



KAPTOR MULTI

**MULTI-PURPOSE
DATALOGGER IP68
WITH DATA
TRANSMISSION**

*Flowrate Measurement,
Acquisition &
Transmission System
for Water & Sewerage
Networks with long-life
batteries*



TECHNICAL DATASHEET

Vs.5



With **KAPTOR MULTI** B.M. Tecnologie Industriali developed and introduced in the 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 40 Ah lasting up to one year and it can be powered by a universal mains too. It acquires data in an internal 4 Mb memory (266144 data acquisition) and in an external 8Gb SD Card.

The acquired data, together with the diagnostics signals, can be remotely transmitted through a built-in GSM/GPRS modem. The IP68 protection rate 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.

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 on full pipes.

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

Main Features

- ✓ Flow measurement in full pipes and open channels
- ✓ TTFM KAPTOR: Ultrasonic Technology
- ✓ OCM KAPTOR: Doppler Technology
- ✓ Protection Rate 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 Aqueduct and Sewerages
- ✓ Water Balance
- ✓ Pumping Station Control
- ✓ Waste Water Treatment Plants
- ✓ Hydroelectric Power Stations
- ✓ Industrial Processes Monitoring



DATALOGGER KAPTOR <small>MULTI</small>	
I / O	
Analog Inputs	1 x analog input 0..10V. 1 x analog input 4..20mA.
Digital Inputs	4 x digital inputs opto-isolated (for water meters).
Serial Port RS232	For programming, firmware update and data download.
RS485 port with mains supply	For TTFM-V18-KAPTOR & OCM-KDO-KAPTOR modules connection.
POWER SUPPLY	
Internal Battery	LiFePOH da 40Ah – 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 40 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	8GB.
REAL TIME CLOCK	
Real Time Clock	Buffered with internal battery.
MODEM and SIM CARD	
Band	QuadBand GSM/GPRS: 900/1800 e 850/1900 MHz.
SIM Holder	External Access.
ANTENNA	
Mounting	Independent from earth
Polarity	Linear (upwards).
Frequency	824 – 960/1710-2170 MHz.
Gain	2dBi.
Cable lenght	1 m.
DISPLAY and KEYBPAD	
Number of digits & Keys	2 lines x 20 digits backlit - 12 alphanumeric keys, 8 function keys.
System Languages	English and Italian.
AMBIENTAL	
Temperature	-10°C ~ +50°C (14°F ~ 104°F).
Protection Grade	IP68.
MECHANICAL	
Case/ Material	Black Case - PA66 (filled).
Dimensions and weight	L300 x W249 x H196 mm10 Kg (including batteries)
COMPLIANCE STANDARDS CE	
Compatibility/Electromagnetic Immunity	EN 61326-1: 2006-05. ETSI EN 301 489-17: V1.2.1.




FLOW RATE ULTRASONIC MODULE - TTFM100-V18-KAPTOR	
Performances	Accuracy: $\pm 1.0\%$ (after calibration). Linearity: 0.5%. Ripeteability: $\pm 0.2\% \sim 0.5\%$.
INTERFACE	
RS485	ModBus standard.
PI P ES	
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	From DN15 up 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 TRANSIT TIME SENSORS for FULL PI P ES	
Type	<p>Clamp-on standard sensors (external pipe's surface):</p> <ul style="list-style-type: none"> • TS2-NG-05-KPT for DN15..100 mm with work frequency 1,5 MHz • TM1-NG-05-KPT for DN50..1000 mm with work frequency 1 MHz • TL1-NG-05-KPT for DN300..6000 mm with work frequency 0,6 MHz <p>Temp.: -20°C ~ +90°C - Max. Fluid Speed: +/-16mt/sec</p> <p>Clamp-on sensors for high temperature applications (external pipe's surface):</p> <ul style="list-style-type: none"> • S1-HT-05-KPT per DN15..150 mm • M1-HT-05-KPT per DN50..700 mm <p>Temp.: -30°C ~ +160°C - Vel. Fluid Speed: +/-16mt/sec</p> <p>Insertion sensors (wetted sensors):</p> <ul style="list-style-type: none"> • B(45)-2-NG-1"-05-kpt DN50..2000 and insertion up to 85 mm <p>Temp.: -20°C ~ +130°C - Max. Fluid Speed: +/-16mt/sec – Max Pressure: 20 Bar – Ball Valve 1"</p>
Mounting methods	"N", "W": for pipes DN \leq 32 mm. "V": for pipes DN40..600 mm. "Z": for pipes DN \geq 600 mm.
Cable lenght	5 m (extensions are available)
Protection Rate	IP68.
MEASURING UNITS	
Metrical/Imperial	m ³ , l, USGal, UKGal, millionUSGal, cubic feet, barrels oil US, barrels oil UK/ sec, min, hours, days.
OUTPUTS (OPTIONAL)	
Current	Active Current Loop 4-20mA - 100 Ω @ 12 VDC.
OCT	Output freq. Open Collector: 12 ~ 9999 Hz o allarms.



