



IIoT Water Chemistry Monitoring Solutions



Product Catalog

Integrator Edition



D6 Labs

Engineered IoT Solutions

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1 Sent.io Direct2Cloud IIoT Gateway



CatM1-MC

Works seamlessly with **AT&T**, **Verizon** and **T-Mobile** to ensure reliable connection anywhere.

Description

Sent.io™ is a Direct2Cloud™ gateway that seamlessly interfaces to a variety of **m.Smart™** I/O expansion and **m.Chem™** IIoT water chemistry sensors. Sent.io is housed in an IP67 enclosure which can be mounted in a variety of ways including magnetic, adhesive, pole mount, DIN rail mount, or permanent wall mount. It can be configured with an internal or external antenna – the internal antenna is sufficient for most applications.

Sent.io™ has a single M8 waterproof connector for power and data connectivity. It is designed to work with our family of **m.Smart™** products for I/O and power, providing a truly plug-and-play solution.

Installation is very simple and takes only minutes; no field configuration or provisioning is required.

Key Features

- Plug and play installation
- IP67 rated – no need for separate enclosure
- Built in CatM1-MC™ cellular connectivity
 - Modbus RTU (RS-485) interface
- 12-24V DC power
- 4" x 4" x 1"
- 32 read/write floating point process variables

Ordering Info

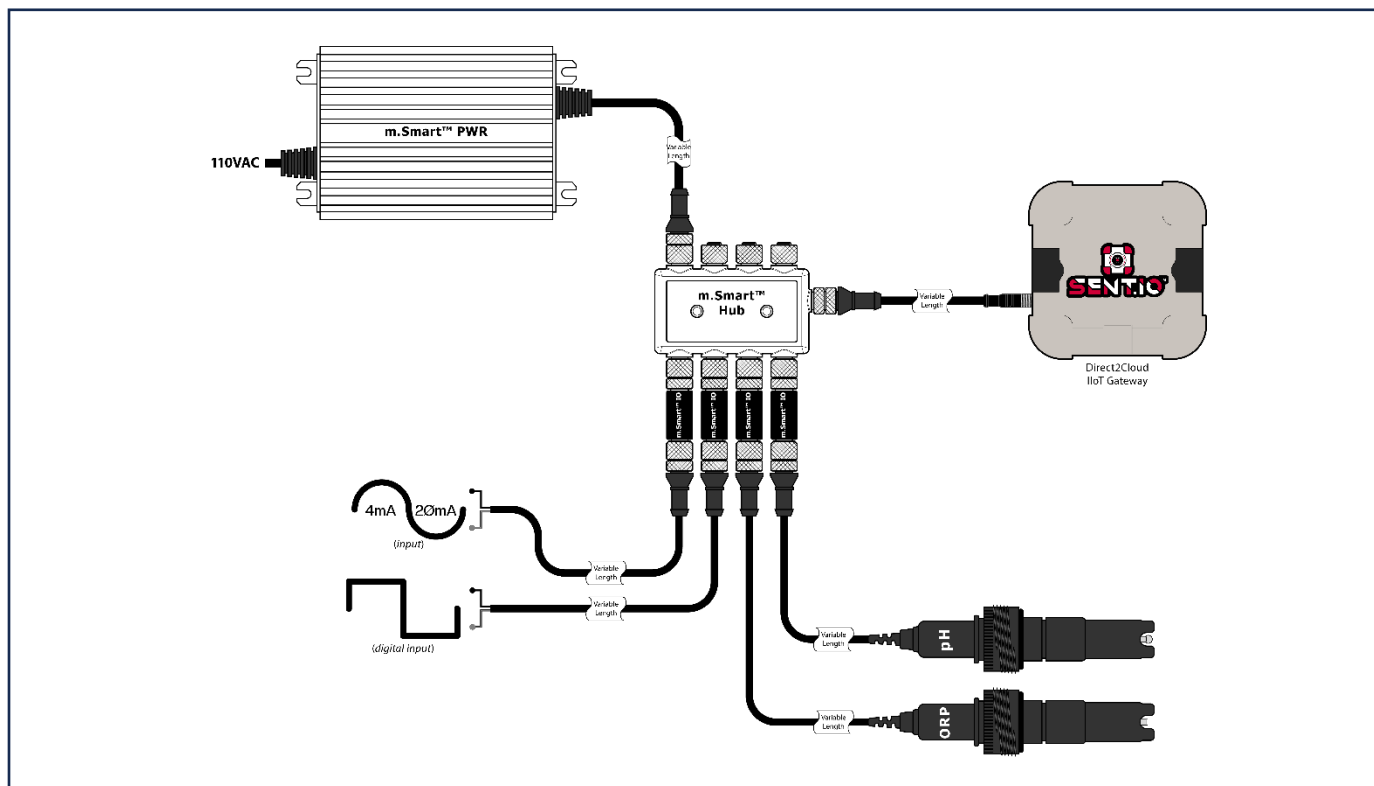
Part Number	Description
SIO-EX-MC-SIMMNNNN-LR	Modbus RTU, External DC Power, Internal Antenna
SIO-EX-MC-SIMMNNNN-XR	Modbus RTU, External DC Power, External Antenna

