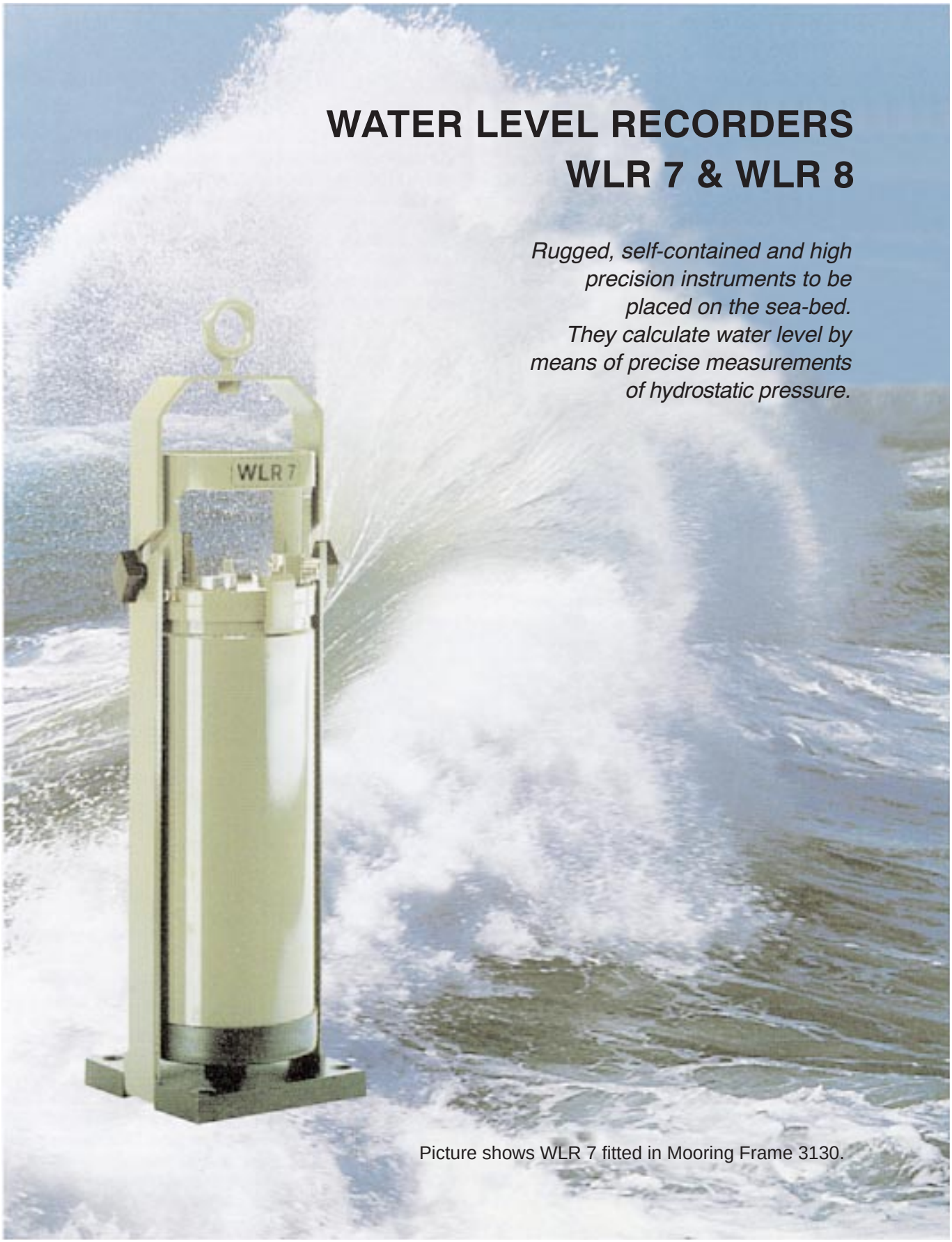
AANDERAA INSTRUMENTS

DATA COLLECTING INSTRUMENTS FOR LAND SEA AND AIR

WATER LEVEL RECORDERS
WLR 7 & WLR 8

Rugged, self-contained and high precision instruments to be placed on the sea-bed. They calculate water level by means of precise measurements of hydrostatic pressure.



Picture shows WLR 7 fitted in Mooring Frame 3130.

The Water Level Recorder WLR 7 is specially designed to measure ocean water levels. Placed on the seabed, the instrument records pressure, temperature and conductivity at regular intervals. On the basis of these data, precise variations in water level can be calculated.

