Manuals+

ELPRO QE-E Quantum Edge User Guide

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Quantum QE-E Beta Trial — Release Notes

This document accompanies the Beta release of the ELPRO QE-E Quantum Edge and provides important information about using the product. This guide is aimed at users who are familiar with ELPRO's 415, 925, and 215 series products, and focusses on differences from these products.

You will also have received an installation guide which shows how to connect to the device.

Configuration

Configure using the CConfig App or using the embedded webpages. Default login admin/admin.

You can download CConfig app or USB drivers (for webpage config) from the ELPRO website. https://elprotech.com/product/el-qe-e-quantum-edge-base/

USB-C port

Use the USB-C port for easy configuration. You need to download the USB Driver from ELPRO website (New version to support Quantum). If you have a USB-C port on your computer which provides 1.5A or more, then you can power the module directly from this port. The small LED beside the USB-C connector turns green if there is sufficient power available. If your computer has a USB-A port, you can use a USB-A to USB-C cable, but you need to power the module separately. Your computer will automatically be configured with the correct IP address via DHCP.

USB IP Address: 192.168.111.1

Note: Our testing has shown that when the Quantum is already powered externally through the Battery or Supply ports, some computers with USB-C will not connect to the Quantum unit. In this case, use a USB-A to USB-C cable to connect to the unit using a USB-A port on the laptop.

Ethernet Ports

You can also use either of the Ethernet ports for configuration. To connect to the Ethernet port, you need to set your PC ethernet port to the correct subnet address (there is no DHCP on the Ethernet by default). The default Ethernet IP address is printed on the side label of the unit.

Ethernet IP Address: 192.168.0.1XX (Depending on unit serial number).

WiFi Port

The WiFi Port is not enabled by default. You need to enable and configure WiFi via the device webpages over Ethernet or USB-C port before you can access the unit via WiFi.

Power Supply

The Quantum provides a flexible power supply with integrated battery charging. The

supply can operate from 9V to 50V and will charge a 13.8V battery over the full input voltage range. At device power up, the supply is configured to draw no more than 2A, and battery charge current is limited to 4A. This is expected to be suitable for most mains-powered applications. For higher current and solar applications, you can configure the power supply operation. Take care as the power supply configuration is enabled after module boot has completed, so your power setup needs to be able to run the module with the default power configuration until module boot is complete.

For Solar charging, select "Enable MPTT". Take care – the unit must be powered from the Battery terminals before enabling this option.

You can enable different settings for the Power Supply. To do this check "Enable Custom settings". You can set the Input Current Limit (The maximum current the device will draw from the power supply) to between 1A and 5A. Set this to a level to suit your power supply. When solar panels are used, the current will be limited by the MPPT circuit, and this current limit can be set to the maximum current of the solar panel used.

You can set the Charge Voltage to between 13.5V and 14.0V, and you can set the maximum charge current to between 0.4A and 5A. Set these to suit your battery.

High Current / High Voltage Output Switch — DO9

The Quantum provides a single Electronic Relay output. This will switch up to 60V AC/DC, 5A continuous, and up to 30A for 100mSec (e.g. for motor start). You can use this to switch high powered external devices. Turn this switch on and off using the Digital Output signal DO9 (Register 0009)

Controllable +12 V supply Output — DO10

The Quantum provides a switchable +12V output on the front panel I/O connector. You can use this to supply other devices (up to 1A) including 115S expansion I/O modules. You can turn this supply on and off using the Digital Output signal DO10 (Register 0010).

Front Panel Push-Button

The front panel push-button provides a method to reboot the device without removing the power, and a method to restore factory default settings. The LED Ring shows the status of the pushbutton and current action.

Idle	Short Press	5-9 Sec Press	10-15 Sec Press	Release
	(Test Cmd)	(Reboot)	(Factory Default)	Executing
Green	Off	Blue	Blue	Red
Green	Blue	Off	Blue	Red

Test Command

Hold the button down for approximately 1 second until the light ring comes blue, then release.
Currently this command has no function. Future releases will implement a module self-test.

Reboot

Hold the button down for approximately 6 seconds until blue colour in the light ring switches, then release. The module will reboot.

Factory Default

Hold the button down for approximately 12 seconds until the blue colour in the light ring switches a second time. The module will return to factory default settings (including login password) and will reboot.

