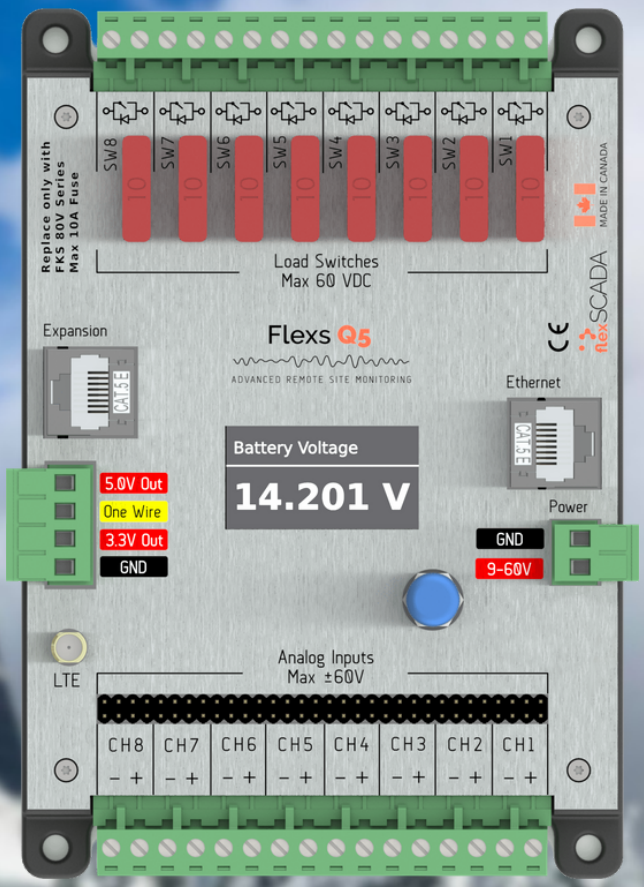
flexSCADA



FlexsQ5 / Q5 Pro

ADVANCED REMOTE SITE MONITORING

Rev: 3.2 Last Updated: 2019/01/21

USER GUIDE

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GOT QUESTIONS?

Can't find what you're looking for?
We love hearing from our customers!
Please contact us with any questions.

CONTACT

+1 877.352.7398
support@flexscada.com
www.flexscada.com
P.O. Box 277
Lytton, B.C. V0K 1Z0
Canada

CONTENTS

GLOSSARY

1-wire/one-wire - a sensor protocol developed by Dallas Semiconductors
A - Amps (Unit of Current)
AC - Alternating Current
AVG - Average
Bit - The smallest possible amount of data: 0 or 1
Bool or Boolean - true or false, usually represented with a single bit
Byte - 8 bits
CH - Channel
CT - Current Transformer
DC or VDC - Direct Current
DFU - Define Firmware Updater
DHCP - Dynamic Host Configuration Protocol
DNS/NS - Domain Name Service (server that converts names to IPs)
FET - MOSFET (Type of semiconductor switch)
FW - Firmware
Floating Point - Any non-whole number
HTTP - HyperText Transfer Protocol
HTTPS - Secure HyperText Transfer Protocol
HVD - High Voltage Disconnect
HW - Hardware
Hz - Hertz (Cycles per second)
I2C - Communication protocol
INS - Instantaneous Value
IP - Internet Protocol v4
IPv6 - Internet Protocol v6
IoT - Internet of Things
JSON - JavaScript Object Notation
kSPS - Thousand Samples Per Second
LAT/LNG - GPS Latitude/Longitude (Decimal Degrees Format)
LTE - 4G Cellular Service
LVD - Low Voltage Disconnect
MAC - Media Access Control
mA - Milliamps (1000th of an Amp)
mJ - Megajoules
MODBUS - Communication protocol used for Industrial PLC's
Mbps - Megabits Per Second
Ohms - Unit of Impedance
PF - Power Factor
PING or IMCP - Internet Control Message Protocol
PoE - Power Over Ethernet
RMS - Root Mean Square
SLAAC - IPv6 Stateless Address Autoconfiguration
SNMP - Simple Network Management Protocol
SW - Switch
Subnet/Netmask/NM - Refer to Internet Protocol
TCP - Transmission Control Protocol
THD - Total Harmonic Distortion
TX - Transmit
Typ - Typical
UART - TTL Level Serial
UID - Unique Identifier
V - Volts
VDC - Volts DC
VT - Voltage Transformer
W - Watt (Unit of Power)

1.0 - Hardware Specifications

PHYSICAL

Dimensions: 157 mm x 108 mm x 40 mm (Mounting Holes: 96 mm x 144 mm - 4 x 3mm)
Also mount with standard DIN Rail - Recommended DIN Rail space: 120 mm
Temperature Rating: –40 to 85°C (industrial rated components)
Environment: Max 95% relative humidity, non-condensing (ETSI300-019-1.4 Standard)
Weight: 200g

POWER REQUIREMENTS

Voltage: 9 - 60 VDC (reverse polarity protected)
Power Consumption: 0.6 W @ 12V Typical (varies based on configuration)

ANALOG INPUTS

Analog Conversion: 24 bit; 0.05 mV @ ±60 V range; 0.004 mV precision @ ±5 V range
Voltage Range: ±60 V (fully differential, bi-polar) (0.5 MΩ. Imp)
Current Range: 0 - 25 mA (requires hardware jumper change)

LOAD SWITCHES

Max Voltage: 60 VDC
Max Current: 8 A Max Cont (100 A Surge <1 ms) (50% derating above 50° C)
Switch Type: Isolated solid state N-Channel FET /w fly-back protection
Fusing: ATO blade style fuse (replace only with fuses rated for correct voltage range)
Software Fuse: 500 mA to 5 A ***PRO ONLY***
Current Sensing: 0 to 5 A ***PRO ONLY***

REGULATED OUTPUTS

5.0 V output: 500 mA Max
3.3 V output: 500 mA Max (Typ 3.47V)
3.3 V Output /w LTE Module: 150 mA Max (Typ 3.47V)

ETHERNET

- 10/100 Mbps Operation
- Long-Range 300 Meter at 10 Mbps
- IEEE 802.3az Energy Efficient Ethernet
- ±15 kV IEC 61000-4-2 Level 4 ESD Protection
- IEEE 802.3 Auto-Negotiation
- IPv4: DHCP, Static; IPv6: SLAAC, DHCPv6, Static
- Passive PoE: Pins 4, 5+; 7, 8- @ 9 to 56V

LTE SPECS ***LTE VERSION ONLY***

- LTE CAT–M1/NB–IoT 3GPP release 13 LTE Adv. Pro
- SMA Connector: SMA-Female
- LTE Bands: 2, 3, 4, 5, 8, 12, 13, 20, 28
- Modem: ublox SARA-R410M-02B
- Certified by: FCC, ISED, PTCRB, NCC, RCM, RED, AT&T, Telus, Telstra, Verizon, GITEKI 2

1.1 - What's Included

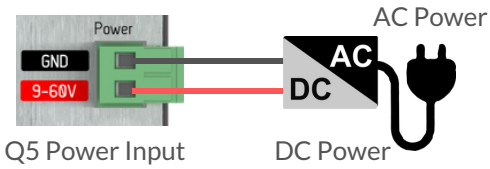
1 x Flexs Q5
1 x DIN Rail Mounting Kit
1 x Product Manual

1.2 - Getting Started

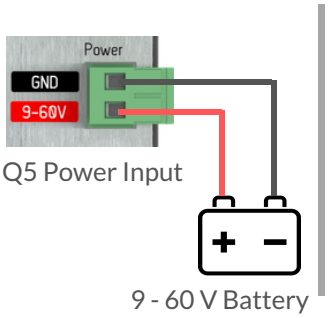
This section provides a brief overview on how to connect to a FlexsQ5 for the first time.
Attach the Q5 to a power source (9 to 60 VDC) using the two pin power terminal located beside the Ethernet port.
The Q5 can alternatively be powered via POE over the Ethernet port.

DO NOT POWER THIS DEVICE DIRECTLY FROM AN AC POWER SOURCE! DOING SO WILL VOID YOUR WARRANTY!

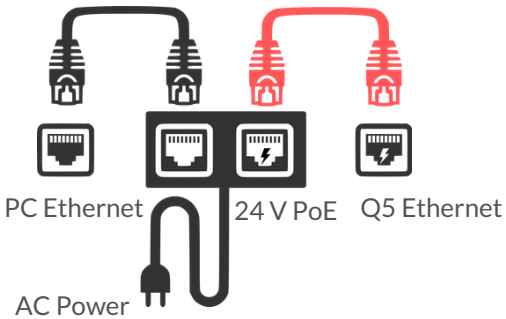
Powering with a DC Power Supply



Powering with a Battery

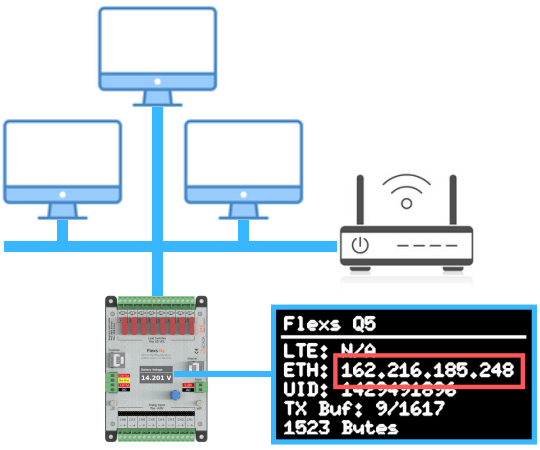


Powering with a Passive PoE



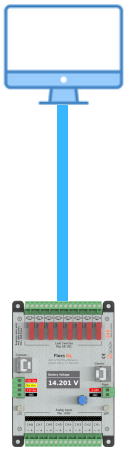
Once power is connected, the Q5 display will illuminate indicating that the Q5 has successfully started.
The Q5 will then search for a router on the network to get an IP address. If the Q5 fails to find a router within the first 10s of bootup, it will fallback to standalone mode. In standalone mode, the Q5 will use the fallback IP (default 192.168.1.20).

Network Connected Mode



Connect using the IP assigned by your network.
This IP can be found on the Q5 display
(highlighted in red above)

