| | Landmine Clearance Test Facility | WTD 51 |
|---|---|---|

Koblenz, 15.01.2001

# Summary Report

| | |
|---|---|
| Planned object: | Mechanical Mine clearance device |
| Identification number: | 2350-14390 |
| Manufacturer: | Fa. Bofors |
| Model: | MINE GUZZLER |
| Project Nr.: | E/K43A/00059/Q5204 |
| Objective: | Development of mine test lanes on two distinctly different types of soils and execution of trials. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Report: | | Pages: | 64 | Pictures: | 36 | Tables: | 27 |
| Author: | TRAR Theimer | Department: | 230 | Phone: | 19 73 | | |

Outcome: The MINE-GUZZLER reached on the total surface an uniform clearance depth of 30 cm in clayey and sandy soil. The mines could be initiated or tilled.

(Signature)

| | | |
|---|---|---|
| Comments: | Mailing List: | BWB – KG IV 3 3x |
| | | WTD 51 - 230 1x |
| | Translation into English | M. Garotta |

# Index

# 1. Problem definition:

The army requires a mine clearance device that is able to clear in a fast and safe way known minefields or areas suspected as mine-affected, in environments requested to be used as water treatment areas, airfields, and camps.

In the context of a trial the clearance efficiency (and safety) of COTS (commercial of the shelf) mine clearance devices from different types and manufacturers under equal conditions shall be compared.

In principle, the following works will be conducted:

- Definition of a test program for the assessment of the clearance efficiency
- Development of a plan for the placement of mines and the supply of surrogate mines.
- Execution of terrain survey
- Execution of a soil analysis
- Marking of the area for pre-trials and clearance trials
- Placement of surrogate mines according to the mine distribution plan
- Execution of the pre-trials and clearance trials in two distinctly different types of soil.
- Establishment of technical data
- Measurements of the vibration
- Transportability of the device
- Assessment of the results and evaluation of the destruction capacity of the mines
- Documentation of the results
- The definition of assessment criteria including the formulation of a proposal for the development and purchase of a device, which was discussed among the purchaser, the manufacturer, and WTD 51, will not be object of this report.

# 2. Test fields and time frame of the trial

## 2.1. Test fields:

1. Test field: WTD 91, Meppen (Hufeisenwall) (Military Technical Centre)

2. Test field: Standortübungsplatz (StOÜbPl) Schmidtenhöhe, Koblenz (Military Training Area)

## 2.2. Time Frame:

Preparation for the trial: 25. - 39. week 2000

| | |
|---|---|
| Execution of the trial: | see Annex 1<br>(Work plan schedule status as of 26.09.2000) |
| Clearance results: | 42. - 52. week 2000 |

## 3. Brief description of the MINE – GUZZLER

(see Annex 15 picture 1 to 6)

The clearance device MINE – GUZZLER is a double track mine clearance device with a mine clearance tiller located on hydraulic supports at the front of the vehicle and operated by hydrostatic drive.

A caterpillar 3412E 640kw engine powers the double track machine with diesel capacity.

The roller is made from a series of metal plates, easily replaced with tungsten carbide teeth, which either cause the mines to detonate or to break up. The operation of the system occurs from a protected driver cabin or otherwise by remote control using onboard television cameras.

Manufacturer: Fa. Bofors Defence AB
SE - 691 80 Karlskoga
Sweden

# 4. Execution of the trials

## 4.1. Overview

Since commercially available mine clearance devices were being tested in order to compare their clearance efficiency, almost equal test conditions for all the devices had to be created.

The following requirements were satisfied:

- Nearly equal soil types
- Nearly equal terrain slopes
- Equal pre-trial test lanes and mine test fields

The trials were conducted in comparable weather conditions.

Since the trials had to be executed in two completely different soil types, they were conducted on soil with a very high sand content in the WTD 91 in Meppen and on soil with high clay content on the StOÜbPl in Koblenz.

The results of the detailed soil surveys, showing almost equal soil conditions, are attached as Annex 2.

On both soil types, pre-trials and clearance trials were conducted. The devices were operated by staff from the manufacturer. The MINE – GUZZLER was controlled from the driver cabin.

During the trial the following security distances given by the manufacturer had to be kept:

| Nr. | Mine clearance device | Side | Front | back |
|---|---|---|---|---|
| 1. | MINE-GUZZLER | 5m | 25m | 25m |

## 4.2. Pre-trials

During the pre-trials the mine clearance device in object covered once a distance of 150m.

The installed clearance depth that the flail system had to maintain had to be at least 30cm.

Next to the needed time, the clearance width and depth were determined. On the StOÜbPl Schmidtenhöhe in Koblenz even the vibration behavior of the driver cabin was evaluated.

The pre-trials were conducted in the same way at the WTD 91 and at the StOÜbPl Schmidtenhöhe in Koblenz.

The area of WTD 91 is almost plain with grass-moss vegetation.

The grass area of the StOÜbPl Schmidtenhöhe shows limited changes in terrain topography along and across the test lanes. Annex 3 (diagram) shows a representation of the test field topography along the test lane

## 4.3. Clearance trials

### 4.3.1. Overview

At the clearance trials a test lane was given to the manufacturer. The test lane was composed of a starting track,

mine test fields I to III and an ending track. The device was positioned at the beginning of the starting track and drove all through the test lane. The clearance process was always conducted in one direction. As the test lane had been covered, the vehicle drove backwards in the same track, placed itself in front of the next part of the test lane, overlapping with the already cleared track, and cleared then the next track. The manufacturer chose an overlapping of about 50 cm.

The device had to reach at least a clearance depth of 30 cm.

The prepared clearance lane of the WTD 91 is provided in Annex 4, whereas the StOÜbPl Schmidtenhöhe detection lane as Annex 5.

The differences between the lengths of the test lanes depend on the fact that on the paths of the StOÜbPl Schmidtenhöhe the starting area had to be shortened.

The topography along the test lane on the StOÜbPl Schmidtenhöhe is visible in Annex 6 and the crosswise slope in the context of the mine test fields amounts to:

Field 2 MINE - GUZZLER, Fa. Bofors 2,4° to 4,2°

### 4.3.2. Mines

On the test field of WTD 91 the mines were distributed according to the distribution plan as in Annex 7, and on the StOÜbPl Schmidtenhöhe according to the mine distribution plan as in see Annex 8.

In the following table the mines distributed in the test field of WTD 91, in Meppen and in the one of StOÜbPl Schmidtenhöhe are listed.

| Name | Type | Quantity | | Comments |
|---|---|---|---|---|
| | | WTD 91 Meppen | Schmidtenhöhe Koblenz | |
| Anti-personnel blast mines | DM 11 | 20 | 0 | |
| | DM 18 | 0 | 14 | |
| | PPM-2 | 15 | 14 | |
| Mine fuse | DM 56 A1 B1 | 5 | 3 | With tripwire |
| Anti-personnel fragmentation mines | DM 31 | 5 | 5 | |

| | | | | |
|---|---|---|---|---|
| Anti-tank mines | DM 21<br>TM 62P3 | 5<br>5 | 5<br>5 | |

See Annex 15 picture 13 and 14

For the clearance trials blast surrogate mines were used. In the weapons arsenal of WTD 91 the explosive content was taken out of the mines and was replaced by non-explosive material.

(see Annex 16).

In order to understand if the mines' fuses were initiated by the clearance vehicles, the mines in the WTD test field were prepared as follows:

- Anti-Tank blast mines DM 21 with blast indicating surrogate (black powder)
  TM 62P3 with fuse chain
- Anti-personnel blast mines DM 11 with detonator
  PPM-2 with detonator
- Anti-personnel fragmentation mines DM 31 with propelling charge
- Fuse for tripwires DM 56 A1B1 with additional detonator

For the trials on the StOÜbPl Schmidtenhöhe test field, inert mines were employed.

The tripwires used for the trials at StOÜbPl Schmidtenhöhe were connected to live fuses, which produced small amounts of smoke at initiation.

# 5. Results

## 5.1. Technical data

The most important technical information about the machine is listed here after:

Data on the machine:

| | **MINE GUZZLER**<br>**Fa. Bofors** |
|---|---|

| | |
|---|---|
| **Measurements** | |
| **Length** | 8560 mm |
| **Width** | 4320 mm |
| **Height** | 3580 mm |
| **Weight** | 47 t |
| **Transport** | |
| **Length** | 8560 mm |
| **Width** | 4120 mm |
| **Height** | 3580 mm |
| **Velocity** | 47 t |
| **Dismantling for transport** | Possible<br>1. Protected driver cabin<br>2. Chassis<br>3. Engine compartment<br>4. Tiller unit |

Technical clearance data

The technical clearance data of the mine clearance device is listed in Annex 9.

## 5.2. Pre-trials

WTD 91 Meppen

The vehicle took the following listed time to cover a distance of 150 m:

MINE - GUZZLER, Fa. Bofors: 15 min

The clearance width corresponds to the specifications given by the manufacturer.

The measurement of the clearance depth (see Annex 15 picture 15) tested by carrying out spot checks showed the following results:

MINE - GUZZLER, Fa. Bofors: 30, 25 and 27 cm

The presented device had no traction problems.

Schmidtenhöhe Koblenz

The device took the following listed time to cover a distance of 160 m:

MINE - GUZZLER, Fa. Bofors: 12,5 min

The clearance width corresponds to the specifications given by the manufacturer.

The clearance depths are represented in the sketch on Annex 10.

The pre-trials lane was covered by the MINE - GUZZLER, Fa. Bofors without problems.

The results of the vibration measurements in the driver cabin are in Annex 11 represented.

## 5.3. Clearance trials

The needed time frames, as well as the needed working conditions for clearance, are for the trials at the WDT 91 and for the ones at Schmidtenhöhe, Koblenz, as annexes attached; Annex 12 and Annex 13, respectively.

The conditions of the tiller after the trial on sandy ground at the WTD 91 in Meppen is shown in annex 15 pictures 10 to 11.

The conditions of the tiller after the trial on clayey ground at the StOÜbPl Schmidtenhöhe is shown in annex 15 picture 12.

Mine search

Immediately after the end of the clearance trial all on-surface remaining mines and mine fragments were collected and stored.

During the in-soil search of mine fragments a rock collector was employed, which sieved the ground. The detailed description is in Annex 16 contained.

The description of the analysis using the rock collector (see Annex 15 picture 27 and 28), as well as the assessment of the mine fragments found after the clearance trials, was done by WTD 91 – 360 and is added as Annex 16 to the report. The mine found as being critical during the trial is represented in Annex 15 picture 16.

In order to assess the clearance depths, the mine fields were surveyed and the results are shown in Annex 14.

## 5.4. General observations:

The vehicle drifts downhill on crosswise slopes. However, by counter steering the vehicle it can be kept in the lane (see Annex 15 picture 17).
Through the alignment of the side plates on the tiller unit, the soil is pushed in front of the tiller system. No soil is pushed sideways of the vehicle (see Annex 15 picture 18 and 19).

Reversing must be done carefully, due to the small clearance width and the wide moving track.

A change in the construction of the fuel filler tube has to be implemented. The tube includes a 90 degrees bend, which does not allow for the fuel to flow fast enough during the filling. This causes the fuel to back up and the fuel filler tube to overflow.