Notes:

1. Monitoring fee is billed in advance, recurring annually from date of first use.
2. Initial cost will include hardware + 1st year's monitoring fee.

2 m.Smart™ Power and I/O

2.1 Introduction



m.Smart™ is a family of products that expands the capabilities of Sent.io™. The entire family is plug and play using industry standard M12 connectors and cables.

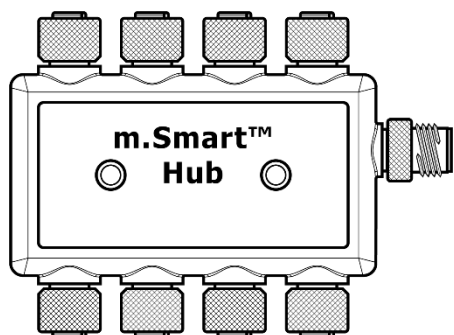
The **m.Smart Hub** has 8-ports. Each port can be used for power, **m.Chem™** water chemistry sensors, and digital/analog I/O.

Multiple power options are available including an IP67 rated, 24V/5A power module and a 10W/30W solar power kit.

String multiple **m.Smart™ Hubs** together to add up to 32 external sensors and I/O to any Sent.io™ to create a complex and comprehensive plug-n-play IIoT monitoring/control solution.

2.2 Products

2.2.1.1 Expansion Hub



The **m.Smart™ Hub** allows up to eight (8) **m.Smart™** and **m.Chem™** connections to a single Sent.io™. Multiple hubs can be connected in series to expand up to 32 sensors and I/O.

The **MS-CON-SIO-xx** cable is used to connect a Sent.io™ gateway to a hub.

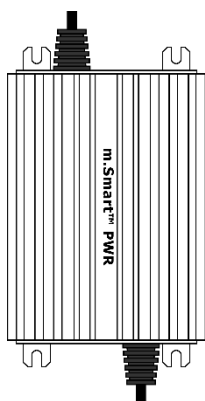
All power modules, **m.Chem™** sensors, and I/O modules connect to the hub using industry standard M12 5-pin A-coded cables.

Ordering Info

Part Number	Description
MS-HUB-8	8-port m.Smart™ Hub
MS-CON-SIO-1M	Sent.io™ to m.Smart™ connection cable – 1 meter
MS-CON-SIO-3M	Sent.io™ to m.Smart™ connection cable – 3 meter
MS-CON-FW-2M	m.Smart Field Wireable Cable – 3 meter (M12 to wire end)

2.2.2 Power Modules

2.2.2.1 IP67 Rated 110VAC / 24VDC 5A Power Module



The **m.Smart AC/DC Power Module** converts 110V AC to 24V DC and can support a total system load of 5A at 24V DC.

