



Kontinitro

EXPLOMET-FO-2000™ MANUAL

Swiss Manufacturer of Detonating Velocity Measuring
Instruments for Explosives and Propellants Since 1936

MEASURING METHOD AND PRINCIPLE OF OPERATION

The Explomet-fo-2000 has 5 independent timers measuring the time intervals between the illumination of 6 fiber optic probes.

One of the probes starts all the timers. Then every triggered probe stops its timer.

The Explomet-fo-2000 operates in one of the following mode:

Velocity and Time: The probes must be illuminated in ascending order, ie P1, P2, P3, P4, P5 and P6. The Explomet-fo-2000 measures the time intervals in micro seconds between the illumination of two consecutive probes and calculates the Velocity of Detonation (V.O.D) in meter per second.

Time Only: The probes are illuminated randomly. The Explomet-fo-2000 measures the time intervals (in microseconds) between the illumination of the first and the second probe, then between the second and the third probe, and so on until a maximum of 6 probes.

SPECIFICATIONS

Dimension:

- **Explomet-fo-2000**
170 x 113 x 63 [mm], 6.70 x 4.45 x 2.48 [in]
- **Explorer Transport Case**
Outside Dim: 486 x 393 x 194 [mm], 19.19 x 15.47 x 7.63 [in]

Weight:

- Explomet-fo-2000: 1.5 [kg], 3.3 [lbs]
- Explomet-fo-2000 with case and material: 5.00 [kg], 11.00 [lbs]

Autonomy:

- 40 hours of continuous operation on rechargeable NiCd batteries
- AC/DC adapter/charger for 220 V/50 Hz or 110 V/60 Hz. Standard batteries charging time: 4 hours

Operating range:

- Distance between two optical test probes on the explosive: from 50 [mm] to 9999 [mm]
- Detonating velocity up to 10'000 [m/s]
- Time interval measurement: 0.1 microsecond up to 10 seconds

Timers:

- 5 synchronous timers

QUICK VIEW

THE EXPLOMET-FO-2000 IS AN ELECTRONIC COUNTER WHICH CAN MEASURE THE VELOCITY OF DETONATION OF ANY EXPLOSIVE OR PROPELLANT UP TO 10'000 [M/S]. THIS MEASUREMENT INSTRUMENT IS TRIGGERED BY THE LIGHT EMITTED DURING THE DETONATION AND TRANSMITTED BY MEANS OF PLASTIC OPTIC FIBER PROBES PLACED INTO THE EXPLOSIVE.

APPLICATION AREAS:

- CIVIL ENGINEERING
- MILITARY ENGINEERING
- AEROSPACE ENGINEERING
- PHYSICS
- CHEMISTRY

KONTINITRO SA

15a Route de Loëx

1213 Onex

Geneva

Switzerland

Tel: +41227921028

Email: guillaume@kontinitro.com

Web: www.kontinitro.com

Operating temperature:

- 0 - 50°C

Accuracy:

+/- 0.1 microsecond [μ S]

Fiber Optic:

Simplex Plastic Optical Fiber Cable

Core \varnothing : 1mm, Outer \varnothing : 2.2mm



- 📄 **Simplex POF 1-2.2mm Characteristics:** Download Available at the Top of Plastic Optic Fiber & Connectors Page on our Website ([PDF](#))
- 📄 **SK-40 POF Core Characteristics:** Download Available at the Top of Plastic Optic Fiber & Connectors Page on our Website ([PDF](#))

Software WinEXPLOMET

Runs on Windows PCs equipped with one serial Port (comes on a USB Key)

LIST OF PROVIDED EQUIPMENT

- **1 High-Strength Shock-Proof Case**
 - Made of polypropylene copolymer
 - Waterproof, resistant to chemicals, moisture and dust
 - Resistant to harsh temperatures (-33°C / +90°C)
 - Contains all the items listed below except the plastic optic fiber spool



- **6 Fiber Optic Probes**
 - Six plastic optic fiber probes with a length of 15 [m] each for your V.O.D measurements
 - Read carefully the instructions on page 5 & 6 for the preparation and installation of your optical probes. The quality and accuracy of your measurement depends in part on how your optical fibers are prepared and installed on the explosive or propellant