*Operation*: The operation of the MINE – GUZZLER, either by remote control using onboard television cameras or from the protected driver cabin, does not present any problems (see Annex 15 picture 20 to 22).

## 5.5. Test lanes after the clearance process

The condition of the test lanes and moving tracks after the clearance trials is shown in the following pictures:

MINE – GUZZLER (see Annex 15 picture 7 to 9)

## 5.6. Transport

(see Annex 15 picture 23)
The transportation between work sites: WDT 91, Meppen to StOÜbPl Schmidtenhöhe, Koblenz occurred by a civilian transportation company.
Due to the dimensions and heavy weight of the MINE – GUZZLER (without dismantling the driver cabin) the transportation by Heavy Load Trucks, used in the Bundeswehr, was not possible. The transportation is only possible by specific civilian Heavy Load Trailers.

## 5.7. Dismantling of the MINE – GUZZLER driver cabin

Since the overall height of the MINE – GUZZLER amounts to 3,58 m, the transportation is only possible through specific transport equipment. In the context of the trial, the driver cabin and the exhaust pipes were dismantled, in order to reduce the vehicle's height for transportation purposes.

For the dismantling of the driver cabin a standard crane of 20 t Liebherr Cie. was used.

During the dismantling process the following instruments were needed:

1 spanner of 13 (ring/groove)

1 spanner of 22 (ring/groove)

1 spanner of 36 (groove)

1 interior hexagonal of 5 mm

1 plier for the detachment of the electrical connections

1 mounting steel and crower

The simple mounting and dismantling process of the driver cabin can be divided into the following steps: (see Annex 15 picture 24 to 26):

1. Detach hexagonal head sheet metal tapping screw of the rippled bottom plate in the driver cabin and lift the bottom plate.
2. Under the bottom plate unloose the two M20 screws on the left side (entrance side) with a spanner of 36.
3. Connect the crane harness
4. Unloose the two screws M20 on the right side with a spanner of 26.
5. Detach electrical connections in the driver cabin.
6. Detach the protective plate of the electrical conduction on the right side outside of the driver cabin.
7. Detach the 7 uncovered electrical connections.
8. Detach the driver cabin's tail heating pipes.
9. Detach the driver cabin's tail ventilation pipe.
10. Lift access ladder
11. Lift driver cabin (weight 4,3 t)
12. Should the device still be too high for transportation purposes, the exhaust pipe can be dismantled and taken away unloosening 3 screws.

Duration of the dismantling process of the driver cabin: 36 min

Staff needed: 2 trained persons and a crane driver.

The mounting process of the driver cabin occurs in the opposite order as just described.

Duration of the mounting process of the driver cabin: 41 min

### 5.8. Preparation for clearance

In order to prepare the clearance, after transport, various adjustments are needed.

Mounting of the depth feelers on both sides of the tiller unit.

Mounting of the television cameras on top of the driver cabin.

Duration: about 30 min.

## 6. Summary

The mine clearance device MINE-GUZZLER from Bofors Cie. coped with the requested clearance tasks in sandy and clayey soil. The device of Fa. Bofors tilled the buried and surface-laid mines through the tiller unit, that is, it caused the mines to initiate through physical contact.

The MINE – GUZZLER reached a very uniform clearance depth.

The operation of the MINE-GUZZLER occurs without problems either by remote control using onboard television cameras or from the driver cabin.

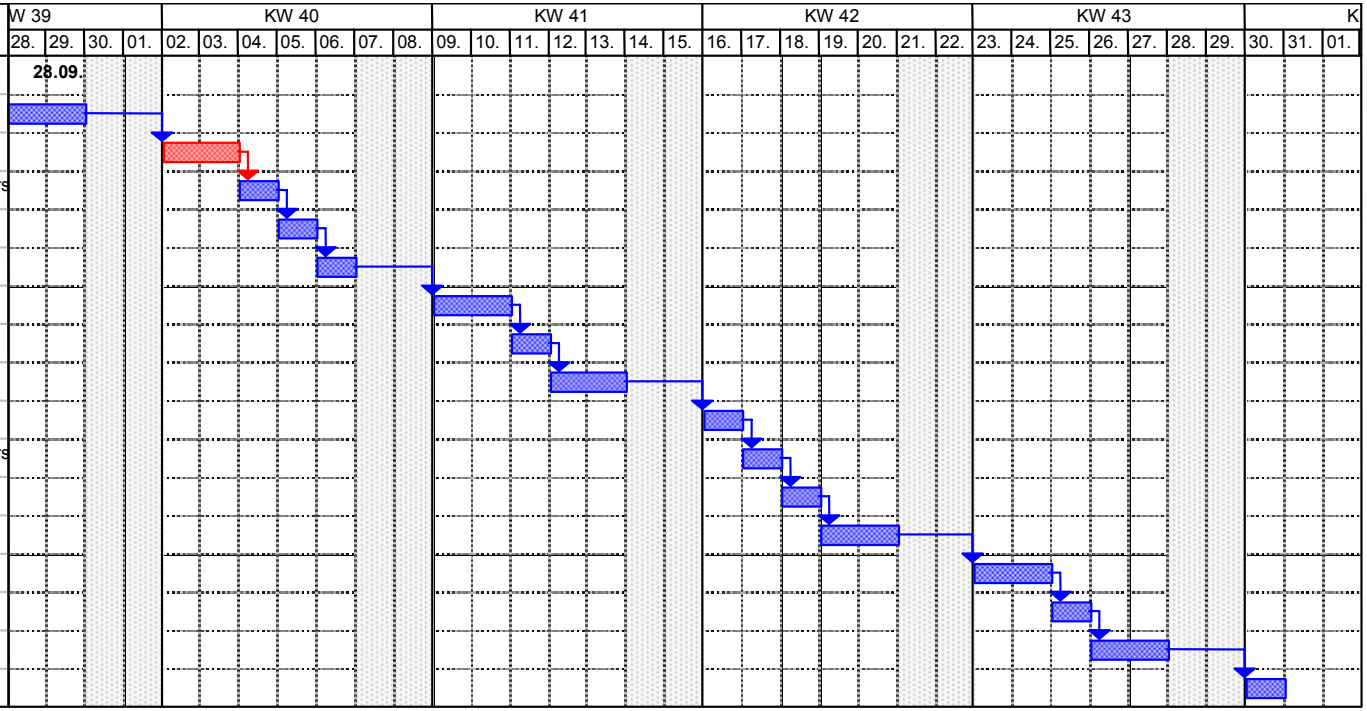
WTD 51 - 230
26.09.2000

Koblenz,

# Trial of mine clearance devices

# Schedule going from 28.09. to 30.10.2000

| Nr. | Name of the procedure |
|---|---|
| 1 | Delivery of the devices to the WTD 91 |
| 2 | Preparation of the devices by companies |
| 3 | Holiday |
| 4 | Information on the devices given by the manufacturers |
| 5 | Execution of the pre-trials |
| 6 | Technical service |
| 7 | Execution of the clearance trials |
| 8 | Technical service |
| 9 | Transport of the devices from WTD 91-WTD 51 |
| 10 | Preparation of the devices by the companies |
| 11 | Information on the devices given by the manufacturers |
| 12 | Execution of the pre-trials |
| 13 | Technical service |
| 14 | Execution of the clearance trials |
| 15 | Technical service |
| 16 | Acquirement of technical data |
| 17 | Dismantling by companies |




**Legend:**

Nr. 1, 9 and 17 Transportation
Nr. 2 to 8 Trials on the WTD 91 in Meppen
Nr. 10 to 16 Trials on the Schmidtenhöhe in Koblenz

## 1. Description of the working procedure

Assessment of soil characteristics of 2x8 test lanes on two mechanically different soil types.

Assessment of the test lanes on their grain size distribution and mechanical soil characteristics. The scope of these analyses was the creation of 2x8 homogenous test lanes for the choice of four mine clearance devices on two mechanically different soil types.

## 2. Execution of the trials

The trials were executed in the test field (WTD 91, Meppen and StOÜbPl Schmidtenhöhe, Koblenz) and in the laboratory of the WTD 51.

In the field the following trials were executed:

Survey according to DIN 4094,

Soil drilling according to DIN 4021,

Determination of the soil compactness according to DIN 18125 part 2

Laboratory tests:

Determination of the grain size distribution according to DIN 18123,

Determination of the flow and rolling borders according to DIN 18122,

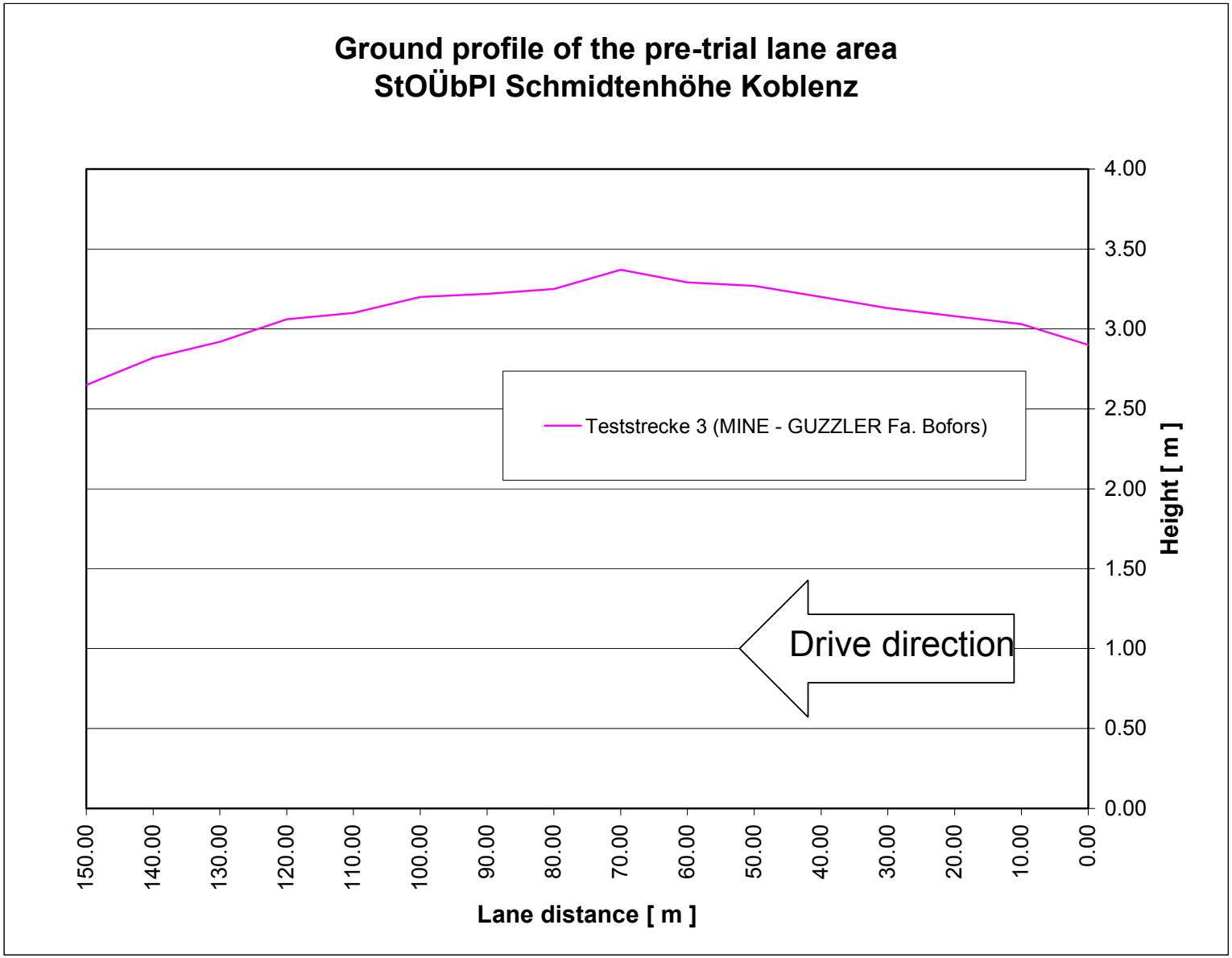
Determination of the water content according to DIN 18121 part 1

## 3. Summary of the results

The analysed soil of the 4 test lanes (for the clearance trials) and of 4 test lanes at WTD 91 in Meppen (for the pre-trials) can be described as a homogenous sand having silt and clay content. The silt and clay contents are very little and therefore irrelevant. The soil compactness and the soil water content were almost on all test lanes identical.