Standalone Mode

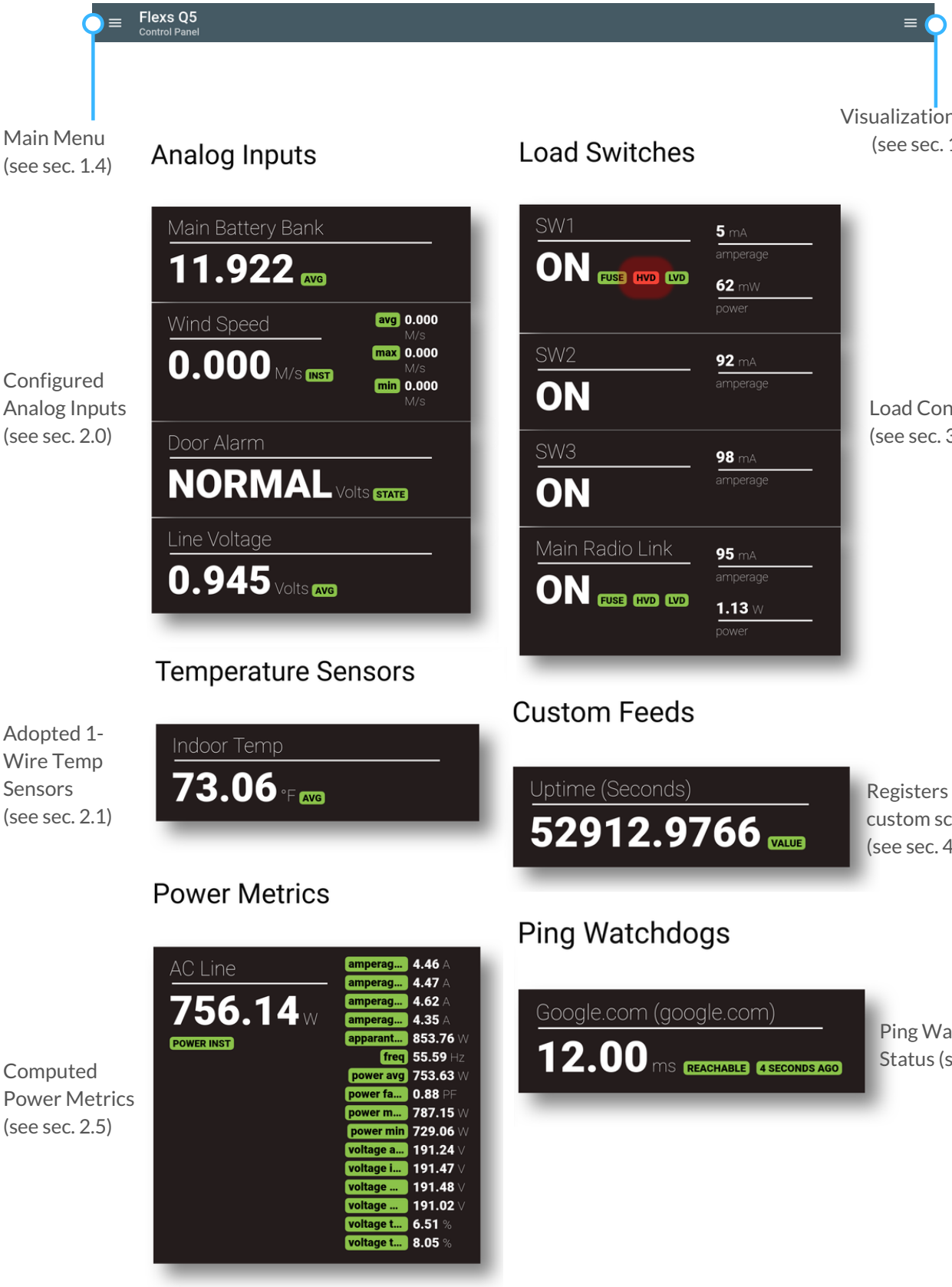


Connect using the following addresses:
http://192.168.1.20 OR with IPv6
http://[fe80::744]

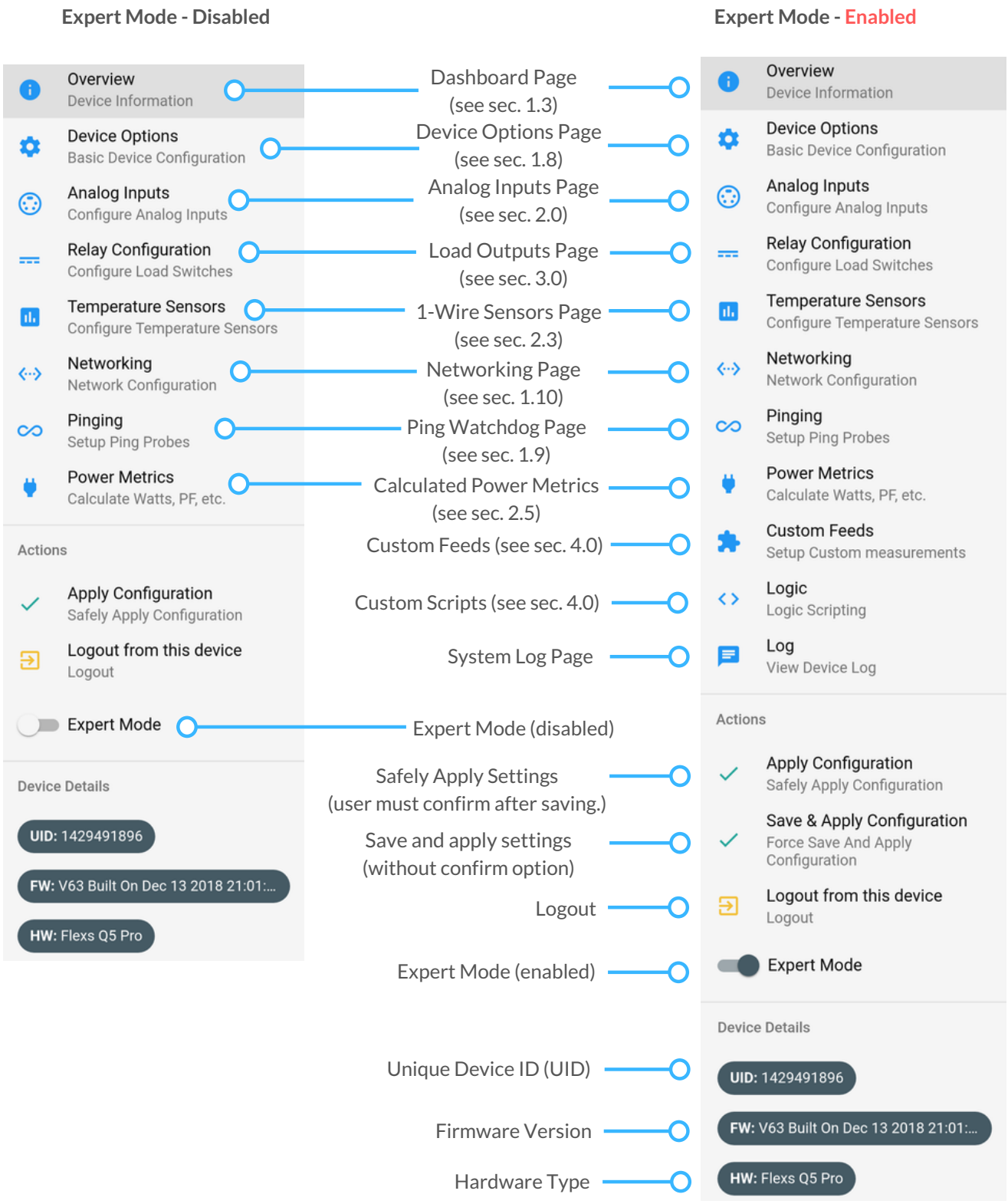
Using Chrome, Firefox or Safari enter the device IP in the address bar to load the Q5's web interface.

The default password for the device is "flexscada".
IT IS HIGHLY RECOMMENDED TO CHANGE THIS PASSWORD WITH A SECURE PASSWORD TO AVOID UNAUTHORIZED ACCESS TO THE DEVICE.

1.3 Web Interface Overview



1.4 - Main Menu


Expert Mode - Disabled
Overview
Device Information
Device Options
Basic Device Configuration
Analog Inputs
Configure Analog Inputs
Relay Configuration
Configure Load Switches
Temperature Sensors
Configure Temperature Sensors
Networking
Network Configuration
Pinging
Setup Ping Probes
Power Metrics
Calculate Watts, PF, etc.
Actions
Apply Configuration
Safely Apply Configuration
Logout from this device
Logout
Expert Mode
Device Details
UID: 1429491896
FW: V63 Built On Dec 13 2018 21:01:...
HW: Flexs Q5 Pro
Dashboard Page (see sec. 1.3)
Device Options Page (see sec. 1.8)
Analog Inputs Page (see sec. 2.0)
Load Outputs Page (see sec. 3.0)
1-Wire Sensors Page (see sec. 2.3)
Networking Page (see sec. 1.10)
Ping Watchdog Page (see sec. 1.9)
Calculated Power Metrics (see sec. 2.5)
Custom Feeds (see sec. 4.0)
Custom Scripts (see sec. 4.0)
System Log Page
Expert Mode (disabled)
Safely Apply Settings (user must confirm after saving.)
Save and apply settings (without confirm option)
Logout
Expert Mode (enabled)
Unique Device ID (UID)
Firmware Version
Hardware Type
Expert Mode - Enabled
Overview
Device Information
Device Options
Basic Device Configuration
Analog Inputs
Configure Analog Inputs
Relay Configuration
Configure Load Switches
Temperature Sensors
Configure Temperature Sensors
Networking
Network Configuration
Pinging
Setup Ping Probes
Power Metrics
Calculate Watts, PF, etc.
Custom Feeds
Setup Custom measurements
Logic
Logic Scripting
Log
View Device Log
Actions
Apply Configuration
Safely Apply Configuration
Save & Apply Configuration
Force Save And Apply Configuration
Logout from this device
Logout
Expert Mode
Device Details
UID: 1429491896
FW: V63 Built On Dec 13 2018 21:01:...
HW: Flexs Q5 Pro

1.5 - Visualisation Menu

Dashboard Page (see sec. 1.3)

Input Graphing Page (see sec. 1.6)

Input Oscilloscope Page (see sec. 1.7)

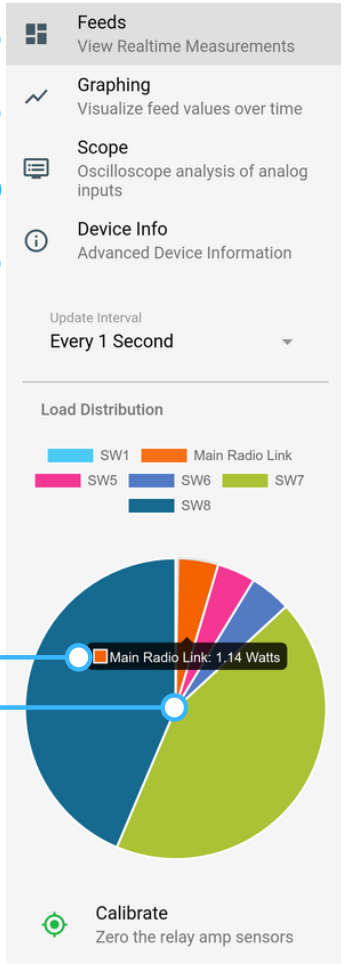
Advanced Device Info

Data Update Interval

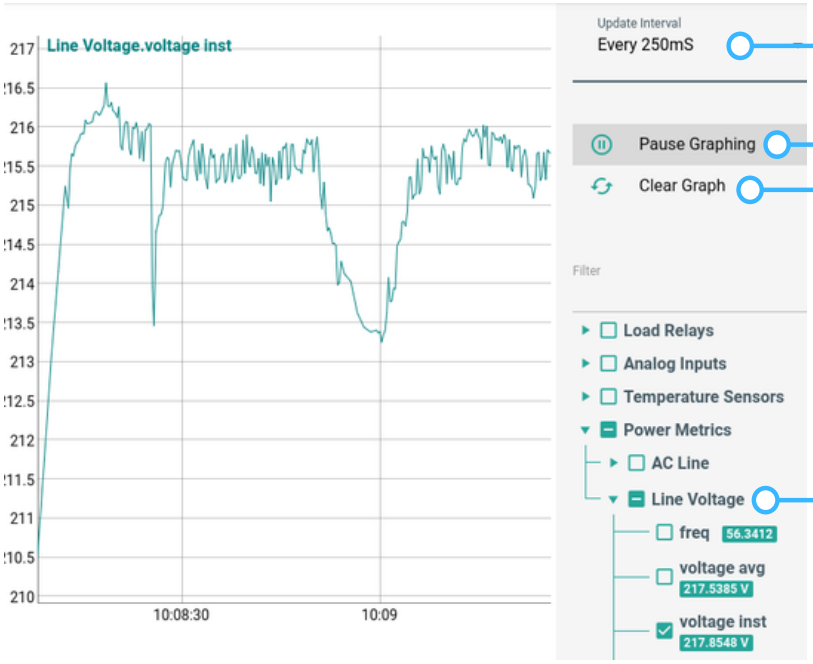
View Load Watts (PRO ONLY)

Load Distribution (PRO ONLY)

Manually Zero Load Sensors (PRO ONLY)