Relays	Output Relay 1A/125VAC or 2A/30VDC for totalizer pulse alarm.
AMBI ENT	
Temperature	-10°C ~ +50°C (14°F ~ 104°F)
Protection Rate	IP68
MECHANI CAL	
Case/ Material	Box in Black POM
Dimensions and weight	L110 x W249 x H196 mm – 0.5 kg (excluding sensors cables)
Cable Lengths	1 m with IP68 connector for KAPTOR MULTI. Connection length: 50 cm


FLOW RATE DOPPLER MODULE – OCM-KDO-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 full pipe, of any material or diameter Max. Pressure 4 Bar
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.
Long- Time Error	0%
Material	Polyurethane- PU, INOX 1.4471, epoxy resin.
Cable lenght	10 – 20 - 30 mt depending on the ordering code
Protection	IP68.
Weight	4 kg (including 30 m cable with wedge sensor)
BUILT-IN HYDROSTATI C LEVEL SENSOR	
Measuring range	0..3500 mm c.a.
Accuracy	< 0,5 % full range.
Drift	Max. 0.75 % full range.
INTERFACE	
RS485	ModBus.



KAPTOR _{MULTI} - BASIC EQUIPMENT		
Quantity	Description	Code
1	<p>KAPTOR_{MULTI}: Portable Multipurpose Data Logger KPT/ ML-SDC-V00.0 Data Logger – SD Card 8Gb – Modem GPRS – Inputs: 1 x 4-20 mA, 1 x 0..10V, 4 x DI – Serial Port RS485 – Service Port RS232 - Rechargeable Battery 40 Ah – HydroFlux– IP68 – SD Card 8 GB - Serial Cable RS232 for configuration and data download – DB9F</p>	 000037250




OPTI ONS & ACCESSORIES KAPTOR _{MULTI}		
Quantity	Description	Code
1	<p>Battery Charger for KAPTOR MULTI & External Battery pack CB-KPT-230 VAC/ 8° Input 100..240VAC – 50/60Hz – Output 14,8VDC – 8A</p>	 000001356
1	<p>External Power Supply Cable for KAPTOR MULTI CAE-KPT-05 Length: 5 m including IP68 connector</p>	 000001357
1	<p>Cable for 4 DI KAPTOR MULTI CADI -KPT-05 Length: 5 m including IP68 connector</p>	000001358
1	<p>Cable for AI KAPTOR MULTI CAAI -KPT-05 Length: 5 m including IP68 connector</p>	000001361
1	<p>USB/ RS232 DB9F converter IDATA USB-SER-2 Cable Length: 450 mm</p>	 000033947
1	<p>Universal Plug Adaptor SWA001</p>	 000030366
1	<p>Roll-Up Measuring tape MTR-3.5-AV Length: 3.5 mt</p>	000033962
1	<p>Spare Kit O-ring in NBR for screwing closures: ON/OFF, SD card, SIM SPK-10/ OR-NBR-KPT Pack of 10 spares</p>	000001773





TTFM-V18-KAPTOR - BASIC EQUIPMENT		
Quantity	Description	Code
1	Ultrasonic Transit Time module TTFM-V18-KAPTOR IP68 – Input for 1 pair of sensors DN15..6000 – 4-20 mA Output – OCT Output – Relay Output – RS485 ModBus Communication – Power supply 8..32 VDC	 000004487

SENSORS FOR TTFM-V18-KAPTOR MODULE		
Quantity	Description	Code
1	TS2-NG-05-KAPTOR Pair of clamp-on transit time sensors. For pipes DN15..100 - Temp.: -30°C ~ +90°C Fluid Speed: +/-16m/sec. IP68. Cable length 5m including IP68 connector.	 000037554
1	TS2-NG-05-KAPTOR Pair of clamp-on transit time sensors. For pipes DN15..100 - Temp.: -30°C ~ +90°C Fluid Speed: +/-16m/sec. IP68. Cable length 5m including IP68 connector.	 000037555
1	TM1-NG-05-KAPTOR Pair of clamp-on transit time sensors. For pipes DN50..1000 - Temp.: -30°C ~ +90°C Fluid Speed: +/-16m/sec. IP68. Cable length 5m including IP68 connector.	 000037556
1	B(45)-2-NG-1"-05-KPT Pair of Insertion transit time sensors For pipes DN50..DN2000 – Fluid Speed: +/- 16 m/s – Temp.: -20..+130 °C – IP68 – Max. Pressure:20 Bar – Max. Insertion: 85 mm with ball valve 1" Cable length: 5 mt including IP68 connector for optional extensions.	 000037557
1	S1-HT-NG-05-KPT Pair of clamp-on transit time sensors for high. For pipes DN15..DN150 – Fluid Speed: +/- 16 m/s – Max. Temp.: 160 °C – IP68 – Cable length: 5 m including IP68 connector.	 000037559
1	M1-HT-NG-05-KPT Pair of clamp-on transit time sensors for high. For pipes DN50..DN700 – Fluid Speed: +/- 16 m/s – Max. Temp.: 160 °C – IP68 – Cable length: 5 m including IP68 connector.	 000037561