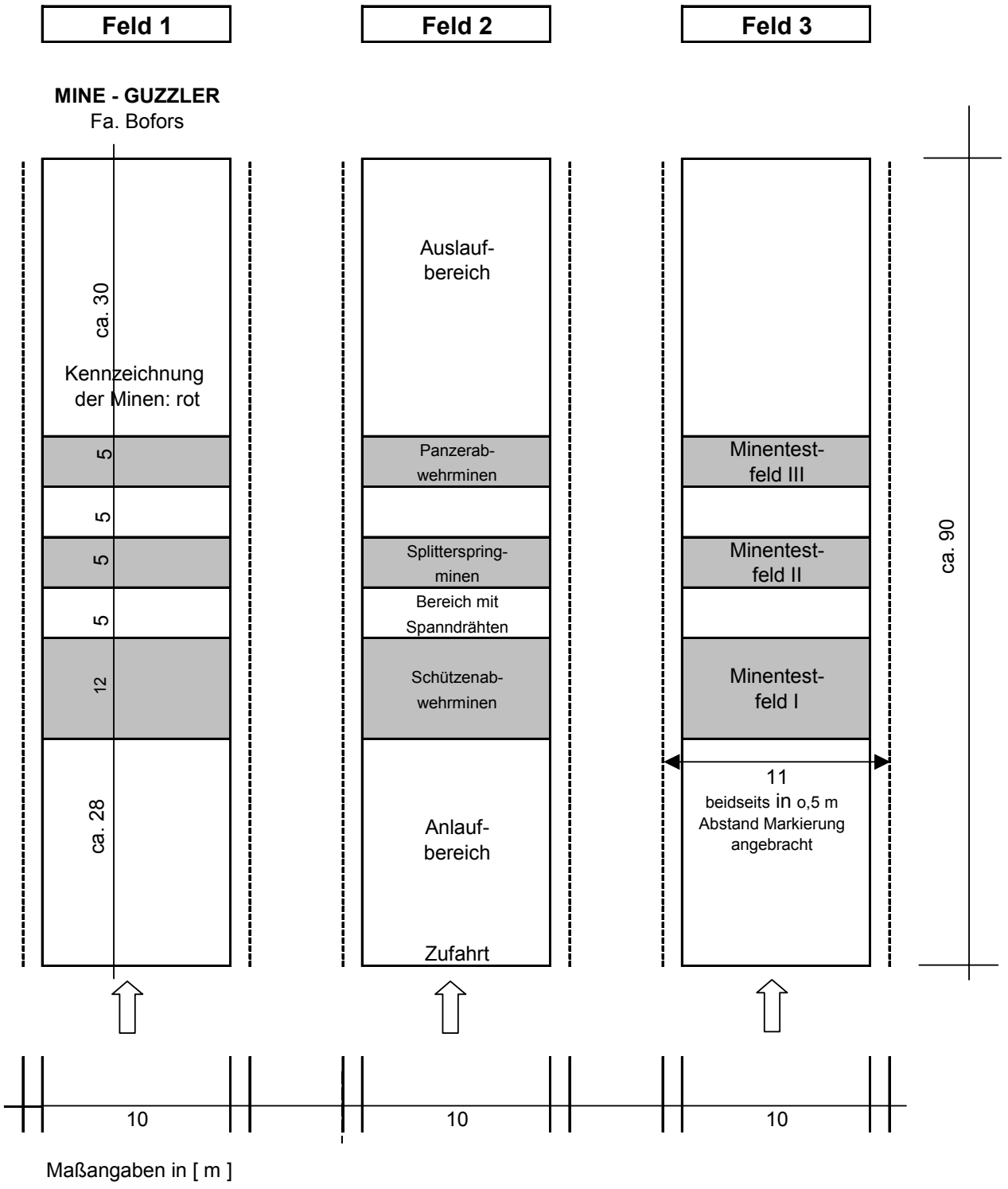
The analysed soil of the 4 test lanes (for the clearance trials) of the StOÜbPl Schmidtenhöhe, Koblenz can be described as a homogenous soil having clay, sandy and gravelly characteristics. The soil compactness and its soil water content were almost on all 4 test lanes (for the clearance trials) the same. The soil of the 4 test lanes for the pre-trials was sandier and more gravelly, with from time to time stony clay.

Summarising, the results clearly show that the soil properties, grain size distribution as well as mechanical characteristics, on both test fields WTD 91 Meppen and StOÜbPl Schmidtenhöhe, Koblenz, were for all 4 devices identical, so that from the soil mechanics point of view, the devices were tested under the same operating conditions.


Ground profile of the pre-trial lane area
StOÜbPl Schmidtenhöhe Koblenz
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Height [ m ]
Teststrecke 3 (MINE - GUZZLER Fa. Bofors)
Drive direction
150.00
140.00
130.00
120.00
110.00
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Lane distance [ m ]

