ML-x17 Low Power Data Logger

The ML-x17 data logger is a small, ultra low power, cost effective data logger with built-in 2G, 3G or 4G cellular modem. This small data logger, is further provided with an internal temperature sensor, 8GB micro SD card and a 2FF SIM card slot. The data logger is available with several power provisions a/o: 3.6 Volt Lithium battery, 8..28V DC-input or integrated solar panel with 3 x AA NiMH charger.

The data logger can acquire physical signals by 2 current loop inputs, 2 voltage inputs, 1 potentiometer input and 3 digital inputs. More or special inputs can be added by means of internal stackable option boards/converters.
The data logger is provided with one serial port to capture measurements from ASCII, MODBUS, NMEA or SDI-12 compatible sensors. External sensors can be powered by the data logger itself, to prevent them to consume power while the data logger is a sleep. Up to 8 mathematical channels are available to calculate meaningful engineering values derived from sensor input values (e.g. a polynomial to calculate a flow from a stream level). Supports up to 8 aggregation channels (e.g. to record 2 or 10 minute wind-speed averages sampled at 1Hz). Logged data can be pushed to a central host by HTTP(S), FTP(S), e-mail, secure TCP or MQTT(S) at configurable intervals and optionally by satellite as well (Iridium SBD).

The ML-x17 is available with 5 different cellular modems:
- ML-217: 2G Global
- ML-317: 3G Global with 2G fall-back
- ML-417: 4G Global (LTE-M) with 2G fall-back
- ML-E417: 4G Europe (LTE Cat 1) with 2G fall-back
- ML-N417: 4G North-America (LTE Cat 1)

When equipped with the integrated solar panel a complete self providing remote monitoring station can be arranged, all you need is a data logger and applicable sensor(s). This self providing cellular data logger is costs saving, because you don't need: a) solar panels, b) big batteries, c) cellular modem and d) encapsulating cabinet.

Features

- 2G/3G/4G Cellular Data Logger
- 8GB Data Storage
- Solar, Battery or DC Powered
- 12V@200mA Sensor Excitation
- Analog & Digital Inputs
- Derived Inputs
- RS232, R485 & SDI-12
- ASCII, MODBUS & NMEA-0183
- TCP, FTP(S), HTTP(S), e-Mail, MQTT
- CSV, TXT, JSON & JPG Files
- Alarm Output & SMS
- IP68, IP67 or IP54 Enclosure
- Remote Configuration

Accessories

- Several option boards
- Camera (JPG)
- Iridium Satellite Modem
- GPS Receiver

Specifications

Data Logging

- 1 second to 1 day intervals.
- Regular, alarm and independent intervals.
- Daily operation time bracket (e.g. 07:00AM to 20:00PM or 21:00PM - 06:00AM)
- 8GB micro SD-Card (file storage), 512kB (program storage), 64kB SRAM (runtime memory).

Data push

- 1 minute to 1 day intervals.
- Regular and alarm intervals.
- Direct push on alarm raise and fall.
- Daily operation time bracket (e.g. 07:00AM to 20:00PM)
- Native TXT, JSON or CSV log files by HTTP(S), FTP (S)[1], e-Mail (SMTP) [2], secure TCP (AES-128) or MQTT.
- JPG pictures by HTTP(S), FTP(S), e-Mail , TCP or MQTT.
- SBD messages by Iridium satellite modems (960x)

Alarming

- Alerts by SMS, e-Mail and MQTT.
- Open collector output (max. 100mA sink current)

Internal Sensors

- Battery (voltage and rest capacity)
- Processor temperature
- GSM signal strength

Analog Inputs (12bit resolution & <0.1% FS accuracy)

- 2x current loop inputs (0/4..20mA, 150 Ohm impedance)
- 2x voltage inputs (0..10V)
- 1x potentiometer input (max. 10M Ohm)

Digital Inputs (0..5V)

- 3x state, On-time meter or pulse counter (max. 10kHz)

Serial Input (1x RS-232, RS-485 or SDI-12)

- **SDI-12** (up to 15 devices, max 20 channels per device)
- **MODBUS RTU/ASCII** (read registers from up to 15 slaves)
- **NMEA-0183** (standard and custom sentences)
- **ASCII** (sensors outputting readable lines of numeric values)

Derived Inputs

- **8x calculation channels**, using mathematical operators and functions (a/o cos, sin, atan2, ln, sqrt).
- **8x aggregation channels**, min/max, average, gust, std dev and up to 3 different percentiles sampled at 1Hz max.