The module is IP67 rated so there is no need for a separate enclosure.

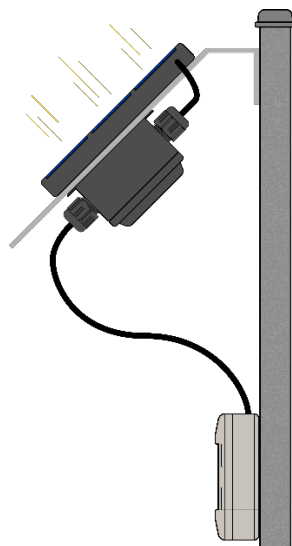
The output of the module is pre-wired with a 3M M12 cable that can be directly connected any port on the m.Smart Hub.

The input of the module is a 1M cable with wire end for field wireable power connection.

Ordering Info

Part Number	Description
MS-PS-AC-24V5A	IP67 rated AC/DC power module, 24V DC, 5A

2.2.2.2 10W Solar Power Kit



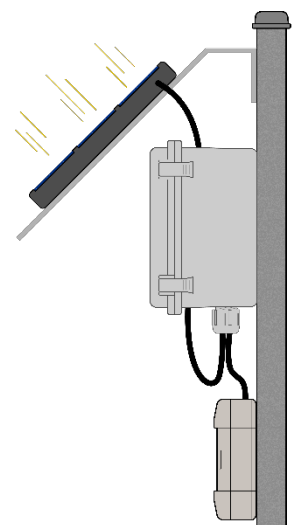
This solar kit is designed for small applications where there are 1 or two sensors. With this solar kit, Sent.io™ can sample as often as every 1 hour and push readings to the cloud as often as every 4 hours.

The solar panel and battery pack are packaged as a single unit that can easily be mounted to a pole or a wall, or it can be hung on a T-post.

Ordering Info

Part Number	Description
MS-PS-SL-10W	10-watt solar panel kit for very low power applications

2.2.2.3 30W Solar Power Kit



This solar kit is designed for larger applications with up to 8 sensors. With this solar kit, Sent.io™ can sample sensors as often as every 15 minutes and push readings to the cloud immediately after sampling.

The solar panel and battery pack are separate units and each can be mounted on a pole or a wall.

Ordering Info

Part Number	Description
MS-PS-SL-30W	30-watt solar panel kit for low power applications

2.2.3 I/O Modules



m.Smart™ I/O modules are plug-n-play and come in a variety of analog and digital inputs and outputs. Each module is a single I/O point and uses 1 of the 32 available process variables on the Sent.io™ Gateway.

The male connector is designed to screw directly into any port on a m.Smart™ Hub or on any Master port on a m.Smart™ PC.

The female connector is used to connect the I/O module to external sensors, actuators, and PLCs.

Configuration is simple using our m.Smart Configurator app. All you need to do is select the slave ID you want to use and, depending on the model, configure the I/O.

The digital I/O module can be configured as NPN/PNP input, counter, missing pulse, or NPN/PNP output.



All modules except for the CT and thermistor modules come with a 3M M12 cable with wire ends ready for field wiring.

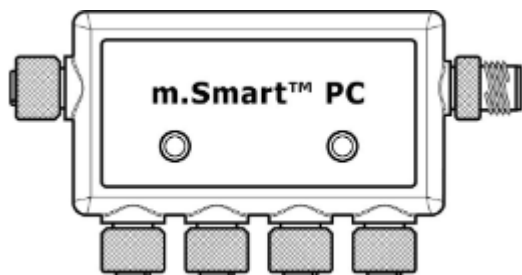
The CT modules come with a pre-wired split core current transformer.

The thermistor module comes with a pre-wired 10K thermistor.

