TURTLE TOUGH®

Create any combination of our analytical modules with Turtle Tough's Modular Analyser systems.

Modular Analyser systems: TT-MA & TT-MAD

Codes: TT-MA | TT-MAD

Turtle Tough's TT-MA and TT-MAD Analysers have been designed specifically to interface with our extreme Turtle Tough sensors to provide the maximum possible service life to the sensor.

The unique modular design enables you to create a fully functional, multi-parameter analyser with any combination of Turtle Tough's analytical modules: pH, ORP, Ion Selective Dissolved Oxygen, Conductivity, Temperature, Data logging and Relays

- Analogue 4-20mA and digital Modbus outputs
- Precise calibration: 1, 2 and 3 point calibrations
- Easy to use 3 button interface
- Bright LED display visible in direct sunlight
- The TT-MAD analyser supports Turtle Tough's Digital Sensor technology

TT-MA-pH Modular Analyser for pH/ORP

Codes: TT-MA-pH

The TT-MA pH analyser allows for precise sensor calibration with support for 2- and 3-point slope calibrations. This means that a precise acid slope (pH below 7) and a precise alkaline slope (pH above 7) is possible for optimal accuracy anywhere in the measurement range.

One-point offset calibrations are possible at any pH value to allow for agreement with laboratory analysis.

The standard TT-MA-pH module supports affordable pH and ORP sensors without the need for expensive preamplifiers. Maximum sensor cable limit for non-preamplifier sensors is 7.5m.

For applications that require distances greater than 7.5 meters (up to 100 metres), the TT-MA-pH-X hardware version supports only a sensor with an integral preamplifier.

TT-MA-pH analyser modules features:

- Scale 4-20mA analogue output is standard for all measurement modules. Active 4-20mA can support remote external displays to allow for viewing measured values in control panels, secondary field locations, or instrumentation shops.
- Modbus digital output optional.
- Precise factory-calibrated linear analogue output allows excellent use in control applications. All analogue outputs have built-in trim calibration support, including offset and span adjustments.
- Calibration of temperature compensation element is available for all measurement modules.
- A simple 3 button interface allows for full control of all analyser features making operation easy.
- Easy to read Bright LED display visible in direct sunlight, reducing common problems associated with LCD displays, such as environmental fatigue and wear.
- Weatherproof NEMA 4X CSA/UL rated and IP65 enclosures include high quality sealing cable glands that are ideal for weatherproof sealing on the sensor, power and output cables.
- Power supply is CSA/UL/CE approved universal 100 to 240 VAC 50/60 Hz power supply module for line powered operation or 3-wire 24VDC powered operation.

Modular Analyser TT-MA for pH & ORP

TT-MA-DO Modular Analyser for Dissolved Oxygen

Codes: TT-MA-DO

The TT-MA-DO analyser module displays and outputs the concentration of dissolved oxygen in ppm, % saturation units, as well as the process temperature.

Automatic correction for temperature, pressure and salinity for calibration and % saturation measurement modes.

A simple gain calibration procedure is performed with the sensor dry in air. The convenient automatic or manual mode gain calibration allows adjustment of the sensor slope (mV per ppm DO) to the correct value based upon pre-programmed 100% DO saturation at that temperature and pressure.

No look-up tables are ever needed to calibrate the dissolved oxygen sensor in the field. No zero calibration is ever needed as our sensors have a true zero potential.

TT-MA-DO analyser modules features:

- Simple AIR calibration
- Scale 4-20mA analogue output is standard for all measurement modules. Active 4-20mA can support remote external displays to allow for viewing measured values in control panels, secondary field locations or instrumentation shops.
- Modbus digital output optional.
- Zero calibration for true 0.00 reading with sensor dry in air.
- Precise and wide-range gain calibration allows for effective (a.k.a. apparent) cell constant to be +/- 70% of the nominal sensor value.
- Automatic correction for the resistance and capacitance contribution of the cable length to the measurement for sensor wire gauge and distance.
- Easy to use three-button operation interface.
- Easy to read Bright LED display visible in direct sunlight.
- Weatherproof NEMA 4X CSA/UL rated & IP65 enclosures include high quality sealing cable glands that are ideal for weatherproof sealing on sensor, power and output cables.
- Power supply is CSA/UL/CE approved universal 100 to 240 VAC 50/60 Hz power supply module for line powered operation or 3-wire 24VDC powered operation.

