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Humanitarian mine action - Test and evaluation - Part 1: Metal Detectors

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Foreword

CWA 14747:2003 is now reissued as CWA 14747-1:2003 following the publication of CWA 14747-2:2008.

This CEN Workshop Agreement (CWA) has been drafted and approved by a Workshop of representatives of interested parties on 6 May 2003, the constitution of which was supported by CEN following the public call for participation made on 13 November 2001. The Chairmanship and Technical Secretariat for this CEN Workshop 7 were provided by the European Commission (EC) - Joint Research Centre (JRC) at Ispra (Italy). The professional standardization support was provided by UNI (Italian CEN Member).

The following organisations have given a consistent and active support to the project:

- International Test and Evaluation Program for Humanitarian Demining (ITEP), based on a mandate issued by the ITEP Board of Directors to EC JRC.
- United Nations Mine Action Service (UNMAS).
- Geneva International Centre for Humanitarian Demining (GICHD).

The development of this CWA has benefited from an:

- EC JRC significant financial support to the process.
- EC - EuropeAid Co-operation Office, financial contribution allocated in the context of the EC Mandate M/306.

A list of the individuals and organizations which supported the technical consensus represented by the CEN Workshop Agreement is available to purchasers from the CEN Management Centre. These organizations were drawn from the following economic sectors: metal detector manufacturers, R&D institutions with experience of metal detector testing and development, demining engineers and demining Non Governmental Organisations using metal detectors. Participants came from 14 different countries as well as from the European Commission and the United Nations.

The endorsement round for this CWA was started on 9 December 2002 and was successfully closed on 6 May 2003. The final text of this CWA was submitted to CMC for publication on 7 May 2003.

It is to be noted that this CWA represents the current state of the art. However, the contents could be reviewed after one year of implementation in order to input more refined information.

Comments or suggestions from the users of the CWA are welcome and should be addressed to the CEN Management Centre.

This CWA is publicly available as a reference document from the National Members of CEN : AENOR, AFNOR, BSI, COSMT, DIN, DS, ELLOT, IBN/BIN, IPQ, IST, MSA, MSZT, NEN, NSAI, NSF, ON, SEE, SIS, SFS, SNV, SUTN, UNI.

Introduction

Metal detectors are an essential part of the toolkit of a humanitarian deminer. Metal detection is one of the few "non-contact" methods available to search for mines in most of the areas of the world where humanitarian mine clearance operations are carried out. Despite the fact that metal detectors have been used for finding mines since the Second World War, there is no universal specification for any performance standards.

Many trials of the capabilities of metal detectors have been performed in recent years, stimulated by the greater international effort to combat the threat posed to civilian populations by mines and unexploded ordnance. However, the lack of an agreed standard for comparing the performance of these instruments has limited the value of this work to the end-users. Without a testing standard, it is difficult to make cross-comparison between instruments to determine which is best-suited to any particular needs.

This CEN Workshop Agreement (CWA) has been prepared by CEN Workshop 7, "Humanitarian Mine Action - Test and Evaluation - Metal Detectors" (CW07). CW07 was established with the objective of developing and agreeing on specifications for the testing and evaluation of metal detectors used in humanitarian mine clearance.

This CWA has been prepared under a mandate given to CEN by the European Commission (EC). In addition, the International Test and Evaluation Program for Humanitarian Demining (ITEP) requested that the Joint Research Centre of the EC initiate this CEN Workshop. Support has also been given by CEN BTWG 126, by the United Nations Mine Action Service (UNMAS) and by the Geneva International Centre for Humanitarian Demining (GICHD), which is responsible for International Mine Action Standards (IMAS). Close co-operation has been maintained with GICHD and UNMAS, with the aim of including it in the IMAS system at a later stage.

CW07 was launched on 8 November 2001 in Brussels, with the approval of the Business Plan. The Workshop process has been chaired by the Joint Research Centre (JRC), which also acted as the Secretariat and financially supported it. Full meetings of the Workshop took place at JRC, Ispra, Italy in December 2001, April 2002 and December 2002. Between the April and December 2002 meetings, a small Drafting Working Group met twice - at DRDC, Suffield in Canada in June 2002 and in Ispra in September 2002 - to make faster progress in writing the CWA.

