Room Measurement and Control Range

Senticon

SENTIENT CONTROL SOLUTIONS

Senticon

SENTIENT CONTROL SOLUTIONS

Senticon Ltd – Room Control and Measurement Experts

Senticon Ltd – UK Head Office

Head Office United Kingdom with subsidiary in Finland
Products manufactured and designed in the UK.

International Management Team

Highly experienced management teams with tens years of experience in building management systems market, in international business management and finances, product development and manufacturing.

Experts in Room Controller Design since 1990

The R&D team with extensive over 100 years experience in room controller design and understanding HVAC applications
Team based in the UK and Finland

Operate through Distributors and OEMs.

Products and solutions are provided through key OEMs and Distributors
Key Markets – Europe and Middle-East

Senticon
SENTIENT CONTROL SOLUTIONS

Why Choose Us

HIGH QUALITY, SMART AND INTELLIGENT CONTROL SOLUTIONS

High Quality Products with Proven Value for Money

Products Designed to be Installer Friendly

Modern Technology and Innovative Approach offer

- Capital Savings on Products
- Installation Savings on Easy-to-Install and Robust Products
- Operational Energy Savings over Traditional Systems
- User-Friendly Interfaces for End-Users
- Product design with Application Knowledge for User Comfort
- Compliance with Green Building Directives such as RESET® and WELL®

Our Room Control Portfolio

VAV Controllers

Touchscreen and Conventional LCD room controllers with intelligent application functionality from basic to advanced applications

Integrated air quality control and measurement with CO2 and VOC part of the range. Energy saving options such as built-in occupancy detection.

Accurate flow measurement and control offer energy efficient control in modern buildings.

Intelligent Room and FCU Controllers

Comprehensive range of colour touchscreen and colour LCD intelligent room controllers for any type of Fan Coil Unit, Chilled Ceiling/Beam and Zone Control applications.

The controllers have full connectivity to BMS and IoT via BACnet, Modbus and LoraWan. Additional integrated measurement such as CO2, VOC, humidity and occupancy provide advanced application support capabilities.

Ceiling Mounted Room Controllers and Touchscreen Interfaces

Ceiling mounted room controller range provides central solution for easy wiring and to cover wide range applications.

The new innovative RS485 over USB-C plug&go room interfaces provide reliable connection for temperature, humidity, VOC, CO2 and occupancy measurements.

Colour touchscreen interfaces offer information display and user adjustment solution to meet even the more complex requirements.

LoRaWAN® Modbus ASHRAE BACnet™

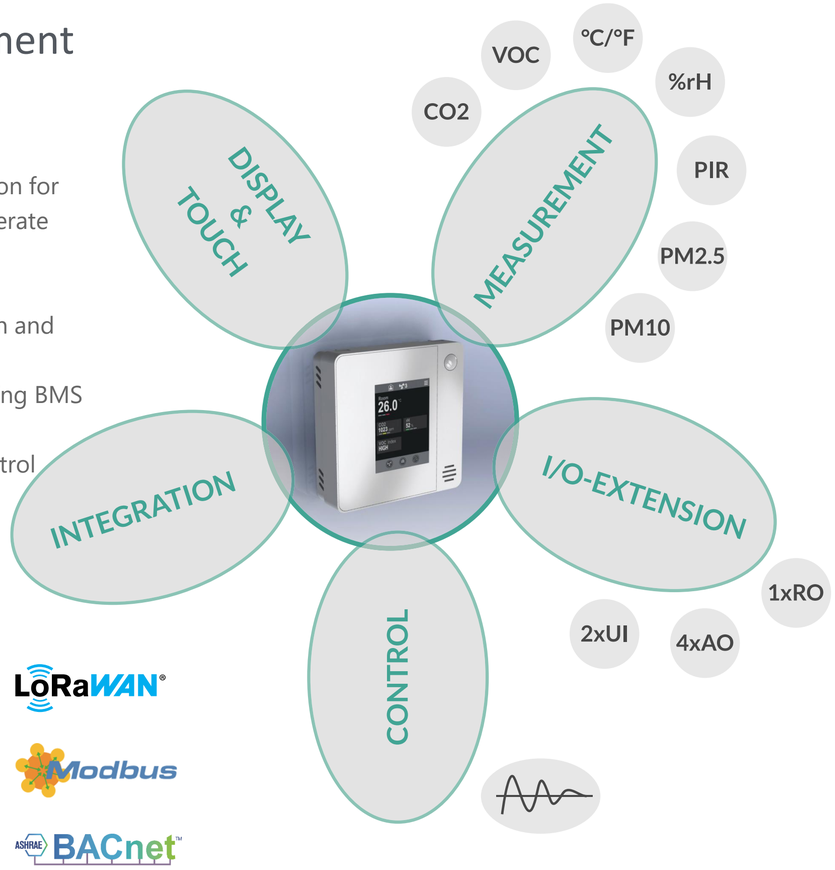
Senticon
SENTIENT CONTROL SOLUTIONS

Our Room Measurement Portfolio

Smart Multi-Function, Combi- Measurement Room Sensors

The Smart Multi-Function Combi Sensors offer a power house solution for room measurement and control. The sensors have capabilities to operate as:-

- Accurate Combination Measurement Solution
- User interface and information display for building operation and data such as energy info
- Provide integrated hardware connectivity points for extending BMS system capabilities
- Integrate local control for effortless energy and comfort control



Multi Measurements

CO2 (Carbon Dioxide)
Volatile Organic Compounds (e.g. smells)
Particulate Matter (e.g. smoke, fumes)
Temperature
Relative Humidity
Movement and Occupancy

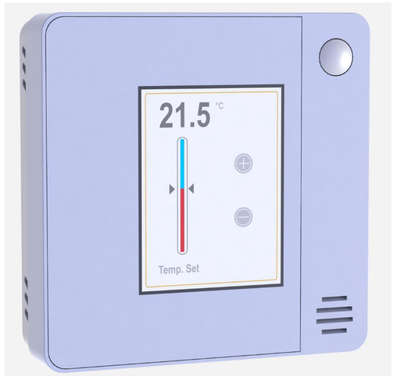
Senticon
SENTIENT CONTROL SOLUTIONS

Modern, Intuitive and Attractive User Interfaces

Capacitive Colour Touchscreen with High End Glass Surface

Large Multi-Colour Touchscreen – configured to requirements – provides room interface for BMS and for the Room Controllers

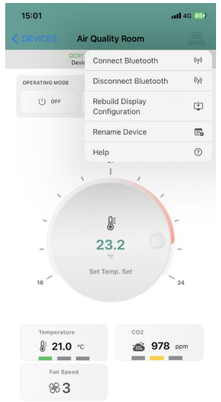
- Display Measurements
- Display Alarms (alarm bar / background colour)
- Display Energy and Consumption Readings from BMS
- Display Built-In Trend Graph
- Fully Customisable 5 Display Locations (values, descriptions, units)
- User Setpoint Adjustments
- Fan Speed Control
- Operating Mode and Boost Functions
- On/Off Button Overrides
- Customisable Screen Colours

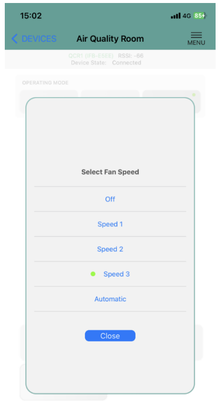


SmartPhone SmartView User App (iOS)

The Senticon devices can be equipped with built-in Bluetooth providing direct access to the devices from the SmartView mobile phone application.

The application offers easy way of interrogating the building settings.





iOS

Senticon
SENTIENT CONTROL SOLUTIONS

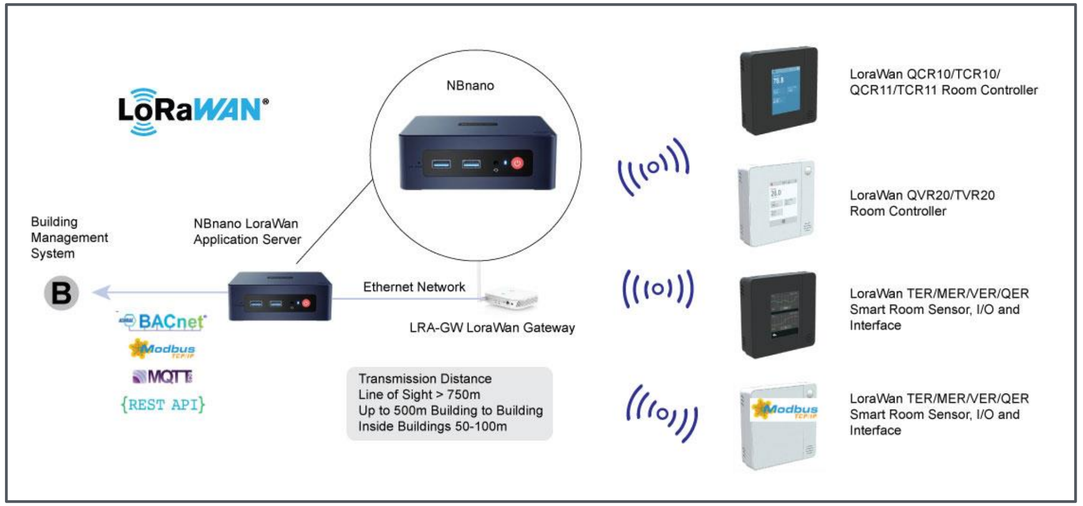
Leaders in Wireless Room Control Solutions

IoT Wireless Connectivity

The LoraWan communications capability allows the controllers and the sensors to connect to BMS via a Private Network, or the devices can be connected to wider public IoT network.

The controllers operate completely stand-alone providing accurate and energy efficient local room control. LoraWan network is used for efficient integration to BMS. Typically to monitor the room measurements and send new setpoints and operating modes to the controllers (e.g. from Hotel Booking systems).

Senticon's unique LoraWan payload structure offers efficient uplink and downlink data communication.



TCR10/QCR10 Series Intelligent Room Controllers

TVR20/QVR20 Series VAV Controllers

TCR12/QCR12 Series Slim Line Room Controllers

TCR80 Series IP65 Enclosed Controllers

Senticon
SENTIENT CONTROL SOLUTIONS

Open Standard Communication Networks are in our DNA

BACnet and Modbus

Senticon Team has been developing communicating network solutions for BMS since 1990s. The team has in-depth technical and practical knowledge on how to integrate distributed controls to BMS efficiently.

As a result, Senticon's room controllers and intelligent smart sensors not only integrate seamlessly via BACnet and Modbus, but also provide extended features for successful and cost effective installation of building control systems.

TCR10/QCR10 Series Intelligent RoomControllers

TCR04/QC04 Series Compact Room Controllers

QER10 Series Smart Room Sensors

TVR20/QVR20 Series VAV Controllers

TCR12/QCR12 Series Slim Line Room Controllers

TCR80 Series Ceiling Mounted Controllers

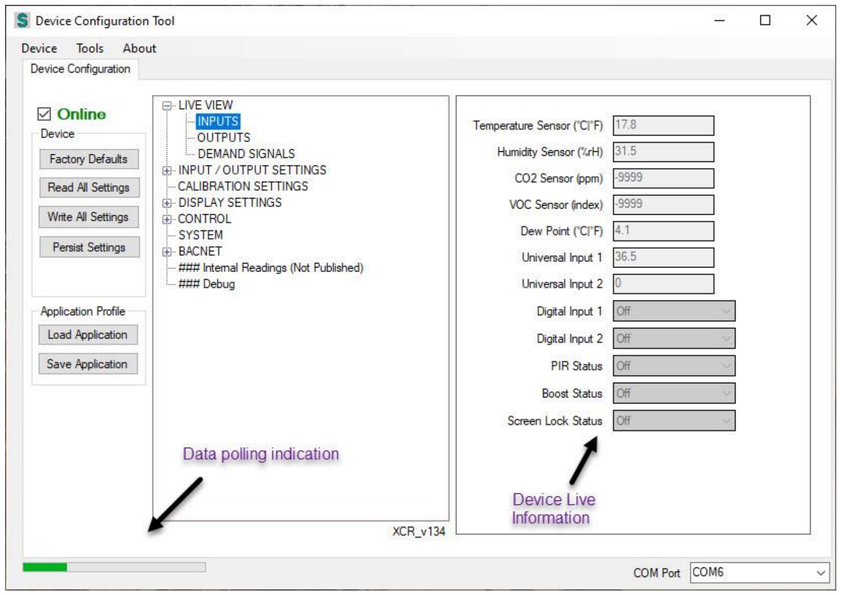
Senticon
SENTIENT CONTROL SOLUTIONS

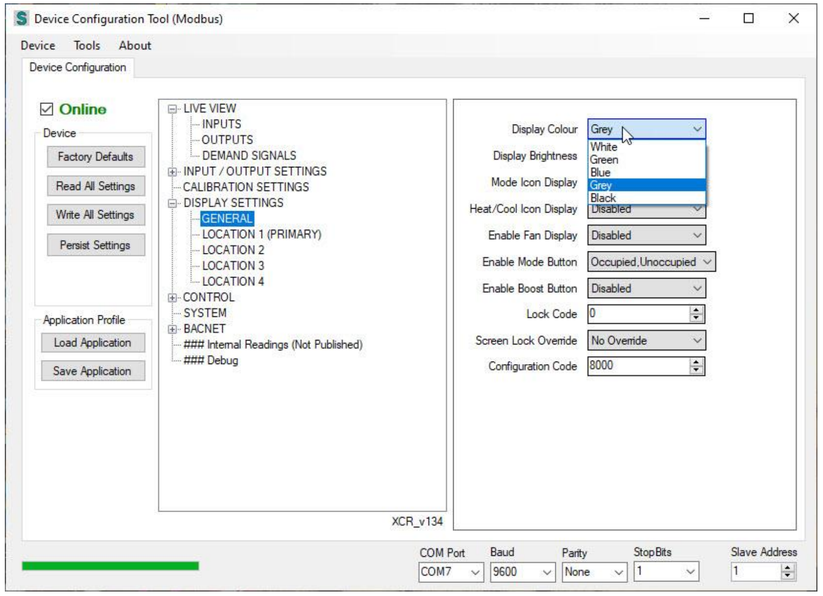
Range of Easy-to-Use Configurations Tools

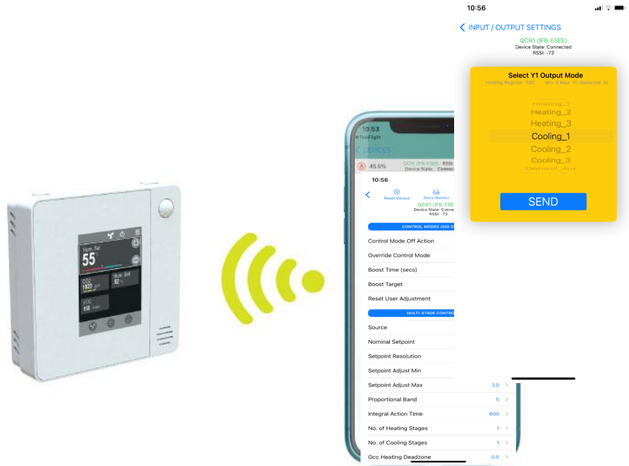
Device Configuration Tool for Windows with Bluetooth Connection / Serial Connection to the Device
Modbus Device Configuration Tool for Connection over Modbus Network
Smart Configuration Tool App for iOS with Bluetooth Connection

Features include:-

- Clear and Intuitive User Interface (= fast tool adaptation and learning curve)
- Auto-device detection on connect (= template matched product model automatically)
- Common point structure for Windows, iOS Tools, Modbus and BACnet (= simplified structure, easy to follow regardless of the platform)
- Save, store, upload, download the configuration to devices (= project configuration with multiple identical devices fast)
- Plug & Play Connection with Bluetooth dongle pair to Windows (= remove hassle from Windows Bluetooth configuration and suitable for laptops without Bluetooth)







Senticon
SENTIENT CONTROL SOLUTIONS

Senticon
SENTIENT CONTROL SOLUTIONS

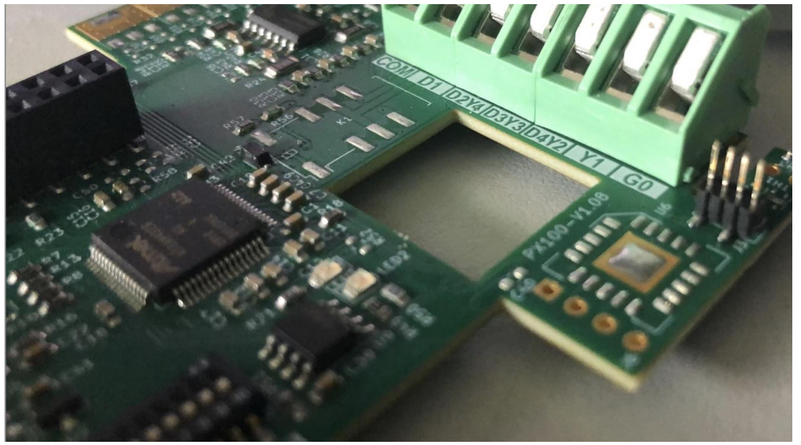
Production and OEM Capabilities

All of our products are manufactured in the United Kingdom. Each product is individually tested and produced to the customer specification. The production uses automated test equipment measuring the functional performance of the device and stores unique references and test results to the production database.

The production processes have been designed to be flexible to allow fast and efficient customisation to e.g. OEM applications.

OEM Customisation Includes:-

- Customer Logo on Product
- Customised Packaging Labelling
- QR Code Links to Customer URL
- Custom Application Programming in the Factory
- Custom Pre-Addressing in the Factory
- Language Translations for Text in Products
- Tailored Software for Special Applications



Scandic

Custom Logo

Custom QR Codes

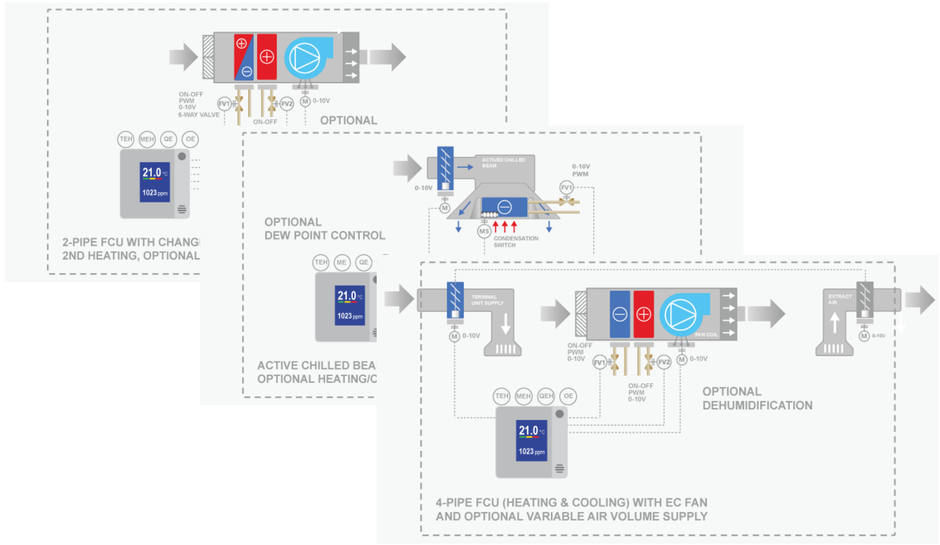
Senticon
BACnet CO2 Contoller, Black
QCR10-BAC-OE-B
SKU:5100 2 00 03 00 01
www.senticon.co.uk

Custom Packaging

Senticon
SENTIENT CONTROL SOLUTIONS

Why Installers Prefer Senticon Products

Senticon products have been designed to be easy to install with robustness and time saving features. The built-in application logic is well thought and designed for the real-life HVAC applications. These features guarantee success in projects.



4 in 1 Sensors and Multi-Measurement Controllers Save Money (one device/wiring instead of many)

- Use one device for measurement, control, user interface and as Modbus/BAC/LoraWan I/O

Installation time and project management saving features

- Easy application programming
- Modbus/BACnet Network Addressing and Baud Setup via software or built-in bit switch (= can be addressed without tools)
- Easy Wiring through central wiring point (= suitable for all wall boxes including ‘Euro wall boxes’)
- Wireless LoraWan Variants for Retrofits / Minimised Cabling
- Supplied with QR Code for Direct Link to Data Sheets (= fast access to information)
- Multi-device backup & restore on the configuration tools
- Consistent documentation and the programming tools menus

Features Safeguarding Installation & Project Success

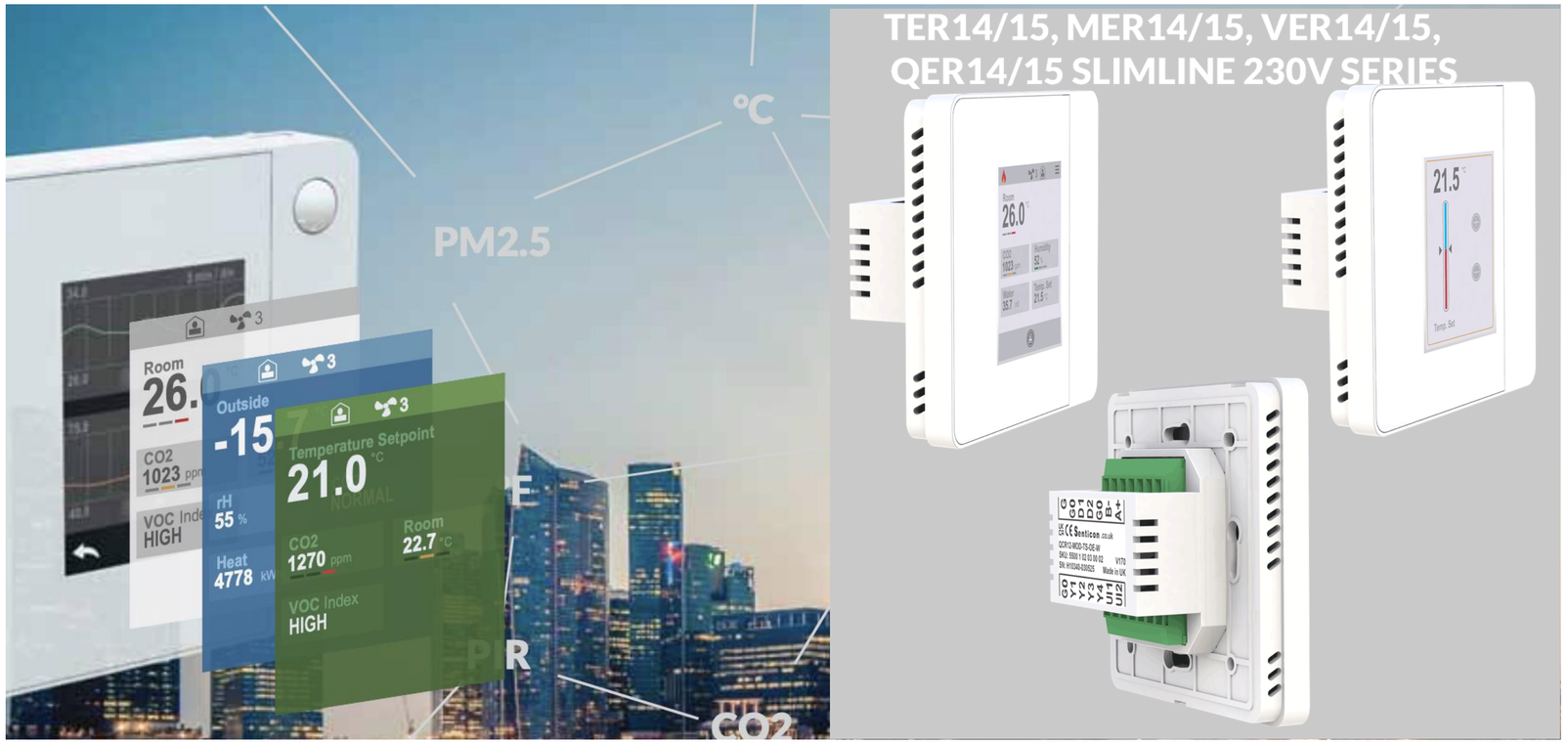
- 60V Over-voltage Protected RS485 Channel (= robust solution for installations)
- Universal input configuration automatically controlled via software (= flexibility and reduced inventory)
- BACnet MS/TP with COV Functionality (= optimise the MS/TP networks)
- Top cable entry for surface mounting (= typically retrofits when cable cannot be routed inside the wall)

Senticon
SENTIENT CONTROL SOLUTIONS

Detailed Product Range Introduction

Senticon
SENTIENT CONTROL SOLUTIONS

QER/TER/MER/VER SMART ROOM SENSOR RANGE



Senticon
SENTIENT CONTROL SOLUTIONS

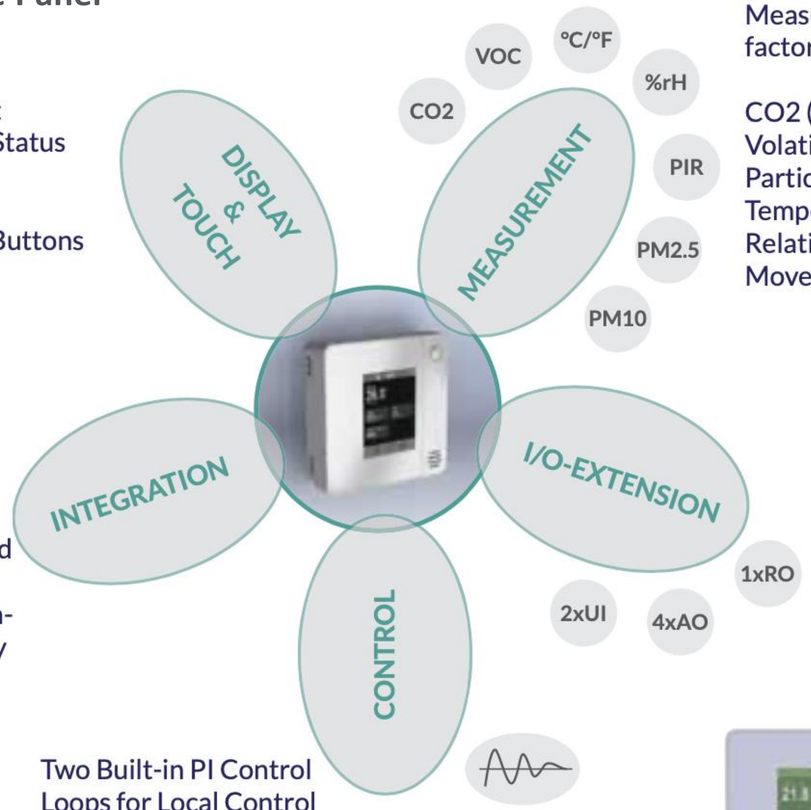
QER/TER/MER/VER – Smart Sensors with Four Functions in One

4 in 1

SENSOR POWERHOUSE

Operates as Room Interface Panel

Colour Capacitive Touchscreen
Modern Glass Front
Use for Control Settings Adjustment
Display Measurements and System Status
Show Energy Consumption Figures
Trend Graph Display
Customise the Elements and Touch Buttons
Alternate Screen Skin Colours



Full Integration

Integrate and control from BEMS and IoT using BACnet MS/TP, Modbus RS485 or LoraWan. Flexible and comprehensive integration from industry specialists.