Modular Analyser TT-MA for Dissolved Oxygen

TURTLE TOUGH®

TT-MA-CON Modular Analyser for Conductivity

Codes: TT-MA-CON

The TT-MA-CON Analyser Module has been designed specifically to support the high-performance features of our world-leading sensors. Don't be fooled by the compact size as these little modules are a fully capable analyser. The ability to plug and play a variety of expansion modules creates a powerful array of analysing hardware.

The TT-MA Conductivity analyser supports a wide range of cell constants, from K=0.005/cm all the way up to K=34.0/cm and anywhere in between. The analyser conductivity range for the selected cell constant is optimized for your application to obtain best resolution and performance and will support low ranges down to 0-5 microSiemens for very clean water RO type samples and all the way up to 0-1,000 milliSiemens as required for strong acids, bases and electrolyte solutions.

TT-MA-CON analyser modules features:

- Scale 4-20mA analogue output is standard for all measurement modules. Active 4-20mA can support remote external displays to allow for viewing measured values in control panels, secondary field locations, or instrumentation shops.
- Modbus digital output optional.
- Zero calibration for true 0.00 reading with sensor dry in air.
- Precise and wide-range gain calibration allows for effective (a.k.a. apparent) cell constant to be +/- 70% of the nominal sensor value.
- Automatic correction for the resistance and capacitance contribution of the cable length to the measurement for sensor wire gauge and distance.
- Economical custom configurations offer the freedom to pay only for the specific modules you need; data logging or relays.
- Easy to use three-button operation interface.
- Easy to read Bright LED display visible in direct sunlight.
- Weatherproof NEMA 4X CSA/UL rated & IP65 enclosures include high quality sealing cable glands that are ideal for weatherproof sealing on sensor, power and output cables.
- Power supply is CSA/UL/CE approved universal 100 to 240 VAC 50/60 Hz power supply module for line powered operation or 3-wire 24VDC powered operation.

Modular Analyser TT-MA for Conductivity

TT-MAD-pH Digital Modular Analyser for pH/ORP

Codes: TT-MAD-pH

Designed exclusively for use with our Turtle Tough digital sensors, the TT-MAD analyser revolutionises pH and ORP measurement in every way.

True plug-n-play sensor technology allows off-site smart calibration, hot-swap capability, automated upload and download of sensor data, sensor event tracking, and eliminates the need to interact with the analyser in any way.

The TT-MAD pH analyser allows for precise sensor calibration with support for two and three-point slope calibrations. This means that a precise acid slope (pH below 7) and a precise alkaline slope (pH above 7) is possible for optimal accuracy anywhere in the measurement range. One-point offset calibrations are possible at any pH value to allow for agreement with laboratory analysis.

QCD Quick Connect Plugs

All Turtle Tough Digital sensors are equipped with 6 metres of cable terminated with our QCD Quick Connect Plug, enabling users to simply plug the sensor into the analyser and start measuring. This eliminates the need for complicated wiring diagrams, finicky terminal strips, or the requirement to use qualified electrical personnel to install sensors. The Quick Connect Plug is waterproof, corrosion resistant and NEMA 6P and IP68 rated for added surety in your measurement process. The extra-long 6 metres of cable allows you to consolidate several analysers into a single panel enclosure for convenient viewing and maintenance. Using additional Quick Connect extension cables, users can run up to 610 metres of cable with no degradation in signal!

Efficient and simple calibration

Calibration settings are stored on the Turtle Tough Digital sensor. Simply calibrate your sensor in the laboratory or workshop and plug it into our digital analyser for instant pH or ORP measurement capability. The calibration values on the sensor are automatically uploaded to the analyser, so sensors can be easily swapped out or replaced at any time with no manual changes to the analyser. Calibration can be automatic or manual and performed either using Windows software or on the Turtle Tough digital analyser or calibration station.