The instrument consists of a high precision quartz pressure transducer, an electronic board, a Data Storage Unit, wiring and hardware, all fastened to the top end plate and housed in a cylindrical pressure case.

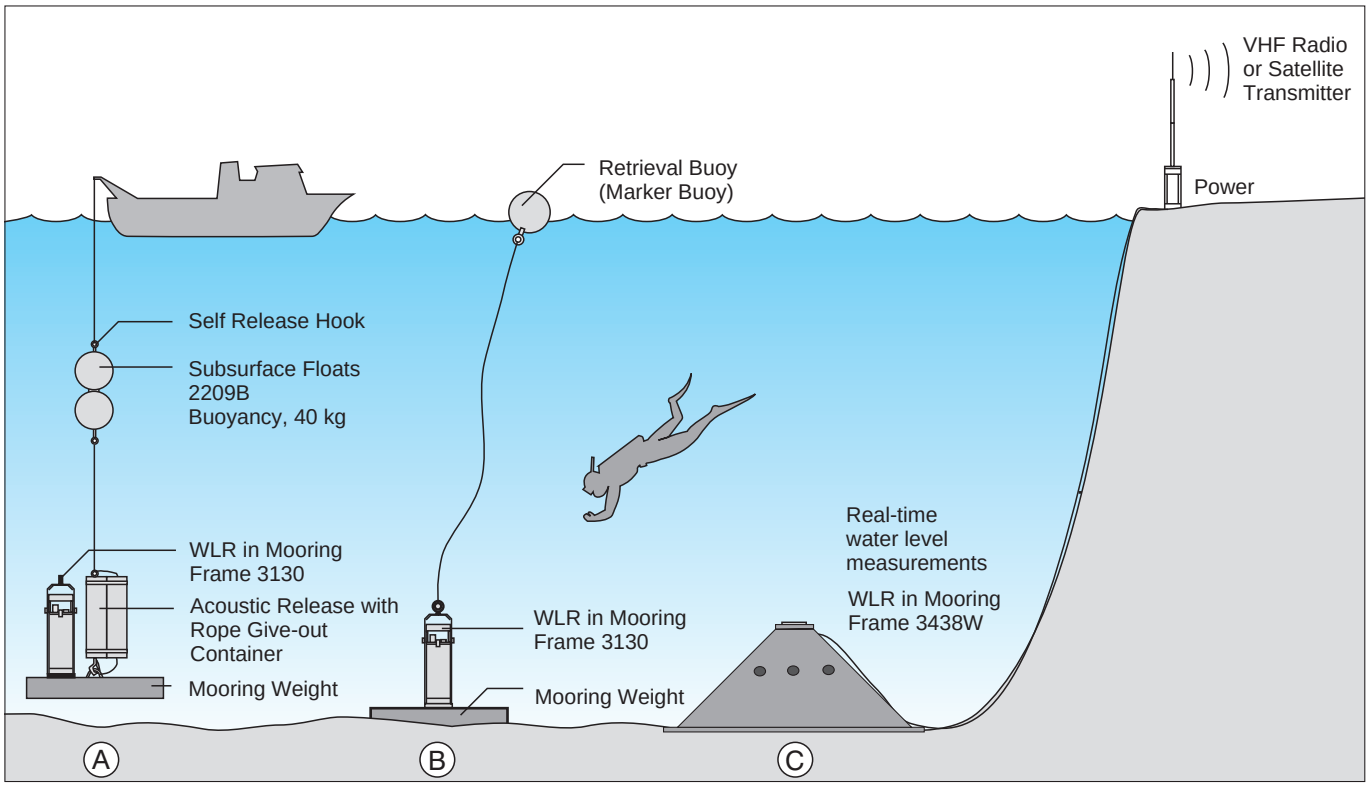
A measurement cycle, triggered by a high precision clock, starts with a forty seconds integration time of the pressure measurements. This eliminates pressure fluctuations due to waves. When the integration is completed, the data words are recorded. The first data word is a fixed reference reading followed by the temperature of the ambient water. The pressure is recorded as two ten-bit words and finally a ten-bit word for the water conductivity (optional sensor).

