PRODUCT MANUAL

Diver-Mate – DM421

Contact details:

Van Essen Instruments B.V.
Delftechpark 20
2628 XH Delft
The Netherlands
Phone: +31 15 275 5000

Van Essen Instruments - Canada
219 Labrador Drive Suite 201
Waterloo, ON,
Canada N2K 4M8
Phone: +1 226-791-6499

Internet: www.vanessen.com
Support: diver@vanessen.com

The presence of the Waste Electrical and Electronic Equipment (WEEE) marking on the product indicates that the device is not to be disposed via the municipal waste collection system of any member state of the European Union. For products under the requirement of WEEE directive (2012/19/EU), please contact your distributor or local Van Essen Instruments B.V. office for the proper decontamination information and take back program, which will facilitate the proper collection, treatment, recovery, recycling, and safe disposal of the device.

CE COMPLIANCE STATEMENT (EUROPE)

We hereby declare that the device described below is in conformity with the directives listed. In the event of unauthorized modification of any devices listed below, this declaration becomes invalid.

Type: Data storage device with Bluetooth communication
Product Model: Diver-Mate (DM421)

Relevant EC Directives and Harmonized Standards:

1999/5/EC R&TTE Directive for Radio and Telecommunications Terminal Equipment in accordance to annex III to which this directive conform to the following standards:

Low Voltage Directive per EN60950-1 (2006)+A11 (2011) for Product Safety testing standard for "Information Technology Equipment"

EMC Directive EN 301 489-1 V1.8.1 / EN 301 489-17 V1.3.2 Electromagnetic emission and immunity for "Information Technology Equipment"

2014/30/EU Electromagnetic Compatibility directive, as amended by EN61326-1:2013

The product(s) to which this declaration relates is in conformity with the essential protection requirements of 2014/30/EU Electromagnetic Compatibility directive. The products are in conformity with the following standards and/or other normative documents:

EMC: Harmonized Standards: EN 61326-1:2013 Lab Equipment, EMC

IEC61000-6-3:2007 Emission standard for residential, commercial and light-industrial environments
IEC61000-4-2:2009 Electrostatic discharge immunity test
IEC61000-4-3:2006 Radiated, radio-frequency, electromagnetic field immunity test
IEC61000-4-4:2012 Electrical fast transient/burst immunity test
IEC61000-4-5:2006 Surge immunity test
IEC61000-4-6: 2014 Immunity to conducted disturbances, induced by radio-frequency fields
IEC61000-4-11:2004 Voltage dips, short interruptions and voltage variations immunity tests

I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications. The items comply with all applicable Essential Requirements of the Directives.

Contents

1 Introduction

The Diver-Mate is designed for simple and fast download of the data from Diver groundwater data loggers. The Diver-Mate increases download efficiency while reducing data transfer errors.

The Diver-Mate stores the data on its internal memory, and it can store data from thousands of Divers. A full battery supports up to 5 days of operational use and a LED indicator shows the battery capacity.

The Diver-Mate becomes a powerful data transfer tool in combination with the Diver-App for Android. The Diver-App allows you to transfer data from the Diver to the Diver-HUB. Alternatively, the data on the Diver-Mate can easily be transferred to Diver-Office using the supplied USB cable.

1.1 Features

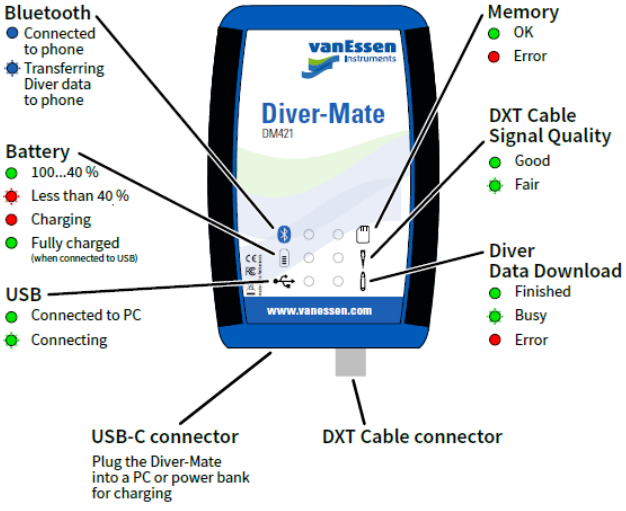
The Diver-Mate features:

