

# QRATE HCC2 Hyperconverged Edge Controller

Fast, functional, more flexible edge control

## Key Features

- + Intel Quad Core 64-bit CPU with 32GB HDD and 8GB RAM
- + 64-bit Linux OS running Docker container management
- + IEC 61131 3 programming with Rockwell Automation ISaGRAF Workbench
- + Embedded web browser configuration tool
- + GPS Receiver
- + Optional 4G LTE & Wi-Fi with Bluetooth
- + Embedded Analog and Digital I/O
- + -40°C to 75°C Operating temperature



**Combining an edge computer, real-time processor, industrial IO, GPS, cellular modem, Wi-Fi/Bluetooth, and an ethernet switch into one rugged platform - the QRATE HCC2 is capable of providing analysis and autonomous control for remote equipment.**

Delivering unrivalled data management performance, QRATE HCC2 offers premiere software tools and applications. The HCC2 has been carefully designed to provide improved configuration workflows compared to generic edge computers – allowing end users to get up and running faster with less steep learning curve. HCC2 users can also choose from flexible surveillance options, be that Cloud, On-Premise, SCADA or even disconnected devices.

## What is a Hyperconverged Edge Controller

The QRATE HCC2 Edge Controller is an RTU and Edge Gateway all in one device. It uses Docker containers to provide virtualization of applications for management, configuration, communication and control of the hardware. Each application defines its own storage and network connections. This enables maximum flexibility for users to run analytics in the field.

Custom Edge Applications can be added to enhance workflows, and optimize processes beyond the capability of a normal RTU. Custom applications can be programmed using languages like C# or Python and deployed in Docker containers.

The applications run on a 64-bit Intel Quad Core Atom architecture that utilizes TPM 2.0 hardware security. Secure Boot protects against malicious software execution during system boot. The operating system is hardened for security and implements a firewall, role based user security and signed applications for additional layers of protection.

RTU functionality is carried out by a dedicated ARM microcontroller. Users can program the RTU using IEC 61131-3 compatible languages and debug programs online.

Data from process control logic, remote communications, edge applications and IO can be integrated through a web based configuration tool called Unity Edge that runs locally on the controller. This eliminates the need for users to maintain software on their PC and ensures that users will always have the correct software.

In short, the QRATE HCC2 combines common Operations Technology with modern Information Technology. The result is a hardware platform with better data integration, and more powerful analytics capabilities.

### QRATE HCC2 applications

#### + Data Log Manager

Time series data is logged in the Data Log Manager application. Users can store up to 1GB of data on the Internal Storage. Data can be exported via micro SD card, USB or from Unity Edge.

#### + Event & Alarm Manager

Registered events and alarms have configurable attributes based on the alarm type (analog or digital). The application enables latching, bypassing and acknowledgement of alarms. Current status and history can be viewed through Unity.

#### + Unity Edge

A web server hosted on the HCC2 that provides online user interface to:

- Configure and run applications
- Manage system date & time
- Configure communication ports
- Map ISaGRAF variables
- Configure Ethernet/IP devices
- Configure Modbus clients & servers
- Manage user security
- Export & Import Configuration backup
- Deploy configurations
- View online data and diagnostics
- Edit online application data.

#### + CP Gateway

CP Gateway is the secure connection software that enables the HCC2 to communicate to an Avalon cloud hosted or on-premise system. It utilises TLS for authentication and encryption of MQTT data. CP Gateway automatically refreshes security tokens with Avalon to ensure that the HCC2 has rights to access it. CP Gateway enables the HCC2 to buffer data locally when communication is lost to Avalon. It will automatically backfill data when Avalon connection is restored.

#### + Modbus Client / Server

Provides highly configurable Modbus TCP/RTU client and server functionality, enabling integration with legacy SCADA or field devices. Editable map files act as templates for new or custom mapping. Backup and restore Modbus maps easily through Unity Edge web based configuration tool.

Modbus protocols supported are: Modbus RTU, Modbus TCP, Modbus RTU over TCP. 32-bit registers are also supported, commonly used by Enron Modbus.

### IO and Programming

Embedded I/O is configured by Unity Edge and can be used by HCC2 docker applications, ISaGRAF programs and Modbus communications. The 26 I/O points are:

#### + Analog Inputs

Eight analog inputs can be wired as single ended or differential inputs. Four inputs are HART compatible and two can be set for 0 to 100mV to accept signals from something like a load cell or accelerometer. Each input can be configured to accept voltage or current signals.

Special functionality is available for Docker applications to receive 5kHz sample data from each input. This can be used to perform functions like signal processing.

#### + Analog Outputs

There are two sourcing outputs that can be configured for voltage or current signal.