- **1 Spool (MOQ 100 [m]) of Plastic Optic Fiber Cable**

- The optical fiber of the spool is the same as proposed on page 2:
Plastic Optic Fiber Simplex 1-2.2 [mm]
- The minimum quantity is 100 [m] but we recommend 300 [m] for safety reasons and a more convenient use



- **1 Terralux™ PRO-1 Orange Flashlight:**

- With your flash light, you can:
 - Simulate an explosion by illuminating the optical probe one after the other.
 - Test the light transmission quality of your optical probes (maximum length of 220 [m]).
Tested in our offices
- Max light output 154 Lumen
- Max Runtime 1h30min
- Convergent light beam
- Impact resistant
- Water resistant
- Its bright orange color makes it easy to spot



- **1 Folding Meter Swiss Made C€**

- 1 [m] Folding meter to measure the distance between your plastic optical fibers:
See Mode **Velocity and Time**



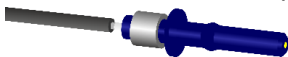
- **20 Optical Connectors: 10x HFBR-4501Z with Crimp Ring (Grey) and 10x HFBR-4511Z with Crimp Ring (Blue)**

- Optical connectors are essential for connecting the plastic optical fibers to the optical sensors of the Explomet-fo-2000

- HFBR-4501Z with Crimp Ring (Grey) on Page 3 of the AVAGO Catalog



- HFBR-4511Z with Crimp Ring (Blue) on Page 3 of the AVAGO Catalog



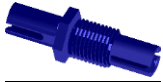
○ **2 Optical Adapters: 1x HFBR-4505Z (Grey) & 1x HFBR-4515Z (Blue)**

- The optical adapters allow perfect connection between two optical connectors to transmit the light generated by the explosion to the Explomet-fo-2000 without loss of light signal

☰ HFBR-4505Z (Grey) on page 3, 8 & 9 of the AVAGO Catalog



☰ HFBR-4515Z (Blue) on page 3, 8 & 9 of the AVAGO Catalog



○ **1 AFBR-4594Z Polishing Kit**

- The polishing kit Includes:
 - 1x Polishing fixture for two optical probes
 - 5x Sheets of 600 grit abrasive paper
 - 5x 3 [µm] Mipox Made in Japan ink lapping film

☰ Please refer to pages 5 and 6 of the AVAGO catalog for the use of the polishing kit



○ **1 Crimping Tool**

- Use the 4.62 aperture indicated on your clamp to fix the optical connectors to the optical fibers through their crimp ring as indicated on the AVAGO catalog on page 5 step 2



○ **1 Battery Charger Ansmann AC48**

- The charger is supplied with the connection designed for the Explomet-fo-2000 and the AC/DC adapter for your electric socket system



- **1 Kingston 8 GB USB Key**

- On the USB stick is included the WinExplomet program as well as all the full documentation for the Explomet-fo-2000
- The USB key is robust and convenient for backup as well as for transporting your data



- **1 USB to RS-232 DB9 Serial Adapter Cable**

- For transferring your data from the Explomet-fo-2000 to your PC



OPERATING INSTRUCTIONS

BATTERY CHARGING

Before the first use of the Explomet-fo-2000, charge the batteries with the Ansmann AC48 battery charger/adaptor. With this adaptor, the Explomet-fo-2000 can be operated normally while charging.

Charging time is about 4 hours. The charging does not stop automatically. Disconnect the charger when finished to prevent batteries overheating.

PROBES PREPARATION

Follow the instruction on the following annex to prepare the cable terminations and connectors

- ☰ **Avago HFBR Characteristics & Guide**: Download Available at the Bottom of Plastic Optic Fiber & Connectors Page on our Website ([PDF](#))

To check the proper transmission of light through the optical cable from the test area to the Explomet-fo-2000 you can simulate a measure with the supplied Terralux flashlight.

Optional: We recommend protecting the last meter of the optical probes plugged into the explosive with a 3 [mm] diameter P.V.C. pipe. This insure a better immunity against parasitic light at explosion's time, and will also reduce the amount of optical test fiber destroyed at each measure.