Firmware Update

You can update firmware in the Quantum unit via USB or via the device webpages. Either way you need to first extract the firmware image file "quantum.itb" from the zip archive.

For USB, copy the file to your USB drive, insert to the USB-A port on the front of the Quantum unit, and reboot the unit (either by power cycle, or holding down the front button to Reboot as above.

For Webpage, connect to the device webpage, click "Full Configuration" on the right hand menu, then navigate to **"System Tools"** and click **"Local Firmware Upgrade (this unit)"**. **Click "Choose File"** to and select the image file **"quantum. it b"**. Next, select **"Send",** and when the file is loaded, select **"Reset"** to restart the unit and activate the new firmware image.
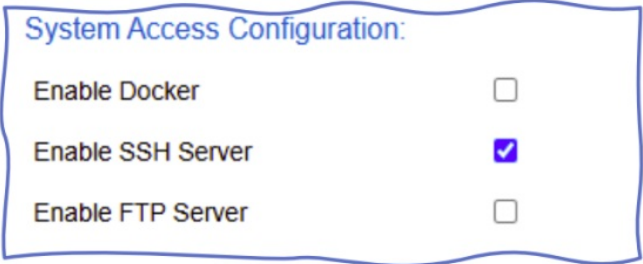
Note: Uploading the firmware image over the USB-C connection (192.168.111.1) can be slow and unreliable. You should make sure you are connected to the Ethernet or WiFi port before starting the firmware image upload.

SSH (Secure Shell) Access

Internally, the Quantum runs a Linux operating system. SSH access is provided to make use of the full available functionality of the unit. You need to enable SSH access through the device webpage configuration (Advanced >> Full Configuration >> System Access >> Enable SSH Server).

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System Access Configuration: Enable Docker ☐ Enable SSH Server ☑ Enable FTP Server ☐	Once SSH is enabled, the root account is available. **Username:** root / **Password** : root You can connect via the Ethernet port on I P address 192.168.0.1XX, or via the USB -C port (192.168.111.1).

Use a terminal application to access the device (e.g. PuTTy). Connect to the device on port 22 using SSH protocol. The first time you connect, expect to see a security warning (see below for PuTTY dialog).

Select "Accept" to save the host key so that you don't receive this warning again. Select "Connect Once" to connect without saving the host key.
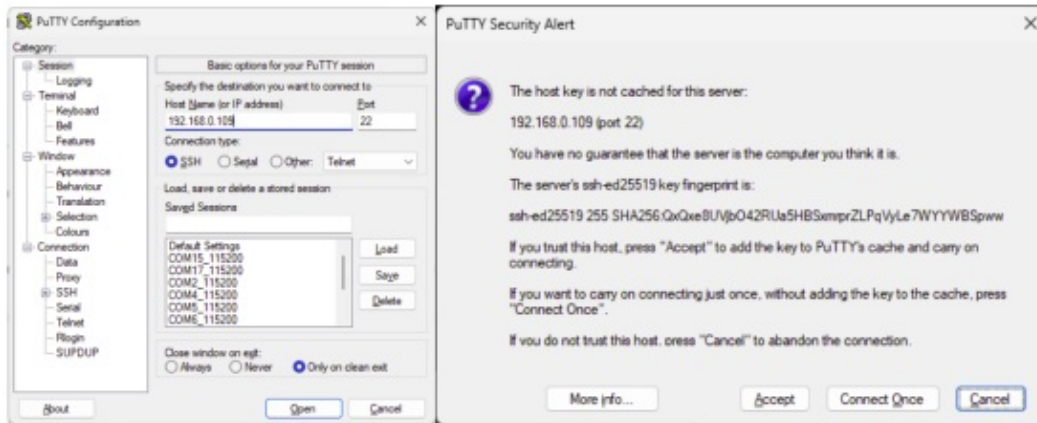
Connect to Internet for Node-RED and Docker

During setup you will need an internet connection to add nodes to Node-RED and to download Docker Images.
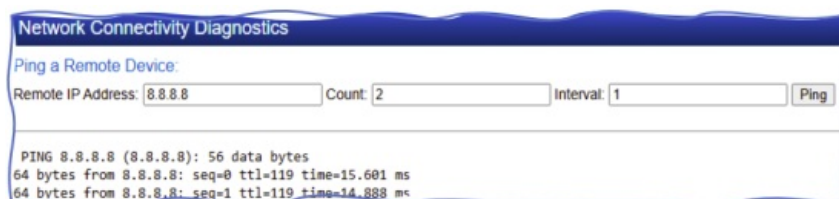
Select "**Advanced** >> **Full Configuration** >> **Advanced Networking** >> **Network**" and configure as shown to access the Internet via WiFi. Set the Mode to **Manual** and **Client (Station).** Set the System Address and Encryption Passphrase to match your WiFi network. Set the Network Mode to **Router** and set the Wireless IP Address to be a valid address on your WiFi network.

