



KAPTOR MULTI

MULTI-PURPOSE DATALOGGER FOR MEASUREMENT IN FULL PIPES AND OPEN CHANNEL

Long life battery system of measurement, acquisition and transmission of flow for water network and sewerages

With **KAPTOR MULTI** B.M. Technologie Industriali developed and introduced in water flow Measurement Market the first multi-purpose Data Logger for measurement in full pipes and open channels. **KAPTOR MULTI** is a Data Logger developed for measuring in water networks, aqueducts and sewerages. Depending on the applications, it can be equipped with the module **TTFM KAPTOR** or **OCM KAPTOR**.

The two different modules, combined together with the analog and digital inputs of KAPTOR MULTI, can acquire pressure, level and flow from external sensors/units to suit every application in water market. **KAPTOR MULTI** has a rechargeable battery LiFePO4 38 Ah lasting up to one year and it can be powered by a universal mains too.

It acquires data on an internal 4 Mb memory and on an external 4Gb SD Card: the acquired data, together with the diagnostics signals, can be remotely transmitted through a built-in GSM/GPRS modem. The IP68 protection grade of the Data Logger unit and of its modules, complete the excellent performances of this device. The advanced configuration menu can guide in a few steps, through a display and a keypad, even a few experienced operator on about how to use **KAPTOR MULTI**.

A sophisticated diagnostic system, with a smart user interface, allows the user to understand quickly if the measurement is correct and, if not, to identify what the problems are. The Data Logger includes the software **HydroFlux**, developed for the advanced management of the acquired information, it allows the creation of master data, tables and graphs, it imports and exports them. **KAPTOR MULTI** is compatible with hydraulic softwares Waterguard and Channelguard.

FLOW RATE MODULES FOR KAPTOR MULTI

TTFM KAPTOR is the **Ultrasonic** Flow Meter module, using clamp-on external sensors or insertion sensors for flow measurement.

OCM KAPTOR is the **Doppler** Flow Meter module, using wedge sensors on Open Channels and insertion sensors on full or part filled pipes.

Main Features

- ✓ Flow measurement in full pipes and open channels
- ✓ TTFM KAPTOR: Ultrasonic Technology
- ✓ OCM KAPTOR: Doppler Technology
- ✓ Protection Grade IP68
- ✓ Battery life: up to 1 year, expandable
- ✓ Compact and easy to install
- ✓ Digital and analog inputs for external sensors
- ✓ Data acquisition on internal memory and SD Card
- ✓ Data transmission to a remote system via GPRS
- ✓ Software "HydroFlux" for data management and configuration

Main Applications

- ✓ Search for Water Losses in Acqueduct
- ✓ Search for Extraneous Waters in sewerages
- ✓ DMAs – District Metered Areas
- ✓ Check of fire system
- ✓ Calibration of Numerical Models
- ✓ Measurement campaigns on Long and Short Periods in Acqueduct and Sewerages
- ✓ Water Balance
- ✓ Pumping Station Control
- ✓ Waste Water Treatment Plants
- ✓ Hydroelectric Power Stations
- ✓ Industrial Processes Monitoring



