PRODUCT MANUAL

Diver-SDI – AS379

Contact details:

Van Essen Instruments B.V.	Van Essen Instruments - Canada
Delftechpark 20	630 Riverbend Drive, Suite 100
2628 XH Delft	Kitchener, ON,
The Netherlands	Canada N2K 3S2
Phone: +31 15 275 5000	Phone: +1 226-791-6499

Internet: www.vanessen.com

Support: diver@vanessen.com

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CE COMPLIANCE STATEMENT (EUROPE)

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

Type: Diver interface
Product Model: Diver-SDI (AS379)

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"

2004/108/EC 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 2004/108/EC 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-SDI™ is an intelligent interface to connect a Diver® to an SDI-12 data recorder. SDI-12 stand for Serial Digital Interface at 1200 baud. It is an asynchronous serial communications protocol for intelligent sensors that monitor environment data. These instruments are typically low-power (12 volts), are used at remote locations, and usually communicate with a datalogger. The protocol follows a master-slave configuration whereby a datalogger (SDI-12 recorder) requests data from the intelligent sensors (SDI-12 sensors), each identified with a unique address.

The Diver can be connected to an SDI-12 recorder through the Diver-SDI as shown in Figure 1. The Diver-SDI casing has an M12 connector (left) and a cable gland (right) and an air vent with a Gore-Tex® membrane. The M12 connector on the left is connected to a Diver communication cable (part no. AS2xxx) that on its turn is connected to a Diver (DI5xx, DI6xx, DI7xx, DI8xx, DI27x).

Figure 1 top view of the Diver-SDI (part no. AS379).

The cable gland on the right side of the casing is used to connect the Diver-SDI to the SDI-12 recorder through a 3-conductor cable. This cable is used for power supply and data transfer.

The air vent ensures that the pressure inside the casing is equal to the outside air pressure. The built-in barometric pressure sensor enables the Diver-SDI to convert Diver pressure data into water level data.

1.1 Features

The Diver-SDI™ features:

- Real-time Diver pressure, temperature and conductivity* data.
- Real-time barometric pressure and temperature data.
- Automatic barometric compensation.
- Dynamic density compensation for accurate water levels in saline conditions*.

(* CTD-Diver DI27x only)

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

1.2 System Overview

A typical multi-drop SDI-12 configuration is depicted in Figure 2. Multi-drop means that more than one Diver-SDI can be connected to an SDI-12 recorder. In the schematic two Diver-SDIs are connected to an SDI-12 recorder. This connection includes both data communication and power. The maximum cable length between the SDI-12 recorder and the Diver-SDI is defined by the SDI-12 standard and is approximately 60 meter.

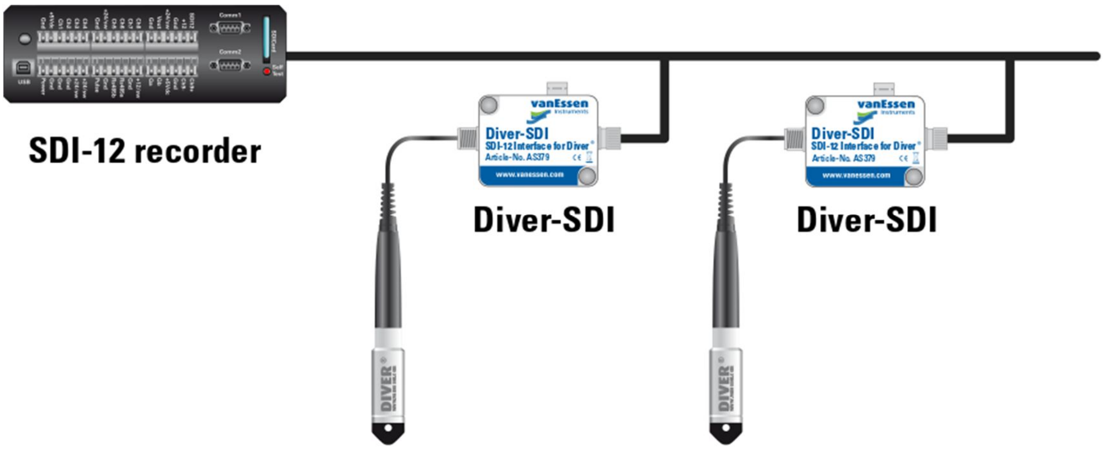

Figure 2 example SDI-12 network with SDI-12 recorder and 2 Diver-SDIs.