ACCESSORIES & OPTIONS FOR TTFM-V18-KAPTOR MODULE & SENSORS		
Quantity	Description	Code
1	Cable for outputs connection for module TTFM-V18-KAPTOR CCU-V18-05-KPT Cable length 5m including IP68 connector.	000001739
1	RC-20-"Z" Waterproof paper roll for "Z" method sensors installation. Watermark: 20 mm. Weight: 0,3 Kg/RT - Height: 0,3 m - Length: 20 m	 000031086
1	Coupling paste for ultrasonic transit time sensors GAA-TTFM: EXTENDED TEMPERATURE Pack of 250 g – Type 15.119 MHT	 000028162
1	Mounting Kit with Chains for clamp-on sensors transit time sensors installation CMS-CLAMP-1000 For pipes up to 1 m di diameter. Material AISI304	
1	Mounting Kit with Chains for clamp-on sensors transit time sensors installation CMS-CLAMP-3000 For pipes up to 3 m di diameter. Material AISI304	
1	Mounting Kit with Chains for clamp-on sensors transit time sensors installation CMS-CLAMP-6000 For pipes up to 6 m di diameter. Material AISI304	
1	2 Extensions for transit time sensors for module TTFM-V18-KAPTOR PC-SST-05-KPT Length: 5m including IP68 connector.	000001764
1	2 Extensions for transit time sensors for module TTFM-V18-KAPTOR PC-SST-20-KPT Length: 20m including IP68 connector.	000001765
1	2 Extensions for transit time sensors for module TTFM-V18-KAPTOR PC-SST-50-KPT Length: 50m including IP68 connector.	000001766
1	Seals Spare Kit for module TTFM-V18-KAPTOR SPK-V18-KPT 10 x seals ref. 6 for module TTFM-V18-KAPTOR 20 x dessicant bags 2g	000001774



OCM KAPTOR – BASIC EQUIPMENT		
Quantity	Description	Code
1	Doppler Flowmeter Module with wedge sensor OCM-KDO-10-KAPTOR Protection Rate IP68 – Fluid Speed: +/-6 m/s – Level: 0..3 m w.c. – Temperature: -10..+40 °C – Communication RS485 modbus – Power Supply: 8..32 VDC – Cable length: 10 m.	 000001777
1	Protection Rate IP68 – Fluid Speed: +/-6 m/s – Level: 0..3 m w.c. – Temperature: -10..+40 °C – Communication RS485 modbus – Power Supply: 8..32 VDC – Cable length: 20 m.	000001778
1	Doppler Flowmeter Module with wedge sensor OCM-KDO-30-KAPTOR Protection Rate IP68 – Fluid Speed: +/-6 m/s – Level: 0..3 m w.c. – Temperature: -10..+40 °C – Communication RS485 modbus – Power Supply: 8..32 VDC – Cable length: 30 m.	000001748
1	Doppler Flowmeter Module with insertion sensor OCM-KDO-R007-0-10-KAPTOR Insertion sensor with Hot-Tap installation – Sensor's length: 400 mm – Connection 1"1/2 GAS – Cable length: 10 m	 000001779
1	Doppler Flowmeter Module with insertion sensor OCM-KDO-R007-0-20-KAPTOR Insertion sensor with Hot-Tap installation – Sensor's length: 400 mm – Connection 1"1/2 GAS – Cable length: 20 m	000001780
1	Doppler Flowmeter Module with insertion sensor OCM-KDO-R007-0-30-KAPTOR Insertion sensor with Hot-Tap installation – Sensor's length: 400 mm – Connection 1"1/2 GAS – Cable length: 30 m	000001781