DALOGER KAPTOR^{MULTI}

I/O	
Analog Inputs	1 analog input 0..10V. 1 analog input 4..20mA.
Digital Inputs	4 digital inputs opto-isolated (for water meters).
Serial Port RS232	For programming, firmware update and data download.
RS485 port with mains supply	For TTFM KAPTOR e OCM KAPTOR .
POWER SUPPLY	
Internal Battery	LiFePOH da 38Ah rechargeable.
External Power Supply	Low tension: 11÷24V _{AC/DC} . High tension by AC/DC converter: 90..240V _{AC} ~ 60/50Hz.
External Battery	Up to 2 rechargeable external batteries 38 Ah each.
Consumption	Max in transmission: 200mA @ 13,2V. Min. in low power 0,39mA @ 13,2V.
DATA ACQUISITION MEMORY	
Internal Flash Memory	4 MB - 262144 records.
SD Card	4GB.
REAL TIME CLOCK	
Real Time Clock	Buffered with internal battery.
MODEM and SIM CARD	
Band	QuadBand GSM/GPRS: 900/1800 e 850/1900 MHz.
Standard	Compatible with controls AT standard 07.07 e 07.05.
SIM Holder	Externak Access.
ANTENNA	
Mounting	Ground plane independent.
Polarity	Linear (upwards).
Frequency	824 – 960/1710-2170 MHz.
Gain	2dBi.
Cable lenght	1,5 m.
DISPLAY and KEYBPAD	
Number of digits	2 lines x 20 digits backlit.
System Languages	Italian and English.
N.° of keys	12 alphanumeric keys, 8 function keys.
AMBIENTAL	
Temperature	-10°C ~ +50°C (14°F ~ 104°F).
Protection Grade	IP68.



MECHANICAL	
Case/Material	Black Case. PA66 loaded.
Dimensions and weight	L300 x P249 x H196 mm. 10 Kg (batteries included).
COMPLIANCE STANDARDS CE	
Compatibility/Electromagnetic Immunity	EN 61326-1: 2006-05. ETSI EN 301 489-17: V1.2.1.

FLOW RATE ULTRASONIC MODULE - TTFM KAPTOR

Performances	Accuracy: $\pm 1.0\%$ (dopo taratura). Linearity: 0.5%. Ripeteability: $\pm 0.2\% \sim 0.5\%$.
INTERFACE	
RS485	ModBus standard.
PIPES	
Materials	Carbon steel, Stainless Steel, Cast Iron, Ductile Iron, Copper, PVC, Aluminum, Concrete, Fiberglass and many other materials. The flow can be measured on pipes with an inner lining by selecting the liner material and thickness in a dedicate menu.
Internal diameter	Up DN15 to DN6000 mm.
Hydraulic conditions	The upstream straight section must be greater than 10 diameters, the downstream section, greater than 5 diameters.
MEASURABLE FLUIDS	
Type	Drinking water, sea water, kerosene, gasoline, fuel oil, oil, propane -45 °C, butane 0 °C ... any liquid that spreads ultrasounds.
Suspended Solids	Up to 20000 ppm (mg/l) with a few air bubbles.
TYPE OF ULTRASONIC TRANSITE TIME SENSORS	
Type	<p>Clamp-on standard (external pipe's surface):</p> <ul style="list-style-type: none"> • TS2-NG-KAPTOR for DN15..100 mm with work frequency 1,5 MHz • TM1-NG-KAPTOR for DN50..1000 mm with work frequency 1 MHz • TL1-NG-KAPTOR for DN300..6000 mm with work frequency 0,6 MHz <p>Temp.: -20°C ~ +90°C - Vel. Max.: +/-16mt/sec</p> <p>Clamp-on for high temperature applications (external pipe's surface):</p> <ul style="list-style-type: none"> • S1-HT-KAPTOR per DN15..150 mm • M1-HT-KAPTOR per DN50..700 mm <p>Temp.: -30°C ~ +160°C - Vel. Max.: +/-16mt/sec</p> <p>Insertion type:</p> <ul style="list-style-type: none"> • B(45)-1-NG-1"-KAPTOR DN50..2000 and pipe thickness ≤ 100 mm • B(45)-2-NG-1"-KAPTOR DN50..2000 and pipe thickness ≥ 100 mm <p>Temp.: -20°C ~ +130°C - Vel. Max.: +/-16mt/sec - Press. Max: 20 Bar.</p>
Mounting methods	"N", "W": pipes DN \leq 32 mm.