Two Built-in PI Control Loops for Local Control

Controls Your Room with Integrated Control Loops

Operates as Smart Sensor

Measure air quality and other important factors in your building.

CO2 (Carbon Dioxide)
Volatile Organic Compounds (e.g. smells)
Particulate Matter (e.g. smoke, fumes)
Temperature
Relative Humidity
Movement and Occupancy

Up to 4 Display Locations to Show Measurements

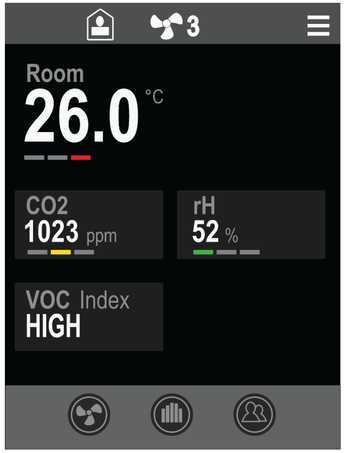
Descriptive Text Indication (Low / Normal / High)

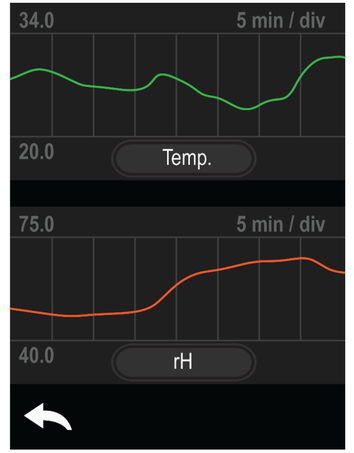
Energy Measurement Indication

Water Consumption Indication

Operates as BACnet/Modbus I/O module

Works as BEMS Input/Output extension. Allows the BEMS extended easily and cost effectively to monitor extra points and areas.





Senticon
SENTIENT CONTROL SOLUTIONS

Room Sensor Range – QER10/TER10/MER10/VER10

TER10 Room Temperature Sensor

Smart Room Temperature Sensor with Control
24Vac/dc Power Supply
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
4 x 0-10V Outputs
Modbus RS485, BACnet MS/TP and LoraWan Communications
Optional
- Occupancy Sensor
- 24V Relay

QER10 CO2 and Multi-Sensor

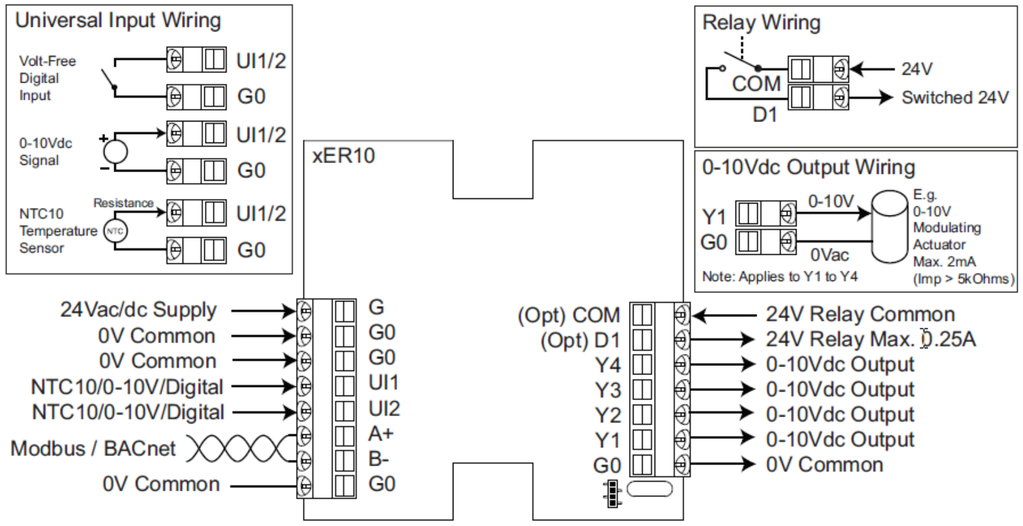
Smart Room CO2 and Temperature Sensor with Control
24Vac/dc Power Supply
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
4 x 0-10V Outputs
Modbus RS485, BACnet MS/TP and LoraWan Communications
Optional
- Humidity Sensor
- VOC Sensor
- Occupancy Sensor
- 24V Relay

MER10 Room Humidity and Temperature Sensor

Smart Room Temperature and Humidity Sensor with Control
24Vac/dc Power Supply
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
4 x 0-10V Outputs
Modbus RS485, BACnet MS/TP and LoraWan Communications
Optional
- Occupancy Sensor
- 24V Relay

VER10 Room VOC, Humidity and Temperature Sensor

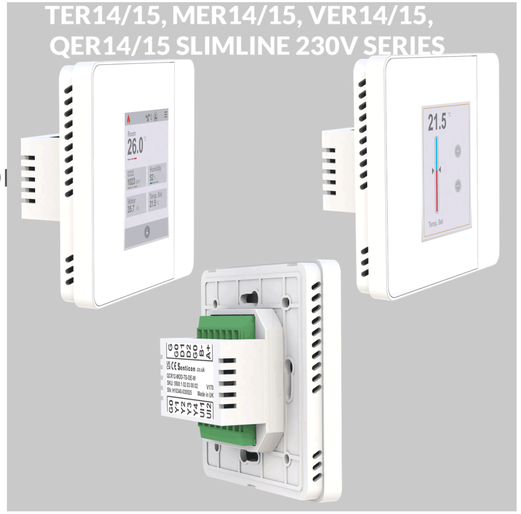
Smart Room VOC, Temperature and Humidity Sensor with Control
24Vac/dc Power Supply
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
4 x 0-10V Outputs
Modbus RS485, BACnet MS/TP and LoraWan Communications
Optional
- Occupancy Sensor
- 24V Relay



ALSO AVAILABLE 0-10Vdc ONLY

Senticon
SENTIENT CONTROL SOLUTIONS

Slimline Room Sensor Range – QER12/TER12/MER12/VER12



TER12 Slimline Room Temperature Sensor

Smart Room Temperature Sensor with Control
24Vac/dc Power Supply
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
4 x 0-10V Outputs
Modbus RS485, BACnet MS/TP and LoraWan Communications
Optional
- Occupancy Sensor
- 24V Relay

QER12 Slimline CO2 and Multi-Sensor

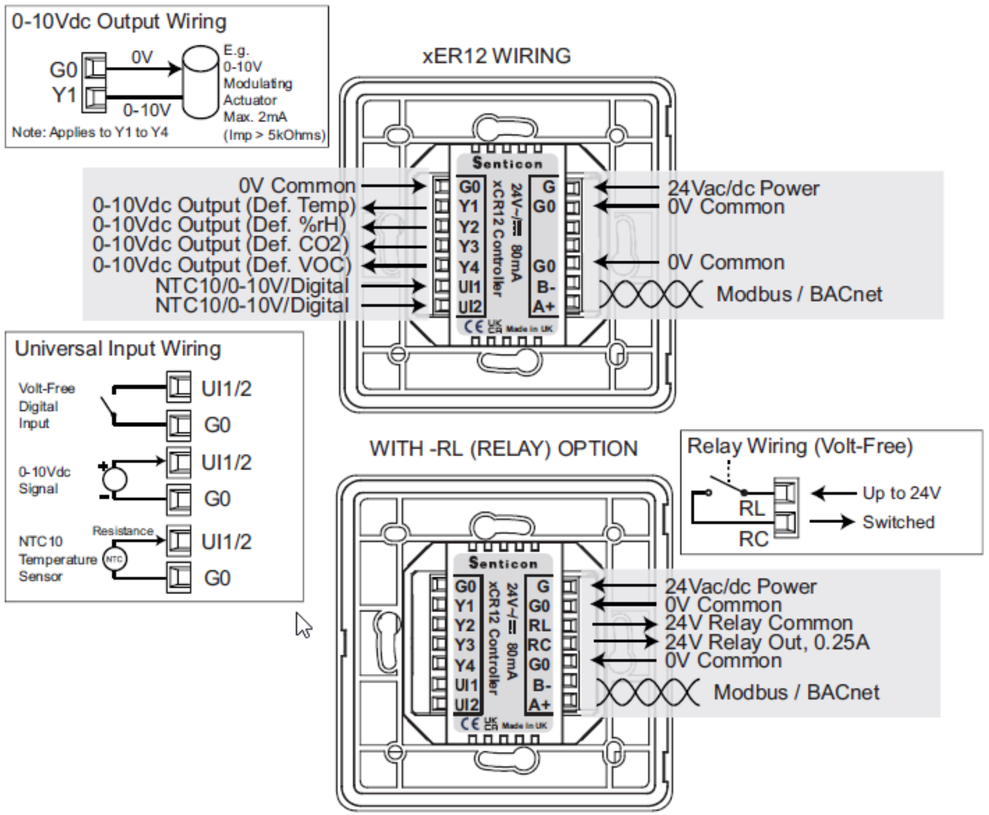
Smart Room CO2 and Temperature Sensor with Control
24Vac/dc Power Supply
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
4 x 0-10V Outputs
Modbus RS485, BACnet MS/TP and LoraWan Communications
Optional
- Humidity Sensor
- VOC Sensor
- Occupancy Sensor
- 24V Relay

MER12 Slimline Room Humidity and Temperature Sensor

Smart Room Temperature and Humidity Sensor with Control
24Vac/dc Power Supply
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
4 x 0-10V Outputs
Modbus RS485, BACnet MS/TP and LoraWan Communications
Optional
- Occupancy Sensor
- 24V Relay

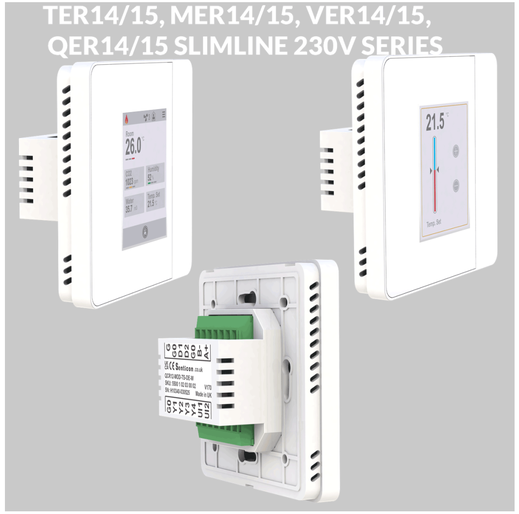
VER12 Slimline Room VOC, Humidity and Temperature Sensor

Smart Room VOC, Temperature and Humidity Sensor with Control
24Vac/dc Power Supply
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
4 x 0-10V Outputs
Modbus RS485, BACnet MS/TP and LoraWan Communications
Optional
- Occupancy Sensor
- 24V Relay



Senticon
SENTIENT CONTROL SOLUTIONS

Mains Slimline Room Sensor Range – QER14/TER14/MER14/VER14



TER14 Room Temperature Sensor

Smart Room Temperature Sensor with Control
90-250Vac Power Supply
1 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
3 x 0-10V Outputs
1 x 240V 5A Relay Output
Modbus RS485, BACnet MS/TP and LoraWan Communications
Optional PIR Occupancy Sensor

MER14 Room Humidity and Temperature Sensor

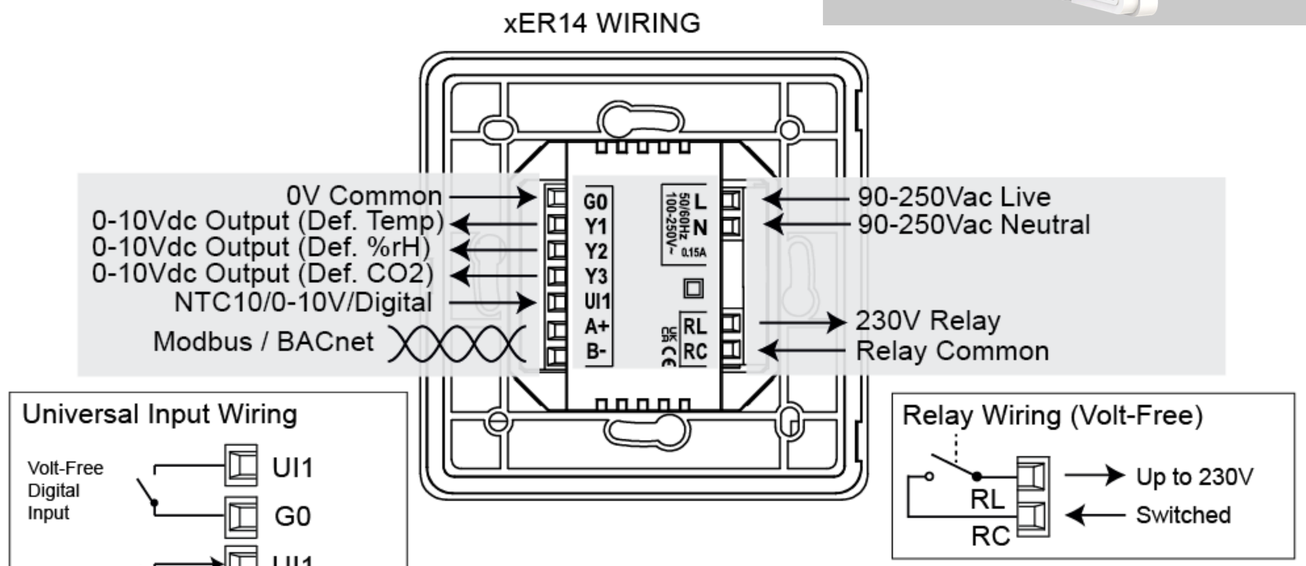
Smart Room Temperature and Humidity Sensor with Control
90-250Vac Power Supply
1 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
3 x 0-10V Outputs
1 x 240V 5A Relay Output
Modbus RS485, BACnet MS/TP and LoraWan Communications
Optional PIR Occupancy Sensor

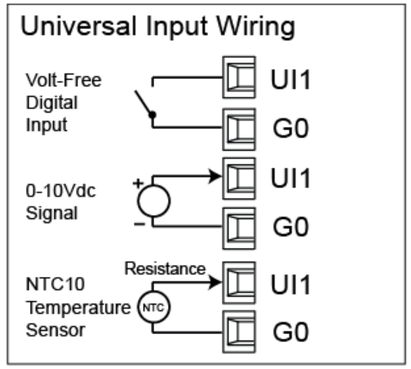
QER14 CO2 and Multi-Sensor

Smart Room CO2 and Temperature Sensor with Control
1 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
3 x 0-10V Outputs
1 x 240V 5A Relay Output
Modbus RS485, BACnet MS/TP and LoraWan Communications
Optional
- Humidity Sensor
- VOC Sensor
- PIR Occupancy Sensor

VER14 Room VOC, Humidity and Temperature Sensor

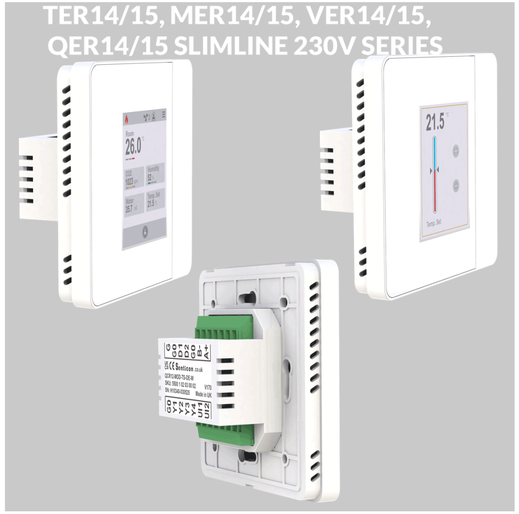
Smart Room VOC, Temperature and Humidity Sensor with Control
90-250Vac Power Supply
1 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
3 x 0-10V Outputs
1 x 240V 5A Relay Output
Modbus RS485, BACnet MS/TP and LoraWan Communications
Optional PIR Occupancy Sensor





Senticon
SENTIENT CONTROL SOLUTIONS

Mains Slimline Room Sensor Range – QER15/TER15/MER15/VER15



TER15 Room Temperature Sensor

Smart Room Temperature Sensor with Control
90-250Vac Power Supply
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
4 x 0-10V Outputs
Modbus RS485, BACnet MS/TP and LoraWan Communications
Optional PIR Occupancy Sensor

MER15 Room Humidity and Temperature Sensor

Smart Room Temperature and Humidity Sensor with Control
90-250Vac Power Supply
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
4 x 0-10V Outputs
Modbus RS485, BACnet MS/TP and LoraWan Communications
Optional PIR Occupancy Sensor

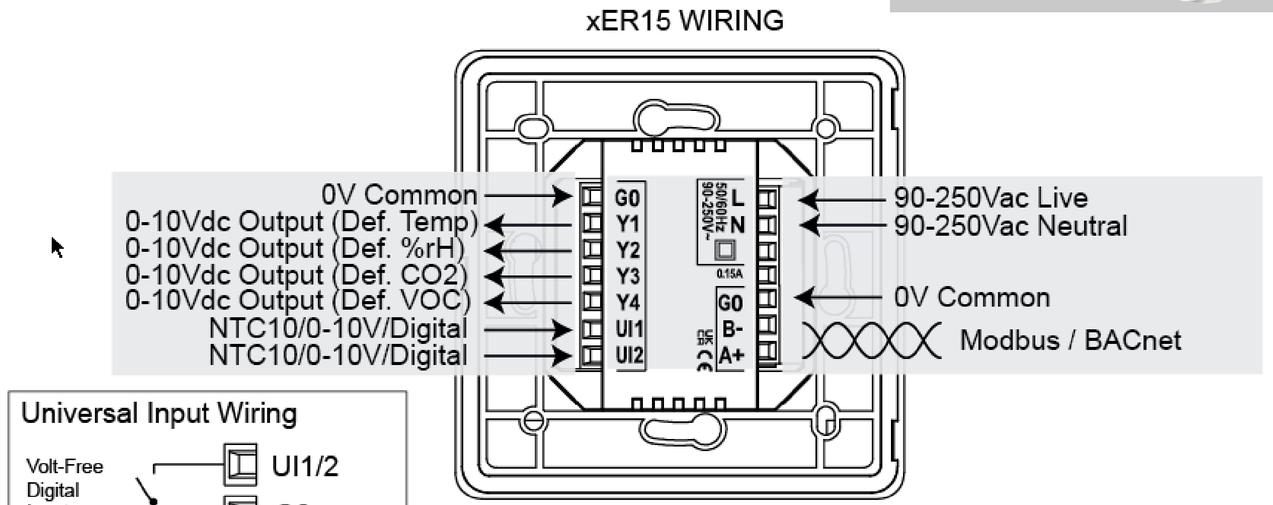
QER15 CO2 and Multi-Sensor

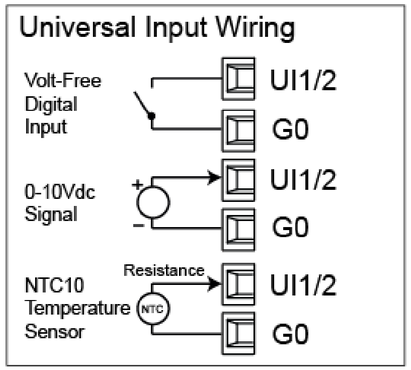
Smart Room CO2 and Temperature Sensor with Control
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
4 x 0-10V Outputs
Modbus RS485, BACnet MS/TP and LoraWan Communications
Optional

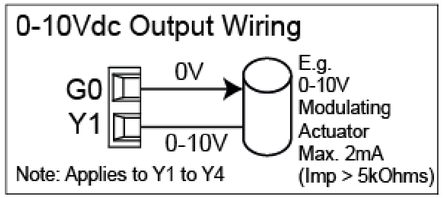
- Humidity Sensor
- VOC Sensor
- PIR Occupancy Sensor

VER15 Room VOC, Humidity and Temperature Sensor

Smart Room VOC, Temperature and Humidity Sensor with Control
90-250Vac Power Supply
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
4 x 0-10V Outputs
Modbus RS485, BACnet MS/TP and LoraWan Communications
Optional PIR Occupancy Sensor





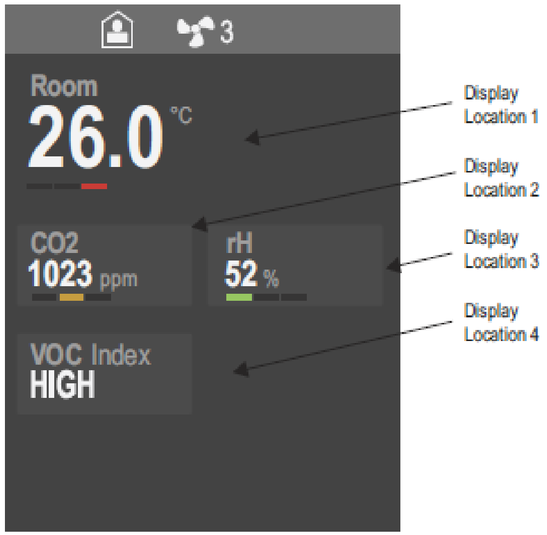


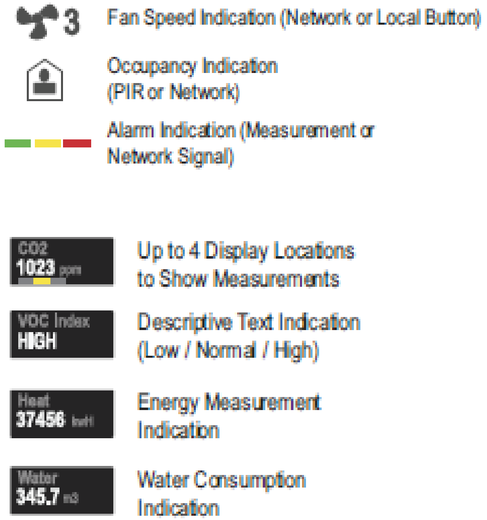
Senticon
SENTIENT CONTROL SOLUTIONS

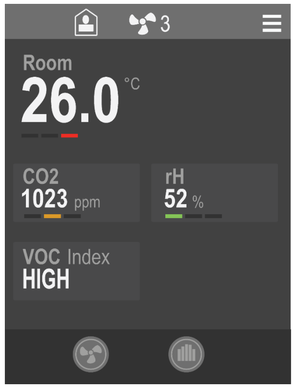
QER/TER/MER/VER – Display / Room Interface Panel

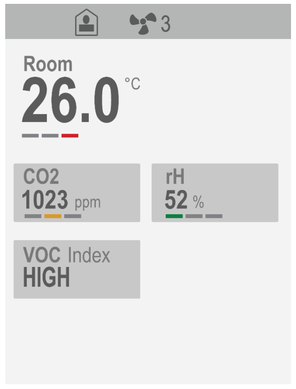
Room Interface Panel Functions

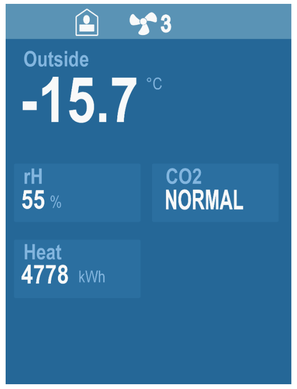
- Colour Skin Options
- Display Configurable for requirements
- Show measurements, setpoints, energy reading, consumption reading etc.
- 4 Display Locations
  - Configurable Values
  - Configurable Descriptions
  - Configurable Units
- Alarm Displays
- Touchscreen Models with extra Functions such as
  - Historical Trend Display
  - Timed Boost Button
  - Setpoint Adjustments
  - Operating Mode Selection

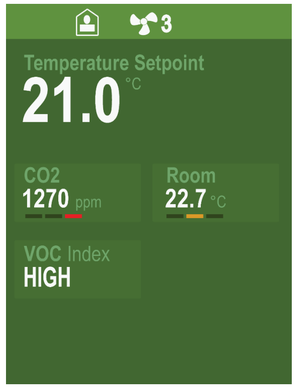


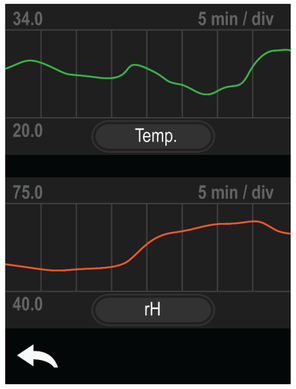


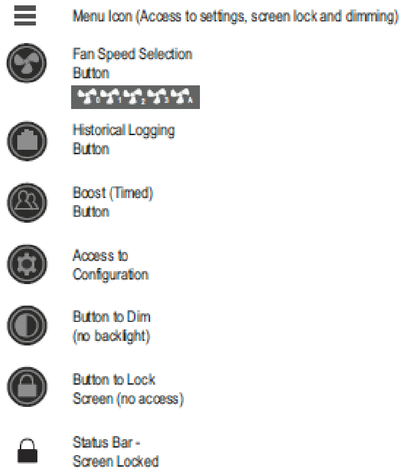












Senticon
SENTIENT CONTROL SOLUTIONS

QER/TER/MER/VER - Measurements

CO2 Measurement

- Automatic Calibration
- Photoacoustic Technology
- Low Power Consumption
- Read over network or send to 0-10V Outputs

Temperature Measurement

- Designed for Accurate Temperature Measurement
- Load Profile Based Calibration

Humidity Measurement

- 2%rH Accuracy within Operating Range
- Reliable Measurement Technology

VOC Measurement

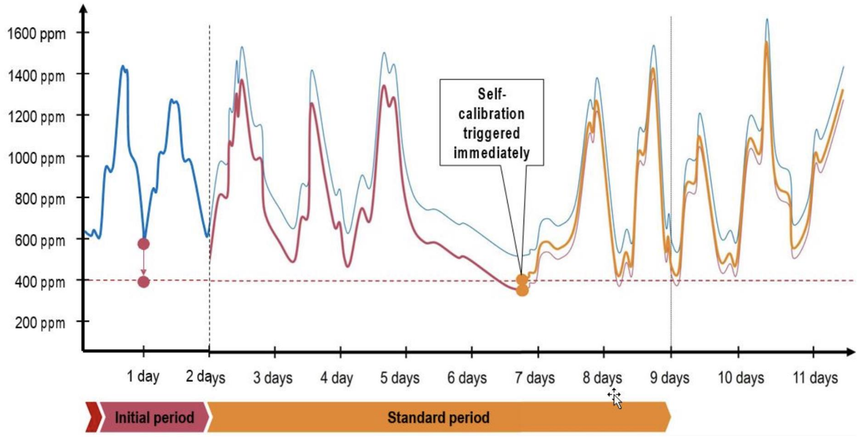
- Standard Air Quality Index

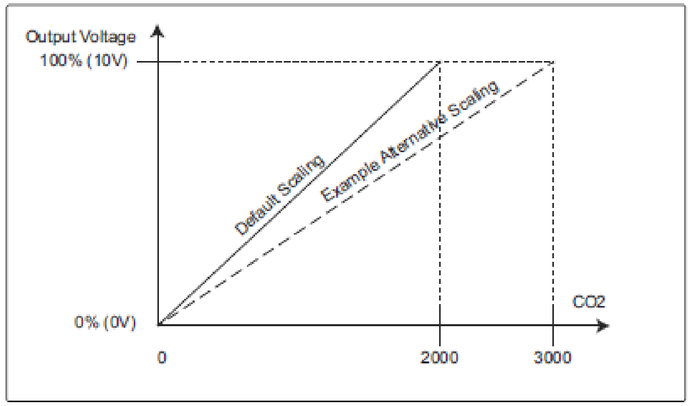
Well Building Standard®, RESET®
Air Standard Calculations