In formulating the standardized test procedures for this CWA, extensive use has been made of the test procedures developed and followed during the International Pilot Project for Technology Co-operation (IPPTC) for commercial off-the-shelf (COTS) metal detectors [1].

Previous standardization work on demining testing has also been useful in the preparation of this CWA, for example the International Test Operations Procedures (ITOPs) [2], [3], [4]. Other previous work on design of demining test targets has also been useful, for example the MIMEVA project [5].

Tests used in other previous metal detector trials [6], [7], in an existing US military Performance Specification for metal detectors [8] and in a standard for metal detectors used for detection of concealed weapons and contraband in the US penal system [9] were all considered in CW07.

Different parts of the CWA are intended to be used by R&D laboratories, manufacturers, operators of test and evaluation facilities, organizations needing to procure metal detectors, Mine Action Centres and metal detector operators in the field.

The order of the testing followed in this CWA follows a logic that begins with tests of the basic operating performance. These tests are in the most controlled conditions, for which targets are in air not soil. To achieve such controlled conditions requires equipment and facilities that are usually not available in field environments so many of these tests need to be performed by specialized laboratories. Analogous tests are however specified for less-controlled conditions. Next the CWA describes tests on targets in soil – again as controlled as possible. Tests then follow that may be feasibly performed in the field with a minimum of equipment.

Few users of this document will wish to, or be able to perform all of the tests specified. A user in the field under MAC control for example, may perform the detection reliability test, some of the tests of operational performance characteristics and some of the basic in-air and in-soil sensitivity measurements. However, the value of testing is greatly increased if a laboratory has already performed controlled tests, for example to determine whether the sensitivity of the detector under test varies with operating temperature.

Manufacturers form one group of users of this CWA. As well as performing tests according to this document, manufacturers can also help others in their testing by provision of information on their product. CW07

recommendations for the minimum set of information that manufacturers supply to users for help in evaluation are given in Annex C.

Users of this CWA who wish to conduct a trial of various metal detectors using the tests specified, may also wish to conduct a pre-trial assessment to exclude detectors at the beginning that clearly do not meet their requirements. Such a pre-trial assessment would include one or more of the tests specified in the CWA, with acceptance levels set by the users according to their own requirements. The basic in-air sensitivity measurement as specified in 6.4 could be used for example, with a minimum acceptance level for the maximum detection height.

It is planned that the publication of this CEN Workshop Agreement will be supported by training sessions on how to use and implement it and by an extensive experimental verification in which all users are encouraged to participate.

1 Scope

This CWA provides guidelines, principles and procedures for the testing and evaluation of metal detectors.

NOTE This CWA is to be used by manufacturers, test and R&D organizations and field demining groups including Mine Action Centres. It is intended that the users will select the appropriate portions of this document.

This CWA applies to all hand-held types of metal detectors for use in humanitarian demining. The Agreement is intended to be used for "commercial off-the-shelf" (COTS) detectors, but many of the tests specified within it could be applied to instruments under development.

2 Normative References

This CWA incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this CWA only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies. These and other, non-normative references are also given in the Bibliography at the end of the CWA.

IMAS 04.10, Glossary of mine action terms and abbreviations, First Edition, 01 October 2001, UNMAS, New York

IMAS 03.40, Test and evaluation of mine action equipment, Draft First edition, 01 October 2001, UNMAS, New York

IEC 60068-2-27:1987 Basic environmental testing procedures. Part 2: tests – test Ea and guidance: shock

IEC 60068-2-29:1987 Basic environmental testing procedures. Part 2: tests – test Eb and guidance: bump

IEC 61000-4-2:1995 + A1:1998 + A2:2000, Electromagnetic compatibility (EMC), Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test. (=EN 61000-4-2:1995 + A1:1998 + A2:2001)

IEC 61000-4-3:2002, Electromagnetic compatibility (EMC), Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test. (=EN 61000-4-3:2002)

IEC 61000-4-8:1993 + A1:2000, Electromagnetic compatibility (EMC), Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test. (=EN 61000-4-8:1993 + A1:2001)

EN 61000-6-1:1997, Electromagnetic compatibility (EMC), Part 6-1: Generic standards – Immunity for residential, commercial and light-industrial environments. (IEC 61000-6-1:1997, modified)

3 Terms and definitions

For the purposes of this CWA, the following terms and definitions apply. Definitions follow Draft IMAS 03.40 or IMAS 04.10 or other references if terms are defined therein.