ISM-2000: Inductive Sensing Current Meter and Sea State Probe with Data Logger

THE CONCEPT

The ISM-2000 series is a combination of our truly robust electromagnetic 2-axis current sensors with smart electronics for fast measurements and good noise reduction. Two channels are spare for a compass or a pressure and a temperature sensor.

The internal software allows the combined processing of all sensor signals to obtain process parameters instead of or in parallel to the samples.
All settings and measured data are permanently buffered.

Thanks to its serial interface (EIA485) and addressable devices a number of ISM-2000 can work at one simple cable (and e.g. at one master computer).
Alternatively two analogous outputs can be used for more traditional wiring.

The above mentioned parts, battery packs and sensors for other parameters may be assembled in accordance to customer demands as well.

THE CURRENT SENSOR

Thanks to the absence of moving or especially delicate parts this current sensor can measure permanently in adverse conditions. It is usable in a wide range of conductivity (fresh water as well as sea water with high salinity) and in multi-phase currents too, e.g. on the shore.

Suspended material and air in the water hinder here the use of other technologies.

The shape of the sensor allows measurements near to the ground or walls too.

An anti-fouling layer at the sensing parts and construction elements made from sea water resistant brass (optional titanium) together with a good tolerance against biological attack ensure long-time measurements with acceptable maintenance periods.

The working principal:

The sensing element produces an alternating magnetic field in its environment.
Free charge carriers inside the flowing water pass this magnetic field near the sensor and are separated by the *Lorentz* force $\mathbf{F}=q(\mathbf{v}\mathrm{x}\mathbf{B})$ until the equality to the electro-static force $\mathbf{F}=q\mathbf{E}$ is reached, resulting in an electric field $\mathbf{E}=\mathbf{v}\mathrm{x}\mathbf{B}$.

In this field a voltage between two electrodes in a distance *a* may be measured:

$$U=kavB$$

with k being the sensors constant. This is true for two orthogonal pairs of electrodes.

The internal electronic equipment separates this signal from noise and ensures the linearity between current velocity and output.

STANDARD VERSIONS

ISM-2000
Fast 2-axis current meter with data logger and serial interface (options: compass and analogous outputs)

ISM-2000M
Probe with current-, pressure- and temperature- sensors for current-, sea-state- and level-measurements

Properties of ISM-2000M

The device is constructed for shallow water applications with firm mounting.
It computes the measured values of flow, pressure and temperature so that the parameters flow, water level (provided that the air pressure is measured at a nearby location at the same time), waves (-height, -period and -direction) as well as temperatures can be determined.

Sliding averaging:
computed over 30 min and posted and stored all 10 min (capacity 1.300 records).

vx	mean current velocity component x
vy	mean current velocity component y
p	mean pressure
WT	water temperature
Hmax	maximal wave height
H1/3d	significant wave height
TH1/3d	mean period of the 33% highest waves estimated with the zero-down-crossing method
Rwe	mean wave direction

Burst measurements:
All 3 hours data are stored for 30 min. with the sampling rate chosen:

vx	Instantaneous value of the velocity compon. x
vy	Instantaneous value of the velocity compon. y
p	Instantaneous value of the pressure

Software options:

The calculations inside the ISM-2000M can be modified to customer preference.

Operator software

The devices of ISM-2000 series can be operated via its serial interface.

With a simple ASCII protocol the different operating modes can be adjusted and data can be read out. This enables an operation of any computers and operating systems.

Programmes for IBM compatible PC on the DOS and WINDOWS® level are standard. Under DOS one works with the ASCII protocol.

For a more convenient handling with the ISM-2000 a comfortable WINDOWS® terminal program was developed for.

Up to three devices (different versions too) can hereby be operated at a serial bus. The following functions are implemented:

Settings:
Programme settings (address, baud rate, etc.)

Restart ISM:
Synchronous start of measurement of the connected devices

Get:
Cluster of the commands which fetch data of the sensor (header, measured values, calibration values, date/time, address, serial number, baud rate, firmware version)

Set:
Cluster of the commands which patch settings of the sensor (Measuring mode, calibration values, date/time, device address, baud rate, and password)

Offline graphic:
Reading of memory, creating an ASCII file (measuring time, measured values) and graphics

Online graphic:
graphic representation of the measured values during the current operation; creating of an ASCII file (measuring time and measured values)

Context-dependent notes appear in a status window. Together with the extensive validity tests false operations are nearly impossible.

Key data of the ISM-2000 (M)

Discus-∅:	84 mm
Shaft length:	170 mm
Cylinder-∅:	90 mm
Cylinder length:	170 mm
Length over all:	430 mm
Weight:	≈ 4 kp
Power supply:	9..36 Vdc
	<3.8 VA
Sampling rate:	1/600-8/s
Mean values:	1..3600 sliding

2-axis current meter
Type:	inductive
Measuring range:	± 3 m/s
Resolution:	1 mm/s
Accuracy:	± 1%

Compass
Type:	fluxgate
Measuring range:	0..360°
Resolution:	1°

Pressure sensor (M)
Type:	piezoresistive
Measuring range:	1..2 bar
Resolution:	0.1 mbar
Accuracy (in 0-25°C):	2.0 mbar

Temperature sensor (M)
Type:	PT100A
Measuring range:	-2..+28°C
Resolution:	0.01 °C
Accuracy:	0.10 °C

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hs engineers

Dr.-Ing. Helmut Schlüter VDI
Hortensienhof 3
D-18107 Lichtenhagen
GERMANY

Tel.:   +49 (0) 381-7 61 20 10
Fax: +49 (0) 381-7 61 20 11

E-Mail: info@hs-engineers.de
Internet: www.hs-engineers.de