INSTRUCTION MANUAL

Vibrating Wire Readout
VWR1

GEOSENSE

UK CA CE

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1. VERSION CONTROL

Version	Date	Author	Approved	Issued
V1.0	Oct 2024	TB	TC	GC

2. INTRODUCTION

This manual is intended for all users of **Geosense®** Vibrating Wire Readout VWR1 units and provides a guide for its operation care and maintenance.

It is VITAL that all personnel responsible for the use of the VWR1 Readout READ and UNDERSTAND this manual, prior to working with the equipment

2.1. General Description

The **Geosense®** VWR1 Vibrating Wire Readout is a vibrating wire manual readout unit which can be used with all types of vibrating wire outputs (e.g. piezometers, strain gauges).

Particular features of the **Geosense® VWR1** are:

- Reliable long-term performance
- Clear visual display of readings
- Rugged, suitable for demanding environments
- High accuracy

The **VWR1** can be used to read a large variety of Vibrating Wire sensors, including but not limited to:

- VW Piezometers (VWP)
- VW Loadcells
- VW Strain Gauges
- VW Displacement Gauges

The unit consists of a control box with keypad and LCD screen, along with a fly lead for easy connection to VW sensors. The fly lead allows for a simple but secure connection to be made temporarily with sensors in the field when time is of the essence and weather conditions are unfavourable.

The screen is backlit to provide adequate visibility in all light conditions, and with a waterproof keypad with large buttons, is ideal for use with gloved hands.

2.2. Theory of Operation

The **VWR1** works on the “pluck and read” principle in which a swept wave frequency spectrum is transmitted to the electronic plucking coil in the VW sensor.

This starts the wire vibrating at its resonant frequency. The plucking coil, in conjunction with a permanent magnet, becomes a sensing coil and transmits a sinusoidal output voltage, having the same frequency as the vibrating wire, back to the readout.

The measured frequency is squared to linearise the output and displayed on the LCD screen.

Temperature is measured by the resistance of the thermistor in Ohms. This value is displayed directly and also transformed into degrees Celsius.

3. CONFORMITY

EU Declaration of Conformity

We

Geosense Ltd
Nova House, Rougham Industrial Estate, Bury St Edmunds, IP30 9ND, United Kingdom

declare under our sole responsibility that the product:

Equipment description: **Vibrating Wire Readout**
Model Number(s): **VWR1**

Electromagnetic Compatibility Directive **2014/30/EU** and Restriction on the use of certain Hazardous Substances **2011/65/EU**

The following harmonised standards have been applied with respect to this product:

EN 61326-1:2021
EN IEC 63000:2018

Authorised Person

Tim Clegg
Director

Date: 24/011/2023
Location: Bury St Edmunds, UK.

DoC-0073-CE

UKCA Declaration of Conformity

Geosense Ltd
Nova House, Rougham Industrial Estate, Bury St Edmunds, IP30 9ND, United Kingdom

This declaration is issued under the sole responsibility of the manufacturer:

Equipment description: **Vibrating Wire Readout**
Model Number(s): **VWR1**

The object of the declaration described above is in conformity with the following statutory requirements:

The Electromagnetic Compatibility Regulations 2016	SI 2016 No. 1091
The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012	SI 2012 No. 3032

References to designated standards/specifications in relation to which conformity is declared:

EN 61010-1:2010 + A1:2019
EN IEC 63000:2018

Signed for and on behalf of Geosense Ltd

Tim Clegg
Director

Date: 24/11/2023
Location: Bury St Edmunds, UK.

DoC-0073-UKCA

4. VARIANTS

There is only one variant of the **VWR1.**

5. WIRING CONFIGURATIONS

The VWR1 consists of a top rugged connector which breaks out into 4 colour coded connectors for reading Vibrating Wire sensors and thermistors.

Colour coding for the cores of the fly lead are included in Table 1.

Table 1: Fly lead colour coding

Colour	Function	VWR1 Output
Red	VW +	Frequency (Hz) (Digits)
Black	VW -	
Green	Temp +	Resistance (Ohms) (Temperature)
White	Temp -	

Connections are made using the fly lead provided with the unit (Figure 1), which breaks out the rugged single connector into 4 colour coded insulated crocodile clips, for easy field use when reading multiple VW instruments in harsh conditions.

Figure 1: VWR1 with fly lead measuring a Geosense VWP-3000

6. MARKINGS

Geosense® VWR1 readout is labelled with the following information:

- Manufacturers name & website address
- Product type
- Model
- Serial number
- CE mark / UKCA mark
- WEEE Symbol

Figure 2: VWR1 front with serial number and CE/UKCA visible

7. DELIVERY

This section should be read by all users of equipment manufactured by **Geosense®.**

7.1. Packaging

Geosense® VWR1's are packed for transportation to site. Packaging is suitably robust to allow normal handling by transportation companies. Inappropriate handling techniques may cause damage to the packaging and the enclosed equipment. The packaging should be carefully inspected upon delivery and any damage **MUST** be reported to both the transportation company and **Geosense®**.