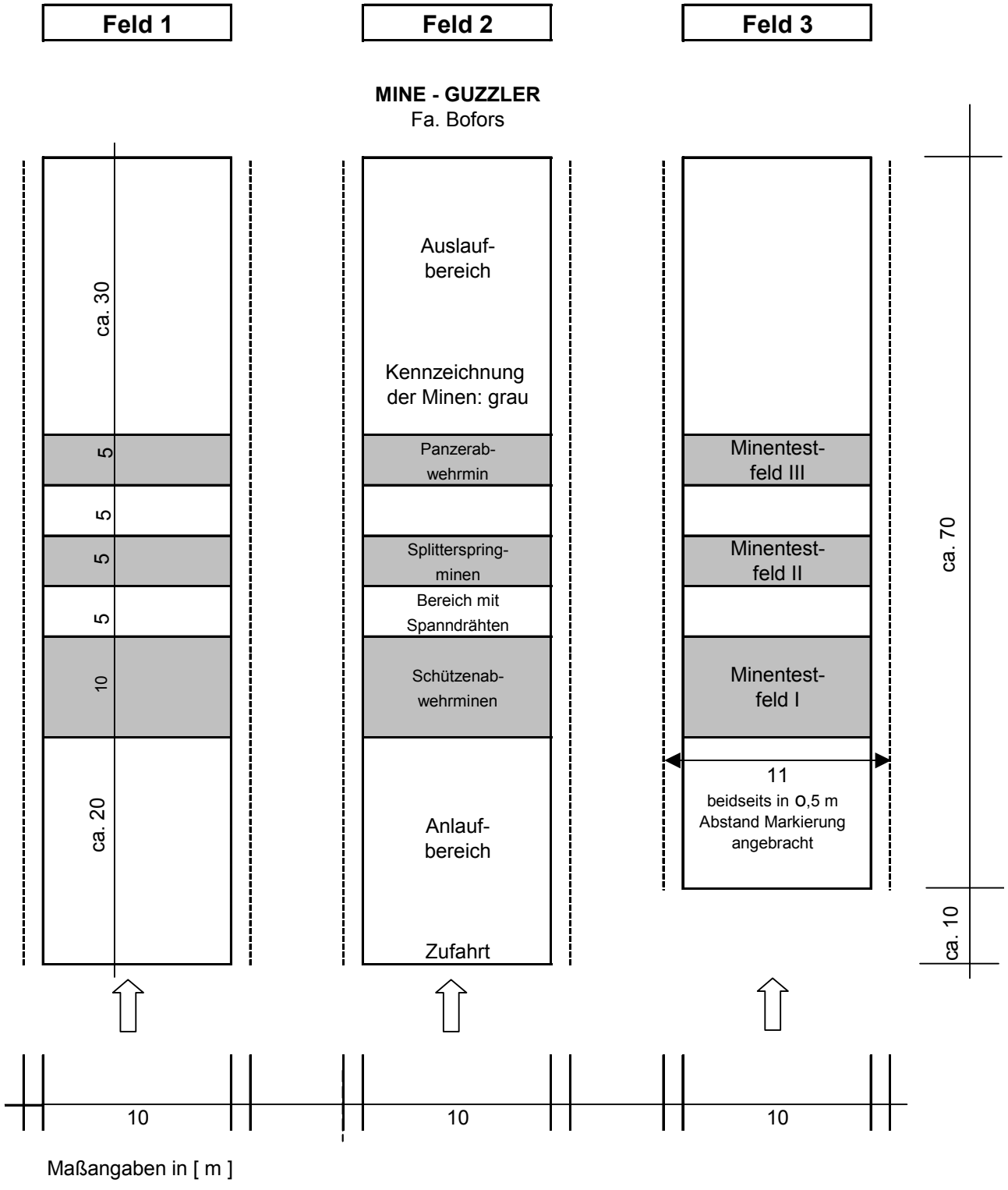
**WTD 51-230** **Koblenz, 26.09.2000**

# Teststrecke für Räumversuche
# WTD 91, Meppen



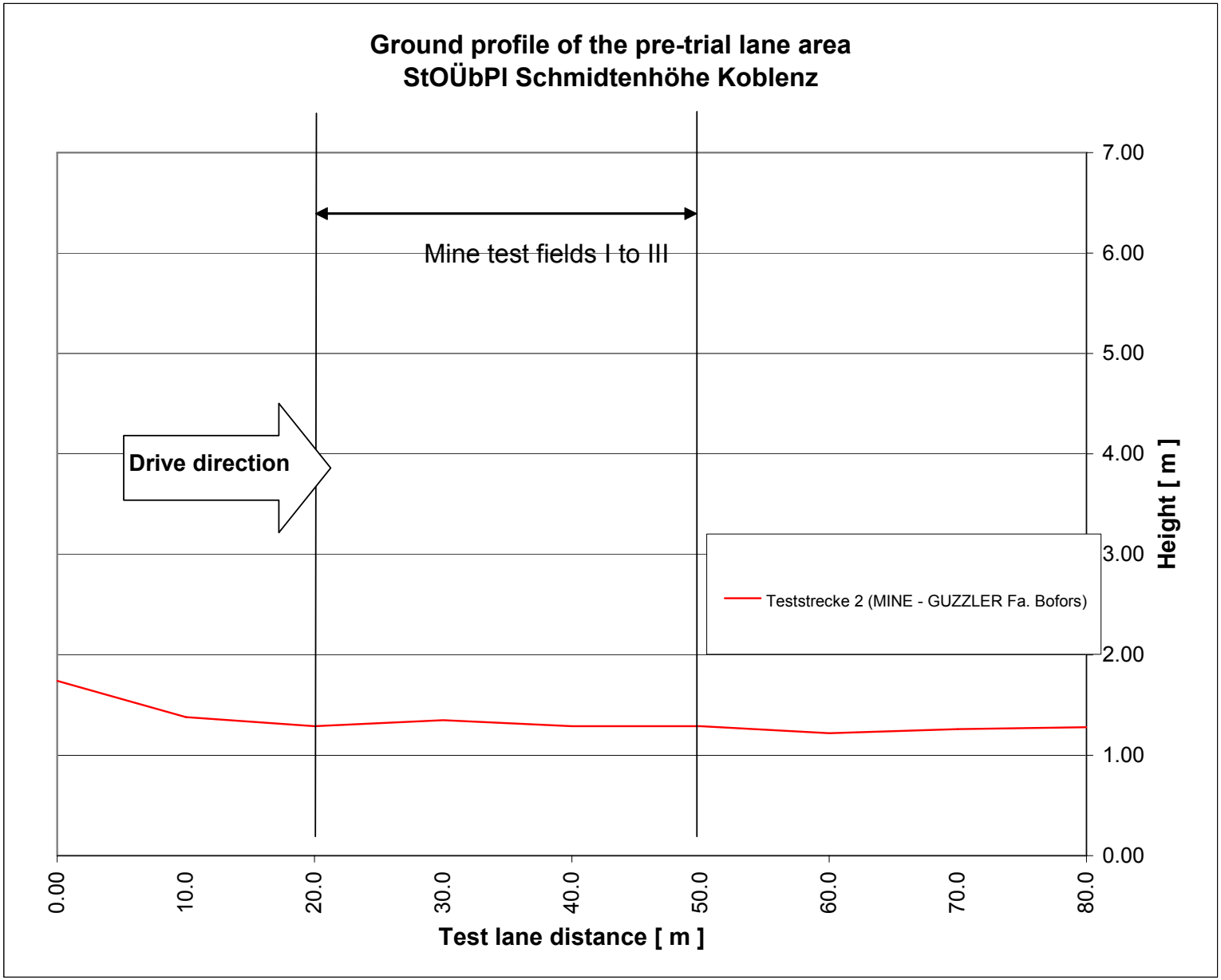
**WTD 51-230** **Koblenz, 26.09.2000**

# Teststrecke für Räumversuche
# StOÜbPl Schmidtenhöhe, Koblenz




Maßangaben in [ m ]

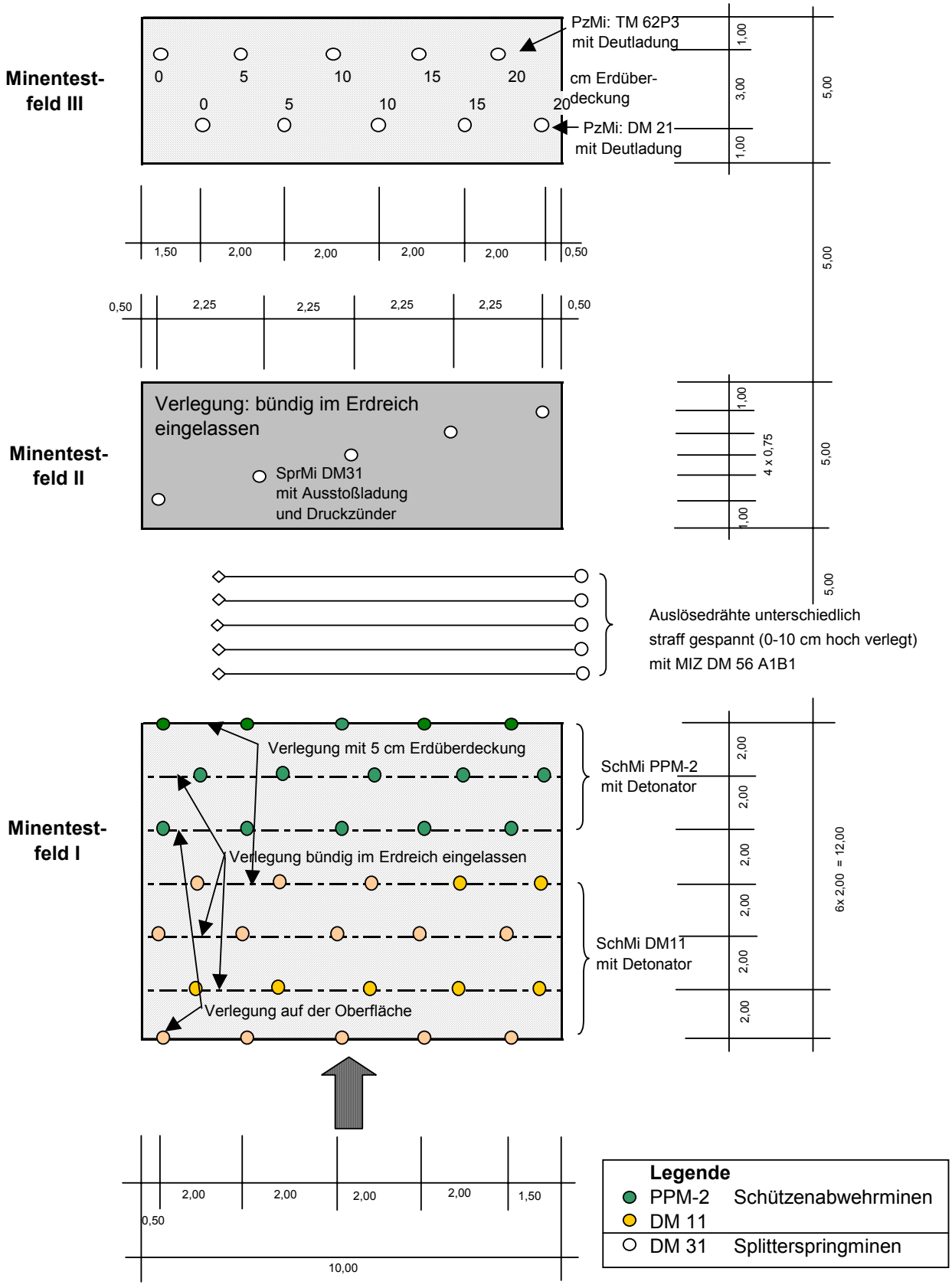
**Annex 6**


Ground profile of the pre-trial lane area
StOÜbPl Schmidtenhöhe Koblenz
Mine test fields I to III
Drive direction
Teststrecke 2 (MINE - GUZZLER Fa. Bofors)
Height [ m ]
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
Test lane distance [ m ]

WTD 51-230 Koblenz, 09.10.2000

# Minenverlegeplan

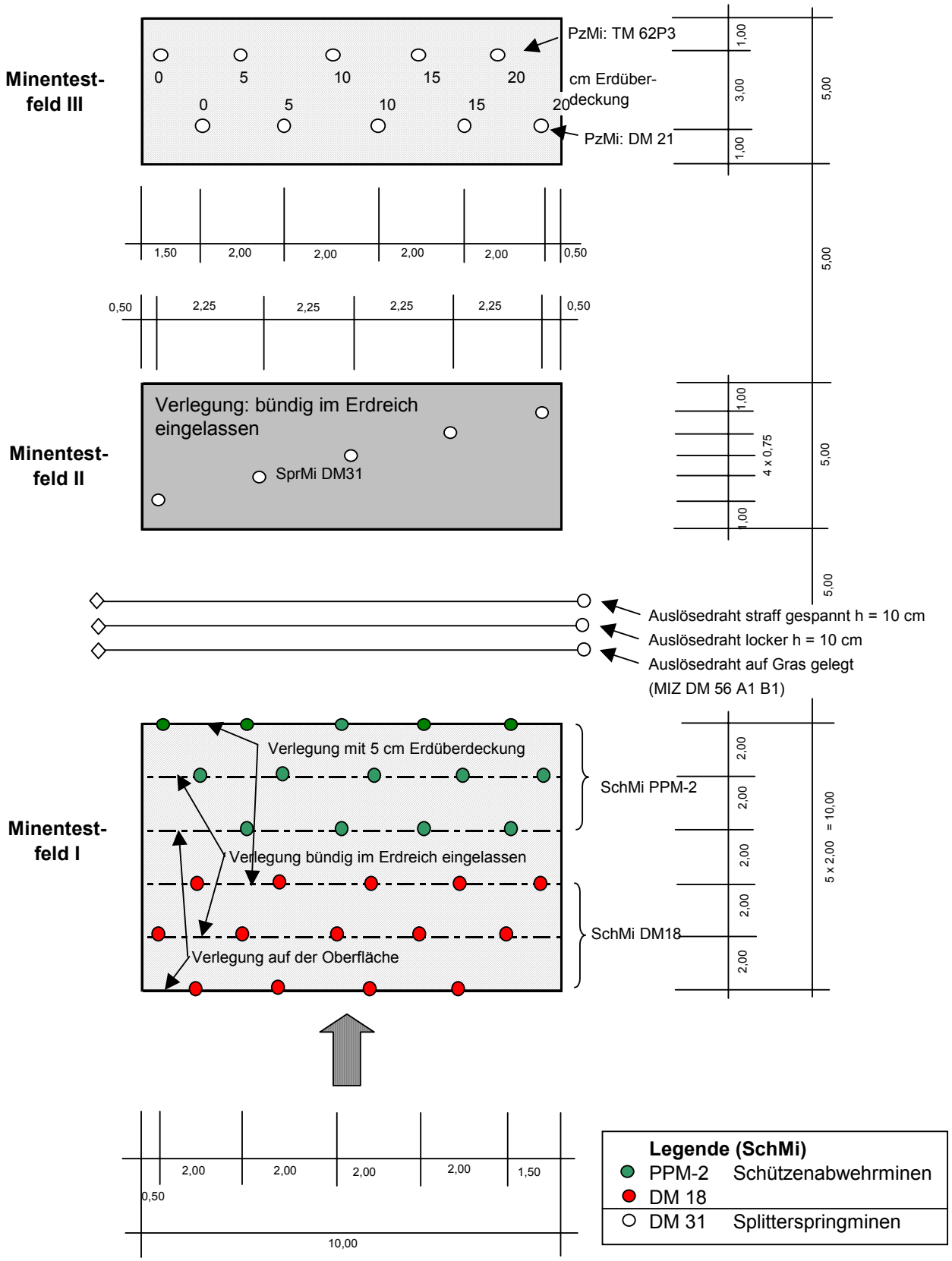
## WTD 91, Meppen



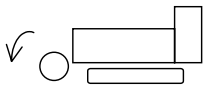
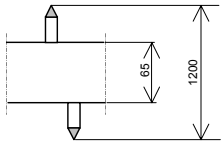
**WTD 51-230** **Koblenz, 26.09.2000**

