by-case basis.

MAINTENANCE AND SUPPORT

> STMR is designed to enable fast and simple replacement of modular components in the field.
> No special tools are required and Level 2 maintenance is achievable through basic workshop facilities.

TEST AND EVALUATION

The following trials have been conducted on the STMR and are available from the manufacturer on request:

> Internal Minelab field test reports.
> Australian DOD, RRAMNS Project.
> Various User Acceptance Trials.

KNOWN LIMITATIONS AND STRENGTHS

No limitations reported to date.

Strengths, according to the manufacturer:

> Low signal-to-noise ratio.
> Depth and sensitivity of detection.
> Ease of use.
> Simple maintenance.
> Ability to work in all soils and environmental conditions.
GENERAL DESCRIPTION

The Schiebel VAMIDS system provides the ability to detect low metal-content mines from a vehicular platform. It is ideal for route clearance/verification, area reduction and quality assurance. It can be mounted on virtually any medium- or heavy-duty tactical or civilian vehicle, providing an efficient and cost-effective detection system. The system is designed for use on established (although possibly primitive) routes but is also well suited for clear, open land.

The system is capable of operating at speeds of up to 10km/h while providing real-time detection, which significantly increases the productivity of clearance operations. VAMIDS is based on the proven technology of the AN-19/2 Mine Detecting Set, by combining this technology with a sophisticated visualisation and marking system.

VAMIDS allows its operators to quickly and efficiently detect landmines and mark the ground prior to clearance. The marking system is designed to accurately mark the location of targets and the cleared lane using an easily identifiable fluid. With up to eight spray nozzles per metre the system provides highly accurate, target-proportional marking capability. The criteria for marking is selected and controlled via the VAMIDS Manager software. A wide variety of marking fluids may be used.

WORKING METHODOLOGY

The flexible arrays are pulled over the ground, ensuring optimal coverage. The individual detection heads are mounted on a flexible drawbed structure that serves as a wear sheet, both supporting and protecting the assembled detection heads.

VAMIDS requires only one dedicated operator, who can normally be trained on all operational aspects within a day. All functions are controlled, and all parameters are set, using the VAMIDS Manager software.

Once the system is calibrated (in a metal-free area), and a functional check is completed, the system is ready for deployment. The operator may observe the metal content in the ground under the machine with the real-time display on the system console. The operator has full control over all marking and safety alarm parameters.

POWER SUPPLY

- The control unit is powered from a nominal 12V up to 36V DC standard vehicle battery. The input power is fuzed and filtered on the power card.
- All DC-DC converters can operate over an input range from 10V DC to 40V DC thereby providing large margins for the specified nominal battery supply voltage.

DETECTORS IN USE TO DATE

VAMIDS has been purchased and is used by humanitarian and commercial demining organisations in several countries. No further detailed information is given by the manufacturer.
**FACTORY SUPPORT**

- All systems are covered by a 12-month, no-cost warranty and operator / maintenance training is provided (on site or at the factory as requested) as part of the procurement package. Further training can be provided for a fee;
- Spare parts are available for a period of ten years after purchase. These can be obtained directly from the factory or from the worldwide network of Schiebel agents;
- Operator and maintenance manuals are provided in most major languages (e.g. English, German, Spanish, etc.);
- Schiebel factory repairs or technicians are available to provide additional support worldwide whenever required.

**MAINTENANCE AND SUPPORT**

With its rugged design VAMIDS requires little maintenance and can be upgraded to the latest modification state. Most repairs can be carried out, at field level, by Schiebel-trained personnel. Workshop repairs can be carried out by Schiebel-trained technicians, using the recommended tools and test equipment.

**TEST AND EVALUATION**

VAMIDS has been comprehensively field tested in all climates by the manufacturer and all detector specifications are fully proven. It has also been evaluated and selected by a range of organisations. (No detailed information is provided by the manufacturer). However the detector has not been tested in comparative trials.

At the ITEP website [www.itep.ws](http://www.itep.ws) the article: Recent Results Achieved in the 5th FP DEMAND Project, published 2003 is available.

**REPORTED LIMITATIONS AND STRENGTHS**

No information available at this time.
GENERAL DESCRIPTION

The Vallon VMV8 Metal Detector has been designed for mounting on a vehicle to locate metal objects in the ground, e.g. metal mines, plastic mines with a bigger metal part and ERW. Quality control is considered to be one of its most suitable applications.

The unit consists of a search head, waterproof detection and evaluation electronics, and a laptop with Vallon EVA 2000 software to display metal parts, to operate the unit and for the documentation.

The search head is customer tailored and can be mounted on the front or side of the vehicle or on a trailer. The VMV8 is very robust and can operate in all weather, soil and climate conditions.

This unit is also highly suitable for the integration of multi-sensor-platforms, using gradient magnetometers, infrared, ground penetration radar or microwaves for detection.

Main components of the VMV8 are

1. Central electronics in a weatherproof housing:
   - with 8 EMI-detection channels based on the pulse induction method
   - with 8 voltage stabilizations, 8 transmitters and 8 receivers, 8 digital-analog-converters as well as 8 interfaces for data transfer;

2. Server electronics with output for Fast Ethernet to PC; with connectors for 1 x DGPS, 8 x active (EMI) sensors and test-computer for service;
   - DC voltage: 12-30V;
   - Dimensions: approx. 410 x 330 x 180 mm (LxWxH);

3. Relay box, 16 channels, provided for:
   - 1 channel for braking signal;
   - 8 channels for painting system;
   - 7 channels AUX;

4. Rugged portable laptop with Vallon EVA2000 2.0 software for data recording and evaluation;

5. Search head made from glass fibre, dimensions approx. 2000-3000 x 460 mm with 8 ea. integrated detection coil systems (other dimensions on request);

6. Mounting kit (glass fibre bars) and protective spoiler.

WORKING METHODOLOGY

The search head has eight electromagnetic sensors emitting pulses. There is a short pause between each magnetic pulse. The electromagnetic reaction of metal objects is registered during these pauses and led to the central control unit.

The detector automatically adjusts itself to the natural conditions of the ground. Detection can be carried on even in adverse soil conditions, such as magnetite, and in soils with changing conductivities. The sensitivity level of the detector is adjustable but remains constant even under changing ground or water conditions.
Data are transferred to the laptop which provides complete system operation and data evaluation, which is displayed in real time as colour maps, bar graphs or measuring curves.

**DETECTORS IN USE**
The detectors are in service with several armed forces and commercial mine clearance organisations.

**POWER SUPPLY**
- The power supply accepts car batteries with 12 or 24V DC.
  - The internal controls stabilise voltage fluctuations between 10-32V DC.
- Safety fuse: 4 amps,
- DC converter from 12V to 30V is included.

**FACTORY SUPPORT**
- The manufacturer has several service stations around the world with current spare parts on stock. Spare parts and related maintenance manual excerpts can be provided directly to the customer for repair at site.
- The manufacturer offers operation and maintenance training at their facilities or on site worldwide.
- Operation and maintenance manuals are available in German, English and French. Other languages on request.
- Warranty for 24 months.

**MAINTENANCE AND SUPPORT**
There are no special requirements for technicians or workshop facilities. All tools needed are standard and available in most workshops. The maintenance manual has step-by-step explanations for repairs.

**TEST AND EVALUATION**
Internal test reports can be provided by the manufacturer on request.

**REPORTED LIMITATIONS AND STRENGTHS**
No information available at this time.
GENERAL DESCRIPTION

Vallon’s vehicle-mounted multi-sensor systems can be customised for time-saving detection of unexploded ordnance, metallic mines or other metal-residue waste over large areas on land or in water. Such combinations of metal detectors (EMI) and difference magnetometers (fluxgate) have been available from Vallon since 1999.

The VMXV8 can be customised for several specifications but its operation is based on its standard electronics unit for the multi-sensor applications. The search head and the sensors are customized platforms with a maximum 16 channels. The measured values are transferred to a rugged laptop which serves as operation panel and data acquisition unit.

To achieve data recording true to scale it is recommended to keep the driving speed absolutely constant or to use a DGPS navigation system which allows the driver to examine the complete area without any blind spots.

The laptop is provided with the Vallon EVA 2000 2.X evaluation software which not only allows data recording and navigation but also subsequent evaluation of survey data and control of a relay box to connect, for example, colour marking systems.

Main components of the VMXV8 are

- Multisensor electronics in a weatherproof housing.
- Customised sensor platform for EMI and fluxgate sensors for land and/or underwater application.
- Relay box with 8-16 channels, potential free contacts.
- USB Memory Stick.
- Portable laptop with USB memory stick, data transfer cable and autoadapter.
- Vallon EVA 2000 2.X software.

WORKING METHODOLOGY

The complete version comprises a multi-sensor platform with fluxgate sensors and/or EMI-sensors. Several differential magnetometers are arranged in one array across the walking/driving direction on a metal-free frame. The sensors detect interferences to the normally homogenous magnetic field of the earth. Steel objects in the ground or in the water affect the earth’s magnetic field.

Metal detectors (EMI) transmit impulses and produce information if they meet metallic objects. In practice these sensors are consisting of round or oval search heads which are arranged side by side and/or one on top of the other. Active sensors are well suited for the detection of metallic objects close to the ground surface or large objects in larger depth.

Data recording is made directly by connecting the sensor electronics to a laptop (using MS Windows 2000 or XP and the Vallon EVA 20002.X software. The software can simultaneously record data from up to 16 sensors. During data survey, measuring values are displayed in real time and the covered distance is displayed in real time for navigation.

The multisensor operates in the water
FACTORY SUPPORT
The manufacturer offers operation and maintenance training at their facilities or on site worldwide. Spare parts can be supplied in very short time. Warranty is for 24 months.

DETECTORS IN USE
The system is in service with commercial mine clearance organisations and border surveillance.

POWER SUPPLY
The power supply accepts car batteries with 12 or 30Volts DC. Internal controls stabilise voltage fluctuations between 10-32V DC. A DC converter from 12V to 30 Volt is included.

MAINTENANCE SUPPORT
There are no special requirements for technicians or workshop facilities. All tools needed are standard and available in most workshops. The maintenance manual has step-by-step explanations for repairs.

TEST AND EVALUATION
Several test reports are available from the manufacturer.

REPORTED LIMITATIONS AND STRENGTHS
No information is available at this time.
## DETECTOR

1. **Brand**  
   MINELAB

2. **Model**  
   STMR ARRAY

3. **Version**  
   2

4. **Used detection technology**  
   Pulse induction | multi-period-sensing-bipolar

## DIMENSIONAL DATA

5. **Working length**  
   - min. length  
     sensor head 1.8 m
   - max. length  
     sensor head 3.2 m

6. **Search head**  
   - Size  
     1800 or 3200 x 400 x 300 mm
   - Weight  
     17 or 32 kg
   - Shape  
     Rectangular fibre glass composite

7. **Electronics enclosure**  
   - Size  
     535 x 500 x 350 mm 6U MIL spec.
   - Weight  
     25 kg

8. **Weight, hand-held unit**  
   —

9. **Weight, carrying (operational detection set)**  
   —

10. **Weight, additional equipment**  
    —

11. **Weight distribution | Balance**  
    —

12. **Other specifications**  
    —

## SYSTEM STATUS AND DEPLOYMENT

13. **Status (Development | In production)**  
    In production | development

14. **Detectors | Systems in use to date**  
    Research and commercial applications

15. **Other types | Models**  
    —

16. **Location of use**  
    US, Africa, Middle East

## ENVIRONMENTAL INFLUENCE

17. **Humidity (limitations)**  
    Nil

18. **Temperature (limitations)**  
   - Storage  
     -55°C to +75°C
   - Operational  
     -30°C to +60°C with thermal protection shutdown

19. **Water resistant (Yes / No)**  
    Min IP65

20. **Shock | Vibration resistant**  
    MIL STD 4150, 28800

21. **Environmental Compensation**  
    Auto

22. **Operational hours | Operating endurance**  
   - low temperature (around 0°C)  
     —
   - medium temperature (around 20°C)  
     —
   - high temperature (higher than 30°C)  
     —
DETECTION OPERATION

23. Calibration | Set-up
   > Auto | Manual
   > Duration

24. Detection range | Sensitivity details | Detection performance | Working depth
   > Small metal content mines (type of mine) PMN2 55 cm | IO 22 cm
   > Anti-tank mines (type of mine) ATMC > 160 cm
   > ERW (please specify) 500 lb bomb > 1.8 m

25. Output indicator
26. Pinpointing feature
27. Adjustment of search head angle
28. Soil influence
29. Best use in
   > Sand
   > Peat
   > Clay
   > Ferruginous soil (laterite)