Ordering Info

Part Number	Description
MS-IO-AI-MA	4-20mA analog input module
MS-IO-AI-V	0-10V analog input module
MS-IO-AO-MA	4-20mA analog output module
MS-IO-DIO	Digital input/output module
MS-IO-CT-20A	20A current transformer input module
MS-IO-CT-150A	150A current transformer input module
MS-IO-CT-600A	600A current transformer input module
MS-IO-T-RT	RTD input module
MS-IO-T-TR	Thermistor input module

2.2.4 m.Smart™ PC



Powered By
 **SNAP SIGNAL**

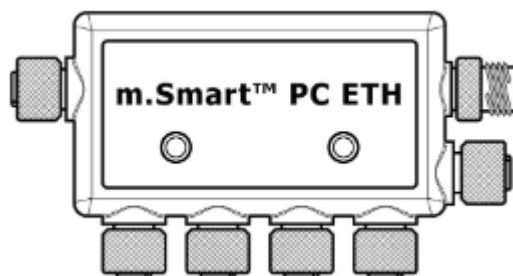
The m.Smart™ programmable controller is used in applications where edge processing or automation is required.

Simple automation rules allow basic if-then style automation, math/logic operations, control logic, trending, and tracking.

ScriptBasic is a full-featured programming language that provides flexibility for more complex applications.

m.Smart™ automation can operate with any m.Smart I/O module, m.Inject controller, or m.Chem sensor. It integrates with Sent.io™ through 32 local process variables that can be used for sensor values, setpoints, control variables, etc.

We offer two variants of the m.Smart PC. The basic model has a Modbus RTU Master port that is used to interface with Sent.io, and four Modbus RTU Slave ports that are used to interface with m.Smart I/O modules, m.Chem Sensors, m.Inject pump controllers, and any industrial automation devices that support the Modbus RTU protocol.



Powered By
 **SNAP SIGNAL**

The m.Smart PC-ETH variant (shown left) includes an Ethernet port that can be used to interface with existing automation equipment using common industrial protocols including Profinet, Ethernet/IP, and Modbus TCP.

We can also offer custom versions of m.Smart PC pre-configured and loaded with custom scripting for specific applications such as continuous injection, pump station control, sewage lift stations, etc. Please contact us at sales@d6labs.com for more information.

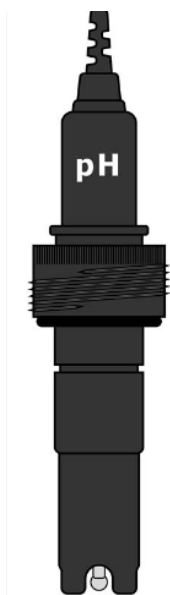
Ordering Info

Part Number	Description
MS-PC	m.Smart Programmable Controller – Modbus RTU
MS-PC-ETH	m.Smart Programmable Controller – Modbus RTU & Ethernet (Profinet, EthernetIP, Modbus TCP)

3 m.Chem™ Plug-n-Play Water Chemistry Sensors

3.1 Products

3.1.1 PH



The m.Chem™ PH sensor measures PH in a range of 0 to 14.

Like all m.Chem™ sensors, it is designed to be plug-n-play with m.Smart™ and Sent.io™ and uses 2 (PH and Temperature) of the 32 process variables on the Sent.io™ gateway.

The sensor comes with a 3 meter cable terminated in an M12 connector pre-wired for operation with m.Smart. Simply plug it into any port on a m.Smart™ Hub or any master port on a m.Smart PC and you are done.

Specifications

- Resolution – 0.01 pH
- Accuracy – +/-0.02 pH
- Temperature Range – 0 to 60°C
- Temperature Accuracy - +/- 0.3°C
- Automatic Temperature Compensation
- IP68 protection grade
- Pressure Range – 0 to 3 bar
- 1 or 2 point calibration every 1 to 2 months

Ordering Info

Part Number	Description
MC-PH-14	m.Chem™ PH sensor 0-14 range

3.1.2 ORP



The m.Chem™ ORP sensor measures across a range of -2000 to +2000 mV.

Like all m.Chem™ sensors, it is designed to be plug-n-play with m.Smart™ and Sent.io™ and uses 2 (ORP and Temperature) of the 32 process variables on the Sent.io™ gateway.

