AWG IV

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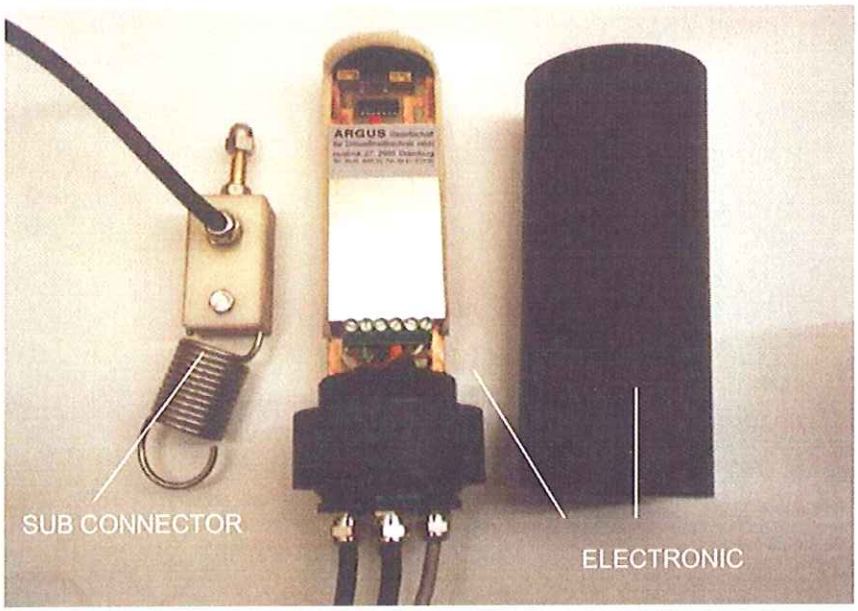
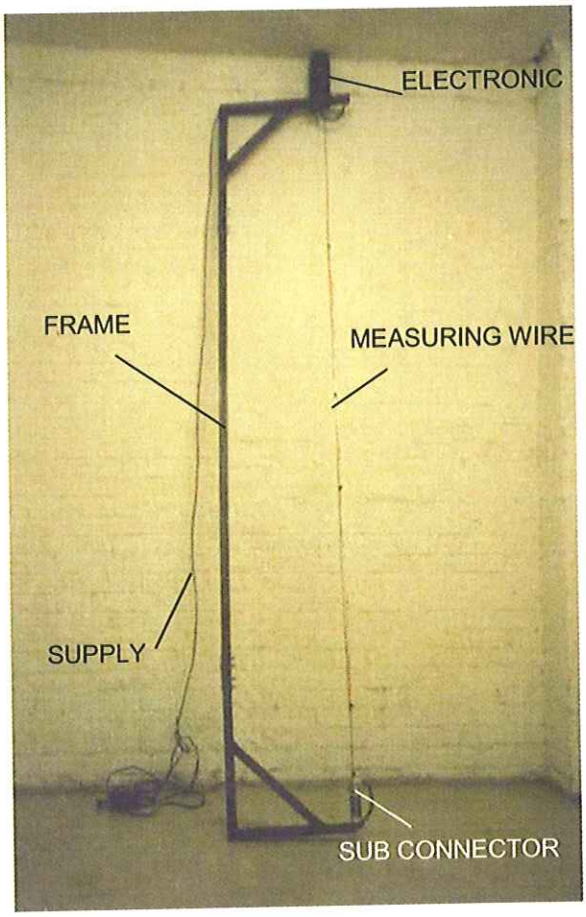


1 Description of the device for AWG IV

In general the device consists of the following elements: a special sensor wire, an electronic unit and a support structure (option). The shipment will be carried out in a disassembled way. After assembling the calibrated version the supply creates a current loop of 0-20 mA, when exposed in water. The actual sensor consists of a special resistant wire with a very low resistance. At this wire an alternating voltage (AC) with app. 1 kHz is fat in. Due to this fact no electrolyse can occur. The current loop is closed via a tracing back wire, which runs inside pipes of the support structure or attached to the mounting post. The measuring wire is spanned between the low end of the support (sub connector) via a pair of tension pliers (socket) and a special contact unit. The wire connection at the electronic housing (head-unit) is carried out in the same way. A stainless steel spring at the "sub-unit" is responsible for the required tension of the sensor wire. The stainless steel support structure is also used as a potential electrode and therefore it should not be isolated in any way. If deployed at harbour areas were electric earth currents can not be avoided (noise) the structure should be mounted isolate to sheet pilings or at measuring posts (not necessary for wood posts).

AWG IV

1.1 Assembly



STANDARD

The standard version comes without support structure but adjusted to a given wire length.