30. Optimal sweep speed
31. Search coil | Antenna
   > Single TX multiple RX
   > Each RX module 400 x 280 x 30 mm

32. Limitations
33. Interference (with other detectors)

POWER

34. Power supply | Source
35. Operating time
36. Power supply

COSTS

37. Price
   > for one detector on request More than US$5,000
   > other information regarding price POA
   > reduction for higher quantity Yes

38. System price
   > with training Subject to location and quantity purchased
   > spare parts On Minelab recommendation
   > extended warranty Available

39. Total
40. Possibility to rent/lease

OTHERS

41. Duration of warranty 12 months (extendable on request)
42. Additional equipment
43. Additional technical data | information
44. Compliant standards Designed to MIL STD 4150, 28800
### DETECTOR

1. Brand | SCHIEBEL ELEKTRONISCHE GERÄTE GMBH
2. Model | VAMIDS™
3. Version | 2.0
4. Used detection technology | Pulse mode

### DIMENSIONAL DATA

5. Working length
   - min. length | Min. 1 m array
   - max. length | Max. 6 m array
6. Search head
   - Size | 1,168 mm wide; 613mm long;
   - Weight | 150mm thick per metre array
   - Shape | 20 kg per metre array
   - Search head is round; array is rectangular
7. Transport case
   - Weight | —
   - Dimensions | —
   - Hard | Soft case (material) | —
8. Weight, hand-held unit | —
9. Weight, carrying (operational detection set) | —
10. Weight, additional equipment | —
11. Weight distribution | Balance | —
12. Other specifications | —

### SYSTEM STATUS AND DEPLOYMENT

13. Status (Development | In production) | In production
14. Detectors | Systems in use to date | Not given
15. Other types | Models | —
16. Location of use | —

### ENVIRONMENTAL INFLUENCE

17. Humidity (limitations) | No
18. Temperature (limitations)
   - Storage | Virtually none
   - Operational | -55°C to +85°C (-67°F to +85°F)
   | -40°C to +55°C (-40°F to +131°F)
19. Water resistant (Yes / No) | Yes
20. Shock | Vibration resistant | Yes
21. Environmental Compensation | Auto
22. Operational hours | Operating endurance | Not applicable
### DETECTION OPERATION

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.</td>
<td>Calibration</td>
<td>Not applicable</td>
</tr>
<tr>
<td>24.</td>
<td>Detection range</td>
<td>Depending on soil and properties of target</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Type 72A - 18cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Metal anti-vehicle at 1m; plastic anti-vehicle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>nearly all types at operational threat depth</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NATO standard 7.62 rounds at 40cm, AK 47 at</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30+cm all larger items down to 1m in depth</td>
</tr>
<tr>
<td>25.</td>
<td>Output indicator</td>
<td>Visual, acoustic, data-based, and electric</td>
</tr>
<tr>
<td>26.</td>
<td>Pinpointing feature</td>
<td>relay-based galvanically separated output</td>
</tr>
<tr>
<td>27.</td>
<td>Adjustment of search head angle</td>
<td>No</td>
</tr>
<tr>
<td>28.</td>
<td>Soil influence</td>
<td>Can operate in light magnetic soil with reduced</td>
</tr>
<tr>
<td></td>
<td></td>
<td>but normally acceptable performance</td>
</tr>
<tr>
<td>29.</td>
<td>Best use in</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Sand</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Peat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clay</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ferruginous soil (laterite)</td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>Optimal sweep speed</td>
<td>Vehicle velocity 0–15km/h</td>
</tr>
<tr>
<td>31.</td>
<td>Search coil</td>
<td>8 coils per metre up to 48 coils</td>
</tr>
<tr>
<td>32.</td>
<td>Limitations</td>
<td>Medium and heavy magnetic soil</td>
</tr>
<tr>
<td>33.</td>
<td>Interference (with other detectors)</td>
<td>None at distance above 2 m separation</td>
</tr>
</tbody>
</table>

### POWER

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>34.</td>
<td>Power supply</td>
<td>Standard vehicle battery</td>
</tr>
<tr>
<td>35.</td>
<td>Operating time</td>
<td>–</td>
</tr>
<tr>
<td>36.</td>
<td>Power supply</td>
<td>12 up to 36V DC</td>
</tr>
</tbody>
</table>

### COSTS

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>37.</td>
<td>Price</td>
<td>US$3,000 - US$4,000</td>
</tr>
<tr>
<td></td>
<td>for one detector on request</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>reduction for higher quantity</td>
<td></td>
</tr>
<tr>
<td>38.</td>
<td>System price</td>
<td>Included</td>
</tr>
<tr>
<td></td>
<td>with training</td>
<td>As required</td>
</tr>
<tr>
<td></td>
<td>spare parts</td>
<td>Available</td>
</tr>
<tr>
<td></td>
<td>extended warranty</td>
<td></td>
</tr>
<tr>
<td>39.</td>
<td>Total</td>
<td>To be determined</td>
</tr>
<tr>
<td>40.</td>
<td>Possibility to rent/lease</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### OTHERS

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>41.</td>
<td>Duration of warranty</td>
<td>12 months</td>
</tr>
<tr>
<td>42.</td>
<td>Additional equipment</td>
<td>–</td>
</tr>
<tr>
<td>43.</td>
<td>Additional technical data</td>
<td>Available</td>
</tr>
<tr>
<td></td>
<td>information</td>
<td></td>
</tr>
<tr>
<td>44.</td>
<td>Compliant standards</td>
<td>MIL-D-0023359G; ISO 9001</td>
</tr>
</tbody>
</table>
### DETECTOR

1. **Brand**
   - VALLON
2. **Model**
   - VMV8
3. **Version**
   - Vehicle mounted metal detector
4. **Used detection technology**
   - Metal detector | Pulse induction

### DIMENSIONAL DATA

5. **Working length**
   - **min. length**: 1500 mm (distance to vehicle)
   - **max. length**: 2084 mm (distance to vehicle)
6. **Search head**
   - **Size**: 2000 - 3000 x 460 mm (other sizes on request)
   - **Weight**: 35 kg
   - **Shape**: Rectangle
7. **Transport case**
   - **Weight**: 2050 - 3050 x 735 mm
   - **Dimensions**: 3100 x 780 x 500 mm
   - **Hard | Soft case (material)**: Wooden case
8. **Weight, hand-held unit**
   - Not applicable
9. **Weight, carrying (operational detection set)**
   - Not applicable
10. **Weight, additional equipment**
   - Not applicable
11. **Weight distribution | Balance**
   - Not applicable
12. **Other specifications**
   - –

### SYSTEM STATUS AND DEPLOYMENT

13. **Status (Development | In production)**
    - In production
14. **Detectors | Systems in use to date**
    - Not given
15. **Other types | Models**
    - VMXV4D for combined metal and UXO detection
16. **Location of use**
    - Worldwide

### ENVIRONMENTAL INFLUENCE

17. **Humidity (limitations)**
    - According to MIL STD 810E
18. **Temperature (limitations)**
    - **Storage**: -57°C to +71°C
    - **Operational**: -32°C to +55°C
19. **Water resistant (Yes / No)**
    - Yes up to 1.5 m
20. **Shock | Vibration resistant**
    - Yes
21. **Environmental Compensation**
    - Auto
22. **Operational hours | Operating endurance**
    - Works with vehicle’s battery
DETECTION OPERATION

23. Calibration | Set-up
  > Auto | Manual
  > Duration

24. Detection range | Sensitivity details |
  Detection performance | Working depth
  > Control of working depth
  > Small metal content mines (type of mine)
  > Anti-tank mines (type of mine)
  > ERW (please specify)

25. Output indicator
26. Pinpointing feature
27. Adjustment of search head angle
28. Soil influence
29. Best use in
  > Sand
  > Peat
  > Clay
  > Ferruginous soil (laterite)

30. Optimal sweep speed
31. Search coil | Antenna
32. Limitations

33. Interference (with other detectors)

POWER

34. Power supply | Source
35. Operating time
36. Power supply
  > weight
  > no. of batteries | size | type
  > rechargeable
  > other

37. Price
  > for one detector on request
  > reduction for higher quantity
38. System price
  > with training
  > spare parts
  > extended warranty
39. Total
40. Possibility to rent/lease

COSTS

41. Duration of warranty
42. Additional equipment
43. Additional technical data | information
44. Compliant standards

OTHERS
## DETECTOR

1. **Brand**  
   VALLON

2. **Model**  
   VMXV

3. **Version**  
   Vehicle mounted multi sensor system (customized solutions)

4. **Used detection technology**  
   Metal detector (EMI) and/or difference magnetometer (fluxgate)

## DIMENSIONAL DATA

5. **Working length**  
   - min. length  
   Depending on the customer’s requirements
   - max. length  
   Depending on the customer’s requirements

6. **Search head**  
   - Size  
   Customized from 1 to 4 meters detection width
   - Weight  
   Depending on construction
   - Shape  
   Rectangle

   **Protective spoiler**  
   - Size  
   Depending on search head size
   - Weight  
   Depending on search head size
   - Shape  
   Depending on search head size

7. **Transport case**  
   - Weight  
   Depending on the customer’s requirements
   - With equipment (full)  
   Depending on the customer’s requirements
   - Dimensions  
   Depending on the customer’s requirements
   - Hard | Soft case (material)  
   Wooden case

8. **Weight, hand-held unit**  
   Not applicable

9. **Weight, carrying (operational detection set)**  
   Not applicable

10. **Weight, additional equipment**  
    Not applicable

11. **Weight distribution | Balance**  
    Not applicable

12. **Other specifications**  
    –

## SYSTEM STATUS AND DEPLOYMENT

13. **Status (Development | In production)**  
    In production

14. **Detectors | Systems in use to date**  
    Not given

15. **Other types | Models**  
    VXV4 for ERW detection only
    or VMV8 for mine detection only

16. **Location of use**  
    Worldwide land and/or underwater

## ENVIRONMENTAL INFLUENCE

17. **Humidity (limitations)**  
    According to MIL STD 810E

18. **Temperature (limitations)**  
    - Storage  
    -37°C to +71°C
    - Operational  
    -32°C to +55°C

19. **Water resistant (Yes / No)**  
    Yes up to 1.5 m

20. **Shock | Vibration resistant**  
    Yes

21. **Environmental Compensation**  
    Auto

22. **Operational hours | Operating endurance**  
    Depending on the customer’s requirements
DETECTION OPERATION

23. Calibration | Set-up
   > Auto | Manual
   > Duration
   Automatic
   A few seconds

24. Detection range | Sensitivity details |
   Detection performance | Working depth
   > Control of working depth
   > Sensitivity adjustment
   > Small metal content mines (type of mine)
   > Anti-tank mines (type of mine)
   > ERW (please specify)
   > Depends on the construction
   > Depends on the construction
   > Depends on the construction

25. Output indicator
   Alarm sound and visual display on PC screen

26. Pinpointing feature
   Yes

27. Adjustment of search head angle
   Manual

28. Soil influence
   Automatic and adjustable

29. Best use in
   > Sand
   > Peat
   > Clay
   > Ferruginous soil (laterite)
   Yes
   Yes
   Yes
   Yes

30. Optimal sweep speed
   Depending on used sensors up to 10 km / h

31. Search coil | Antenna
   EMI and | or fluxgate

32. Limitations
   Operational temperature limited by ruggedized laptop to -10°C to +60°C

33. Interference (with other detectors)
   EMI | Distance of 16 m

POWER

34. Power supply | Source
   Car battery

35. Operating time
   Unlimited

36. Power supply
   > weight
   > No applicable
   > no. of batteries | size | type
   > Car battery
   > rechargeable
   > Yes
   > other
   Works from 12 to 30 Volts DC

COSTS

37. Price
   > for one detector on request
   > reduction for higher quantity
   > Upon request
   > Upon request

38. System price
   > with training
   > Upon request worldwide
   > spare parts
   > Upon request
   > extended warranty
   > Max 24 months

39. Total
   > Upon request

40. Possibility to rent/lease
   > Upon request

OTHERS

41. Duration of warranty
   24 months

42. Additional equipment
   Depending on the customer’s requirements

43. Additional technical data | information
   DIN EN ISO 9001:2000
   MIL STD 810F, 501.4-II, 502.4-I, 502.4-II, 503.4, 506.4-III, 514.5 C1

44. Compliant standards
   –
PLF II SUIT

DuoTong Mechanical Factory, WuXi JiangSu | China

GENERAL DESCRIPTION

The PLF II suit is specially designed for deminers in post-conflict mine detection and clearance operations. The suit consists of a protective vest, arm protectors, groin protector and leg protectors. It is designed to offer maximum coverage while keeping flexibility and weight at safe practical levels. It is easy to put on and remove, has a high level of air permeability and is comfortable.

