QUANTUM EDGE

ELPRO EL-QE-X-XX-XXX (v2)
QUANTUM EDGE

Industrial Wireless Controller, I/O Gateway & more!

DESCRIPTION

The EL-QE-E is the latest model in the ELPRO Technologies next generation product line. The I/O Gateway, Controller, and/or Protocol Converter provides a powerful IIoT Gateway Solution in upcoming networking applications.

Able to provide a mesh Point to Point or Point to Multi-Point topology within “Fog” or “Cloud” based IT/OT architectures.

It uses efficient communication methods that map data via an IP-based wireless network while simultaneously providing protocol conversion from the base radio to other nodes in the network or to the Cloud via industrial protocols such as DNP3, MQTT Sparkplug and LoRaWAN (Model Specific).

The Quantum base model provides core Ethernet and short range 2.4Ghz & 5Ghz WiFi communication mediums with future release models to include Licensed UHF/VHF, Unlicensed 900Mhz FHSS & Fixed Frequency 869MHz wireless technologies, Long Range 2.4Ghz and 5.Ghz WiFI, Wide Band 900MHz OFDM, 5G Cellular and LoRaWAN for both 869Mhz or 900Mhz bands. The Quantum Series model variations are detailed on the last page, with some models having dual communincation options.

The product also provides a Linux based Docker container which is an open sourced platform for developing, and running custom applications. This provides a platform to run innovative and cutting edge features such as Node-Red, a flow based development tool that is embedded and provides custom based programing for connecting hardware devices, AP’s and online services.

FEATURES

Quad Core 1.6GHZ Processor Arm® Cortex®-A53, 4GB RAM Memory, 16GB Flash Memory, 2.3 TOP Neural Processor Unit for edge-AI Processing

Inbuilt short range 2.4GHz or 5Ghz selectable WiFi, compatible with our existing 245U-E and 215U-2 wireless modems & I/O products.

Integrated digital, analog, and pulse I/O, expandable I/O for extra local alarms and inputs/outputs

Support for serial MTL HART MUX communications

HART Multi-drop interface on all analog input/outputs (upcoming release)

ELPRO ProMesh(TM) redundant path selection and network formation

Gather-scatter/block mapping and integrity checking transmissions for efficient event triggered peer-to peer I/O

Modbus TCP/UDP Client and/or Server & Modbus RTU I/O gateway

DNP3 I/O gateway, including internal status registers

MQTT and SparkplugB Gateway IoT Connectivity

LoRa Gateway & Application Server (Model Specific)

Rockwell EtherNet/IP Gateway (Future)

Diagnostic Data & Event Logging capabilities

IO Plus Logic engine for compatibility with existing Condor implementations.

User configurable Internal Web based Dashboard to display I/O and Diagnostics

Node-Red, Flow-based Programming environment with configurable Control, Actions and User Dashboards.

Docker Container & Linux Environment available for third party Applications ***Advanced Programming required***

Over-the-air network diagnostics and configuration

System Firmware Upgrade: Centralised management of firmware patch updates and automated over the air deployment

Centralised & Automated over the air management/rotation of system encryption keys

Over the air Transparent Layer 2 Wireless LAN (IEEE802.11)

Supports multiple data rates simultaneously for high performance over short and long communication links

Standard Ethernet bridge to allow modem function for external Ethernet host devices (full L2/L3 network support)

Secure data protection using advanced Encryption methods

Port Forwarding (NAT): Advanced network Port Forward, configuration for connected Ethernet devices.

Radio Access Control: Extension of existing MAC/IP filtering to include deny/allow-list filtering based on MAC or Serial number.

Upcoming models to include additional communications interfaces, sometimes multiple to provide communication with other Radio and Cellular frequency bands and communication mediums.

APPLICATIONS

- Factory automation and safety interlocks
- Process monitoring and control
- Water treatment facilities
- Tank and equipment monitoring
- Environmental monitoring
- Energy management
- Asset management
- Valve position monitoring