# Minenverlegeplan

## StOÜPl Schmidtenhöhe, Koblenz



# Technische Räumdaten

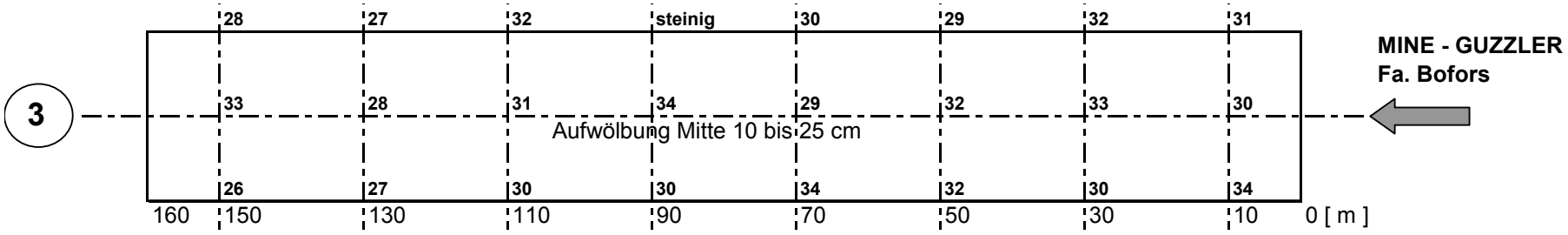
| | **MINE - GUZZLER Fa. Bofors** |
|---|---|
| **Räumprinzip** | Fräsen<br>1 Walze |
| **Bedienung** | von Fahrerkabine<br>und Funkfern-<br>steuerung |
| **Reichweite Funkfernsteuerung** | ca. 800 m |
| **Drehrichtung** |  |
| **Walzen-durchmesser** | 1200 mm<br>650 mm<br>  |
| **U/min** | 180 |
| **Anzahl Fräsköpfe/ Schlegel** | 405 |
| | **MINE - GUZZLER Fa. Bofors** |
| **Räumbreite** | 3,15 m |
| **Räumtiefe** | bis 50 cm |
| **Räumgeschwindig-keit/Räumleistung** | max. 4 km/h |
| **dynamischer Spalt** | ca. 2 cm |

230

Koblenz, 20.10.2000

# Vergleichserprobung Minenräumgeräte Schmidtenhöhe Koblenz

## Vorversuche: Frästiefen in cm



**Wehrtechnische Dienststelle für Kraftfahrzeuge und Panzer**

**Anlage zum Untersuchungs-/ Erprobungsbericht**

**Trier, den** 15.11.2000
**App.:** 2633

**Dok.-Nr.:**

**Dezernat:** 150

**Verfasser:** Philippi

## Versuchs- und Meßergebnisse

**WTA - Nr.:**

**TA - Nr.:** 01457 / 001

**Auftragstext:** Human relevant vibration measurements on the driver seat

Der Bericht besteht aus 3 Seiten.

**Bemerkungen:**

Verfasser

## 1. Description of the device to be tested

Mine clearance device of the Bofors company with track arrangement

## 2. Description of the test lane

The analyses of the vibrations were conducted during the clearance process on a test area in Koblenz (Schmidtenhöhe).

## 3. Measured places

The analyses of the vibration were conducted from the base and from the seat of the driver cabin, each time from three different directions.

## 4. Description of the instruments used for measuring

DAT-Recorder Sony PC 208 (S-Nr. 070000-066005)

Seat pad of the B&K company Type 4322 (S-Nr.: 055003)

Acceleration receiver, B&K Type 4321 (S-Nr.: 030116-044001)

Calibrator, B&K Type 4294 (S-Nr.: 030119-004002)

Real time analyser, B&K Type 2143 (S-Nr.: 070000-02211)

## 5. Method and Procedure

The analyses were conducted according to the ergonomic SEV 09-40 of the NATO procedure for the standard testing of mechanical equipment. The results of the measurements were evaluated according to ISO 2631-1 of 1997. The assessment of the human relevant vibration load follows the assessment model of VDI 2057 in connection to the 2. Regulation for professional disease (bulletin 2110) of May 1993.

For the assessment only the data delivering the highest results was used, according to VDI 2057.

Table 1 lists the acquired Keq-values with the relative allowed exposure times in minutes for the maintenance of proper health conditions (Tgmin). Each time, 3 trial repetitions were executed.

The arithmetic average values of the trial repetitions were calculated (see Table 2). Since a particular attention was given to the transmission of the vibration to the driver seat, the so-called seat transmission factor SEAT was calculated Table 3.

## 6. Results

In the following tables the acquired Keq-values, of the accelerations, taking into consideration the relevant allowed exposure times for the maintenance of proper health conditions, together with the arithmetic average values, are represented.

| Test lane: Grassland | v in km/h | Driver seat Base | | | Driver seat From the seat | | | TGmin |
|---|---|---|---|---|---|---|---|---|
| | | KX | KY | KZ | KX | KY | KZ | Z |
| 1. Trial | | 1,7 | O,8 | 2,6 | 2,2 | 3,1 | 3,2 | > 8 h |
| 2. Trial | ca. 2 | 1,7 | O,8 | 4,0 | 1,7 | 2,8 | 3,2 | > 8 h |
| 3. Trial | ca. 2 | 1,7 | 1,1 | 3,0 | 1,7 | 3,1 | 3,4 | > 8 h |
| | ca. 2 | | | | | | | |

**Table 1: Keq-values (Bofors Model)**

| | During the clearance process | | | | | |
|---|---|---|---|---|---|---|
| Test lane: Grassland | Driver seat Base | | | Driver seat From the seat | | |
| | KX | KY | KZ | KX | KY | KZ |
| Bofors | 1,7 | 0,9 | 3,2 | 1,8 | 3,0 | 3,3 |

**Table 2: Arithmetical average Keq-values**

## 7. Calculation of the transmission seat factors SEAT

$$\mathbf{SEAT} = \frac{a_{wis}}{a_{wip}} \qquad \mathbf{i = x, y, z}$$

$a_{wis}$ = Acceleration from seat

$a_{wip}$ = Acceleration from base

| | During the clearance process | | | |
|---|---|---|---|---|
| Vehicle | v in km/h | SEAT | | |
| | | KX | KY | KZ |
| Bofors | | 1,06 | 3,33 | 1,03 |

**Table 3: Arithmetic average values of the transmission seat factors SEAT**

## 8. Assessment of the results

For the mine clearance device the vibration during the clearance process is reasonable. The daily time to be invested can amount to 8 hours and more, without expecting any health damages.

**230** **Koblenz, 30.10.200**

# Räumzeiten/Randbedingungen bei WTD 91, Meppen

| | **Fa. Bofors MINE GUZZLER** |
|---|---|
| Datum | 09.10.00 |
| Beginn Uhrzeit | 9.40 |
| Räumzeit für 1. Spur [ min ] | 10 |
| Gesamtzeit [ min ] | 43 |
| Räumstrecke Länge/Breite [ m ] | 90/10 |
| Wetter-bedingungen | sonnig, trocken |
| Temperatur [ °C ] | 10 |
| Farbe der Minen | grau |

**230** **Koblenz, 30.10.2000**

# Räumzeiten/Randbedingungen auf StOÜbPl Schmidtenhöhe Koblenz

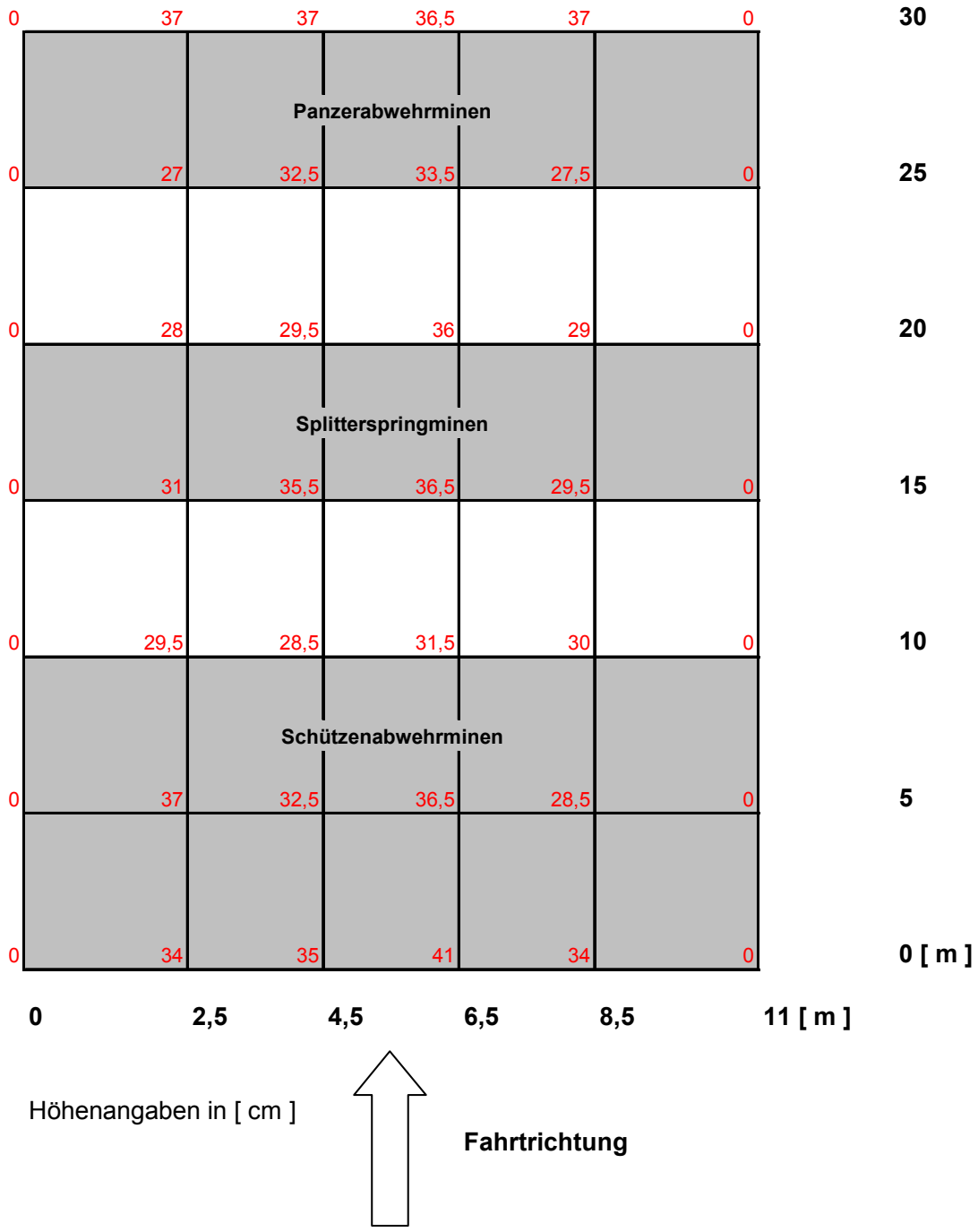
| | **Fa. Bofors MINE GUZZLER** |
|---|---|
| Datum | 24.10.00 |
| Beginn Uhrzeit | 9.30 |
| Räumzeit für 1. Spur [ min ] | 7 min 20 sek |
| Räumstrecke [ m ] | 80 m |
| Gesamtzeit [ min ] | 24 |
| Räumstrecke Länge/Breite [ m ] | 80/10 |
| Wetter-bedingungen | sonnig, trocken, leicht bewölkt |
| Temperatur [ °C ] | 15 - 17 |
| Farbe der Minen | grau |