Once the shipment has been checked it is recommended that **Geosense®** VWR1's remain in their original packaging for storage or transportation.

Cable should be handled with care. Do not allow it to be damaged by sharp edges, rocks for example, and do not exert force on the cable as this my damage the interim conductors and render the installation useless.

7.2. Handling

Whilst they are a robust devices, **Geosense® VWR1** series systems are precision measuring instruments. They and their associated equipment should always be handled with care during transportation, storage and installation.

Once the shipment has been inspected (see 7.3), it is recommended that equipment remains in its original packaging for storage or onward transportation.

7.3. Inspection / Functionality Check Readings

It is important to check all the equipment in the shipment as soon as possible after taking delivery and well before installation is to be carried out. Check that all the components detailed on the documents are included in the shipment. Check that the equipment has not been physically damaged.

All **Geosense®** VWR1 instruments carry a unique identification serial number which is located on the cable connection block or on the side of the cell (dependent on model).

Geosense® VWR1 instruments are supplied with individual calibration sheets that include their serial numbers and these are shipped with the equipment. Calibration sheets should be kept safe and secure for future reference. See section 8.

7.4. Storage

All **Geosense®** VWR1 instruments and associated equipment should be stored in an environment that is protected from direct sunlight.

It is also recommended that cables be stored in a dry environment to prevent moisture migrating along inside them in the unlikely event of prolonged submersion of exposed conductors. The cables should also be protected from rodents and traffic.

No other special requirements are needed for medium or long-term storage although temperature limits should be considered when storing or transporting associated components, such as readout equipment.

8. CALIBRATION

All **Geosense®** VWR1 readouts are supplied with a calibration sheet like the example below.

GEOSENSE QUALITY FORM
FORM No G/QF/174
ISS. 1
DATE Nov-22
SIG. GC

VWR1 Readout Certificate of Calibration

Model	VWR1
Serial No.	00501
Check. Date	11/11/2022

Vibrating Wire — **Absolute maximum deviation detected: 0.00%**

Reference Frequency Hz	Readout Reading Hz	Error FSO %
600.0	600.03	0.00
1000.0	1000.00	0.00
1500.0	1500.00	0.00
2000.0	2000.03	0.00
2500.0	2500.00	0.00
3000.0	3000.00	0.00
3500.0	3500.00	0.00
4000.0	4000.00	0.00
4500.0	4500.00	0.00
5000.0	5000.00	0.00
5500.0	5499.97	0.00
6000.0	5999.97	0.00

Thermistor — **Absolute maximum deviation detected: -0.18%**

Reference Resistor Ω	Readout Reading Ω	Error FSO %
750.3	749.8	0.00
1579.4	1576.7	-0.01
3738.8	3733.2	-0.02
9757.8	9736.8	-0.07
29384.3	29330.8	-0.18