- Real-time atmospheric pressure measurement.
- Informational indicators: ready, sending data, receiving data.
- Warning indicators: Diver not connected/communicating, cable malfunctioning.
- 16 GB data storage.
- Powerful USB rechargeable battery supports up to 5 days in the field.
- Battery capacity indicator.
- Bluetooth® Low Energy for communication with the Diver-App for Android™. This free download is available from the Google Play Store https://play.google.com/store/apps/details?id=com.vei.divermate

This manual outlines all the features and operating principles of the Diver-Mate. The next chapter gives an overview of the supported equipment, installation procedures and configuration.

1.2 The Diver-Mate

The Diver-Mate is depicted in the figure below. The front face of the Diver-Mate contains 6 status indicators for Bluetooth, battery, USB, memory, DXT cable and Diver. The USB-C connector and DXT Cable connector are located at the bottom of the Diver-Mate.



The Diver-Mate has 6 indicators, see figure below. The meaning each indicator is:

Bluetooth – shows if there is a Bluetooth connection with a phone/tablet. Flashes when data is being transferred from the Diver-Mate to the connected device.

Battery – shows the battery charge and if the battery is being charged.

USB – shows if there is a data connection with the connected computer.

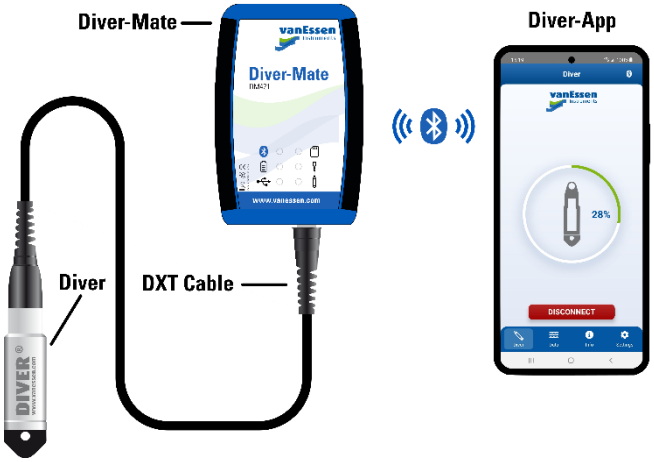
Memory – shows if data storage status.

DXT Cable – shows the connection status of the cable and the Diver.

Diver – shows if a Diver is connected. Flashes when data is being transferred.

1.3 System Overview

The Diver-Mate can be used as a stand-alone device or with the Diver-App for Android™ software to collect Diver data in the field as depicted in the figure below. The Diver is connected to through a DXT Cable to the Diver-Mate.



The Diver-Mate contains a rechargeable lithium battery. A fully charged battery supports up to 5 days in the field. The data collected from Divers is stored on the Diver-Mate's internal 16 GB memory. This memory is sufficient to store the data of more than 59,000 full TD-Divers or approximately 2.000 field days while reading 30 full TD-Divers per day.

Connect the DXT Cable (with a Diver connected) to the Diver-Mate to download the Diver data as shown in the image below. The Diver indicator on the Diver-Mate starts flashing during the download and will be continuous on when the download completes.

The Diver-Mate includes a pressure sensor for measuring the atmospheric pressure. Its value can be read using the Diver-App for Android. Connect the Diver-Mate to the smart phone through Bluetooth.

1.4 Specifications

The technical specifications of the Diver-Mate are given in appendix A.

1.5 Supported Equipment

The following Divers can be used in combination with the Diver-Mate:

- TD and Baro-Diver (DI8xx),
- Mini and Baro-Diver (DI5xx),
- Micro-Diver (DI6xx),
- Cera-Diver (DI7xx),
- CTD-Diver (DI27x), and
- MTD-Diver (DI24x).

The following cables can be used in combination with the Diver-Mate:

- DXT Cable (AS2xxx)
- DDC Cable (AS6xxx); DDC-DXT Adapter (AS348) required

See appendix B for more details on these products.