#### + Digital Input

The eight optoisolated digital inputs provided can accumulate pulses if required and can function with a maximum frequency of 10KHz.

#### + Digital Input/Output

The remaining eight optoisolated channels can be configured as inputs or outputs by the user. When programmed as an input the channel maintains the pulse count functionality up to 10KHz. When configured as an output it supports 100mA loads.

### Software tools

In addition to the Unity Edge configuration tool that enables device configuration, the HCC2 has the following software that enables custom programming and remote device management.

#### + Light Update Tool

Users install this software on their Windows based PC to update HCC2 Operating System images and firmware, over Ethernet connection. SFTP and SSH protocols enable secure package transfer and communication with the device. Each update is signed to ensure it is valid HCC2 software. View local and device update logs as well as application versions and hardware information.

#### + ISaGRAF Workbench

Rockwell Automation ISaGRAF enables IEC 61131 3 compatible programming. Users can write custom logic for process control in four languages; Ladder, Function Block, Structured Text, and Sequential Function Chart. ISaGRAF allows online editing and debugging of running programs.

The HCC2 supports four resources, this essentially lets the user download four programs to run at one time. The resources share I/O with the other applications running on the HCC2 and Unity Edge manages the mapping of ISaGRAF variables to I/O points. ISaGRAF licenses can be purchased directly from Sensia. One license is required per PC.

**Communication**

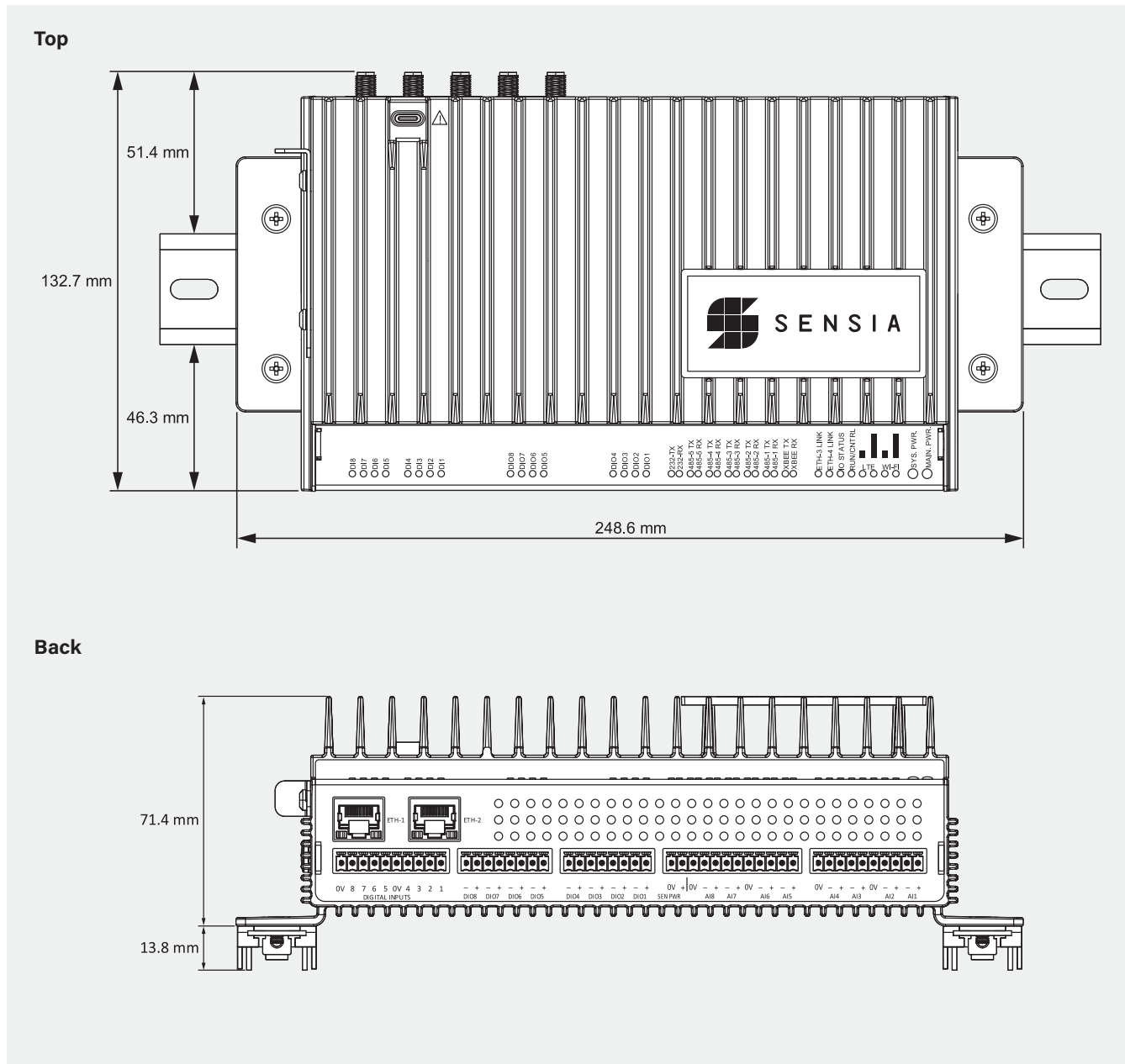
The controller has 6 serial ports: (1x) RS232 full-duplex, (1x) RS485 full-duplex, (4x) RS485 half-duplex. Each port will support Modbus client or server. (2x) Gigabit/s Ethernet ports enable communication with the edge controller for local and remote surveillance, control, and configuration, additionally (2x) 10/100 Mb/s ports are designed to function as a two-port Ethernet switch, this enables two functions. First, a Device Level Ring (DLR) can be connected by adding other DLR compatible devices. Second, Ethernet/IP protocol is enabled so that Rockwell Automation I/O and VFDs can be connected.