You can also connect via the Ethernet port by setting the Ethernet IP Address to an address on your Ethernet network.

Select the Default Gateway to the address of your router on the local network.

Once you have configured the networking, select "Save Changes and Reset" and wait for the unit to restart. The **RF1** LED should come on indicating the WiFi connection.

You can use the Ping command to check you have an internet connection. (Network Diagnostics >> Network Diag Tools).

Using Node-RED

[Node-RED](#) is a visual programming language that lets you program complex control algorithms to operate locally on the Quantum unit. You need to enable Node-RED access through the device webpage configuration (Advanced >> Full Configuration >>
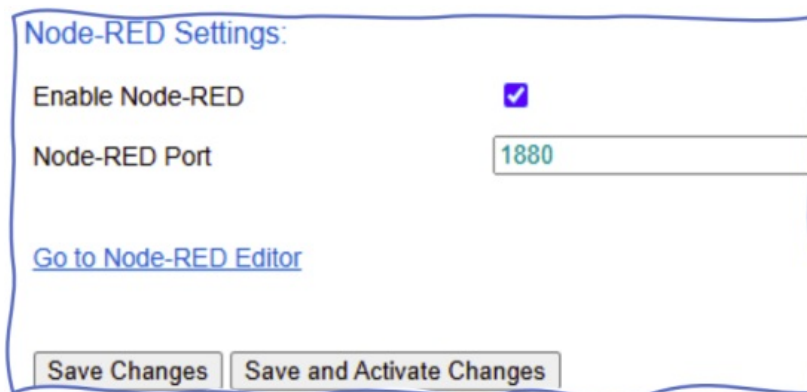
Node-RED >> Enable Node-RED).

Once you have enabled Node-RED, you can select "Save and Activate Changes". It takes around one minute for Node-RED to get up and running. Click on the shortcut "Go

to Node-RED Editor" or enter the Node-RED URL including the port number into your browser. e.g. to access via the USB-C port, enter 192.168.111.1:1880.

Installing additional Node-RED nodes

Node-RED is an extensible language which allows you to install "nodes" to provide additional functionality. To add new nodes directly from Node-RED, your Quantum unit needs to have access to the Internet. This can be through the WiFi, one of the Ethernet ports. You will need to configure the Networking to enable Internet access (see the section above).

To add a new Node, select the Right-hand drop-down menu, and select "Manage Palette". This will bring up a "User Settings" panel. Select the "Install" tab under "Palette" and enter a search term (The example below searches for nodes including the word "modbus" in the description).

Select the desired node and click "install". Depending on your internet connection and the size of the node, this could take several minutes.

Installing nodes without Internet

```
C:\Users\Public>npm pack node-red-contrib-mqtt-bridge
npm notice
npm notice package: node-red-contrib-mqtt-bridge@1.0.0
npm notice === Tarball Contents ===
npm notice 1.1kB LICENSE
npm notice 1.1kB README.md
npm notice 1.1kB bridge/bridge.html
npm notice 1.3kB bridge/bridge.js
npm notice 769B  config/config.html
npm notice 1.9kB config/config.js
npm notice 783B  package.json
npm notice === Tarball Details ===
npm notice name:          node-red-contrib-mqtt-bridge
npm notice version:       1.0.0
npm notice filename:      node-red-contrib-mqtt-bridge-1.0.0.tgz
npm notice package size:  2.8 kB
npm notice unpacked size: 8.1 kB
npm notice shasum:        105be824dcfdd57e0a19ffb3749f2e064c1c345f
npm notice integrity:     sha512-fKDUpOLzjvCLs[...]7CRuhr0QJD09g==
npm notice total files:   7
npm notice
node-red-contrib-mqtt-bridge-1.0.0.tgz

C:\Users\Public>copy node-red-contrib-mqtt-bridge-1.0.0.tgz e:\
        1 file(s) copied.

C:\Users\Public>
```

Access If you don't have internet access from the Quantum unit, you can still install new nodes using a Flash Drive from the USB-A port on the front of the module.