1.6 - Input Graphing Page



Data Update Interval

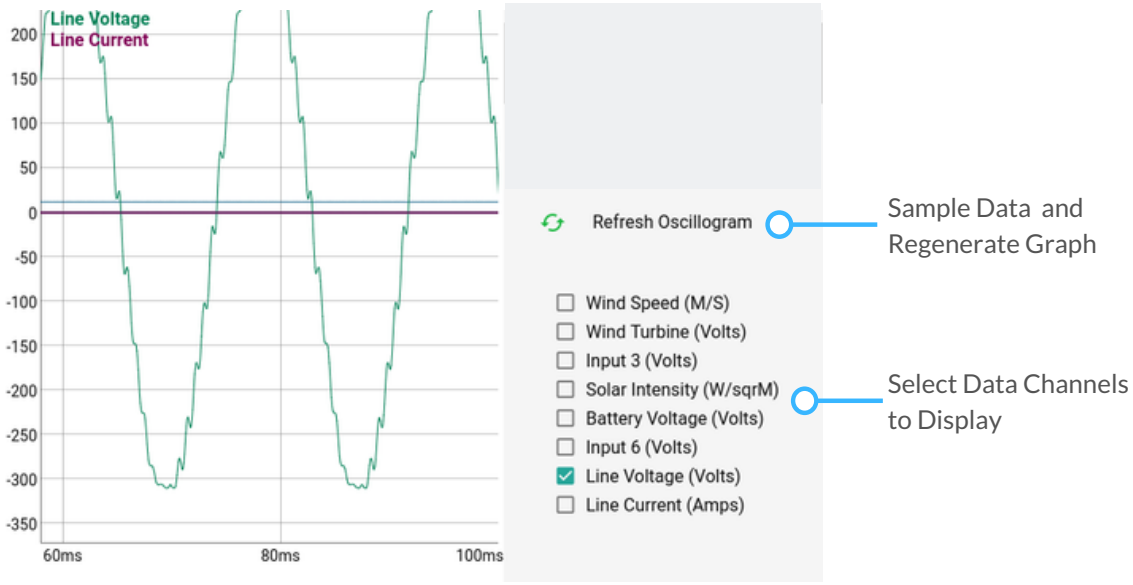
Pause/Start Data Collection

Clear Graph Of All Data

The graphing tool is used to view short term trends, such as current or voltage readings. The Update Interval range can be configured from 100ms to 1 minute.

Select Data Metrics to Graph

1.7 - Input Oscilloscope Page



The oscilloscope tool provides a close-up look at how "clean" your power source is.
When the refresh button is clicked, 2,000 simultaneous readings are taken across all 8 channels and then displayed in the web interface. The sample rate of the Q5 is 8,000 samples/second (i.e. 8 samples taken each millisecond).

1.8 - Device Options Page

Device Name and Description are displayed in the cloud platform. These are useful when searching for a device.

Tags are used in the filtering of graph data in Grafana.

Coordinates will autofill when a GPS module is attached.

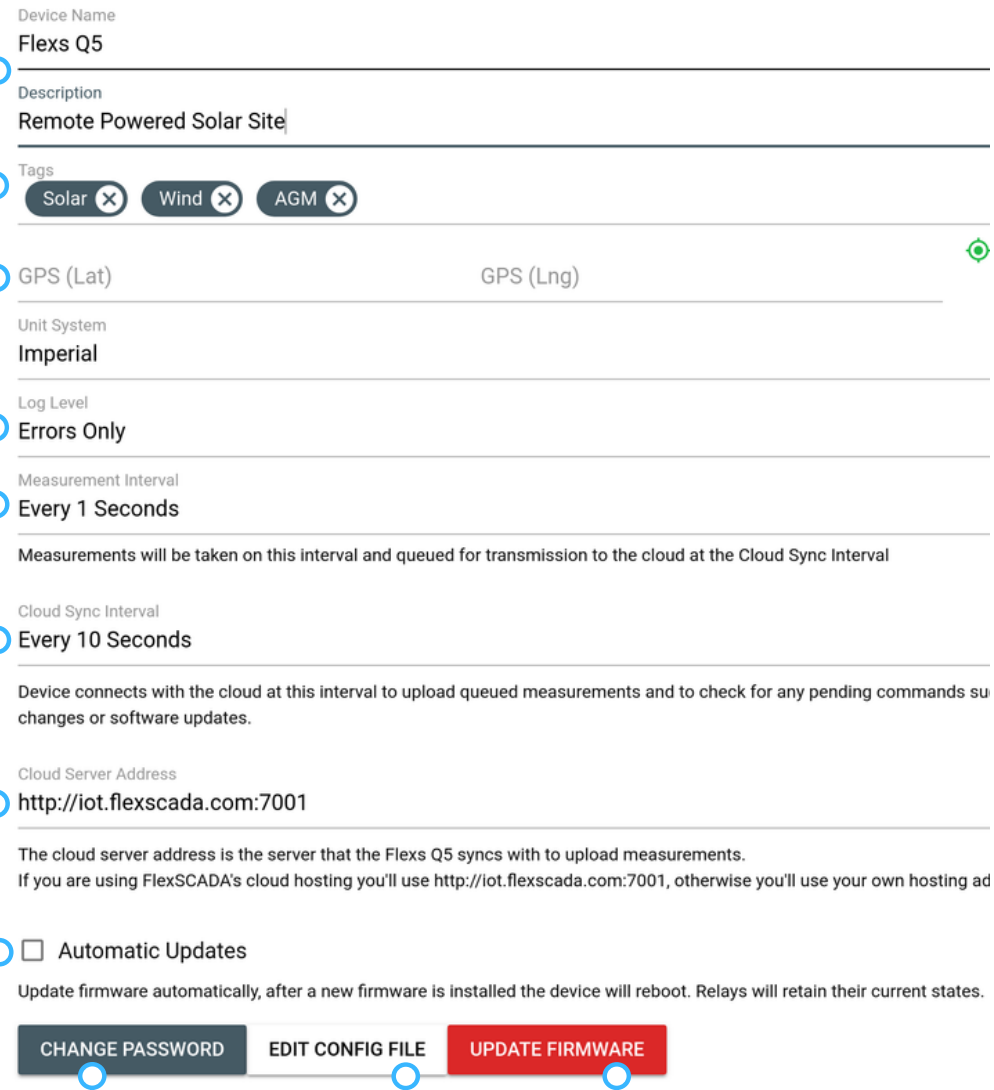
Event logging level.

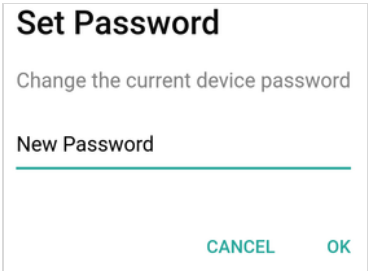
Transmit measurements to cloud at this interval. **Also used for avg, min and max values on the dashboard.**

Sync configuration data with cloud at this interval.

Default address - change this only when running customer hosted cloud software.

If enabled Q5 will check cloud for available updates at boot. See Section 6.0.

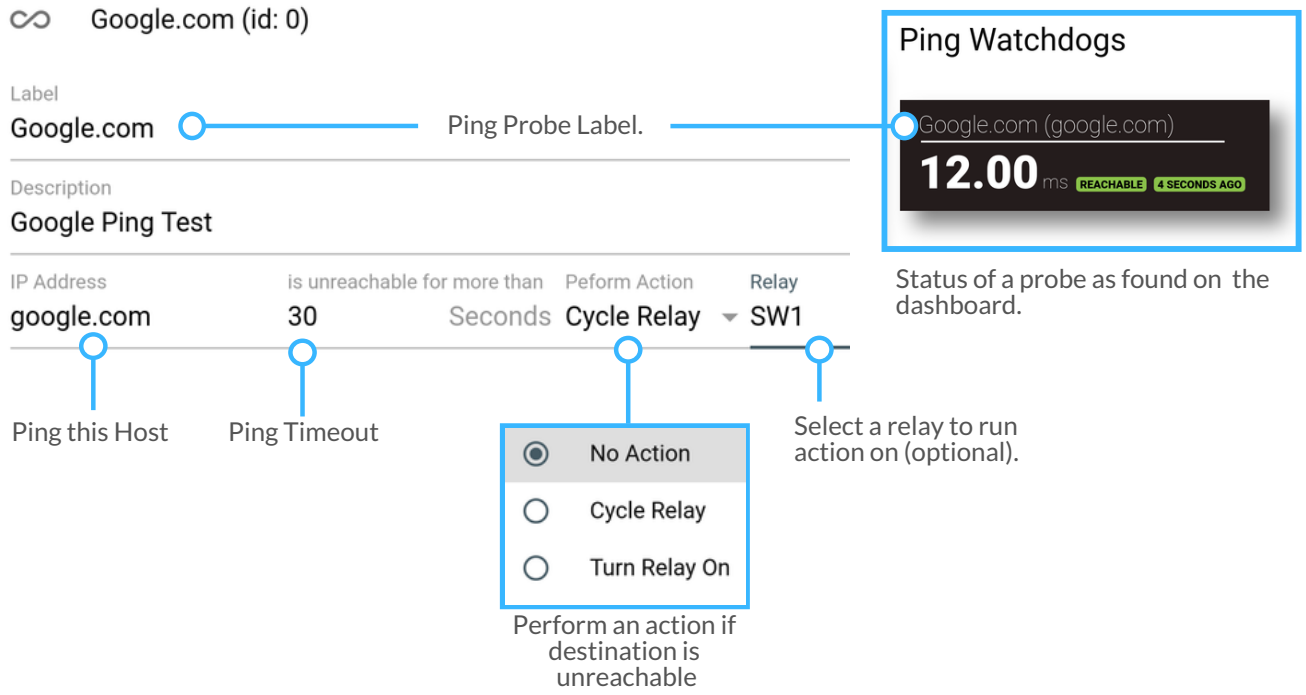




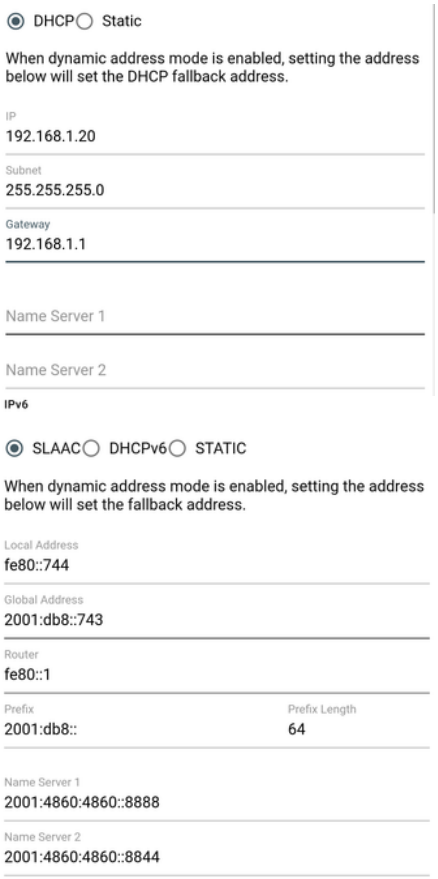
UPDATE FIRMWARE allows you to manually enter the Device Firmware Updater (DFU) to manually update the device firmware. More on this in section 6.0.

EDIT CONFIG FILE allows the advanced feature of editing the actual JSON config file. This is only recommended for expert users.

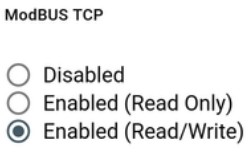
1.9 - Ping Probes Page

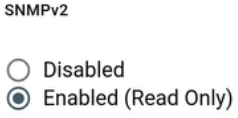


1.10 - Network Page



If the network mode is set to DHCP, the device will request an IP from a DHCP server on the network. Should the Q5 fail to get an IP it will fall back to the IP configuration entered here. The same applies to IPv6. The FlexesQ5 supports both IPv4 and IPv6 at the same time.
Additionally, this page includes options for enabling and disabling SNMP, Modbus TCP and modifying the SSL Certificate.

