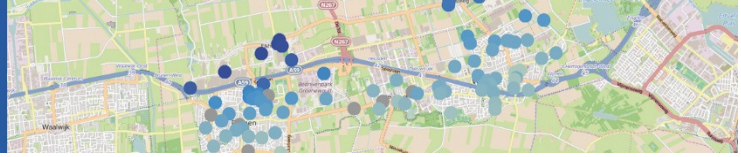
PRODUCT MANUAL

Diver-DCX



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1 Introduction

The Diver-DCX (AS337) or Diver Direct Communication eXchanger, see Figure 1, is specifically engineered to integrate Divers into any SDI-12 compatible telemetry system. The SDI-12 standard was developed to interface dataloggers with smart sensors for environmental data acquisition, and is used globally for applications in water resource management, industry, mining, and research.

Diver-DCX extends the communication format of Divers to any SDI-12 compatible telemetry system, enabling real-time digital transmission of water level and water quality data. The built-in pressure sensor provides barometric compensation of water levels collected by the Diver, which reduces the need for post-processing.

A temperature and pressure sensor on Diver-DCX provides air temperature and atmospheric pressure readings, reducing the need for additional sensors to measure these parameters. The robust compact housing and pressure vent, made from industry-standard GORE-TEX®, offer a durable water-resistant barrier to the internal electrical components, resulting in reliable operation. Since power is supplied by an external source (no internal battery is required), this allows the compact Diver-DCX to be mounted inside the well casing, translating to long-term, uninterrupted use.

Figure 1 the Diver-DCX.

1.1 SDI-12

SDI-12 stands for serial data interface at 1200 baud. It is a standard to interface battery powered data recorders with smart sensors designed for environmental data acquisition.

Van Essen Instruments' Baro, Mini, Micro, Cera and CTD-Divers are able to act as SDI-12 sensors in an SDI-12 network by using the Diver-DCX and a DiverDataCable, see Figure 2. The Diver-DCX converts SDI-12 commands to the Diver communications protocol and provides a hardware and protocol conversion interface between the Divers and an SDI-12 network.

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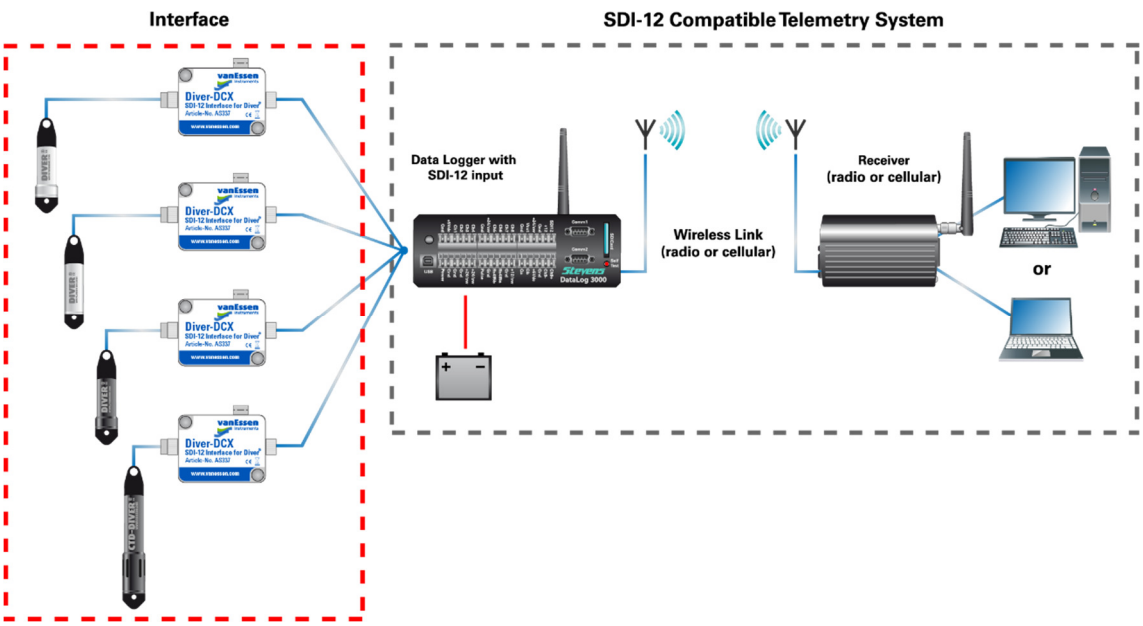

Figure 2 SDI-12 architecture for use with Diver-DCX.