You need to have an internet connection and the **npm** (Node Package Manager) application installed on your PC.

Step 1 — use **"npm pack"** command to download the package to your computer and copy to a USB drive.

Step 2 — Move the USB drive to the Quantum unit (USB-A port) and use **"npm install"** to install the new node. The USB drive is available at /**media/usb0**.

```
192.168.111.1 - PuTTY
# cd /config/userconfig/node-red/
# ls /media/usb0
System Volume Information
node-red-contrib-mqtt-bridge-1.0.0.tgz
# npm install /media/usb0/node-red-contrib-mqtt-bridge-1.0.0.tgz

added 1 package, and audited 2 packages in 11s

found 0 vulnerabilities
#
```

Before installing, you need to change to the Node-RED user directory at: /**config**/**userconfig**/**node-red**. Note that this directory is retained through firmware updates, but will be deleted if the unit is set to factory default (via the front panel switch).

Step 3 — Restart Node-Red to find the newly installed nodes (Note it takes about a minute for Node-RED to get up and running).

```
192.168.111.1 - PuTTY
#
# killall node-red
# start_node-red
#
```


Node-RED
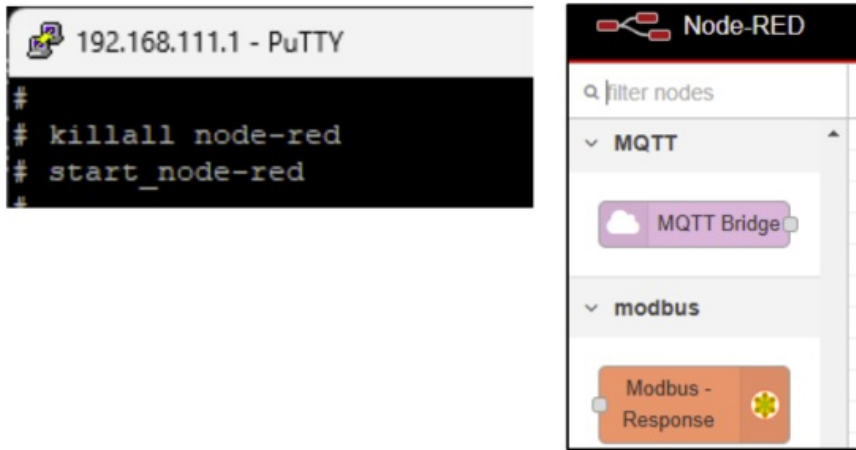
Using Docker to extend device functionality

[Docker](#) allows you to run a separate applications on the Quantum unit. This is additional to the existing functions of the Quantum. This application communicates with the Quantum unit and the outside world through IP networking.

Set up Docker on the Quantum

Before using Docker, you need to enable both Docker application and SSH server to allow you to access the Docker environment. Enable Docker and SSH access through the device webpage configuration (Advanced >> Full Configuration >> System Access >> Enable SSH Server / Docker) Enable Docker and assign the Docker server an IP address. You must give the Docker server an IP address on a different subnet to the Quantum's primary IP address. You will also need to configure networking rules to let your PC access this IP subnet.

(Network Configuration Page)

Click **"Save and Activate"** to activate the changes.

Set up PC Networking to access Docker

Use the **route add** command on your PC to add a route to the Docker subnet and use the **route print** command to check the route is configured correctly.

```
C:\Windows\System32>route add 192.168.1.0 MASK 255.255.255.0 192.168.0.110
 OK!

C:\Windows\System32>route print
===========================================================================
Interface List
[ ... ]
IPv4 Route Table
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0       10.04.73.1     10.04.73.163      25
[ ... ]
    192.168.0.255  255.255.255.255         On-link      192.168.0.2     201
      192.168.1.0    255.255.255.0   192.168.0.110      192.168.0.2      26
    192.168.56.0    255.255.255.0         On-link     192.168.56.1     201
```