PROTECTIVE PERFORMANCE | MASS

<table>
<thead>
<tr>
<th>PROTECTION LEVEL</th>
<th>MATERIAL SPECIFICATIONS</th>
<th>MASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resists shrapnel (mass less than 0.72g and velocity not more than 500m/s)</td>
<td>Kevlar composite and multi-module polyethylene</td>
<td>Complete suit not more than 6kg</td>
</tr>
</tbody>
</table>

COLOUR OPTIONS AND SIZE

The main body colour is blue and the arm protector is coffee coloured. Other colours could be supplied depending on quantity. The PLF II suit is available in small, medium and large sizes, with other sizes available on request.

TEST AND EVALUATION

The PLF II suit was tested by the relevant government department in September 2002. Test reports can be provided by the manufacturer on request.

COST

Not given.
GENERAL DESCRIPTION
The Envostar Demining Body Armour provides frontal protection from the shoulders to the upper thighs. Specially fixed extensions protect the vulnerable armpit areas. The modular system consists of a backless apron – a back panel can be mounted – and backless trousers. The front ruff is designed to overlap the visor to ensure continuous protection for both the upper body and face.

The lightweight design helps to minimise hazards caused by heat stress and fatigue.

The apron is well suited for hot and humid climates.

The outer cover is washable and can be replaced if worn out. According to the manufacturer, the apron design is most suitable for the kneeling position.

PROTECTIVE PERFORMANCE | MASS

<table>
<thead>
<tr>
<th>PROTECTION LEVEL</th>
<th>MATERIAL SPECIFICATIONS</th>
<th>MASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>V50- 450m/sec according to standards MIL-STD-622F and NATO/STANAG 2920 using calibre 0.22, 17 grain fragment simulating projectiles conforming to MIL-P-46593A and UNMAS IMAS 10.30.</td>
<td>Protective panels are water-repellent treated, and manufactured by the Twaron company. The outside cover is made of cotton and can be easily replaced.</td>
<td>Apron: 2 kg (medium size) Trousers: 1.8 kg</td>
</tr>
</tbody>
</table>

COLOUR OPTIONS
The Demining Body Armour is available in several colours.

TEST AND EVALUATION
Test reports can be provided by the manufacturer on request. According to the manufacturer, the equipment has been regularly tested by H.P. White Laboratories, Maryland, USA.

COST
US$210 for the apron, up to US$1,200 for the whole Demining Body Armour.
LBA 371 AND 372 DEMINING VESTS

LBA International Ltd. | United Kingdom

GENERAL DESCRIPTION
The LBA 371 and 372 Demining Vests have been recently developed to meet the demand for equipment specifically designed for mine clearance work. The vests offer maximum coverage while keeping flexibility and weight as priority.

The vests cover the groin, armpits and neck. The front armour section is a one-piece design with a unique sewing, and permits a three dimensional neck protection without any joins in the Aramid fibres. The 372 offers enhanced groin and shoulder protection compared to the 371. Both versions are available with back protection if required.

The manufacturer offers a range of protection levels but the F2 fragmentation system level seems to have been found the most appropriate level. (F2 level offers a V50 against a 17-grain fragment of 450 m/s).

Panels of water-repellent woven Aramid provide the protection. The Aramid used is a special construction that provides the best protection against all sizes of fragments, while still keeping the system light and flexible. These packs are tailored to provide the maximum protection. The design allows a high degree of flexibility to accommodate body shape variations while avoiding restrictions to movement. The jacket has removable armour packs (for cleaning). Spare covers are also available. The armour in the jacket may be removed and the outer shell washed as required. The suit can be manufactured in a range of machine washable fabrics, including Cordura and fire retardant materials.

PROTECTIVE PERFORMANCE | MASS

<table>
<thead>
<tr>
<th>PROTECTION LEVEL</th>
<th>MATERIAL SPECIFICATIONS</th>
<th>MASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>V50: 450m/s according to STANAG 2920</td>
<td>Aramid fibre</td>
<td>Version 371: 1.9 kg;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Version 372: 3.4 kg;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(both sizes medium)</td>
</tr>
</tbody>
</table>

COLOUR OPTIONS AND SIZE

> The standard colour is navy blue, but other colours could be supplied depending on quantity.
> The vests are available in small, medium, large and extra large, and other sizes are available on request.

TEST AND EVALUATION
Test reports can be provided by the manufacturer on request. LBA International’s quality system has been approved to ISO 9001.

COST
Not given.
**GENERAL DESCRIPTION**

The newest of Med-Eng’s personal protective equipment (PPE), the Advanced Clearance Ensemble (ACE), provides full body protection. The modular component design allows for the addition of trousers, sleeves and blast or ballistic plates without assistance. The equipment offers easy assembly with fasteners and pull cords for emergency extraction with minimal movement.

**Primary features are**

- Scalable, modular components.
- Multi-purpose protective platform.
- Suitable for multi-threat environments.
- Lightweight, comfortable fit.
- Continuous fragmentation protection.
- Ballistic protection to the torso.

**PROTECTIVE PERFORMANCE | MASS**

<table>
<thead>
<tr>
<th>PROTECTION LEVEL</th>
<th>MATERIAL SPECIFICATIONS</th>
<th>MASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>V50 level according to NATO STANAG 2920</td>
<td>Layered Aramid fibre</td>
<td>15.5 kg, vest, blast plates and pouch, sleeves and trousers, weight based on medium size</td>
</tr>
</tbody>
</table>

**COLOUR OPTIONS AND SIZE**

The standard colour is olive and the kit is available in small, medium small, medium and large sizes. Med-Eng’s PPE for deminers and ERW technicians is comprised of soft and rigid ballistic inserts. All equipment is machine washable once inserts are removed and has a seven-year life expectancy. Details can be provided by the manufacturer on request.

**TEST AND EVALUATION**

All Med-Eng PPE products have been tested in live blast testing at DRES (Defense Research Establishment Suffield) using the NATO STANAG 2920 and IMAS 10.50 PPE standards. Internal test reports can be provided by the manufacturer on request.

**COST**

Not given.
MED-ENG DEMINING APRON

Med-Eng Systems Inc. | Canada

GENERAL DESCRIPTION
Since 2001, the Med-Eng Demining Apron has addressed the need for comfort and flexibility while providing basic protection against threats from blast type anti-personnel mines. While providing frontal protection, the apron is lightweight with an open back to provide necessary ventilation and allows heat to disperse in hot, humid climates.

Primary features are
> A one-piece garment easily put on and removed.
> Frontal protection from the shoulders to the upper thighs.
> Rigid chest plate for fragmentation, overpressure and impact protection.
> Chest plate integrates with the VBS-250 Visor Band System or LDH Helmet for continuous protection of the upper body, neck and head.
> Apron weight is distributed around the hips to reduce risk of neck strain.

PROTECTIVE PERFORMANCE | MASS

<table>
<thead>
<tr>
<th>PROTECTION LEVEL</th>
<th>MATERIAL SPECIFICATIONS</th>
<th>MASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>V50 level according to NATO STANAG 2920</td>
<td>Layered Aramid fibre</td>
<td>3.41 kg, apron only, weight based on regular size</td>
</tr>
</tbody>
</table>

COLOUR OPTIONS AND SIZE
The standard colour of the apron is charcoal grey and the kit is available in regular or large sizes. Med-Eng PPE is comprised of soft and rigid ballistic inserts. All equipment is machine washable once inserts are removed and has a seven-year life expectancy.

Details can be provided by the manufacturer on request.

TEST AND EVALUATION
All Med-Eng PPE products have been tested in live blast testing at DRES (Defense Research Establishment Suffield) using the NATO STANAG 2920 and IMAS 10.30 PPE standards. Internal test reports can be provided by the manufacturer on request.

COST
Not given.
GENERAL DESCRIPTION
The Med-Eng Lightweight Demining Ensemble (LDE) has been in production since 1999 and provides continuous frontal protection. The modular system allows for additional full body protection when combined with protective sleeves, back protector and breast and groin steel add-ons. The LDE is lightweight and flexible and can be worn in all climates without body cooling equipment.

Primary features are
- The apron’s chest plate integrates with the VBS-250 Visor Band System or LDH Helmet for continuous protection of the upper body, neck and head.
- Lightweight design reduces heat stress and fatigue.
- Retractable groin plate for easier kneeling.
- Trousers include thigh and shin plates for greater protection.
- Scalable protection platform to provide more balanced, full-body protection.

PROTECTIVE PERFORMANCE | MASS

<table>
<thead>
<tr>
<th>PROTECTION LEVEL</th>
<th>MATERIAL SPECIFICATIONS</th>
<th>MASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>V50 level according to NATO STANAG 2920</td>
<td>Layered Aramid fibre</td>
<td>8.56 kg, apron and trousers, weight based on medium size</td>
</tr>
</tbody>
</table>

COLOUR OPTIONS AND SIZE
The standard colours of the LDE are olive with black trim and the kit is available in extra small, small, medium small, medium and large sizes. Med-Eng PPE is comprised of soft and rigid ballistic inserts. All equipment is machine washable once inserts are removed and has a seven-year life expectancy. Details can be provided by the manufacturer on request.

TEST AND EVALUATION
All Med-Eng PPE products have been tested in live blast testing at DRES (Defense Research Establishment Suffield) using the NATO STANAG 2920 and IMAS 10.50 PPE standards. Internal test reports can be provided by the manufacturer on request.

COST
Not given.
GENERAL DESCRIPTION
Since 1999, Med-Eng has been providing high demining protection levels with the SRS-5 Suit & Helmet Ensemble. The ensemble is the only head-to-toe protective system of Med-Eng that allows mine clearance personnel to operate on the widest range of blast-type anti-personnel mines. A built-in fan allows for ventilation and cooling in the helmet along with an anti-fog appliqué on the visor to reduce misting. The manufacturer offers the BCS-4 cooling system and mentions that it is recommended for use with the SRS-5. Details will be given by the manufacturer on request.

SRS 5 Suit | Primary features are
> Additional frontal chest and groin protection, including an integrated groin protector.
> Retractable groin plate for easier kneeling.
> Break away zippers, fasteners and pull cords for quick emergency extraction.

SRS 5 Helmet | Primary features are
> Provides full face, neck and head protection.
> Wide field of view.
> Advanced retention system for stability.
> Three visor options | VB-250, VBE-580 and VBC-250.
> Visors integrate with SRS 5 Suit collar for continuous protection.
> Optional communication connections for select radios and mine detectors.

PROTECTIVE PERFORMANCE | MASS

<table>
<thead>
<tr>
<th>PROTECTION LEVEL</th>
<th>MATERIAL SPECIFICATIONS</th>
<th>MASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>V50 level according to NATO STANAG 2920</td>
<td>Layered Aramid fibre</td>
<td>19.59 kg, jacket with chest and groin plates, trousers and back protector, and integrated groin protector; 3.2 kg, helmet with visor; Weights based on medium size</td>
</tr>
</tbody>
</table>

COLOUR OPTIONS AND SIZE
The standard colours of the SRS-5 ensemble and the helmet are olive and the ensemble is available in small, medium small, medium and large sizes; the helmet is available in medium and extra large sizes. Med-Eng PPE is comprised of soft and rigid ballistic inserts. All equipment is machine washable once inserts are removed and has a seven-year life expectancy. Details can be provided by the manufacturer on request.

TEST AND EVALUATION
All Med-Eng PPE products have been tested in live blast testing at DRES (Defense Research Establishment Suffield) using the NATO STANAG 2920 and IMAS 10.30 PPE standards. Internal test reports can be provided by the manufacturer on request.

COST
Not given.
FBF210 EXPLOSION-PROOF OUTFIT

Research Institute of Surgery, Chongqing | China

GENERAL DESCRIPTION

The FBF210 Explosion-Proof Outfit (EPO) is comprised of helmet and visor, protective suit and footwear. It can protect against fragments and the secondary projectiles of an explosion, but also attenuate and alleviate the blast waves. The suit protects the chest, abdomen, crotch and legs against explosive devices. The footwear protects lower limbs and feet.

It is light, soft and can be put on and taken off conveniently. The jacket should be put on first and then the trousers. The protective jacket is open backed and facilitates ventilation. The protective footwear can be put on without taking off the user’s shoes.

There are tool pockets on the protective jacket with no hampering of protective performance. Details of the size and number of pockets are available on request.