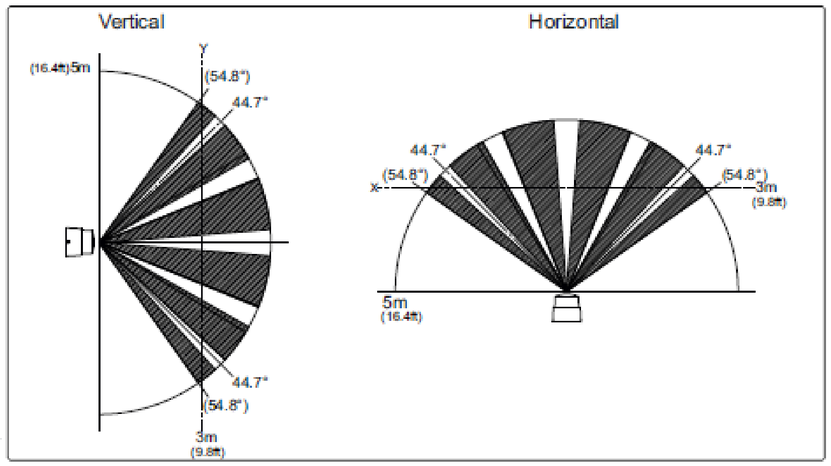
Measured air pollutants include harmful gases (acetone from paints and glues, toluene from furniture, mattresses and building products), other gases (ethanol from alcohol, perfumes and cleaners), odours (hydrogen sulfide and volatile sulfuric compounds from rotten food and farts; ammonia and amines from pet urine), smoke (benzene and nitrosamines from cigarette smoke)

Occupancy Detection

- Sensitive pyroelectric infrared motion sensor
- Better sensitivity and signal-to-noise ration reducing the false detections
- Excellent monitoring angle
- Good range





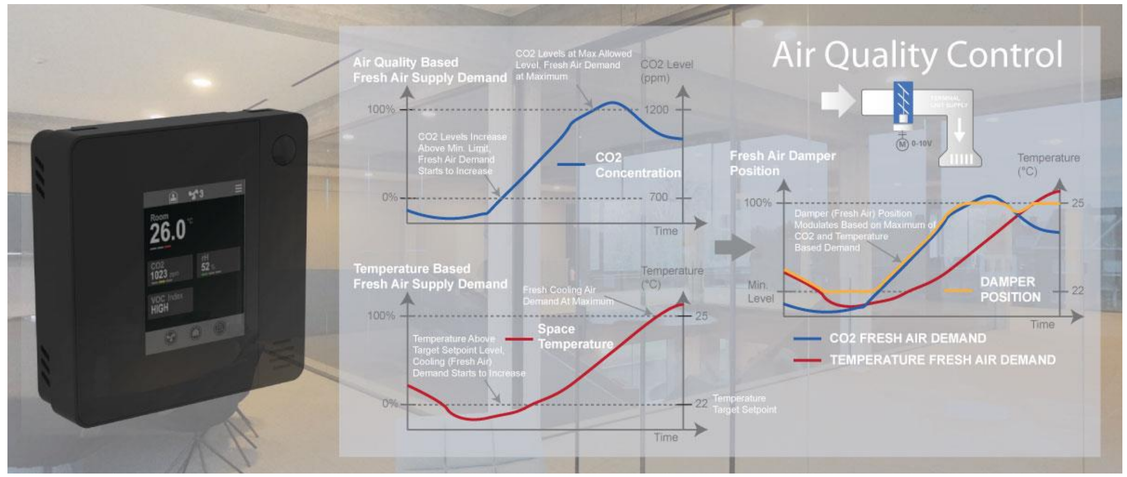


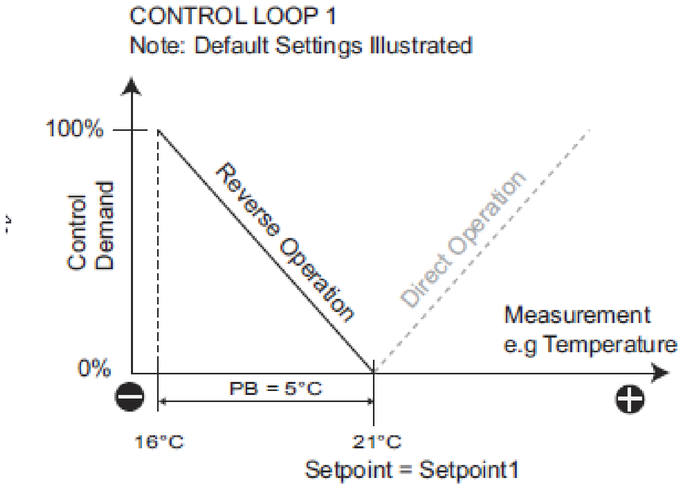
Senticon
SENTIENT CONTROL SOLUTIONS

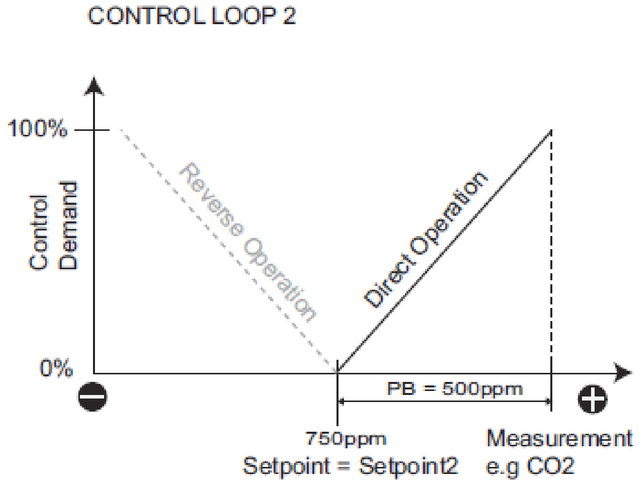
QER/TER/MER/VER Smart Room Sensors – Control Functions

Control Functions

- 2 x Independent PI Control Loops
- Selectable Control Measurement (Temperature, CO2, VOC, Humidity)
- Maximum (VAV) Function on the Output Modes
- Boost Button to Override Output for a Specified Time
- Setpoints Adjustable from Touchscreen







Senticon
SENTIENT CONTROL SOLUTIONS

QER10, 12/MER10, 12/TER10, 12/VER10, 12 Smart Room Sensors, 24V Powered – Model Selection

Part Number		SKU# Number					
Example	QER10-MOD-LCD-BLE-RH-VOC-B	1000	1	04	02	00	01
Product Name		Product		Product Options			
QER10	Room CO2 and Temperature Multi-Sensor, 2UI, 4AO, 24Vac/dc Supply	1000					
MER10	Room Humidity and Temperature Multi-Sensor, 2UI, 4AO, 24 Vac/dc Supply	1100					
TER10	Smart Room Temperature Sensor, 2UI, 4AO, 24Vac/dc Supply	1200					
VER10	Room VOC, Humidity and Temperature Multi-Sensor, 2UI, 4AO, 24Vac/dc Supply	1300					
QER12	Slimline Room CO2 and Temperature Multi-Sensor, 2UI, 4AO, 24Vac/dc Supply	1020					
MER12	Slimline Room Humidity and Temperature Multi-Sensor, 2UI, 4AO, 24Vac/dc Supply	1120					
TER12	Slimline Smart Room Temperature Sensor, 2UI, 4AO, 24Vac/dc Supply	1220					
VER12	Slimline Room VOC, Humidity and Temperature Multi-Sensor, 2UI, 4AO, 24Vac/dc Supply	1320					
Communication Options							
MOD	Modbus RS485		1				
BAC	BACnet MS/TP		2				
Interface Options							
	No Interface			00			
LCD	Colour Display			01			
TS	Colour Capacitive Touchscreen			02			
BLE	Bluetooth App Interface			03			
LCD-BLE	Colour Display and Bluetooth			04			
TS-BLE	Touchscreen and Bluetooth			05			
LRA	LoraWan Wireless Interface, EU868Mhz			06			
LCD-LRA	Colour Display and LoraWan Interface, EU868MHz			07			
TS-LRA	LoraWan Wirelss Interface EU868MHz with Touchscreen			08			
Measurement Options							
	No Extra Measurements				00		
RH	Relative Humidity (QER Only)				01		
RH-VOC	Volatile Organic Compound and Humidity (QER Only)				02		
OE	Passive Infrared Sensor (PIR)				03		
RH-OE	Relative Humidity and PIR (QER Only)				04		
RH-VOC-OE	VOC, Relative Humidity and PIR (QER Only)				05		
Output Options							
	No Output Options					00	
RL	24V Relay Output					01	
Colour Options							
B	Black						01
W	White						02

Senticon
SENTIENT CONTROL SOLUTIONS

Slimline QER14, 15/MER14, 15/TER14, 15/VER14, 15 Smart Room Sensors, 90-250V Powered – Model Selection

Part Number		SKU# Number					
Example	QER14-MOD-TS-B	1030	1	02	00	00	00
Product Name		Product		Product Options			
QER14	Slimline Room CO2 and Temperature Multi-Sensor, 1UI, 3AO, 1RO, 90-250Vac Supply	1040					
MER14	Slimline Room Humidity and Temperature Multi-Sensor, 1UI, 3AO, 1RO, 90-250Vac Supply	1140					
TER14	Slimline Smart Room Temperature Sensor, 1UI, 3AO, 1RO, 90-250Vac Supply	1240					
VER14	Slimline Room VOC, Humidity and Temperature Multi-Sensor, 1UI, 3AO, 1RO, 90-250Vac Supply	1340					
QER15	Slimline Room CO2 and Temperature Multi-Sensor, 2UI, 4AO, 90-250Vac Supply	1050					
MER15	Slimline Room Humidity and Temperature Multi-Sensor, 2UI, 4AO, 90-250Vac Supply	1150					
TER15	Slimline Smart Room Temperature Sensor, 2UI, 4AO, 90-250Vac Supply	1250					
VER15	Slimline Room VOC, Humidity and Temperature Multi-Sensor, 2UI, 4AO, 90-250Vac Supply	1350					
Communication Options							
MOD	Modbus RS485		1				
BAC	BACnet MS/TP		2				
Interface Options							
	No Interface			00			
LCD	Colour Display			01			
TS	Colour Capacitive Touchscreen			02			
BLE	Bluetooth App Interface			03			
LCD-BLE	Colour Display and Bluetooth			04			
TS-BLE	Touchscreen and Bluetooth			05			
LRA	LoraWan Wireless Interface, EU868Mhz			06			
LCD-LRA	Colour Display and LoraWan Interface, EU868MHz			07			
TS-LRA	LoraWan Wirelss Interface EU868MHz with Touchscreen			08			
Measurement Options							
	No Extra Measurements				00		
RH	Relative Humidity (QER Only)				01		
RH-VOC	Volatile Organic Compound and Humidity (QER Only)				02		
OE	Passive Infrared Sensor (PIR)				03		
RH-OE	Relative Humidity and PIR (QER Only)				04		
RH-VOC-OE	VOC, Relative Humidity and PIR (QER Only)				05		
Colour Options							
B	Black					00	01
W	White					00	02

Senticon
SENTIENT CONTROL SOLUTIONS

Senticon
SENTIENT CONTROL SOLUTIONS

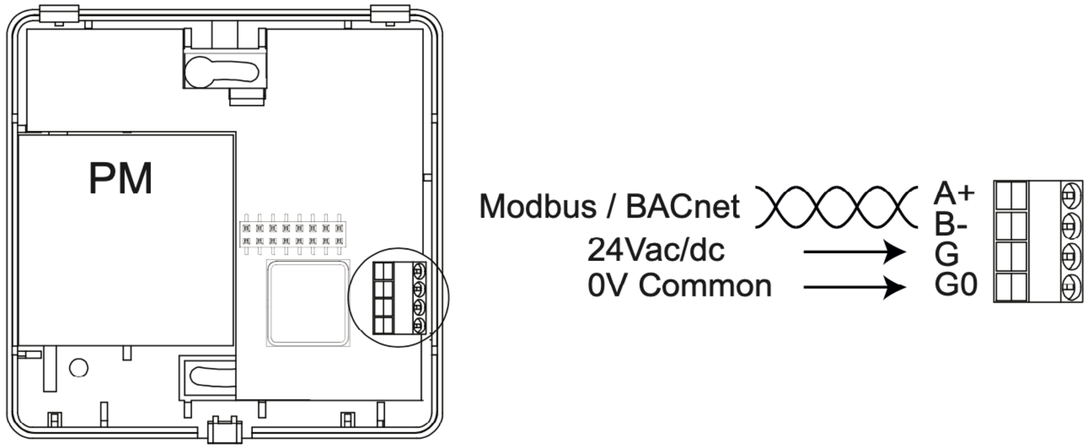
PMR25 PARTICULATE MATTER SENSORS

Senticon
SENTIENT CONTROL SOLUTIONS

PMR25 PARTICULATE MATTER SENSORS

• Smart Multi-Function Sensors for monitoring Particle Matter (PM1.0, PM2.5, PM4, PM10), Temperature, VOC and
Humidity
• Optional CO2 and Occupancy Measurement (Passive Infrared)
• BACnet MS/TP or Modbus RS485 RTU with up to 60V industrial isolation on RS485 for system integration
• Optional 2.4" Colour Screen / Touchscreen for Alarms, Trend Graphs and User Interface Functions
• Can be used as BACnet/Network User Interface for BMS Systems in distributed applications (provides measurements,
user overrides and system indications)
• Built-in Bluetooth wireless connection to Device Configuration Tool USB-BLE dongle or to SmartConfig Smart Phone App
• Available in both White and Black. The screen has number of different skin colour options for user preferences.
• User display language customisable using the language packs

PMR25 WIRING



Particulate Matter

Mass Concentration Range:	0..1,000µg/m^3
Mass Concentration Size Range	PM1.0: 0.3 to 1.0µm PM2.5: 0.3 to 2.5µm PM4: 0.3 to 4µm PM10: 0.4 to 10.0µm
Mass Concentration Precision:	PM1.0/PM2.5: 0 to 100 ug/m^3: ±5 µg/m^3+ 5% m.v. PM1.0/PM2.5: 100 to 1000 ug/m^3: ±10% m.v. PM4/PM10: 0 to 100 ug/m^3: ±25 µg/m^3 PM4/PM4: 100 to 1000 ug/m^3: ±25% m.v.
Number Concentration Range:	0..3,000µ#/cm^3
Number Concentration Size Range	PM1.0: 0.3 to 0.5µm PM1.0: 0.3 to 1.0µm PM2.5: 0.3 to 2.5µm PM4: 0.3 to 4.0µm PM10: 0.4 to 10.0µm
Number Concentration Precision:	PM0.5/1.0/PM2.5: 0 to 1000 #/cm^3: ±100 #/cm^3 PM0.5 1.0/PM2.5: 1000 to 3000 #/cm^3: ±10% m.v. PM4/PM10: 0 to 1000 #/cm^3: ±250 #/cm^3 PM4/PM4: 1000 to 3000 #/cm^3: ±25% m.v.
Start-Up Time	Up to 30 seconds
PM2.5 Mass Concentration Calibration:	Calibrated to TSI DustTrak™ DRX 8533 Ambient Mode
PM2.5 Number Concentration Calibration:	Calibrated to TSI OPS 3330

Particulate Matter Sensors – PMR25

Part Number		SKU# Number					
Example	PMR25-BAC-TS-CO2-W	1400	2	02	06	00	02
Product Name		Product		Product Options			
PMR25	Room Particulate Matter Sensor, with Relative Humidity and VOC	1400					
Communication Options							
MOD	Modbus RS485		1				
BAC	BACnet MS/TP		2				
Interface Options							
	No Interface			00			
LCD	Colour Display			01			
TS	Colour Capacitive Touchscreen			02			
Measurement Options							
	No Extra Measurements				00		
OE	Passive Infrared Sensor (PIR)				03		
CO2	CO2 Carbon Dioxide Measurement				06		
OE-CO2	CO2 Measurement and Passive Infrared Sensor (PIR)				07		
Colour Options							
B	Black						01
W	White						02

Senticon
SENTIENT CONTROL SOLUTIONS

QCR/TCR10/11/12/13/14 INTELLIGENT ROOM CONTROLLER RANGE

Senticon
SENTIENT CONTROL SOLUTIONS

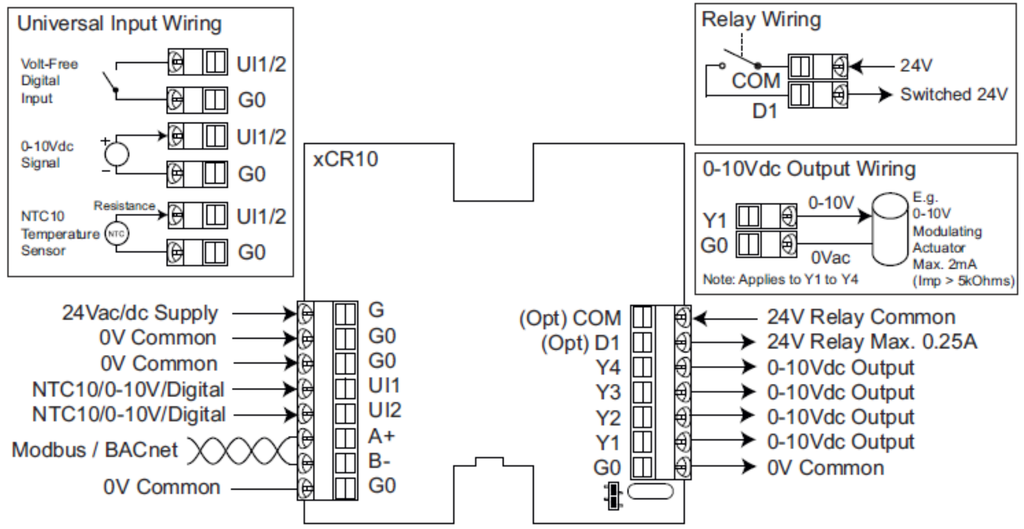
TCR10/QCR10 Room Controllers

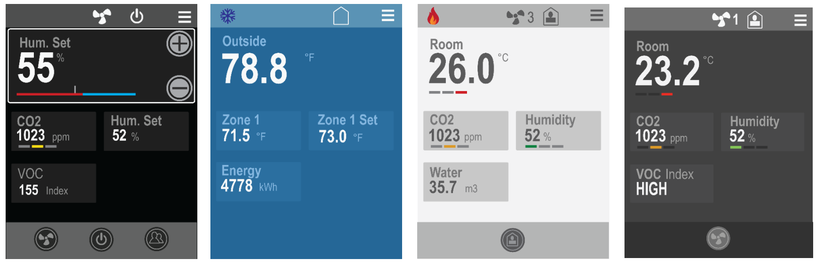
TCR10-MOD/BAC/LoRA

Room Temperature Controller
Built-In Temperature Measurement
Touchscreen Interface
24Vac/dc Power Supply
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
4 x 0-10V Outputs
Modbus RS485, BACnet MS/TP and LoraWan Communications

QCR10-MOD/BAC/LoRA

Room Temperature and CO2 Controller
Built-In Temperature and CO2 Measurement
Touchscreen Interface
24Vac/dc Power Supply
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
4 x 0-10V Outputs
Modbus RS485, BACnet MS/TP and LoraWan Communications





Options, Programming and Phone Apps

Optional 24V Pilot Relay Output (Volt-Free Contacts) (xCR10)
Optional Humidity
Optional VOC
Optional PIR Sensor
Optional Phone App user Interface (BLE) – iOS
Windows Programming tool with Bluetooth Connection (Dongle or Built-In)
Modbus Programming Tool, Modbus RS485

Senticon
SENTIENT CONTROL SOLUTIONS

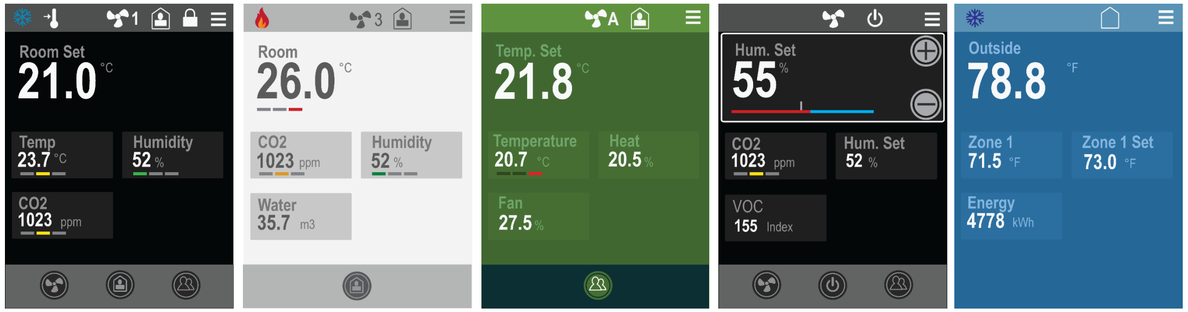
TCR11/QCR11 Room Controllers

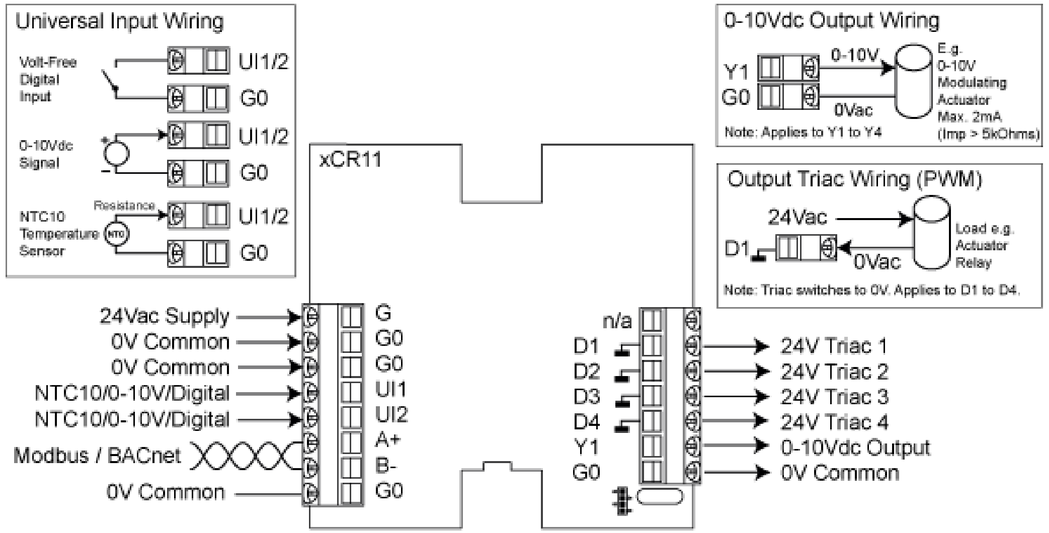
TCR11-MOD/BAC/LoRA

Room Temperature Controller
Built-In Temperature Measurement
Touchscreen Interface
24Vac Power Supply
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
4 x 24Vac Triac Outputs
1 x 0-10V Output
Modbus RS485, BACnet MS/TP and LoraWan Communications

QCR11-MOD/BAC/LoRA

Room Temperature and CO2 Controller
Built-In Temperature and CO2 Measurement
Touchscreen Interface
24Vac Power Supply
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
4 x 24Vac Triac Outputs
1 x 0-10V Output
Modbus RS485, BACnet MS/TP and LoraWan Communications





Options, Programming and Phone Apps

Optional Humidity
Optional VOC
Optional PIR Sensor
Optional Phone App user Interface (BLE) – iOS
Windows Programming tool with Bluetooth Connection (Dongle or Built-In)
Modbus Programming Tool, Modbus RS485

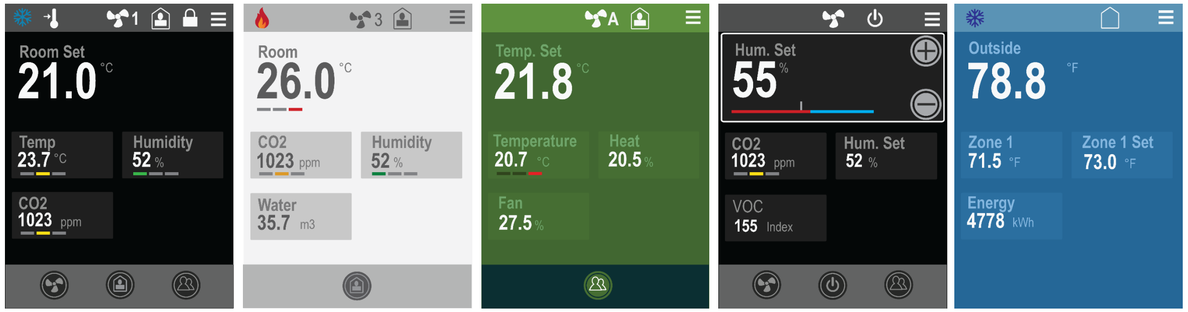
TCR12/QCR12 Slimline Room Controllers

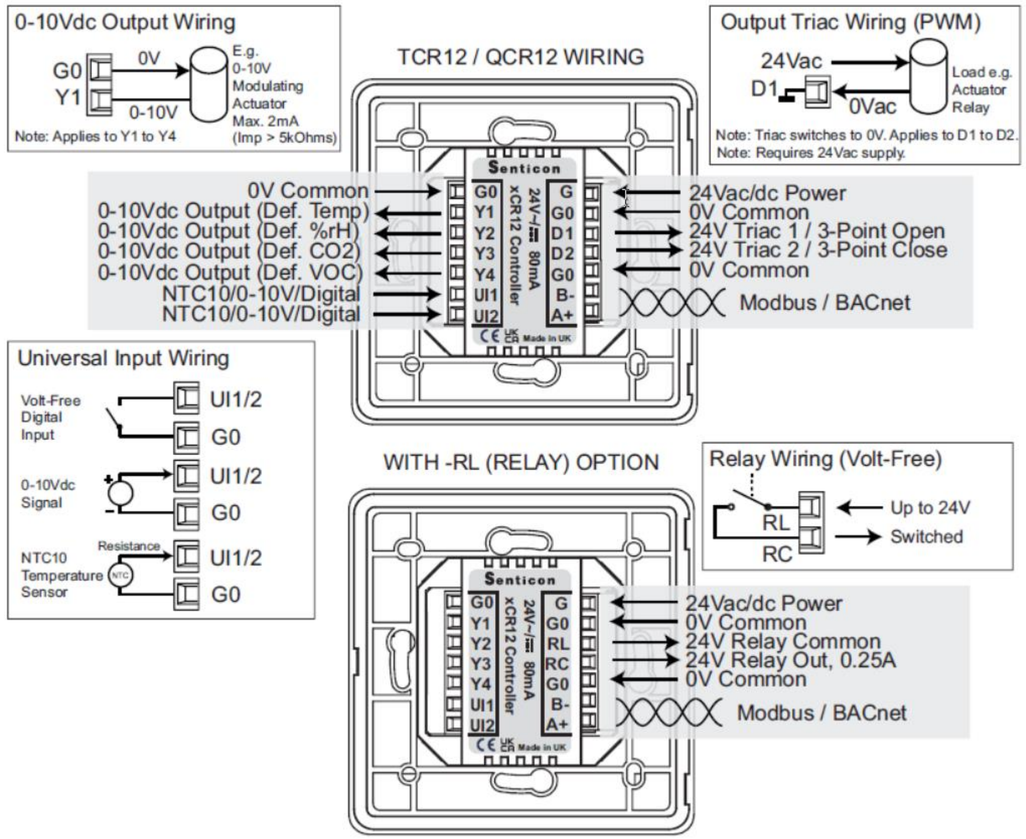
TCR12-MOD/BAC/LoRA

Room Temperature Controller
Built-In Temperature Measurement
Touchscreen Interface
24Vac Power Supply
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
2 x 24Vac Triac Outputs
4 x 0-10V Outputs
Modbus RS485, BACnet MS/TP and LoraWan Communications