Each Diver-SDI is connected to a Diver through a Diver communication cable. The maximum length of the Diver communication cable is 500 meters.

Each Diver-SDI must be programmed with a unique address ('0' to '9', 'A' to 'Z' or 'a' to 'z'). The Diver-SDI acts as a slave for the SDI-12 recorder that requests the data from each Diver-SDI.

A maximum of 8 Diver-SDIs can be used per SDI-12 network. The Diver-SDI is powered by the SDI-12 network (nominal 12 volt DC).

2 Getting Started

2.1 Supported Equipment

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

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

To connect the Diver to the Diver-SDI a Diver communication cable (AS2xxx) is required. Detailed information about supported equipment can be found in Appendix E.

2.2 Installation

Connect the Diver-SDI to a Diver through a Diver communication cable (AS2xxx). Connect the Diver communication cable to the Diver-SDI by attaching it to the M12 connector.

Connect the SDI-12 recorder to the Diver-SDI using a 3-conductor cable. The 3-conductors are for

- 12-volt power supply
- ground
- serial data

Feed the SDI-12 communication and power supply cable into the enclosure through the cable gland and connect the wires as depicted in Figure 3. The cable gland provides an IP67 sealing for SDI-12 cables with a diameter from 3.5 to 7 mm.

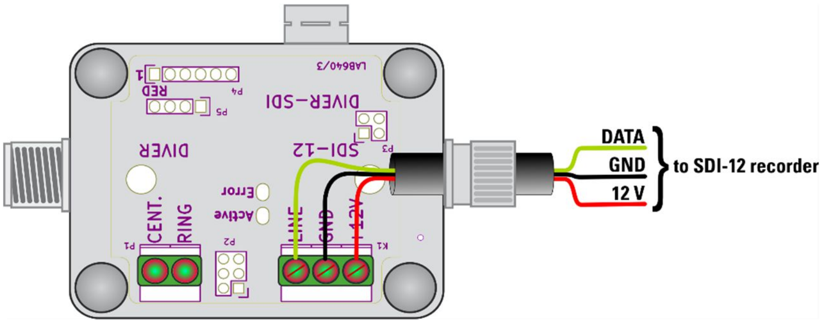

Figure 3 Diver-SDI connection to SDI-12 bus (cable colors may vary).

Once the Diver-SDI is connected to the SDI-12 recorder use the software supplied with the recorder to change the Diver-SDI's default address '0' to one of the following addresses: '1' to '9', 'A' to 'Z' or 'a' to 'z'. For example, the command '0Ac!' will change the address of the Diver-SDI from '0' to 'c'.

Notes:

- The SDI-12 interface for Divers must be externally powered with +12VDC (7 Volt to 16 Volt). The peak current of the Diver-SDI is 10 mA and the average stand-by current is 50 A.
- All SDI-12 devices on a single SDI-12 bus, i.e. connected to one SDI-12 recorder, must have a unique address. The default Diver-SDI address is '0'. When the Diver-SDI address is changed, the change takes place immediately.
- There are two LED signal indicators: Active and Error on the printed circuit board. Details of these indicators can be found in section 2.4. When the Diver-SDI is in stand-by mode, the LEDs will be powered off to conserve power.

2.3 SDI-12 Communication Protocol

The data communication between an SDI-12 recorder and the connected sensors, e.g. Diver-SDI, consists of exchanging ASCII characters on a serial data line. Before the data communication starts, the SDI-12 recorder sends a break to wake up the sensors on the data line. A break is continuous spacing on the data line for at least 12 ms. The SDI-12 recorder then sends a command. The sensor, in turn, returns the appropriate response. Each command is for a specific sensor. The first character of each command is a unique sensor address that specifies with which sensor the recorder wants to communicate. Other sensors on the SDI-12 bus ignore the command and return to low-power standby mode. When an SDI-12 recorder tells a sensor to start its measurement procedure, the recorder does not communicate with any other sensor until the data collection from the first sensor is complete.