THE EQUIPMENT USED IN THE CALIBRATION OF THE PRODUCT DETAILED ABOVE IS TRACEABLE TO NATIONAL/INTERNATIONAL STANDARDS

THIS IS AN ELECTRONIC CERTIFICATE AND IS VALID WITHOUT A SIGNATURE

CALIBRATED TO UKAS TRACEABLE STANDARD
GEOSENSE CERTIFIED
ISO 9001:2015

9. OPERATION

9.1. Front Panel Overview

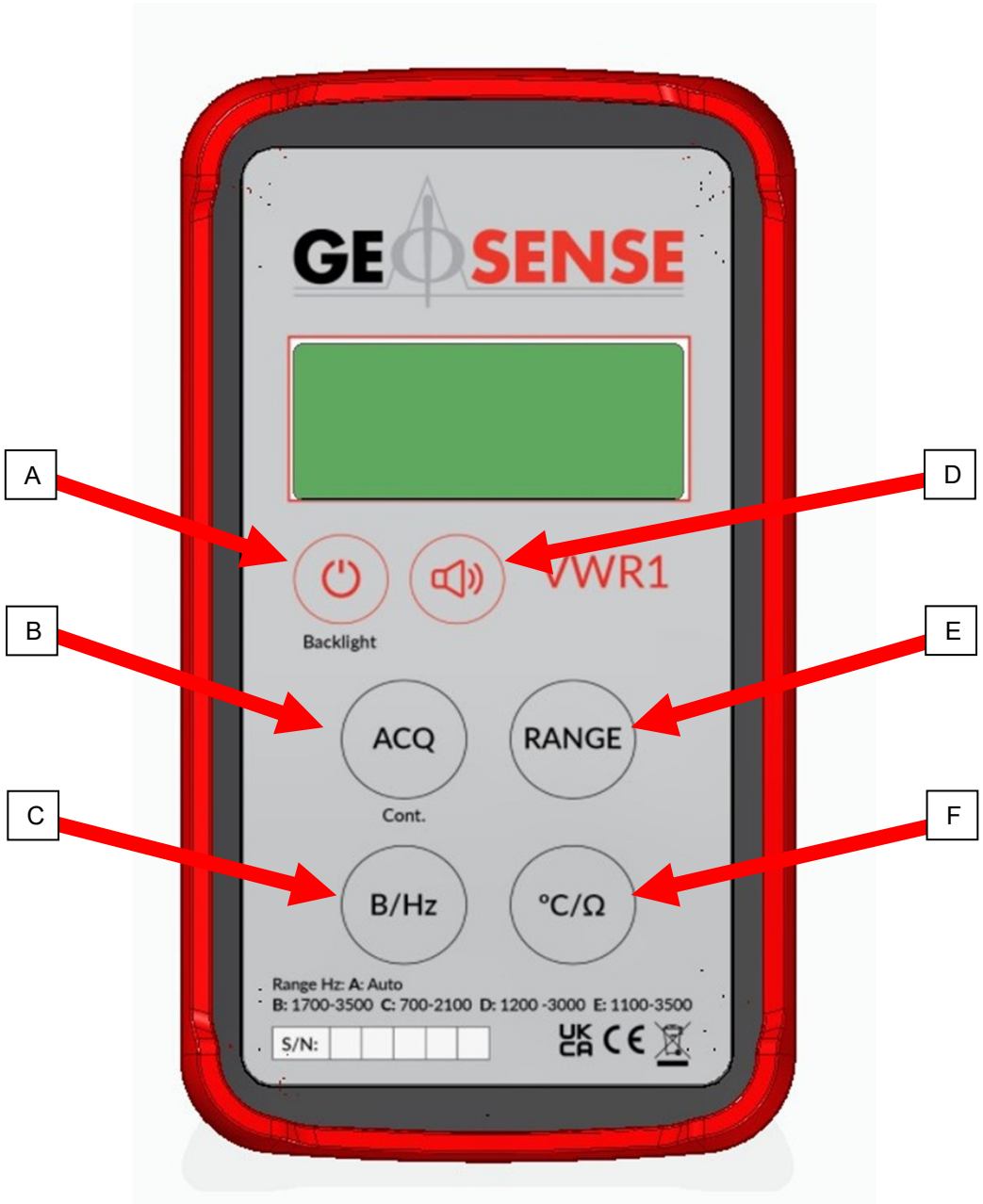

Figure 2: Front panel of VWR1 (powered off)

Table 2: Button functions of the VWR1

Button	Function	Description
A	Power and Backlight	Hold to power on and off, press once for backlight on
B	Acquire Reading	Hold for continuous readings, press once for single reading
C	Frequency Units	Press to switch between B (Digits) and Hz (Hertz)
D	Speaker	Press once to enable or disable the speaker to hear the ring of the VW sensor
E	Range	Press to change the range (as stated on the base of the unit)
F	Thermistor Units	Press to switch between temperature in Celsius or resistance in ohms

9.2. Taking a Reading Using the VWR1

Using the information provided in Table 2, the typical process of reading a VW sensor, in this case a Geosense VWP-3000, is as follows:

1) Connect the fly lead to the unit, making sure to align the two red dots on the connector and the port. (note, for removal, the sleeve on the connector must be pulled back to release the connector from the port)

Figure 3: Connector and port showing alignment dots in red

2) Connect the fly lead to the VWP using the colour coding in Table 1.

Figure 4: VWR1 connected to fly lead, with a VWR1 being read

3) Power on the unit by holding the power button. Set the range for the sensor using the “RANGE” button, or if unsure, set the range to “A” which is Auto mode.

4) Once on, press the “ACQ” button to take a single reading. Holding the button down will set the unit to take continuous readings.

5) If you need the backlight on, short press the power button

6) The readings from the sensor will be shown on the screen. The units can be changed by pressing the two bottom buttons (“B/Hz” and “°C/Ω”)

7) Once the readings are complete, disconnect the fly lead from the sensor, turn off the unit, and store in a safe place. Always replace the protective cap over the port on the VWR1 after disconnecting the fly lead and store all components in a dry and clean condition.

10. MAINTENANCE

Geosense® VWR1 Vibrating Wire Readouts are basically maintenance free device for most applications, but the following should be considered during the service life:

- It is important never to store the unit and its accessories in a damp or dirty environment as this will reduce its service life.
- Keep the cable connection cap on when the fly lead is not connected to the top of the unit and keep both the readout and the fly lead clean and dry.
- Avoid any large impacts or significant vibration which can damage internal components.
- Keep cables away from physical damage.
- Do not submerge the unit.
- If storing the unit for a extended period, it is good practice to remove the batteries prior to storage in case they were to leak.
- The unit is powered by four standard disposable AA form factor 1.5v batteries. These can be replaced by removing the protective rubberised cover and then removing the backplate on the reverse of the unit held in place with two crosshead screws.