QCR12-MOD/BAC/LoRA

Room Temperature and CO2 Controller
Built-In Temperature and CO2 Measurement
Touchscreen Interface
24Vac Power Supply
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
2 x 24Vac Triac Outputs
4 x 0-10V Outputs
Modbus RS485, BACnet MS/TP and LoraWan Communications





Options, Programming and Phone Apps

Optional Humidity
Optional VOC
Optional PIR Sensor
Optional Phone App user Interface (BLE) – iOS
Windows Programming tool with Bluetooth Connection (Dongle or Built-In)
Modbus Programming Tool, Modbus RS485

TCR13/QCR13 Slimline Room Controllers

TCR13-MOD/BAC/LoRA

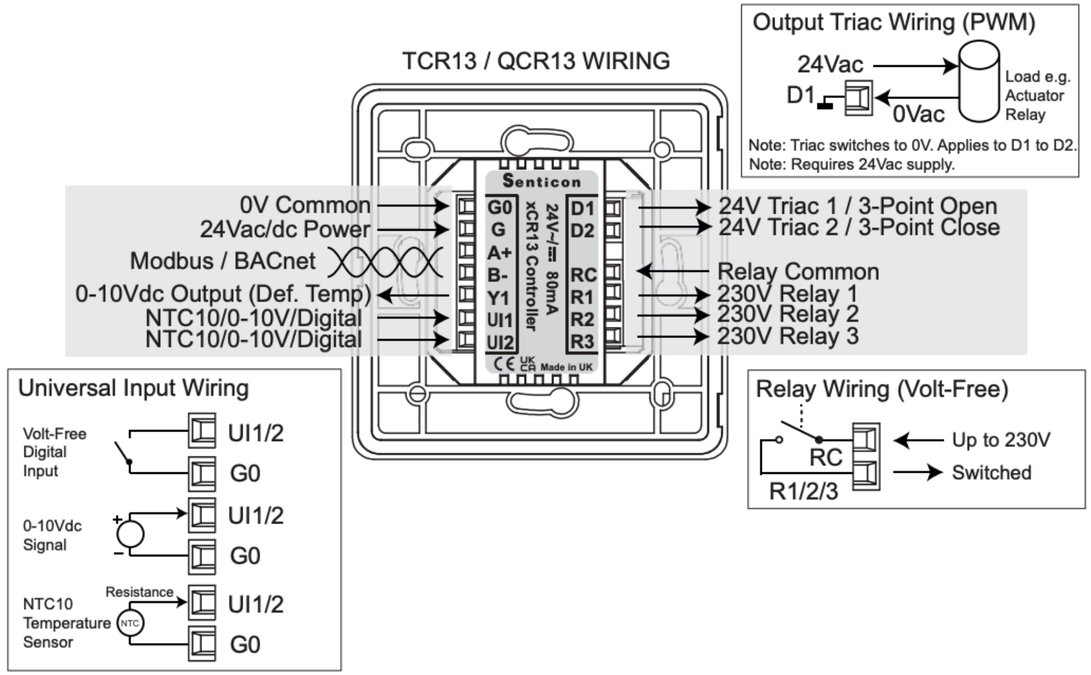
Room Temperature Controller, 24Vac Supply
Built-In Temperature Measurement
Touchscreen Interface
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
2 x 24Vac Triac Outputs
1 x 0-10V Output
3 x 230Vac 5A Relays
Modbus RS485, BACnet MS/TP and LoraWan Communications

QCR13-MOD/BAC/LoRA

Room Temperature and CO2 Controller, 24Vac Supply
Built-In Temperature and CO2 Measurement
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
2 x 24Vac Triac Outputs
1 x 0-10V Output
3 x 230Vac 5A Relays
Modbus RS485, BACnet MS/TP and LoraWan Communications

Options, Programming and Phone Apps

Optional Humidity
Optional VOC
Optional PIR Sensor
Optional Phone App user Interface (BLE) – iOS
Windows Programming tool with Bluetooth Connection (Dongle or Built-In)
Modbus Programming Tool, Modbus RS485



230V Powered TCR14/QCR14 Slimline Room Controllers

TCR14-MOD/BAC/LoRA

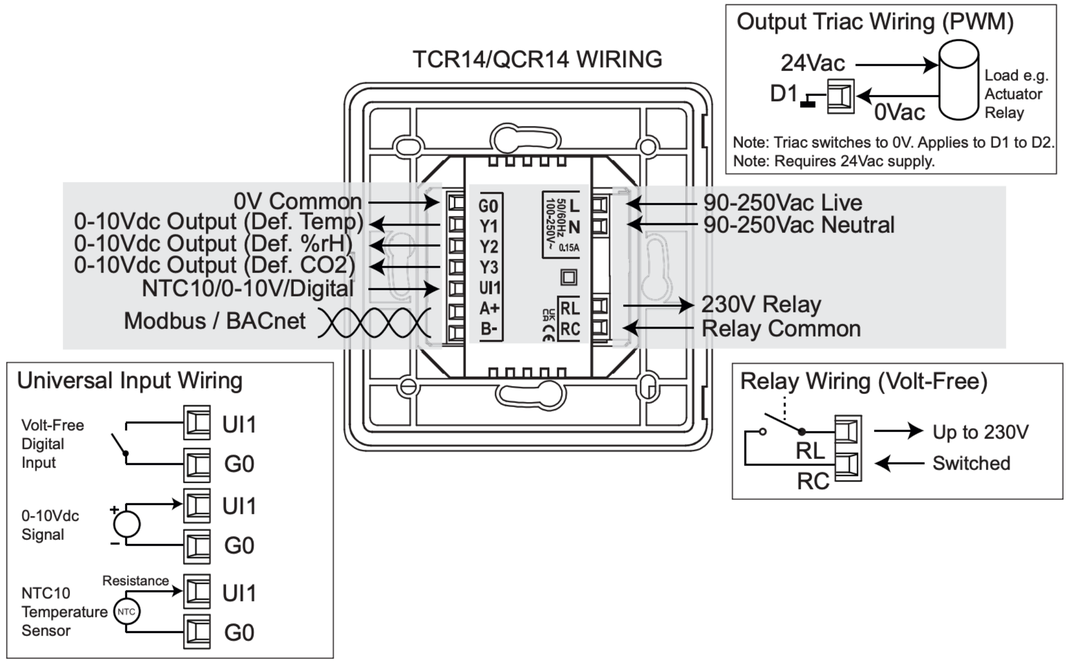
Room Temperature Controller
Built-In Temperature Measurement
Touchscreen Interface
90-250Vac Power Supply
1 x Universal Input (0-10V, NTC10, Digital) – Automatically Selected by App
3 x 0-10V Outputs
1 x 230Vac 10A Relay
Modbus RS485, BACnet MS/TP and LoraWan Communications

QCR14-MOD/BAC/LoRA

Room Temperature and CO2 Controller
Built-In Temperature and CO2 Measurement
90-250Vac Power Supply
1 x Universal Input (0-10V, NTC10, Digital) – Automatically Selected by App
3 x 0-10V Outputs
1 x 230Vac 10A Relay
Modbus RS485, BACnet MS/TP and LoraWan Communications

Options, Programming and Phone Apps

Optional Humidity
Optional VOC
Optional PIR Sensor
Optional Phone App user Interface (BLE) – iOS
Windows Programming tool with Bluetooth Connection (Dongle or Built-In)
Modbus Programming Tool, Modbus RS485



230V Powered TCR15/QCR15 Slimline Room Controllers

TCR15-MOD/BAC/LoRA

Room Temperature Controller

Built-In Temperature Measurement

Touchscreen Interface

90-250Vac Power Supply

2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App

4 x 0-10V Outputs

Modbus RS485, BACnet MS/TP and LoraWan Communications

QCR15-MOD/BAC/LoRA

Room Temperature and CO2 Controller

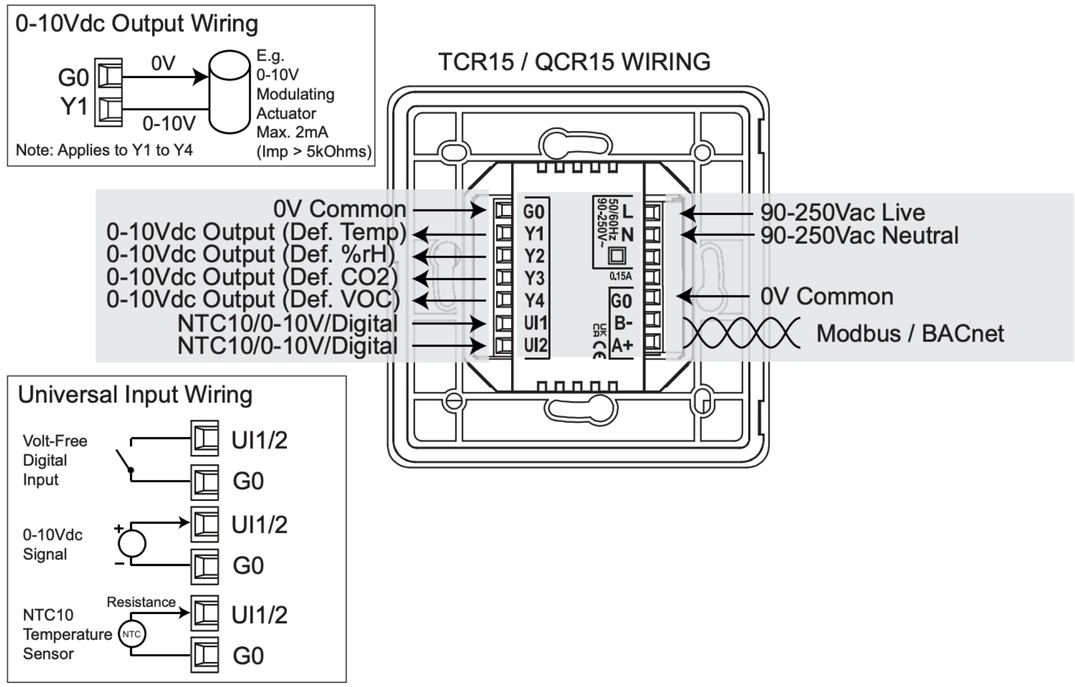
Built-In Temperature and CO2 Measurement

90-250Vac Power Supply

2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App

4 x 0-10V Outputs

Modbus RS485, BACnet MS/TP and LoraWan Communications



Options, Programming and Phone Apps

Optional Humidity

Optional VOC

Optional PIR Sensor

Optional Phone App user Interface (BLE) – iOS

Windows Programming tool with Bluetooth Connection (Dongle or Built-In)

Modbus Programming Tool, Modbus RS485

TCR10/QCR10 Room Controller Range Software Functions Overview - Operating Modes

Operating Modes

- Occupied Mode
- Unoccupied Mode
- Off Mode

Mode Control

- Via Network
- Via Display
- Via Digital (Universal) Inputs
- Via Built-in PIR
- Via Boost Button

Mode Related Options

- Option to Reset Setpoints
- Frost Protection Mode
- Asymmetrical Cooling and Heating Deadzones
- Display Configurable for Mode Selection

Control Mode	Heating and Cooling Stages 1/2/3 Demand	Auxiliary Control Loop Demand	Air Quality CO2 and VOC Control Demand	Humidity and Dehumidty Control Demand, Fan Demand
Occupied	Based on control loop with occupied deadzone settings	Based on control loop	Based on control loop	Based on control loop
Unoccupied	Based on control loop with unoccupied deadzone settings	Based on control loop	Based on control loop	Based on control loop
Off	0% (Frost logic enables heating stages to 100%)	0% (Frost logic enables heating to 100%)	0%	0%

Senticon
SENTIENT CONTROL SOLUTIONS

TCR10/QCR10 Room Controller Range Software – Extensive Range of Control Functions

Multiple Control Loops

6-Stage (Temperature) Control Loop
- Built-in Sensor, UI Sensors, Network

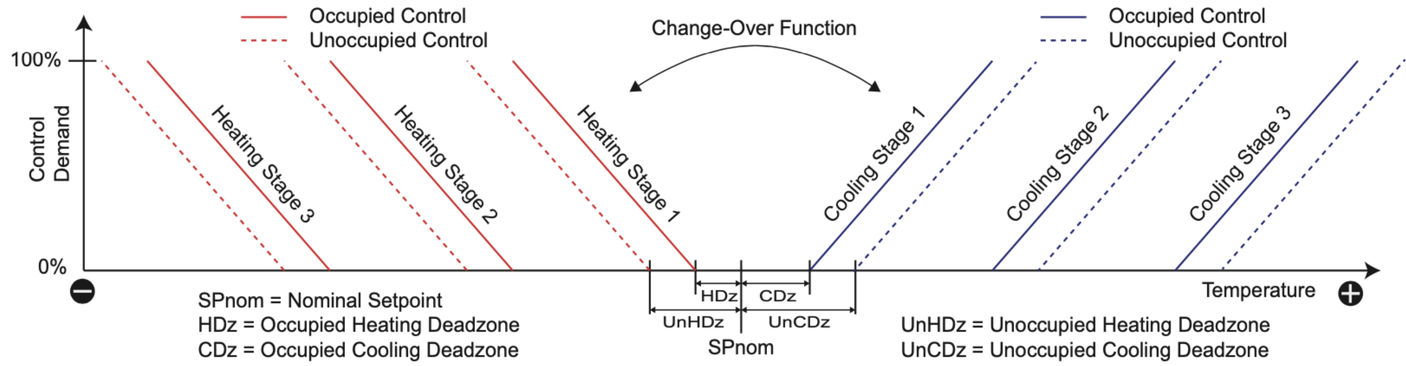
Auxiliary Heating/Cooling PI Control Loop
- Built-in Sensor, UI Sensors, Network

CO2 Control Loop

Humidify/Dehumidify Control Loop

VOC Control Loop

Value Range / Enumerations
0 = Network Value (Reg 538)
1 = Temperature (Built-In, Default)
2 = UI1 - NTC10
3 = UI2 - NTC10
4 = UI1 - 0..10Vdc
5 = UI2 - 0..10Vdc



Additional Control

High/Low limit Reset (Cascade) Control

Change-Over Control (Heating/Cooling)

EC Fan Control

Dew Point Control

Condensation Control

Maximum Demand (e.g. Cooling and CO2/VOC for VAV)

Average temperature sensing

Extension Timer / Booster Control

0-10V Modulating and 6-Way Valve Control

PWM and On/Off Thermic Actuator Control

3-Point (Raise/Lower) Actuator Control

Damper Control

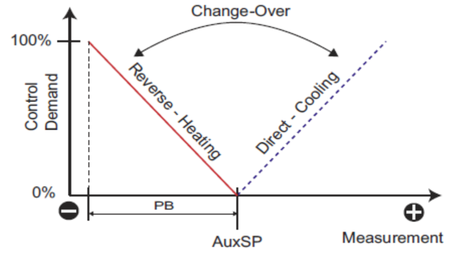
Outputs Reversing Control

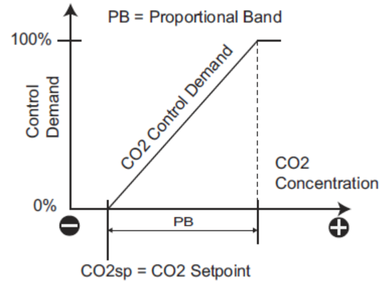
Dehumidify Cooling Output Override

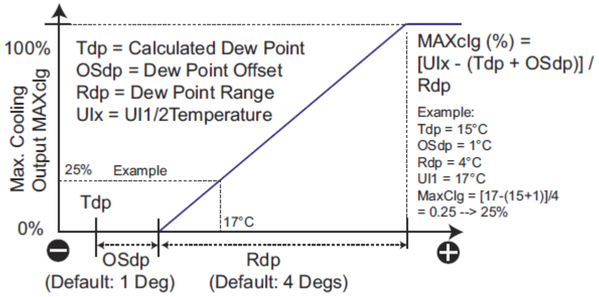
Minimum / Maximum Output Levels

Relay Output Control

Movement Control







Flexibility, Modularity

Each output function individually assignable

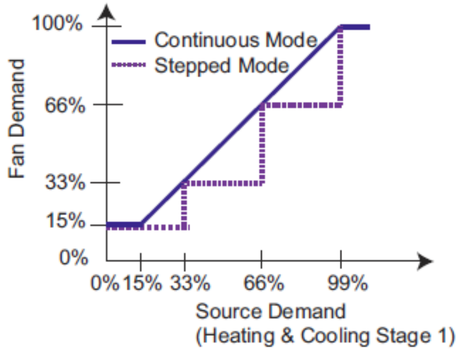
Control loop input sources selectable (making them universal)

Maximum Function facilitates configuration for ‘unusual’ applications

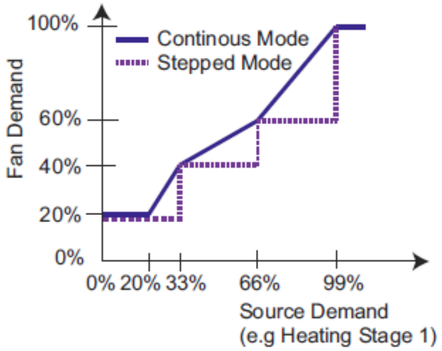
Senticon
SENTIENT CONTROL SOLUTIONS

TCR10/QCR10 Room Controller Range Software Function – Fan Control Example

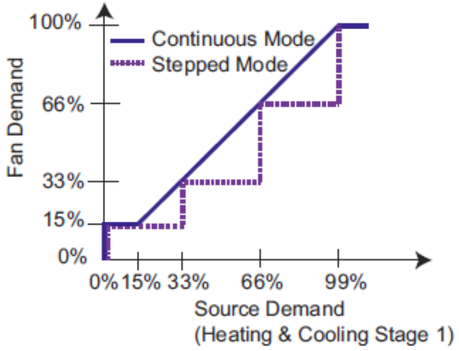
Fan Speed Settings : Default
Fan Off Mode: Minimum Speed



Fan Speed Settings : Custom Example
Fan Off Mode: Minimum Speed



Fan Speed Settings : Default. Except Fan Off Mode
Fan Off Mode: Off (Fan Off at 0% Demand)

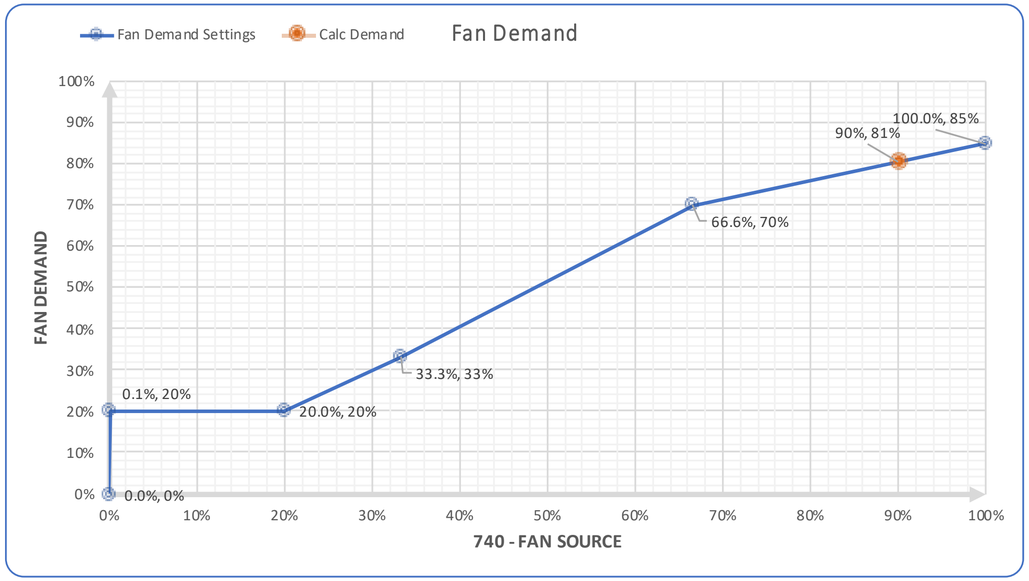


Senticon
SENTIENT CONTROL SOLUTIONS

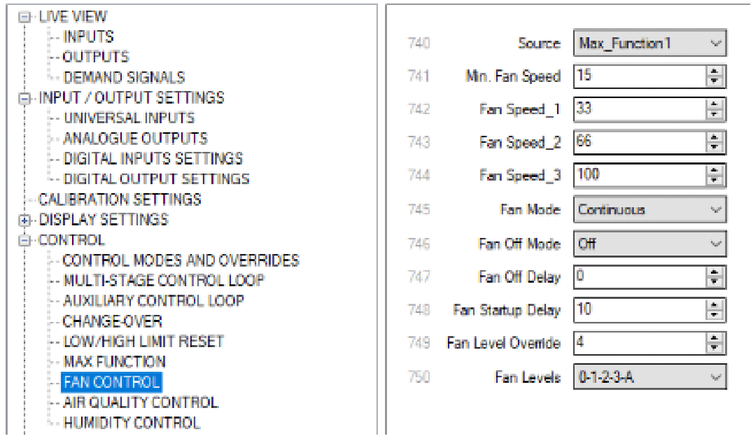
TCR10/QCR10 Room Controller Range Software Function – Fan Control Example

TCR10/QCR10 SERIES FAN SPEED CURVE CALCULATION / SIMULATION

	Source Value	Fan Demand Settings	Calc Demand	
740 - Source	90%		81%	Enter Source Value
Off	0.0%	0%		
Switch Min. Level	0.1%	20%		
741 - Min. Fan Speed	20.0%	20%		Enter Min Fan Speed
742 - Fan_Speed_1	33.3%	33%		Enter Fan Level 1
743 - Fan_Speed_2	66.6%	70%		Enter Fan Level 2
744 - Fan_Speed_3	100.0%	85%		Enter Fan Level 3



CONFIGURATION TOOL VIEW



Note: X-axis switching points are fixed. Y-axis Fan Demand Levels at given point are adjustable.

Note: 745 - Fan Mode : Stepped - makes the output levels to step change between switching points (not linear).

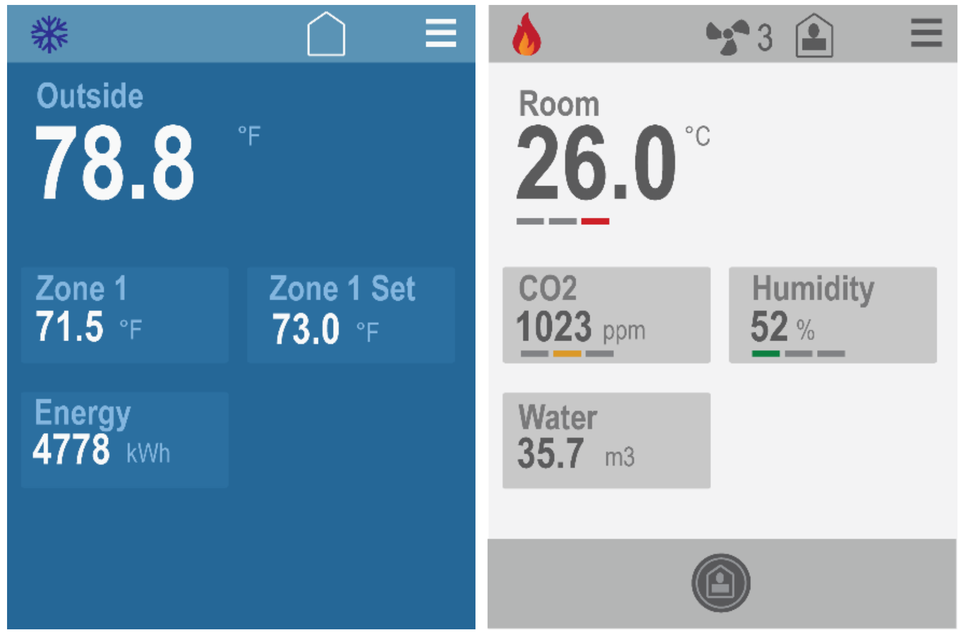
		Demand
Slope 1	0.97744	88.4210526315789000%
Slope 2	1.11111	96.0000000000000000%
Slope 3	0.44910	80.5089820359281000%