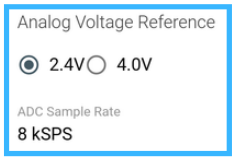




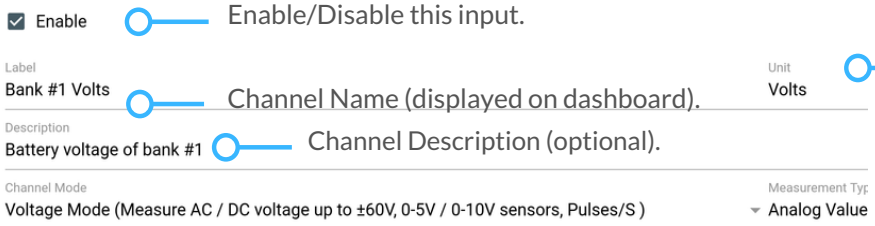
See Section 5.0 SNMP

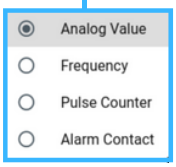
2.0 - Analog Inputs

There are several types of inputs, each of which can be roughly categorized as Analog, Frequency, Pulse Counter and Alarm Contacts. This section provides greater detail on how to use and configure each of these input types.



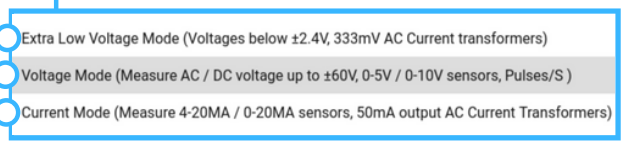
These expert options should not be changed unless directed by FlexSCADA.

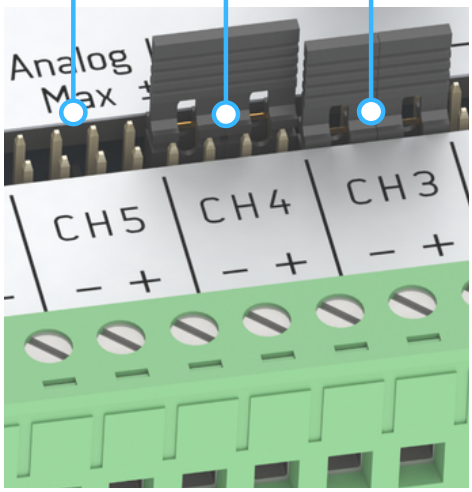




- Used for most applications with DC or AC.
- Eg. wind speed, RPMs, pulse inputs.
- Always up counting. Eg. total gallons.
- Eg. Door open, or water detected.

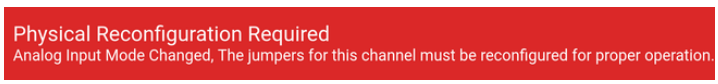
See section 2.4 for more details on measurement types.





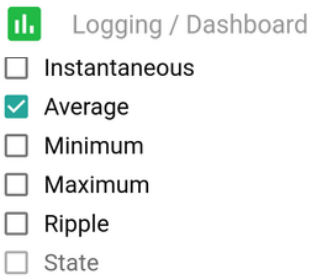
The Q5 hardware has been designed to accept a wide range of inputs. To insure proper operation, it is important to select the correct *Channel Mode* and corresponding hardware configuration.
Voltage Mode accepts a wide voltage range (±60V AC/DC) and can be used for a number of functions (alarm contacts, battery voltages, 0-5V sensors, AC Power Metrics, etc). See sec 2.1 for examples
Current Mode is used for current based sensors, such as 4-20mA sensors and current transformers. See sec 2.2 for examples.
Extra low Voltage Mode is used where high accuracy in a very low voltage range is required. The max voltage range for this mode is ±2.4V AC/DC.

When changing between input *Channel Modes*, you will be alerted about a required hardware change to the jumpers on the Q5. When making this change the Q5 must be powered down.



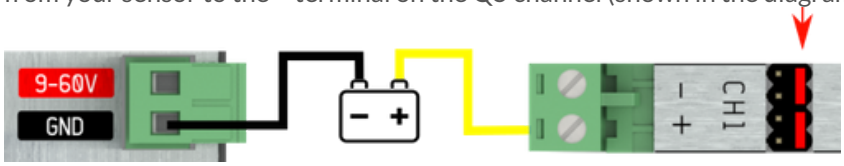
FAILURE TO MAKE THIS HARDWARE CONFIGURAT*ION CHANGE BEFORE CONNECTING YOUR INPUT MAY DAMAGE YOUR DEVICE AND VOID YOUR WARRANTY!*

In the *Logging / Dashboard* section, you must enable the metrics you wish to be visible on the dashboard or sent to the cloud for graphing. Some items may be grayed out, depending on the input configuration chosen. For example, the State metric is only valid when the *Measurement Type* is set to Alarm Contact.
For min, max and average time period see Section 1.8 - Measurement Interval.

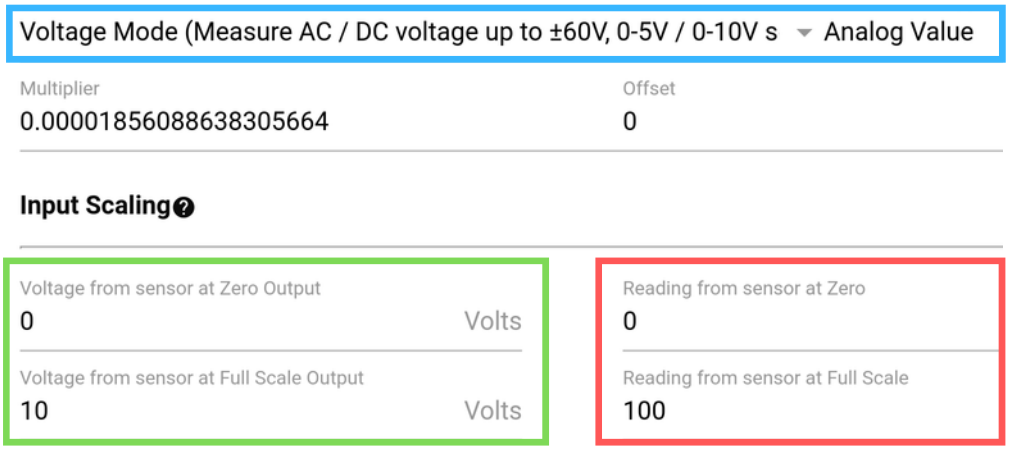


2.1 - Voltage Input

Below is an example of a typical 0-10V sensor attached and configured for use with the Q5. When installing, first confirm that the Q5 is configured in Voltage Mode (see section 2.0 for details on voltage mode). Next, attach the analog output from your sensor to the + terminal on the Q5 channel (shown in the diagram below).

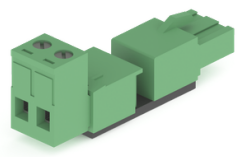


Navigate to the *Analog Inputs* menu, select the channel, then select *Voltage Mode* under *Channel Mode*. Next select *Analog Value* under the *Measurement Type* drop down (Channel Mode and Measurement Type are highlighted in the blue box).

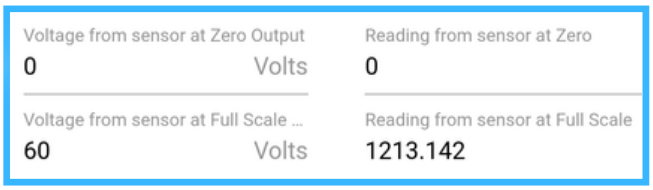


Set the sensor range using the specs found on the side of the sensor or in the provided data sheet. In the above example, 0V corresponds to 0 PSI and 10V corresponds to 100 PSI. Enter the voltage output range of the sensor's analog output in the green box. If the sensor output was a 0-5V signal level, the values in the green box would be 0 and 5 instead of 0 and 10.
The *Multiplier*, *Offset* and *Gain* are automatically set when using the *Input Scaling* section.

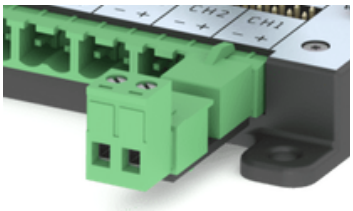
For higher voltages (up to 300V) the Q5 Voltage Reducer hardware module may be used with the following configuration. For more details on AC power, refer to section 2.5.



Q5 Voltage Reducer Module (for voltages up to 300V RMS).



Input Scaling for Q5 Voltage Reducer Module



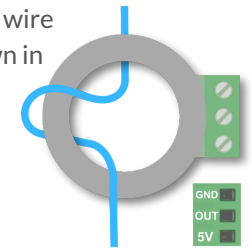
Q5 Voltage Reducer Module (installed).

Current Sensors

Current sensors (not to be confused with current transformers) take a current signal and convert it to an analog voltage output. FlexSCADA and its resellers can provide a 100 A non-invasive current sensor which can be configured as shown below.

Scale Ratio

Load wire shown in blue.



To double the accuracy and halve the range the load wire can be looped through the sensor a second time. In the above example, the new max range is ±50 A.

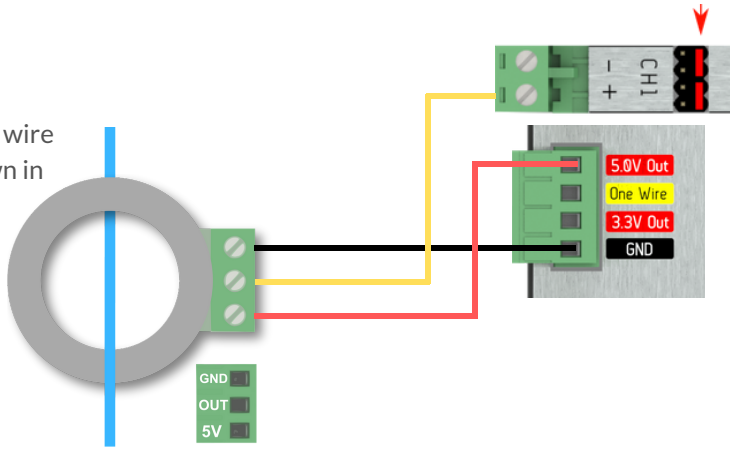
Reading from sensor at Zero
0

Reading from sensor at Full Scale
30

Input Scaling with two loops.

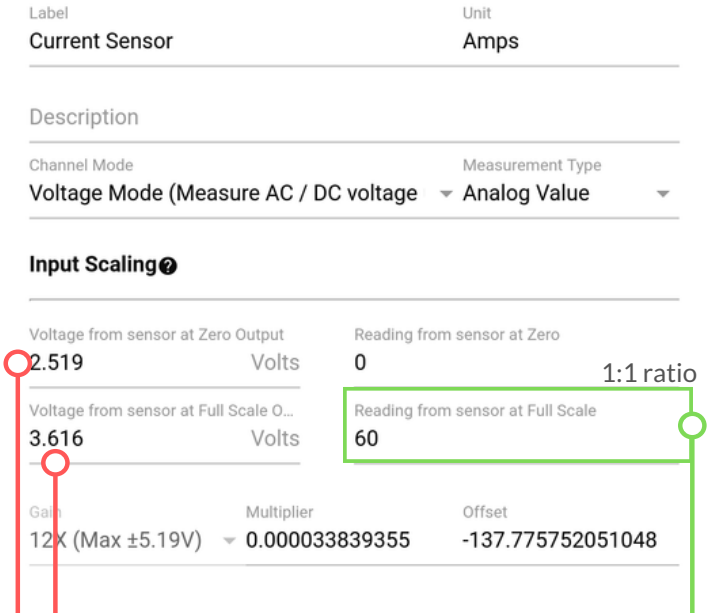
The load wire can be looped through the sensor as many times as needed to get the desired scale. Only the ***Full Scale*** field is modified to reflect this ratio change.