ACCESSORIES & OPTIONS FOR OCM-KDO-KAPTOR MODULE & SENSORS			
Quantity	Description		Code
1	Mounting Collar for velocity/hydrostatic wedge sensors CL-PTF-200/800-A301 Suitable for pipes DN200..8000 – Material : SS 301		000032077
1	Ball Valve for Hot-Tapping removal of insertion sensors B/IM902112 Art.902 ball valve - Material: SS316 – Connection:1"1/2 Type B/IM902112		000033049
1	Telescopic Rod in Aluminium OCP-0Z-TELESKOP-00 Suitable for temporary installation of wedge sensors – Max. extension. 5,5 m		000011377
1	Spare Parts Kit: seals for Module OCM-KDO-KAPTOR SPK-KDO-KPT 10 x seals ref. 7 for Module OCM-KDO-KAPTOR 20 x dessicant bags 2g		00001784
1	Spare Parts Kit: diaphragms for Module OCM-KDO-KAPTOR SPK-MM-KPT 10 x diaphragms with flexible hose 4x6mm in PVC		00001785

PRESSURE MEASURING MODULE FOR KAPTOR MULTI – MP-AI-KAPTOR		
Description		Code
Pressure Transmitter for relative pressure measurement – Piezo - Precision: 0,5% - Output 0..10V @ 3 Wires – Power Supply: 24VDC – Process Connection: ½" GAS DIN 3852. Cable Length: 5 m including IP68 connector		
0..0,10 Bar – TPR331-1000-005-KPT		000037540
0..0,25 Bar – TPR331-2500-005-KPT		000037541
0..0,40 Bar – TPR331-4000-005-KPT		000037542
0..0,60 Bar – TPR331-6000-005-KPT		000037543
0..1,00 Bar – TPR331-1001-005-KPT		000037544
0..4,00 Bar – TPR331-4001-005-KPT		000037545
0..6,00 Bar – TPR331-6001-005-KPT		000037546
0..10,0 Bar – TPR331-1002-005-KPT		000037547
0..16,0 Bar – TPR331-1602-005-KPT		000037548
0..25,0 Bar – TPR331-2502-005-KPT		000037549
0..40,0 Bar – TPR331-4002-005-KPT		000037550
0..60,0 Bar – TPR331-6002-005-KPT		000037551
0..100,0 Bar – TPR331-1003-005-KPT	000037552	



ACCESSORIES & OPTIONS FOR PRESSURE SENSOR MODULE		
Quantity	Description	Code
1	Spare Parts Kit: seals for pressure measurement Module MP-AI-KAPTOR SPK-MP-KPT 10 x seals ref. 7 for Module MP-AI-KAPTOR 20 x dessicant bags 2g	00037566
1	Spare Parts Kit: diaphragm for Module MP-AI-KAPTOR SPK-MMMP-KPT 10 x diaphragms with flexible hose 4x6mm in PVC	000037567

EXTRA BATTERY PACK for KAPTOR MULTI		
Description		Code
External Battery for KAPTOR MULTI EPB-40Ah-KPT Protection Rate IP68 – Capacity: 40 Ah		00037564
Connection Cable for External Battery Pack Kaptor Type CC-EBP-KPT IP68 - LENGTH : 1 MT		00001786



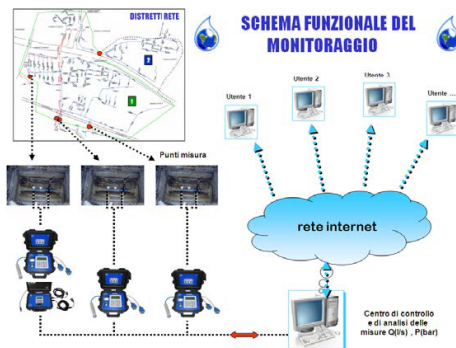
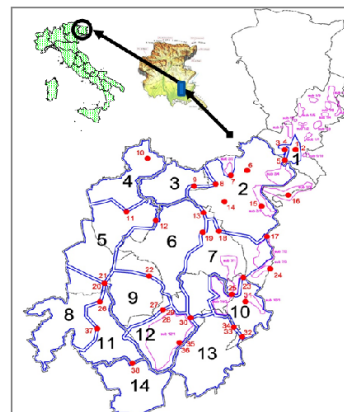
WATERGUARD

Software Features

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

WATERGUARD is a 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.

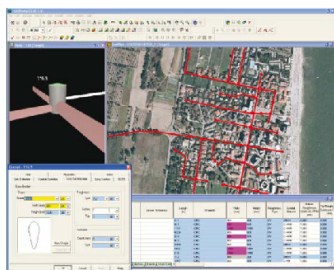
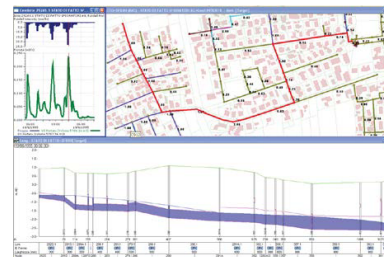
WATERGUARD is an user friendly software and is composed of windows to help the operator.

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