OPERATING MANUAL

DCX DATA LOGGERS

KELLER

➢ March 2009

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1 General

The level of groundwater (or other liquids) and the fluctuations thereof can be accurately determined on site by measuring the pressure at a defined depth beneath the surface of the groundwater (hydrostatic pressure). Only the density of the liquid needs to be known to convert from pressure (mbar) to level (cm). Example for water: 100 mbar ≈ 100 cm water column (cmWC).

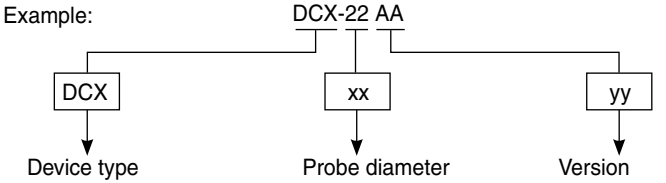
With open systems, i.e. using the classic filling level measurement, measurement always takes place in relation to the ambient pressure (air pressure at surface). For this reason, conventional level probes (in the probe cable) have an integral capillary tube that generates the reference to the ambient pressure directly at the sensor. This makes the measurement independent of air pressure fluctuations acting upon the surface of the liquid. With intelligent measuring systems it is also possible to determine the level using an absolute pressure measurement, and compensate for the influence of the air pressure electronically using an additional barometer. A standard cable without capillary tube that is less susceptible to faults can be used for the level probe with this measuring method.

Different data logger versions are available from KELLER depending on the measuring method.

2 Designs / Designations

Different versions of the data logger are available with different characteristics, whereby the main distinction is made in terms of diameter and the measuring method that is used.

Example: DCX-22 AA



3 Properties

DCX-16	Small probe diameter
DCX-18 ECO	Rechargeable battery operated / fully welded
DCX-22	High-precision version / customer specific versions AA version (absolute-absolute)

4 Measuring Methods

4.1 Relative Pressure Measurement

➢ DCX-16 VG ➢ DCX-18 ECO VG ➢ DCX-22 VG

The DCX-… VG systems are used for classic level measurement and are equipped with a relative pressure sensor. The air pressure is routed to the rear of the sensor via the capillary tube that is integrated in the probe cable. The cable must not be kinked or crushed! In the DCX-VG systems, the capillary tube has a GoreTex® diaphragm at the top end. This diaphragm prevents dirt or liquid from entering the capillary tube and ensures that there is a continuous exchange of air.

➢ **DCX-16 VG**

➢ **DCX-18 ECO VG**

➢ **DCX-22 VG**

4.2 Absolute pressure measurement

➢ DCX-16 (SG) ➢ DCX-18 ECO (SG) ➢ DCX-22 (SG)

The DCX-… and DCX-… SG devices operate using an absolute pressure sensor. If the influence of air pressure fluctuations (e.g. at shallow fluid or water depths) is also going to be taken into consideration, a second data logger (DCX-22) with barometer is placed at the surface and records the air pressure trend. The correct level is then calculated on the PC as the difference between the two measured values. The Logger 4.x program is used for this purpose.

Without read-out / installation cable

➢ **DCX-16** ➢ **DCX-18 ECO** ➢ **DCX-22**

The DCX-16, DCX-18 ECO or DCX-22 probes must be removed from the liquid to read out the data, since the interface connector is in the probe itself.

These versions without cable can be used in an extremely flexible way.

With read-out / installation cable

➢ DCX-16 SG

➢ DCX-18 ECO SG

➢ DCX-22 SG

Unlike the DCX-16, DCX-18 ECO and DCX-22 models, the DCX-… SG model has a cable with a read-out connector at the end of the cable. It is therefore possible to read the data from the device without removing it from its measuring location.