Analyser configuration management

The configuration of the Turtle Tough Digital analyser can be downloaded as a backup to the attached sensor. This configuration can then be uploaded onto different analysers to create a cloned configuration. This allows for rapid parameter programming of multi-analyser installations.

Digital Modular Analyser TT-MAD for pH/ORP

Sensor calibration features

- No contact with a transmitter of any kind is required for an operator to change out a sensor.
- Calibration values automatically loaded from the digital sensor to TT-MAD-pH analyser.
- Install and swap out for maintenance, cleaning, re-calibration or replacement is quick, easy and simple.
- Rugged field-ready QCD quick connect plug standard: Smart digital sensors come with 6 meters (20 feet) cable terminated with NEMA 6P and IP67 rated quick connect waterproof and corrosion-resistant QCD connector. No tools are ever needed to install or change out a smart digital sensor. Total cable length up to 610 meters using extension cables with mating rugged NEMA 6P and IP67 quick connect waterproof and corrosion-resistant DSS connector terminations.
- Automatic pH calibration recognizes 4.00, 6.86, 7.00, 9.18 & 10.00 pH buffers for 1-point, 2-point and 3-point calibrations with built-in correction for temperature induced changes to pH buffers.
- Manual pH calibration allows offset and slope adjustment to any pH buffer or a grab sample reference value.
- Display previous 5 calibration sets on transmitter and the date that correspond to each one. Historical and current calibrations can be viewed and saved to track calibrations through sensor lifecycle.
- Total time in field service use is logged on the sensor for systematic tracking of complete sensor lifecycle to allow for best practice installation, maintenance and inventory/stocking management.
- Min and max temperatures in use digitally stamped on the sensor for process condition tracking.
- Calibrate the smart digital sensor on Windows software as well as on TT-MAD-pH analyser.
- Calibration values can be hard reset back to factory defaults (configuration unchanged).

Comprehensive data

The Turtle Tough Digital systems log the following information:

- Previous five calibration sets on the transmitter and the date stamp of each
- Total time in field service, for easy tracking of sensor lifespan and lifecycle management
- Minimum and maximum temperatures experienced by the sensor
- Digital date stamping of key dates: shipped from the factory, first field installation, last field service use

Automatic temperature compensation

The temperature compensation coefficient can be adjusted by the user for unusual or extreme applications, or the automatic temperature compensation in the system ensures accurate reading from -40 to 210°C.