2 Features and Operation

2.1 Software

The Diver-Mate can be used with the Diver-App for Android™ (available in the Google Play Store) and the Diver-Office software. In addition, the Diver-Mate's memory can be accessed using Windows File Explorer.

2.2 Battery

The Diver-Mate contains a rechargeable polymer lithium battery. This battery can be charged by connecting the Diver-Mate to a computer, USB charger, or power bank with the supplied USB-C cable.

It will take approximately 4 hours to fully charge an empty battery. A fully charged battery will last about 5 days (dependent on usage). Avoid fully discharging the battery and charge the battery after each use.

The battery indicator on the Diver-Mate shows the battery charge status:

- Continuous green – battery capacity is 40 to 100%.
- Flashing red – battery capacity is less than 40% (it is recommended to charge the battery).
- Continuous red – battery is being charged.

2.3 Bluetooth Low Energy

The Diver-Mate is equipped with Bluetooth Low Energy. The Bluetooth functionality can only be used with the Diver-App, see Appendix B Diver-App for Android™ software.

Only one phone can be connected to the Diver-Mate at the same time. Pairing is not recommended.

When the Diver-Mate is connected through Bluetooth to a phone or tablet, the blue Bluetooth indicator will be continuously on. A flashing Bluetooth indicator means that data is being transferred over from the Diver-Mate to the phone or tablet.

2.4 Checking the Diver-Mate

The Diver-Mate is equipped with a motion sensor, which makes a soft rattling sound when handling the Diver-Mate. Gently shake the Diver-Mate before each field trip to check the battery and memory status. The battery and memory indicator will show their status. If the battery is green, it is sufficiently charged for at least one day of use.

- Continuous green – battery capacity is 40 to 100%.
- Flashing red – battery capacity is less than 40% (it is recommended to charge the battery).

- Continuous green – Memory OK.
- Continuous red – Memory error.

2.5 Connecting the Diver-Mate to a Diver

When a Diver is connected through a DXT Cable to the Diver-Mate the data from the Diver will be automatically be downloaded to the Diver-Mate's internal memory.

The meaning of the DXT Cable and Diver indicators is described below when the Diver-Mate is connected to a DXT Cable and a Diver.

- Continuous green – Good signal quality.
- Flashing green – Fair signal quality.
- Flashing red – There is an issue with the communication cable, for example the communication cable is broken.

- Flashing green – Diver data is being downloaded.
- Continuous green – Diver data downloaded and connected with Diver.
- Continuous red – The Diver could not be detected.

2.6 Reading Atmospheric Pressure

The Diver-Mate includes a pressure sensor for measuring the atmospheric pressure. Its value can be read using the Diver-App software for Android.

2.7 Data Storage and Managing Data

Connect the Diver-Mate through the supplied USB cable to a USB port on your computer to manage the data on the Diver-Mate. When connected the status of the USB indicator is:

- Continuous green – Connected.
- Flashing green – Transferring data.

Note: The Diver-Mate's memory cannot be managed/ accessed through Bluetooth other than reading Diver time series data in the Diver-App.

2.7.1 File and Folder Structure

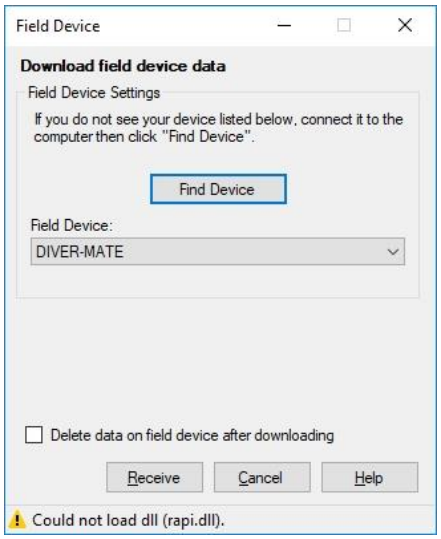
You may use (Windows) File Explorer to view the Diver data on the Diver-Mate. After the Diver-Mate is connected through the USB port, the Diver-Mate appears as a drive named DIVER-MATE.