HCC2 Ethernet/IP device library supports FlexIO, Flex5000, Powermonitor 5000 and Powerflex drives.

Every HCC2 comes with an embedded GPS module. This can be used for location services or real-time clock synchronization.

QRATE HCC2 is available in a hardware configuration that includes a Wi-Fi and Bluetooth radio as well as 4G LTE modem. The Wi-Fi and Bluetooth can be used for local site communication and the 4G LTE modem will provide Internet connectivity for remote surveillance, including Avalon cloud systems.


**HCC2 Profile**



**HCC2 Catalog Numbers**

Part number	QRATE HCC2 Hyperconverged Edge Controller Model Number List
50365260-2001	Assembly, base model, QRATE HCC2 Hyperconverged Edge Controller, Gen 02 RTU only
50365260-2002	Assembly, base model, QRATE HCC2 Hyperconverged Edge Controller, Gen 02, RTU plus app enablement
50369741-2001	Assembly, QRATE HCC2 Hyperconverged Edge Controller, wifi/bluetooth, LTE, Gen 02 RTU only
50369741-2002	Assembly, QRATE HCC2 Hyperconverged Edge Controller, wifi/bluetooth, LTE, Gen 02, RTU plus app enablement
50384935	License, QRATE HCC2 upgrade to RTU plus app enablement

**Environmental Specifications**

Attribute	Value
Operating Altitude	+ 0 to 2000 m (0 to 6600 ft)
Thermal Management	+ Cooled by natural convection and thermal conduction through the enclosure
Operating Temperature	+ -40°C to +75°C (-40°F to +167°F) + As per IEC 60068-2-2 (Test Db, Operating Dry Heat)
Storage Temperature	+ -40°C to +85°C (-40°F to +185°F)
Humidity Range	+ Up to 95% noncondensing + As per IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)
EMC (Directive 2014/30/EU)	+ EN 61326-1; Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements + EN 301 489-1; ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility + ICES-003; Information Technology Equipment (including Digital Apparatus) + FCC 47 CFR PART 15 SUBPART B
US/ CANADA	+ Class I, Division 2, Groups A, B, C, D, T4 + Suitable for Class I, Zone 2, Groups II C, T4 + Ordinary Location (US and Canada)
ATEX (Directive 2014/34/EU) / IECEx	+ EN 60079-0; Explosive atmospheres – Part 0: Equipment – General requirements + EN 60079-7; Explosive atmospheres – Part 7: Equipment protection by increased safety “e” + IECEx, Ex ec IIC T4 Gc  + ATEX Marking:  II 3 G Ex ec IIC T4 Gc -40 °F < Ta < 167 °F (-40 °C < Ta < 75 °C) + Certificate Number: UL 22 ATEX 2730X + Certificate Number: IECEx UL 22.0023X
ROHS (Directive 2011/65/EU)	+ ROHS-EU
Electrical Safety	+ EN 61010-1; Safety requirements for electrical equipment for measurement, control, and laboratory use
Radio Equipment Directive (RED) (Directive 2014/53/EU)	+ Article 3.1(a) Safety Standards + Article 3.1(b) EMC Standards + Article 3.2 Radio Standards
PCS Type Certification Review Board (PTCRB)	+ ETSI TS 102.230 + ETSI TS 36.124 + AT&T Approval
Mexico	+ Certificate Number: ULM-NOM-13900 for base model + NOM-208 + NOM-221 + IFETEL
UKCA	+ Certificate Number. UL23UKEX2880X for base model
China CCCEx	+ Certificate Number. (TB D) for base model
Certifications by Country (Base Model, No. 503652601)	+ Argentina, Australia, Canada, China, Columbia, Ecuador, Egypt, EU, Kuwait, Libya, Mexico, Oman, Romania, Saudi Arabia, UAE, USA, Venezuela
Certifications by Country (Wi-Fi/ Bluetooth and LTE Model, No. 50389741)	+ Canada, Columbia, Ecuador, EU, Libya, Mexico, Oman, USA