The sensor comes with a 3 meter cable terminated in an M12 connector pre-wired for operation with m.Smart. Simply plug it into any port on a m.Smart™ Hub or any master port on a m.Smart PC and you are done.

Specifications

- Resolution – 1mV
- Accuracy – +/-15mV
- Temperature Range – 0 to 60°C
- Temperature Accuracy - +/- 0.3°C
- Automatic Temperature Compensation
- IP68 protection grade
- Pressure Range – 0 to 3 bar

Ordering Info

Part Number	Description
MC-ORP	m.Chem™ ORP sensor -2000 to + 2000mV

3.1.3 Conductivity/TDS



The m.Chem™ Conductivity sensor is available in three different measurement ranges ranging from ultra-pure to wastewater.

Like all m.Chem™ sensors, it is designed to be plug-n-play with m.Smart™ and Sent.io™ and uses 3 (EC, TDS and Temperature) of the 32 process variables on the Sent.io™ gateway.

The sensor comes with a 3 meter cable terminated in an M12 connector pre-wired for operation with m.Smart. Simply plug it into any port on a m.Smart™ Hub or any master port on a m.Smart PC and you are done.

Specifications

- Constants
 - K 0.01 (0-20uS/cm)
 - K 1.0 (0-2000 uS/cm)
 - K10.0 (0-20,000 us/cm)
 - Accuracy – 2% FS
 - Resolution
 - 1uS/cm (K0.01)
 - 100uS/cm (K1.0)
 - 1000uS/cm (K10.0)
 - Temperature Range – 0 to 60°C
 - Temperature Accuracy - +/- 0.3°C
- Automatic Temperature Compensation
 - IP68 protection grade
 - Pressure Range – 0 to 3 bar
 - Conductivity Range is EC (uS/cm) / 2 (20,000 us/cm == 10,000 ppm)

Ordering Info

Part Number	Description
MC-EC001	m.Chem™ Conductivity Ultra Pure (K0.01)
MC-EC1	m.Chem™ Conductivity (K1)
MC-EC10	m.Chem™ Conductivity (K10)

3.1.4 Free Chlorine



The m.Chem™ Free Chlorine sensor measures across a range of 0 to 20 mg/l (ppm).

Like all m.Chem™ sensors, it is designed to be plug-n-play with m.Smart™ and Sent.io™ and uses 2 (Cl- and Temperature) of the 32 process variables on the Sent.io™ gateway.

The sensor comes with a 3 meter cable terminated in an M12 connector pre-wired for operation with m.Smart. Simply plug it into any port on a m.Smart™ Hub or any master port on a m.Smart PC and you are done.

Specifications

- Principle – constant voltage
- Accuracy – 2% or +/- 10ppb HOCL
- Temperature Range – 0 to 60°C
- Temperature Accuracy - +/- 0.3°C
- Response Time – 90% < 90°C
- Automatic Temperature Compensation
- IP68 protection grade
- Pressure Range – <1 bar
- 2-point calibration - monthly

Ordering Info

Part Number	Description
MC-CL	m.Chem™ Free Chlorine Sensor

3.1.5 Flow Cells

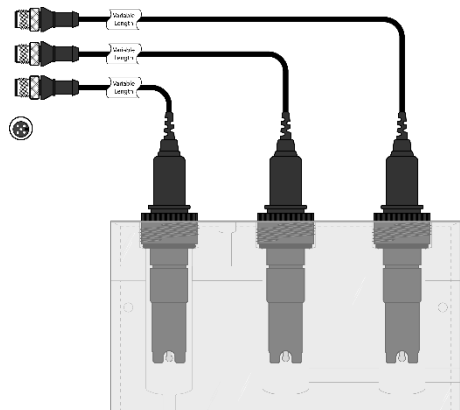


Figure 1: Triple Flow Cell

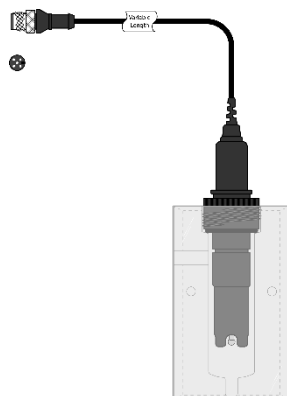


Figure 2: Single Flow Cell

m.Chem™ flow cells provide an easy way to mount and connect any m.Chem™ sensor to your system.