The Diver-DCX supports the SDI-12 Version 1.3 commands listed below. Data recorders that support SDI-12 Version 1.3 can usually send standard commands to an SDI-12 "sensor" like the Diver-DCX automatically.

Divers have the ability to record and store readings in their internal memory, independent from the SDI-12 network, while connected to an SDI-12 datalogger. Before connecting the Diver to Diver-DCX and datalogger, it can be programmed and started using the Diver-Office software.

1.2 Independent Data Recording

All sampling options in the Diver are available while the Diver is operating as an SDI-12 sensor. The Diver can be set to record at a fixed sampling interval, event based, averaging and pumping/slug tests. This allows the Diver to store data in its internal memory and provide back-up data if the SDI-12 network fails. Each time the SDI-12 datalogger asks the Diver for a current reading, the internal Diver battery is used to transmit the information to the SDI-12 datalogger. The Diver will also be using its internal battery if it is recording independently - draining the battery more quickly. If the Diver independent recording option is not used, the internal battery will only be used for communication with the SDI-12 datalogger.

If the Diver has been programmed to record on its own independent schedule, data can be downloaded from the Diver using a laptop PC. Temporarily disconnect the Diver from the cable preferably in between recordings by the SDI-12 datalogger. Connect a laptop to download the independently recorded data.

1.3 Additional Information

Additional information may be found in an SDI-12 reference, for example see Reference on page 7, or consult your SDI-12 data recorder documentation.

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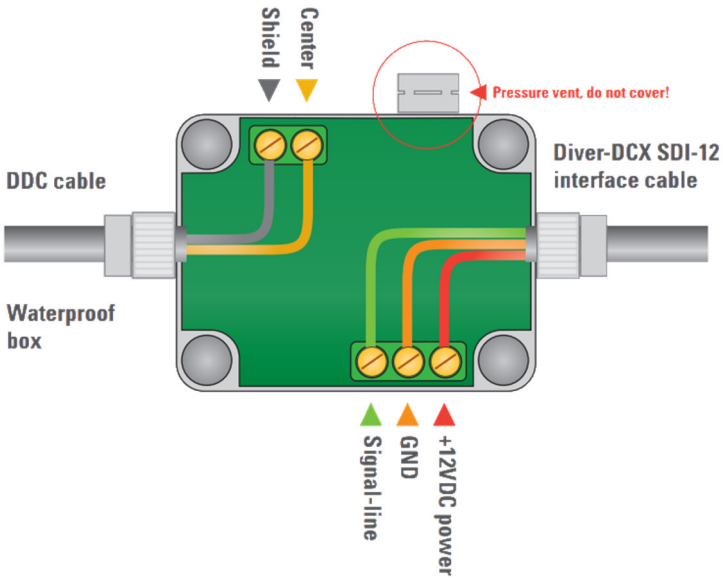
2 Installation

The following steps must be taken to install the Diver-DCX:

1. Turn off power to the SDI-12 datalogger and/or the SDI-12 network.
2. Open the Diver-DCX box using a flat or Philips screwdriver.
3. Connect the upper left two terminals of Diver-DCX to the DiverDataCable as shown in the picture below.
4. Connect the Diver to the DiverDataCable
5. Connect the three SDI-12 terminals of the Diver-DCX to the interface of the SDI-12 datalogger as shown in the picture below



6. Turn on power to the datalogger and/or the SDI-12 network such that power is applied to the Diver-DCX
7. Using the SDI-12 datalogger change the default address '0' to the desired value using the following command '0A*b*!', where *b* is the desired address.