The data is stored in the Data Storage Unit (DSU) 2990 or 2990E which also records the time of the first measurement and subsequently the time of every first measurement after midnight. The data is simultaneously transmitted acoustically into the sea by keying on and off a 16.384 kHz carrier. These acoustic signals can be monitored at the surface using a Hydrophone Receiver 3079. The acoustic transducer is standard on the WLR 7 model but optional on the WLR 8 model.

On the high seas, the influence of barometric pressure on water level measurements is negligible. A depression or elevation of the sea surface relative to the pressure will compensate for changes in the measurement due to air pressure.

A deep sea version, designated WLR 8, has a pressure case able to operate down to 6000 meters depth. The WLR belongs to a family of instruments that utilize the same recording format and the same data reading system. Other members of this family are Recording Current Meter RCM 7, Temperature Profile Recorder TR 7 and Automatic Weather Station 2700.

TYPICAL MOORINGS



Drawing A shows deployment of the WLR mounted in Mooring Frame 3130 and an acoustic release device which makes instrument retrieval possible from all depths. The device will respond to an acoustic signal from the surface. The installation is lowered onto the seabed by means of a winch with a self-releasing hook. This system is recommended for areas with heavy sea traffic.

Drawing B shows the WLR placed on the seabed. A diver can retrieve the WLR by loosening two fastening knobs on the mooring frame. This allows repeated measurements from the same location since the frame remains in place and only the WLR is brought to the surface for data retrieval.

Drawing C shows an arrangement used in shallow waters that permits real-time telemetry of data brought ashore by a cable. The same cable can also power the WLR from batteries or mains from land. Data can be transmitted further via VHF/UHF radio, satellite or telephone communication.

SPECIFICATIONS FOR WLR 7 and WLR 8

Measuring system:
A digital system based on counting pulses from a sensor with frequency output. Five channels are measured in sequence and a ten-bit binary word is produced for each channel.
The channels are:

Ch.1. Reference. A fixed reading obtained by hard wiring a shift register inside the electronic board to check the WLR's performance and to identify individual instruments

Ch.2. Temperature.

Sensor type:	The sensor is based on a thermistor controlled oscillator with frequency 2.048–4.096 kHz
Thermistor:	Fenwall GB32JM19
Range:	–3 to +35°C
Resolution:	0.04°C
Accuracy:	±0.1°C
Response time:	30 seconds

Ch.3. and 4. Pressure (10 + 10 bits)

Sensor type:	The sensor is based on a pressure controlled oscillator with frequency 36–40 kHz
Ranges WLR 7:	0 – 700 kPa (60 m) (standard) 0 – 3500 kPa (340 m) (standard)
Ranges WLR 8:	0 – 14MPa (1370 m) (standard) Other ranges on request
Resolution:	0.001% of range
Repeatability:	±0.01% of full scale
Calibration Accuracy:	0.02% of full scale
Integration Time:	40 seconds

The pressure inlet port is 341 mm above the bottom of the instrument for the WLR 7 and 360 mm for the WLR 8
The instrument is calibrated in upright position.

Ch.5. Conductivity (optional)

Sensor Type:	Conductivity Cell 3094 for WLR 7 Conductivity Cell 4094 for WLR 8
Ranges:	0 – 77 mmho/cm (standard) 0 – 42 mmho/cm (on request)
Resolution:	0.1% of range
Accuracy:	±0.25 mmho/cm

Sampling Intervals

Selectable:	MS(ManualStart),1, 2, 5, 10, 15,20, 30, 60 or 120 min.
Accuracy:	Better than ±2 s/day within 0 to 20°C
External Triggering:	A 6 volt pulse to the signal output terminal activates the instrument

Recording System Aanderaa standard type
Data Storage Unit 2990 or 2990E

Data Format:	PDC-4. (Pulse Duration Code 4 s.)
Storage Capacity:	
DSU 2990:	65500 10 bit words
DSU 2990E:	262000 10 bit words

Telemetry Acoustic Transducer

Acoustically:	Acoustic carrier keyed on and off
Frequency:	16.384 KHz ±5 Hz
Detection Range:	Up to 800 m with Hydrophone 3079

Note!
On the WLR 8 the Acoustic Transducer is optional.