230

Koblenz, 30.11.2000

# Nivellement des Minentestfeldes

## MINE - GUZZLER; Fa. Bofors



| WTD 51 | **Mine Clearance Device - samples** | Koblenz, 22.12.2000 |
|---|---|---|
| Dept. 230 | | Task Nr.: 00059 |
| TRAR Theimer | Pictures | Page 1 of 10 |

**Picture 1**

MINE - GUZZLER
Overall view, front right

**Picture 2**

MINE - GUZZLER
Overall view
back right

**Picture 3**

MINE - GUZZLER
Overall view, side right

| WTD 51 | **Mine Clearance Device - samples** | Koblenz, 22.12.2000 |
|---|---|---|
| Dept. 230 | | Task Nr.: 00059 |
| TRAR Theimer | Pictures | Page 2 of 10 |

**Picture 4**

MINE - GUZZLER
During the clearance process

**Picture 5**

MINE - GUZZLER
During the clearance process

**Picture 6**

MINE - GUZZLER
During the clearance process

| WTD 51 | **Mine Clearance Device - samples** | Koblenz, 22.12.2000 |
|---|---|---|
| Dept. 230 | | Task Nr.: 00059 |
| TRAR Theimer | Pictures | Page 3 of 10 |

**Picture 7**

Moving tracks of the
MINE – GUZZLER

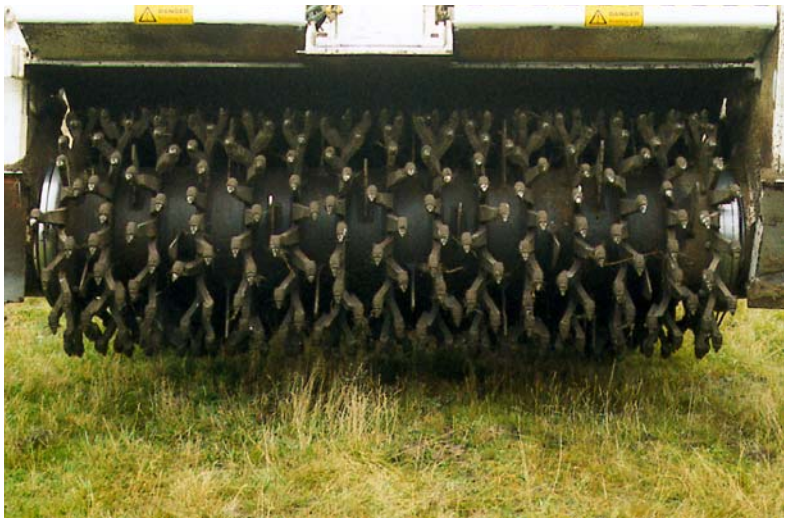
**Picture 8**

Moving tracks of the
MINE – GUZZLER

**Picture 9**

Moving tracks of the
MINE – GUZZLER

| WTD 51 | **Mine Clearance Device - samples** | Koblenz, 22.12.2000 |
|---|---|---|
| Dept. 230 | | Task Nr.: 00059 |
| TRAR Theimer | Pictures | Page 4 of 10 |



**Picture 10**

MINE – GUZZLER
Condition of the tiller drum after the trials on WTD 91

**Picture 11**

MINE - GUZZLER
Condition of the tiller drum after the trials on WTD 91

**Picture 12**

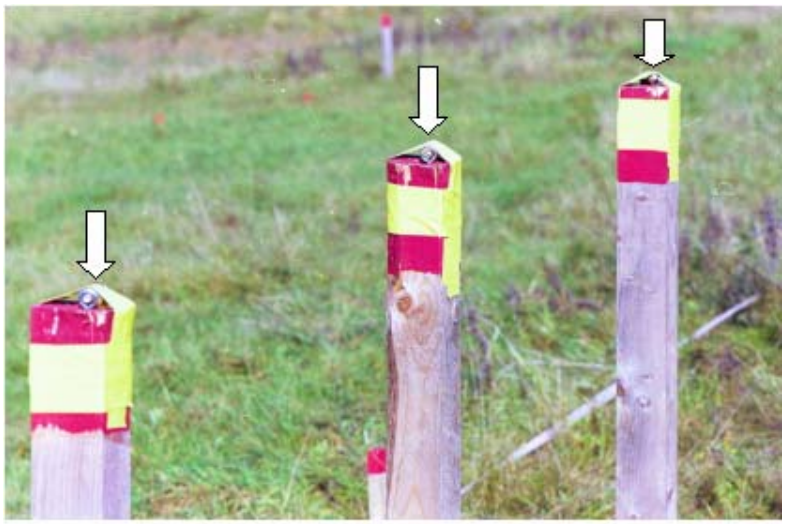
MINE - GUZZLER
Condition of the tiller drum after the trials on WTD 91

| WTD 51 | **Mine Clearance Device - samples** | Koblenz, 22.12.2000 |
|---|---|---|
| Dept. 230 | | Task Nr.: 00059 |
| TRAR Theimer | Pictures | Page 5 of 10 |


| | | |
|---|---|---|
| 1 | DM 31 | Splitterspringmine |
| 2 | DM 21 | Panzerabwehrmine |
| 3 | TM 62P3 | Panzerabwehrmine |
| 4 | PPM-2 | Schützenabwehrmine |
| 5 | DM 18 | Schützenabwehrmine |

**Picture 13**

Used mines



**Picture 14**

Mine fuse
MIZ DM 56 A1B1


**Picture 15**

Clearance depth measurements

| WTD 51 | **Mine Clearance Device - samples** | Koblenz, 22.12.2000 |
|---|---|---|
| Dept. 230 | | Task Nr.: 00059 |
| TRAR Theimer | Pictures | Page 6 of 10 |

**Picture 16**

WTD 91
APM DM 31 in contact with
MINE – GUZZLER

**Picture 17**

MINE – GUZZLER
By counter steering a relative straight moving track can be maintained

**Picture 18**

MINE – GUZZLER
Through the side plates soil cannot be pushed sideways of the vehicle.

| WTD 51 | **Mine Clearance Device - samples** | Koblenz, 22.12.2000 |
|---|---|---|
| Dept. 230 | | Task Nr.: 00059 |
| TRAR Theimer | Picture | Page 7 of 10 |

**Picture 19**

MINE – GUZZLER
No soil piles up sideways of the vehicle

**Picture 20**

MINE – GUZZLER
View from front window

**Picture 21**

MINE – GUZZLER
View from left side windows

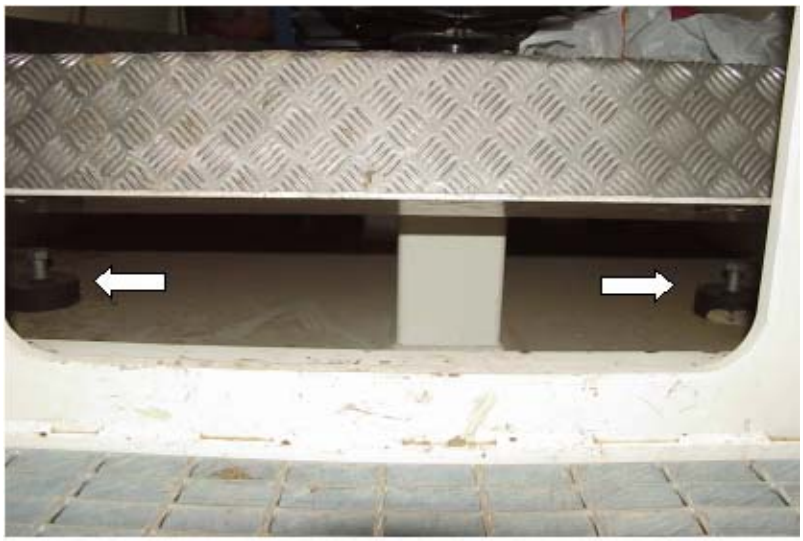
| WTD 51 | **Mine Clearance Device - samples** | Koblenz, 22.12.2000 |
|---|---|---|
| Dept. 230 | | Task Nr.: 00059 |
| TRAR Theimer | Pictures | Page 8 of 10 |

**Picture 22**

MINE – GUZZLER
View from the rear window

**Picture 23**

MINE – GUZZLER
Transport by heavy load trailer



**Picture 24**

MINE – GUZZLER
Detachment of the screws in the false floor of the driver cabin

| WTD 51 | **Mine Clearance Device - samples** | Koblenz, 22.12.2000 |
|---|---|---|
| Dept. 230 | | Task Nr.: 00059 |
| TRAR Theimer | Pictures | Page 9 of 10 |

**Picture 25**

MINE – GUZZLER
Lifting of the driver cabin with a crane

**Picture 26**

MINE – GUZZLER
without driver cabin


**Picture 27**

Searching for mine fragments with the rock collector

| WTD 51 | **Mine Clearance Device - samples** | Koblenz, 22.12.2000 |
|---|---|---|
| Dept. 230 | | Task Nr.: 00059 |
| TRAR Theimer | Pictures | Page 10 of 10 |

**Picture 28**

Searching for mine fragments with the rock collector

WEHRTECHNISCHE DIENSTSTELLE
FÜR WAFFEN UND MUNITION
**WTD 91**

**Dezernat 360**

49716 Meppen; den 11.01.2001
Tel. (05931) 43 - 2360
App.:

| Ausfertigung | Verteiler |
|---|---|
| 1. - 8. | WTD 51 - 230 |
| 9. - 10. | WTD 91 - 360 |

Bericht Nr.: 34/00/91-360

WTA-Nr.: E/E510/00672/Q5204

Protokoll Nr.:

Prüfgegenstand: Vergleichserprobung von Minenräumfräsen

Aufgabe: Vorbereitung und Bewertung der Räumergebnisse an Panzer- und Schützenminen

Result (summarised version):

In Meppen the large AT-mines were cleared by the mine clearance device in object. at 100%
Most of them initiated during the clearance process.
The AP fragmentation mines were all initiated through the tripwire, whereas through the pressure fuse only half of them were initiated. The remaining mines were made harmless by destruction of the fuse. For the small AP-mines no complete proof could be reached, we can assume that the clearance success was almost 100%.
In Koblenz the soil was a lot more clayey. The evidence for the probable clearance success of the AP-mines was however even better.

**Keywords: Mine clearance tillers, AT-mines, AP-mines, blast surrogate mines, clearance success.**

Königstein

Königstein

Index Pages:

## 1 Background:

The WTD 51 – 230 had the task to execute comparative trials of up to 5 different mine clearance devices at two different places with different soil characteristics.

WTD 91- 410 was supposed to choose the terrain in Meppen, to prepare it, to measure it and to follow up the trial.

WTD 91 – 360 had to prepare for Meppen partially loaded blast surrogate mines, to activate them and to evaluate the clearance success on the basis of the uncleared mines and mine fragments found.

For Koblenz inert mines should be prepared to be used in the same mine fields and to be evaluated later on.

## 2 Preparation of the test fields:

The distribution plan of the AP-mines and the AT-mines was re-elaborated several times and finally used according to the WTD 51 – 230 report.