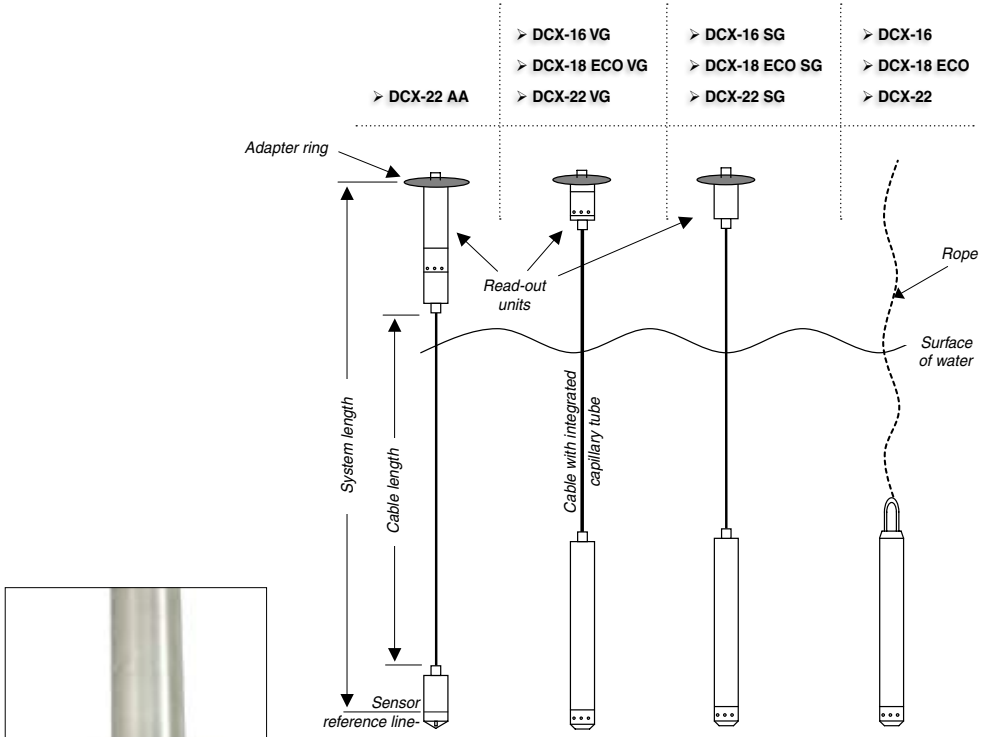
4.3 Absolute-absolute pressure measurement ➢ DCX-22 AA

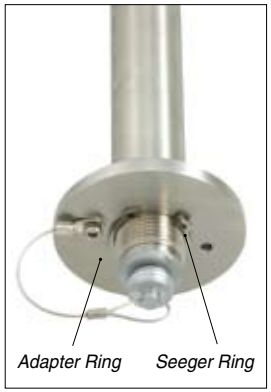
➢ DCX-22 AA

The DCX-22 AA model includes a second pressure sensor that takes barometric pressure measurements and automatically calculates the difference between the two measurements.
Compared to the DCX-… VG models (which uses a capillary tube to compensate barometric pressure), this solution has the advantage that the entire system is completely sealed. The disadvantage is that the resolution is somewhat lower than with the DCX-… VG series.

The length of the cable between the sensor and the read-out unit is restricted to 10 m in the DCX-22 AA model.

5 Installation





The data loggers are inserted into a standpipe and secured with an adapter ring (see accessories). The relevant adapter ring is screwed onto the housing of the read-out unit and secured with a Seeger ring (see accessories).

It must be noted that the cable length that is selected cannot be modified by the user in the DCX models (AA / SG / VG / ECO). The required cable length must therefore be specified when the order is placed.

Usage example (installation of a DCX-22 AA)

The dip pipe with closure cap is securely installed at the measuring location. If the pipe needs to be fully embedded in the ground in order to provide protection, it must be ensured that the enclosure is vented so as not to restrict the movement of water in the dip pipe.

The probe is inserted into the pipe. It is connected via the cable to the read-out unit, in which the battery and the barometric air pressure sensor are also installed.

A suitable adapter ring is screwed to the read-out unit, and rests on the edge of the dip pipe closure cap after installation. The length of the system is now exactly defined.

The DCX can be connected to a laptop on site using a data cable. The device can now be configured or the measured values stored in the data logger can be downloaded.

6 Configuration / Reading out data

In order to configure the device and read out data, the DCX is connected to a PC (on which the Logger 4.x software is already installed) via an interface cable. The K-103A interface converter is used to make the connection to the serial interface (RS-232) on the PC. Otherwise, if the data logger is connected to a USB interface, the K-104A or K-104M (for DCX-18 ECO) converter must be used (see accessories). If a type K-104 converter is used, the supplied USB driver must also be installed.