We also recommend the use of our:

- ☰ **Reinforced Duplex POF 1-2.2mm Characteristics:** Download Available at the Top of Plastic Optic Fiber & Connectors Page on our Website [\(PDF\)](#)
- ☰ **Reinforced 6 Channels POF 1-2.2mm Characteristics:** Download Available at the Top of Plastic Optic Fiber & Connectors Page on our Website [\(PDF\)](#)

For the preparation of the optical probes:

- Cut the needed length of fiber optic
- Number the probes at each end
- Fix an optical connector at one end, see description on
- ☰ **Avago HFBR Characteristics & Guide:** Download Available at the Bottom of Plastic Optic Fiber & Connectors Page on our Website [\(PDF\)](#)
- With a thin and sharp blade (cutter, scalpel, swiss knife), cut straight the other end of the optical probe
- Place the optical probes **perpendicularly** into or against the explosive/propellant

If necessary, fasten the plastic optic fiber to the explosive with a tape or soft PVC glue

For Dynamites, Watergels Explosives or Cartridged Explosives, respect a minimum distance of three time the diameter of the cartridge between the detonator and probe number 1 **P1**. The closest probe to the detonator is the probe number 1 **P1** (Mode: [Velocity and Time](#)).

- ☰ **Sketch Explomet-fo-2000:** Download Available at the Top of Explomet-fo-2000 Page on our Website [\(PDF\)](#)

We recommend protecting the unused optical receiver on the Explomet-fo-2000 with the supplied grey plastic caps.

TURN ON THE EXPLOMET-FO-2000™

The Explomet-fo-2000 is menu driven. Press the number on the keypad to access the required menu.

VELOCITY AND TIME MODE

```
* MAIN MENU *
1 VELOCITY & TIME
2 TIME ONLY
3 DATA MANAGEMENT
```

1 VELOCITY & TIME

```
MEASURE NO 1
ENTER NUMBER OF
PROBES (2,...,6):
```

Measure No 1: This is the sequential number given to this measure.

Enter number of probes (2,...,6): Enter the number of probes that you will use for your V.O.D measurement.

The instrument accepts from 2 to 6 probes

Use the **Del** key to delete incorrect data

Press **Enter** key to continue

```
LENGTH (1-2):
```

If you want the instrument to display the V.O.D, enter in [mm] (maximum 9999 [mm]) the **very precisely** measured distance between probe 1 and probe 2 on the explosive. We recommend using the meter supplied with your hardware or a digital caliper for high accuracy measurement.

Use the **Del** key to delete incorrect data.

If you don't need the V.O.D, do not enter the length.

Press **Enter** to continue.

Repeat the above steps until the display shows:

```
* LENGTH MENU *
1 VERIFY LENGTH
2 START MEASURE
```


1. Verify Length

This will bring you back to the previous screen where you can verify or correct the length between the probes.

Use the **Del** key to delete incorrect data.

After each verification press the **Enter** key.

Once you have checked all inputs the instrument displays again:

```
* LENGTH MENU *
1  VERIFY LENGTH
2  START MEASURE
```

2. Start Measure

Press **2** when ready to start the measure:

```
* MEASURE NO 1 *
WAITING FOR MEASURE
WHEN FINISHED
PRESS DEL KEY
```

At this stage, the instrument waits for the explosion.

Fire the explosive!

- If all probes have been illuminated, the Explomet-fo-2000 automatically displays the results
- If some probes were not illuminated you must force the end of the measure by pressing the **Del** key

```
MEASURE NO 1 P1-P2
LENGTH: 9999 MM
TIME : 2231.0 US
VOD : 4481 M/S
```

Measure No 1 P1-P2: Results for the measure between Probe 1 (**P1**) and Probe 2 (**P2**).

Length: length, if any, in [mm].

Time: Measured time in microseconds [μ S].

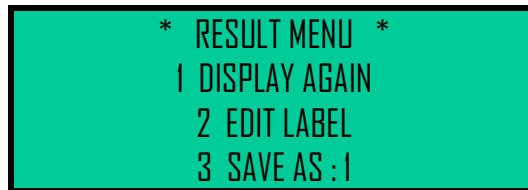
VOD: Velocity Of Detonation in meter per second (if applicable).