Battery

High cap.Bat.3382:	7.2V, 14 Ah, sufficient for 343 days recording of all five channels at 10 minute intervals

Materials and Finish Nickel plated bronze and stainless acid proof steel. Durable epoxy coating

Weight (kg)	WLR 7		WLR 8	
	Net	Gross	Net	Gross
in air:	13.7	19.1	15.2	20.5
in water:	9.2		10.9	

Dimensions (mm)

WLR 7:	432 x OD128
WLR 8:	450 x OD128

Accessories (included)

WLR 7:	Mooring Frame 3130
WLR 8:	Mooring Frame 3371 Weight: In air 3.2 kg, in water 2.7kg Pyramidical Mooring Frame 3438W for WRL 7 (optional)

Packing

Plywood case:	190 x 250 x 600 mm

Spares A set of recommended spares and accessories is included with the instrument

Warranty Two years against faulty materials and workmanship

CONVERSION FORMULA:

General formula for converting raw data into engineering units: $A+BN+CN^2+DN^3$. (A, B, C and D are the calibration coefficients).

Pressure: The depth of water may be calculated from: Depth (m) = $0.001 \cdot (P-AP) \cdot (1/d) \cdot (1/g)$ where P is the total pressure and AP is the atmospheric pressure both in Pascal. d is the density of water and g the earth's gravity in m/s^2 at the actual site of measurement. The N is derived from the readings in channels 3 and 4 (N_3 and N_4): $N = N_3 \cdot 1024 + N_4$.

DECK UNIT 3127

This battery or mains powered unit is recommended to users for checking instrument performance as well as for calibrating purposes. An LCD display shows the decimal number corresponding to the ten bit binary output signal. The unit has an RS-232C output and is furnished with a push button that will trigger one measuring cycle of the instrument.

HYDROPHONE RECEIVER 3079

The hydrophone receiver is used to monitor the acoustic signals transmitted by a moored instrument. The Hydrophone is connected to and powered by Deck Unit 3127 which displays the acoustic signals as a decimal reading. Sensitivity to echoes has been reduced by an echo discriminator and to noise by a noise suppression circuit.

DATA STORAGE UNIT (DSU) 2990.

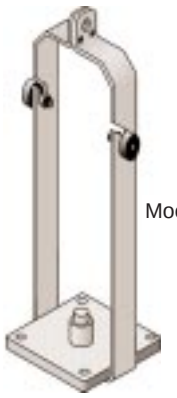
is the standard data storage unit for all Aanderaa recording instruments. This portable, watertight unit stores up to 65500 ten bit, PDC-4 coded words in a set of EEPROMs. The data stored in the DSU is transferred to a computer via a DSU Reader 2995. The real-time clock and LCD display are powered by a built-in battery when the unit is removed from the instrument. An extended version, designated 2990E, storing up to 262000 datawords is also available.

DSU READER 2995

This unit provides a full duplex communication between a computer and the Data Storage Unit 2990. It converts the 0 to –5 volt serial signals associated with the DSU to dual-polarity signals in accordance the RS-232C standard. It also supplies the control voltage for powering the DSU during the read-out process.

DATA READING PROGRAM 5059

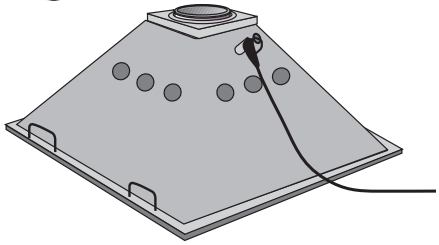
is a new software program that may be used to download DSU 2990 data to a Personal Computer. The program is based on the latest software technology and is designed to be used with Windows 95, Windows 98 and Windows NT.
In addition to enable for downloading and exporting DSU data, it may also be used for data analysis. The 5059 include extensive charting and analysis facilities, and the resulting analysis graphs may be exported for use with other program such as Microsoft Word and Microsoft Excel.
The modern user interface, including drag & drop facilities combined with an extensive built-in Help system makes the 5059 easy to use. A sensor, station and instrument library allows you to build up a library holding configuration and calibration sets for all your instruments. A limited version is supplied free of charge. The full version is available at a moderate cost. Please contact the factory or visit our web site to obtain a 30 day fully functional trial version.



Mooring Frame 3130

MOORING FRAMES P/N 3130 and 3438W (for WLR 7) and P/N 3371 (for WLR 8)

Rugged frames for mooring the Water Level Recorders to the ocean floor which permits vertical stability as well as easy deployment and retrieval. The frames can be mounted on an anchor bar or other structures using four 1/2" bolts. The WLRs are easily installed and removed from the mooring frames.



Mooring Frame 3438W

Representative's Stamp