The Logger 4.x software can now be run on the PC.

Caution:
The cable must remain connected while communication with the DCX read-out unit is taking place (write, read, online function). Always stop the program before disconnecting the cable to the data logger.

Important:
The read-out unit may only be opened and closed in dry ambient air (e.g. to replace the batteries). Dry the unit before opening or closing, and clean it if necessary!

7 Replacing the battery

Attention: Dry the DCX data logger before opening!

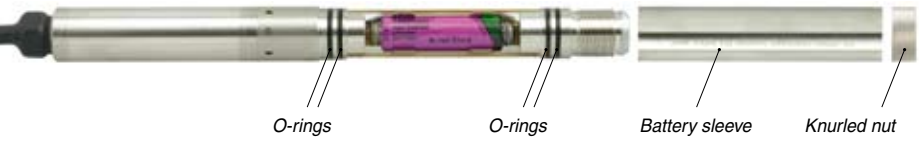
The data logger may only be opened and closed in dry ambient air to replace the batteries. Dry the logger before closing, and clean it if necessary!

Please ensure that the polarity is correct when inserting the new battery (see marking on battery holder). Please also check the black O-rings that seal the battery compartment. If you find any damage, the seal rings must be replaced (see accessories). Please ensure that the O-rings are not damaged when reinstalling the sleeve.

Note:
The battery capacity indicator is automatically reset to 99% whenever the battery is changed (voltage interruption). This also takes place if the same battery or a discharged battery is re-inserted. The battery should therefore only be removed if it is fully discharged.

7.1 ➢ DCX-22 AA ➢ DCX-22 SG ➢ DCX-22 VG

In order to replace the battery, first unscrew the knurled nut and then pull off the battery sleeve:



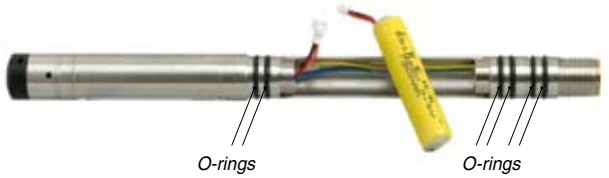
7.2 ➢ DCX-22

In order to replace the DCX-22 battery, first unscrew holder and knurled nut and then pull off battery sleeve:

7.3 ➢ DCX-16

In order to replace the DCX-16 battery, first unscrew holder and knurled nut.

Carefully disconnect battery (connector).



Insert connector into opening in sleeve, insert new battery and then re-install battery sleeve and knurled nut.

8 Battery ➢ DCX-18 ECO

8.1 Charging the battery

The DCX-18 ECO model is operated using a battery that can be charged using the K-104M interface cable. The battery is welded into the unit and cannot be changed.

Normal charging:
Normal charging starts when the DCX-18 ECO is connected to the PC via the USB interface. A complete charging cycle requires approximately 7 hours.

Quick charging:
If the DCX-18 ECO level probe is connected to the power supply or the car adapter via the K-104M interface cable, quick battery charging takes place. A complete charge requires approximately 1 hour.

8.2 Checking the charge / capacity

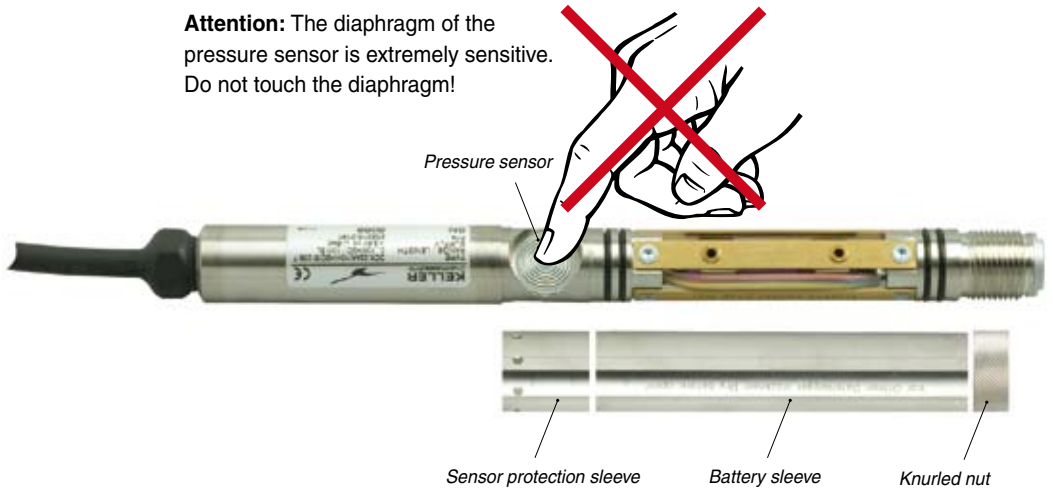
The battery display using the Logger 4.x software (reader/writer) shows the charging capacity in percent. We recommend charging as soon as the capacity drops below 30%.