The protective outfit can be used on slopes below 45° and is suitable for use in jungle, coast and desert areas. It can be used in rainy conditions and in temperatures between -40°C up to +65°C.

There are few limitations to the working position as it can provide effective protection in standing, kneeling or prone positions. The outfit is expected to last about 10 years.

PROTECTIVE PERFORMANCE | MASS

<table>
<thead>
<tr>
<th>PROTECTION LEVEL</th>
<th>MATERIAL SPECIFICATIONS</th>
<th>MASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protective suit</td>
<td>Dyneema Fraglight</td>
<td>Jacket</td>
</tr>
<tr>
<td>V&lt; 360m/s 0.72g steel ball</td>
<td></td>
<td>Trousers</td>
</tr>
<tr>
<td>Protective footwear</td>
<td>Dyneema Fraglight</td>
<td>&lt; 6.0kg</td>
</tr>
<tr>
<td>no amputation should occur</td>
<td>within the impact level of 210g TNT explosion</td>
<td></td>
</tr>
</tbody>
</table>

COLOUR OPTIONS AND SIZE

The standard colour is orange or camouflage but other colours are available on request. The protective suit and footwear are available in small, medium and large sizes, and other sizes are available on request.

TEST AND EVALUATION

The EPO was tested by the Research Institute of Engineer Equipment Test and Verification of General Equipment Department in China, and reports are available from the manufacturer on request.

IN USE TO DATE

The EPO is in service with demining missions in Yunnan and Guangxi Provinces of China, and in Afghanistan, Congo, Eritrea, Lebanon, Pakistan, Thailand and Turkey.

COST

Not given.
GENERAL DESCRIPTION

The Fender HPB Demining Apron was designed in cooperation with demining organisations working in Afghanistan to meet the specific requirements for demining in that environment. The apron protects deminers when operating metal detectors in the upright position, as well as in both squatting and kneeling positions during prodding. The protective ensemble consists of a vest unit covering the front, sides, shoulders, neck and upper part of the back, including a second collar to protect between the vest and the visor. The lower part consists of a detachable apron with straps to provide comfortable and functional protective clothing.

The ballistic inserts of the vest can easily be removed, and the outer cover can be washed in a washing machine at temperatures up to 40°C. The apron can be cleaned using a brush and a wet cloth.

PROTECTIVE PERFORMANCE | MASS

<table>
<thead>
<tr>
<th>PROTECTION LEVEL</th>
<th>MATERIAL SPECIFICATIONS</th>
<th>MASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-50- 450/sec according to STANAG 2920</td>
<td>Aramid fibre</td>
<td>4.9 kg (large size)</td>
</tr>
</tbody>
</table>

COLOUR OPTIONS AND SIZE

- Outer cover (vest) | Cordure, 1000 denier, UN blue.
- Cover, lower part | PVC-coated polyester, 900 denier, 600g/sqm, dark blue.
- The demining ensemble is available in small, medium, large and extra large sizes.

TEST AND EVALUATION

The Fender HPB was tested by the United Nations Mine Action Centre Afghanistan (UNMACA). Internal test reports are available through the Programme Manager of UNMACA.

COST

Not given.
**GENERAL DESCRIPTION**

The *RAVELIN Demining Vest* was designed in cooperation with Norwegian People’s Aid and Danish Church Aid to meet the specific requirements for demining in tropical climates. The vest protects deminers operating metal detectors in an upright position, as well as in both squatting and kneeling positions during prodding.

The vest unit covers the front, abdomen, sides, shoulders and neck, and includes a second collar to protect between the vest and the visor. Rofi offers three different versions of the vest: OB (open back strap system), HPB (half-protected back) and PB (protected back).

The ballistic inserts of the vest can easily be removed, and the outer cover can be washed in a washing machine at temperatures up to 40°C.

**PROTECTIVE PERFORMANCE | MASS**

<table>
<thead>
<tr>
<th>PROTECTION LEVEL</th>
<th>MATERIAL SPECIFICATIONS</th>
<th>MASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>V50- 450m/sec</td>
<td>Aramid fibre</td>
<td>2.2 kg</td>
</tr>
<tr>
<td>optionally 600m/sec</td>
<td></td>
<td></td>
</tr>
<tr>
<td>according to STANAG 2920</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COLOUR OPTIONS AND SIZE**

- Outer cover (vest) | Cordura, 1000 denier, UN blue or red.
- The demining vest is available in small, medium, large and extra large sizes.

**TEST AND EVALUATION**

Test reports can be provided by the manufacturer on request.

**IN USE TO DATE**

Used or purchased by many organisations, including Danish Church Aid, Danish Demining Organisation, Norwegian People’s Aid, RONCO, Swiss Federation for Demining and the US State Department. The vest is currently used in demining projects in Afghanistan, Angola, Bosnia and Herzegovina, Croatia, Eritrea, Ethiopia, Iraq, Iran, Mozambique, Oman, Sri Lanka, Sudan and Yemen.

**COST**

Not given.
SADEC APRON AND SD 450 APRON

Apron Security Devices (PVT) Ltd. | Zimbabwe

GENERAL DESCRIPTION

Both aprons cover the deminer’s body from the shoulder to mid-thigh, including the crotch. They are lightweight and their open-back design allows body heat to disperse when performing demining activities in hot climates, as well as the free movement of the arms. An optional evaporative cooling system is available. Tool pockets can be provided as an option.

Performance ensures basic protection against threats from blast anti-personnel mines. One of the main features is the one-piece design which aims to maintain integrity during a blast. A protective collar is fitted to overlap a full-length visor.

The aprons are secured with clips which are easily accessed by the wearer and can be operated with one hand. The outer cover is washable and can easily be replaced.

PROTECTIVE PERFORMANCE | MASS

<table>
<thead>
<tr>
<th>PROTECTION LEVEL</th>
<th>MATERIAL SPECIFICATIONS</th>
<th>MASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>V50 - 450m/s according to STANAG 2920</td>
<td>SADEC apron ballistic polyamide; SD 450 apron Kevelar</td>
<td>SADEC apron 3.7 kg SD 450 apron 3.5 kg</td>
</tr>
</tbody>
</table>

COLOUR OPTIONS AND SIZE

The demining aprons can be delivered in orange and royal blue. The aprons are suitable for all normal positions when used with a visor. Information on sizes has not been given by the manufacturer.

TEST AND EVALUATION

In-house testing is done for quality assurance and research and development by the manufacturer in their own laboratory using a firing rig built in accordance with STANAG 2920. Independent tests have been carried out by organisations such as Mine Action Centre of the Southern African Development Community. Test reports can be provided by the manufacturer on request.

COST

Not given.
**SDV VEST**

Apron Security Devices (PVT) Ltd. | Zimbabwe

**GENERAL DESCRIPTION**

The *SDV Vest* covers the chest, abdomen and crotch areas of the deminer’s body. The vest is lightweight and its open-back design with a section of elastic netting allows body heat to disperse when performing demining activities in hot climates and free movement of the arms. An optional evaporative cooling system is available. Tool pockets can be provided as an option.

Performance ensures basic protection against threats from blast anti-personnel mines. The components of the vest are overlaid to maximise the integrity during a blast. A protective collar is fitted to overlap a full-length visor.

The vest is secured with hook and loop tape that is rearward facing so that its exposure in a blast is minimised. The outer cover is washable and can easily be replaced.

**PROTECTIVE PERFORMANCE | MASS**

<table>
<thead>
<tr>
<th>PROTECTION LEVEL</th>
<th>MATERIAL SPECIFICATIONS</th>
<th>MASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>V50- 450m/s</td>
<td>Kevelar and polycarbonate</td>
<td>2.7 kg</td>
</tr>
<tr>
<td>according to STANAG 2920 and higher in the chest area due to the integral polycarbonate breastplate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COLOUR OPTIONS AND SIZE**

The demining vest can be delivered in orange and royal blue. The vest is suitable for all normal positions when used with a visor. Information on sizes has not been given by the manufacturer.

**TEST AND EVALUATION**

In-house testing is done for quality assurance and research and development by the manufacturer in their own laboratory using a firing rig built in accordance with STANAG 2920. Independent tests have been carried out by organisations such as Mine Action Centre of the Southern African Development Community. Test reports can be provided by the manufacturer on request.

**COST**

Not given.
### DUOTONG MECHANICAL FACTORY | PLFII HELMET

<table>
<thead>
<tr>
<th>PROTECTION LEVEL</th>
<th>MATERIAL</th>
<th>WEIGHT</th>
<th>VISOR PROTECTION AREA</th>
<th>FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resists shrapnel (mass less than 0.72g and velocity not more than 400m/s)</td>
<td>Protective visor</td>
<td>crystal; Helmet</td>
<td>multilayer Kevlar fibre</td>
<td></td>
</tr>
<tr>
<td>Not more than 2 kg</td>
<td>Not given</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### FEATURES
- The PLFII helmet and the fitted visor are specially designed to protect the deminer's head when engaged in mine clearance and detector work.
- Headband of the helmet is fully adjustable for both girth and depth.
- The protective visor is hinged and can be lifted or closed as required.
- Both sides of the helmet have space to fit the earphone of a mine detector.

#### OPTIONS

### ENVOSTAR CO., LTD | CMAC VISOR | LO VISOR

<table>
<thead>
<tr>
<th>PROTECTION LEVEL</th>
<th>MATERIAL</th>
<th>WEIGHT</th>
<th>VISOR PROTECTION AREA</th>
<th>FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Related to IMAS 10.30</td>
<td>5mm polycarbonate (LEXAN)</td>
<td>Not given</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMAC</td>
<td>visor 10cm²</td>
<td>Long (LO) visor</td>
<td>12cm²</td>
<td></td>
</tr>
</tbody>
</table>

#### FEATURES
- CMAC visor is mounted on a workman’s helmet (no protection for the head is given).
- LO visor is mounted on a standard head harness.
- The visors are supplied in protective bags and visor covers.
- Visors can be mounted on a protective helmet.
- Cost: US$65, both models

#### OPTIONS

### RESEARCH INSTITUTE OF SURGERY | EXPLOSION-PROOF OUTFIT

<table>
<thead>
<tr>
<th>PROTECTION LEVEL</th>
<th>MATERIAL</th>
<th>WEIGHT</th>
<th>VISOR PROTECTION AREA</th>
<th>FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helmet and visor</td>
<td>5mm polycarbonate (LEXAN)</td>
<td>Not given</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V ≈ 510 m / s</td>
<td></td>
<td>0.72g steel ball</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 2.05 kg</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### FEATURES
- The helmet and the visor in combination with the jacket provides protection of the neck.
- The visor is made of a mist-proof material.

#### OPTIONS

### LBA | TETRANIKE VISOR | VISOR BAND

<table>
<thead>
<tr>
<th>PROTECTION LEVEL</th>
<th>MATERIAL</th>
<th>WEIGHT</th>
<th>VISOR PROTECTION AREA</th>
<th>FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-50 (&gt;240 m / s) NATO</td>
<td>5mm polycarbonate</td>
<td>Not given</td>
<td></td>
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</tr>
<tr>
<td>STANAG 2920</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### FEATURES
- Headband is fully adjustable for both girth and depth.
- Visor is hinged and can be lifted and closed at will.
- Headband is supplied separately from the visor
- Headband is of moulded Nylon 66.
- Visors can be fitted optionally to fragmentation and non-fragmentation helmets.
**MED-ENG SYSTEMS INC. | LDH VISOR | VBS-250 | VBS-450**

**PROTECTION LEVEL**
- V-50(250m/sec) in accordance with NATO STANAC 2920
- Not given

**MATERIAL**
- 6mm polycarbonate
- Not given

**WEIGHT**
- Helmet with visor | 1.67 kg (based on medium size)
- Not given

**VISOR PROTECTION AREA**
- Not given

**FEATURES**
- The Lightweight Demining Helmet (LDH) provides head and face protection against blast anti-personnel mines.
- Ventilated holes help reduce physiological heat stress while the full-face visor provides a high degree of protection.

**OPTIONS**
- An anti-fog self-adhesive appliqué can be added to the visor to increase the level of scratch resistance and reduce misting.
- Integrates with the LDE Demining Ensemble or the Demining Apron to provide continuous frontal protection.
- Standard colour is grey and the visor is available in small and large size, the helmet in one size.

---

**ROFI INDUSTRIER | VISOR**

**PROTECTION LEVEL**
- VBS-250 for protection against blast anti-personnel mines: V-50(250m/sec) rating in accordance with NATO STANAG 2920, and IMAS 10.30,
- VBS-450 for protection against fragments from blast anti-personnel mines.