Base Communications (Ethernet & WiFi)	
Technology	IEEE 802.11ac Wave 2 1x1 WiFi
Frequency bands[d]	2.400–2.484 GHz / 5.150–5.895 GHz
Transmit power	2.4Ghz - 18dBm (62mW)/5Ghz - 15dBm (32mW)
Modulation	Orthogonal Frequency Division Multiplexing (OFDM)
Receiver sensitivity	2.4Ghz: –92 dBm@7.2Mbps, -62 dBm@200 Mbps 5Ghz: –91 dBm@7.2Mbps, -59 dBm@433 Mbps
Channel spacing	2.4Ghz (13, overlapping 20Mhz channels) / 5Ghz (13, 20Mhz channels). 20/40/80 MHz channel size support
Supported Data Rates	2.4Gh (1 –200 Mbps)/ 5Ghz (6 - 433 Mbps) “Auto Mode” selects fastest rate possible relative to RSSI and Channel Width.
Typical range	Both 2.4Ghz & 5Ghz - 250m (820ft) LoS
Antenna connector	1 x female SMA, standard polarity
EMC	FCC Part 15; EN 301 489-17; AS/NZS CISPR22
RF (radio)	EN 300 328; EN 301 893; FCC Part 15; RSS 210

Basic Comms	**Primary/Secondard Communication Options**
Ethernet, Short range 2.4Ghz & 5Ghz WiFi	Longe Range WiFi (2.4Ghz, 5.8Ghz), OFDM 900Mhz, Cellular, LoRaWan, Narrow-band Long range UHF/ VHF radio, 900MHz unlicensed FHSS, unlicensed 869MHz,

Communications (900MHz High Speed OFDM)	
Technology	900Mhz Orthogonal Frequency Division Multiplexing
Frequency bands[d]	902–928 MHz [a] 915–928 MHz [b]
Transmit power	100 mW (+20 dBm) to 800mW (+29 dBm)
Modulation	Orthogonal Frequency Division Multiplexing (OFDM)
Receiver sensitivity	–93 dBm @ 1Mbps, -65 dBm @ 65 Mbps (8% FER)
Channel spacing	900Mhz, 4 x 5 MHz, 2 x 10 MHz, 2 x 20 MHz (USA/ CAN only)
Supported Data Rates	1–65 Mbps [a] 0.25–27 Mbps [b] Auto mode selects fastest rate relative to RSSI
Typical range	16 km (10 miles) @ 29dBm (800mW)
Antenna connector	female SMA standard polarity
EMC	FCC Part 15; EN 301 489-17; AS/NZS CISPR22
RF (radio)	FCC Part 15; RSS 210, AS/NZS 4268

Communications (2.4Ghz Longe Range WiFi)	
Technology	IEEE 802.11ac Wave2 2x2 WiFi
Frequency bands	2.400–2.484 GHz [d]
Transmit power	28dBm (630mW)
Modulation	Orthogonal Frequency Division Multiplexing (OFDM)
Receiver sensitivity	–92 dBm@7.2Mbps, -62 dBm@200 Mbps
Channel spacing	13, overlapping 20Mhz channels (40Mhz Turbo)
Supported Data Rates	1 –200 Mbps[d] “Auto Mode” selects fastest rate possible relative to RSSI and Channel Width.
Typical range	15km (9 miles) LoS [d]
Antenna connector	2 x female SMA, standard polarity
EMC	FCC Part 15; EN 301 489-17; AS/NZS CISPR22
RF (radio)	EN 300 328; FCC Part 15; RSS 210

Communications (5.8GHz Longe Range WiFi)	
Technology	IEEE 802.11n/ac 2x2 MIMO, 2x2 MMCX
Frequency bands	5.150–5.895 GHz [d]
Transmit power	30 dBm (2 x 27dBm/Chain)
Modulation	Orthogonal Frequency Division Multiplexing (OFDM)
Receiver sensitivity	–92 dBm@7.2Mbps, -62 dBm@200 Mbps
Channel spacing	40/80MHz channel size support
Supported Data Rates	5Ghz (6 - 867 Mbs)[d] “Auto Mode” selects fastest rate possible relative to RSSI and Channel Width.
Typical range	15km (9 miles) LoS [d]
Antenna connector	2 x female SMA, standard polarity
EMC	FCC Part 15; EN 301 489-17; AS/NZS CISPR22
RF (radio)	EN 301 893; FCC Part 15; RSS 210

Communications (Longe Range UHF/VHF - C1,C3,C4,C5 Radio)	
Technology	VHF / UHF Radio
Frequency bands[e]	148-174 MHz, 340-400 MHz, 400-480 MHz, 470-520 MHz

Transmit power-average[e]	
QPSK	4 W (+36 dBm)
16/64QAM	2.5 W (+34 dBm)
2-FSK, 4-FSK	10 W (+40 dBm)

Modulation	QPSK, 16-QAM, 64-QAM, 2-FSK or 4-FSK (compatibility mode)	
Receiver sensitivity 6.25/12.5/25 kHz	QPSK-FEC	–116 dBm
	QPSK	–113 dBm
	16-QAM	–104 dBm
	64-QAM	–97 dBm
	2-FSK	–110 dBm
	4-FSK	–102 dBm
Channel spacing	6.25, 12.5, 25.0 kHz (software configurable)	

Data Rates - Raw/ no compression. Data compression can provide up to 50% improvment, depending on data content.