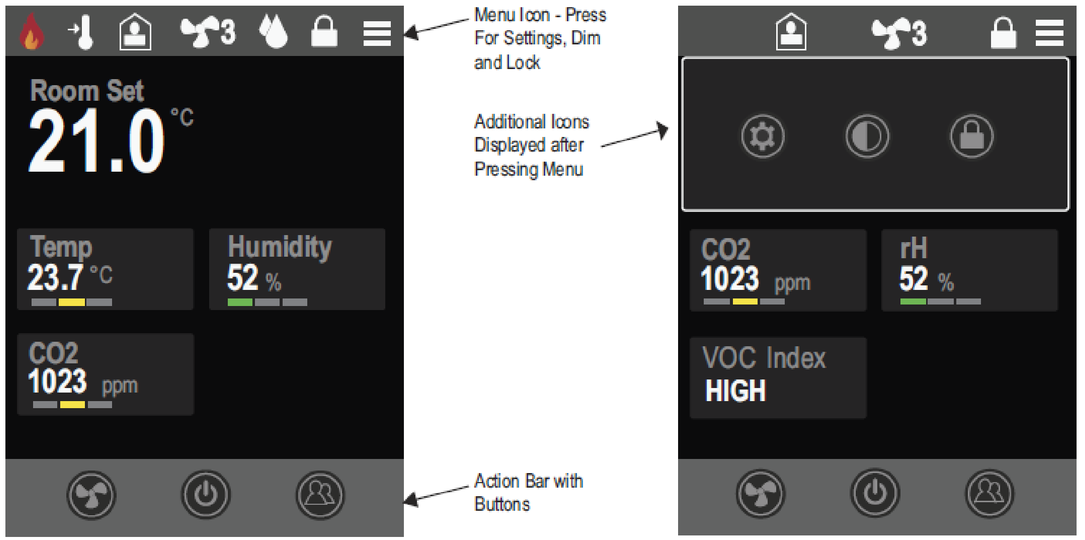
Senticon
SENTIENT CONTROL SOLUTIONS

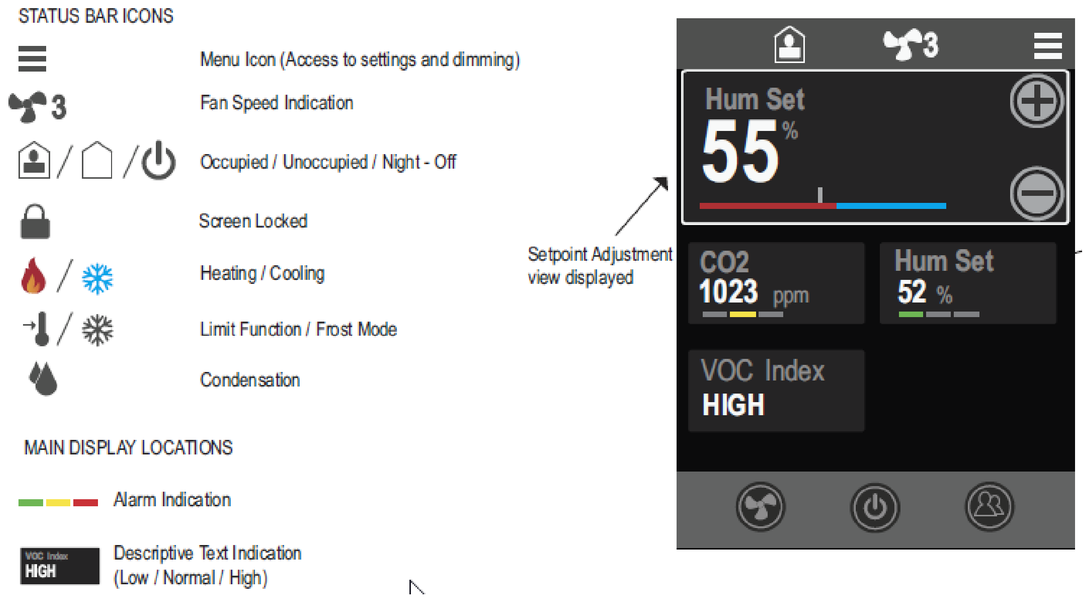
TCR10/QCR10 Room Controller Range – Display

Display Configuration Options

Display Skin Colours
Configurable Display Locations
Select Measurement or Network Parameter Display (e.g. Energy)
Selectable Descriptions
Selectable Units
Show Measurements as Text, or Value
Show Alarm Colours; Green, Amber, Red
Language Displays
Configure Status Bar Elements
Configure Buttons
Set up Background Light Levels

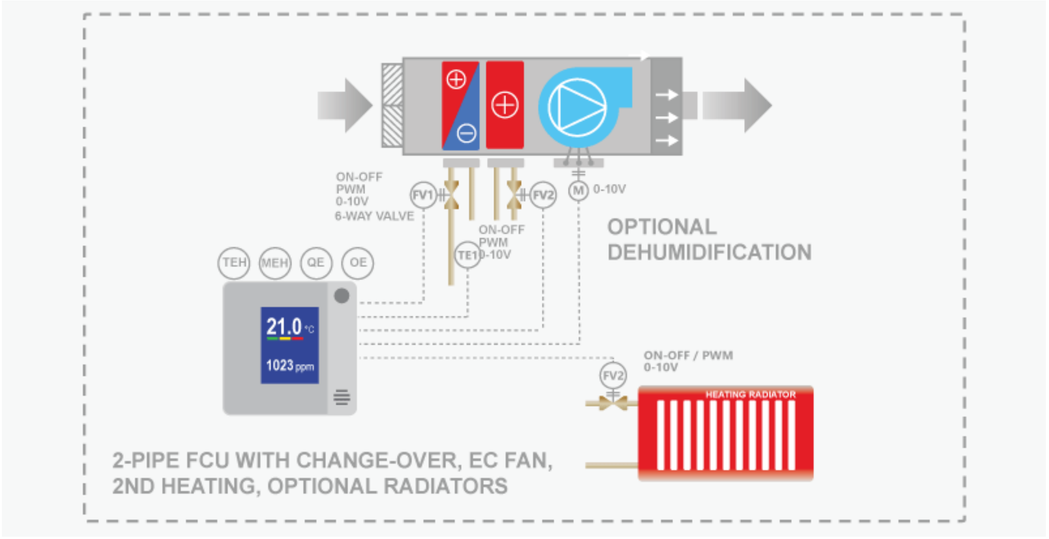


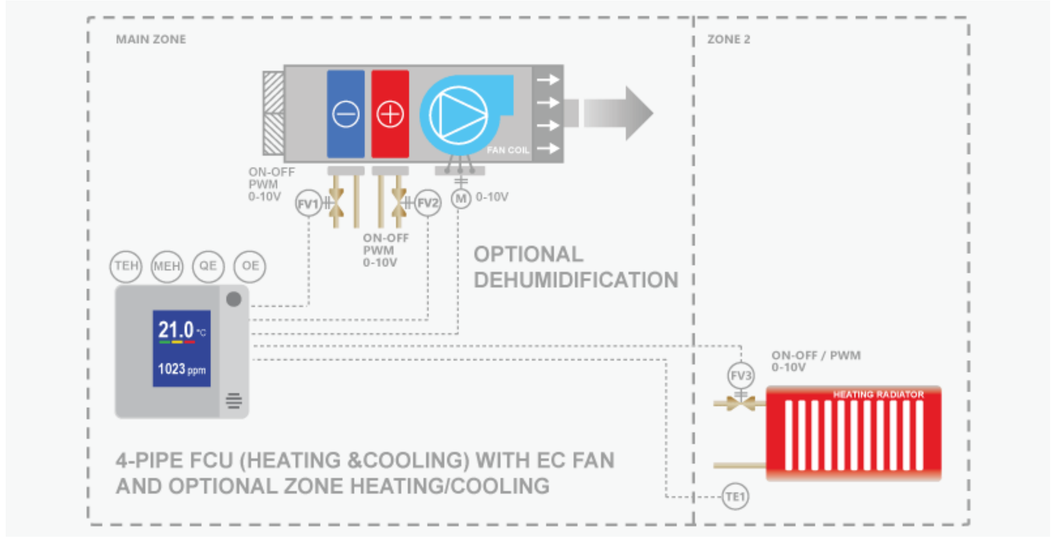


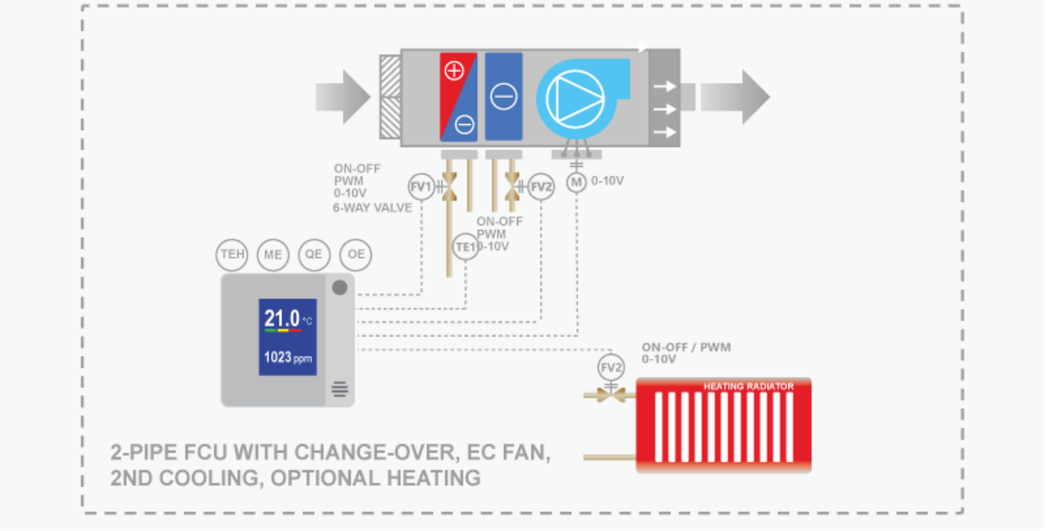


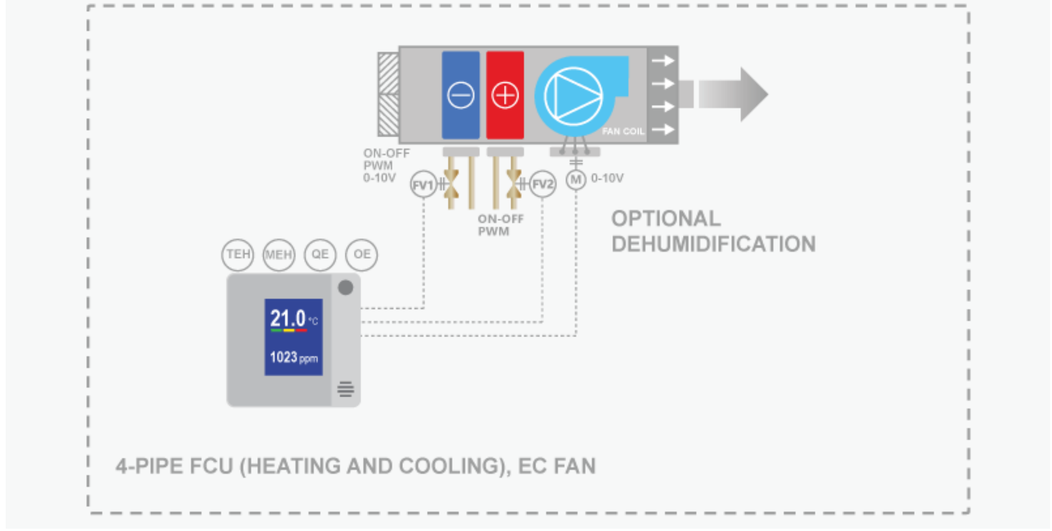
TCR10/QCR10 Room Controller Range – FCU Application Examples

Flexible Software Design allows use in practically all applications.



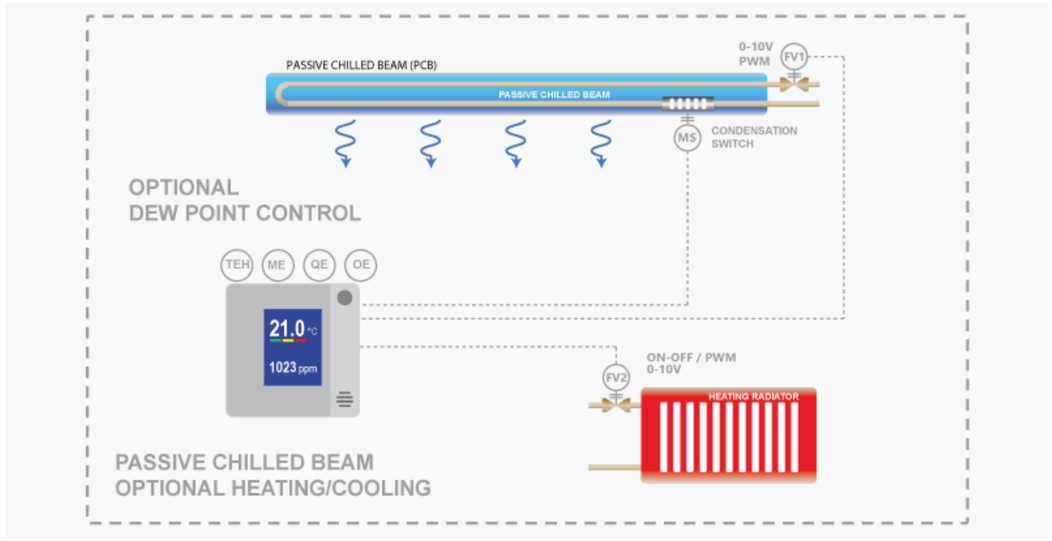


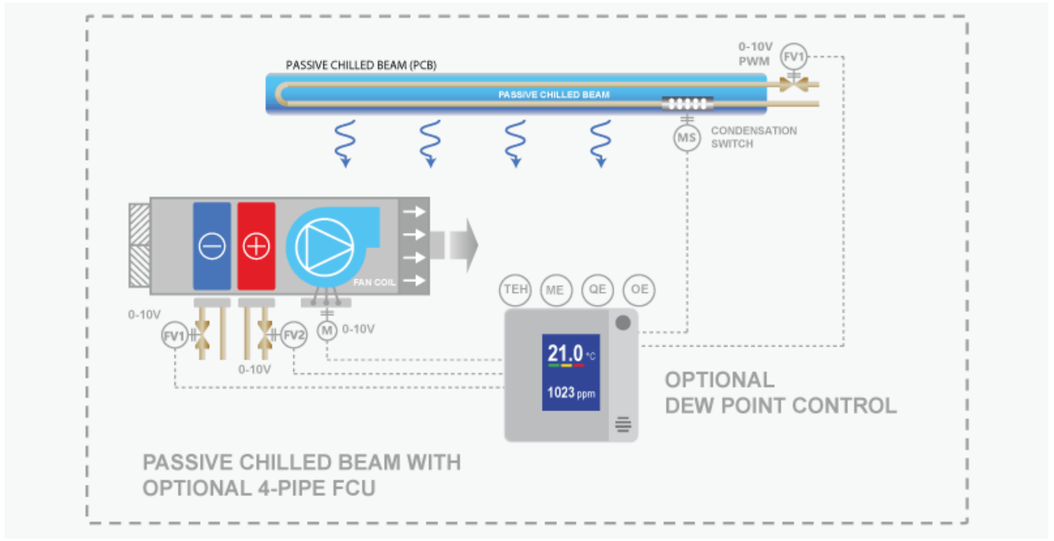


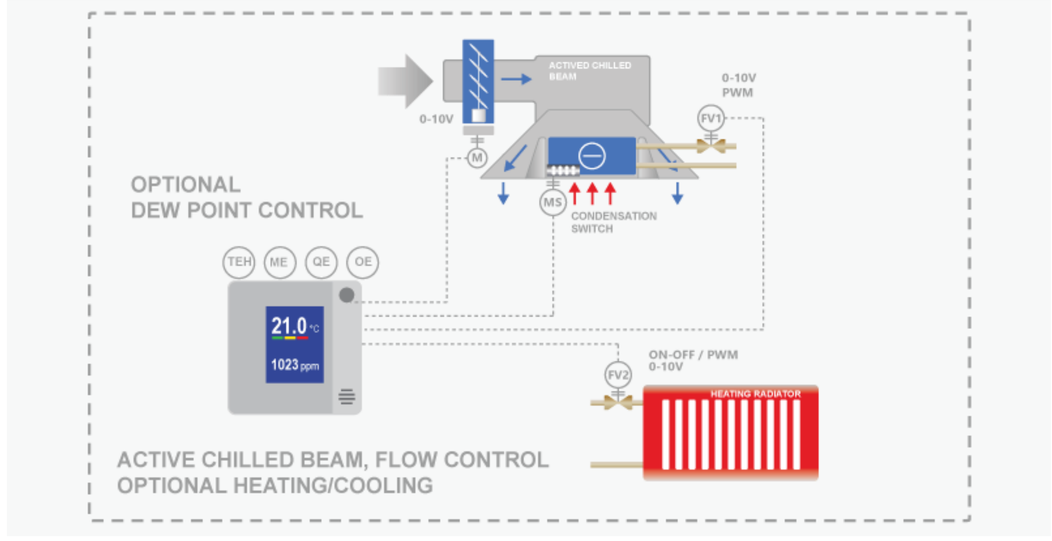


TCR10/QCR10 Room Controller Range – Active/Passive Chilled Beam

Flexible Software Design allows use in practically all applications.





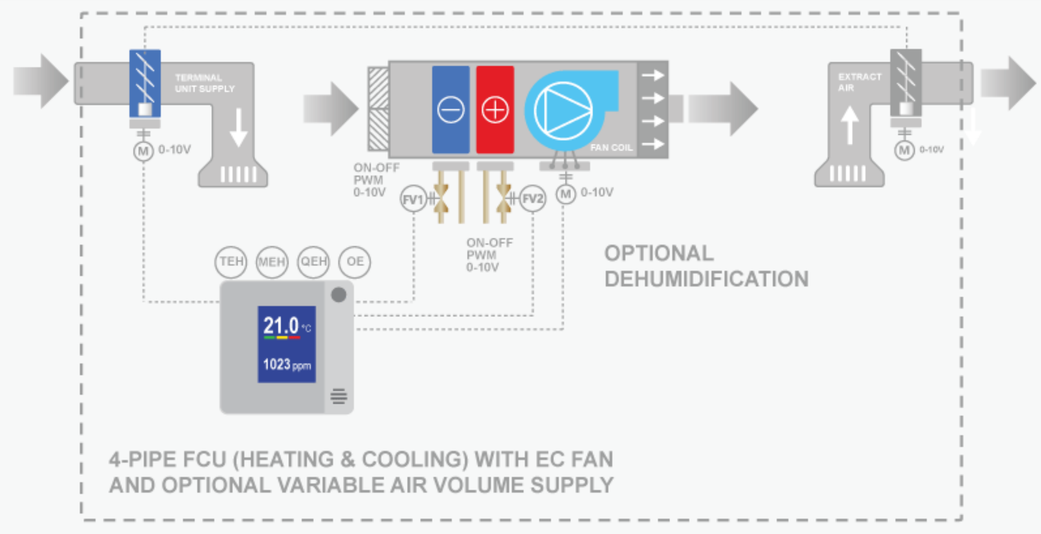


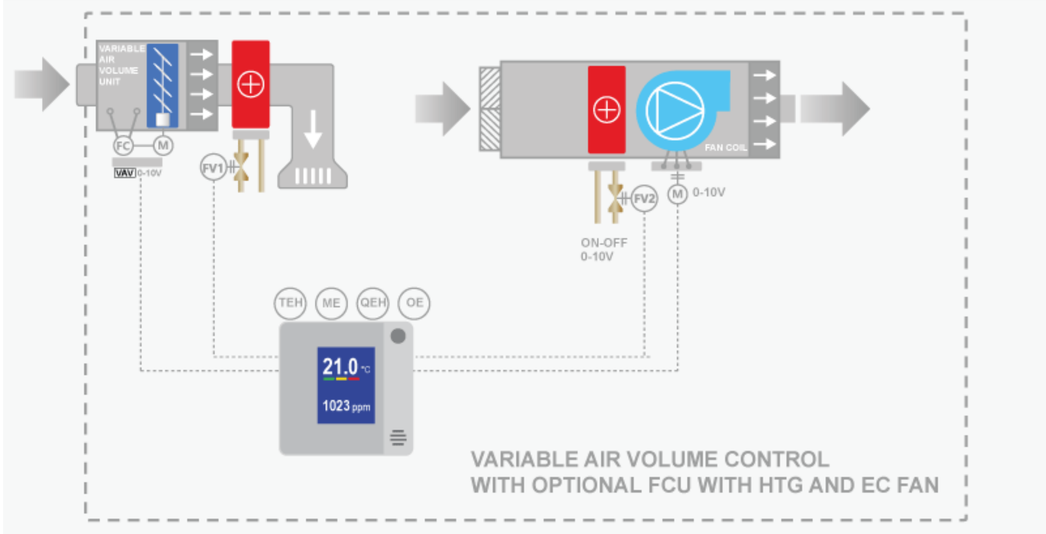
Building Fabric Protection Features

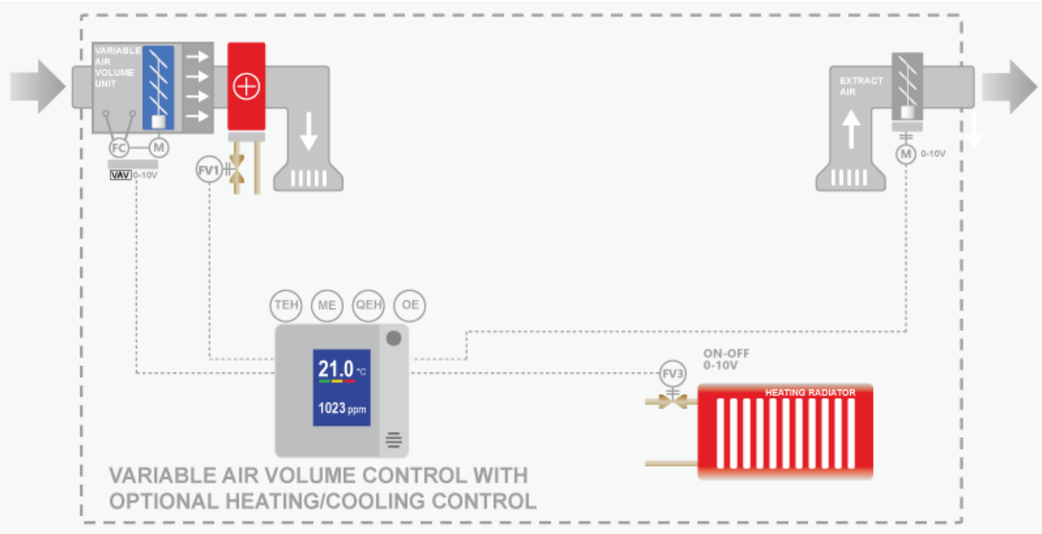
Adaptive Dew Point Calculation for Preventive Condensation
Condensation Control via Condensation Switches
Condensation Control via Resistive Condensation Sensors
Frost Protection Control

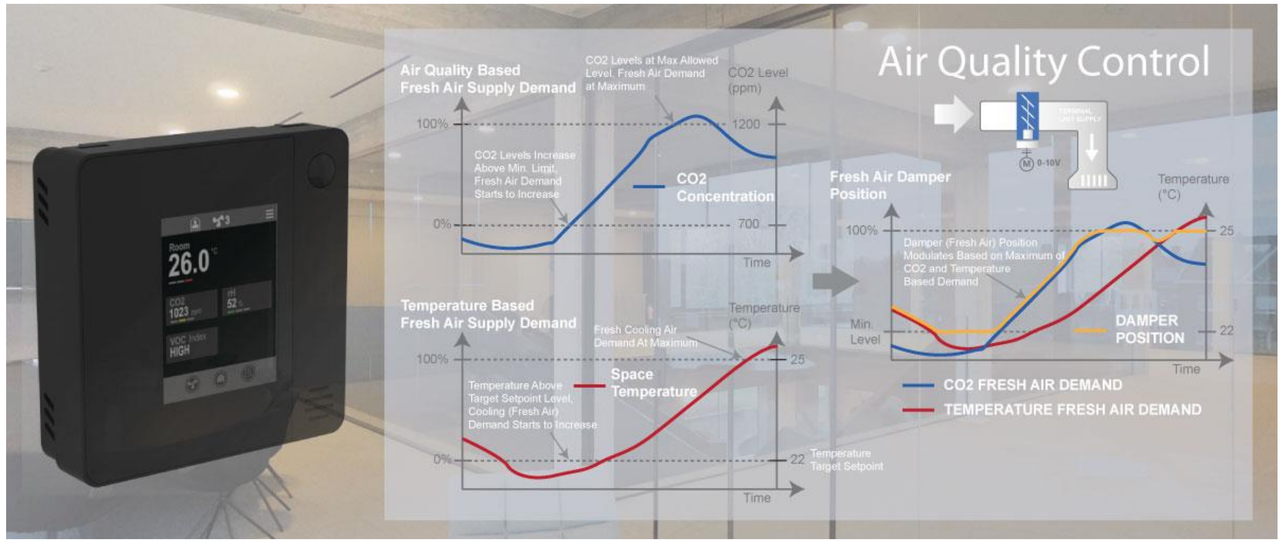
TCR10/QCR10 Room Controller Range – Variable Air Volume Control

Flexible Software Design allows use in practically all applications.









TCR10/QCR10 Room Controller Range – Hotel Room Control Application Example

The BMS is connected to a hotel booking system. When the booking becomes active, the BMS activates the room from Off (Frost Protection) Mode to Unoccupied, and the controller starts to use the Unoccupied Economy control settings. For example in the Off mode heating setpoint is 16°C and in the Economy mode the effective heating setpoint becomes 18 (Nominal Setpoint 21 minus 3 degrees Unoccupied Heating Deadzone).

When the hotel guest enters the room, he places the door card to the card reader and the controller automatically activates the Occupied (Comfort) mode. The heating is controlled to the Nominal Setpoint (minus Occupied Heating Deadzone) e.g. 20.5°C by default.

When the hotel guest leaves the room and removes the door card, the controller will automatically switch back to Unoccupied mode.

When the room occupancy ends the BMS will send signal for the room controller to go to Off mode to maximum energy savings.

When in Off mode if the cleaner enters the room, the controller goes to Occupied Mode. When the cleaner exits and removes the card, the controller goes back to Off mode as defined by the BMS.

If any time the window is opened, the window switch overrides the controller to Off mode (or Unoccupied mode if BMS override is active) to save on energy.