Important:

Error Messages in Velocity and Time:

- OVERFLOW: the measured time is greater than 10 seconds
- ERROR: two consecutive probes have been illuminated in reverse order
- NO RESULT: the probe(s) was(were) not illuminated

Use the navigation key **2** ↑ **6** → **8** ↓ **4** ← to browse through the results.
Pressing the **Enter** key shows you the next result, until:



1 Display again: This will bring you back to the results screen.

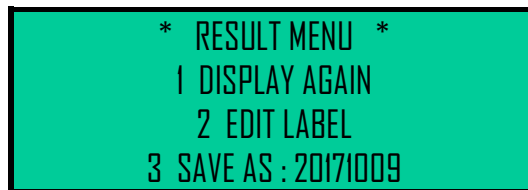
2 Edit Label: If you intend to save the results in the memory you can define a label in the form of a number (up to 8 digits). If you don't define a specific label the measure number will be used as the label.

Note: leading zero is not accepted. If you want to use the date as a label, enter the year first, for example, 20171009 for October 9th, 2017.



Press **Del** to correct input.

Press **Enter** to continue.



3 Save As: This saves the results in memory.



You come back to the Main Menu.

TIME ONLY MODE

```
* MAIN MENU *
1 VELOCITY & TIME
2 TIME ONLY
3 DATA MANAGEMENT
```

2 TIME ONLY

```
MEASURE NO 1
ENTER NUMBER OF
PROBES (2..6):
```

Enter the number of probes you will use in the test and press **Enter** key.

The instrument accepts **2** to **6** probes.

Use the **Del** key to delete incorrect data.

Press **Enter** Key to continue.

```
* MEASURE NO 1 *
WAITING FOR MEASURE
WHEN FINISHED
PRESS DEL KEY
```

At this stage, the instrument waits for the explosion.

Fire the explosive!

- If all probes have been illuminated the Explomet-fo-2000 automatically displays the results.
- If some probes were not illuminated you must force the end of the measure by pressing the **Del** key

The instrument displays the time interval between the first illuminated probe and the second illuminated probe and so on until the last one:

Example:

```
MEASURE NO 1
P1-P2 : 9052.5 US
P2-P4 : 3050648.3 US
P4-P3 : 64012.3 US
```

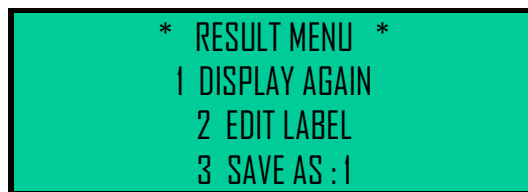
- **P1-P2:** Time in microseconds for the measure between Probe P1 & Probe P2.
- **P2-P4:** Time in microseconds for the measure between Probe P2 & Probe P4.
- **P4-P3:** Time in microseconds for the measure between Probe P4 & Probe P3.

In this example, the probes were illuminated in the following order: **P1-P2-P4-P3**.

Error Messages in Time Only:

- **OVERFLOW:** the measured time is greater than 10 seconds
- **NO RESULT:** the probe(s) was(were) not illuminated

Use the navigation key **2** **↑** **6** **→** **8** **↓** **4** **←** to browse through the results. Pressing the **Enter** key shows you the next result, until:



1 Display again: This will bring you back to the results screen.

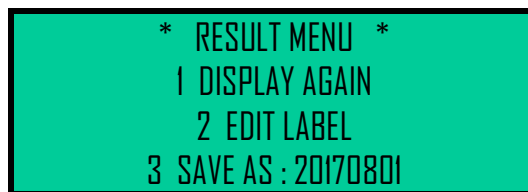
2 Edit Label: If you intend to save the results in the memory you can define a label in the form of a number (up to 8 digits). If you don't define a specific label the measure number will be used as the Label.

Note: leading zero is not accepted. If you want to use the date as a label, enter the year first, for example, 20170801 for August 1st, 2017.



Press **Del** to correct input.

Press **Enter** to continue.



3 Save As: This saves the results in memory.



You come back to the Main Menu.