Encoding	6.25khz	12.5Khz	25Khz
QPSK-FEC	4 kbps	8 kbps	16 kbps
QPSK	8 kbps	16 kbps	32 kbps
16-QAM	16 kbps	32 kbps	64 kbps
64-QAM	24 kbps	48 kbps	96 kbps
2-FSK		4.8 kbps	9.6 kbps
4-FSK		9.6 kbps	19.2 kbps
64-QAM	45 kbps	80 kbps	140 kbps

Typical range	100 km (62 miles) at 4 W 16 km (10 miles) at 0.5 W
Antenna connector	SMA female, standard polarity
EMC	FCC CFR47 Part 15; EN 301 489-3; EN 301 489-5
RF (radio)	FCC CFR47 Part 90; IC RSS 119; EN 300 113; EN 300 220-2; AS/NZS4295; AS/NZS4268

Communications (Unlicenced 869Mhz Fixed & 900Mhz FHSS)	
Transmission	900Mhz Frequency Hopping Spread Spectrum (FHSS) [bd] 869Mhz Single frequency [c]
Frequency bands	902–928 MHz [d], 869.525 MHz[c], 869.875 MHz[c]
Transmit power	1W (+30 dBm)[bd] , 5mW[c] (5dBm) or 500mW[c] (27dBm)
Modulation	Frequency shift keying (FSK)
Receiver sensitivity	–109 dBm @ 19.2 kbps (3% FER) [ab] –109 dBm @ 14.4 kbps (3% FER) [c]
Channel spacing	50 x 250 kHz [ab], single 250 kHz [c]
Supported Data Rates	19.2–115.2 kbps [ab], 14.4–76.8 kbps [c]
Typical range	32 km (20 miles) @ 4W EIRP [a] 15 km (9.3 miles) @ 1W EIRP [b] 10 km (6 miles) @ 500 mW EIRP [c]

Antenna connector	female SMA standard polarity
EMC	FCC Part 15; EN 301 489-3; AS 3548
RF (radio)	FCC Part 15.247; EN 300 220-2; AS 4268.2; RFS29 NZ

Communications (LoraWAN EU868, US915, AS923, AU915, KR920, IN865)

Technology	RAK2287 LPWAN Concentrator Module
Frequency bands	Supports global license-free frequency bands EU868 = 863-870Mhz, Europe US915 = 902-928MHz, Nth & Central America AU915 = 915-928MHz, Australia, NZ, Sth America IN865 = 865-867Mhz, India AS923 = 923-925Mhz, Asia KR920 = 920-923Mhz, Sth Korea
Transmit power	Tx power up to 27 dBm
Modulation	Chirp Spread Spectrum (CSS)
Receiver sensitivity	Rx sensitivity down to -139 dBm @ SF12, BW 125 kHz
Channel spacing	8 x 8 channels LoRa packet detectors, 8 x SF5-SF12 LoRa demodulators, 8 x SF5-SF10 LoRa demodulators, one 125/250/500 kHz high-speed LoRa demodulator and one (G) FSK demodulator
Supported Data Rates	125 kHz, 250 kHz or 500 kHz, depending on the region or the frequency plan
GPS	Built in ZOE-M8Q GPS module
Typical range	10 km in rural areas and up to 3 km in dense urban areas depending on band and configuration.
Antenna connector	1 x female SMA, standard polarity
EMC	FCC Part 15; EN 301 489-3; AS 3548
RF (radio)	FCC Part 15.247; EN 300 220-2; AS 4268.2; RFS29 NZ

Communications (Cellular LTE)