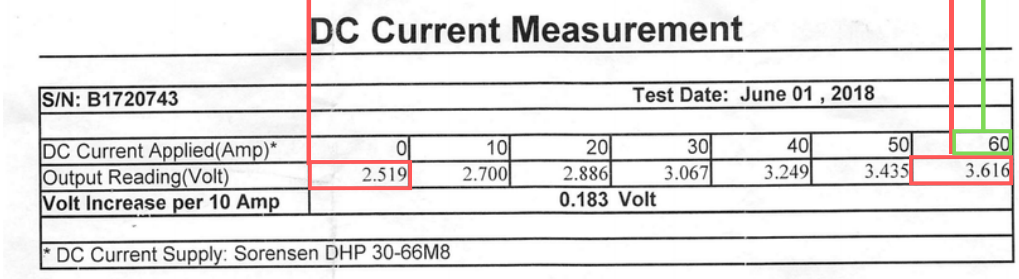
Load wire shown in blue.



Sensor Power Requirements: 5 V DC
Max Current: ±100 A
Part No. ACC-AMP-100NI

Example channel configuration.
The exact values to be entered can be found on the calibration document included with the current sensor.





DC Current Measurement

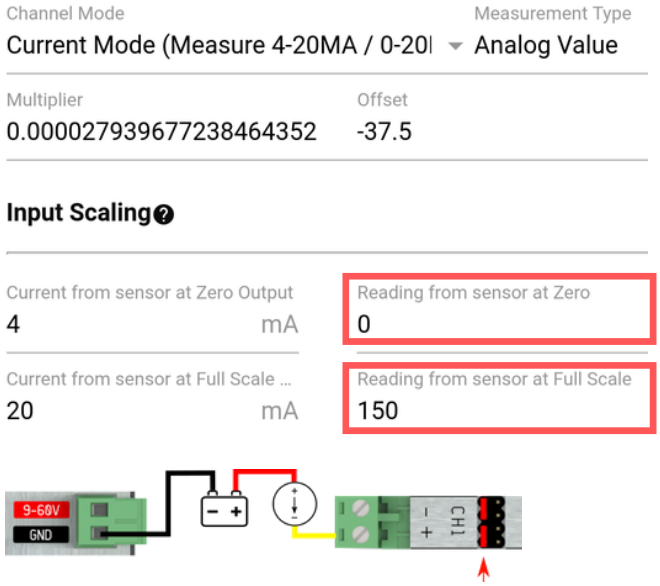
S/N: B1720743				Test Date: June 01 , 2018			
DC Current Applied(Amp)*	0	10	20	30	40	50	60
Output Reading(Volt)	2.519	2.700	2.886	3.067	3.249	3.435	3.616
Volt Increase per 10 Amp	**0.183 Volt**						
* DC Current Supply: Sorensen DHP 30-66M8							

Example calibration report included with each current sensor.

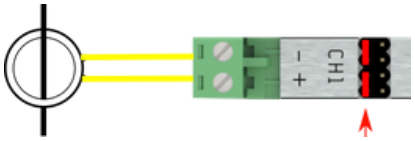
2.2 - Current Inputs

The 4 - 20 mA sensor is the de facto industry standard. This section details how to configure the Q5 to accept this type of input. As the Q5 does not power current loops, external power will need to be provided in order for your current loop to function.
To utilize this feature the hardware jumpers must be configured in *Current Mode* (see section 2.0). Next, configure the input from the *Analog Inputs* menu. The Channel Mode and Measurement Type must be configured as shown below. The configuration example below shows a 4 - 20 mA sensor with a range of 0 - 150 PSI. The sensor range for the specific sensor must be entered as shown in the red boxes.

WARNING! EXCEEDING THE CURRENT RATINGS OF THE Q5 WILL DAMAGE YOUR DEVICE AND VOID THE WARRANTY!

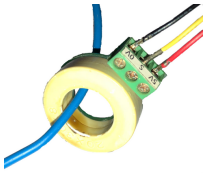


Hardware configuration example for a 4 - 20 mA sensor.



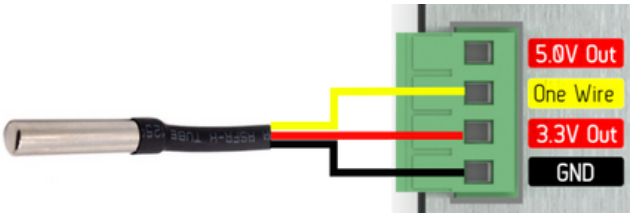
Current transformers can also be used with the Q5 without the need for additional conditioning. Current transformers are connected as shown above.

Note: Current transformers are not to be confused with the 100A non-invasive current sensors sold by FlexSCADA. The non-invasive current sensor converts current readings into a 0-5V voltage style reading. See sec 2.1



2.3 - 1-Wire Sensors

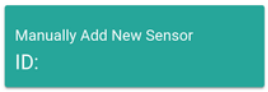
The Q5 supports 1-wire sensors. The below diagram shows how to connect and provide a 1-wire sensor with power and data communication. The Q5 supports up to 64 sensors, each sharing the same 3 wires.



To attach additional one-wire sensors a standard wiring bus will be required, as the terminals are not physically capable of holding more than a few sensors.
Each one-wire sensors has a unique digital ID that makes it possible to view its value without interfering with the other sensors.

Once the sensors have been connected, they must be configured. In the web interface, navigate to the *Temperature Sensors* menu. Located at the bottom of the page you will see "*1 unconfigured sensors found on this device*" followed by the unconfigured sensor showing an ADD button (any one-wire sensor can be used in this way).
Alternately, it is possible to pre-add the sensors using the ID found on the sensors sold by FlexSCADA and its re-sellers. All one-wire sensors will have a unique ID. FlexSCADA one-wire sensors have been labeled with this pre-existing ID for ease of use.

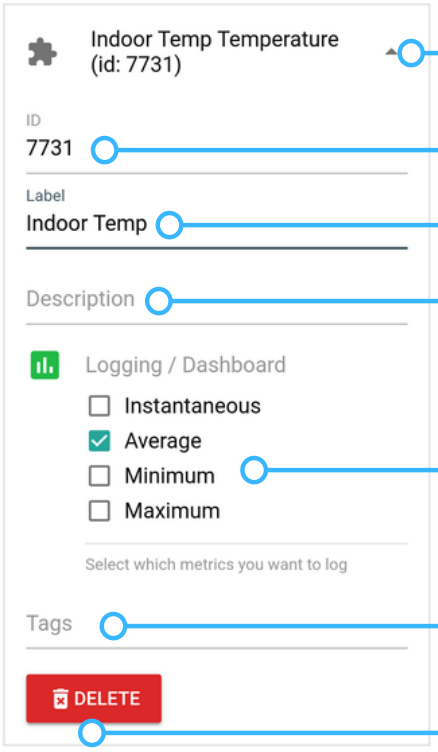
Adopt unconfigured temp sensor.



Manually add temp sensor. (Sensor ID found on sensor wire shown right.)

The display units can be modified in the *Device Options* menu.

The below example shows a newly added temp sensor, along with the options to name the sensor and choose which metrics to log or add to the dashboard.



Show/Hide sensor options.

ID of the sensor, this can be updated if a sensor needs to be replaced.

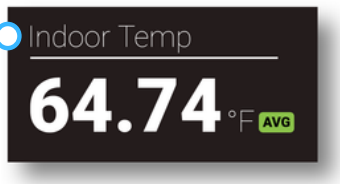
Sensor Label - this label is used on the dashboard and in the graphing.

Detailed sensor description. (optional)

Select what metrics you wish to graph or display on the dashboard. For min, max and average time period see Section 1.8 - Measurement Interval.

Tags help in selecting datasets when graphing. An example might be "greenhouse 1" allowing an easy way to select sensors belonging to that greenhouse.

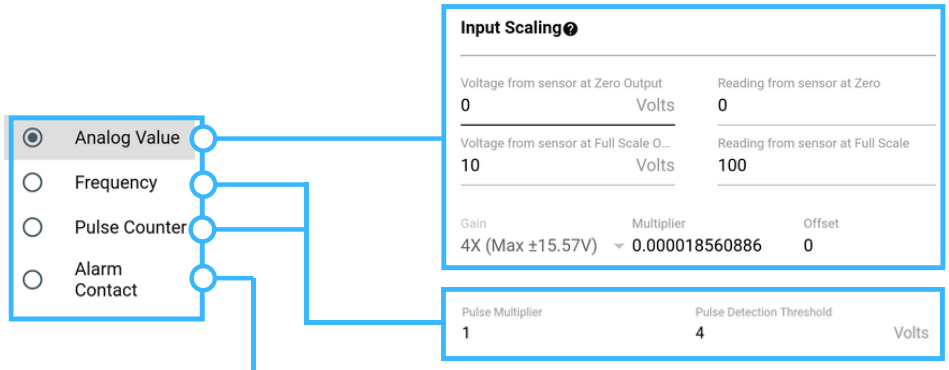
Delete this sensor.



New temp sensor displayed on the dashboard.

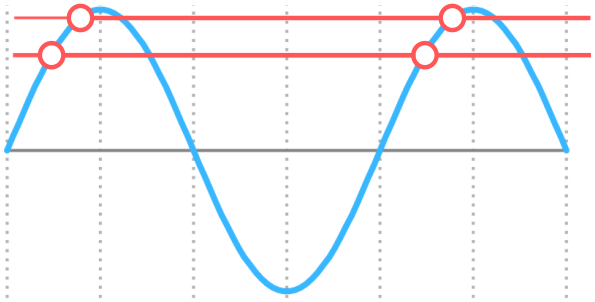
2.4 - Understanding Measurement Types

Not all measurements utilize an analog value. This section details the various *Measurement Types* supported by the Q5.
Each channel provides the following *Measurement Type's* option:



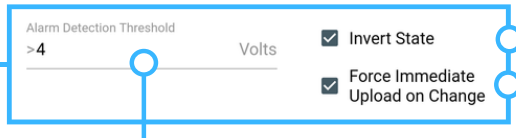
For additional information on the Analog Value option and Input Scaling calculator refer to sections 2.1 and 2.2.

Both *Frequency* and *Pulse Counter* require a threshold to recognize when a valid signal has been detected. This is known as the *Pulse Detection Threshold*. To avoid counting the same rising edge twice, the signal must exceed 20% of the *Pulse Detection Threshold* in order to be considered a valid pulse (see graphic below).



Frequency is the number of valid pulses per second or hertz (Hz).
Alternately, *Power Metrics* can be used to find the frequency of an input (see section 2.5 for more information).
Pulse Counter is a total count of all pulses since the Q5 has booted.

Pulse Multiplier is used to adjust sensor readouts. For example, the spec sheet for an anemometer reads as follows: **Output Frequency: 1,1 HZ / m/s.** But **we want** the sensor to read out the exact m/s on our graphs. The multiplier could be set to 1 / 1.1 = **0.909 multiplier**.
In another example a flow sensor reads **450 output pulses/liter.** The multiplier could adjust the output to read in liters/minute. We are looking at Hz (pulses per second) so we need to divide by 60 seconds. 450 / 60 = 1 liter per 7.5 pules/s = 1 (liter) / 7.5 (pulses) = **0.133333 multiplier.**



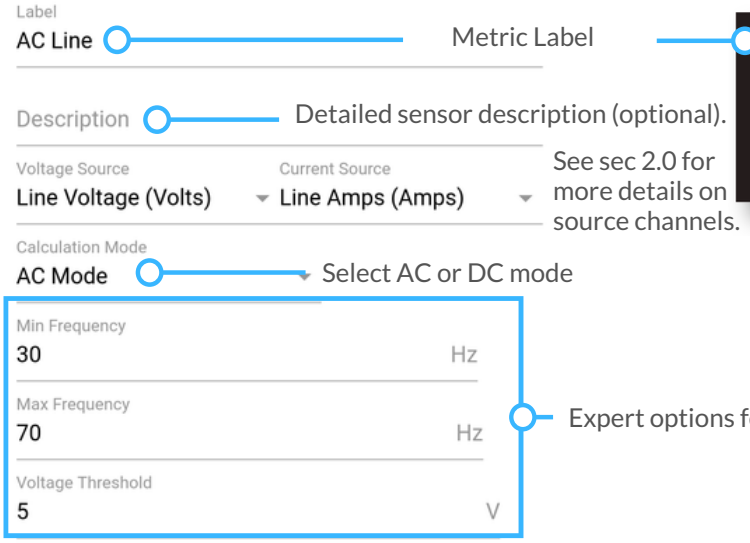
Alarm under threshold.