Accessory Port (1x RS-232 & 5V excitation, to connect and power a GPS receiver, Iridium SBD modem, JPG camera or TFT-display)

Built-in cellular modem (5 different models)

- **ML-217** 2G (Quad-band GPRS)
- **ML-317**: 3G (Penta-band & Quad-band GPRS fall-back)
- **ML-417**: 4G (LTE-M & Quad-band GPRS fall-back)
- **ML-E/N417**: 4G (LTE-Cat 1 for Europe or North-America)
- 2FF (Class B) SIM-CARD slot.
- Integrated GSM antenna, external GSM antenna optional.

Configuration by:

- USB (local) or secure TCP tunnel (remote)

Power consumption

- 60mA@3.6V average operating[3] current during a duty cycle of less than 1 sec[4] per log interval.
- 250mA@3.6V average operating current during 20 to 60 seconds cellular communication.
- <80uA@3.6V sleep current.
- 12V@200mA excitation to power external sensors.

Power supply (5 different editions)

- **(3)LI** : (3x) 3.6V D-Size SAFT-LSH20 Lithium battery [5]
- **PV** : 1Wp Integrated solar panel and 3x AA NiMH charger
- **SLA** : 12V SLA battery charger and 21VOC solar panel input
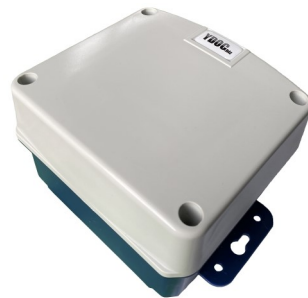- **DC**: 8..28V DC input and integrated 3x AA NiMH charger

Enclosure (6 different covers)

- **(3)LI /SLA/DC**: IP68 (30min@2m), 130x120x85mm, 460g.
- **PV** : IP67, 130x120x125mm, 530g.
- **TFT**: IP54, 130x120x85mm, 600g.
- UV stabilized polycarbonate.
- Wide temperature operating range −30°C to +75°C

1) TLS-Explicit, ML-417 (LTE-M) does not support FTPS.   2) ML-417 (LTE-M) has no e-mail abilities.
3) 60mA if no external sensors need to be powered.   4) <1 sec. if external sensors are responsive and don't require time to "warm up".
4) SAFT LSH20 Lithium or NiMH batteries not included.

Editions

Stock Keeping Unit Table

SKU format:	**ML-x17y-z** (**x=Modem**, **y=Edition**, **z=Power Supply**)
Modem (x)	**Description**
ML-217y-z	Data logger with built in global 2G modem (Quad band GPRS)
ML-317y-z	Data logger with built in global 3G modem (Penta band & Quad band GPRS fallback)
ML-417y-z	Data logger with built in global 4G modem (LTE-M & Quad band GPRS fallback)
ML-E417y-z	Data logger with LTE Cat 1 modem for European bands (B1/B3/B7/B8/20) & 2G fallback (900/1800)
ML-N417y-z	Data logger with LTE Cat 1 modem for American bands (B2/B4/B5/B12) & 3G fallback (850/1900)
Edition (y)	**Description**
ML-x17TFT-z	With 4 analog & 3 digital inputs, serial port & TFT-display cover on accessory port.
ML-x17ADS-z	With 4 analog & 3 digital inputs, serial & accessory port.
ML-x17AD-z	With 4 analog & 3 digital inputs (no serial port, no accessory port).
ML-x17DS-z	With 3 digital inputs & serial port (no analog inputs, no accessory port).
Power Supply (z)	**Description**
ML-x17y-LI	Powered from a 3.6V DC SAFT LSH20 or equivalent D-size lithium battery.
ML-x17y-3LI	Powered from up to three 3.6V DC SAFT LSH20 or equivalent D-size lithium batteries.
ML-x17y-DC	With integrated 3 x AA NiMH charger powered from external 8..30V DC source.
ML-x17y-PV	With integrated 3 x AA NiMH charger powered from 1Wp integrated solar panel.
ML-x17y-SLA	With integrated Seal Lead Acid/LiFePO4 charger for external 12V battery and 21VOC solar panel.

Example:

ML-317ADS-PV is a data logger with a built in 3G modem, PV-cover, digital & analog inputs, a serial and accessory port.

Remark: The data logger will be supplied with 3 unmounted PG7 cable glands, giving the user the freedom to choose the number and size of the glands them self to avoid unnecessary points of risk for moisture penetration. We recommend removing the PCB before drilling and to use a wood drill.

**Data acquisition systems to monitor off-grid or hard to reach locations.
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