Technology	3G/4G/5G Connectivity including Band 28
Frequency bands[d]	Worldwide LTE, UMTS/HSPA+ and GSM/GPRS/EDGE coverage
Region	Australia, Asia, New Zealand, South America North America, EMEA, Thailand
Cell Category	Cat4
Band (LTE)	B1, B2, B3, B4, B5, B7, B8, B8_US, B9, B12, B13, B14, B18, B19, B20, B25, B26, B28
Band (WCDMA)	B1, B2, B4, B5, B6, B8, B19
Band (GSM/EDGE)	B2, B3, B5, B8
Carrier	Telstra, Optus, Vodaphone, Verizon, AT&T, T-Mobile, FirstNet, US Cellular, Rogers, Telus, Vodaphone, O2, Three, Orange, Deutsche Telecom

LED Indications & Diagnostics

LED Indication	Power/OK, Radio Primary & Secondary (if fitted), TX/RX/Link, RS-232, RS-485, LAN/100/1000, I/O status

Protocols and Configuration

System address	ESSID; 1 to 31-character text string
Networking protocols	TCP/IP, UDP, ARP, DHCP, DNS, ICMP, HTTP, VLAN 802.1Q, IPv6 pass through
Industrial protocols	Gateway: MQTT Client & Broker, SparkplugB, Modbus RTU, Modbus TCP/UDP, DNP3 I/O, HART to Modbus, ELPRO WIB compatibility Pass through: EtherNet/IP, PROFIBUS DP, PROFINET, DNP, IEC 61850, and others
Configurable parameters	Unit details, I/O mappings, I/O parameters, radio settings, Dashboard, IO Plus logic, DNP3 I/O and gateway (level 2+), Modbus TCP/UDP/RTU gateway Embedded Modbus master/slave for I/O transfer Frequency agility parameters for automatic selection of radio paths, prioritization of traffic flows, bandwidth efficiency features, bandwidth utilization, redundancy, routing, bridging, VLAN
User configuration	Network access: USB or Ethernet Remote access: over the air
Node Red	Flow-based, Web page accessable development tool for visual programming
Docker	A 3rd party process/application running in an isolated Docker container on the host radio.
Linux SDK Environment	A 3rd party process/application running directly on the host radio environment (Must be compliant with ELPRO SDK).
Security	WPA2-PSK, AES 256 bit, multilevel password protected configuration, Access Control List
IP filtering	IP address, MAC address, ARP filtering whitelist/blacklist & serial number, Access Control List

Compliance (EMC & RF, check communication option Specs)

Safety	UL Listed (RoHS Compliant), EN/IEC 61010
Hazardous area	UL Class I, Division 2, ATEX Zone 2; IECEx ec IIC

Connections

LAN	2 x 1Gb auto-MDIX RJ-45
Serial	1 x RS-232, 1 x RS-485, 300–12Mb/s baud including Profibus rates, SDI-12 Serial over IP modem support
USB	1 x Type C 1 x Type A
DVI	Video Output 1080p
SD-Card	1 x Micro SD-Card

Input and output

Discrete input/output	8 digital I/O (1-4 configurable as PI or PO) Inputs: Contact to GND, 2 Vdc, Wetting 5 mA Outputs: open Drain to 30VDC, 400mA max Max. I/P pulse rate – 10 KHz Min. I/P pulse width – 40 µs
High current output	One digital output N/O (Form A) contact to 60Vdc/30Vac 5Amp Output current (continuous) 30A start current (Peak 100msec)
Analog inputs	6 AI (selectable for Voltage/current) Dip Switch Selectable for mA or voltage Each pair configurable for differential input Accuracy: 0.1% at ambient temp Resolution 12-bit ADC Analog In support HART Protocol FSK Physical layer
Analog output	2 AO (sourcing) Current range: 0.5mA - 24 mA Current resolution: 13 bits Accuracy (current): 0.1% Analog Out support HART Protocol FSK Physical layer
Analog loop power	+24 Vdc output provided to power loop devices Max. Current 200 mA – current limited
Expansion	Compatible with 115S series Modbus I/O modules

Power supply

Main supply	9-50 Vdc, under voltage / over voltage protection, Replaceable Fuse Supply max 60W (including battery charging) Support Solar panel up to 200W for battery charging