Cut the wire in the needed length. Give two meters more for the tracing back wire. Take the sub unit and fill it with grease. Push the cable through the sub unit inlet and connect it to the inside contact by turning the wire connecting socket screw. Pull on the cable for controlling the connection. Insert the measuring wire into the socket. The sleeve nut has to be tightened up to the point the wire in the socket cannot be turned anymore. Attach the sub unit to the lower frame angle and insert the measuring wire into the socket at the electronic housing. Attach the electronic to the structure as described. Insert the tracing back wire into the electronic casing and connect it to terminals 1 and 2. The electrode cable has to be connected to the structure (support structure or metal post). The instrument is calibrated for a measuring length of 10 m. If any other length is required the wire voltage needs to be readjusted as follows:

a) open the electronic casing

b) connect a true RMS instrument to the wire socket at the head unit and to the contact "sub con 1" at the electronic. Adjust the wire voltage by turning the potentiometer **"wire voltage"** on the back side of the inside electronic cover with the small screwdriver to **200 mV AC.**

AWG IV

OPTION
calibrated versions

a) For a measuring length >=5 meters

If a support frame is needed it has to be sub- divided. If the instrument can not be installed under low water conditions, the lower end of the frame (support structure) together with the pre assembled complete foot contact and measuring wire has to be mounted first. Now the other sub- support frame pipes can be assembled. At least the electronic unit can be added and wired to the system.

Contact preparations
After inserting the measuring wire the sleeve nut of the sub connector socket has to be tightened up to the point the measuring wire cannot be turned anymore. The same procedure has to be done to the socket at the electronic housing. The "head-unit" is now being pulled up to the electronic holder at the top of the frame giving some tension to the spring at the sub unit.

b) For a measuring length <=5 meters

The complete unit can be pre-assembled in the workshop and if required, a zero calibration can be done. (electrically shortcut)

AWG IV

1.2 Function

A galvanic isolated alternating voltage, which is created at the electronic, is detected by the measuring sensor (wire). In parallel to the wire the pipe support structure or a metal post give electrical potential. This "terminal" will be connected with the measuring input device and serves as a detector for the submerged part of the sensor wire due to the tide variation. The signal will be amplified, rectified and filtered. The output level is 0-20 mA DC as a linear function of the water level (0.5m bottom offset). The medium conductivity should be more than 100µS/cm and as homogeneous as possible.

AWG IV

1.3 Technical Data

Temperature	in operation non operation	-10 - +40°C -30 - +70°C
Humidity	foot unit Electronic	watertight up to 2 bar watertight IP65
Energy	Voltage Current Power	standard: +/- 15 V DC option: 11 - 14 V DC standard: +70 mA -20 mA option: max. 250 mA standard: 1,3 W option: max. 3,2 W

1.4 Measuring tolerance

Temperature drift	Electronic	0,004 V/°C
Scaling	Measuring wire	0,04 V/cm 2,5 m wire length 0,01 V/cm 10 m wire length
Resolution	Unit	3 mm

Nortek Vector Velocimeter

High Resolution 3D Current Meter

The Vector was designed from the outset as an integrated open water system. This gives the Vector some unique advantages:

- ✔ **Single-canister system with internal memory and batteries**
- ✔ **Small and light weight**
- ✔ **Titanium probe and plastic canister provides mechanical strength and prevents corrosion**
- ✔ **No moving parts that can be blocked, or sensitive parts that are easily damaged**
- ✔ **Biological fouling does not affect accuracy**

External OBS, conductivity or other analog sensors can be integrated with the Vector using the analog input lines.

Wave directional spectra

The Vector can be configured to sample the high-resolution pressure sensor and the three velocity components at a rapid rate in user specified burst intervals. This type of data, known as "wave triplet data", can be used to calculate the wave directional spectrum or to look at individual wave records for transient phenomena such as ship waves. External analog sensors can be sampled at the same rate as the velocity and pressure.

The core of the Vector is an acoustic Doppler velocimeter, used to achieve accurate and non-intrusive velocity data at rates as high as 64 Hz. The system comes standard with compass, tilt, pressure, and temperature sensors and it can be used both in self-contained and online mode.

Leading oceanographers, coastal engineers, and hydraulic engineers all over the world commonly use the Vector for a wide range of high-resolution applications. The most common uses are:

- ✔ **Studies of surf-zone dynamics**
- ✔ **Turbulence studies in rivers, estuaries, and coastal areas.**
- ✔ **Combined wave and current monitoring**
- ✔ **Boundary layer studies**

In most cases, the Vector is deployed as a self-contained instrument with internal recorder, or operated from an on-line PC. It can also be operated from any third-party controller using RS-232 or RS-422 communication.

For integration with other data acquisition systems the three analog outputs (one for each velocity component) are commonly used.

Ease of Use

The Vector comes standard with Windows software both for real time data collection and for controlling autonomous deployments. Different views and menus guide the user through the process from configuration to data conversion. The software has an on-line help section and requires no special skills.

Statistical analysis of the Vector velocity data can be performed with the Win32 post-processing software ExploreV (Explore for Velocimeters).