A typical recorder/Diver-SDI measurement sequence proceeds as follows:

1. The data recorder wakes all Diver-SDIs on the SDI-12 bus with a break.
2. The recorder transmits a command to a specific, addressed Diver-SDI, instructing it to make a measurement.
3. The addressed Diver-SDI responds within 15 ms returning the maximum time until the measurement data will be ready and the number of data values it will return.
4. If the measurement data is immediately available, the recorder transmits a command to the Diver-SDI instructing it to return the measurement(s). If the measurement is not ready, the data recorder waits for the Diver-SDI to send a request to the recorder, which indicates that the data are ready. The recorder then transmits a command to get the data.
5. The Diver-SDI responds, returning one or more measurements.

More detailed information about the SDI-12 protocol can be found in the document “SDI-12 A Serial-Digital Interface Standards for Microprocessor-Based Sensors Version 1.4”. This document is available for download on the SDI-12 support group website: www.sdi-12.org .

2.4 LED Indicators

There are two LED indicators located on the printed circuit board inside the Diver-SDI: Active (green) and Error (red), as shown in Figure 4. These indicators could be used for troubleshooting.

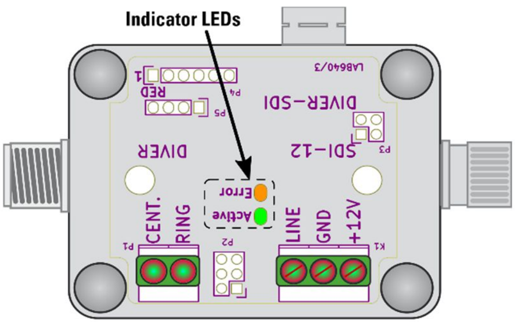

Figure 4 Position of LED indicators inside the Diver-SDI.

When the Diver-SDI is powered on it will attempt, up to 10 times, to detect the connected Diver. During each attempt the Error LED (red) will flash once. If the maximum number of attempts (10) is exceeded the Diver-SDI will function, but no Diver data will be available.

When a Diver is detected the Active LED (green) will flash between 1 and 8 times. The number of flashes is an indicator for the signal strength: 1 = poor and 8 = excellent. In practice, a signal strength of 3 or higher is sufficient for uninterrupted communication.

The Active LED (green) will also flash during regular SDI-12 communication between the Diver-SDI and the SDI-12 recorder. The length and frequency of flashing depends on the SDI-12 command. When a communication error occurs the Error LED will flash briefly.

2.5 Diver-SDI Commands and Responses

Appendix B lists the SDI-12 basic command/response set. The Diver-SDI supports all commands listed in appendix B. Some of those commands and their responses are specific to the Diver and Diver-SDI. In this section those commands are described in detail.

2.5.1 Send Identification

The response to Send Identification **aI!** command is:

a	14	VANESSEN	xxddd-	yyy	SDIvvvvv	nnnnn	<CR><LF>

a = address of the Diver-SDI.

xx = Diver model (14=Mini-Diver, 15=Micro-Diver, 16=Cera-Diver, 17=CTD-Diver, 19=TD-Diver).

ddd= firmware version of the connected Diver, e.g. *119* means version 1.19.

yyy= firmware version number of the Diver-SDI, e.g.*100* means version 1.00.

SDIvvvvv = serial number of the Diver-SDI , e.g. *SDI00123*.

nnnnn = serial number of the connected Diver, e.g. *AB123*.

2.5.2 Send Data for the TD-, Mini-, Micro-, Cera- and Baro-Diver

For the TD-, Mini-, Micro-, Cera- and Baro-Diver, the Start Measurement **aM!** or Start Concurrent Measurement **aC!** command will trigger the Diver-SDI to take five measurements. The results are available within one second after the Start (Concurrent) Measurement command was sent. Subsequently, the Send Data **aDn!** command must be issued to collect the five measurements.

The response to the **aD0!** command is:

a	+x	Sy	<CR><LF>

Where x is the measured pressure in cmH_2O, y the measured temperature in degrees Celsius of the connected Diver, and s is the sign of the temperature, i.e. ‘+’ or ‘-’. Please refer to appendix C to convert pressure in cmH_2O to other units.

The response to the **aD1!** command is:

a	+x	Sy	<CR><LF>

Where x is the measured pressure in cmH_2O, y the measured temperature in degrees Celsius of the barometric pressure sensor in the Diver-SDI and s is the sign of the temperature, i.e. ‘+’ or ‘-’.