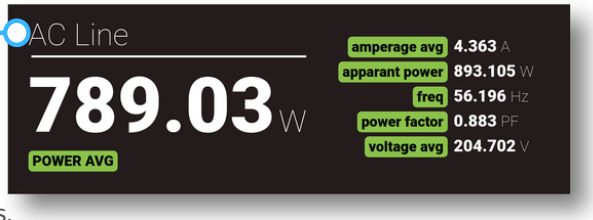
Send update to cloud when alarm is triggered.

Threshold over or under which to trigger alarm.

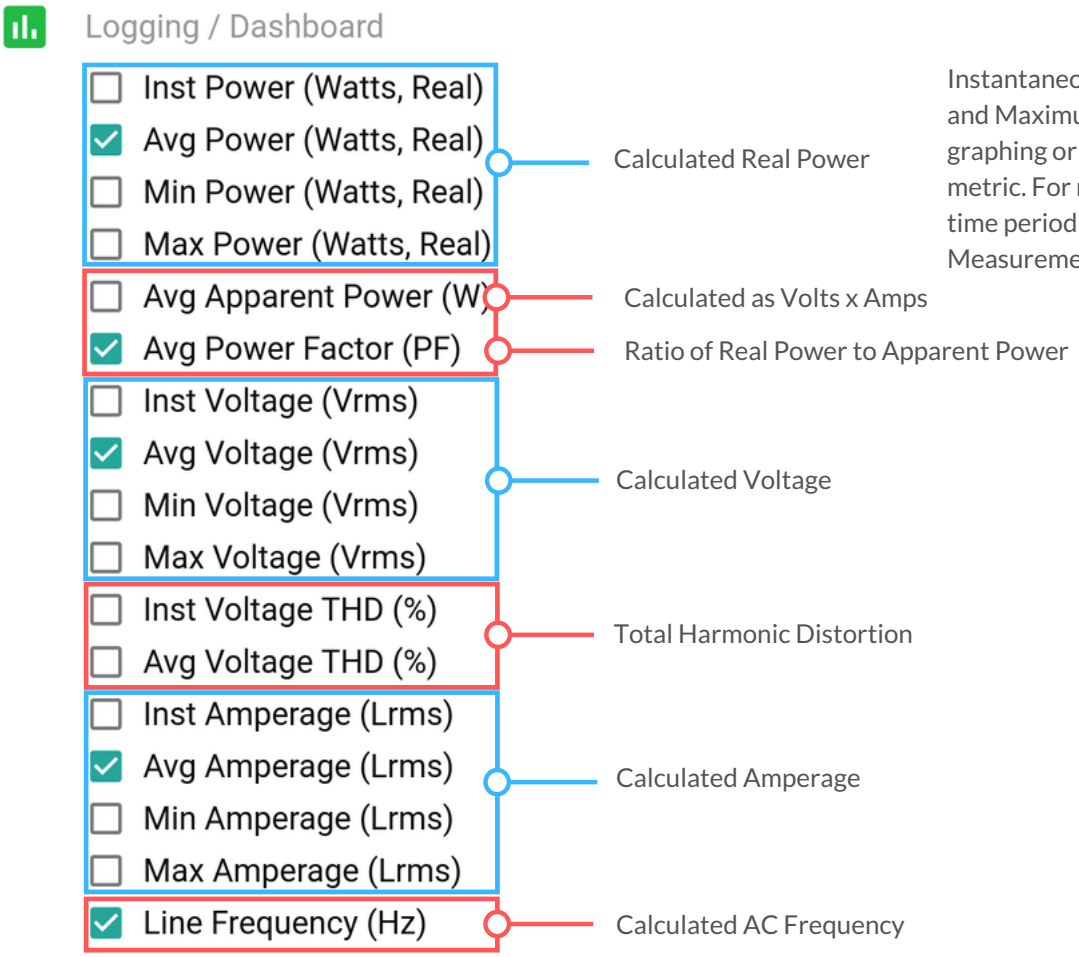
2.5 - Power Metrics

The *Power Metrics* menu provides the ability to calculate a number of power related metrics for both DC and AC power. With AC power it is possible to calculate watts, amps, volts, power factor, apparent power, frequency and Total Harmonic Distortion (THD). With DC the main use for power metrics is for calculating wattage.



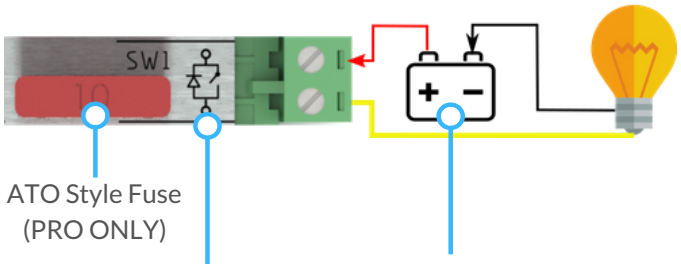


Power Metrics as displayed on the dashboard.



3.0 - Relay Configuration

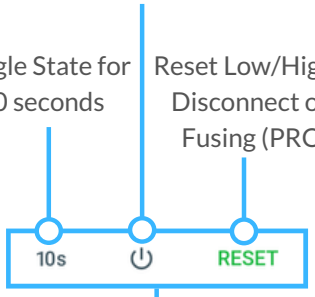
Both the Q5 and Q5 Pro include 8 solid state load relays capable of switching up to 10A DC (Max 100W). The pro version includes internal current sensing on all 8 relays capable of accurately measuring loads up to 5 Amps DC.



ATO Style Fuse (PRO ONLY)

Polarity must be correct, or load will not turn off.

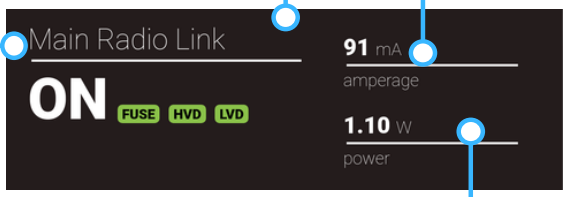
Load switch only, circuit must be powered.



Toggle State

Toggle State for 10 seconds

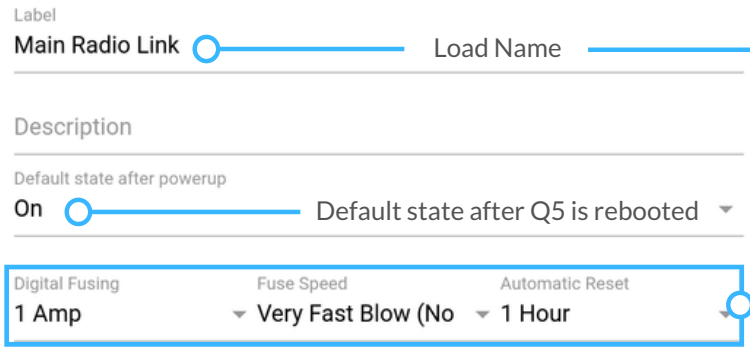
Reset Low/High Voltage Disconnect or Digital Fusing (PRO ONLY)



Load Current (PRO ONLY)

Load Relay as found on the dashboard

Load Voltage is required to calculate wattage (PRO ONLY).



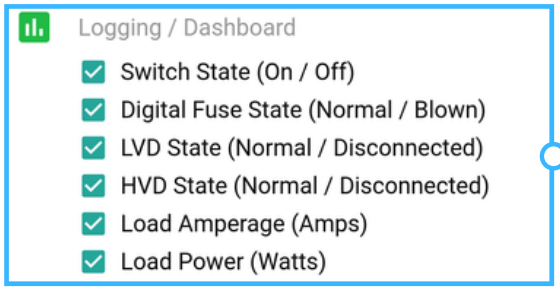
Load Name

Default state after Q5 is rebooted

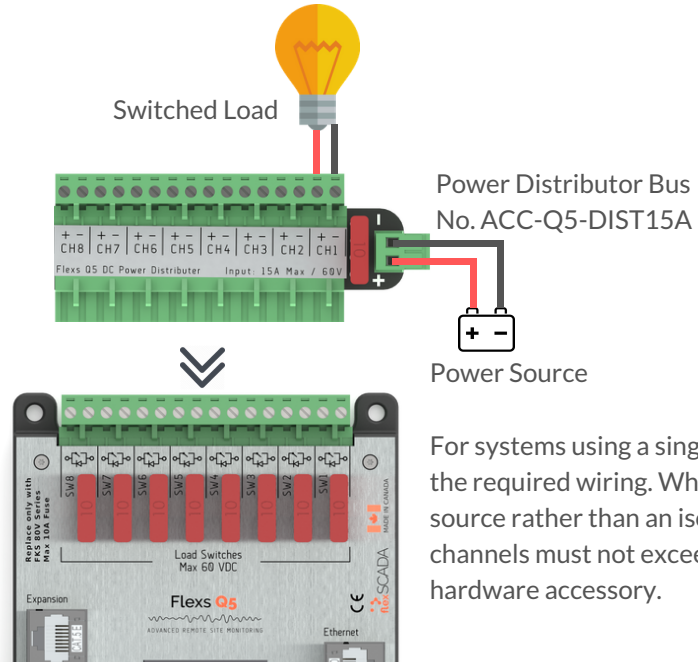
Digital Fusing (PRO ONLY)

Eg Battery voltage powering this device, required for Low/High Voltage Disconnect.

Low and High Voltage Disconnect serve the same purpose; protecting the load from damage in the event of extreme power fluctuations.



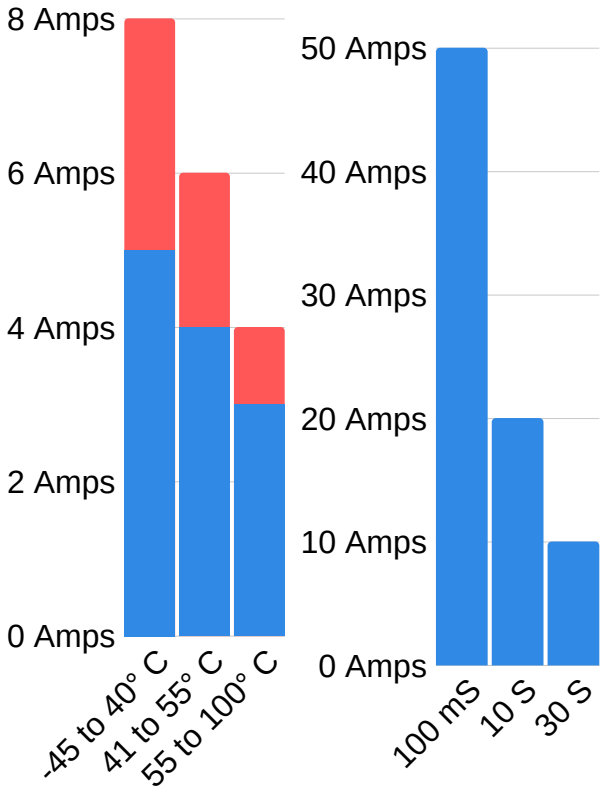
Choose the metrics to be logged or displayed on the dashboard. *LVD*, *HVD* and *Load Power* require *Load Voltage* to be provided. *Load Amperage*, *Load Power* and *Digital Fusing* are available with the Q5 Pro only.



For systems using a single voltage we offer a distribution bus to cut down on the required wiring. When using the distributor each channel acts as a power source rather than an isolated switch. The max combined load across all channels must not exceed 15 A. No software configuration is required for this hardware accessory.