	"V": pipes DN40..800 mm. "Z": per tubazioni con DN≥300 mm.
Cable length	5 m extendable with 5 m extensions (Max. 200 m).
Protection Grade	IP68.
MEASURING UNITS	
Metrical/Imperial	m ³ , l, USGal, UKGal, millionUSGal, cubic feet, barrels oil US, barrels oil UK/ sec, min, hours, days.
OUTPUTS	
Current	Active Current Loop 4-20mA - 100 Ω @ 12 VDC.
OCT	Output freq. Open Collector: 12 ~ 9999 Hz o allarms.
Releys	Output Relay 1A/125VAC or 2A/30VDC for totalizer pulse alarm.

FLOW RATE DOPPLER MODULE - OCM KAPTOR

TYPE OF SENSORS AND APPLICATIONS

Wedge sensors	Installation on the channel bottom. Suitable for Open Channels with regular or irregular shape, small or medium.
Insertion sensors	Installation on every kind of pipe, of any material or diameter.

MEASURABLE FLUIDS

Type	Water or any other fluid with chemical compatibility with the pipe or sensors materials, with a minimum amount of 100 ppm, suspended solids > 0,06 mm.
Temperature	-10°C ~ +50°C.
Pressure	Max. 4 Bar.

DOPPLER AREA VELOCITY SENSOR

Frequency	1 MHz.
Mesuring range	+/- 6 mt/sec.
Accuracy	+/- 1% of reading or +/- 0,03 mt/sec.
Drift	100 % stable.
Material	Polyurethane, INOX 1.4471, epoxy resin.
Cable length	30 mt extendable up to 100 mt.
Protection	IP68.

BUILT-IN HYDROSTATIC LEVEL SENSOR

Measuring range	0...3500 mm c.a.
Accuracy	< 0,5 % full range.
Drift	Max. 0.75 % full range.

INTERFACE

RS485	ModBus.
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MECHANICAL

Dimensions and weight	4 Kg (with 30 cable).
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KAPTOR_{MULTI} - BASIC EQUIPMENT

Quantity	Description
1	KAPTOR_{MULTI}: Data Logger for pipes and open channel measurements. Rechargeable batteries 38 Ah – SD Card - RS232 – Modem GPRS – Internal Memory 262144 records - 2 AI - 4 DI.
1	ANTENNA-KAPTOR Multi-band Antenna, IP68, pre-connected, IP68, 1,5 mt cable.
1	SD Card 4 GB.
1	HydroFlux: Software for configuration and data management.
1	User's Manual
1	EXTRA BATTERY PACK Input 110-240VAC with IP68 connector.

TTFM KAPTOR - BASIC EQUIPMENT

Quantità	Description
1	TTFM KAPTOR: Ultrasonic transit time Flow Meter module for full pipes. Interface RS485 – Power supply 8..24V. Input for clamp-on or insertion sensors. Box IP68.
1	TS2-NG-KAPTOR Pair of clamp-on transit time sensors. For pipes DN15..100 - Temp.: -20°C ~ +80°C - Max. Speed: +/-16mt/sec. IP68. Cable length 5m.
1	TM1-NG-KAPTOR Pair of clamp-on transit time sensors. For pipes DN50..1000 - Temp.: -20°C ~ +80°C - Max. Speed: +/-16mt/sec. IP68. Cable length 5m.
1	TGA-TTFM Pack of Acoustic Couplant gel
1	CMS-CLAMP-1000 Mounting Kit with chains for a fast clamp-on sensors installation. For pipes up to 1 mt diameter.
1	RC-20-“Z” Waterproof Paper Roll for “Z” type mounting of clamp-on sensors. Wiegth: 0,3 Kg - Height: 0,3 m - Length: 20 m.