**MATERIAL**
- Not given

**WEIGHT**
- VBS-250 | 1.20 kg, visor (based on medium size)
- VBS-450 | 1.65 kg, visor (based on medium size)
- Not given

**VISOR PROTECTION AREA**
- Not given

**FEATURES**
- The VBS-250 and VBS-450 Visor Band Systems fit select PASGT-style helmets to provide protection against blast anti-personnel mines.
- The Visor can be locked in the lowered position during operations or in the raised position during rest periods.

**OPTIONS**
- Visor integrates with chest plate of LDE and ACE to provide continuous frontal protection over the upper body, neck and head.
- Can be easily attached to or removed from helmet.

---

**SECURITY DEVICES | VISOR**

**PROTECTION LEVEL**
- V-50 (250m / sec)
- V50 (250m / s)

**MATERIAL**
- 5mm polycarbonate
- Including bag and head frame | 1 kg

**WEIGHT**
- Including bag and visor band | 1 kg
- 1,250 cm²

**VISOR PROTECTION AREA**
- Not given

**FEATURES**
- Soft headbands for maximum comfort and durability.
- Supplied with a protective bag.
- Removable and washable sweatband.
- Purpose-designed soft-head frame for maximum comfort and durability.
- Removable and washable sweatband is fitted to the head frame.
- Supplied with a protective bag.
- A scratch removing kit is available.
- Minimum restriction to movement and vision.
- Durable and easy to maintain.
- Scratch shields available as an option.
- Available in full and half face versions.
GENERAL DESCRIPTION

This chapter deals with the results of the trials performed between 2003 and 2006 as part of the project called Systematic Test and Evaluation of Metal Detectors (STEMD). The original ITEP-Project belonged to the Joint Research Centre and it was finished by the German Federal Institute for Material Research and Testing Detectors were tested in laboratory and field conditions on three continents. The purpose of the trials was to provide the demining community with information about the state of art of currently available, commercial-off-the-shelf (COTS) detectors. The tests were performed according to the CEN (European Committee for Standardisation) workshop agreement for testing metal detectors (CWA 14747). The trials are repeatable and they provide neutral information. A complete set of reports can give answers to a broad spectrum of questions concerning the detector performance in laboratory and field conditions, with different targets and under extreme soil conditions. All the results of the lab tests and the field trials can be found on the ITEP website www.itep.ws (search key word “STEMD”).

1. RELIABILITY TRIALS

A target which can be found in the lab conditions may nevertheless be missed in the field if the operator loses concentration, or does not sweep over the point where it lies, or sweeps too fast or too slowly for the detector electronics, or misinterprets a weak mine signal as a soil signal. An operator may also incorrectly signal the presence of a mine when none is there if there is a signal from a small area of magnetic soil minerals or a small piece of metal clutter or electronic noise. Such errors are unpredictable but one may measure the probability of their happening in statistically-based blind reliability trials, in which a team of operators attempts to find rendered safe mines or other targets buried at locations unknown to them. The Probability of Detection (POD) for a given target in given conditions and the False Alarm Rate (FAR) depend on the detector design, the operator behaviour as well as environmental factors mutually influencing each other. This complex of influencing factors is part of test and evaluation. Details of the method are now standardised in CWA 14747 Section 8.5 under the name “reliability tests”.

The estimated POD for a particular choice of detectors, soils and targets is the ratio of the number of detected targets and the total number of opportunities to detect a target. For example, if two runs were made on a lane with 30 targets, and if 22 out of 30 targets were detected in the first run and 26 targets in the second run, than the estimated POD is \((22+26) / (30+30) = 0.8\). The estimated FAR is defined as the number of false alarms counted on an area divided by the size of that area, or the average number of false alarms per square metre. The area is calculated as the area of the test lane minus the area of all detection halos. For example, let us consider 30 antipersonnel mines PMA-2 buried to a 30m long and 1 m wide lane. The halo radius of this target is \(r = 10\)cm, the total area of all halos is \(30\pi r^2 = 0.9\)m², so that the lane area needed for the calculation of the FAR is 29.1m².

False alarms are a serious problem in demining because they considerably slow down clearance operations. In the Croatian STEMD trial, the operators achieved very different FARs (also because they used different detectors). In most cases, deminers with a higher FAR needed more time to complete their work in a lane. For example, the operator with the highest FAR (about 1.8 false alarms per m²) was three times slower than the operator with the lowest FAR (about 0.10 false alarms per m²). In clearance operations deminers spend a significant portion of their time investigating false alarms and excavating metal clutter, so that false alarms slow down their work even more than they do in a test.
When a metal detector search head comes close to a magnetic soil, the detector gives an audio signal. This is a source of many false alarms, especially if the metal detector does not have any ground compensation abilities. Ground compensation procedure is a reduction of the detector sensitivity to soil with a much smaller reduction of its sensitivity to metal. A simple empirical measurement of the effect of a soil on detectors can be made by setting a detector without soil-compensation to a definite sensitivity and measuring the minimum distance to the soil surface at which the detector starts giving signals. This distance is called the ground reference height (GRH).

POD and FAR are related in the sense that they both decrease if the operator adjusts down the sensitivity of the instrument, or implicitly does so by requiring a clearer sound before calling an indication. It is therefore the usual practice to quote POD and FAR together. The POD and FAR are combined in a diagram called an ROC diagram, where ROC stands for “receiver operating characteristic”. An ideal detector would have POD = 1 and FAR = 0 and it would be represented by a point in the upper left corner of an ROC diagram. To each point on an ROC diagram, 95% confidence limits are attributed. They describe the uncertainty of the estimate of the POD and of the FAR. The difference between two detectors can be roughly estimated as statistically significant if the confidence intervals of the two points representing those detectors do not overlap. For example, let us examine the overall results of the STEMD trial performed in Croatia (described in more detail in the next section) presented in Figure 1. The group of three detectors comprising the two Minelab models and Foerster MINEX 2FD has about the same POD, with small differences which are not statistically significant. The differences are considered not significant because their POD confidence intervals partially overlap. These detectors have a significantly higher POD than all other detectors in the trial. However, the FAR of Foerster MINEX 2FD is clearly significantly larger than the FAR of the Minelab models. There is also a small but statistically significant difference between the FARs of the two Minelab models, in favour of F3.

Generally, the deeper the target is placed the smaller the POD. Therefore, it is meaningless to quote a POD without also quoting the target depth and it is common practice to show graphs of POD against target depth. The curves describing the dependency of the POD on depth are called POD curves. They can be estimated with a generalised linear model with the help of maximum likelihood estimation (described in [8]). Such a curve is presented in Figure 2. Each POD curve can be presented with 95% confidence bounds which describe the uncertainty of the test results. The width of the area between the confidence bounds depends on the experimental results: it is influenced by the detector, the soil and the experimental error, and the target depth. From Figure 2 we can see that the estimated POD of Minelab F3 drops with depth, as expected. At the smallest depths it is practically 100%; it drops to 90% at about 8cm depth to 50% at about 12cm depth.

In a reliability test, targets are placed in metal-free lanes at random positions not known to detector operators. The proximity of one target may affect the POD of finding a neighbour, which is why a minimum separation distance is imposed (0.5m in CWA 14747). While searching, the operators mark the places of indications and, later, supervisors measure and record the positions of the markers. A target is considered to have been detected when a marker is dropped within a prescribed radius around the true target location. The area defined with this radius is called a detection halo, or in this document just a halo. The halo radius, according to CWA 14747:2003, is defined as “the half of the maximum horizontal extent of the metal components in the target plus 100mm”. A marker outside of the halo is classified as a false positive indication, or a false alarm.
At first glance, the results of all reliability tests performed up to the present are surprisingly low. However, reliability tests are purposely designed to be difficult. The choice of depths in a trial does not represent the actual situation in a minefield, but rather a difficult scenario. In reality, most mines are found near the ground surface. In a trial, some mines have to be buried deeper to bring the detectors to their limits. Such a choice of depths makes the differences between detectors more apparent. For example, the targets used in the Croatian STEMD trial (presented in Figure 1 and discussed above) were buried between 1cm and 14.5cm. On the other hand, the choice of operators has to be representative: the persons operating the detectors have to be chosen among deminers who would actually use those detectors in minefields. Earlier trials have shown that the operators’ experience and skill have a large influence on the test results.

**Figure 1** STEMD trial Croatia, ROC diagram, all soils, all detectors, targets PMA-2 and PMA-3, with 95% confidence limits.

**Figure 2** STEMD trial Croatia, POD curve for Minelab F3 in Obrovac soil, targets PMA-2 and PMA-3, with 95% confidence bounds.

---

### 2. THE STEMD TRIALS

The main aim of the STEMD trials was to give the demining community an overview of the commercially available metal detectors. Three field trials and one lab trial were performed. The field trials were carried out in Laos in 2004, in Mozambique in 2004 and in Croatia in 2006. The Lao and the Mozambican trials were organised by the Joint Research Centre of the European Commission (JRC), while the Croatian trial was organised by BAM (Federal Institute for Materials Research and Testing / Bundesanstalt für Materialforschung und –prüfung, Berlin, Germany). The laboratory tests were carried out at the JRC test facilities in Ispra, Italy, from 2003 to 2006.

A great value of the STEMD trials is that the detectors were tested in the same conditions and with a standardised procedure, which enables valid comparisons between the detector models currently available on the market.

Table 1 is an overview of the participating detectors and the main objectives of the trials. Table 2 provides an overview of the technical characteristics of the tested devices important for the user. Selected results in the following sections give an impression of detector performance under the specific trial objectives and conditions.
1. RESULTS OF STEMD TRIALS

Table 1 Overview of the detectors participating in the STEMD trials.

<table>
<thead>
<tr>
<th>PARTICIPATING_DETECTORS</th>
<th>LAB TRIAL</th>
<th>FIELD TRIAL LAOS</th>
<th>FIELD TRIAL LAOS</th>
<th>FIELD TRIAL CROATIA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>JRC ISPRA</td>
<td>MIL-D1 and MIL D1 DS</td>
<td>CEIA MIL-D1</td>
<td>CEIA MIL-D1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not available</td>
<td>Not available</td>
<td>AKA Condor 7252* and Vector 7260</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ebinger EBEX 421 GC/LS*</td>
<td>Ebinger EBEX 421 GC/LS*</td>
<td>Not available</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Guartel MD8+</td>
<td>Not available</td>
<td>Guartel MD8+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Foerster MINEX 2FD 4.500.01</td>
<td>Foerster MINEX 2FD 4.500</td>
<td>Foerster MINEX 2FD 4.530*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Minelab F3, F1A4 and F1A4 UXO*</td>
<td>Minelab F3 and F1A4 UXO*</td>
<td>Minelab F3 and F1A4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Schiobel ATMID</td>
<td>Schiobel ATMID</td>
<td>Schiobel ATMID</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shangai Research Institute Model 90</td>
<td>Not available</td>
<td>Shangai Research Institute Model 90</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vallon VMH3 and VMH3CS UXO*</td>
<td>Vallon VMH3 and VMH3CS UXO*</td>
<td>Vallon VMC1* and VMH3CS*</td>
</tr>
</tbody>
</table>

MAIN OBJECTIVES

Lab tests with the CWA 14747:

> Sensitivity tests to different metals, spheres, ITOP inserts
> Battery life
> Ruggedness, temperature etc.

Requirements of ERW Lao:

> Ability to detect BLU-26B and 20mm cannon shell targets up to 300mm depth and
> Ability to reject small pieces of metal scrap

> Compare the reliability of detection and other detector performance data in different types of soils
> Psychological approach to the investigation of the human factor

> Compare performance of detectors in different types of Mozambican soils
> Measure sensitivity of detectors to typical local targets of interest and standard targets

TARGETS

> Standard ITOP targets
> Standard metal balls from aluminium, stainless and chrome steel
> Mines rendered safe and mine surrogates
> Two soil types

1. The letter “M” marks the modified software. The manufacturer has not named this prototype.

* After the name of a detector model marks its first appearance in a metal detector field trial.
## 1. RESULTS OF STEMD TRIALS

### Table 2
Overview of the physical principles and technical properties of the detectors participating in the STEMD trials.