After the start-up section, 2 different AP-mines were encountered. In Meppen 20 DM11 and 15 PPM-2 mines were deployed. These mines contained only the detonators. (In Koblenz due to restricted availability only 14 + 14 AP-mines could be used).

After that, 5 MIZ DM56 A1B1 of the AP-fragmentation mine DM31 followed, which were fixed to wooden sticks and connected with tripwires. All the wooden sticks and the tripwires were collected after the first clearance action. (In Koblenz, only 3 MIZ from each were bound to wooden sticks.)

The 5 AP-fragmentation mines DM31 were buried at slightly varying depths. Their MIZ DM56 A1B1 had to be set off without tripwires, as pressure fuses. These mines contained only the initiation charge.

Two series of AT-mines followed, 5 DM21 and 5 TM-62 P3, which had been buried at varying depths up to 20 cm. The DM21 contained the fuse and 100g of black powder explosive charge. The TM-62 P3 contained the whole fuse with about 10g of extra charge.

# 3 Preparation of the mines:

## 3.1 Blast surrogate mines employed in Meppen:

| | prepared | used | remaining |
|---|---|---|---|
| AP-mines DM11<br>Lot DN-113<br>Explosive body replaced by wax<br>Detonator about 0,1 g screwed in | 79 | 60 | 19 |
| AP-mines PPM-2<br>Lot 06-06-76 and 06-30-77<br>Explosive body taken out<br>Detonator, about 1 g employed | 60 | 45 | 15 |
| AP-fragmentation mines DM31<br>Explosive body inert filled<br>S.P.-propelling charge (about 5g)<br>MIZ DM56 A1B1 lot RM-3-81 A | 20 | 15 | 5 |
| AT-mine DM21<br>Explosive body inertly filled<br>S.P.-explosive charge (about 100g)<br>MIZ DM1001 with fuse chain from the lot DIN 1-4 lot | 20 | 15 | 5 |
| AT-mine TM 62 P3<br>Lot 06-26-89<br>Explosive body inertly filled<br>MIZ MWD-62 loaded (about 10g) | 20 | 15 | 5 |

## 3.2 Inert mines used in Koblenz:

| | prepared | used | remaining |
|---|---|---|---|
| AP-mines ( EX) DM18<br>without smoke charge | 59 | 42 | 17 |
| AP-mines PPM-2<br>completely emptied | 59 | 42 | 17 |
| AP-fragmentation mines DM31<br>inert filled, without explosive charge<br>with inert MIZ DM56 A1B1 | 20 | 15 | 5 |
| AT-mine DM21<br>inert filled, without explosive charge<br>with inert MIZ DM1001 | 20 | 15 | 5 |
| AT-mine TM-62 P3<br>inert filled, without explosive charge<br>with inert MIZ MWD-62 | 20 | 15 | 5 |

## 4 Schedule of trials:

| | |
|---|---|
| 10.05.02 | Discussion with WTD 51 - 230 with the contractor in Meppen WTD 91 – 410. |
| 12.07.00 | Selection of the Russian mines according to their availability. |
| 21.07.00 | Assignment of partial contract 00672/703. |
| 14.08.00 | Start of the work on the blast surrogate mines DM21. |
| 05.09.00 | Discussion with WTD 51 - 230 and exhibition of the 5 different blast surrogate mines. |
| 13.09.00 | Unlocking time test for the APM PPM-2. |
| 04.10.00 | Distribution of the blast surrogate mines in Meppen. |
| 09.10.00 | Clearance process with MINE-GUZZLER, Fa. Bofors |
| 18.10.00 | Search process of the grass-moss vegetation with wheeled loader and rock collector finished. |
| 01.11.00 | Photographing of the mine fragments from the three mine test fields |
| 07.11.00 | Survey and assessment with a representative of the army. |
| 28.09.00 | Transport of the inert mines to Koblenz. |
| 13.10.00 | Distribution process of the inert mines at the Schmidtenhöhe finished. |
| 24.10.00 | 1 clearance process with the MINE-GUZZLER, Fa. Bofors done. |
| 23.11.00 | Mission to Koblenz-Rübenach for the common inspection of the mine fragments from the three mine test fields of Koblenz-Schmidtenhöhe. |
| 24.11.00 | Assessment and photographing of the mine fragments in the presence of a representative of the army were taken. |

# 5 Mine clearance trials in Meppen:

## 5.1 Preparation of the mine test fields:

The test fields had been measured and marked by the Department 410 in September 2000 on the grass-moss vegetation ground.

On 04.10.00, blast surrogate mines were distributed by the Department 360 in the mine field, more precisely, 35 small AP-mines, 5 AP-fragmentation mines and 10 AT-mines. These mines were all armed at the moment, of deployment due to time needed for activation, especially the AP-mines PPM-2. .

On 09.10.00, 5 MIZ DM 56 A1B1 fuses were mounted on wooden sticks with tripwires.

These 5 fuses and the 5 MIZ, which had been installed as pressure fuses on DM31 mines, were armed immediately before the clearance trial.

## 5.2 Clearance process done by Fa. Bofors

On 09.10.00 in the morning, the MINE-GUZZLER of the Fa. Bofors cleared the first mine field (mine with grey colour). The result were four flat cleared tracks with exact forward and backward movement tracks, neatly positioned one next to the other. Due to the slight amount of soil thrown up in front of the inwards revolving tiller drums not all initiations of the small AT-mines could be heard. The video recordings produced even less observations than the observations by ear.
For details see paper 1 + 2.

The AP-fragmentation mines DM31 were very difficult to observe. After a run had been completed, one mine was hanging in a very dangerous condition, having its tripwire pending over the tiller pushing frame.

Out of the 10 AT-mines, only 8 were heard at the beginning.

Later on, the 2 AT-mines, which had not been observed, were dug out and analysed. Both mines, which had been buried deeply, had been initiated.

For the DM21, the fuse chain had not activated the surrogate mine charge. This problem was already known from past clearance trials.

The fuse chain of the TM-62 had been initiated but due to the burial depth the initiation had not been heard.

Therefore all the 10 AT-mines had been cleared through initiation.

## 5.3 Searching with mine prodders and spade:

On 16.10.00, the mine field of the MINE-GUZZLER was searched with mine prodders, spades and rock collector.
On 17.10.00, the prodder was used to look for AP-fragmentation mines and AT-mines and not the rock collector. Nothing was found.

After the use of the rock collector, the excavated soil was levelled back into the mine field, whereby some parts of PPM-2 and TM-62 P3 mine cases were found.

### 5.4 Sieving with the rock collector:

On 16.10.00, the company Hoogen came with a field tractor and rock collector Grimme CS1700. In the beginning the system seemed to work fine, but a large amount of sand was generated in front of the vehicle very soon, which did not allow the sieving part to work and which made the tractor stop several times. Apparently, the problem was that the penetrated grass-moss branches prevented the sand from circulating. The vehicle was anyway able to detect a DM31 with broken fuse and a deactivated MIZ DM56 A1B1.

The attempt to increase the traction force of the tractor using a tank recovery vehicle caused an even larger amount of sand, and did not solve the problem.

In the end, a wheeled loader to excavate the sand and pour it into the operating rock collector was employed. After 4 half filled shovels, the rock collector emptied its bucket and moved forward over the sand heap for about 5 m to restart the loading process. The output was finally combed with the fingers.

In the AP-mine section of the first mine field, one APM DM 11 was found crushed. One AP-mine initiated inside the rock collector. However it is not clear which mine type it concerned. According to the location in which it was found it must have been a PPM-2, lying on the extreme left part and was therefore missed by the tiller. If a fourth clearance run, located 0,5 m further left, would have been executed, it could have been tilled. This mine had therefore to be eliminated from the calculations of the cleared pieces.

### 5.5 Single results:

Comments on the initiations heard, the recovered mines and the mine fragments found with the rock collector in the Meppen mine field, are given in:

Measurement paper 1-9 for field 1 “Mine GUZZLER” of Fa. Bofors.

The first two measurement papers summarise the visible and heard results during the clearance process. After that, 3 measurement papers on the outcome of the results in the single mine field sections follow, that is, in the AP-mines, AP-fragmentation mines and AT-mines sections.

4 pictures are included showing an overview of the field, showing also the single field sections, that is, the AP-mines, AP-fragmentation mines and AT-mines sections, and a zoom of some specific parts (especially of APM DM11) follow.

## 5.6 Overview of the clearance results:

Clearance trial with the MINE-GUZZLER in Meppen on 09.10.00, in a mine field prepared with blast surrogate mines.

| Vehicle / Mine | Field 1<br>Fa. Bofors<br>MINE-GUZZLER |
|---|---|
| TM-62 | 5 initiated<br>(4 x broken)<br>(1 x body remained intact) |
| DM21 | 5 initiated<br>(2 x scrap)<br>(3 x body remained intact) |
| DM31 | 2 x initiated<br>3 x broken } 5 |
| MIZ | 4 initiated<br>(1 cannot be estimated) |
| PPM-2 | 14 heard<br>13 rings found<br>(a lot of fragments) |
| DM11 | 14 heard<br>15 cases found<br>2 damaged bodies<br>(few fragments) |

### 5.7 Overview of the used mines:

| | |
|---|---|
| ATM TM-62 | 5 x clearance success = 100 % |
| ATM DM 21 | 5 x clearance success = 100 % |
| AP-fragmentation mine DM31 | 5 x clearance success = 100 % |
| MIZ DM56 A1B1 | 5 x clearance success = 100 % |
| APM PPM-2 | Presumably all 15 initiated, but they were not heard due to the large amount of sand. Few parts were found during the sifting process (a lot of case fragments) |
| APM DM11 | almost all were found – almost a complete proof (only few case fragments found) |

The AT-mines were cleared to 100%, whereby most of them had been initiated.

The AT-fragmentation mines were also cleared to 100%. Almost all had been initiated through the pull initiated fuse, whereas through the pressure fuse only half of them were made harmless, by breaking up the fuse.

## 6 Mine clearance trials in Koblenz:

### 6.1 Preparation of the test fields:

In week 40/41 in 2000 the mine field was measured, marked and inert mines were placed, in order to test the mine clearance device of WTD 51-230 on the StOÜbPl Schmidtenhöhe in Koblenz.

Different from Meppen, in Koblenz only 14 +14 = 28 small AP-mines were distributed. The APM (EX) DM18 was still equipped with a dummy. The APM PPM-2 had been armed before deployment.

The AP-fragmentation mines were used with activated MIZ DM56 A1B1. The AT-mines and TM-62 P3 were buried in the ground without the safety catch.

,

### 6.2 Execution of the trials:

On 24.10.00, the “MINE-GUZZLER” of Fa. Bofors cleared the second mine field (mines with grey colour). Despite the humid clayey soil, the runs were well executed in a regular fashion. The time needed to clear a surface of 10 x 80 was of 24 min.

## 6.3 Sieving with the rock collector:

In week 45-46 in 2000 the mine field on the Schmidtenhöhe was searched with the rock collector Grimme CS 1700 pulled by a tractor CASE III MX 135.

The rock collector needs, while moving forward, an inclined surface. The ground is reduced to small pieces, i.e. sieved, through the 7 rotating star-shaped rubber rollers. The pieces with a diameter larger than 2,5 cm are collected in a special container.