The response to the **aD2!** command is:

a	sx	<CR><LF>

Where x is the compensated pressure in cmH_2O and s is the sign of the compensated pressure, i.e. ‘+’ or ‘-’. The compensated pressure is equal to the Diver pressure minus the barometric pressure.

The commands **aD3!** to **aD9!** do not return any values.

2.5.3 Send Data for the CTD-Diver

For the CTD-Diver, the Start Measurement **aM!** or Start Concurrent Measurement **aC!** command will trigger the Diver-SDI to take seven measurements. The results are available within two seconds after the Start (Concurrent) Measurement command was sent. Subsequently, the Send Data **aDn!** command must be issued to collect the seven measurements.

The response to the **aD0!** command is:

a	+x	sy	+z	<CR><LF>

Where x is the measured pressure in cmH_2O, y the measured temperature in degrees Celsius, z the measured conductivity in mS/cm of the connected CTD-Diver and s is the sign of the temperature, i.e. ‘+’ or ‘-’. Please refer to appendix C to convert pressure in cmH_2O to other units.

The response to the **aD1!** command is:

a	+x	sy	<CR><LF>

Where x is the measured pressure in cmH_2O, y the measured temperature in degrees Celsius of the barometric pressure sensor in the Diver-SDI and s is the sign of the temperature, i.e. ‘+’ or ‘-’.

The response to the **aD2!** command is:

a	sx	<CR><LF>

Where x is the compensated pressure in cmH_2O and s is the sign of the compensated pressure, i.e. ‘+’ or ‘-’. The compensated pressure is equal to the Diver pressure minus the barometric pressure.

The response to the **aD3!** command is:

a	sx	<CR><LF>

Where x is the dynamically compensated pressure in cm and s is the sign of the compensated pressure, i.e. ‘+’ or ‘-’. Dynamically compensated pressure means that the water density, estimated from the water temperature and electrical conductivity, is considered to calculate the water level. See Appendix D for a detailed explanation of the dynamic density compensation method.

The response to the **aD4!** command is:

a	+x	+y	<CR><LF>

Where x is the salinity in psu (practical salinity units) and y the specific conductivity at 25 °C in mS/cm. The salinity is derived from the measured conductivity and temperature. See Appendix D for a detailed explanation of how the salinity is calculated.

The commands **aD5!** to **aD9!** do not return any values.

3 Appendix A – Specifications

3.1.1 Casing

Dimensions (L × W × H)	65 mm × 50 mm × 35 mm
Weight	~82 g
Material	ABS
Protection classification	IP65

3.1.2 Connections

Diver Cable	M12 connector (connect to AS2xxx cable)
	Length: 0.5 to 500 meter
SDI-12	Cable Gland PG-7
Compatible Diver models	Mini-Diver (DI5xx), Micro-Diver (DI6xx), Cera-Diver (DI7xx), CTD-Diver (DI27x), TD-Diver (DI8xx)

3.1.3 Power Consumption

External supply voltage	8 to 16 V
Standby current	50 A
Maximum current	10 mA
SDI-12 bus	
Compatibility	SDI-12 V1.4
Communication	1200 bps, 7 bits, even parity, 1 stop bit
Multi-drop	yes, up to 8
Address	user programmable: ‘0’ to ‘9’, ‘A’ to ‘Z’ and ‘a’ to ‘z’