Please avoid discharging to a capacity of less than 10%. If the data logger is not being used, recording should be stopped and the battery recharged once per year.

9 Cleaning

Dry the read-out unit before opening!

Attention: The diaphragm of the pressure sensor is extremely sensitive. Do not touch the diaphragm!



If the data logger is used in extremely contaminated media, it is advisable to check the pressure sensor from time to time and to clean it if necessary. Do not exert pressure on the diaphragm. Be sure to dry the read-out unit before opening!

9.1 Cleaning the DCX-22 AA air pressure sensor

In order to clean the pressure sensor properly, remove the knurled nut, the battery sleeve and the sensor protection sleeve. Reinstall the battery sleeve with knurled nut (without sensor protection sleeve). Rinse sensor with fresh water. **Caution**: do not damage the sensitive diaphragm.

After cleaning the sensor, please ensure that all parts are dry before reinstalling the parts.

The sensor protection sleeve can be fitted (with holes away from the electrical connector). Then the battery sleeve is fitted. **Attention**: the battery sleeve can only be fitted in one direction. Please ensure that the O-rings are not damaged during these assembly operations. Otherwise they must be replaced (see accessories). Finally, the knurled nut is reinstalled and hand-tightened.

9.2 Cleaning the level probe pressure sensor

DCX-22 AA

The protection cap of the pressure sensor on the level probe can be removed by hand. Then rinse sensor with fresh water, if needed.

Attention:
The diaphragm of the pressure sensor is extremely sensitive. Do not touch the diaphragm!

DCX-22 / DCX-18 ECO / DCX-16

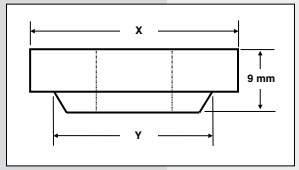
10 Accessories

DESCRIPTION	SCOPE OF DELIVERY	PRODUCT NO.	
2“ standpipe connection	Optional	506815.0009	
Closure cap for connector with hexagon socket screw (Inox M3 x 6) for securing	Supplied with DCX-16/DCX-22	506815.0010	
Seeger ring DIN: 471 (BN: 682) Ø 18 mm	Supplied	508830.0002	
O-ring for battery compartment For model DCX-22 Ø 17 mm x 1,5 mm / nitrile	Spare part	508610.0024	
O-ring for read-out connector For model DCX-22 Ø 13 mm x 1,5 mm / nitrile	Spare part	508610.0051	
O-ring for read-out connector For model DCX-18 ECO Ø 13,5 mm x 1,5 mm / nitrile	Spare part	508610.0055	
O-ring for battery compartment & read-out connector For model DCX-16 Ø 11 mm x 1,5 mm / nitrile	Spare part	508610.0007	

DESCRIPTION	SCOPE OF DELIVERY	PRODUCT NO.
Protection cap for DCX-16	Supplied with DCX-16	507205.0033 
Protection cap for DCX-18	Supplied with DCX-18	507220.0109 
Protection cap for DCX-22	Supplied with DCX-22	507220.0001 
Battery suitable for: DCX-16 (AA/SG/VG) Make “Minamoto“: Lithium 3,6V AAA	Supplied with DCX-16	557005.0017 
Battery suitable for: DCX-22 (AA/SG/VG) Make “Tadiran“: Lithium 3,6V AA Type: SL-760	Supplied with DCX-22	557005.0010 
Battery suitable for: DCX-22 (AA/SG/VG) <u>Models as of 2009:</u> With connector cable Make “Tadiran“: Lithium 3,6V AA Type: SL-760	Supplied with DCX-22	557005.0006 
Plug-in power supply unit 15 V (Europe) DC connector Input: 230 VAC Output: 15 VDC, 210 mA	K-102I, K-104, K-104B, K-104M, K-107	309010.0025 