Because the rock collector only reaches a ground penetration depth of max. 25 cm (the clearance depth of the mine clearance device amounts to 25 to 50 cm) and the traction force of the tractor was insufficient due to the soil conditions, i.e. a lot of natural vegetation (WTD 91) and high clay content, the following procedure was followed in the Schmidtenhöhe test fields.

With the tracked multi-purpose excavator, the soil was directly removed and deposited on the unflailed soil in about 1,50 m wide and 0,50 m high strips next to the mine fields. After that the soil was sieved 3 to 4 times with the rock collector. During the sieving process the container was opened and the sieved soil dropped out. Two persons, standing each at one side of the container, took out the mines and the remaining pieces. Another person walking directly in front of the rock collector sorted out the visible pieces beforehand. Due to continuous rain while working with the rock collector, the sieving part of the rock collector was constrained as a consequence of the water-logged soil. The soil would agglutinate and bigger soil lumps had to be reduced by hand. It cannot be disregarded that mine pieces were completely covered by the soil and were therefore not found.

The following surfaces were searched for mine fragments:

For the Fa. Bofors, the searched area included 10 m before the beginning of the mine field to the end of the tilled area.

In the area behind the mine field up to the end of the tilled track, all kind of mine fragments were found.|

WTD 51-230 put a lot of efforts in the search for mine fragments and very good results were achieved.

The tilling result for inert mines was completely different in the loamy ground of the Schmidtenhöhe than in the sandy soil of Meppen.

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## 6.4 Single results:

Details about the fragments of the inert mines found in the mine field in Koblenz with the rock collector are given in:

Measurement paper 10 - 13 for Field 2 „MINE-GUZZLER“ of Fa. Bofors

The measurement papers contain an overview of the mine fragments found. After that 3 pictures are given: a complete overview of the field, the AT-mines and the AP-mines.

In comparison to the other mine clearance devices tested, the result of the MINE-GUZZLER of Fa. Bofors in Koblenz was the best. Almost all the inert mines were tilled, merely 1 EX-Mine DM 18 could not be proofed. Presumably, it had been tilled like the others. This would mean a clearance result of 100% for the entire mine field.

## 6.5 Overview of the clearance results:

Mine test field prepared with inert mines in Koblenz during the clearance trial with the MINE-GUZZLER, on 24.10.00.

| Vehicle<br><br>Mine | Field 2<br>Fa. Bofors<br>MINE-GUZZLER |
|---|---|
| TM-62 | 5 tilled |
| DM21 | 5 tilled |
| DM31 | 5 broken |
| MIZ | 3 initiated |
| PPM-2 | 14 tilled |
| DM18 | 13 tilled |

## 6.6 Results for the single mines:

| | |
|---|---|
| ATM TM-62 | 5 x clearance success = 100 % |
| ATM DM 21 | 5 x clearance success = 100 % |
| AP-fragmentation mine DM31 | 5 x clearance success = 100 % |
| MIZ DM56 A1B1 | 3 x initiated<br>clearance success = 100 % |
| APM PPM-2 | 14 x clearance success = 100 % |
| APM (EX) DM18 | 14 x clearance success ≈ 100 % |

The AT-mines would have been cleared by the MINE-GUZZLER.

The AP-fragmentation mines would also have been cleared.

For the small AP-mines the PPM-2 could be cleared with 100% of success. Following the experiences in Meppen, also in Koblenz all of them had to have been initiated. For the smallest AP-mines DM18 100% of clearance success could not be proved, but based on the condition of the fragments, it can be assumed that also for the AP-mines 100% of success was reached.

## 7 Clearance results for the mine clearance device:

The mine clearance tiller MINE-GUZZLER of Fa. Bofors produced in Meppen as well as in Koblenz very neat clearance runs. Most of the mines were initiated, whereas the others were broken up. Since not all the parts were found, the result has to be quoted as high. A clearance success of almost 100% has to be considered.

The clearance result of the presented machine shows that a final selection is only possible following further criteria:

- Capability to maintain working performance in difficult, rocky terrain,
- Capability to withstand 10 AP-mines initiated in the same tool position and 5 AT-mines distributed over the tool width,
- Time and costs of repairing after setting-off AT-mines,
- Purchase and maintenance costs of the machine,
- Transportation costs and possibilities.

| Office: WTD 91 | Dept: 360 | Editor Königstein | Date 09.10.00 |
|---|---|---|---|
| Measurement paper | | Paper Nr. 1 | Page total |

## Clearance trial in field 1 in Meppen with „Mine Guzzler“ of Fa. Bofors with blast surrogate mines (grey)

| Distributed mines: | Observed initiations during the clearance process: 1. | 2. | 3. | 4. | Total |
|---|---|---|---|---|---|
| APM DM 11: 20 | 5 x | 4 x | 5 x | | 14 x |
| APM PPM-2: 15 | 5x | 5 x | 4 x | | 14 x |
| MIZ DM 56: 5 with tripwire | 4 x initiation | | | | 4 x |
| | (1 x cannot be evaluated, was not armed) | | | | |
| APM DM 31: 5 with pressure fuse | | | 1 x | | 1 x |
| | (the week explosive charge could not be heard well in the earth thrown up under the tiller) | | | | |
| ATM DM 21: 5 | 1 x | 1 x | 1 x | 1 x | 4 x |
| ATMTM 62: 5 | 1 x | 1 x | 1 x | 1 x | 4 x |

| Office | Dept | Editor | Date |
|---|---|---|---|
| WTD 91 | 360 | Königstein | 09.10.00 |

| | | | |
|---|---|---|---|
| ☐ Measurement paper ☐ | | Paper Nr. 2 | Page total |

## Clearance trial in field 1 in Meppen with „MINE-GUZZLER“ of Fa. Bofors with blast surrogate mines (grey)

For the AP-mines, the DM11 were more difficult to hear than the PPM-2, because their embedded detonators are clearly different:

DM 11 has about 0,1 g; PPM-2 has about 0,8 g.

1 MIZ DM 56 A1B1 had accidentally not been armed. The fuse was, later on, found with the rock collector. This fuse cannot be evaluated.

The AP-mines DM31, with their weak explosive charge, could not be heard under the earth thrown up by the tiller. After a clearance run had been completed, one mine that had been launched in the air was hanging by its tripwire over the tiller pushing frame. This mine could therefore still have been very dangerous and would have had to be chopped off.

Of the AT-mines DM 21, a steel case and a wire were stuck inside the drums of the tiller.

Both AT-mines with burial depths of 20 cm were later on dug out. Both had successfully been cleared.

| Office | Mine distribution Plan | Date | |
|---|---|---|---|
| WTD 91 | | 09.10.00 | |
| Dept. 360 | AP-mines | Page Nr 3 | Page Total |
| Editor Königstein | ☐ Measurement Paper | ☐ Field 1 „MINE-GUZZLER“ (Fa. Bofors) | |

| | | |
|---|---|---|
| 09.10.<br>17.10. | – 14 initiations were heard.<br>– 13 case rings and many fragments were found. | |
| | <u>(14 x clearance success</u>) | |
| | ⊗ ⊗ ⊗ ⊗ ⊗ | 5 cm deep |
| | ⊗ ⊗ ⊗ ⊗ ⊗ | 0 cm deep |
| | ⊗ ⊗ ⊗ ⊗ ⊗ | on top ! <u>PPM-2</u> |
| | ○ ○ ○ ○ ○ | 5 cm deep |
| | ○ ○ ○ ○ ○ | 0 cm deep |
| | ○ ○ ○ ○ ○ | 0 cm deep |
| | ○ ○ ○ ○ ○ | on top ! DM 11 |
| 09.10.<br>17.10. | 14 initiations heard.<br>15 rubber cases of initiated mines<br>+ 2 broken mine cases<br><u>+ some fragments were found</u><br><br>**<u>(17 x clearance success</u>)** | |

| Office | Mine distribution Plan | Date |
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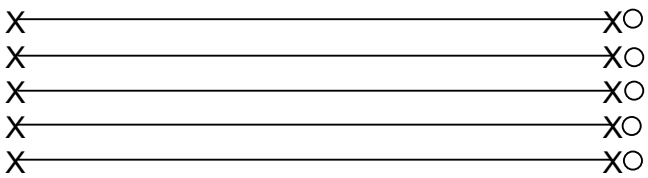
| | |
|---|---|
| 09.10. | 1 initiation was heard.<br>After the end of the fourth clearance run a mine which had been pushed out was hanging with its tripwire on the left pushing frame of the tiller. This mine could therefore still have been very dangerous |
| 18.10. | 3 mines were found with broken fuses (mine body was even buried). [4]<br>○ [4]<br>initiated<br>○ [4]<br>○ [4]<br>○ [8]<br>initiated |
| 04.12. | 1 initiation seen [8] through monitor<br>DM 31<br>with pressure fuse |
| 09.10. |  [3]<br>MIZ DM 56 A1<br>With tripwire fixed<br>to wooden stick<br>4 MIZ set off at the edge of the mine clearance device over the tightly bound trip wire and initiated after the given time delay of 2 seconds.<br>1 MIZ was sucked up by the tiller drums. It had not been armed (cannot be evaluated) |

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| Königstein | | | |

| | |
|---|---|
| 09.10. | 4 initiations were heard.<br><br>4 initiations were heard.<br>[1] The mine buried at 20 cm depth was dug out. It had been initiated but was still lying in its original position. The mine had therefore been initiated and consequently successfully cleared.<br><br>[1]<br>⊗ 0 ⊗ 5 ⊗ 10 ⊗ 15 ⊗ 20 cm deep TM-62 P3 |
| 09.10. | ○ 0 ○ 5 ○ 10 ○ 15 ○ 20 cm deep DM 21<br>[2]<br><br>4 initiations were heard and seen.<br>[2] The mine buried at 20 cm depth was dug out. The case was only damaged. The cover had been tilled several times, whereby the MIZ had detonated but not the S.P. - explosive charge. After that, the body had been tilled twice more and been reversed on place. This mine had been initiated and was therefore successfully cleared. |


7.
7.


8.
8


Feld 1
Bofors
09.10.2000

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## Clearance trial in Koblenz-Schmidtenhöhe with „MINE-GUZZLER“ of Fa. Bofors on the inert mine field 2 (grey)

| Distributed mines: | Fragments found: | Proof |
|---|---|---|
| APM (EX) DM 18: 14 | 13 plastic cases<br>13 Al-plates<br>this means that all had presumably been tilled | (13 x) |
| APM PPM-2: 14 | 14 upper rings<br>14 ribbed case covers<br>14 lower cases,<br>this means 100 % were tilled. | 14 x |
| MIZ DM 56: 3<br>with tripwire | 3 x initiated through tripwire,<br>this means 100 % initiated. | 3 x |
| APM DM 31: 5<br>with pressure fuse | 5 fuses broken off from mine body<br>this means 100 % were tilled | (5 x) |
| ATM DM 21: 5 | 5 mine covers<br>5 interior parts with fuse parts<br>this means 100 % tilled | (5 x) |
| ATM TM-62: 5 | 5 black + 5 red rings<br>4 ZDV-cases<br>3 bodies<br>this means 100 % were tilled | (5 x) |


MINE - GUZZLER
Fa. Boters


MINE - GUZZLER
Fa. Bolors


MINE - GUZZLER
Fa. Bofors