<table>
<thead>
<tr>
<th>DETECTORS</th>
<th>MANUFACTURERS</th>
<th>MODE</th>
<th>COIL</th>
<th>SET UP</th>
<th>SENSITIVITY ADJUSTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>STATIC</td>
<td>DYNAMIC</td>
<td>SINGLE</td>
<td>DOUBLE D</td>
</tr>
<tr>
<td>Condor 7252</td>
<td>AKA</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>-</td>
</tr>
<tr>
<td>Vector 7260</td>
<td>AKA</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>-</td>
</tr>
<tr>
<td>MIL-D1</td>
<td>CEIA</td>
<td>x</td>
<td>-</td>
<td>-</td>
<td>x</td>
</tr>
<tr>
<td>EBEX® 421 GC</td>
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<td>- x</td>
<td>x</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>EBEX® 420 HS</td>
<td>Ebinger</td>
<td>- x</td>
<td>x</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Minex 2FD 4.500</td>
<td>Foerster</td>
<td>x</td>
<td>-</td>
<td>-</td>
<td>x</td>
</tr>
<tr>
<td>Minex 2FD 4.510</td>
<td>Foerster</td>
<td>x</td>
<td>-</td>
<td>-</td>
<td>x</td>
</tr>
<tr>
<td>Minex 2FD 4.530</td>
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<td>x</td>
<td>-</td>
<td>-</td>
<td>x</td>
</tr>
<tr>
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<td>Guartel</td>
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<td>x</td>
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<td>x</td>
</tr>
<tr>
<td>F3</td>
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<td>x</td>
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<tr>
<td>M90</td>
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<td>x</td>
<td>-</td>
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</tr>
<tr>
<td>VMC1</td>
<td>Vallon</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>-</td>
</tr>
<tr>
<td>VMH3</td>
<td>Vallon</td>
<td>x^3</td>
<td>x</td>
<td>x</td>
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</tr>
<tr>
<td>VMH3CS</td>
<td>Vallon</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>-</td>
</tr>
<tr>
<td>VMH3 (M)</td>
<td>Vallon</td>
<td>x^3</td>
<td>x</td>
<td>x</td>
<td>-</td>
</tr>
</tbody>
</table>

1. The sensitivity level is normally fixed but can be changed.
2. A large number of digitized levels are available, so the adjustment is effectively continuous.
3. Will be made available for this model.
## 1. RESULTS OF STEMD TRIALS

Table 2  Overview of the physical principles and technical properties of the detectors participating in the STEMD trials.

<table>
<thead>
<tr>
<th>DETECTORS</th>
<th>MANUFACTURERS DETECTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condor 7252</td>
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<td>Vallon</td>
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### PRINCIPAL FEATURES

<table>
<thead>
<tr>
<th>SET UP</th>
<th>SOFTWARE ACCESS</th>
<th>SIGNAL*</th>
<th>MANUFACTURERS DETECTORS</th>
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</thead>
<tbody>
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<td>NO</td>
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</tr>
<tr>
<td>x</td>
<td>-</td>
<td>-</td>
<td>Y</td>
</tr>
</tbody>
</table>

3 Will be made available for this model.
4 The signal can be delivered to the operator as an audio signal (A), LED-display (L), or a vibration (V) of the handle.
5 The audio signal can be changed for different targets.
6 These detectors can be updated to static mode since summer 2006 but have not been tested in static mode.
Several different coil configurations are used in the design of metal detectors. The detectors described in this catalogue have either a single coil search head or a double-D search head. Double-D metal detectors use a receiver coil consisting of two halves resembling two D letters. It appears to a detector user that each half produces a different tone. The audio signal has a sharp transition when the search head is moved left-right above the object. All manufacturers who decide to use other search coil designs have a choice between the static mode and the dynamic mode. Static mode detectors produce a sound whenever the secondary field exceeds a detection threshold. (Double-D detectors are static mode detectors.) Dynamic mode detectors give an alarm when they detect a change of the secondary field, that is, when the search head approaches a conductive object and when it strays from it, but no alarm when the detector is not moved relative to the object.

**Magnetic properties of soils present in the trials**

This section is an overview of the magnetic properties of the soils used in the trials. The magnetic susceptibility of the ground is the main physical property which determines how much the ground influences detector performance. Most detectors are designed to handle magnetic soils but they may still be affected if the susceptibility has strong frequency dependence.

The Bartington magnetic susceptibility meter was used to measure the magnetic susceptibility at 3 frequencies (465 and 4650 Hz on 10ml samples and 958 Hz in-situ). The frequency dependence was evaluated very simply by comparing the results at 465 and 4650 Hz. Measurements with the probes MS2B and MS2D are not comparable, since they are calibrated differently. This is why the measurements with the MS2D loop do not give values between the values measured with the MS2B probes. Many other measurements [8] [4] have shown that the susceptibility drops with increasing frequency.

The ground reference height (GRH) was measured once with each of five Schiebel detectors AN19/2 M7, calibrated so that a standard test piece created a signal at a distance of 10 cm to the centre of the search head. The frequency dependence and the ground reference height are known to be correlated, and this may be clearly seen from the results presented in this section (see also [6]).

*Table 3 and Table 4* are the results of the measurement performed on the Lao test sites. [2] [3]
## 1. RESULTS OF STEMD TRIALS

### Table 3
STEMD trial Laos, soil magnetic properties, measured in the pits.

<table>
<thead>
<tr>
<th>SITE 1</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PIT 1</td>
<td>MS2B (465 Hz)</td>
<td>MS2D LOOP (968 Hz)</td>
<td>MS2B (4650 Hz)</td>
<td>MS2B</td>
<td>SCHIEBEL AN19 MOD. 7</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>22, 24, 23, 19</td>
<td>14</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>PIT 2</td>
<td>29</td>
<td>18, 17, 16, 16</td>
<td>27</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>SITE 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIT 1</td>
<td>936</td>
<td>681, 782, 678, 744</td>
<td>900</td>
<td>36</td>
<td>260, 280</td>
</tr>
<tr>
<td>PIT 2</td>
<td>977</td>
<td>679, 654, 668, 720</td>
<td>918</td>
<td>59</td>
<td>250, 250</td>
</tr>
<tr>
<td>SITE 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIT 1</td>
<td>1903</td>
<td>2238, 2100, 2009, 2089</td>
<td>1697</td>
<td>206</td>
<td>480</td>
</tr>
<tr>
<td></td>
<td>1827</td>
<td>1638</td>
<td>189</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIT 2</td>
<td>1767</td>
<td>1760, 1728, 1684, 1706</td>
<td>1647</td>
<td>120</td>
<td>350</td>
</tr>
<tr>
<td></td>
<td>1654</td>
<td>1576</td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPOT 1</td>
<td>6574</td>
<td>6071</td>
<td>6016</td>
<td>558</td>
<td>650</td>
</tr>
<tr>
<td></td>
<td>6330</td>
<td>5772</td>
<td>558</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPOT 2</td>
<td>7101</td>
<td>6600, 6441, 6514, 8499, 8534</td>
<td>6472</td>
<td>629</td>
<td>820</td>
</tr>
<tr>
<td></td>
<td>7718</td>
<td>7020</td>
<td>698</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPOT 3</td>
<td>10544</td>
<td>8776, 9403, 9209, 9676</td>
<td>9688</td>
<td>856</td>
<td>930</td>
</tr>
<tr>
<td></td>
<td>11056</td>
<td>10185</td>
<td>871</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 4
STEMD trial Laos, soil magnetic properties, measured in the test lanes.

<table>
<thead>
<tr>
<th>SITE 1</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LANE 1</td>
<td>MS2B (465 Hz)</td>
<td>MS2D LOOP (968 Hz)</td>
<td>MS2B (4650 Hz)</td>
<td>MS2B</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>19, 23, 13, 12, 13, 15, 20</td>
<td>21</td>
<td>-1</td>
</tr>
<tr>
<td>LANE 2</td>
<td>105</td>
<td>21, 22, 13, 14, 15, 16</td>
<td>106</td>
<td>-1</td>
</tr>
<tr>
<td>LANE 3</td>
<td>94</td>
<td>36, 38, 70, 49, 55, 67, 94</td>
<td>94</td>
<td>0</td>
</tr>
<tr>
<td>LANE 4</td>
<td>209</td>
<td>15, 6, 21, 19, 29, 40, 17, 11, 9, 15</td>
<td>208</td>
<td>1</td>
</tr>
</tbody>
</table>

### SITE 2

<table>
<thead>
<tr>
<th>LANE 1</th>
<th>MS2B (465 Hz)</th>
<th>MS2D LOOP (968 Hz)</th>
<th>MS2B (4650 Hz)</th>
<th>MS2B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>904</td>
<td>505, 356, 470, 476</td>
<td>849</td>
<td>55</td>
</tr>
<tr>
<td>LANE 2</td>
<td>764</td>
<td>471, 437, 359, 512</td>
<td>716</td>
<td>48</td>
</tr>
<tr>
<td>LANE 3</td>
<td>964</td>
<td>391, 397, 433, 400</td>
<td>906</td>
<td>58</td>
</tr>
<tr>
<td>LANE 4</td>
<td>868</td>
<td>450, 499, 571, 520</td>
<td>828</td>
<td>40</td>
</tr>
</tbody>
</table>
The most extreme ground conditions were found with magnetic susceptibility about $11,000 \times 10^{-5}$ and a difference between low and high frequency measurement of more than $850 \times 10^{-5}$ (measured in SI units). By values of about $1500 \times 10^{-5}$ and frequency differences of $75 \times 10^{-5}$, some detectors were unable to compensate. In the most difficult soils only two detector types were able to compensate the ground and still react on a metal fragment. Table 5 shows which detectors could compensate in which soil type, depending on the magnetic properties of soil.

**Table 5**

<table>
<thead>
<tr>
<th>DETECTORS</th>
<th>DETECTOR COPY</th>
<th>DIFFERENCE OF SUSCEPTIBILITIES AT 465 AND 4650 Hz ($10^{-5}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>78 - 200</td>
</tr>
<tr>
<td>Schiebel ATM1D</td>
<td>1</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>1'</td>
<td>Y</td>
</tr>
<tr>
<td>Foerster 2FD 4.500</td>
<td>2</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>2'</td>
<td>N</td>
</tr>
<tr>
<td>Ebinger 421 GC/LS</td>
<td>3</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>3'</td>
<td>Y</td>
</tr>
<tr>
<td>Minelab F1AUX0</td>
<td>4</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>4'</td>
<td>N</td>
</tr>
<tr>
<td>Cea MIL-D1/D5</td>
<td>5</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>5'</td>
<td>Y</td>
</tr>
<tr>
<td>Minelab F3</td>
<td>6</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>6'</td>
<td>Y</td>
</tr>
<tr>
<td>Vallon VMH3</td>
<td>7</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>7'</td>
<td>Y</td>
</tr>
<tr>
<td>Vallon VMH3 UXO</td>
<td>8</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>8'</td>
<td>Y</td>
</tr>
<tr>
<td>GROUND REFERENCE HEIGHT (mm)</td>
<td>480</td>
<td>650</td>
</tr>
</tbody>
</table>

Table 6 presents the results of the soil measurements on the Mozambican test site [31] [6].

**Table 6**

| MAGNETIC SUSCEPTIBILITY MEASURED WITH BARTINGTON MS2 MAGNETIC SUSCEPTIBILITY METER ($10^{-5}$) | DIFFERENCE OF SUSCEPTIBILITIES AT 465 AND 4650 Hz ($10^{-5}$) | GROUND REFERENCE HEIGHT (cm) |
| MS2B (465 Hz) | MS2D LOOP (968 Hz) | MS2B (4650 Hz) | MS2B | SCHIEBEL AN19 MOD. 7 |
| LANE 1 | 2 | 2 | 2 | 0 | 0 |
| LANE 2 | 11 | 9 | 11 | 1 | 9 |
| LANE 3 | 130 | 95 | 124 | 6 | 83 |
| LANE 4 | 868 | 671 | 842 | 25 | 168 |
| LANE 5 | 1112 | 890 | 1082 | 30 | 180 |
| LANE 6 | 636 | 466 | 591 | 45 | 211 |
| LANE 7 | 2885 | 2231 | 2829 | 57 | 210 |
Table 7 is an overview of the soil types present in the Croatian STEMD trial [4] [6].

Table 7  STEMD trial Croatia, soil magnetic properties (with standard deviations).