**Mechanical Specifications**

Attribute	Value
Mount Style (See HCC2 Installation)	+ Panel Mount + DIN Rail clips for: TS35 'Top Hat' Section (EN 50022 - 35 x 7.5)
General Dimensions (WxDxH) (See HCC2 Dimension)	+ Panel Mount: 248.6 mm x 132.7 mm x 71.4 mm (9.8 in. x 5.2 in. x 2.8 in.) + DIN Rail Mount 248.6 mm x 132.7 mm x 85.2 mm (9.8 in. x 5.2 in. x 3.4 in.)
Weight	+ Base unit: 1.59 kg (3.5 lb) + Unit including packaging: 2.94 kg (4.5 lb)
Enclosure Type Rating	+ Metal Enclosure meets IP20

**Input/Output Specification**

Attribute	Value
Power Supply Input	+ Input Range 11 to 30 Vdc, 21W Class 2 or LPS + Dual redundant power feeds (each monitored with values available to the application logic)
Sensor Power	+ 11.1 Vdc @ 5 mA
Analog Inputs	+ Eight Analog Input Channels (either differential inputs or single-ended inputs) + HART Modem (Ch1 to Ch4) + Measurement resolution: 18-bit + Calibrated measurement accuracy: 0.1% FS @ 25 °C, 0.25% over full operating temperature range + Single-Ended Voltage Mode: 0 to 10 Vdc, 0 to 5 Vdc + Differential Voltage Mode: -10 to 10 Vdc + Low level Voltage Mode: (Ch7 & Ch8) 0 to 100 mVdc + Low-level voltage mode input calibrated accuracy: 0.1% FS @ 25 °C, 0.25% FS over full operating temperature range + Current Mode: 0 to 20 mA, 4 to 20 mA + Transient Overvoltage Protection: 13.50 Vdc max + Overcurrent Protection: 90 mA Trip Current + Input Impedance in Current Mode: 280 Ω + Input Impedance in Voltage Mode: 1.9 MΩ + Input Impedance in Low Level Voltage Mode: 94 kΩ
Analog Outputs	+ Two Analog Output Channels + Output setting resolution: 12-bit + Calibrated output accuracy: 0.25% FS @ 25 °C, 0.3% FS over full operating temperature + Voltage Mode support mode: 0 to 10 Vdc, 0 to 5 Vdc + Current Mode output mode: 4 to 20 mA + Current Mode output type: Current Sourcing + Maximum load impedance in Current Mode: 500 Ω (Note: Output is short-circuit protected, 250 mA Trip Current) + Minimum load impedance in Voltage Mode: 2 kΩ (Note: Output is Short-Circuit protected, 90 mA Trip Current) + Transient Protection: 31.90 Vdc max current mode, 15.90 Vdc max. voltage mode
Digital Inputs	+ Eight opto-isolated Digital Input Channels + 10-30 Vdc input, 20 mA max. + Pulse Counter on all Digital Input Channels + Maximum Input Frequency 10 kHz + Over current protection: 60 mA Trip Current + Transient Overvoltage Protection: update to 44.20 Vdc max + IEC 61131-2 Type 1 Input
Digital Input / Outputs	+ Eight opto-isolated configurable Digital Input or Output channels + Overcurrent protection: 1.10 A Trip Current + Transient Overvoltage Protection: 44.20 Vdc max <b>Digital Inputs</b> + 10-30 VDC, 10 mA + Input Minimum On Threshold: 10 V + Input Maximum Off Threshold: 7.5 V + Pulse Counter on all Digital Input Channels + Maximum Input Frequency: 10 kHz <b>Digital Outputs</b> + 10-30 VDC, 100 mA Class 2 or LPS + Solid-state Relay type output + PWM output on all Digital Output Channels (500 Hz maximum frequency) + On Resistance: 2.4Ω max + Function: resistive, general purpose, pilot duty