3 Sensor Parameters

The Diver-DCX can output the following parameters:

- Barometric pressure
- Diver parameters
  - Pressure
  - Temperature
  - Conductivity (CTD-Diver only)
- Compensated pressure: Diver pressure minus the Barometric pressure
- Dynamically compensated pressure

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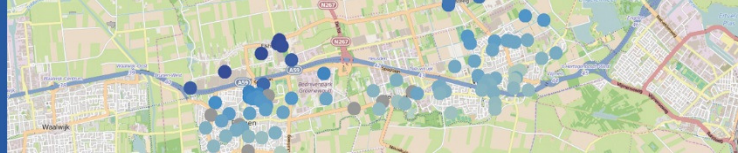

3.1 Default Settings

The Diver-DCX has the following default settings:

Sensor address:	0
Pressure units:	cmH_2O
Temperature units:	degrees Celsius
Actual Conductivity units:	mS/cm
Specific Conductivity units:	mS/cm

3.2 Pressure

By definition 1 cmH_2O equals 98.0665 Pascal.

3.3 Conductivity

The type of conductivity that is reported, actual or specific, by the Diver-DCX depends on the type that is programmed in the CTD-Diver. Programming of the conductivity type must be done prior to connecting the CTD-Diver to the Diver-DCX.

4 Sensor Address

The Diver-DCX supports software-changeable addresses.

IMPORTANT If two or more Diver-DCXs are connected to the same system the sensor address of the Diver-DCX must be changed prior to connecting the Diver-DCXs to the system.

5 Power budget

Quiescent current:	25 mA
Measurement current:	180 mA; the measurement duration depends on the command send, but is typically 12ms

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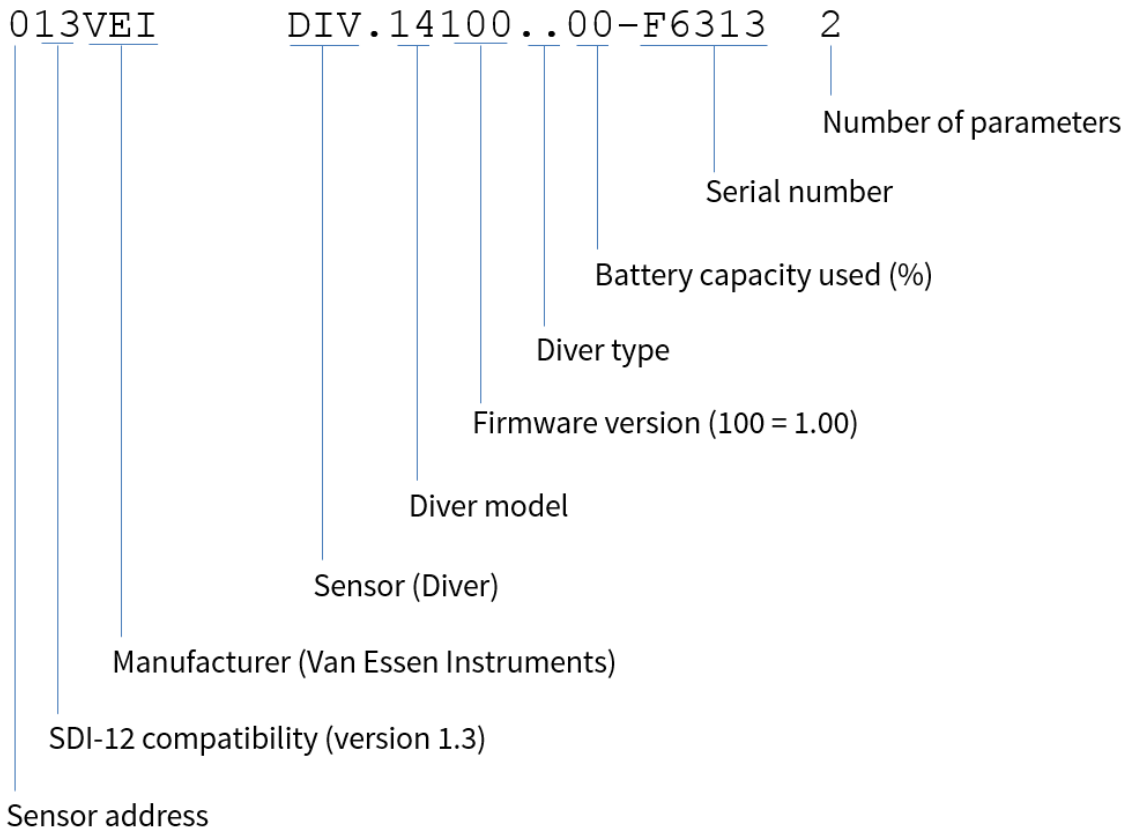
6 Sensor Identification