The drive contains the following files and folders:

- Text file named *info.txt*. This file contains information on the data folders.
  DO NOT MODIFY OR DELETE THE INFO.TXT FILE.
- Data folders with the timestamped format *YYYYMMDD*. This timestamp is based on the time of the connected Diver when downloading data.
  Each folder contains Diver data downloaded on date specified plus an *info.txt* file. To free up memory space, you can delete complete folders and/or individual DAT files. DO NOT MODIFY OR DELETE THE INFO.TXT FILE in the data folders.
- A *firmware* folder, see section Firmware Update on page 6.
- An *info* folder with a *Diver-Mate.txt* text file.

2.7.2 Diver-Office

Diver-Office allows you to import the data that is stored on the Diver-Mate. To import data in Diver-Office from the Diver-Mate, follow the steps below:



1. From the menu bar in Diver-Office go to Import > Diver-Mate/Diver-**Pocket...**
2. Ensure the Diver-Mate is connected to your computer through the USB port.
3. If the Diver-Mate does not show automatically in the Field Device dropdown list, click the Find Device button.
4. Select the Diver-Mate from the Field Device dropdown list.
5. (Optional) Select the empty checkbox beside Delete data on field device after downloading, to delete the data on the Diver-Mate once the data has been imported into Diver-Office. Leave the check box empty to retain the data on the Diver-Mate.
6. Click the Receive button to import the data into your Diver-Office project.
7. Once the import process has finished, a log window will display listing the time series that were imported, and those that were not.

2.8 Firmware Update

The most recent firmware for the Diver-Mate can be found in the Downloads section of the Diver-Mate product page: www.vanessen.com/products/accessories/diver-mate/

Complete the following steps to install a new firmware version:

1. Make sure the Diver-Mate is not connected through Bluetooth (Bluetooth LED is off).
2. Next, connect the Diver-Mate via the USB cable to your computer.
3. Open File Explorer and open the DIVER-MATE drive.
4. Copy the firmware file *DMVxxx.bin* to the firmware folder on the Diver-Mate. Create a folder named “firmware” in the root if it does not exist.
   Note: xxx is the version number, for example *DMV311.bin*
5. Disconnect the USB cable. After a few seconds the 3 LEDs on the right will blink several times indicating that the firmware is updated.

Note: After the firmware is updated the extension of the firmware file is changed from “bin” to “fin”.

3 Appendix A – Specifications

3.1.1 Casing

Dimensions	79 mm × 132 mm × 24 mm (W×L×H)
Weight	~152 grams
Casing	ABS
Protection classification	IP41

3.1.2 Connections

Diver Cable	AS2xxx
Compatible Diver models	TD-Diver (DI8xx), Mini-Diver (DI5xx), Micro-Diver (DI6xx), Cera-Diver (DI7xx), CTD-Diver (DI27x), MTD-Diver (DI24x)
Computer	USB-C
Smart phone	Bluetooth Low Energy (version 4.2)

3.1.3 Indicators

Bluetooth	connected, data transfer
Battery	capacity, charging
USB	connected
Memory	OK, error
DXT Cable	connected
Data downloading	finished, busy, error

3.1.4 Other

Memory	16 GB
Battery	Rechargeable Lithium Polymer 3.7V, 2.4Ah/8.88Wh (IEC 62133-2:2017 compliant)
Battery life	10 days (single charge, dependent on usage)
Operating Temperature	-20 to 60 °C
Storage Temperature	0 to 30 °C

3.1.5 Barometric Pressure Sensor

Range	400 to 1100 cmH_2O
Accuracy[+]	±2.0 cmH_2O
Resolution	0.06 cmH_2O

[+] maximum over temperature range -20 to 60 °C

4 Appendix B – Diver Accessories

4.1 Diver-Office software

Program Diver data loggers and download measurements onto your PC. Export the data to a spreadsheet or modeling program. Diver-Office is a flexible "project-based" measurement software package designed for exchanging Diver data. Diver-Office is easy-to-use and has an intuitive user interface.

- Barometric compensation
- Units: Metric and U.S.
- 8 languages: Chinese, Dutch, English, French, German, Polish, Portuguese and Spanish

Free download from www.vanessen.com

4.2 Diver-App for Android™ software

Program Diver data loggers and download measurements onto your smart phone using the Diver-Mate. Send the downloaded data to Diver-HUB. Diver-App is easy-to-use and has an intuitive user interface.