3.1.4 Pressure

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

3.1.5 Temperature

Range	-20 to 80 °C
Calibrated	0 to 50 °C
Accuracy[+]	±1 °C
Resolution	0.2 °C

[+] maximum

4 Appendix B – SDI-12 Basic Command/Response Set

Name	**Command**	**Response**
Break	Continuous spacing for at least 12 milliseconds	None
Acknowledge Active	a!	a<CR><LF>
Send Identification	aI!	allccccccccmmmmmmvvvxxx...xx<CR><LF>
Change Address	aAb!	b (support for this command is required only if the sensor supports software changeable addresses)
Address Query	?!	a<CR><LF>
Start Measurement*	aM!	atttn<CR><LF>
Start Measurement and Request CRC*	aMC!	atttn<CR><LF>
Send Data	aD0! . . . D9!	a<values><CR><LF> or a<values><CR><CRC><LF> a<values><CR><LF> or a<values><CR><CRC><LF> a<values><CR><LF> or a<values><CR><CRC><LF> a<values><CR><LF> or a<values><CR><CRC><LF> a<values><CR><LF> or a<values><CR><CRC><LF>
Additional Measurements*	aM1! … aM9!	atttn<CR><LF>
Additional Measurements and Request CRC*	aMC1! . . . aMC9!	atttn<CR><LF> atttn<CR><LF> atttn<CR><LF> atttn<CR><LF> atttn<CR><LF>
Start Verification*	aV!	atttn<CR><LF>
Start Concurrent Measurement	aC!	atttnn<CR><LF>
Start Concurrent Measurement and Request CRC	aCC!	atttnn<CR><LF>
Additional Concurrent Measurements	aC1! . . . aC9!	atttnn<CR><LF> atttnn<CR><LF> atttnn<CR><LF> atttnn<CR><LF> atttnn<CR><LF>
Additional Concurrent Measurements and Request CRC	aCC1! … aCC9!	atttnn<CR><LF>
Continuous Measurements	aR0! … aR9!	a<values><CR><LF> (formatted like the D commands)
Continuous Measurements and Request	CRC aRC0! … aRC9!	a<values><CR><LF> (formatted like the D commands)

*This command may result in a service request. See section 4.4.6 of "SDI-12 A Serial-Digital Interface Standards for Microprocessor-Based Sensors Version 1.4". This document is available for download on the SDI-12 support group website: www.sdi-12.org.

5 Appendix C – Pressure Conversion Table

To convert from cmH2O to …	Multiply by
hecto Pascal (hPa)	0.980665
kilo Pascal (kPa)	0.0980665
millibar (mbar)	0.980665
inch of mercury (inHg)	0.028959020848
pounds-per-square-inch (psi)	0.014223343334

6 Appendix D – Dynamic Density Compensation

6.1 Introduction

The dynamic density compensation method allows for accurate water level estimation in case of high and varying salinity and temperatures. The water density will be estimated based on the measured water temperature and conductivity.

This appendix outlines how the temperature and conductivity data from the CTD-Diver is used to estimate the water density and calculate the water level above the CTD-Diver by the Diver-SDI. This is a 3-step process:

1. The salinity is calculated from the specific conductivity data
2. The salinity is used to calculate the water density
3. The water density is used to determine the water level above the CTD-Diver.

6.2 Specific Conductivity

In case the CTD-Diver is set to measure conductivity instead of specific conductivity at 25 °C the conductivity will be converted in the Diver-SDI using:

$$C_s = \frac{C_m}{1+0.0191\ (T_m - 25)}$$

where C_s is the specific conductivity at 25 °C_m and T_m are the measured conductivity and temperature, respectively.

6.3 Salinity

Salinity is the saltiness or dissolved salt content of a body of water. Salinity is an important factor in determining many aspects of the chemistry of natural waters and of biological processes within it [2]. Salinity cannot not be measured directly, but needs to be calculated from conductivity measurements. Salinity is most commonly reported using the Practical Salinity Scale 1978, a scale developed relative to a standard potassium-chloride solution and based on conductivity, temperature and barometric pressure measurements. Salinity expressed in the PSS is a dimensionless value, although by convention, it is reported as practical salinity units (psu). Salinity in practical salinity units is nearly equivalent to salinity in parts per thousand [1].

If conductivity values have been compensated to 25 °C and water depths are sufficiently shallow that pressure corrections are not necessary, salinity can be calculated using the conductivity measured by the CTD-Diver. The salinity is expressed in practical salinity units (psu). The relationship between specific conductivity and salinity is listed in Table 1 [1].

Table 1 Rating table for conversion of specific conductivity, in millisiemens per centimeter, to salinity, in practical salinity units [1].