SPECIFICATIONS

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Battery Supply	12V PbSO4 (Lead-acid) or LiFePO4 (Lithium Iron Phosphate) backup battery. Battery charging from 9V Main Supply. 12V/24V Solar Panel up to 200W. Charge up to 5A / 60W from main supply Low Temp Charge disable (Selectable -20 or 0°C (-4 or 32°F) Over/Under Voltage protection with replaceable fuse.
Average current draw	500 mA at 13.8 V (idle), 300 mA at 24 V (idle)
General	
Processor Core	NXP i.MX 4 x Cortex®-A53 1.6Ghz, 4G RAM Memory, 16G Flash Memory, 2.3 TOPS NPU for Edge AI processing, TensorFlow Lite
Dimensions	180 x 150 x 40mm (HxDxW), 6.70 x 5.9 x 1.6 inches
Weight	0.8 kg (1.8 lb)
Housing	Die-cast, Powder-coated aluminum and high-impact Plastic, Poly Carbonate/ABS Blend
Terminal blocks	Front - Removable, max. 16 AWG (1.5mm²) Bottom - Removable, max 12 AWG (4mm²)
Mounting	DIN rail
Temperature rating	-40 to +70°C (-40 to +158°F)
Humidity rating	0-90% RH non-condensing
Altitude	0-2000m / 6500ft (Performance derating applies above this altitude)

[a] Configured for US.
[b] Configured for Australia, Brazil
[c] 869 MHz ISM band (Europe)
[d] Specific parameters may vary depending on Country, Region & Model
[e] Available RF power and frequency may vary depending on country and model

Specifications subject to change

ELPRO EL-QE-X-XX-XXX
QUANTUM EDGE SERIES

Main Model Order Codes	
EL-QE-E	Base Model, Local Wifi (2.4/5Ghz), IO, Ethernet, Serial
EL-QE-E-LW8	Base EL-QE-E & LoraWAN868, IO, Ethernet, Serial
EL-QE-E-LW9	Base EL-QE-E & LoraWAN915, IO, Ethernet, Serial
EL-QE-R-C1	Base EL-QE-E & Radio 148-174Mhz, IO, Ethernet, Serial
EL-QE-R-C3	Base EL-QE-E & Radio 340-400Mhz, IO, Ethernet, Serial
EL-QE-R-C4	Base EL-QE-E & Radio 400-480Mhz, IO, Ethernet, Serial
EL-QE-R-C5	Base EL-QE-E & Radio 470-520Mhz, IO, Ethernet, Serial
EL-QE-R-U8	Base EL-QE-E & Radio 868Mhz, IO, Ethernet, Serial
EL-QE-R-U9	Base EL-QE-E & Radio 902-928Mhz FHSS, IO, Ethernet, Serial
EL-QE-WB-900	Base EL-QE-E & 900MHz High Speed OFDM, IO, Eth, Serial
EL-QE-WIFI-2.4	Base EL-QE-E & Long Range Wifi (2.4Ghz), IO, Ethernet, Serial
EL-QE-WIFI-5	Base EL-QE-E & Long Range Wifi (5Ghz), IO, Ethernet, Serial
EL-QE-CEL	Base EL-QE-E & Cellular LTE Bands, IO, Ethernet, Serial

Combination Model Order Codes		
EL-QE-R-Cx-LW8	Base EL-QE-E & Radio Cx & LoraWAN868, IO, Ethernet, Serial	
EL-QE-R-Cx-LW9	Base EL-QE-E & Radio Cx & LoraWAN915, IO, Ethernet, Serial	
EL-QE-CEL-R-Cx	Base EL-QE-E & Cellular LTE & Radio Cx, IO, Ethernet, Serial	
Select Radio model, i.e. C1, C3, C4, C5, C9, U8, U9	C1	148-174Mhz
	C3	340-400Mhz
	C4	400-480Mhz
	C5	470-520Mhz
	U8	868Mhz Fixed Freq
	U9	902-928Mhz FHSS
EL-QE-WIFI-xx-LW9	Base Model, WiFi(xxx) & LoraWAN915, IO, Ethernet, Serial	
Select WiFi model, i.e. 2.4 or 5.8	2.4	2.4Ghz WiFi
	5	5Ghz WiFi
EL-QE-WB900-LW9	Base Model, WB900MHz OFDM & LoraWAN915, IO, Ethernet, Serial	
EL-QE-WIFI-xx-LW8	Base Model, WiFi(xxx) & LoraWAN868, IO, Ethernet, Serial	
Select WiFi model, i.e. 2.4 or 5.8	2.4	2.4Ghz WiFi
	5.8	5.8Ghz WiFi
EL-QE-CEL-LW8	Base Model, Cellular LTE & LoraWAN868, IO, Ethernet, Serial	
EL-QE-CEL-LW9	Base Model, Cellular LTE & LoraWAN915, IO, Ethernet, Serial	

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HOW TO ORDER

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