16 → 18 → 21deg Intelligent Switching

TCR/QCR10/11/12/13/14/15 Series Room Controller Range – Model Selection

Part Number		SKU# Number						
Example	QCR10-BAC-TS-OE-W	5000	2	02	03	00	0	2
Product Name		Product			Product Options			
TCR10	Room Temperature Controller, 2UI, 4AO, 24V Supply	5000						
QCR10	Room Temperature and CO2 Controller, 2UI, 4AO, 24V Supply	5100						
TCR11	Room Temperature Controller, 2UI, 4DO, 1AO, 24V Supply	5200						
QCR11	Room Temperature and CO2 Controller, 2UI, 4DO, 1AO, 24V Supply	5300						
TCR12	SlimLine Room Temperature Controller, 2UI, 4AO, 2DO, 24V Supply	5400						
QCR12	SlimLine Room Temperature and CO2 Controller, 2UI, 4AO, 2DO, 24V Supply	5500						
TCR13	SlimLine Room Temperature Controller, 2UI, 2DO, 3RO (230V), 1AO, 24V Supply	5600						
QCR13	SlimLine Room Temperature and CO2 Controller, 2UI, 2DO, 3RO (230V), 1AO, 24V Supply	5650						
TCR14	SlimLine Room Temperature Controller, 1UI, 3AO, 1RO (230V), 90-250Vac Supply	5700						
QCR14	SlimLine Room Temperature and CO2 Controller, 1UI, 3AO, 1RO (230V), 90-250Vac Supply	5750						
TCR15	SlimLine Room Temperature Controller, 2UI, 4AO, 90-250Vac Supply	5800						
QCR15	SlimLine Room Temperature and CO2 Controller, 2UI, 4AO, 90-250Vac Supply	5850						
Serial Communication Option								
MOD	Modbus RS485		1					
BAC	BACnet MS/TP		2					
Interface and Wireless Options								
	No Interface			00				
TS	Colour Capacitive Touchscreen			02				
BLE	Bluetooth App Interface			03				
TS-BLE	Touchscreen and Bluetooth			05				
LRA	LoraWan Wireless Interface			06				
TS-LRA	LoraWan Wirelss Interface with Touchscreen			08				
Measurement Options								
	No Extra Measurements				00			
RH	Relative Humidity				01			
RH-VOC	Volatile Organic Compound and Humidity				02			
OE	Passive Infrared Movement (PIR)				03			
RH-OE	Relative Humidity and Movement (PIR)				04			
RH-VOC-OE	VOC, Relative Humidity and Movement (PIR)				05			
Output Options								
	No Output Options					00		
RL	24V Relay Output (Only for TC10/QCR10/TCR12/QCR12) *1					01		
Region (LoraWan)								
	Non Lora or EU868MHz LoraWan						0	
US	US915MHz LoraWan						1	
AS	AS923MHz LoraWan						2	
IN	IN815MHz LoraWan						3	
Colour Options								
B	Black							1
W	White							2

Senticon
SENTIENT CONTROL SOLUTIONS

Senticon
SENTIENT CONTROL SOLUTIONS

QVR/TVR VAV ROOM CONTROLLER RANGE

Energy Saving VAV Controls

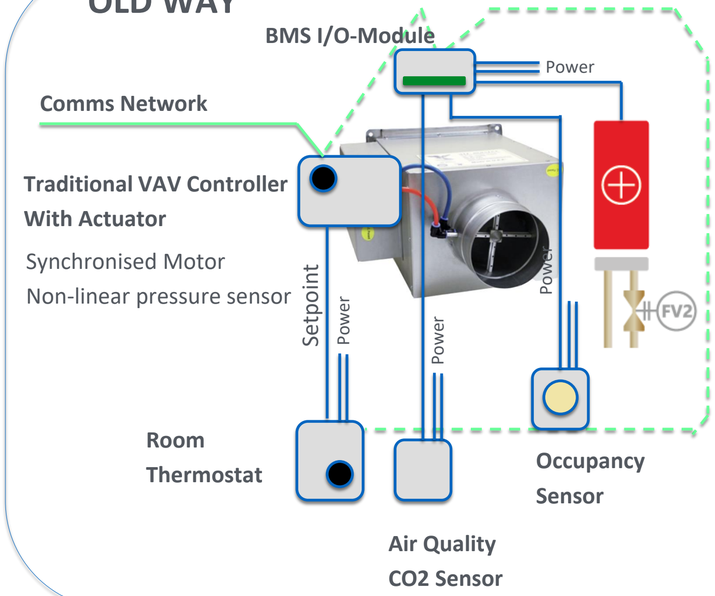
Capital and Installation Savings

The new approach – savings on the capital investments and installation

Combined temperature and flow controller – one controller provides cost effectiveness
Only single controller commissioning required
One controller for BACnet MS/TP – simpler networking, less commissioning, less gateway costs
One set of tools and products to understand – faster adaptations and less commissioning issues
Air quality (CO2, VOC) and occupancy control can be also integrated

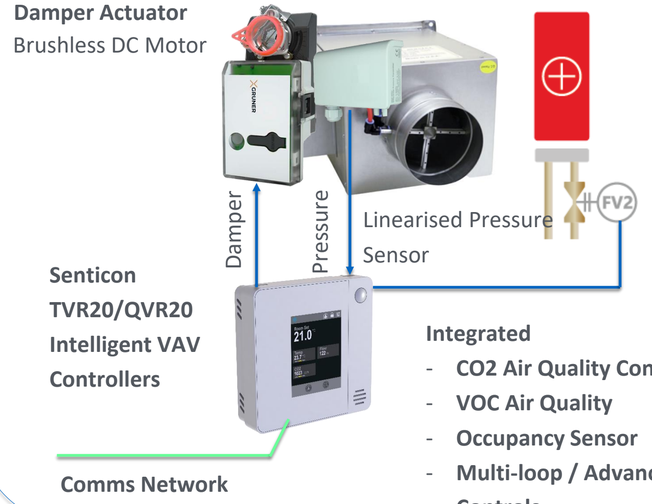
ENERGY SAVING WAY– more for less
Significant capital and installations savings $$$

"OLD WAY"



- Non efficient motors
- Inferior accuracy – increased min. air flow
- Complicated and expensive wiring
- Complex commissioning
- Reduced network performance - BMS
- Danger for simultaneous heating/cooling
- Costs of installing multiple devices

"ENERGY SAVING WAY"

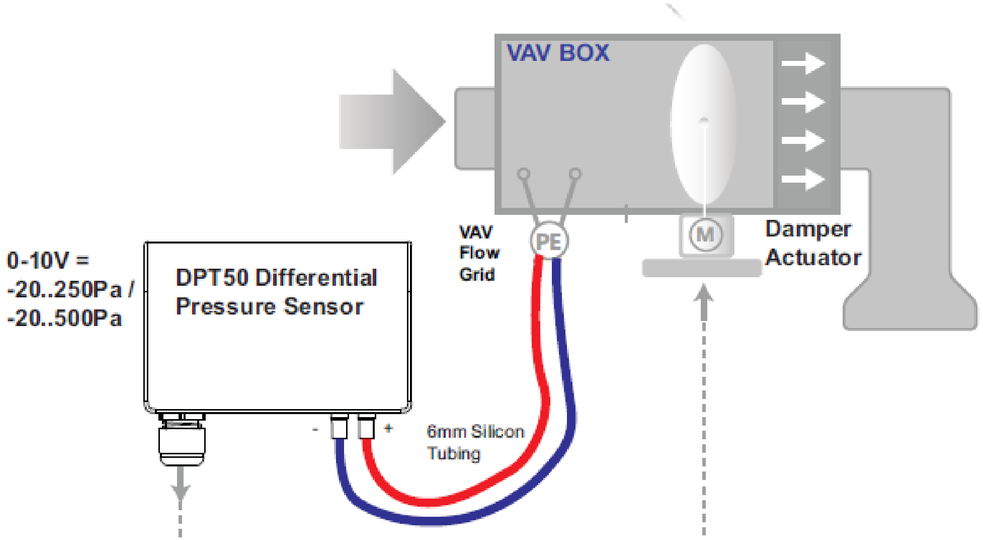


- Efficient Brushless DC Motors
- Accurate DP Sensors - min. air flow as required
- Simplified and cost effective structured cabling
- Efficient commissioning
- Optimised network performance
- Intelligent Room Control offers energy efficiency even for more complex strategies
- Additional energy saving and performance features (CO2, VOC, occupancy) can be provided at optimised extra capital

BACnet Modbus LoRaWAN

Senticon
SENTIENT CONTROL SOLUTIONS

TVR/QVR Room Controller Range – Pressure Independent Variable Air Volume Control with Pressure Sensor



PRESSURE INDEPENDENT VAV WITH EXTERNAL PRESSURE SENSOR AND DAMPER ACTUATOR

xVR CONTROLLERS
- Enter k-value
- Calculates air flow (m3/h, l/s, cfm)
- Set min and max flow values
- Flow setpoint automatically from,temperature, humidity, air quality (CO2/VOC) demand
- Energy saving functionality

0-10V Damper Actuator Position Control Signal

0-10V Pressure Measurement

Temperature
Humidity
CO2
VOC
Occupancy

TVR20 / QVR20 Pressure Independent VAV Controllers

Reducing VAV system min. flow from typical 30%, this large intervention field study in several California office buildings demonstrated cooling energy savings of up to 30% and reduced summer comfort complaints by half.
"ASHRAE Journal 2019"

Accurate measurement allows Senticon Solutions Min. Airflow to be set 10% of Maximum providing up to 30% Energy Savings

Increasing temperature setpoint by 1 degrees provides cooling energy savings up to 4-5% per degree.
"Energystar Study"

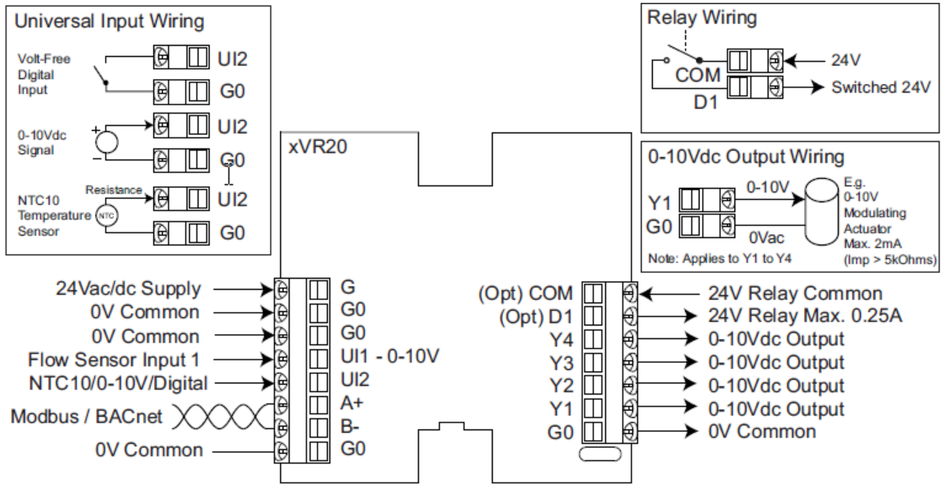
Senticon's Occupied / Unoccupied control logic and BUILT-IN OCCUPANCY SENSOR can provide 10-15% energy savings by increasing setpoint automatically during unoccupied times

Senticon
SENTIENT CONTROL SOLUTIONS

VAV Room Controller Range Overview

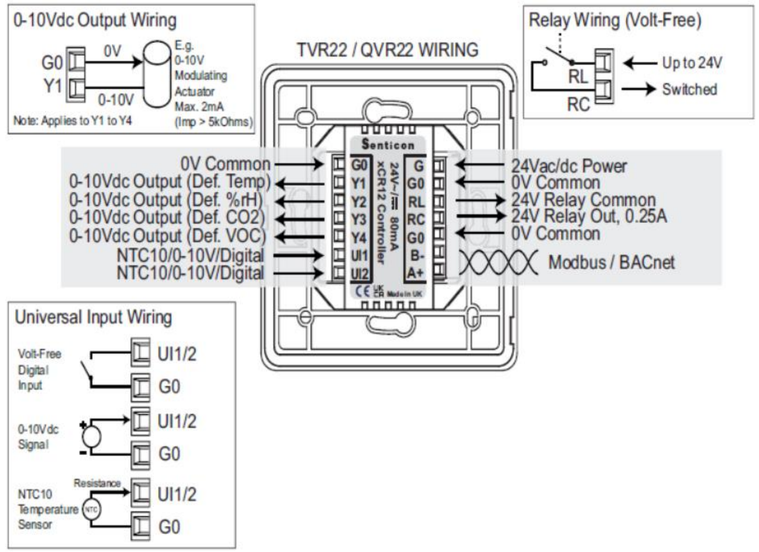
TVR20/22-MOD/BAC VAV ROOM TEMPERATURE CONTROLLER

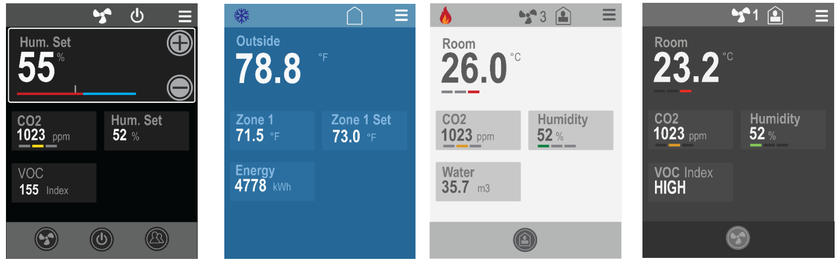
VAV Temperature Controller
Built-In Temperature Measurement
Air Flow Measurement via Flow Sensor Input (UI1)
Pressure Dependent and Pressure Independent VAV Control
Zone Temperature Measurement
Touchscreen Interface
1 x Flow Sensor Input – 0-10Vdc
1 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
4 x 0-10V Outputs (VAV Damper, Re-Heat, Zone Heating)
Modbus RS485, BACnet MS/TP and LoraWan Communications



QVR20/22-MOD/BAC VAV ROOM TEMP AND CO2 CONTROLLER

VAV Temperature and CO2 Controller
Built-In Temperature and CO2 Measurement
Air Flow Measurement via Flow Sensor Input (UI1 / UI2)
Pressure Dependent and Pressure Independent VAV Control
Touchscreen Interface
1 x Flow Sensor Input – 0-10Vdc
1 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
4 x 0-10V Outputs (VAV Damper, Re-Heat, Zone Heating)
Modbus RS485, BACnet MS/TP and LoraWan Communications





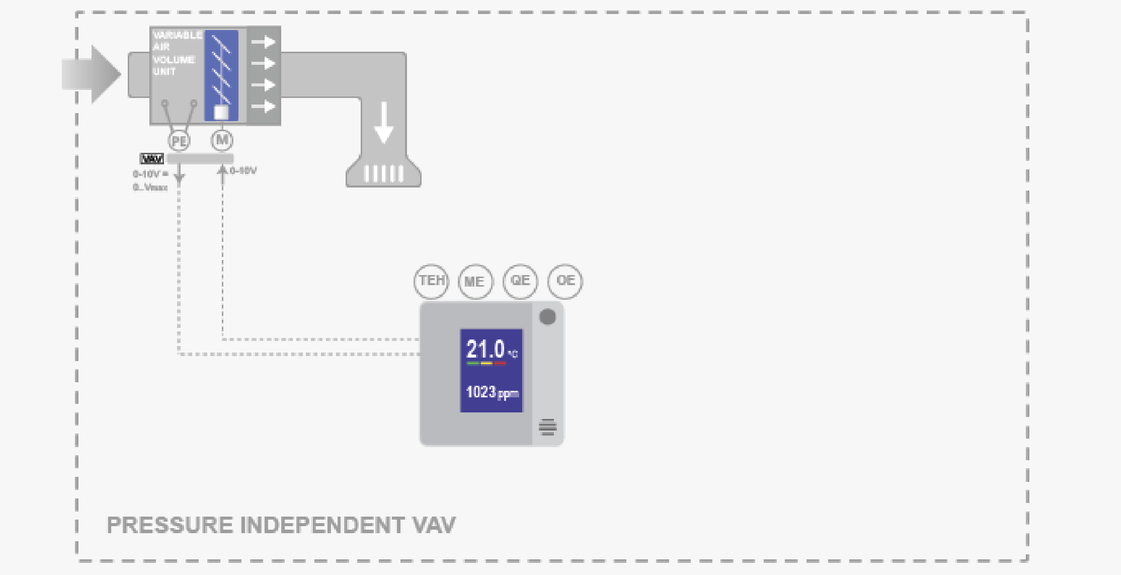
Options, Programming and Phone Apps

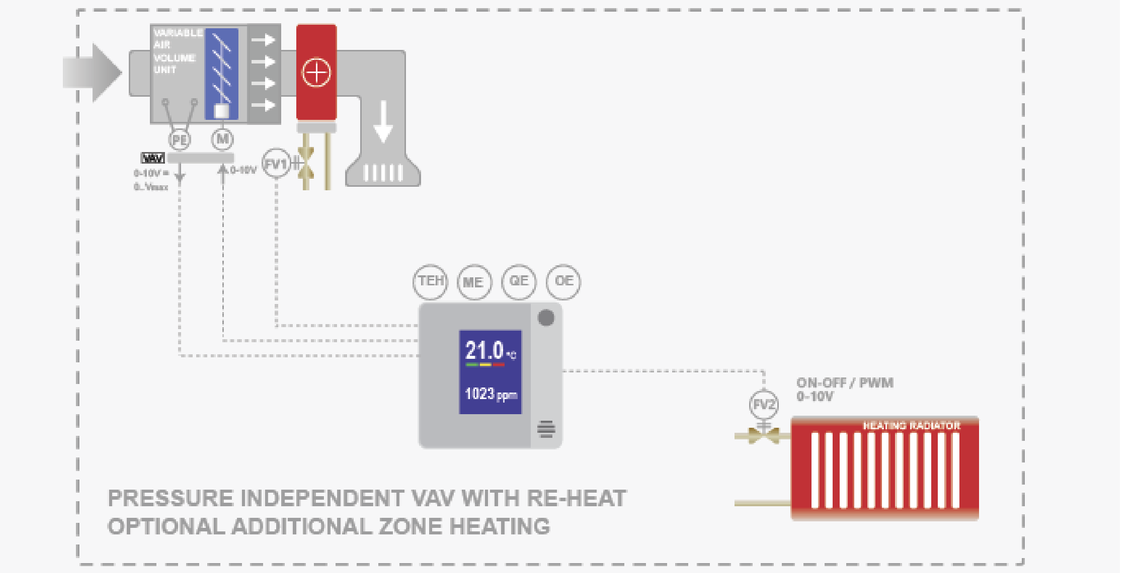
Optional 24V Pilot Relay Output (Volt-Free Contacts) (xCR20)
Optional Humidity
Optional VOC
Optional PIR Sensor
Optional Phone App user Interface (BLE) – iOS
Windows Programming tool with Bluetooth Connection (Dongle or Built-In)
Modbus Programming Tool, Modbus RS485

Senticon
SENTIENT CONTROL SOLUTIONS

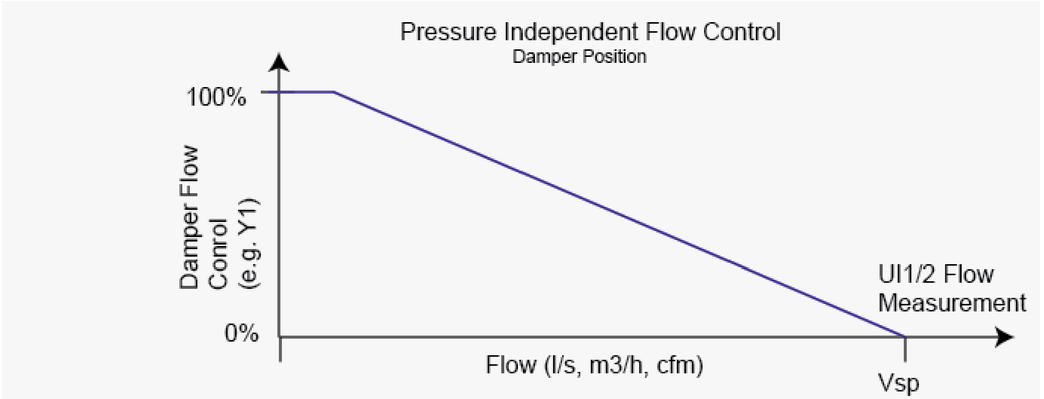
TVR/QVR Room Controller Range – Pressure Independent Variable Air Volume Control with Flow Sensor

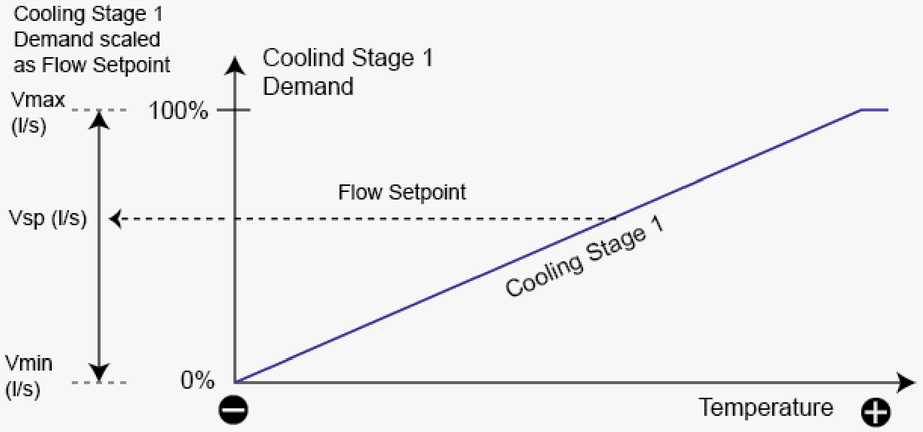
Combine Temperature Control with Air Quality CO2 Control.





- **Flexible Cascade Control where Room Temperature Loop gives Demand based Flow Setpoint to Flow Control Loop**
- **0-10 Flow Signal from the Volume Flow Sensor (l/s, m3/h, cfm)**
- **Min Flow and Maximum Flow Setpoints (l/s, m3/h, cfm)**
- **Fixed VAV Flow Setpoint for Heating Mode (l/s, m3/h, cfm)**





Senticon
SENTIENT CONTROL SOLUTIONS

TCR/QCR02/03/04 ROOM TEMPERATURE AND CO2 CONTROLLERS

TRY BUTTONS – NICE ‘OLD-FASHIONED ’CLICK FEELING ☺

Senticon
SENTIENT CONTROL SOLUTIONS

TCR02/QCR02 Slimline Room Controllers

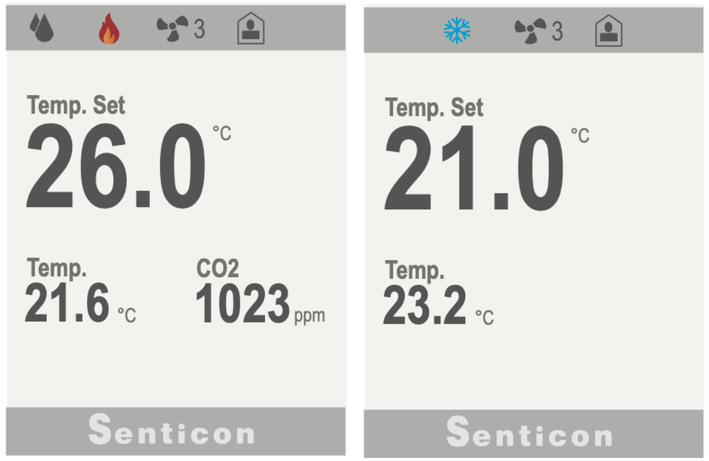
TCR02-MOD/BAC

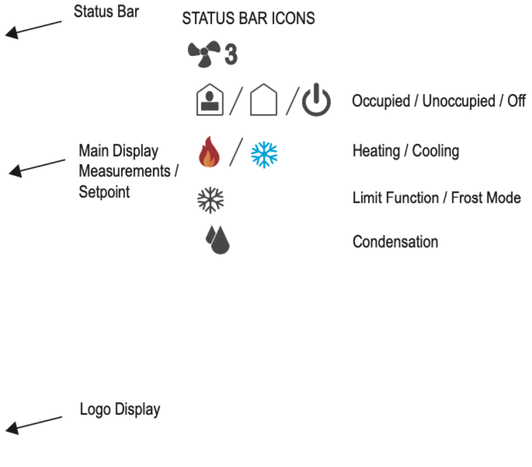
Slimline Room Temperature Controller
Built-In Temperature Measurement
Colour LCD Display
2 Button (Setpoint Up and Down) and 3 Button Versions (Setpoint, Fan)
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
3 x 0-10V Outputs
2 x 24Vac Triac Outputs
Modbus RS485 or BACnet MS/TP Communications

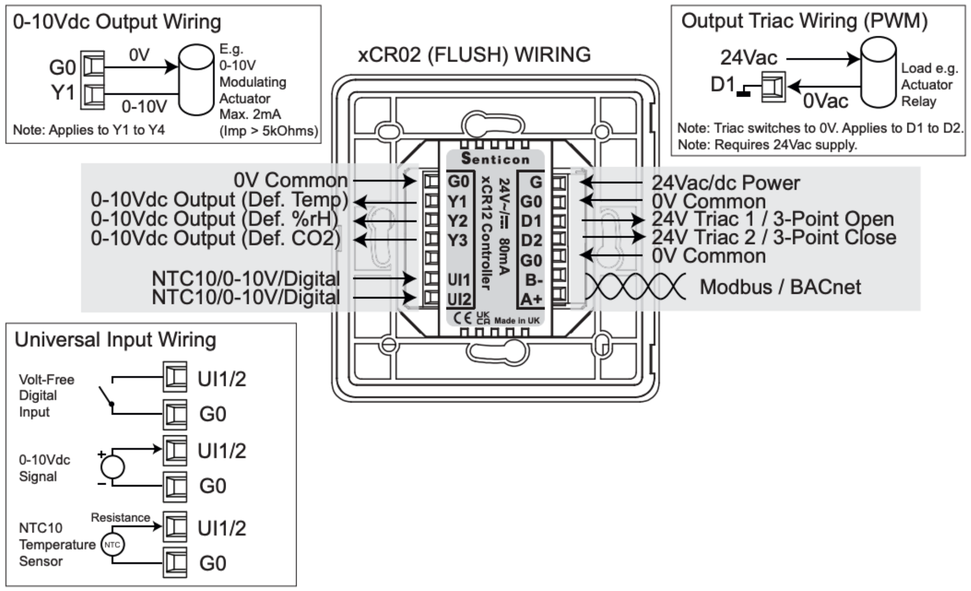
QCR02-MOD/BAC

Slimline Room Temperature and CO2 Controller
Built-In Temperature and CO2 Measurement
Colour LCD Display
2 Button (Setpoint Up and Down) and 3 Button Versions (Setpoint, Fan)
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
3 x 0-10V Outputs
2 x 24Vac Triac Outputs
Modbus RS485 or BACnet MS/TP Communications

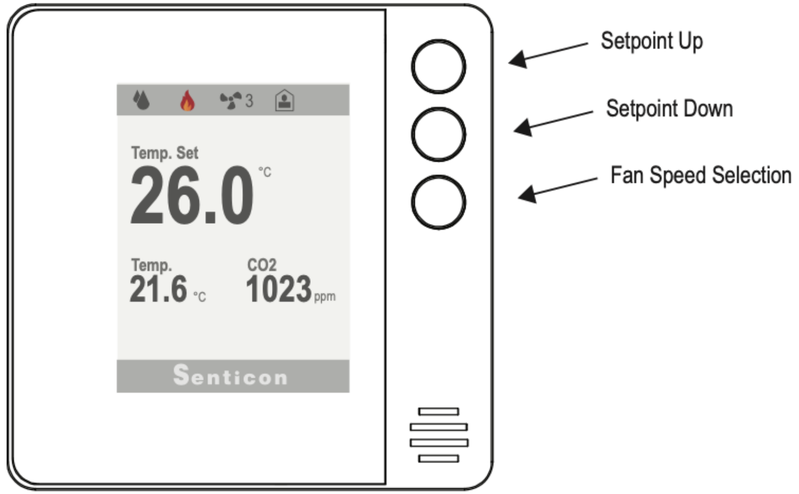
LCD DISPLAY







BUTTONS



Senticon
SENTIENT CONTROL SOLUTIONS

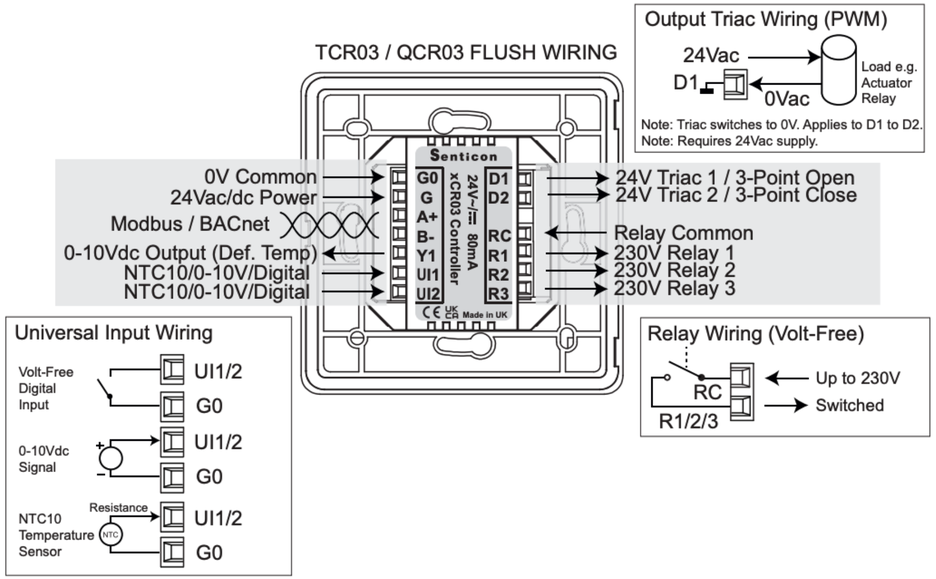
TCR03/QCR03 Slimline Room Controllers

TCR03-MOD/BAC

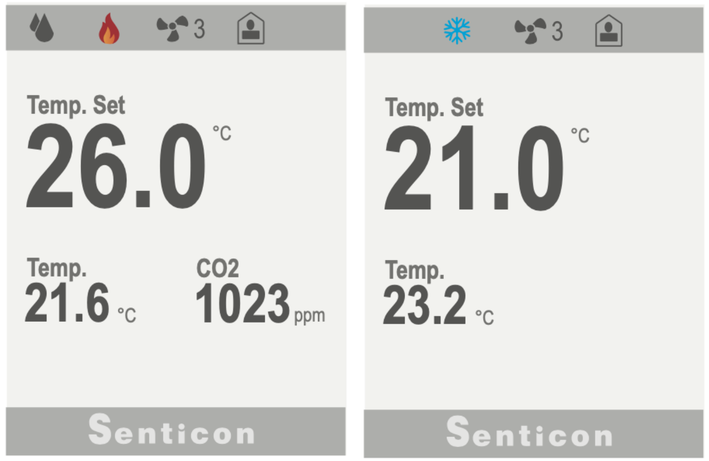
Slimline Room Temperature Controller
Built-In Temperature Measurement
Colour LCD Display
2 Button (Setpoint Up and Down) and 3 Button Versions (Setpoint, Fan)
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
1 x 0-10V Output
3 x 230Vac 5A Relay Outputs
Modbus RS485 or BACnet MS/TP Communications