Specific conductivity in mS/cm	Salinity in psu	Specific conductivity in mS/cm	Salinity in psu	Specific conductivity in mS/cm	Salinity in psu
0.100	0.046	11.000	6.233	38.000	24.099
0.300	0.142	13.000	7.464	41.000	26.220
0.500	0.240	15.000	8.714	44.000	28.364

Specific conductivity in mS/cm	Salinity in psu	Specific conductivity in mS/cm	Salinity in psu	Specific conductivity in mS/cm	Salinity in psu
0.700	0.340	17.000	9.981	47.000	30.532
1.000	0.492	20.000	11.911	50.000	32.722
2.000	1.016	23.000	13.873	53.000	34.935
3.800	2.001	26.000	15.865	56.000	37.172
5.000	2.679	29.000	17.885	59.000	39.430
7.000	3.836	32.000	19.931	62.000	41.712
9.000	5.022	35.000	22.003	65.000	44.016

6.4 Density

The overall function for conversion of water temperature and salinity to density is:

$$_{water}(T,S) = {}_{temp}(T) + {}_{salinity}(T,S)$$

where T is the temperature in degrees Celsius and S is the salinity in practical salinity units.

The water density as a function of temperature can be approximated by:

$$_{temp}(T) = a_0 + a_1 \cdot T + a_2 \cdot T^2 + a_3 \cdot T^3 + a_4 \cdot T^4 + a_5 \cdot T^5 + a_6 \cdot T^6$$

where T is in degrees Celsius and

$$_{salinity}(T, S) = (b_0 + b_1 \cdot T + b_2 \cdot T^2 + b_3 \cdot T^3 + b_4 \cdot T^4)\ S + (c_0 + c_1 \cdot T + c_2 \cdot T^2)\ S^{1.5} + d_0 \cdot S^2$$

where S is the salinity in practical salinity units and

$a_0 = 9.998434 \cdot 10^{2}$; $b_0 = 8.24493 \cdot 10^{-1}$; $c_0 = -5.72466 \cdot 10^{-3}$; $d_0 = 4.8314 \cdot 10^{-4}$

$a_1 = 6.740015 \cdot 10^{-2}$; $b_1 = -4.0899 \cdot 10^{-3}$; $c_1 = 1.0227 \cdot 10^{-4}$

$a_2 = -9.018250 \cdot 10^{-3}$; $b_2 = 7.6438 \cdot 10^{-5}$; $c_2 = -1.6546 \cdot 10^{-6}$

$a_3 = 9.653555 \cdot 10^{-5}$; $b_3 = -8.2467 \cdot 10^{-7}$

$a_4 = -1.087056 \cdot 10^{-6}$; $b_4 = 5.3875 \cdot 10^{-9}$

$a_5 = 8.035684 \cdot 10^{-9}$

$a_6 = -2.655749 \cdot 10^{-11}$

6.5 Water level

The water level WL above the CTD-Diver can be written as:

$$WL = 1000 \cdot (p_{Diver} - p_{baro}) / {}_{water}(T,S)$$

where p_{DIver} is the pressure measured by the CTD-Diver in cmH_2O, P_{baro} the barometric pressure measured by the barometric sensor of the Diver-SDI and the water density $_{water}(T,S)$ is in kg/m^3.

6.6 References

[1] pubs.usgs.gov/tm/2006/tm1D3/pdf/TM1D3.pdf

[2] https://en.wikipedia.org/wiki/Salinity

7 Appendix E – Diver Equipment

7.1 Diver-Office software

Program Diver dataloggers 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.
- 7 languages: Dutch, English, French, German, Polish, Portuguese and Spanish

Free download from www.vanessen.com

7.2 USB Reading Unit

The Diver USB Reader can be used for programming or reading the Diver. Connect the USB Reader to the USB port of your PC or Laptop. Simply insert the Diver into the base of the USB Reading Unit and you are ready to communicate with your Diver.

The USB Reading Unit can be used in the field or the office.

Part no: AS330

7.3 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

7.4 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

7.5 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

7.6 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

7.7 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 dataloggers. 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

7.8 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

7.9 Mini-Diver

This Diver is manufactured using a stainless steel (316 L) casing with a 22 mm diameter. The Mini-Diver can store a maximum of 24,000 measurements (date/time, pressure and temperature) in its memory.

The Mini-Diver samples pressure and temperature at fixed length intervals..

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

Part no: DI5xx

7.10 Baro-Diver

This Diver measures atmospheric pressure and is used to compensate for the variations in atmospheric pressure measured by the other Divers. This Diver can also be used for measuring shallow water levels up to 1 meter. The stainless steel (316 L) casing has a diameter of 22 mm. The Baro-Diver can store a maximum of 24,000 measurements.

Part no: DI500