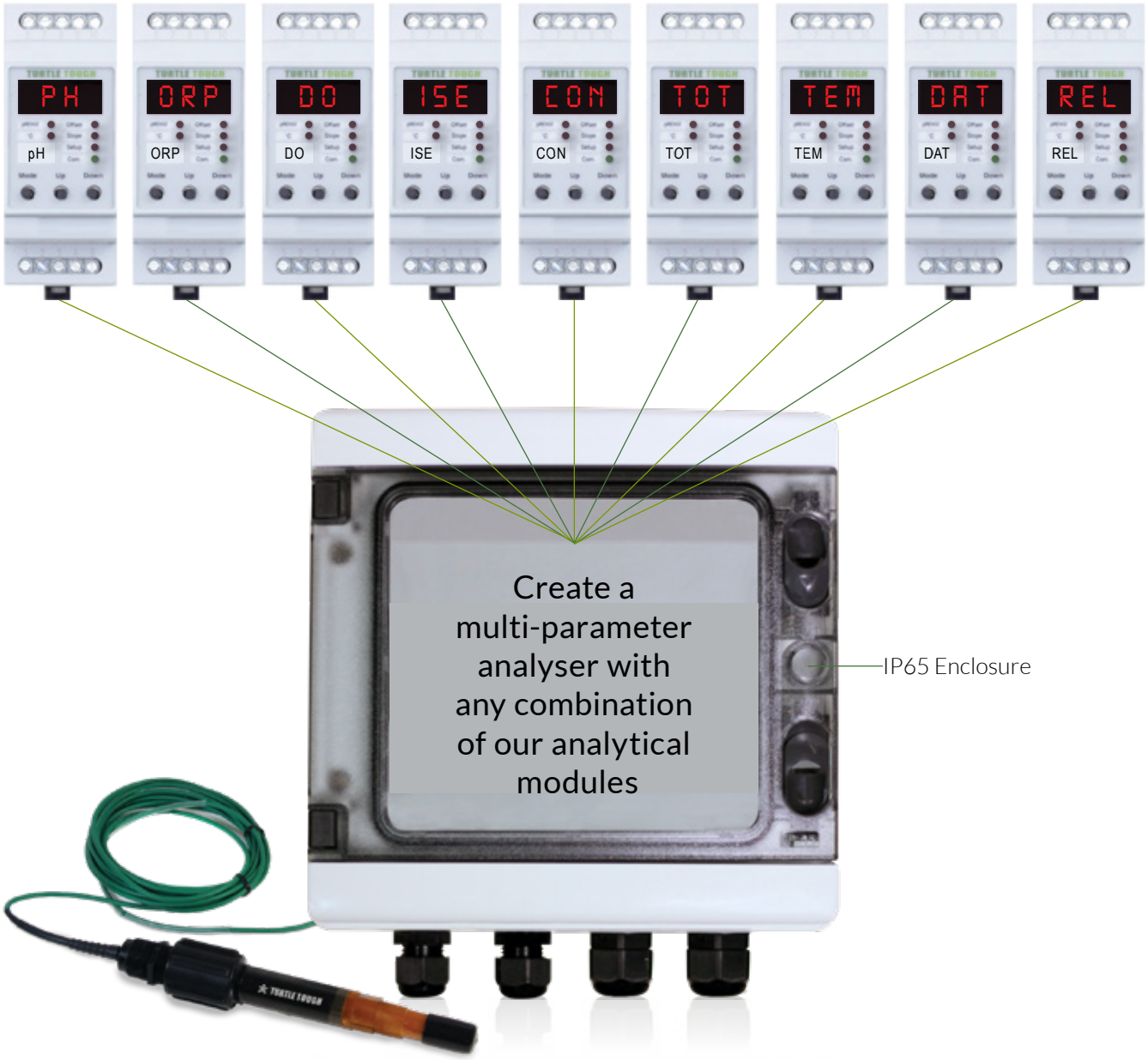
Digital Modular Analyser TT-MAD for pH/ORP

Analytical modules for TT-MA & TT-MAD

Don't be fooled by the compact size as these little modules are a fully capable analyser with high-quality analogue circuitry that provides stable, low noise measurement. The ability to plug-n-play a variety of expansion modules creates a powerful array of analysing hardware.

Available modules:
pH/ORP, Dissolved Oxygen, Ion Selective, Conductivity
TOT pH compensation, Temperature, Datalogger, Relay

Choose only the specific modules needed for your application with our economical custom configurations



TURTLE TOUGH

Modular Analyser systems
TT-MA and TT-MAD

Compatible sensors for TT-MA & TT-MAD Analysers

TT-MA
- pH/ORP sensor
- Dissolved Oxygen sensor
- Conductivity sensor
- Ion Selective sensor

TT-MAD
- Digital pH/ORP Sensor

Our Modular Analysers are compatible with Turtle Tough's pH/ORP, Dissolved Oxygen, ISE, and Conductivity sensors.

Specifications
pH/ORP Module

Sensor	Combination Sensor
Power supply	24VDC ±10%
Consumption	60 mA max
pH/mv range	0-14 pH, ±1000Mv
pH input	< 1pA, >10GΩ
Accuracy	±0.2% Excluding Sensor (Ideal)
Temp sensor	Pt100, Pt1000
Temp range	0-210°C ± 0.3°C
Temp comp	Fixed (Manual) or Automatic using Temperature (TC) Measurement
Analogue output	0-20mA or 4-20mA, max. 500Ω
Output hold	Automatic when in calibration mode
Housing	Lexan UL94V-0 (Upper part) Noryl UL94V-0 (Lower part)
Mounting	M36 for 35 mm DIN rail
Ip class	Housing IP40. Connector IP20
Connector	Max 16A. Max 2.5mm² Max torque 0.6 Nm
Temperature	Usage -15 to +50 °C (Storage -35 to +75 °C)
Weight	75 grams (2.64 ounces)
Dimensions	L 86 x W 36 x H 58 mm (3.4" X 1.4" X 2.3")
Ce mark	EN61326A