3.1 - Relay Specifications

The Q5 Relays are subject to environmental de-rating as detailed below.



Red - under 30 Volts.
Blue - 30 to 60 Volts.

Max on time in 1 minutes period.

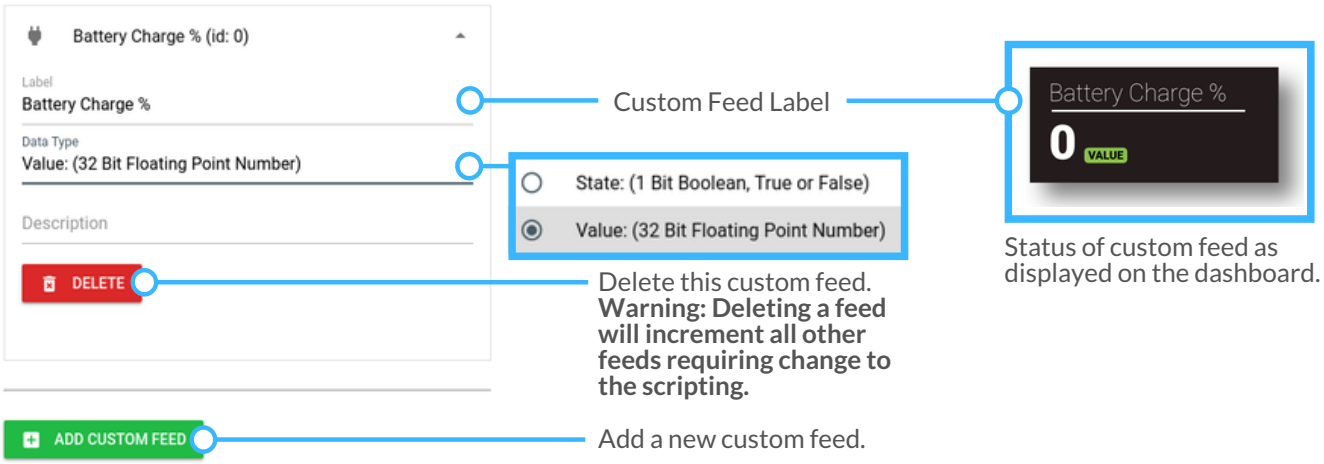
Technical Specifications

- Switch Impedance: 8 mOhms (Not including fuse)
- Max Open Voltage: 70 VDC
- Power Consumption: 2 mW in closed state
- Isolation Level: +/- 125 V (Channel to Channel or Channel to Q5 Ground)
- Max Surge Rating: 250 A transient pulsed; tp ≤ 10 µs
- Max Current Sensing: 5 A (PRO ONLY)
- Contains fly-back suppression for switching inductive loads such as relays, motors, etc.(up to 140 mJ (Max 250 A Peak Current)

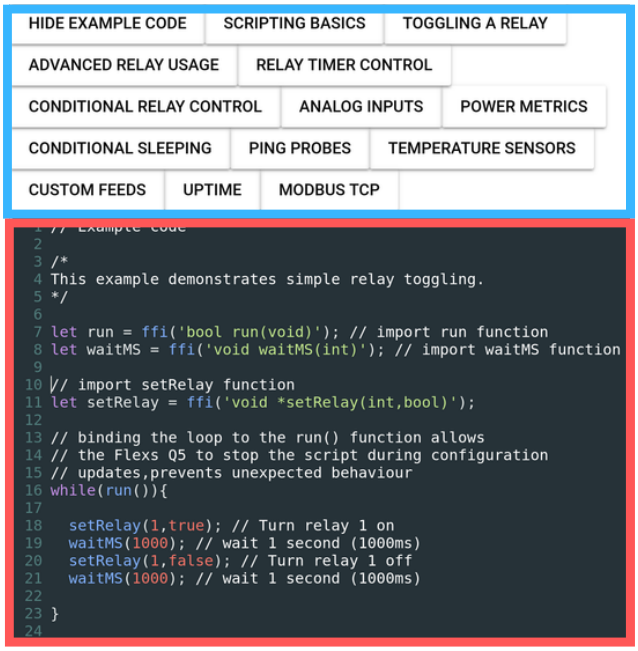
4.0 - Scripting

The FlexsQ5 has an on-board scripting language that utilizes JavaScript syntax. This scripting provides access to all on-board analog inputs, temperature sensors, load outputs, custom feeds and Modbus TCP.

Custom feeds are a location where you can store data generated by your scripts. This data is uploaded to the cloud server and can also be viewed on the dashboard. Additionally you can access custom feeds from SNMP. See section 5.0.
Custom feeds can be configured as either a bool (true or false) or as a floating point number (a number with decimal places). See the on board "Custom Feeds" example for more info on how to write to the custom feeds.



Logic menu is where all the action with scripting takes place. Included on this page are a number of helpful examples (highlighted in blue). Below you will find the syntax highlighted code editor (highlighted in red).



All scripting is managed as a secondary priority to the main functions of the Q5 (to avoid interruptions to system tasks). For a more in-depth look at scripting, please see the on board examples.
Any errors in the scripting will prevent all of the script from functioning. Details on where the error is located can be seen at the top of the page upon saving the settings.

The line in your script causing the error.

Error shown at top of page, indicating the line causing the problem.

4.1 - HTTP API

The FlexsQ5 has a HTTP/HTTPS API that allows for a number of parameters to be accessed or modified. Below are some examples of how to use this API.
All requests must be authenticated using the BASIC AUTH headers with the password hashed using SHA256.

```php
<?php

//Change the following variables as needed
$ip = '192.168.1.20';
$password = 'flexscada';

//Initialize CURL
$curl = curl_init();

//Set CURL Options
curl_setopt_array($curl, array(
  CURLOPT_URL =>
  "http://$ip/api/metrics",// /metrics or /crypto
  CURLOPT_RETURNTRANSFER => true,
  CURLOPT_TIMEOUT => 2,
  CURLOPT_CUSTOMREQUEST => "GET",
  CURLOPT_USERPWD =>
  ":" . hash('sha256', $password . "FlexsQ5!")
));

//Run CURL Request
$response = curl_exec($curl);
$err = curl_error($curl);

curl_close($curl);

//if no error was found
if (!$err) {
  //Decode the JSON Response
  $returnedData = json_decode($response, true);
  //Return the decoded data
  print_r($returnedData);
} else {
  // If there was an error, show that
  echo "cURL Error #:" . $err;
}
```


```json
{
  "inputs": [
    {
      "ch": 1,
      "label": "Main Battery",
      "unit": "V",
      "value": {
        "inst": 49.142,
        "avg": 48.992,
        "min": 47.501,
        "max": 49.50,
        "ripple": 0.0021,
        "state": 0
      }
    }
  ],
  "relays": [
    {
      "ch": 1,
      "label": "Main Microwave",
      "state": 0,
      "load_avg": -0.0009,
      "load_inst": -0.0118,
      "power_avg": 0,
      "hvd_tripped": 0,
      "lvd_tripped": 1,
      "fuse_tripped": 0
    }
  ],
  "temp_sensors": [
    {
      "id": 7731,
      "index": 0,
      "label": "Indoor Temp",
      "registered": true,
      "value_inst": 0,
      "value_avg": 0
    }
  ],
  "power_metrics": [
    {
      "id": 0,
      "label": "AC Line",
      "voltage": {
        "avg": 2.6372,
        "max": 2.6423,
        "min": 2.6319
      },
      "amperage": {
        "avg": 3.023,
        "max": 3.1572,
        "min": 2.9257
      },
      "real_power": {
        "avg": -7.0377,
        "max": -6.7507,
        "min": -7.4345
      },
      "powerfactor": -0.8828,
      "apparent_power": 7.9723,
      "thd": 30.641
    }
  ],
  "epoch": 1548106981
}
```


This PHP example requests all the metrics from the FlexsQ5. The response shown left includes all enabled channels and relays. The /crypto endpoint displays IP Address info and other system parameters.

The above example code can be downloaded here:
https://pastebin.com/y66r1niS

```php
<?php

//Change the following variables as needed
$ip = '192.168.1.20';
$password = 'flexscada';

//Initialize CURL
$curl = curl_init();
//Valid Commands
//set_relay = set relay state
//reset_relay = reset softfuse, LVD or HVD
//pulse_relay = toggle relay for 10 sec
//toggle_relay = change relay state
$postData['command'] = 'set_relay'; //valid command
$postData['channel'] = 1; //Relay Channel Number
//Only valid on set_relay command
$postData['state'] = 1; // 0 = OFF; 1 = ON

//Set CURL Options
curl_setopt_array($curl, array(
  CURLOPT_URL =>
  "http://$ip/api/ctrl",
  CURLOPT_RETURNTRANSFER => true,
  CURLOPT_TIMEOUT => 2,
  CURLOPT_CUSTOMREQUEST => "POST",
  CURLOPT_POSTFIELDS => json_encode($postData),
  CURLOPT_USERPWD =>
  ":" . hash('sha256', $password . "FlexsQ5!")
));

//Run CURL Request
$response = curl_exec($curl);
$err = curl_error($curl);

curl_close($curl);

//if no error was found
if (!$err) {
  //Decode the JSON Response
  $returnedData = json_decode($response, true);
  //Return the decoded data
  print_r($returnedData);
} else {
  // If there was an error, show that
  echo "cURL Error #:" . $err;
}
```

This PHP example shows how to set a relay state on the flexsQ5.

```
{
    "status": "success"
}
```

The Q5 will respond with the above reply indicating that the state change was successful.

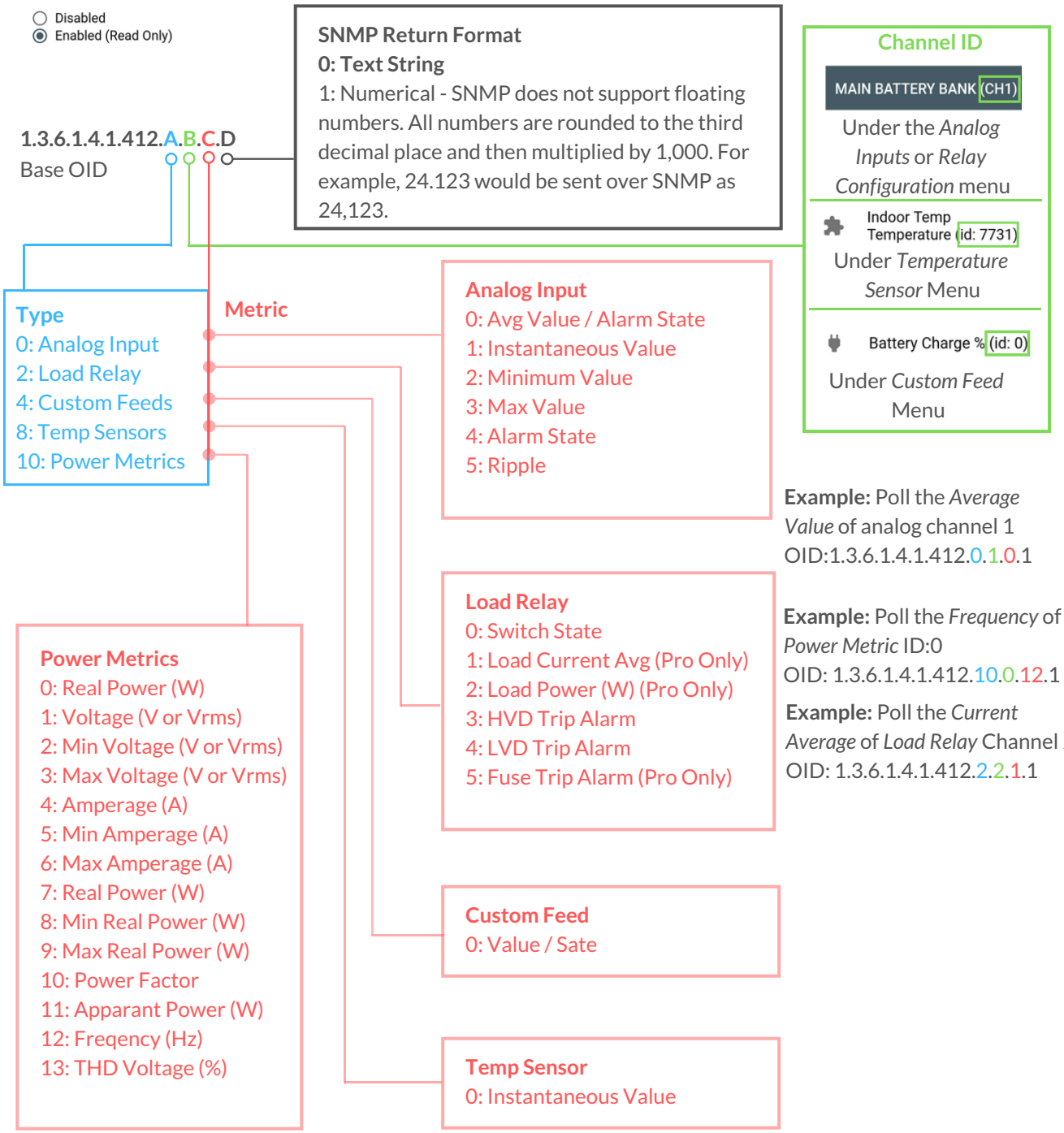
Using this same API endpoint it is also possible to reset the soft fuse, toggle the relay and toggle the relay for a timed 10 seconds.