OCM KAPTOR – BASIC EQUIPMENT

Quantity	Description
1	OCM KAPTOR SENSOR Doppler Flow Meter module for open channels, Wedge sensor with built-in level measurement. Interface RS485 – Power Supply 8..24V. Box IP68.
1	Mounting Collar for pipes DN200...800

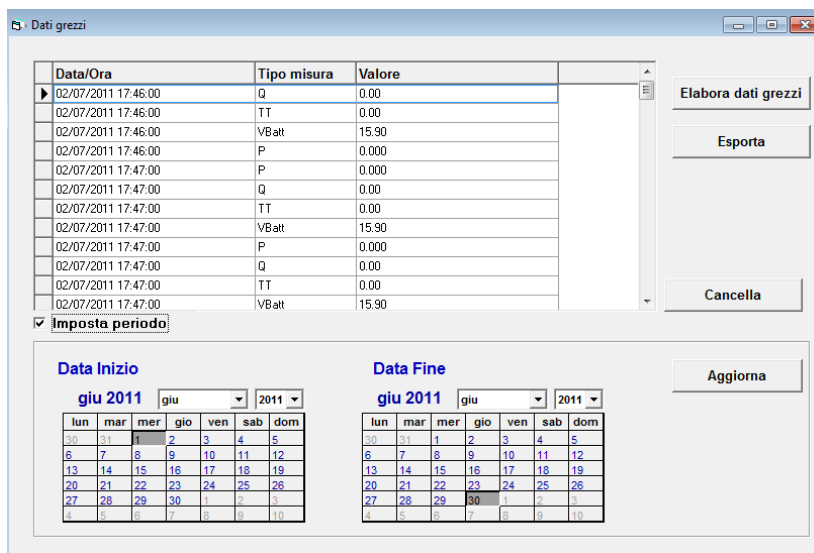


HydroFlux is a software developed by B.M. Tecnologie Industriali for the configuration and advanced data management of **KAPTOR MULTI**. It is part of the standard supply of **KAPTOR MULTI**.

With **HydroFlux**, it is possible to set all the parameters by using the user interface and a laptop/PC connected to **KAPTOR MULTI**. It is possible to enter the users receiving alarms, select the plant and the DMA's name, set-up the data transmission, the sampling time and logger parameters, etc...

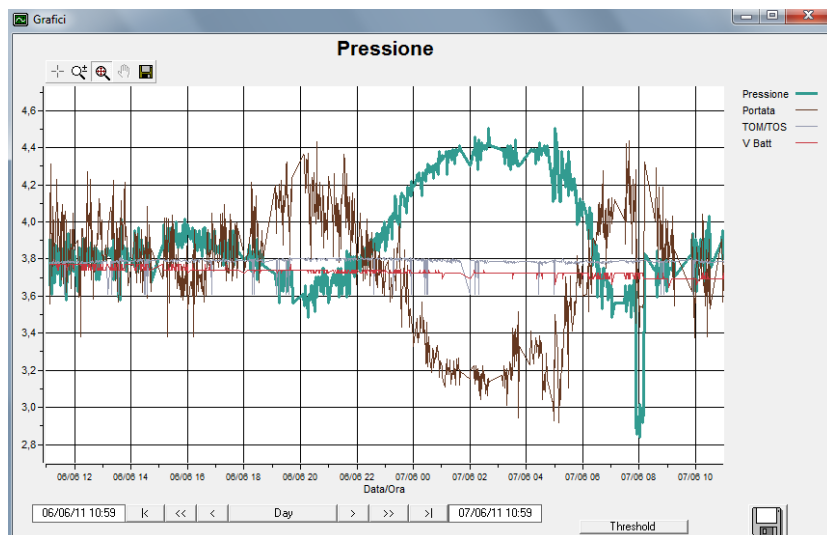
HydroFlux can create measuring stations to link the data downloaded from a **KAPTOR MULTI**. Data can be processed to be displayed in diagrams and charts: in this way their trends could be easily checked and data could be easily transferred.

With **HydroFlux**, data can be downloaded from the internal memory of **KAPTOR MULTI** with the serial port or with a USB Pen Drive.



Data/Ora	Tipo misura	Valore
02/07/2011 17:46:00	Q	0.00
02/07/2011 17:46:00	TT	0.00
02/07/2011 17:46:00	VBatt	15.90
02/07/2011 17:46:00	P	0.000
02/07/2011 17:47:00	P	0.000
02/07/2011 17:47:00	Q	0.00
02/07/2011 17:47:00	TT	0.00
02/07/2011 17:47:00	VBatt	15.90
02/07/2011 17:47:00	P	0.000
02/07/2011 17:47:00	Q	0.00
02/07/2011 17:47:00	TT	0.00
02/07/2011 17:47:00	VBatt	15.90

HydroFlux provides a graphical display of data too, for an easy check of their trends.