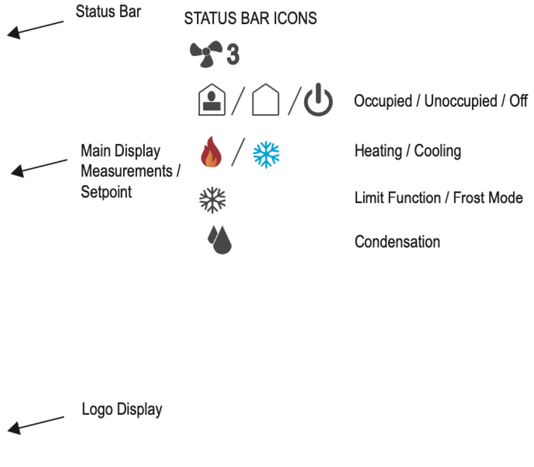
QCR03-MOD/BAC

Slimline Room Temperature and CO2 Controller
Built-In Temperature and CO2 Measurement
Colour LCD Display
2 Button (Setpoint Up and Down) and 3 Button Versions (Setpoint, Fan)
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
1 x 0-10V Output
3 x 230Vac 5A Relay Outputs
Modbus RS485 or BACnet MS/TP Communications

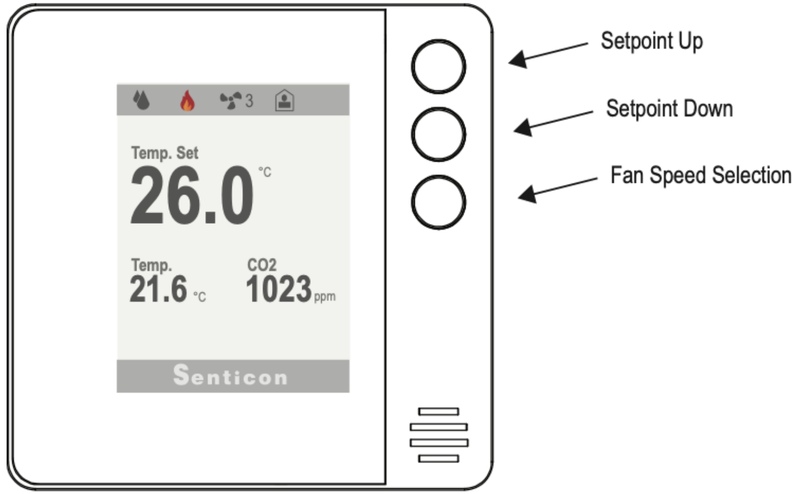


LCD DISPLAY





BUTTONS



Senticon
SENTIENT CONTROL SOLUTIONS

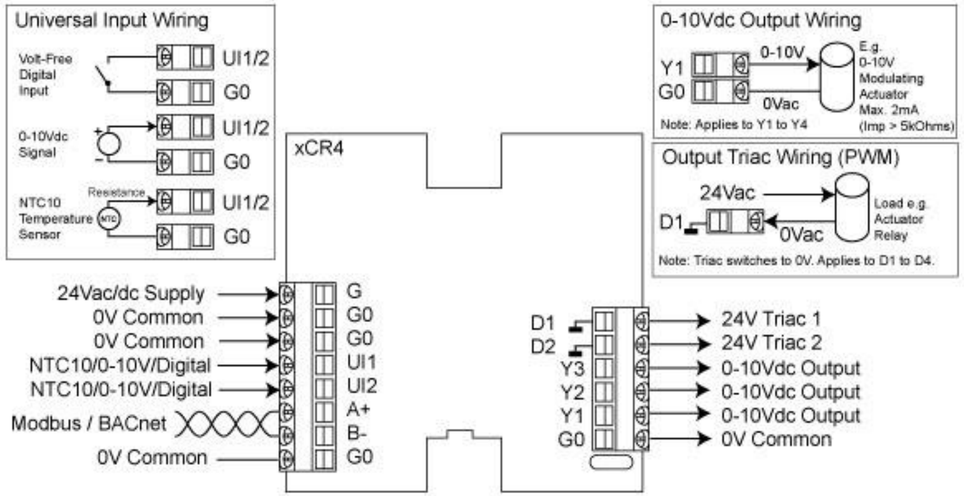
TCR04/QCR04 Room Controllers

TCR04-MOD/BAC

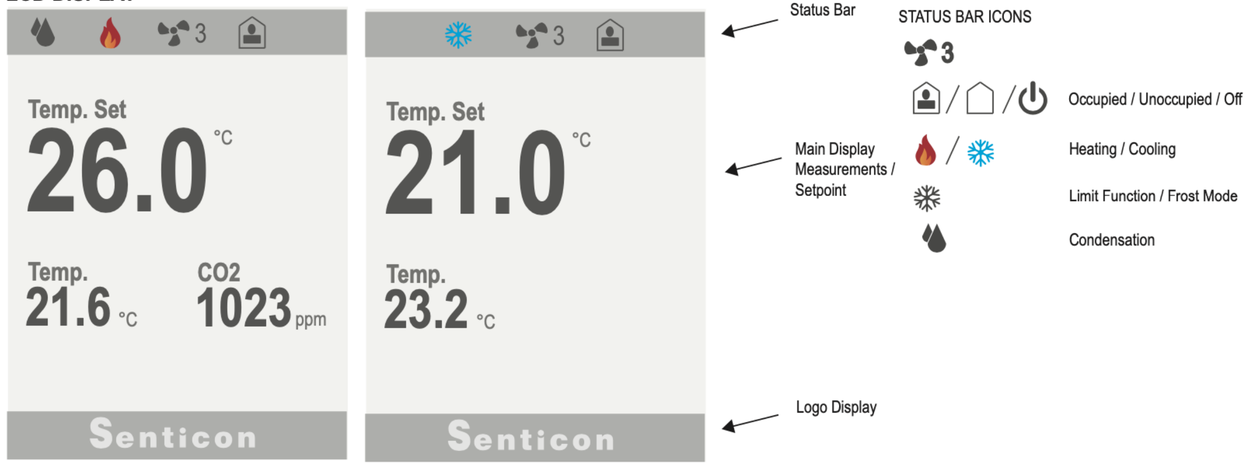
Room Temperature Controller
Built-In Temperature Measurement
Colour LCD Display
2 Button (Setpoint Up and Down) and 3 Button Versions (Setpoint, Fan)
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
3 x 0-10V Outputs
2 x 24Vac Triac Outputs
Modbus RS485 or BACnet MS/TP Communications

QCR04-MOD/BAC

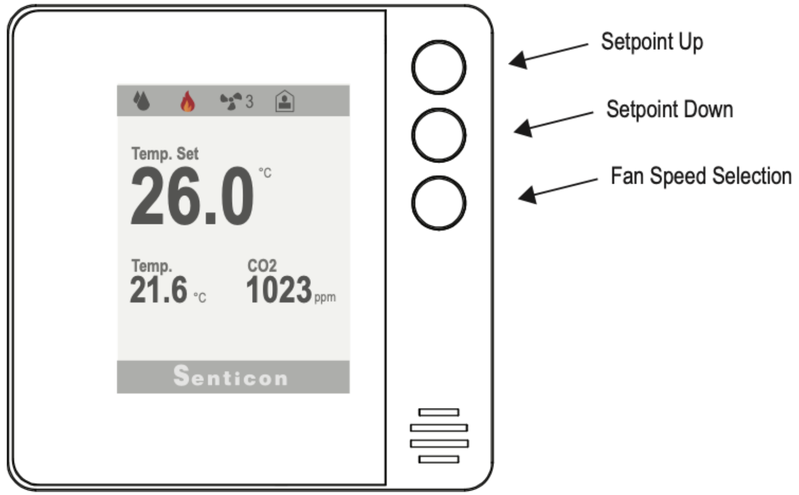
Room Temperature and CO2 Controller
Built-In Temperature and CO2 Measurement
Colour LCD Display
2 Button (Setpoint Up and Down) and 3 Button Versions (Setpoint, Fan)
2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App
3 x 0-10V Outputs
2 x 24Vac Triac Outputs
Modbus RS485 or BACnet MS/TP Communications



LCD DISPLAY



BUTTONS



Senticon
SENTIENT CONTROL SOLUTIONS

TCR/QCR02/03/04 Room Controller Range Control Functions

4-Stage (Temperature) Control Loop

- Built-in Sensor, UI Sensors, Network

CO2 Control Loop

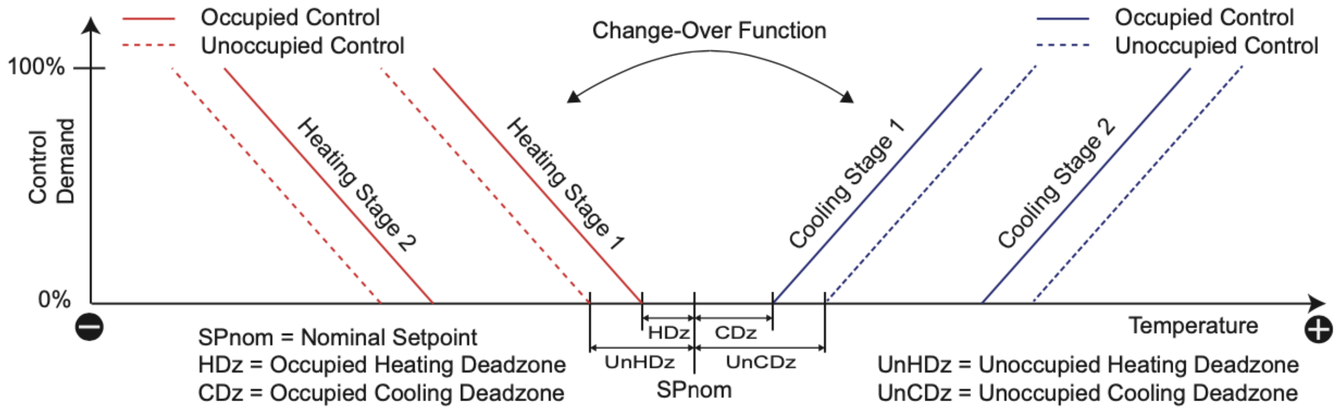
Additional Control

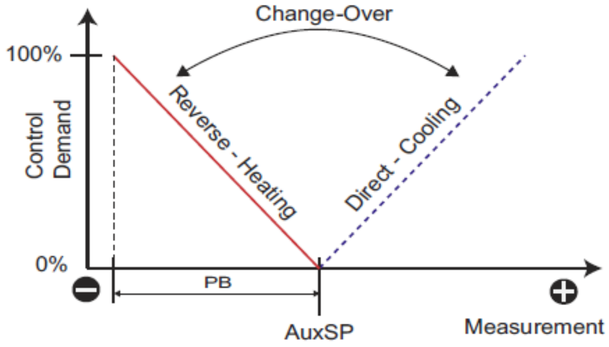
Change-Over Control (Heating/Cooling)
EC Fan Control
Condensation Control
Maximum Demand (e.g. Cooling and CO2/VOC for VAV)
0-10V Modulating and 6-Way Valve Control
PWM and On/Off Thermic Actuator Control
Outputs Reversing Control
Minimum / Maximum Output Levels
Movement Control

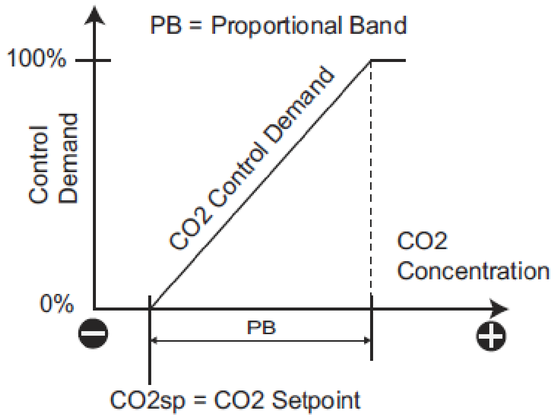
Flexibility, Modularity

Each output function individually assignable
Control loop input sources selectable (making them universal)

Value Range / Enumerations
0 = Network Value (Reg 538)
1 = Temperature (Built-In, Default)
2 = UI1 - NTC10
3 = UI2 - NTC10
4 = UI1 - 0..10Vdc
5 = UI2 - 0..10Vdc

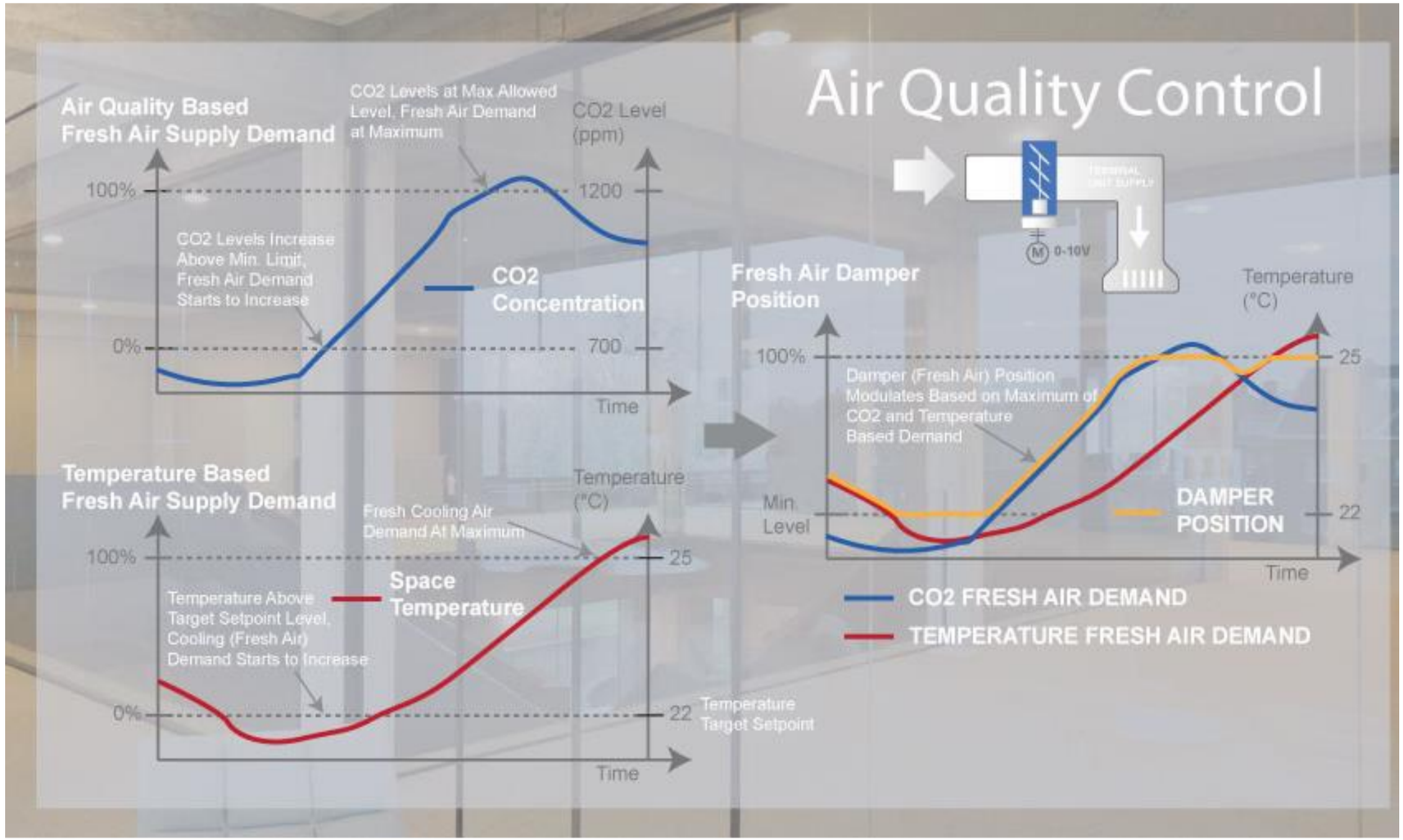






Senticon
SENTIENT CONTROL SOLUTIONS

TCR/QCR02/03/04 Maximum VAV Control



Senticon
SENTIENT CONTROL SOLUTIONS

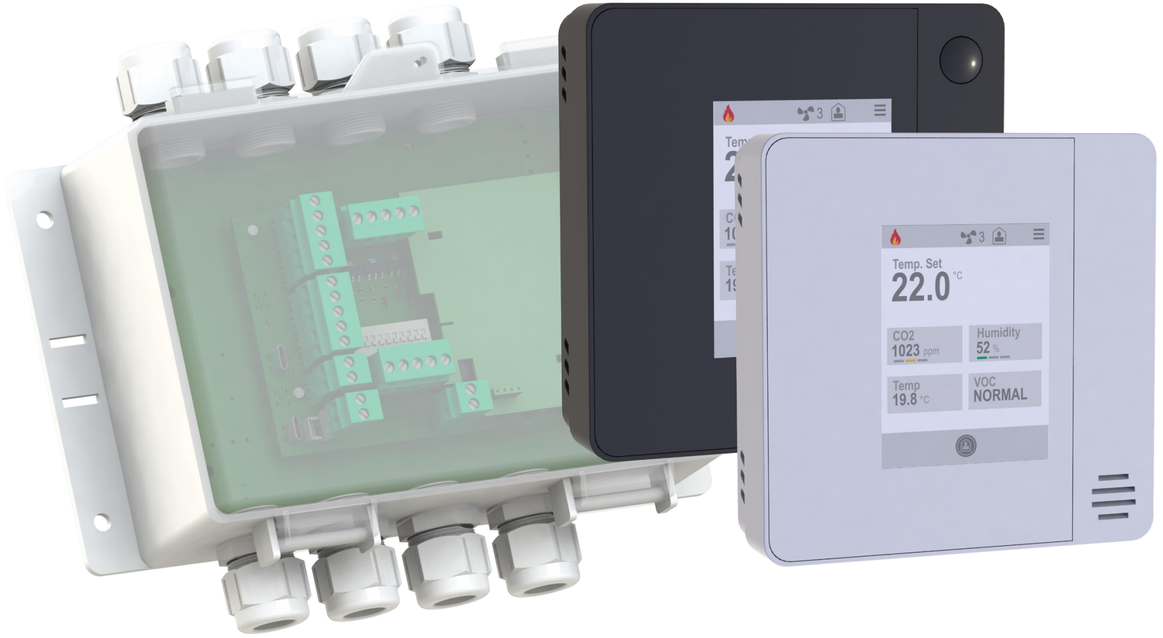
TCR/QCR02/03/04 Room Controller Range – Model Selection

Part Number		SKU# Number					
Example	TCR04-MOD-LCD-3B-W	4000	1	23	00	00	02
Product Name		Product		Product Options			
TCR02	Slimline Room Temperature Controller, 2UI, 3AO, 2DO	4200					
QCR02	Slimline Room Temperature and CO2 Controller, 2UI, 3AO, 2DO	4300					
TCR03	Slimline Room Temperature Controller, 2UI, 2DO, 3RO, 1AO	4400					
QCR03	Slimline Room Temperature and CO2 Controller, 2UI, 2DO, 3RO, 1AO	4500					
TCR04	Room Temperature Controller, 2UI, 3AO, 2DO	4000					
QCR04	Room Temperature and CO2 Controller, 2UI, 3AO, 2DO	4100					
Serial Communication Option							
MOD	Modbus RS485		1				
BAC	BACnet MS/TP		2				
Interface Options							
LCD-2B	Colour LCD Display with Two Buttons			22			
LCD-3B	Colour LCD Display with Three Buttons			23			
LCD-3B-BST	Colour LCD Display with Three Buttons, Setpoint Up and Down, Boost Button			33			
LCD-3B-OM	Colour LCD Display with Three Buttons, Setpoint Up and Down, Operating Mode Button			43			
Measurement Options							
	No Extra Measurements				00		
OE	Passive Infrared Movement (PIR) - Only Available with LCD-2B Models				03		
Colour Options							
W	White					00	02

Senticon
SENTIENT CONTROL SOLUTIONS

Senticon
SENTIENT CONTROL SOLUTIONS

TCR80 Series Controllers and TDR/QDR20 Series Room Interfaces

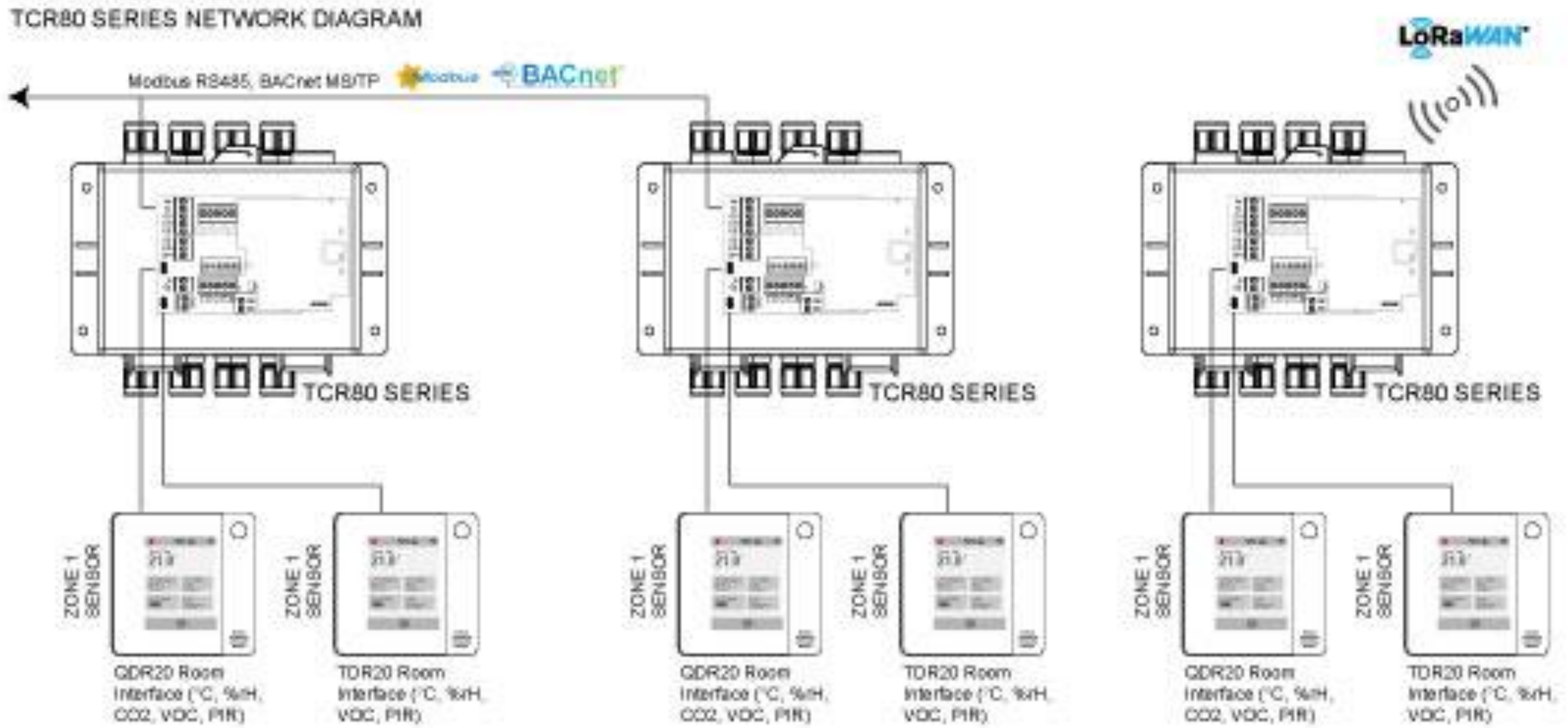


ASHRAE BACnet™ Modbus LoRaWAN® Bluetooth™

Senticon
SENTIENT CONTROL SOLUTIONS

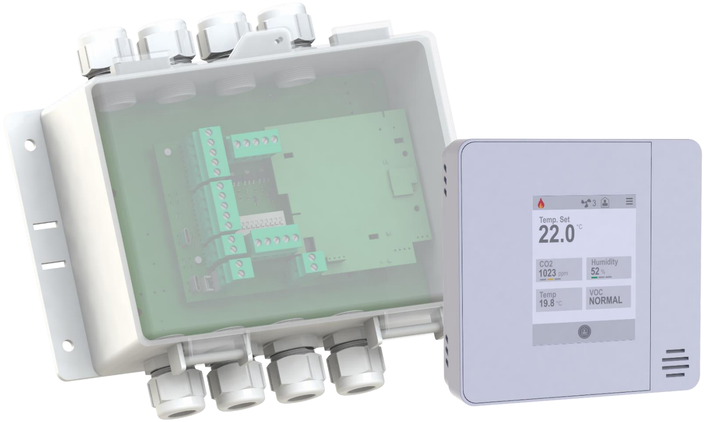
TCR80 Series Controllers Network Architecture

Modbus, BACnet or LoraWan Connection to BMS/IoT
Support for up to two zone TDR20/QDR20 Interfaces
USB-C cable connection to Interfaces – plug&play no wiring required, fast and safe



Senticon
SENTIENT CONTROL SOLUTIONS

TCR81 Series Controllers



TCR81-MOD/BAC

Multi-purpose Ceiling Mounted Controller, IP65 Enclosure with Cable Glands

Plug & Play Bus connection to TCR20/QDR20 Room Interfaces

2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App

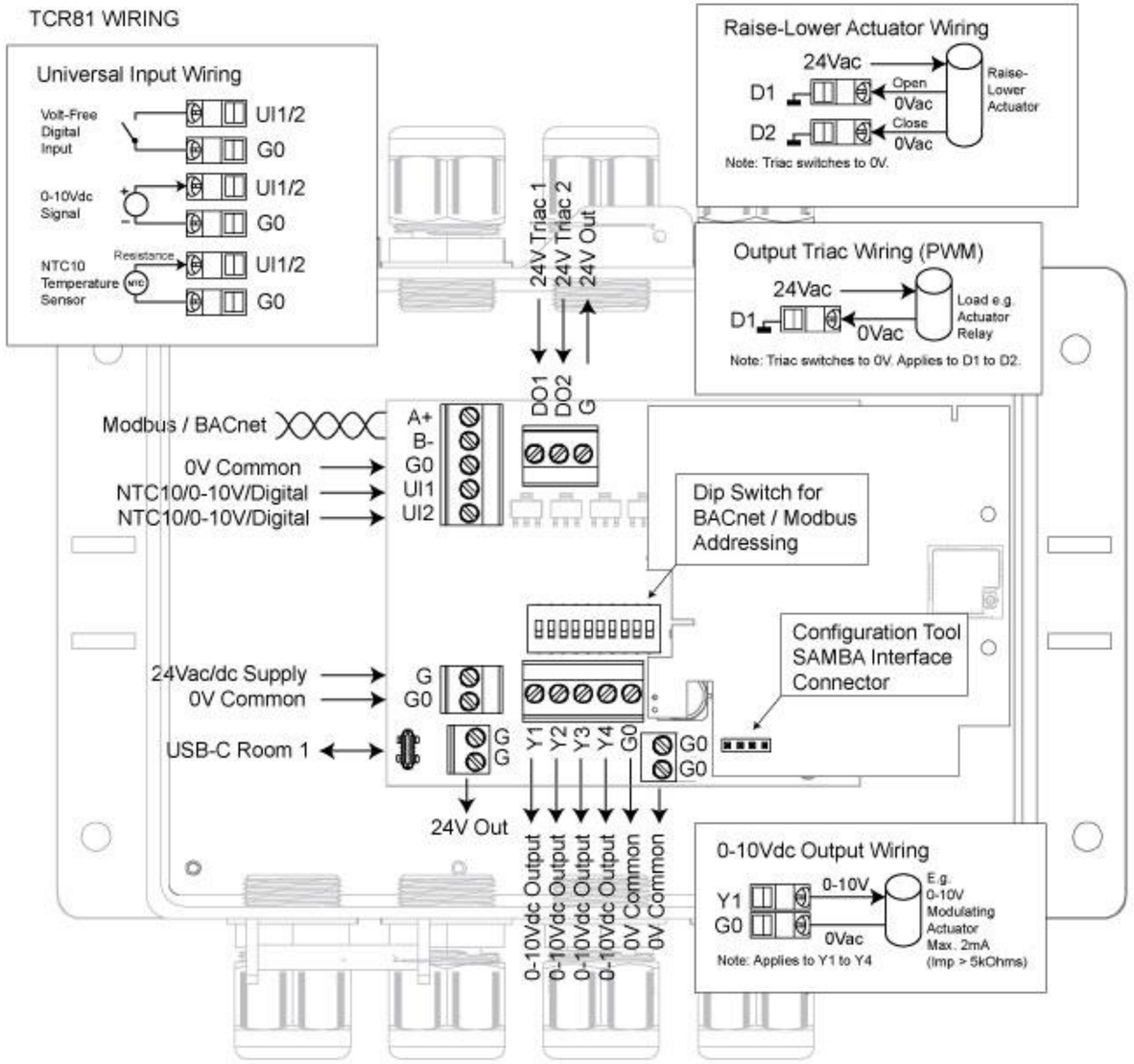
4 x 0-10V Outputs

2 x 24Vac Triacs

24 or 240V Power Supply (8VA available for actuators, sensors etc.)