10.1. Battery Replacement

The unit is powered by four standard nominal 1.5v AA batteries. Replacement of these is by removal of the back cover using a crosshead screwdriver. Batteries should be replaced whenever the readout battery level indicator reaches 1 bar remaining.

Figure 5: Rear battery compartment of VWR1

11. TROUBLESHOOTING

Table 3: Troubleshooting symptoms, causes and remedy

Symptom	Possible cause	Possible remedy
Readout does not turn on	Flat batteries	Replace batteries
Reading not as expected	Loose connection or low power	Check wiring/connections then check battery level
Buttons not functioning	Damage to unit	Return to Geosense for repair
Reading shows as dashes	Loose connection or short	Check connection to the readout and to the VWP cores. Check to cores are touching

12. SPARE PARTS

Geosense® VWR1 has the following spare parts available

- Replacement quick connector 1 to 4 fly lead

Contact **Geosense®** for more details and Service / Calibration options.

13. RETURN OF GOODS

13.1. Returns Procedure

If goods are to be returned for either service/repair or warranty, the customer should contact **Geosense®** for a **Returns Authorisation Number,** request a **Returned Equipment Report Form QF034** and, where applicable, a **Returned Goods Health and Safety Clearance Form QF038, PRIOR TO SHIPMENT**. Numbers must be clearly marked on the outside of the shipment.

Complete the **Returned Equipment Report Form QF034**, including as much detail as possible, and enclose it with the returned goods.

All returned goods are also to be accompanied by a completed **Returned Goods Health and Safety Clearance Form QF038** attached to the outside of the package (to be accessible without opening the package) and a copy of both forms should be emailed to support@geosense.co.uk, in advance.

13.1.1. Chargeable Service or Repairs

Inspection & Estimate

It is the policy of **Geosense®** that an estimate is provided to the customer prior to any repair being carried out. A set fee for inspecting the equipment and providing an estimate is also chargeable.

A valid purchase order (credit customer) or advance payment for the inspection fee(s) is required before inspection can take place. In the event of a warrantable claim being accepted, the value will be credited back to the customer's account (credit customer) or refunded (pre-payment customer).

13.1.2. Warranty Claim

(See Limited Warranty Conditions)

This covers defects which arise as a result of a failure in design or manufacturing. It is a condition of the warranty that the **VWR1** must be handled and used in accordance with the manufacturer's instructions and has not been subjected to misuse.

To make a warranty claim, contact **Geosense®** and request a **Returned Equipment Report Form QF034.** Tick the warranty claim box and return the form with the goods as detailed above. You will then be contacted and informed whether your warranty claim has been validated.

13.2. Packaging and Carriage

All used goods shipped to the factory **must** be sealed inside a clean plastic bag and packed in a suitable carton. If the original packaging is not available, **Geosense®** should be contacted for advice. **Geosense®** will not be responsible for damage

resulting from inadequate returns packaging or contamination, under any circumstances.

13.3. Transport & Storage

All goods should be adequately packaged to prevent damage in transit or intermediate storage.

14. LIMITED WARRANTY

The manufacturer, (**Geosense Ltd)**, warrants the **VWR1** manufactured by it, under normal use and service, to be free from defects in material and workmanship under the following terms and conditions:

Sufficient site data has been provided to **Geosense®** by the purchaser as regards the nature of the installation to allow **Geosense®** to select the correct type and range of **VWR1** and other component parts.

The **VWR1** equipment shall be installed in accordance with the manufacturer's recommendations.

The equipment is warranted for **2 years** from the date of shipment from the manufacturer to the purchaser.

The warranty is limited to replacement of part or parts which are determined to be defective upon inspection at the factory. Shipment of defective part or parts to the factory shall be at the expense of the Purchaser. Return shipment of repaired/replaced part or parts covered by this warranty shall be at the expense of the Manufacturer.

Unauthorised alteration and/or repair by anyone which, causes failure of the unit or associated components, will void this **LIMITED WARRANTY** in its entirety.

The Purchaser warrants through the purchase of the **VWR1** equipment that he is familiar with the equipment and its proper use. In no event shall the manufacturer be liable for any injury, loss or damage, direct or consequential, special, incidental, indirect or punitive, arising out of the use of or inability to use the equipment sold to the Purchaser by the Manufacturer.

The Purchaser assumes all risks and liability whatsoever in connection with the **VWR1** equipment from the time of delivery to Purchaser

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