The example shown left can be downloaded here: https://pastebin.com/fsvaPpP4

In this manual we have only shown examples written in PHP, however the Q5 API can be accessed from any code language using the correct HTTP requests.

5.0 - SNMP

Simple Network Management Protocol (SNMP) has been used by networks for over 30 years, making it one of the most widely supported protocols.
The Q5 supports SNMP version 1 and 2c, with the default community of "public". At this time, the community can not be changed to encourage better security methods such as a VPN.
Enable SNMP in the *Networking* menu as shown.



Example: Poll the average value of *channel 1* using the *NetSNMP* command line tool.

 # snmpget -v2c -c public <IP Address> 1.3.6.1.4.1.412.0.1.0.1

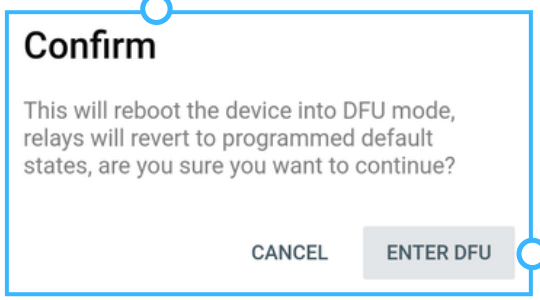
6.0 - Device Firmware Updater

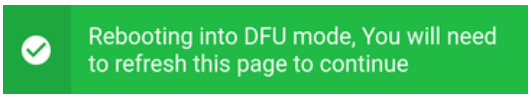
FlexSCADA will occasional release new firmware to add additional functionality to the Q5. This section explains how the Device Firmware Updater (DFU) mode works to upgrade your Q5's firmware.
Select *Device Options* from the main menu. On the *Device Options Page*, you will find two options relating to firmware updates.

☐ Automatic Updates

When enabled, the Q5 will check for available updates on the FlexSCADA server when the Q5 is rebooted. If using scripting this option is discouraged, as future updates may affect script operation.

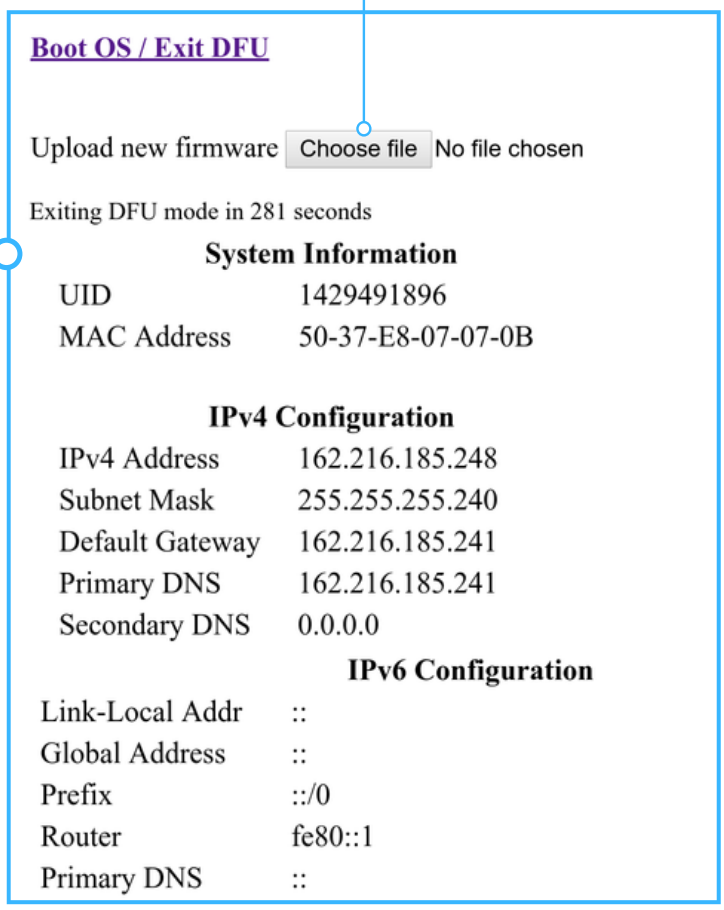
The *UPDATE FIRMWARE* button allows you to manually update the firmware of the Q5 using the DFU mode.



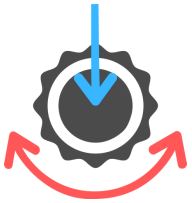


After refreshing the page, you should be in DFU mode (shown at right).
You have 5 minutes to find and upload your firmware before the Q5 will revert back to the main operating system. You can also exit the DFU mode by clicking the link marked *"Exit DFU"*.
The UID, MAC and current IP configuration are also visible from the DFU mode.

After selecting and starting the upload do not unplug or refresh the page for 30 seconds.



It is also possible to manually force the device into DFU mode by holding the control knob down while power is applied to the device. This is also mentioned in Section 7.0.

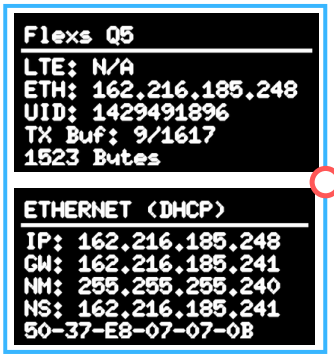


Rotating goes between pages, clicking accesses additional views.

7.0 - Device Interface

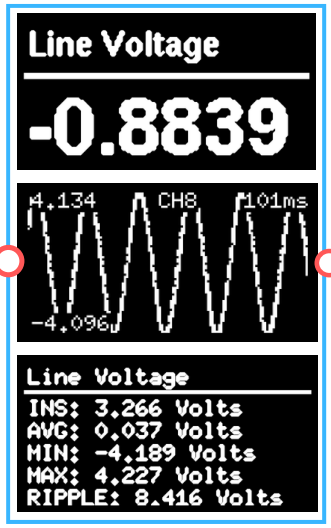
Using the multi-function knob on the Q5, it is possible to view a number of parameters without using the web interface. The knob can be rotated and pressed to navigate between pages or access additional views. In the case of relays, clicking the knob allows you to change the state of the relay. The naming and scaling of each view found below corresponds to what has been configured in the web interface.

Pressing the knob while the power is applied will put the device in DFU mode - See Section 6.0. Continuing to hold the knob for an additional 60 seconds will reset the configuration to factory default.

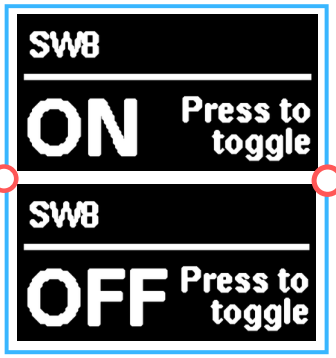


Q5 Homes Page - showing current IP, device UID, available buffer for readings and Bytes of readings taken.

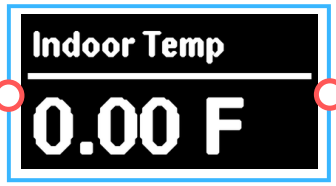
Ethernet Page - Shows current IP, Gateway, Netmask, Name Server and MAC Address.



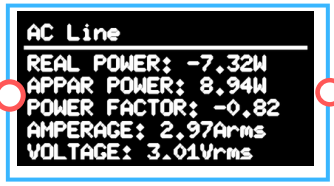
Analog Input Page - See Section 2.0. There will be one page for each enabled analog input. Press the knob to switch between views.



Load Relay Page - Press the knob to switch relay ON/OFF. See Section 3.0 for more info on naming relay channels.



One Wire Sensors Page - See Section 2.3 for more details.



Power Metrics Page - See Section 2.5 for more details.

Custom Feed Page - See Section 4.0 for more details.

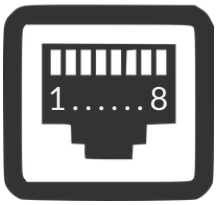
Ping Page - See Section 1.9 for more details.

8.0 - Expansion Interfaces

This section details how some of the expansion interfaces on the Q5 can be used.

RJ45 Expansion Connector

WARNING! CONNECTING A POE TO THIS PLUG WILL DAMAGE YOUR Q5 AND VOID YOUR WARRANTY!

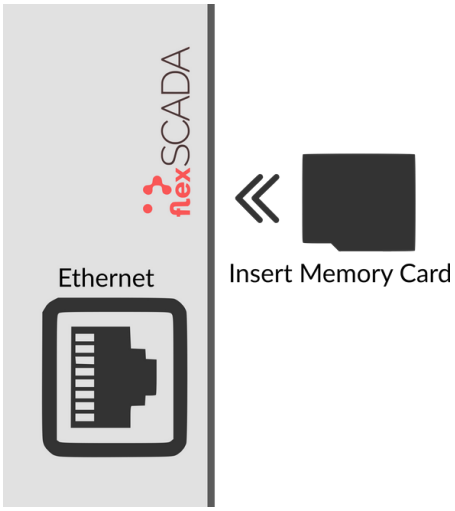


Expansion

Expansion Pinout
1..... I2C-SCL / UART-TX (I/O)
2..... I2C-SDA / UART-RX (I/O)
3..... 3.3V DC OUT (500 mA Max)
4..... GND
5..... 5V DC OUT (500 mA Max)
6..... IO Push/Pull 1.8 V / 5 V Open Drain Out
7..... GND
8..... One-Wire (I/O)

Note: The I2C, UART and IO pins are not accessible via the Q5 software at this time. Customers that need access to one of these interfaces should contact FlexSCADA.

Memory Expansion



The Q5's internal memory allows for roughly 1 month* of readings to be stored before older data is erased. In applications where extensive long term data-logging is required the Q5 may be outfitted with an external memory card for additional capacity. For more info on how to use this feature please contact FlexSCADA.
*Actual duration depends on measurement interval and number of metrics being logged.

9.0 - Warranty Terms

The FlexsQ5 comes with a 3 year Limited Manufacturer's warranty. The FlexsQ5 Pro comes with a 5 year limited Manufacturer's warranty.
For warranty coverage the following terms and conditions apply:

- The product must have failed while operating within the specifications outlined in this document.
- Water or moisture damage is not covered.
- Physical damage to the product as a result of improper use will not be covered.
- Buyer must submit an RMA via our website showing proof of purchase.
- Buyer must ship the product to our RMA department for review.

Please contact us with any additional warranty questions.