We offer two variants – single and triple cell.

The single cell flow-cell is perfect when you only need one sensor.

The triple cell flow cell is good for more complex applications where multiple sensors are required.

The flow cells can be mixed and matched to include as many sensors as you need.

Every flow-cell is sized to work with any of our m.Chem™ sensors and comes with tubing adapters and all accessories so you won't need to make a run to the local hardware store trying to find the right fittings.

Two mounting holes are included on each flow cell allowing it to be bolted to a wall or fixed surface.

Note: Flow cells are shown with sensors for illustrative purposes only. Sensors must be purchased separately.

Ordering Info

Part Number	Description
MC-FC-3-39	m.Chem™ 3 sensor flow cell (39x1.5mm threads)
MC-FC-1-39	m.Chem™ 1 sensor flow cell (39x1.5mm threads)

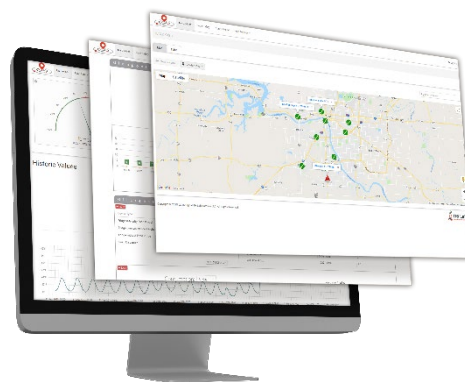
4 Cloud Platform

The Whisker.io® cloud platform is a power IIoT portal that provides all the tools you need to monitor and manage your assets from anywhere in the world. It's easy to learn, easy to use, and its enterprise-grade features make it suitable for management of large-scale deployments spread over a wide geographical region. The portal can be accessed from anywhere in the world using a mobile phone, tablet or PC with a modern HTML5 browser. All features, including unlimited users and text messages, are included with the monitoring fees charged for any Sent.io™ Direct2Cloud IIoT gateway.

4.1 Drill Down Interface

The intuitive drill down interface allows you to identify and zoom into a problem with just two clicks of the mouse whether you are managing 10 devices at 1 location or 10,000 devices at 1,000 locations.

The top-level map shows color coded icons for every location that has monitored/managed devices. Green means good, red means there is a problem. Click on the location to drill down.



The location map uses the same color-coded icons for each device at that location. Again, green means good, red means there is a problem. Click the device icon to drill down to see the current data or use an HMI or dashboard to see the data in a more contextual view.

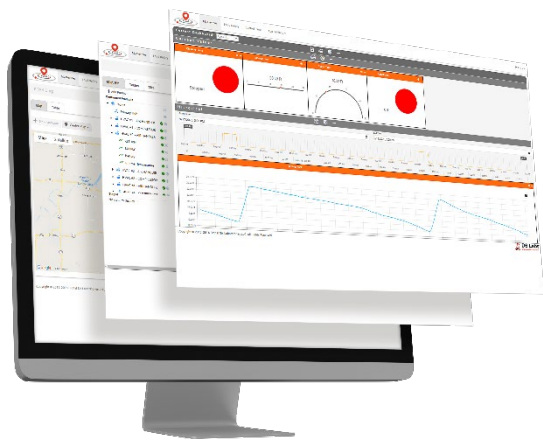
4.2 HMI

Build custom HMI style user interfaces by dragging tags onto the HMI surface to create widgets. Widgets are tied to channels on devices and immediately start displaying real-time data.

Add a floorplan, schematic, or picture to the background to bring context to the HMI.