DATA MANAGEMENT

```
* MAIN MENU *  
1 VELOCITY & TIME  
2 TIME ONLY  
3 DATA MANAGEMENT
```

3 DATA MANAGEMENT

```
* DATA MANAGEMENT *  
1 BROWSE DATA  
2 TRANSFER TO PC  
3 ERASE DATA
```

1 Browse Data: List of the measures with their Label saved in memory.

```
BROWSE DATA  
→ NO : 1 20171009  
NO : 2 20170801  
NO : 3
```

The left arrow shows the selected measure.

Use the navigation key **1** Home **7** End **2** ↑ **8** ↓ **3** Pg Up **9** Pg Dn to browse through the results.
Press the **Enter** key to display the result.

Press the **Del** key to exit.

2 Transfer to PC: This allows you to transfer the data saved in the memory to your PC.

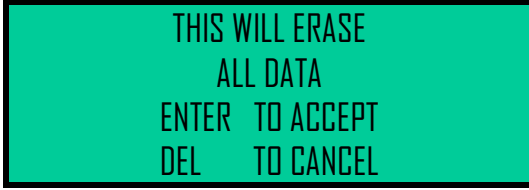
Connect the Explomet-fo-2000 to the serial Port of the PC with the USB cable. Run the WinExplomet program on the PC as described on page 13.

```
READY FOR TRANSFER  
POWER OFF WHEN  
FINISHED
```

Once the transfer is finished turn the power off.


Note: the transfer doesn't erase the data in memory.

3 Erase Data:



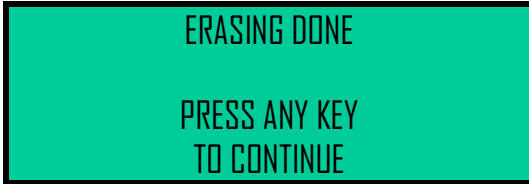
THIS WILL ERASE
ALL DATA
ENTER TO ACCEPT
DEL TO CANCEL

If you want to erase all the data press **Enter**.



NOW ERASING DATA...

Wait until you see this display.



ERASING DONE
PRESS ANY KEY
TO CONTINUE

All data are now deleted.

WinEXPLOMET


The WinExplomet program is on the supplied USB key or sent by us via internet.

To install WinExplomet on your PC

- 1) Insert the USB key in the PC
- 2) Run the SETUP program (Application)
- 3) Follow the installation steps
- 4) When the installation is finished run the WinExplomet program
- 5) Choose the proper Port Setting
- 6) Make sure that the Explomet is "Ready to Transfer" (see [Data Management](#) on page 12 &13)
- 7) Transfer Data
- 8) Optionally, save your data on the hard disk or your USB key

LOW BATTERIES

When the EXPLOMET-FO-2000™ displays:



!! Warning !!
Low Batteries

The batteries must be charged as soon as possible.

MAINTENANCE

REPLACING BATTERIES

To remove the batteries, unscrew the 4 screws on the bottom shell and open carefully the case. Remove the batteries from the battery holder and replace them with batteries of the same type.

BATTERY CHARGER

Be sure to use only the Ansmann AC48 charger supplied with the explomet-fo-2000 to ensure the proper operation of your device

CALIBRATION

The Explomet-fo-2000 is calibrated only once during its manufacture and this for the duration of its use which is on average of fifteen years. Nevertheless, we remain at your disposal for any verification of your device and can issue a certificate of V.O.D/Calibration to guarantee the perfect functioning of your measuring instrument.

GENERAL

As the Explomet-fo-2000 uses microelectronic technology, do not expose it to humidity, dust and preserve it from shocks. Be sure to close the optical receptors with the supplied grey plastic caps.

Swiss Made

HEAD & TECHNICAL OFFICES

15A ROUTE DE LOËX, 1213 ONEX, GENEVA, SWITZERLAND

TEL : +41227921028, EMAIL : INFO@KONTINITRO.COM, WEB : WWW.KONTINITRO.COM

EXPLOMET-FO-2000™, EXPLOMET-MULTICHANNEL™, EXPLOMET-MULTIMODE™ & DETOMET™ are Registered Trade Marks of KONTINITRO SA