In response to the “send identification” command, the Diver-DCX will respond as follows:



Diver model:

- 14 = Mini-Diver
- 15 = Micro-Diver
- 16 = Cera-Diver
- 17 = CTD-Diver

Diver type:

- .. = regular Diver
- .B = Baro-Diver

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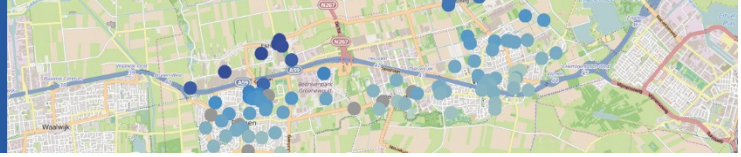

7 SDI-12 version 1.3 Command Set

Name	Command	Response and comments
Address Query	?!	a<CR><LF> The wildcard address '?' character is supported only for the Address Query command. It is ignored as an invalid address for all other commands.
Acknowledge Active	a!	a<CR><LF> Basic address characters in the range '0' to '9' and extended address characters in the ranges 'A' to 'Z' and 'a' to 'z' are supported. All other characters are ignored as an invalid address. The default address is '0'.
Change Address	aAb!	b<CR><LF> Software changeable addresses and the Change Address command are supported.
Send Identification	aI!	a13VEI DIV.xxvvvyyzz-SSSSS n<CR><LF> where xx = Diver model; vvv = device firmware version × 100 (120 = 1.20); yy= Diver type (baro or regular); zz = battery capacity used (%);SSSSS = Diver serial number; n = number of Diver parameters.
Start Verification	aV!	a0012<CR><LF> One result is available within 1 second for reading by the Send Data command.
Start Measurement	aM!	a001n<CR><LF> n parameters will be available for reading by the Send Data command within 1 second. A service request (a<CR><LF>) will be sent when the parameters are ready. The number of parameters returned is determined by type of Diver connected.
Send Data	aD0!	a<value><CR><LF> Pressure measured by the Diver in cmH2O Where <value> is xxxx.x for models DI500, DIx01, DIx02, DI271 and xxxx for DIx05, DIx10, DI272, DI273
	aD1!	a<value><CR><LF> Temperature measured by the Diver in degC Where <value> is xx.xx; range is -20.00 to +80.00
	aD2!	a<value><CR><LF> Conductivity measured by the Diver in mS/cm; blank if no CTD-Diver is connected Where <value> is xx.xxx for 30 mS/cm range, xxx.xx for 120 mS/cm range
	aD3!	a<value><CR><LF> Pressure measured by the DCX in cmH2O Where <value> is xxxx.x
	aD4!	a<value><CR><LF> Compensated Pressure (aD0! – aD3!) Where <value> is x.x

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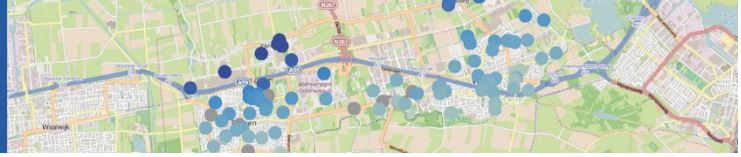

8 Reference

SDI-12, A Serial-Digital Interface Standard for Microprocessor-Based Sensors, version 1.3. SDI-12 Support Group, Logan, Utah, January 3rd, 2012. www.sdi-12.org .

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