Specifications

Digital pH/ORP Module

Sensor	Digital Turtle Tough pH & ORP Sensors
Power supply	24VDC ±10%
Consumption	60 mA max
Ph/mv range	-2 -16 pH, ±1000mV ORP
Accuracy	±0.2% Excluding Sensor (Ideal)
Temp sensor	Integral Platinum TC Element
Temp range	-40-210°C ± 0.3°C
Temp comp	Fixed (Manual) or Automatic using Temperature (TC) Measurement
Analogue output	0-20mA or 4-20mA, max. 500Ω
Digital Output	MODbus RS-485 RTU
Output hold	Automatic when in calibration mode
Housing	Lexan UL94V-0 (Upper part) Noryl UL94V-0 (Lower part)
Mounting	M36 for 35 mm DIN rail
Ip class	Housing IP40. Connector IP20
Connector	Max 16A. Max 2.5mm² Max torque 0.6 Nm
Temp	Usage -15 to +50 °C (Storage -35 to +75 °C)
Weight	75 grams (2.64 ounces)
Dimensions	L 86 x W 36 x H 58 mm (3.4" X 1.4" X 2.3")
Ce mark:	EN61326A

Specifications
Conductivity Module

Power Supply	24VDC ±10%
Consumption	60 mA max
Sensor	2-Wire Contacting Cell
Accuracy	±1% Excluding Sensor (Ideal)
Temp sensor	Pt100, Pt1000
Temp range	0-210°C ± 0.3°C
Temp comp	Fixed (Manual) or Automatic using Temperature (TC) Measurement
Analogue output	0-20mA or 4-20mA, max. 500Ω
Output hold	Automatic when in calibration mode
Housing	Lexan UL94V-0 (Upper part) Noryl UL94V-0 (Lower part)
Mounting	M36 for 35 mm DIN rail
IP class	Housing IP40. Connector IP20
Connector	Max 16A. Max 2.5mm² Max torque 0.6 Nm
Temperature	Usage -15 to +50 °C (Storage -35 to +75 °C)
Weight	75 grams (2.64 ounces)
Dimensions	L 86 x W 36 x H 58 mm (3.4" X 1.4" X 2.3")
CE mark	EN61326A

Specifications
Dissolved Oxygen Module

Power Supply	24VDC ±10%
Consumption	60 mA max
Resolution	0.01 ppm anywhere in the range
Galvanic sensor	1.0-6.0 mV per ppm
Response range	0.25-2.50 mV per % saturation
Accuracy	±1% Excluding Sensor (Ideal)
Temp sensor	Pt100, Pt1000
Temp range	0-50°C ± 0.2°C
DO Temp comp	Automatic in all configurations
Analogue output	0-20mA or 4-20mA, max. 500Ω
Housing	Lexan UL94V-0 (Upper part) Noryl UL94V-0 (Lower part)
Mounting	M36 for 35 mm DIN rail
IP class	Housing IP40. Connector IP20
Connector	Max 16A. Max 2.5mm² Max torque 0.6 Nm
Temperature	Usage -15 to +50 °C (Storage -35 to +75 °C)
Weight	75 grams (2.64 ounces)
Dimensions	L 86 x W 36 x H 58 mm (3.4" X 1.4" X 2.3")
CE mark	EN61326A