You can use the Ping command from your PC to check you have everything set up

```
C:\Windows\System32> ping 192.168.1.10

Pinging 192.168.1.10 with 32 bytes of data:
Reply from 192.168.1.10: bytes=32 time<1ms TTL=64
Reply from 192.168.1.10: bytes=32 time<1ms TTL=64
Reply from 192.168.1.10: bytes=32 time<1ms TTL=64
Reply from 192.168.1.10: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.1.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

correctly.

Accessing Docker

Once you have docker enabled, there will be a separate internal bridge interface providing connection to the docker containers that you will add.
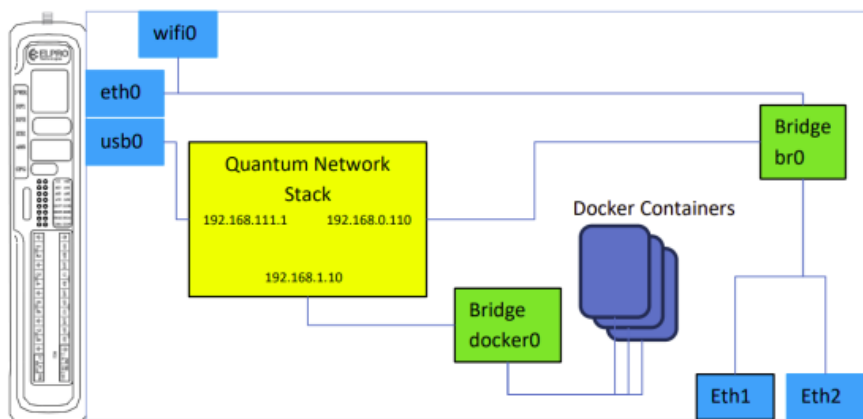
Once Docker is enabled and routing is setup, you can connect to the unit using ssh to access the docker IP address. (login / password : root / root)

```
192.168.1.10 - PuTTY

login as: root
root@192.168.1.10's password:
#
```

Docker configuration is stored at /**config**/**userconfig**/**docker**. Note that this directory is retained through firmware updates but will be deleted if the unit is set to factory default (via the front panel switch or the webpage menus).

Example – Apache httpd

The example here installs and runs the httpd image at https://hub.docker.com/r/arm64v8/httpd/. This example requires an internet connection. If no internet connection is available, you can download the docker image to your computer, and use a USB drive to copy to the Quantum unit.

Change to the docker configuration directory, and download the image (Note: arm64 image required)

```
# pwd
/config/userconfig/docker
# docker pull arm64v8/httpd
Using default tag: latest
latest: Pulling from arm64v8/httpd
4d2547c08499: Pull complete
9210228325db: Pull complete
4f4fb700ef54: Pull complete
5610b6395af5: Pull complete
befla28bd6c5: Extracting [======================>                    ]  11.53MB/26.02MB
3ed6709e510f: Download complete
```

Use the **docker images** command to check the image is loaded, and **docker run** command to run the image. The example below assigns port 8080 to the httpd image's

```
# docker images
REPOSITORY      TAG       IMAGE ID       CREATED      SIZE
arm64v8/httpd   latest    a591e930bbb4   4 days ago   178MB
```