<table>
<thead>
<tr>
<th>Soil Types in the Croatian Trial</th>
<th>Magnetic Susceptibility at 958 Hz (10^-5)</th>
<th>Difference of Susceptibilities at 465 and 4650 Hz (10^-5)</th>
<th>Ground Reference Height (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LANES 3, 4 (Neutral; Clay) Benkovac Soil</td>
<td>13 ± 2</td>
<td>0.6</td>
<td>No signal</td>
</tr>
<tr>
<td>LANES 1, 2 (Uncooperative; Bauxite) Obrovac Soil</td>
<td>154 ± 13</td>
<td>25.5</td>
<td>18.8 ± 0.9</td>
</tr>
<tr>
<td>LANES 5, 6 (Uncooperative; Heterogeneous; Bauxite with Neutral Stones) Benkovac Soil</td>
<td>190 ± 36</td>
<td>35.4</td>
<td>19.7 ± 2.5</td>
</tr>
</tbody>
</table>

The STEMD trial in Laos

The main threat in Laos is created by ERW (explosive remnants of war) going back to the time of the Vietnam War. Landmines themselves have only a minor influence on the population and development of the country. The purpose of this trial was to assess the metal detectors possibly suitable for detection of smaller ERW. Reliability tests were performed on two test sites with two different soil types. Maximum detection depth tests were carried out on three sites. The soil magnetic properties are described in Table 3 and Table 4. The main results of the maximum detection depth and reliability test with the comparison of the detectors are presented in the following paragraphs.

Figure 3 presents the results of the maximum detection depth measurements on test site 5. The canon shell was buried vertically and horizontally. The horizontally oriented shell was more difficult to detect to all detectors except two: for Minelab F3 there was no difference, and Schiebel ATMID could detect the horizontally laid shell more easily than the vertical one. Due to failure in soil compensation on Site 3, no meaningful data could be collected for the Foerster and the Minelab F1A4 UXO. This site displayed high magnetic susceptibility values (Pit 1: 1700 to 2000, Pit 2: 1500 to 1700 x10^-5 SI units; see also Table 5). Both CEIAs and one Minelab F3 were able to detect all targets in all orientations to the required depth of 300 mm.
1. RESULTS OF STEMD TRIALS | LAOS

Figure 3 STEMD trial Laos, test site 3, maximum detection depths of different targets, measured in cm. The 20mm shell was buried vertically and horizontally. The target marked with “steel” was a Cr6 steel ball of 10mm diameter.

Figure 4 STEMD trial Laos, test site 1, ROC diagram. The crosses indicate 95% confidence intervals.

The results of the reliability trial are presented in Figure 4 to Figure 9. The ROC-diagrams (Figure 4 and Figure 5) clearly show that the Minelab F1A4 achieved the best results. At test site 1 it was among the best detectors regarding POD and the best one regarding FAR. At test site 2 it achieved the highest POD, together with detectors Minelab F3, Ebinger and CEIA. Among these detectors, Minelab F1A4 UXO had the lowest FAR because of its large search head which does not cause alarms from small metal pieces. The dependence of POD on depth is presented on Figure 6 to Figure 9. For all detectors, POD generally falls with increasing depth as expected. The 20mm cannon shell is more difficult to detect than the BLU-26B submunition. The red solid line represents the average performance of all detectors. The dashed lines represent 95% confidence bounds. Differences in POD between detectors smaller than the spacing between the two dashed lines are not statistically significant. [21]
Figure 5  STEMD trial Laos, test site 2, ROC diagram. The crosses indicate 95% confidence intervals.

Figure 6  STEMD trial Laos, test site 1, 20mm shell, POD curve, polynomial fit, with 95% confidence bounds.

Figure 7  STEMD trial Laos, test site 1, BLU submunition, POD curve, polynomial fit, with 95% confidence bounds.
1. RESULTS OF STEMD TRIALS | LAOS | MOZAMBIQUE

The STEMD trial in Mozambique

The trial in Mozambique was performed at the training site of the Accelerated Demining Programme (ADP) in Moamba, Mozambique, in April and May 2005. The purpose of the trial was to assess the abilities of commercially available metal detectors to deal with the Mozambican soil and to find out which of them are suitable for demining operations in Mozambique. Maximum detection depth was measured on 13 targets in 7 lanes, each containing a different soil type. The lanes are labelled 1 to 7 according to the increasing difficulties they create to metal detector performance. An overview of the soil magnetic properties is given in Table 6.

Figure 8 STEMD trial Laos, test site 2, 20mm shell, POD curve, polynomial fit, with 95% confidence bounds.

Figure 9 STEMD trial Laos, test site 2, BLU submunition, POD curve, polynomial fit, with 95% confidence bounds.
The diagram in Figure 10 illustrates the influence of soil on the detection abilities of each detector and their capabilities of ground compensation. Each column represents the average of 13 targets for a certain detector in a certain lane. The maximum detection depths are normalised so that the result in lane 1 for each detector is set to unity. From lane 1 to lane 7, the sensitivity of most detectors went down to 30 - 40%. The exceptions were the two Minelab models, which were not affected by the soil magnetic properties, and the Vallon detectors, the Ebinger EBEX 421GC and the SHRIMT M90, which were affected less than the others. SHRIMT M90 should not be used in soils with a higher magnetic susceptibility than in lane 3, since it has no ground compensation and it would have a very high false alarm rate. For many detectors, the magnetic properties of the soils from lanes 2 and 3 seemed not to present serious difficulties compared to the soil from lane 1.

**Figure 10**
STEMD trial Mozambique, maximum detection depth measurements. The results are normalised so that the result for each detector in lane 1 is set to unity. Each column represents the average for a certain detector in a certain soil. The soil types are marked from L1 (lane 1) to L7 (lane 7).

![Figure 10](image)

*Figure 11 shows the detection capability to a minimum metal content anti-personnel mine Type 72 (T72). Among the targets used in the trial, this mine was not the most complicated but it belongs internationally to the mines very difficult to detect.*

We focus only on the in-soil results. The maximum detection depth of the surrogate T72 was similar to the maximum detection depth of the 10 ITOP insert (by some detectors it was larger, by some smaller). T72 could not be detected by the three detectors without ground compensation (Ebinger EBEX 420 HS, Guartel MD8+ and SHRIMT M90). Three detectors could detect it in all lanes to 130mm standard depth: these were Foerster MINEX 2FD 4.5000, Minelab F1A4 and Vallon VMH3 (M).
Basic conclusions of this trial were:

- In-air data measured with a detector set up to the ground should not be used for a prediction of detection ability to target detection for in-soil depth.
- Detectors without ground compensation (GC) facility should not be used for soil types with a magnetic susceptibility as the Mozambican lane 3 or higher. The danger of missing a mine or misinterpretation of a soil signal is too large.

**The STEMD trial in Croatia**

The last STEMD trial was performed in Croatia, in Benkovac, at the test site of HCR-CTRO (Croatian Mine Action Centre | Centre for Testing, Development and Training), in September and October 2006. This report gives an overview of the detection reliability test results, since the detection reliability tests were the main part of the trial. Other tests performed during the trial were maximum detection distance measurements, pinpointing tests and footprint measurements. In the reliability tests, nine detector models were tested in three soil types. There were two 30m lanes for each soil type. The soil on the test site originates from three locations in Croatia, here named after nearby towns: Benkovac, Obrovac and Sisak. These soil types are described in Table 7. Targets were anti-personnel mines PMA-2 and PMA-3 buried to depths from 1cm to 14.5cm, measured to the top of the target.

The overall results are presented in an ROC diagram in Figure 1 and have been described above. Figure 12 to Figure 17 are diagrams with the results in each soil type separately. The POD curves are presented for PMA-2 and PMA-3 mines counted
together, since no significant difference between the results with these two targets was found. For clarity the POD curves are presented without confidence bounds. Figure 2 gives an idea of the confidence bounds. It should be kept in mind that the width of the area between the confidence bounds depends on the detector, the soil, the target depth and the experimental error. For more information see the final report of the trial [4].

Figure 12 is an ROC diagram of the Sisak soil results. The two Minelab detectors had the highest POD and the lowest FAR in the trial. Minelab F3 had a smaller FAR and the difference to Minelab F1A4 was at the limit of statistical significance, while there was no difference between their PODs. Regarding POD, the difference to AKA Vector 7260 was not statistically significant, and the difference to Foerster MINEX 2FD was at the limit of statistical significance. Regarding FAR, the difference between AKA Vector 7260 and Minelab F3 was at the limit of statistical significance, in favour of the Minelab detector. There are other detectors with a FAR smaller than the FAR of AKA Vector, but they all had low PODs. Figure 13 shows POD curves for the same soil. It can be seen that they all dropped to 0.5 at larger depths than in the Obrovac soil. That was expected, since the electromagnetic properties of Sisak soil were easier for metal detectors. In the depth range down to 5 cm depth, there were no differences between most of the detectors: they detected more than 90% of the targets. There were two exceptions: Schiebel ATMID and Vallon VMHCS, with a POD about 80%. The depth at which the POD dropped to 0.5 depended on the detector: the weakest was Schiebel ATMID with 7 cm, and the best were Minelab F1A4 and Foerster MINEX 2FD with about 18 cm depth.

Figure 14 is an ROC diagram of the Obrovac soil results. The two Minelab detectors and the Foerster detector had a clearly higher POD than other detectors. Regarding the POD, the difference between the Minelabs and the Foerster was not significant, while the difference to other detectors was highly significant. However, the two Minelab models had a much lower FAR than the Foerster model. An obvious ideal choice for demining operations in this soil type would be Minelab F3 or Minelab F1A4. Figure 15 shows POD curves for the same soil type. The depth range between 0cm and 5cm is especially interesting, because mines are mostly laid near the surface. At those depths Minelab F3 and Foerster MINEX 2FD had the highest POD. They were closely followed by Minelab F1A4, but it is not possible to see from this diagram whether the difference between them is statistically significant. An interested reader should study the final report of the trial [4], where all POD curves are published with their corresponding 95% confidence bounds. The lowest POD in that depth range was achieved by AKA Vector 7260. At the depth of about 10cm, the two Minelab models and the Foerster were clearly above the other detectors: their POD was between 0.7 and 0.9, while all other detectors were below POD=0.5. The depth at which the POD drops to 0.5 was about 12cm for Minelab F1A4, Minelab F3 and Foerster, while other detectors achieved weaker results.

Figure 16 is an ROC diagram from Benkovac soil. The differences between detectors were very similar to the differences appearing in Obrovac soil, since the two soils were quite similar (see Table 7 and [4,10]). Again the two Minelab models would be the best choice for this type of soil. Figure 17 shows POD curves for the same soil type. In the range between 0cm and 5cm depth, the best detectors were Minelab F3 and CEIA MIL-D1, but very closely followed by Minelab F1A4, Foerster MINEX 2FD and then by other detectors. The depths at which the POD reaches 0.5 were very different: from 0cm for AKA Vector to about 20cm for Minelab F1A4.
1. RESULTS OF STEMD TRIALS | MOZAMBIQUE | CROATIA

**Figure 12** STEMD trial Croatia, Sisak soil, ROC diagram with crosses indicating 95% confidence limits.

**Figure 13** STEMD trial Croatia, Sisak soil, POD curves. The legend is the same as on Figure 12.

**Figure 14** STEMD trial Croatia, Obrovac soil, ROC diagram with crosses indicating 95% confidence limits.

**Figure 15** STEMD trial Croatia, Obrovac soil, POD curves. The legend is the same as on Figure 13.

**Figure 16** STEMD trial Croatia, Benkovac soil, ROC diagram with crosses indicating 95% confidence limits.

**Figure 17** STEMD trial Croatia, Benkovac soil, POD curves. The legend is the same as on Figure 13.
REFERENCES


GENERAL DESCRIPTION

These guidelines provide basic information for programme managers to consider before embarking on the procurement of metal detectors, either for a new or established programme. The guidelines are not all-inclusive and may well require some adaptation for specific organisations or geographical locations.

DETERMINING OPERATIONAL NEED

Establish real operational needs by considering:

a. The threat Experience and/or survey information should define the threat likely to be encountered from mines or munitions in the area. The depth at which the items are likely to be buried should also be defined.

b. Soil conditions The soil and its effect on detectors should be determined. This can be done by measurement of magnetic susceptibility or, more simply, by observing how existing detectors react to the soil conditions. A constant alarm signal from a detector would indicate that the soil is very difficult for operation with that particular type of detector and some form of soil compensation is required. The extent of the soil problem should also be estimated. If it is general throughout the area, then a soil compensating detector will probably be required. If the soil effect is limited to a small, well-defined area, then a less sophisticated detector may be all that is required for most of the area.

c. Quantity and delivery of detectors Determine how many detectors are required and when. This could affect cash phasing, scheduling training on a different detector or ensuring that the required support requirements are in place on time.