Specifications
Ion Selective Module

Power Supply	24VDC ±10%
Consumption	60 mA max
Sensor	Combination Sensor
ISE/mV range	0-10, 0-100, 0-999 ppm; ±1000mV
ISE input	< 1pA, >10GΩ
Accuracy	±0.2% Excluding Sensor (Ideal)
Temp sensor	Pt100, Pt1000
Temp range	0-150°C ± 0.3°C
Temp comp	Fixed (Manual) or Automatic using Temperature (TC) Measurement
Analogue output	0-20mA or 4-20mA, max. 500Ω
Output hold	Automatic when in calibration mode
Housing	Lexan UL94V-0 (Upper part) Noryl UL94V-0 (Lower part)
Mounting	M36 for 35 mm DIN rail
IP Class	Housing IP40. Connector IP20
Connector	Max 16A. Max 2.5mm^2 Max torque 0.6 Nm
Temperature	Usage -15 to +50 °C (Storage -35 to +75 °C)
Weight	75 grams (2.64 ounces)
Dimensions	L 86 x W 36 x H 58 mm (3.4" X 1.4" X 2.3")
CE mark	EN61326A

Specifications
TOT for total ISE Module

Power Supply	24VDC ±10%
Consumption	60 mA max
Input current	0-20mA or 4-20mA, max. 250Ω
Accuracy	Class 1%
Analogue output	0-20mA or 4-20mA, max. 300Ω
Serial port 1	RS485, 9.6/19.2k Baudrate
Housing	Lexan UL94V-0 (Upper part) Noryl UL94V-0 (Lower part)
Mounting	M36 for 35 mm DIN rail
IP class	Housing IP40. Connector IP20
Connector	Max 16A. Max 2.5mm^2 Max torque 0.6 Nm
Temperature	Usage -15 to +50 °C (Storage -35 to +75 °C)
Weight	200 grams (7.05 ounces)
Dimensions	L 86 x W 36 x H 58 mm (3.4" X 1.4" X 2.3")
CE mark	EN61326A

Why use a TOT module?

As some ions can exist in a variety of forms in solution which can depend on pH, then pH compensation is required to calculate the TOTAL ion measurement. The TOT Module determines Total ISE by using a compensation algorithm using Free ISE, pH and temperature as the primary process inputs.

Total ISE can be calculated for the following ions:

- Ammonia (NH3 + NH4+)
- Fluoride (HF + F-)
- Cyanide (HCN + CN-)
- Sulphide (HS- + S2-)

Specifications
Datalogger Module

Power Supply	24VDC ±10%
Consumption	60 mA max
Serial memory	8 Megabytes (8MB)
Number nodes	Max 63 TT-MA Modules
Clock/calendar	RTC with 10 year battery backup
Serial port 1	RS485, 9.6/19.2k Baudrate
Serial port 2	RS232, 115k Baudrate
Housing	Lexan UL94V-0 (Upper part) Noryl UL94V-0 (Lower part)
Mounting	M36 for 35mm DIN rail
IP class	Housing IP40. Connector IP20
Connector	Max 16A. Max 2.5mm² Max torque 0.6 Nm
Temperature	Usage -15 to +50 °C (Storage -35 to +75 °C)
Weight	200 grams (7.04 ounces)
Dimensions	L 86 x W 36 x H 58 mm (3.4" X 1.4" X 2.3")
CE mark	EN61326A

Why use a Datalogger module?

When values from TT-MA Analyser Modules are required to be recorded/stored in a standalone system then the Datalogger Module for TT-MA Analyser Modules with the RS485 MODbus output option (included at time of order) is the solution.

Specifications
Relay Module

Power Supply	24VDC ±10%
Consumption	60 mA max
Input Current Range	(0)4-20mA, 70Ω
Digital input	Pos. logic: 5-30VDC; Neg. logic: 0V
Input S1	External Reset
Input S2	Alarm Block
Relay Description	2 each Single-Pole, Single-Throw (SPST)
Relay Rating	250VAC / 5A (Dry Contact Type)
Housing	Lexan UL94V-0 (Upper part) Noryl UL94V-0 (Lower part)
Mounting	M36 for 35 mm DIN rail
IP Class	Housing IP40. Connector IP20
Connector	Max 16A. Max 2.5mm^2 Max torque 0.6 Nm
Temp	Usage -15 to +50 °C (Storage -35 to +75 °C)
Weight	200 grams (7.04 ounces)
Dimensions	L 86 x W 36 x H 58 mm (3.4" X 1.4" X 2.3")
CE mark	EN61326A