4.3 Dashboards



The Whisker.io® portal lets you build custom dashboards that display real-time and historical information using widgets and graphs.

Combine data from devices at different locations to see the data you need in the way you want to see it.

Create multiple dashboards so each stakeholder can have the data they need to do their job.

Graph panels include a global pan and zoom control, making it easy to zoom in on an anomaly; every graph in the stack

will pan and zoom together so you can view time series data from different sources for any event or excursion.

Contact us at sales@d6labs.com, or call us at **1-844-365-8647** for a demo of our IIoT cloud portal.

4.4 Smart Alerts

Whisker.io® has a powerful, user configurable alert system. For any channel on any device, you can configure multiple alerts to notify you and your team by text or email whenever there are problems.

Alerts can be configured to trigger when communications are lost (Inactivity), when a channel's latest reading exceeds a threshold for a specified amount of time (Threshold), when a channel's value changes by more than a specified amount in a specified period (RateOfChange), or when a channel's value exceeds the running average by more than a specified amount (TrendPeak).

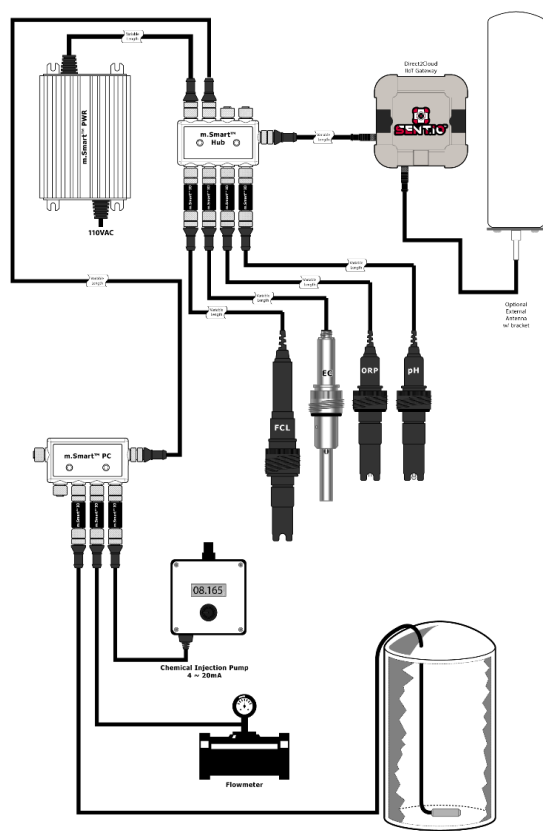
Alerts can be stacked so notifications are escalated as the problem persists or gets worse. For example, you can set an alert to notify that temperature exceeds a threshold for more than 15 minutes. A second alert could notify the next level in chain of command if the alert exceeds the threshold for more than 2 hours, which is an indication that the first alert notification was not addressed.

Alert notifications can be snoozed whenever the equipment has downtime.



5 Example Applications

5.1 Water Chemistry with Chemical Injection



In this application, we need to inject chemicals into water flowing out of a tank in proportion to the flow rate, and we need to monitor several water chemistry parameters of the effluent.

Four m.Chem™ sensors are used to monitor PH, ORP, Conductivity, and Free Chloride.

Power is provided by an m.Smart™ 24V AC/DC power supply.

An m.Smart™ Programmable Controller (PC) with a custom script automates the process of continuous chemical injection. It monitors tank level and flow rate and it controls a diaphragm pump's speed via a 4-20mA output to achieve continuous injection.

An 8-port m.Smart™ Hub is used to connect the m.Chem™ sensors, m.Smart™ PC and Sent.io™ IloT Gateway together. required.