INFORMATION GATHERING

This step involves researching various sources to determine which detectors are likely to meet the defined operational needs. This should produce a short list of potential candidates – and if an in-country trial will be necessary to determine if a detector is suitable. Sources of such information include:

a. Manufacturers information Review the data provided by manufacturers and try to obtain any test and evaluation data that they can provide.

b. GICHD catalogues Review the latest edition of the GICHD Metal Detector Catalogue for a listing of available detectors, their general characteristics and sources for additional test and evaluation reports. (The latest version is available on the GICHD Website at http://www.gichd.ch/542.0.html#829).

c. Review available technical reports and experiences of other users A valuable source of test and evaluation reports by a third party is the International Test and Evaluation Programme website at http://www.itep.ws/reports/search1.php.

Other mine action programmes can also be asked for their experiences with particular metal detectors.
2. GUIDELINES FOR THE PROCUREMENT OF METAL DETECTORS

IN-COUNTRY TRIAL

An in-country trial can serve many purposes. One of the most important is determining whether or not a particular model of detector can meet performance needs for the particular threat and environmental conditions in a specific country. Other important aspects are ergonomic issues, training issues and how well the local deminers adapt to the new equipment. Exposure to the new equipment allows them to gain confidence and knowledge of the equipment’s capabilities before they must use it in live minefields. It also creates an opportunity to revise and validate SOPs if necessary, prior to delivery of the detectors.

The decision to conduct an in-country trial will be based on whether or not there is sufficient information to make a purchase decision. If a trial is required it must be realised that this will require a certain amount of effort and resources to provide suitable test lanes, detector operators and test targets. Keep in mind that the number of candidate detectors should be kept to a minimum to keep the trial workload to a practical level. Guidance on planning and conducting an in-country trial are described in the CEN Workshop Agreement 14747 June 2003 – Humanitarian Mine Action – Test and Evaluation – Metal Detectors. The most recent version of this agreement may be found at http://www.itep.ws/pdf/CWA_metal_detectors.pdf. Sections 8, 9 and 10 are of particular interest for those contemplating running a comparative trial. Only those tests necessary for providing information needed to make a procurement decision should be undertaken. For example, the test for detector performance near large linear metallic objects (such as railway tracks) will only be required if such scenarios will be met in the programme.

Another source of background information on field trials is the Metal Detector Handbook for Humanitarian Demining available at http://www.itep.ws/pdf/metal_detector_handbook.pdf. The reader should also refer to Annex 1 of this publication for useful information on interpreting trial data.

CONTRACTS AND THE REQUEST FOR PROPOSAL

There are many things to consider in drafting a contract for procurement. Before writing a contract, most programme offices issue a Request for Proposal (RFP) to candidate suppliers. The RFP is the basis on which many assessment factors are presented by the manufacturers/suppliers for normal issues such as price, availability, delivery schedule, import procedures/duties and fees. The RFP can also clarify the degree of support a supplier is prepared to provide, and at what cost. Some factors will vary in importance depending on the particular mine action programme, including:

- **a.** Presence and reliability of in-country or a maintenance / repair capability by the manufacturer.
- **b.** Initial procurement should include the provisioning of a quantity of spare detectors and operator-replaceable spare parts to reduce downtime for non-serviceable equipment.
- **c.** A method for returning non-serviceable detectors / components for warrantee replacement or repair must be established and the responsibilities of the user and manufacturer should be clearly defined.
- **d.** Technical support or a “help-line” is a desirable feature for the user.
- **e.** How will the user be informed of equipment upgrades / recalls?
2. GUIDELINES FOR THE PROCUREMENT OF METAL DETECTORS

f. What is the recommended training for operators and those who will maintain the detectors?

g. What operator and maintenance manuals are provided, and in what language? Suppliers should provide examples.

h. If an in-country trial is required, what support will the supplier provide?

Once the RFPs have been received and assessed, then the need for an in-country trial has to be decided. The potential candidates should be kept to a minimum and the trial, if necessary, will determine which candidate best meets the programme’s operational requirements. The combination of responses for the RFP, trial results and additional information from other sources will permit a procurement decision to be made and a contract to be written.

ORGANISATIONAL ADJUSTMENTS

Normally there are no organisational changes associated with the introduction of a replacement metal detector. The exception to this might be the introduction of a detector with increased capabilities, such as a multi-sensor detector based on a metal detector and a ground penetrating radar. This combination has demonstrated in trials that considerable increases in productivity are possible and that the make-up of demining teams may require changes. SOPs may also need to be adjusted. These changes could influence the quantity of detectors procured and may require additional purchases of other demining equipment for demining teams.

OPERATING COSTS

The most expensive element of detector operating cost is batteries. The procurement process should assess whether or not rechargeable batteries will be used. Several programmes have converted to rechargeable batteries – and saved money. This is an important programme decision, with key variables being the reliability of power available for recharging cells and the costs of implementing a workable battery management procedure to assure a reliable supply of charged batteries.

Recharging options now include use of solar power, use of generators, generators coupled with a bank of larger “back-up” batteries for when the generator is not running, or use of mains power. Most detector manufacturers provide a rechargeable batteries option with their product.
3. THE CEN WORKSHOP AGREEMENT 126 ON PERSONAL PROTECTIVE EQUIPMENT AND ITS TESTING AND EVALUATION

GENERAL DESCRIPTION

The CEN Workshop process is designed to offer a new mechanism and approach to standardization. The Workshop concept provides a unique opportunity for any party faced with a challenge to find others in a similar situation and to develop a result by consensus, validated in an open arena. The process is much more rapid than the full process required for the production of standards yet is rigorous enough to provide valid processes and methodologies for industry.

The presence of landmines and other explosive remnants of war represent a serious safety hazard and a major obstacle to reconstruction and development in former disputed areas around the world. Current estimates record at least 78 countries in the world\(^1\) contaminated with mines and unexploded ordnance. Recent conflicts have added a new generation of UXO threats, which those engaged in humanitarian mine action have to deal with alongside the more familiar mines and booby traps.

The current methodologies for clearance are varied and include mechanical ground preparation, scent detection by animals and the processing of ground by human deminers. This latter activity is the most common, forming part of the fundamental core of every demining programme.

All currently recognised methods of ground clearance involve people being inside the threat area at some time. Globally, the most common approach to ground clearance is still the use of manual deminers covering the ground with a variety of tools and assets that may include explosive detecting animals and machines. When animals are used, humans control the animals and check their indications. When machines are used, they can assist the process and may sometimes be effective in reducing the area that must be cleared, but humans are still needed to check their effectiveness and deal with discovered devices.

The protective equipment issued to these individuals varies widely, and its proven effectiveness against mine threats is often uncertain. The standards currently used to determine appropriate protective equipment are based on the NATO STANAG 2920 which is designed for ballistic protection against projectiles and are generally recognised as being inappropriate for the mine action activity and the range of threats that can be anticipated.\(^2\)

Some accidental initiation of devices is recognised as being inevitable during demining. Processes, procedures and good management form the basis for protection, but PPE provides the final line of defence against human errors and malfunctions. In many cases, effective personal protective equipment (PPE) can prevent seriously disabling injury. Humanitarian principles and the legal aspects of an employer’s “duty of care” make it essential to limit injuries during mine action by the provision of effective PPE. To achieve this reliably, it is necessary to provide a baseline and a clearly defined set of test and evaluation (T&E) standards.

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1 Landmine Monitor, 2006
2 IMAS 10.3.0 Personal Protective Equipment, in which it is stated that: “Such tests for ballistic protection do not realistically replicate mine effects, but will continue to be used until an accepted alternative is developed as an international standard.”
In 2000 the European Commission proposed European Parliament and Council Regulation concerning action against anti-personnel landmines\(^3\), calling for the establishment of international Specifications and Methodology and their implementation, in close cooperation with CEN (the European Committee for Standardization or Comité Européen de Normalisation), ISO (the International Standards Organisation) and the UN. The European Commission also mandated the European standardization bodies to proceed with this standardization\(^4\). Such standardization would include the test and evaluation of any PPE or component thereof, in support of humanitarian demining.

In March 2002, CEN responded to this mandate by issuing its CEN BT/WG 126 “Humanitarian Mine Action”, as an action plan to cover humanitarian mine action. Specific actions to identify PPE test and evaluation standards for humanitarian mine action were identified and subsequently confirmed in October 2005.

The main objective is to develop widely accepted and applied specifications for the testing and evaluation of PPE, so increasing confidence that the PPE used is safe, reliable and fit for purpose.

Standardization will support the development of new protective equipment and facilitate the development of a minimum operating standard for performance and effectiveness of PPE products in a manner appropriate for end use in humanitarian mine action – and define the requirements. This will increase the use of effective PPE and thus reduce the incidence of severely disabling injury and fatal injuries. The benefit of agreed specifications and verifiable performance indicators is widely acknowledged.

The PPE originally used in humanitarian demining was designed for combat purposes. Since 1995, some physical/mechanical design elements have been altered to meet the needs of humanitarian demining, but the materials used have remained substantially unchanged.

The CEN Workshop started its work in June 2006 to establish standard ways of testing the performance of PPE. The results of such tests will enable users to select products that provide appropriate protection against the varying degrees of threats in their working areas. This will save money and lives, and reduce the number of severe injuries from accidents in humanitarian demining.

The Workshop is scheduled to complete its work by August 2007. By then it should have determined:

- Vital criteria to be tested; and
- Appropriate testing methodology(ies).

This will be achieved by establishing specifications for:

- Reliably replicable simulated threats;
- Determining the physical suitability of finished PPE products;
- Carrying out, and recording the results of, tests in a uniform manner; and
- Determining ergonomic criteria and constraints required by end-users in mine action.

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\(^4\) Mandate to the European Standardisation Bodies on Technologies for Humanitarian Demining, EC Joint Research Centre and Research Directorate-General, M306 EN, Brussels, 25 August 2000.
3. THE CEN WORKSHOP AGREEMENT 126 ON PERSONAL PROTECTIVE EQUIPMENT AND ITS TESTING AND EVALUATION

The following tasks shall be undertaken by the Workshop, as a minimum:

- Defining a limited range of threat types that can be protected against;
- Agreeing a means of simulating each threat type in a reliably replicable manner;
- Agreeing sample sizes and their presentation to the threat during tests of materials;
- Determining how to test for the effects of use-context on equipment performance (temperature, humidity and moisture content);
- Determining the reliability of physical aspects of the equipment (fastenings, etc.) that may impact on safety;
- Determining the minimum equipment required to conduct tests;
- Agreeing specifications for the conduct of tests and the recording of results;
- Determining appropriate scales to facilitate the comparison of results;
- Agreeing the range of ergonomic requirements of PPE for the varied purposes for which it is used in humanitarian mine action.

MILESTONES

- Kick-off meeting | 8 June 2006
- First Technical Workshop meeting | September 2006
- Second Technical Workshop meeting | December 2006
- Third Technical Workshop meeting | if required, in 2007
- CEN Workshop Agreement | finalised by August 2007
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<tbody>
<tr>
<td>A</td>
<td>Ampere</td>
</tr>
<tr>
<td>ATMID</td>
<td>All Terrain Mine Detector</td>
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<td>BAC</td>
<td>Battle Area Clearance</td>
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<td>CIMMD</td>
<td>Close-In Man-Portable Mine Detector</td>
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<td>CMAC</td>
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<tr>
<td>cm</td>
<td>centimetre</td>
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<td>CROMAC</td>
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<td>CWA</td>
<td>CEN Workshop Agreement</td>
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<tr>
<td>DRES</td>
<td>Defence Research Establishment, Suffield</td>
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<tr>
<td>EDIT</td>
<td>Electromagnetic wave Detection and Imaging Transceiver</td>
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<td>EMIS</td>
<td>Electromagnetic Induction Spectroscopy</td>
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<td>EOC</td>
<td>Explosive Ordnance Clearance</td>
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<td>EOD</td>
<td>Explosive Ordnance Disposal</td>
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<td>Explosive Remnants of War</td>
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<td>GPS</td>
<td>Global Positioning System</td>
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<td>IPPTC</td>
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<td>IPEP</td>
<td>International Test and Evaluation Programme</td>
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<td>Liquid Crystal Display</td>
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<td>nano-Tesla</td>
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<td>nT/m</td>
<td>nano-Tesla per metre</td>
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<td>PC</td>
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<td>Q</td>
<td>Quadrature</td>
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<td>Resonant Microstrip Patch Antenna</td>
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<td>S/N</td>
<td>Signal-to-geologic Noise</td>
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<td>STANAG NATO</td>
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<td>TDEM</td>
<td>Time Domain Electromagnetics</td>
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<td>UNADP</td>
<td>United Nations Accelerated Deming Programme</td>
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<td>United Nations Mine Action Center Afghanistan</td>
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<td>United Nations Office for Project Services</td>
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