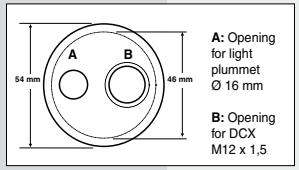
DESCRIPTION	SCOPE OF DELIVERY	PRODUCT NO.
Plug-in power supply unit 15 V (U.K.) DC connector Input: 230 VAC Output: 15 VDC, 150 mA	K-102I, K-104, K-104B, K-104M, K-107	309010.0026 
Plug-in power supply unit 15 V (USA) DC connector Input: 120 VAC Output: 15 VDC, 210 mA	K-102I, K-104, K-104B, K-104M, K-107	309010.0027 
Car adapter cable Connection to converter K-104M (DCX-18 ECO)	Optional	309010.0051 
Extension cable “Reference“ for DCX-18 ECO (PE cable Ø 5,8 mm)	Optional	5 meters 602515.0023 10 meters 602515.0024 20 meters 602515.0025 50 meters 602515.0026 100 meters 602515.0027 

DESCRIPTION	SCOPE OF DELIVERY	PRODUCT NO.
Interface converter K-103A (not for DCX-18 ECO) For communication between the PC and DCX-16/22. Connected to serial interface (RS 232 – RS 485 converter)	Optional	309010.0002 
Interface converter K-104A (not for DCX-18 ECO) For communication between the PC and DCX-16/22. Connected to USB interface (USB – RS 485 converter)	Optional	309010.0009 
Interface converter K-104M (only for DCX-18 ECO!) For communication between the PC and DCX-18 ECO Connected to USB interface (USB – RS 485 converter) **(for quick charging, use plug-in power supply unit or car adapter cable!)**	Optional	309010.0050 
USB connecting cable to K-104	Supplied with K104 converters	309010.0052 

DESCRIPTION	SCOPE OF DELIVERY	
Software CD: Logger 4.x Contains the programs for configuring the data logger and reading out the measured values. The software can also be downloaded from the Internet free of charge: --> www.keller-druck.com --> Products --> Pressure transmitters --> Autonomous data collectors	Supplied	239005.0003 
Adapter rings for standpipe insertion **(optionally available)** Suitable for - DCX-16 SG/VG - DCX-18 ECO (SG/VG) - DCX- 22 SG/VG - DCX-22 AA  	Optional	

Size [mm]			
x	**y**	**Drawing no.**	**Product no.**
30	25	33386 Pos. 1	506810.0006
40	25	33386 Pos. 2	506810.0018
49	39	33386 Pos. 3	506810.0015
55	50	33386 Pos. 4	506810.0019
60	55	33386 Pos. 5	506810.0014
65	55	33386 Pos. 6	506810.0020
35	32	33386 Pos. 8	506810.0022
37	32	33386 Pos. 9	506810.0025
42	32	33386 Pos. 10	506810.0026
76	32	33386 Pos. 11	506810.0027
125	32	33386 Pos. 12	506810.0030

Adapter rings for 2” standpipe connection for light plummet	Optional	



Drawing no.	Product no.
33386-70	506810.0021

11 Declaration of Conformity

CE

For the following product

DCX-16 / DCX-18 ECO / DCX-22 / DCX-22 AA

We hereby declare that the product complies with the most important protection requirements that are defined in the directive of the committee for harmonizing the legal requirements of the member states with regard to electromagnetic compatibility (2004/108/EC).

This declaration applies to all of the above-mentioned items that are marked with the CE symbol and are a constituent of this declaration.

The following standards were used to evaluate the products with regard to electromagnetic compatibility:

EN 61000-6-1: 2007
EN 61000-6-2: 2005
EN 61000-6-3: 2007
EN 61000-6-4: 2007
EN 61326-2-3: 2006

This declaration applies to the manufacturer:
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submitted by:
Keller GmbH, Schwarzwaldstrasse 17, D-79798 Jestetten

Jestetten, December 16, 2008

H.W. Keller, Managing Owner
with legally valid signature

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