## Process and Memory Specification

Attribute	Value
CPU Board Processor Core	+ 1.5 GHz, Intel Atom® x6000E Series, Quad Core
CPU Board Processor Architecture	+ Intel Architecture, 64-bit, Multi-Chip Processor
I/O Processor Core	+ ARM Cortex-M7
I/O Processor Architecture	+ 32-bit RISC ARM Harvard
FLASH Memory (Non-Volatile)	+ 32GB (on CPU board) – eMMC + 2MB (I/O processor internal) + 128MB (on I/O board) – NAND flash + 32KB (on I/O board) – FRAM
Memory (Volatile)	+ 8GB DDR4 (on CPU board) + 384KB (I/O processor internal) + 8MB (on I/O board, arranged as 4M x16) – PSRAM
SD Card	+ Micro SD Form Factor
SIM Card	+ Micro SIM Form Factor + Supplied by Sensia

## Real-time Clock Specifications

Attribute	Value
Clock capabilities	+ Day, Month, Year, Hour, Minute, Second
Clock accuracy	+ ±20 ppm @ 25 °C (10.5 minutes/year) + GNSS time synchronization
Backup time (at 25 °C)	+ 2 years without primary power via lithium coin cell (not user-replaceable)

## Communication Ports Specification

Attribute	Value
Ethernet (Eth-1 to Eth-4)	+ RJ-45 Connector + Auto-negotiation to automatically select the highest available link-up speed + Speed: <ul style="list-style-type: none"> <li>▪ Eth-1 &amp; Eth-2 10/100/1000 Mbps</li> <li>▪ Eth-3 &amp; Eth-4 10/100 Mbps</li> </ul> + Auto half/full duplex modes + Auto MDI/MDI-X to detect straight-through and crossover cable connections + LED Speed and Activity indication on Eth-1 & Eth-2 + LAN3 & LAN4 DLR capable + Ethernet/IP, CIP, Modbus Server (Eth-1, Eth-2) and Modbus Client (Eth-1, Eth-4) protocols supported
USB 1 & 2	+ USB A Female Connector + Supports USB 2.0 Full Speed (12 MBit/s)
USB-C: Maintenance Port (Not intended for normal use)	+ USB-C female connector + Unity access port
Micro USB-B: Console Port (Not intended for normal use)	+ Micro USB-B female connector + BIOS console port
RS232	+ Wire Terminal Connections + 4-wire full duplex (Tx, Rx, RTS, CTS & 0V) + Baud Rates: 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 + Parity Modes: None, Even and Odd + Stop Bits: 1 or 2 + Flow Control: Hardware, None + Default Data Format: 8 data bits and 1 stop bit hardware flow control + Supports Modbus RTU in Client and Server Modes + Transmit and Receive link activity status indicators

RS485-1	<ul style="list-style-type: none"> <li>+ Wire Terminal Connections</li> <li>+ 5-wire full duplex</li> <li>+ Baud Rates: 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200</li> <li>+ Parity Modes: None, Even and Odd</li> <li>+ Stop Bits: 1 or 2</li> <li>+ Flow Control: None</li> <li>+ Default Data Format: 8 data bits and 1 stop bit without flow control</li> <li>+ Supports Modbus RTU in Client and Server Modes</li> <li>+ Transmit and Receive link activity status indicators</li> </ul>
RS485-2 & RS485-3	<ul style="list-style-type: none"> <li>+ Wire Terminal Connections</li> <li>+ 3-wire half-duplex</li> <li>+ Baud Rates: 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200</li> <li>+ Parity Modes: None, Even and Odd</li> <li>+ Stop Bits: 1 or 2</li> <li>+ Flow Control: None</li> <li>+ Default Data Format: 8 data bits and 1 stop bit without flow control</li> <li>+ Supports Modbus RTU in Client and Server Modes</li> <li>+ Transmit and Receive link activity status indicators</li> </ul>
RS485-4 & RS485-5	<ul style="list-style-type: none"> <li>+ Wire Terminal Connections</li> <li>+ 3-wire half-duplex</li> <li>+ Baud Rates: 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200</li> <li>+ Parity Modes: None, Even and Odd</li> <li>+ Stop Bits: 1, 1.5 or 2</li> <li>+ Flow Control: None</li> <li>+ Default Data Format: 8 data bits and 1 stop bit without flow control</li> <li>+ Software configurable 120 Ω End-of-Line Termination Resistor</li> <li>+ Supports Modbus RTU Client and Server Modes</li> <li>+ Transmit and Receive link activity status indicators</li> </ul>
Display	<ul style="list-style-type: none"> <li>+ HDMI 1.1 output</li> </ul>
Resolution	<ul style="list-style-type: none"> <li>+ 1920 x 1080P (max)</li> </ul>