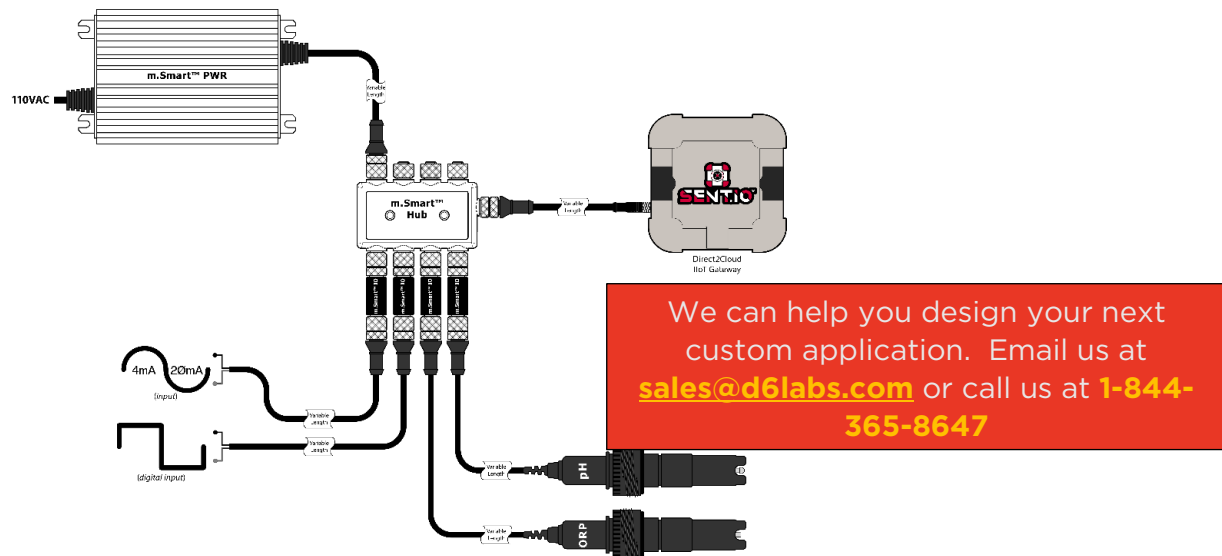
The Sent.io™ IloT gateway and all m.Smart™ components are IP67 rated and can be mounted directly onto the equipment being monitored – no

protective enclosures are necessary. The EC, PH, and ORP sensors are mounted in a 3 position flow cell and the Free Chlorine sensor is mounted in a single flow cell.

The entire solution is plug-n-play. Installation should take less than 45 minutes and no on-site configuration of equipment should be required. No additional cables or parts should be required. Once installed, the user can remotely monitor water chemistry and pump operation. The user will also be able to remotely change setpoints for pump operation such as target concentration, start and stop levels, and temperature thresholds for injection.

The entire application uses 12 of the available 32 process variables in Sent.io, leaving plenty of room for expansion.

5.2 Chemistry and I/O Monitoring



In this application, we need to monitoring two water chemistry parameters, a flow rate (4-20mA) and pump run status (digital input).

The system is powered using a m.Smart™ 24V AC/DC power supply, but it could also be powered by a 30W solar kit if line power is not available.

m.Chem™ PH and ORP sensors are used to monitor water chemistry.

m.Smart™ I/O modules are used for the 4-20mA and digital inputs.

Sent.io™ provides cloud connectivity. It is configured to sample the m.Chem™ sensors and m.Smart™ I/O modules automatically every 15 minutes. Sample data is pushed to the cloud immediately if connectivity is available. If connectivity is not available, samples are buffered and will be pushed when connectivity is restored.

All connections are made using a m.Smart™ Hub, using five of the eight available ports.

The entire solution is plug and play – no onsite configuration is required and no additional cables or components are required. All components (except for m.Chem™ sensors) are IP67 rated and can be directly mounted to the equipment being monitored without the need for an enclosure. Each m.Chem™ sensor is mounted in a single flow cell.

Installation should take less than 15 minutes and once installed, the user will be able to remotely monitor the chemistry and I/O inputs from anywhere in the world using a mobile device or PC. The application uses 4 of the available 32 process variables on Sent.io, leaving plenty of room for expansion.