```
# docker run -dit --name http-demo -p 8080:80 arm64v8/httpd
3ec5742be6864c8514b3549779dfeb86455fb50ed353caead6c05f97fd1ce5fe
#
```

internal port 80 (http).

Now use the web browser on your PC to access the docker image at **192.168.1.10:8080**

← → C ⚠ Not secure 192.168.1.10:8080

It works!

Register memory map

Digital output registers (coils)

0001 — 0008	**Local DIO1–DIO8 as digital outputs**

0009	High Voltage Digital Output (Bottom Side)
0010	+12V external supply enable
0011 — 0020	Spare
0021 — 0400	Space for locally attached 115s expansion I/O modules. Twenty register per module address, maximum number of modules is 19.
0401 — 6000	General purpose bit storage used for: Staging area for data concentrator; Fieldbus mappings storage; Force mapping registers
6001 — 10000	Not Available

Digital input registers (bits)

10001 — 10008	**Local DIO1–DIO8 as digital inputs**
10009 — 10020	Set point status from analog inputs 1 through 12
10021 — 10400	Space for locally attached 115s expansion I/O modules. Twenty register per module address, maximum number of modules is 19.
10401 — 16000	General purpose bit storage used for: Staging area for data concentrator; Fieldbus mappings storage;

16001 — 20000	Not Available

Input registers (words)

30001 — 30006	Local AI1–AI6 (analog inputs, current or voltage mode)
30007	Local supply voltage (0–40 V scaling)
30008	Local battery voltage (0–40 V scaling)
30009	Current at Supply Terminals (0 — 20A)
30010	Battery Current (-12 A – +8A)
30011 — 30014	Local pulse input rates: PI1–PI4
30015 — 30020	Spare
30021 — 30400	Space for locally attached 115s expansion I/O modules. Twenty registers per module address, maximum number of modules is 19.
30401	RSSI: When configured as a Remote, Repeater, or Manual Client, the RSSI of the connected upstream device in –dBm

30402	Connected Time: When configured as a Remote, Repeater, or Manual Client, the time (in hours) that the connection to theupstream device has been made.
30403	Generation Count: When configured as a Remote, Repeater, or Manual Client, the generation count of the connection to theupstream device. This is the number of times the connection has been lost and re-established
30404 — 30405	Upstream IP Address: When configured as a Remote, Repeater, or Manual Client, the IP Address of the upstream device.
	Most Significant Byte High byte of Register 30404
	Second Byte Low byte of Register 30404
	Third Byte High byte of register 30405
	Least Significant Byte Low byte of register 30405
30406	Radio 802.11 Channel number (1 — 13)
30407 — 30408	Radio Transmit Frequency (in MHz). 32-bit. Most significant word at lower (odd) address.
30409 — 30410	Radio Receive Frequency (Same as Transmit Frequency)
30411	Module uptime: The time (in hours) that this module has been up and running
30412	Channel Utilization % (average of last 60 seconds)
30413	Background Noise (average of last 60 seconds)

30414	Tx retry % (average of last 60 seconds): The percentage of total transmissions that required at least one retry
30415	Tx failed % (average of last 60 seconds): The percentage of total transmissions that failed to get an acknowledgement after allretries exhausted.
30416 — 30419	Channel Utilization, Background noise, Tx Retry % and Tx Failed % (average of the last 60 minutes)
30420 — 30423	Channel Utilization, Background noise, Tx Retry % and Tx Failed % (average of the last 60 hours)
30424 — 30493	Spare — General purpose word storage used for: Staging area for data concentrator; Fieldbus mappings storage;
30494 — 30500	Internal information registers: serial number, firmware version and patch level
30494	First four digits of serial number (Encodes Manufacture Month & Year
30495	Next three digits of serial number (Encodes Manufactured Firmware version)
30496	Remaining four digits of the serial number
30497	First part of Current Firmware version
30498	Second part of Current Firmware version
30499	Third part of Current firmware version
30500	Patch Level of current firmware version

30501 — 32000	General purpose word storage used for: Staging area for data concentrator ; Fieldbus mappings storage;
32001 — 32255	RSSI List:
	When configured as a Base, Repeater, or Manual AP. The RSSI of each connected downstream is added to an I/O register according to the last byte of that device's IP Address. For example, a downstream device with IP Address 192.168.0.199 will have its RSSI stored in I/O register 32000 + 199 = 32199. If no device is connected with that IP address, the corresponding register has the valueZero.
32256 — 36000	General purpose word storage used for: Staging area for data concentrator ; Fieldbus mappings storage;
36001 — 36008	Local pulsed inputs 1–4, big endian format Most significant word at lower/odd address
36009 — 38000	Spare space for 32-bit register values
38001 — 38026	Local analog inputs as floating point values.
	Mod Scan format (sign + exponent + most significant 7 bits of significand at even/higher addressed location; lower 16 bits of significand at lower/odd addressed location) (example: Analog input 1 at 12.3 mA gives registers 38001=CCCD, 38002=4144)

38027 — 40000	Spare space for floating point values

Amendment Register:

Issue No.	Date	Details of Amendment
1.01.11.2	31-Jan-2025 04-Feb-2025 11-Feb-2025	Preliminary Release Update with Docker, Register Map Information. Add Docker Download example and Firmware update instruction

Documents / Resources

[ELPRO QE-E Quantum Edge](#) [[pdf](#)] User Guide
QE-E, QE-E Quantum Edge, QE-E, Quantum Edge

References

- [User Manual](#)

🏷 ELPRO, QE-E, QE-E Quantum Edge, Quantum
📁 ELPRO   Edge

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