- Units: Metric and U.S.
- 2 languages: Dutch and English

4.3 Diver-HUB software

Diver-HUB is an easy-to-use, cloud-based web portal delivering centralized and secure access to your groundwater monitoring data from anywhere in the world - allowing you to manage groundwater monitoring data in real-time. Diver-HUB analyzes Diver data logger time-series, and creates interactive maps and graphs based on your monitoring data.

4.4 Communication Cable

Deploying a Diver on a Diver communication cable saves time on downloading and provides real time data from a Diver. Connect your laptop equipped with Diver-Office to the Diver Data Cable using the USB Interface Cable to program and read data from the Diver.

Available in lengths from 1 meter to 500 meter.

Part no: AS2xxx

xxx = length in meter, e.g 10 meter cable is AS2010

4.5 TD-Diver

This Diver is manufactured using a stainless steel (316 L) casing with a 22 mm diameter. The TD-Diver can store a maximum of 72,000 measurements (date/time, pressure and temperature) in its working memory and 72,000 measurements in its backup memory.

The TD-Diver samples pressure and temperature at fixed length intervals and stores these values in fixed length or continuous memory.

The TD-Diver is available in the following pressure ranges: 10 m, 20 m, 50 m and 100 m.

Part no: DI8xx

4.6 Baro-Diver

The Baro-Diver is manufactured using a stainless steel (316 L) casing with a 22 mm diameter. The Baro-Diver can store a maximum of 72,000 measurements (date/time, pressure and temperature) in its working memory and 72,000 measurements in its backup memory.

The Baro-Diver measures atmospheric pressure and is used to compensate for the variations in atmospheric pressure measured by the other Divers. The Baro-Diver can also be used for measuring shallow water levels up to 1 meter.

The Baro-Diver samples pressure and temperature at fixed length intervals and stores these values in fixed length or continuous memory.

Part no: DI800

4.7 Cera-Diver

The ceramic-shelled Cera-Diver is specifically designed for monitoring water levels under potentially corrosive conditions, such as brackish water and seawater.

The Cera-Diver has a 22 mm diameter ceramic (zirconium-oxide) casing and can store 48,000 measurements (date/time, pressure and temperature).

The Cera-Diver hade the following sample methods: fixed length intervals, event dependent, averaging and pumping test.

The Cera-Diver is available in the following pressure ranges: 10 m, 20 m, 50 m and 100 m.

Part no: DI7xx

4.8 Micro-Diver

The Micro-Diver is the smallest Diver measuring only 18 mm in diameter. It is specifically designed for monitoring wells or drive-points too small to accommodate larger data loggers. This Diver is suitable for pipes with a diameter of at least 20 mm.

The Micro-Diver has a stainless steel (316 L) casing and can store 48,000 measurements (date/time, pressure and temperature).

The Micro-Diver hade the following sample methods: fixed length intervals, event dependent, averaging and pumping test.

The Micro-Diver is available in the following pressure ranges: 10 m, 20 m, 50 m and 100 m.

Part no: DI6xx

4.9 CTD-Diver

Where there is a need to monitor groundwater levels and salt water intrusion , injected wastewater, or contamination from chemical discharges and landfill sites, the CTD-Diver with its 22 mm diameter rugged, corrosion proof ceramic (zirconium-oxide) housing, is the instrument of choice.

The CTD-Diver is equipped with a four-electrode conductivity sensor that measures electrical conductivity from 0 to 120 mS/cm. There are two options for measuring conductivity: true or specific conductivity at 25 °C.

The CTD-Diver can store 48,000 measurements (date/time, pressure, temperature and conductivity).

The CTD-Diver hade the following sample methods: fixed length intervals, event dependent, averaging and pumping test.

The CTD-Diver is available in the following pressure ranges: 10 m, 50 m and 100 m.

Part no: DI27x

4.10 DDC-DXT Adapter

The DDC-DXT Adaptor is the connection between the Diver-Mate or Smart Interface Cable and a DDC cable. The Smart Interface Cable screws onto the DDC-DXT Adaptor. Once connected, the Diver deployed on the cable can be read by clicking the DDC -Adaptor onto the top connector of the DDC Cable.

Part no: AS348