It is possible to select the time interval for and the data to be displayed: Pressure, Flow, TOM/TOS,

With **HydroFlux** the user can configure **KAPTOR MULTI** by using a PC: GPRS variables, to allow the device a remote data transmission to a web portal; and DataLogging configuration for serial connection.

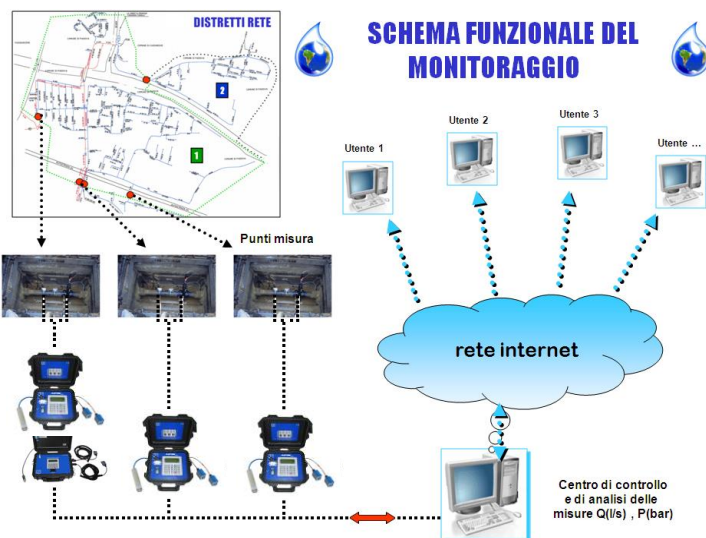
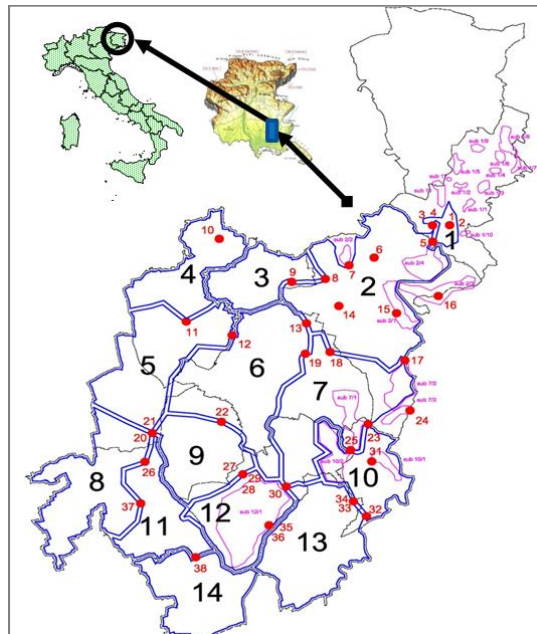
Last but not least, it is possible to set-up general parameters such as: analog inputs calibration or read, set and delete DMAs and measuring stations from the in internal memory of the device.



KAPTOR MULTI is compatible with the hydraulic software **WATERGUARD** for water losses management in water networks.

WATERGUARD is an basic tool for DMAs (District Metered Areas) by using pressure and flow rate measurements to manage and reduce water losses in water networks.

WATERGUARD receives signals sent by any measuring device (of flow rate, pressure, power absorption, power consumption, any signal related to an electrical impulse) by GPRS/GSM technologies. Data are analyzed and validated; in this way the user can optimize the management of the water network and choose how to act to reduce water losses and, for example, the power consumption of pumping stations. The system is based on the data collection from the measuring devices, by using Data Loggers with GPRS/GSM modem. Data are collected and remotely sent to a server located in the customer's facilities or in the web farm of BM TECNOLOGIE INDUSTRIALI.