Upgrades in the form of new firmware versions from Nortek can be loaded into the Vector using the standard software, removing the traditional need for opening the canister and replacing components.

NORTEK AS

www.nortek-as.com

Water Velocity Measurement

Range	± 0.01, 0.1, 0.3, 2, 4, 7 m/s (software selectable)
Accuracy	± 0.5% of measured value ± 1 mm/s
Sampling rate (output)	1 - 64 Hz
Internal sampling rate	100 - 250 Hz

Sampling Volume

Distance from probe	0.15 m
Diameter	15 mm
Height (user selectable)	5 - 20 mm

Doppler Uncertainty (noise)

Typical uncertainty at 16 Hz	1% of velocity range

Echo Intensity

Acoustic frequency	6 MHz
Resolution	0.45 dB
Dynamic range	90 dB

Sensors

Temperature	**Thermistor embedded in end bell**	
	-Range	-4°C to 40°C
	-Accuracy/Resolution	0.1°C / 0.01°C
	-Time response	10 min
ompass	**Flux-gate with liquid tilt**	
	-Maximum tilt	30°
	Accuracy/Resolution	2° / 0.1°
Tilt	**Liquid level**	
	-Accuracy/Resolution	0.2° / 0.1°
	Up or down	Automatic detect
Pressure	**Piezoresistive**	
	-Range	0-20 m (standard)
	-Accuracy/Resolution	0.25% / Better than 0.005% of full scale

Data Communication

I/O	RS-232 or RS-422
Baud rate	300 - 115200
User control	Handled via Vector WIN32 software, ActiveX function calls, or direct commands
Analog outputs	3 channels standard, one for each velocity component. Output range is 0-5V, scaling is user selectable.

Analog Inputs

No. of channels	2
A/D converter	16 bit
Power source	Battery voltage, 5VDC or 12VDC (please specify)

Software ("Vector")

Operating system	WIN95/98, NT 4.0, WIN2000
Functions	Deployment planning, start with alarm, data retrieval, ASCII conversion. Online data collection and graphical display. Test modes.

Data Recording

Capacity (standard)	2 MB, expandable to 21MB or 78MB
Data record	24 bytes at sampling rate + 28 bytes/second

Power

DC Input	9 - 16 VDC
Peak current	2.5 amp at 12VDC (user selectable)
Max consumption at 64 Hz	1.5W
Typical consumption at 4 Hz	0.6 - 1.0 W
Sleep consumption	0.0013 W
Battery capacity	50 Wh
New battery voltage	13.5 VDC
Data collection capacity	Refer to planning section in software

Connectors

Bulkhead (Impulse)	LPMBH-8-FS (bronze, titanium optional
Cable	LPMIL-8-MP on 10-m polyurethane cable

Materials

Standard model	Delrin housing. Titanium probe and screws

Environmental

Operating temperature	-5°C to 45°C
Storage temperature	-15°C to 60°C
Shock and vibration	IEC 721 - 3 - 2
Pressure rating	300 m for canister. Pressure sensor can tolerate depths of 1.5 x pressure range.

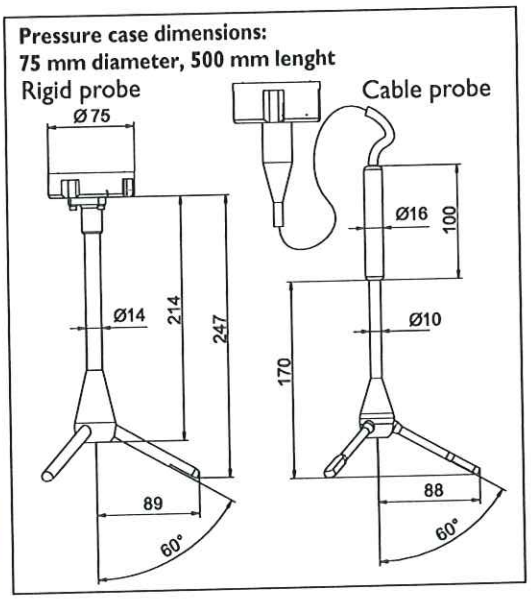
Dimensions

Cylinder	Diameter: 75 mm Length: 550 mm or 450 mm
Weight in air	5.0 kg
Weight in water	1.5 kg

Options

Acoustic beams	Probe mounted on fixed stem or on 2-m cable (see drawing)
Battery	Lithium and Rechargeable Ni-Mn available
External battery	4 battery packs in 75mm diameter, 500mm lenght. External canister

Pressure case dimensions:
75 mm diameter, 500 mm lenght



www.nortek-as.com

NORTEK AS
Vangkroken 2
N-1351 RUD
Norway
Tel: +47 6717 4500
Fax: +47 6713 6770
E-mail: inquiry@nortek.no

NORTEKUSA
Tel: +1 858-586 0900
Fax: +1 858-586 0110
E-mail: inquiry@nortekusa.com
www.nortekusa.com