Incoming data (RAW DATA) are saved and classified in an Oracle data base. A copy of the raw data is always saved in the system. Then, raw data are analyzed to check if they are continuative, suitable and if there are errors or troubles. After this first check, they are processed by default o by rules defined by the operator.

The system is opened, so new rules can be defined by the user in any moment in a dedicated **WATERGUARD** window. When data are elaborated or validated, they are saved in an Oracle data base, as it happened for the raw data.

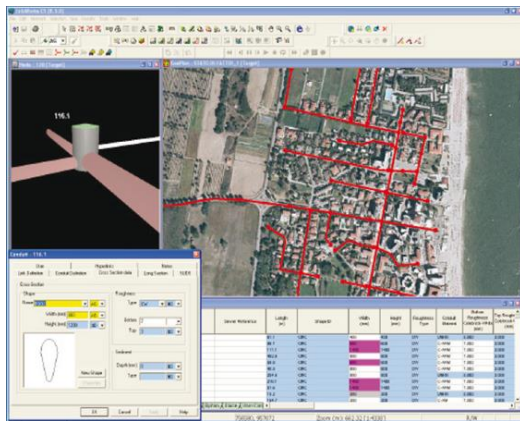
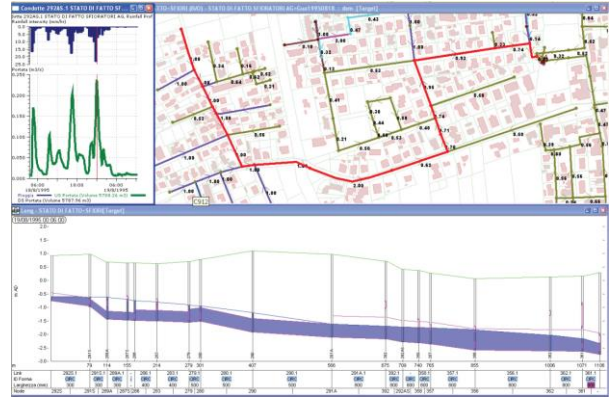
WATERGUARD is an user friendly software and is composed of windows to help the operator.

It has a GIS system too: it is possible to upload all the information about the water network features and the installed devices in a geographical reference.



KAPTOR MULTI is compatible with the hydraulic software **CHANNEL GUARD** © for the analysis of sewer networks.

This software receives and saves the data sent from the measuring points, using an Oracle data base. After receiving the data, the software checks and validates them, reporting any error. Validation is based on threshold values, respecting the flow rate curves of the measuring point and any validation procedure the Water Company needs, as it is a free software. Everything is supported by a GIS system that, besides a geo-reference of all the data, allows an easy management of the cartographic elements. The software has a historical recording of the data. It allows to manage raw data sent by the monitoring devices, treated, validated and historical data.



Channel Guard, besides giving the flow rate and volume values of each single measuring point, permits to create water balances, considering the different concentration times. The software can also manage the data coming from rain gauges in order to correlate weather events and flooding that could happen in the sewer networks.

Numerical models, if correctly calibrated with the sewer flow rate measurements, will be able to verify the behaviour of the sewer network in case of anomalies or floods and to test the sewer network if new parts are going to be built, if spillways are going to be set or closed, if rain water storage tanks or flywheels are used, if existing pumping stations are enhanced or new ones are built, etc.

Main Functions:

- Hydrologic and hydraulic calculations are fully integrated
- Different methods of hydrological calculations are available
- Unsteady hydraulic calculation, an essential approach to simulate the real behaviour of the drainage systems
- Analysis of the flooding events. The water, when it goes out the collecting system, is represented by a bi-dimensional module taking into account the position of the soil, the obstacles, etc.
- Simulations of complex handmade objects: spillways, siphons, lifting, storage tanks, etc.
- The calculation is possible even for wide networks
- Drawing of the inputs of groundwater in the sewer network