Modbus RS485 or BACnet MS/TP Communications, 60V Industrial Isolation

LoraWan Wireless Communications



Senticon
SENTIENT CONTROL SOLUTIONS

TCR82 Series Controllers

TCR82-MOD/BAC – TWO ZONE CONTROLLER

Multi-purpose Ceiling Mounted Controller, IP65 Enclosure with Cable Glands

Plug & Play Bus connection to 2 x TCR20/QDR20 Room Interfaces

2 x USB-C Connectors for the Zone Sensors (terminal block versions available)

4 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App

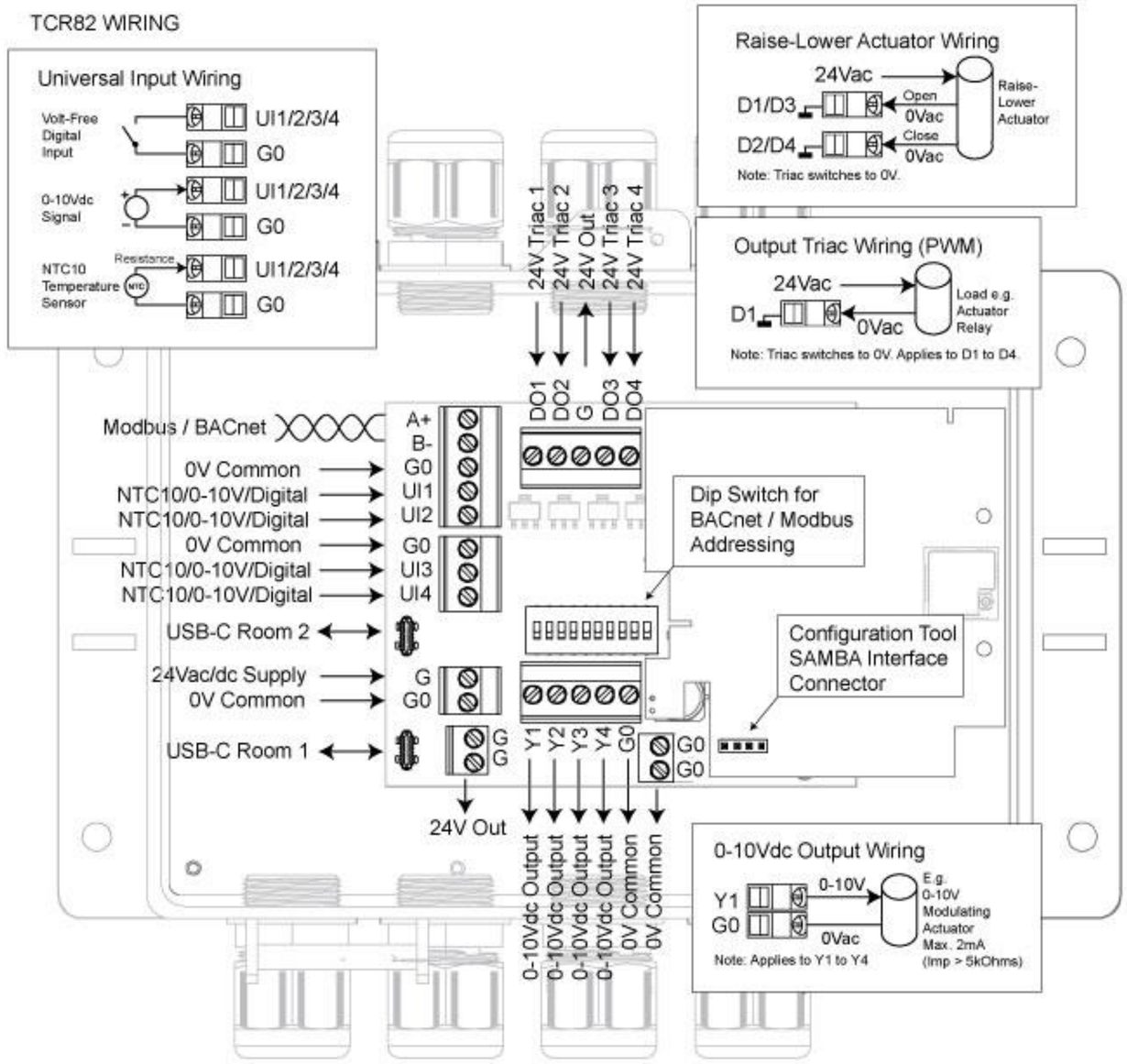
4 x 0-10V Outputs

4 x 24Vac Triacs

24 or 240V Power Supply (8VA available for actuators, sensors etc.)

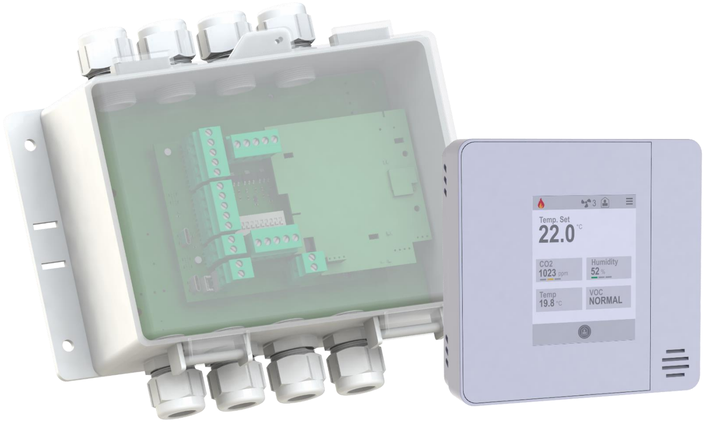
LoraWan Wireless Communications

Modbus RS485 or BACnet MS/TP Communications, 60V Industrial Isolation



Senticon
SENTIENT CONTROL SOLUTIONS

TCR83 Series Controllers



TCR83-MOD/BAC

Multi-purpose Ceiling Mounted Controller, IP65 Enclosure with Cable Glands

Plug & Play Bus connection to TCR20/QDR20 Room Interfaces

2 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App

42x 0-10V Outputs

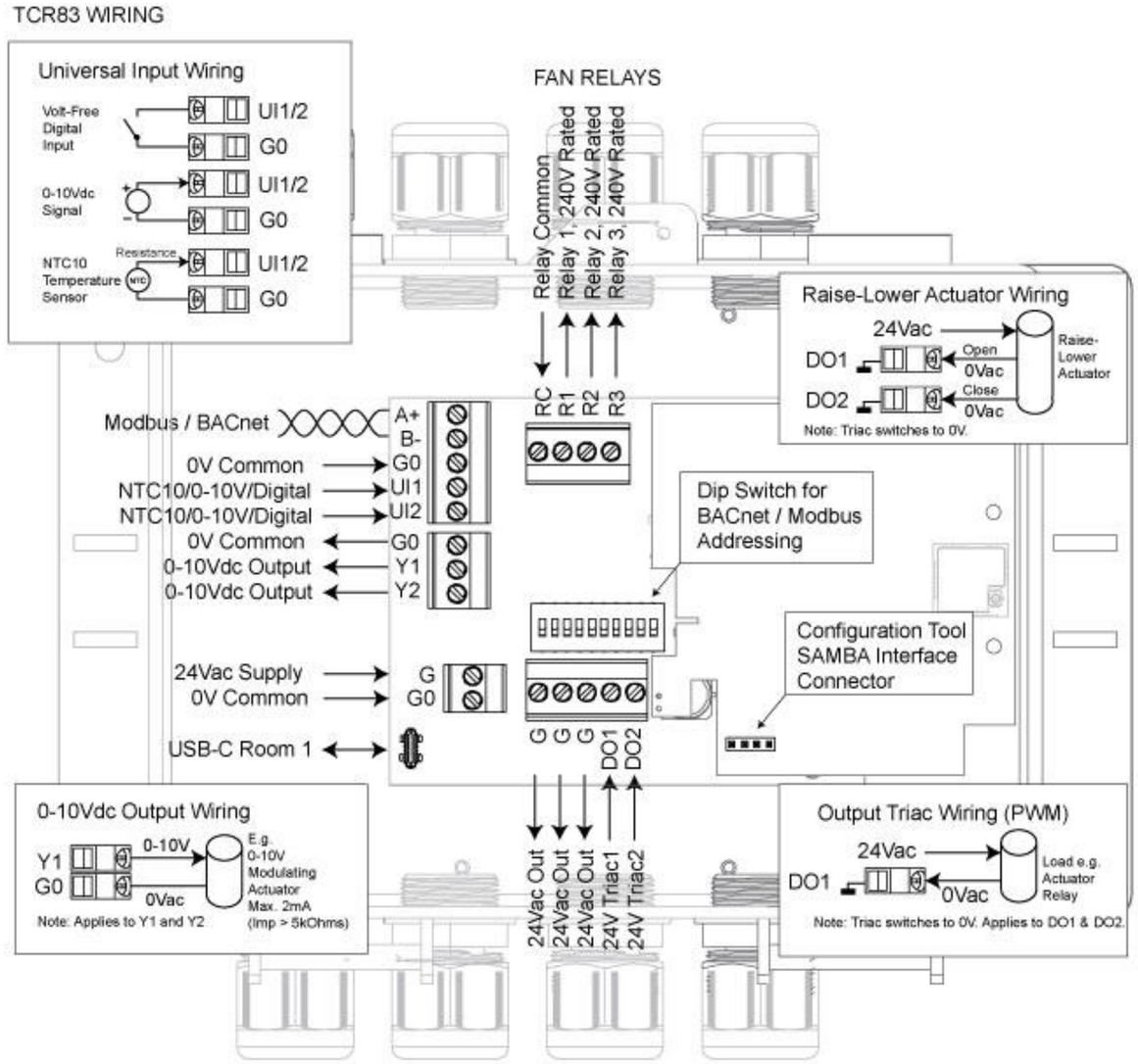
2 x 24Vac Triacs

3 x 240V Relays, 3A (3-Speed Fan Control)

24 or 240V Power Supply (8VA available for actuators, sensors etc.)

LoraWan Wireless Communications

Modbus RS485 or BACnet MS/TP Communications, 60V Industrial Isolation



Senticon
SENTIENT CONTROL SOLUTIONS

TCR86 Series Controllers

TCR86-MOD/BAC

Ceiling Mounted Controller, for FCU, RTU and HPU, IP65 Enclosure with Cable Glands

Plug & Play Bus connection to TCR20/QDR20 Room Interfaces

4 x Universal Inputs (0-10V, NTC10, Digital) – Automatically Selected by App

2 x 0-10V Outputs

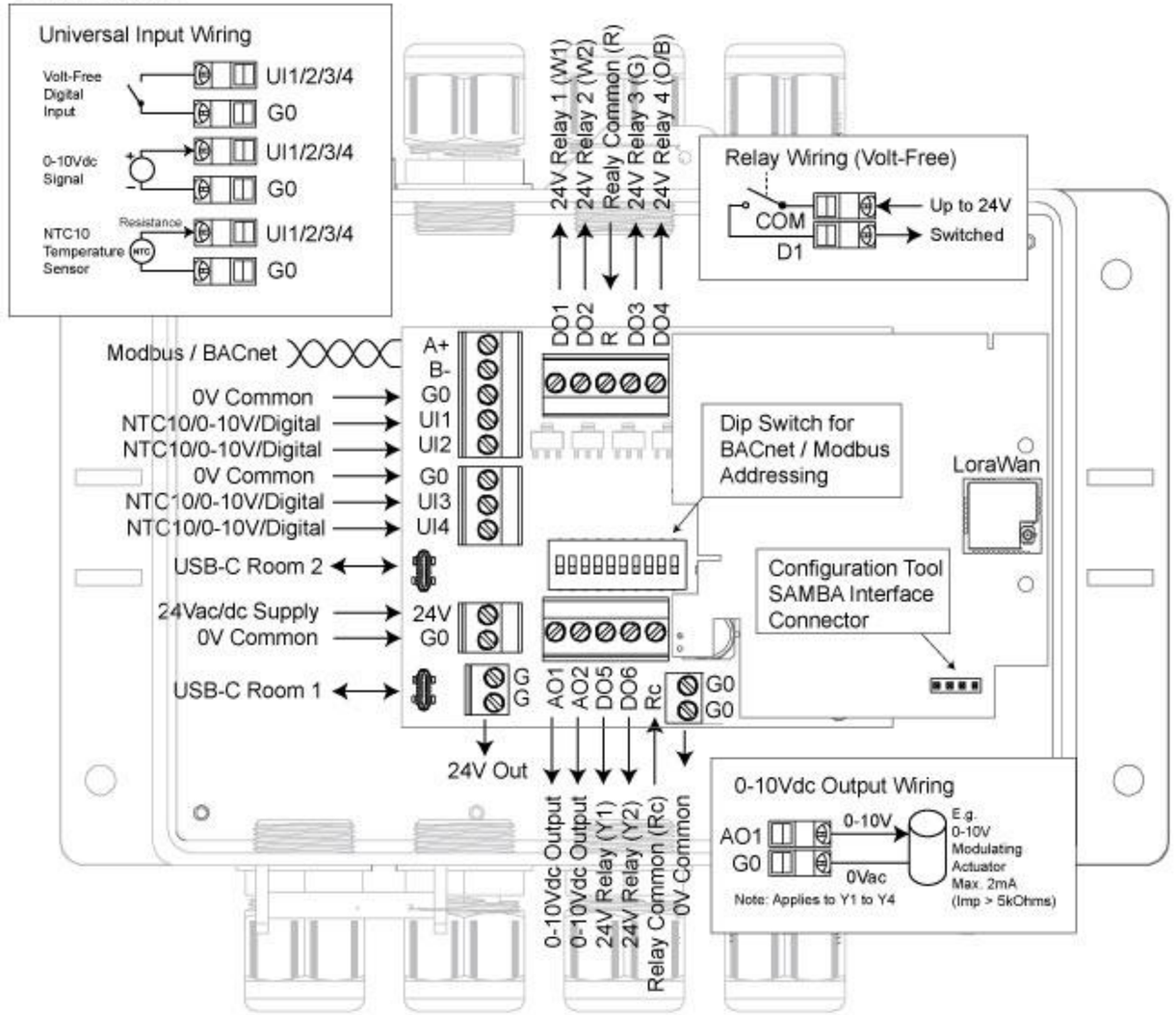
6 x 24V Pilot Relays, 0.5A

24 or 240V Power Supply (8VA available for actuators, sensors etc.)

LoraWan Wireless Communications

Modbus RS485 or BACnet MS/TP Communications, 60V Industrial Isolation

TCR86 WIRING



Senticon
SENTIENT CONTROL SOLUTIONS

TCR80 Series Ceiling Mounted Controller Functions

Multiple Control Loops

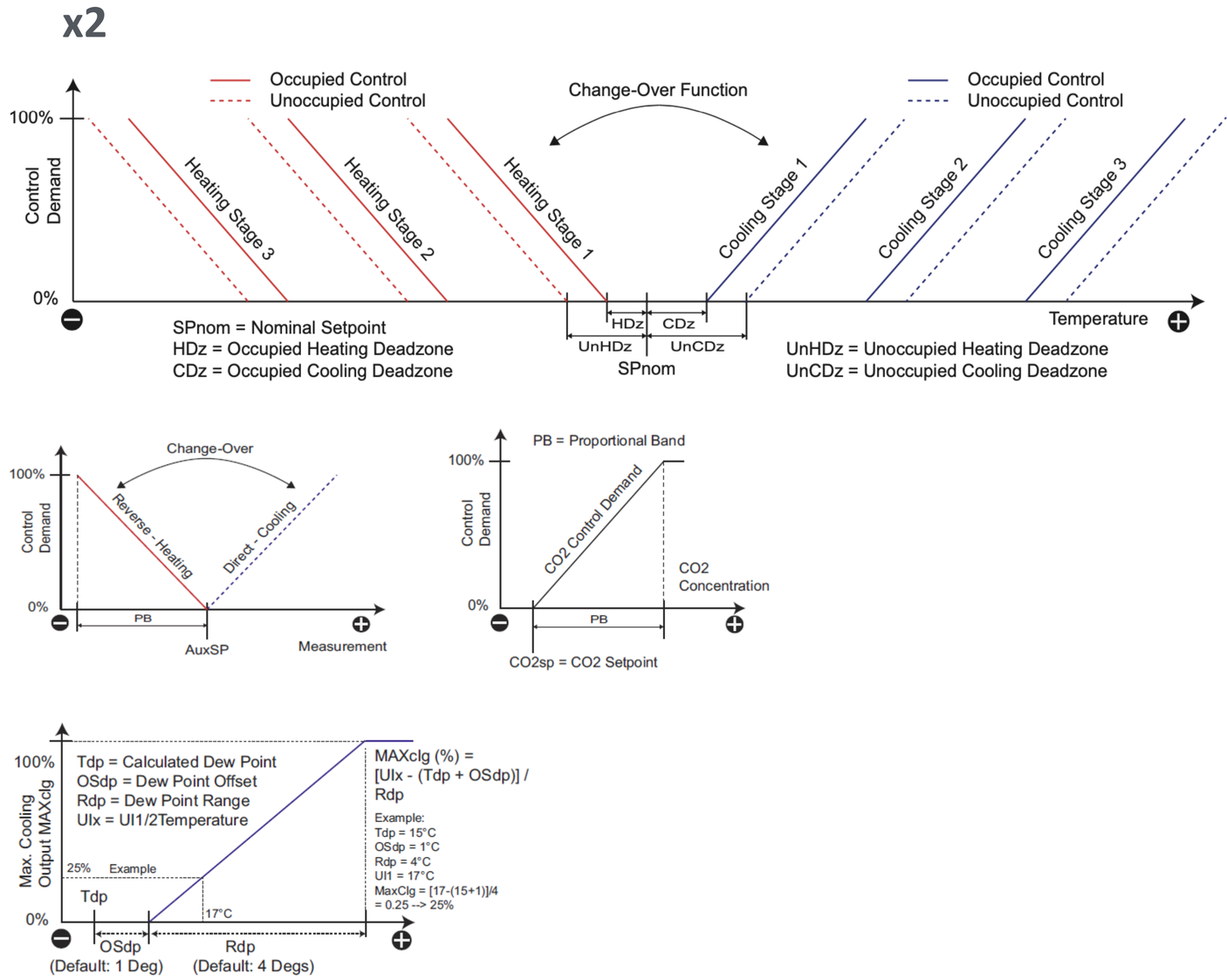
- 6-Stage (Temperature) Control Loop
  - Built-in Sensor, UI Sensors, Network
- Auxiliary Heating/Cooling PI Control Loop
  - Built-in Sensor, UI Sensors, Network
- CO2 Control Loop
- Humidify/Dehumidify Control Loop
- VOC Control Loop

Additional Control

- High/Low limit Reset (Cascade) Control
- Change-Over Control (Heating/Cooling)
- EC Fan Control
- Dew Point Control
- Condensation Control
- Maximum Demand (e.g. Cooling and CO2/VOC for VAV)
- Average Temperature
- Extension Timer / Booster Control
- 0-10V Modulating and 6-Way Valve Control
- PWM and On/Off Thermic Actuator Control
- 3-Point (Raise/Lower) Actuator Control
- Damper Control
- Outputs Reversing Control
- Dehumidify Cooling Output Override
- Minimum / Maximum Output Levels
- Relay Output Control
- Movement Control

Flexibility, Modularity

- Each output function individually assignable
- Control loop input sources selectable (making them universal)
- Maximum Function facilitates configuration for ‘unusual’ applications



Senticon
SENTIENT CONTROL SOLUTIONS

TCR80 Series – Model Selection

Part Number		SKU# Number						
Example	TCR82-MOD-24-W	8200	1	00	60	10	0	2
Product Name		Product			Product Options			
TCR81	Ceiling Mounted Room Controller, 2UI, 4AO, 2DO, 1 x Room Interface Units	8100						
TCR82	Ceiling Mounted Room Controller, 4UI, 4AO, 4DO, 2 x Room Interface Units	8200						
TCR83	Ceiling Mounted Room Controller, 2UI, 2AO, 2DO, 3RO, 1 x Room Interface	8300						
Serial Communication Option								
	No communication (select when using LoraWan)		0					
MOD	Modbus RS485		1					
BAC	BACnet MS/TP		2					
Wireless Communication Options								
	No Interface			00				
BLE	Bluetooth App Interface			03				
LRA	LoraWan Wireless Interface (select Lora region below)			06				
BLE-LRA	Bluetooth App Interface and LoraWan Wireless Interface (select Lora region)			09				
Zone Sensor Supply								
	USB-C Connector				60			
5V	5V+ Zone Sensor Communications Spring Loaded Terminals				61			
Power Supply Option								
24	24V Power Supply					10		
240	240V Power Supply, 24Vac 8VA available for actuators					11		
Region Options (Lora)								
	Non Lora & EU868MHz Lora (Default)						0	
US	US915MHz Lora						1	
AS	AS923MHz Lora						2	
Colour Options								
W	White							2

Senticon
SENTIENT CONTROL SOLUTIONS

TDR20/QDR20 Room Interface – Plug & Play

TDR20 Room Interfaces, Temp

Built-In Temperature Measurement

2.4” Colour Touchscreen

Optional Humidity, VOC and Occupancy

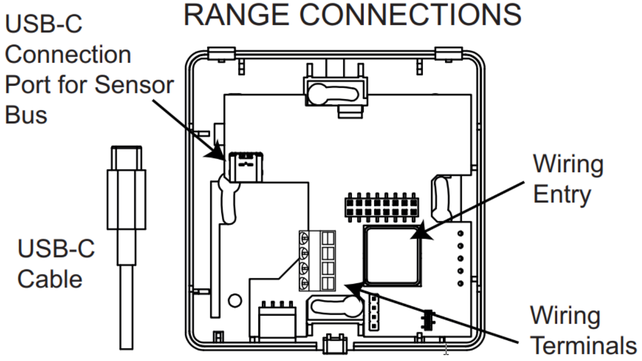
QDR20 Room Interfaces, CO2 & Temp

Built-In Temperature and CO2 Measurement

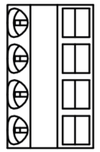
2.4” Colour Touchscreen

Optional Humidity, VOC and Occupancy

SURFACE MOUNTED STANDARD RANGE CONNECTIONS



Wiring Terminals for Sensor Bus
(If USB-C sensor bus connection not in use)



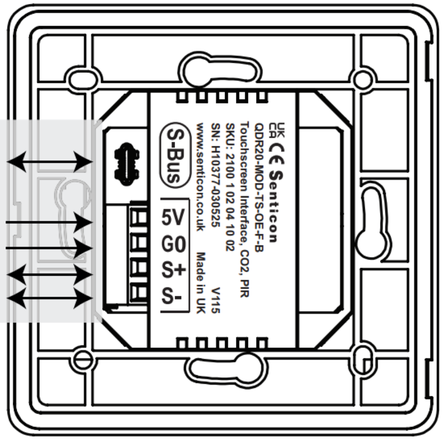
+VDC (5V)
G0
S- (B-)
S+ (A+)

Note: Sensor bus uses RS485 over USB-C cable
(requires full USB-C cable e.g. Senticon USB-C-CAB-6)

SLIMLINE SERIES CONNECTIONS

Sensor Bus
(RS485 over USB-C Connection)

5Vdc (if no USB-C)
0V (if no USB-C)
S-Bus+ (if no USB-C)
S-Bus- (if no USB-C)



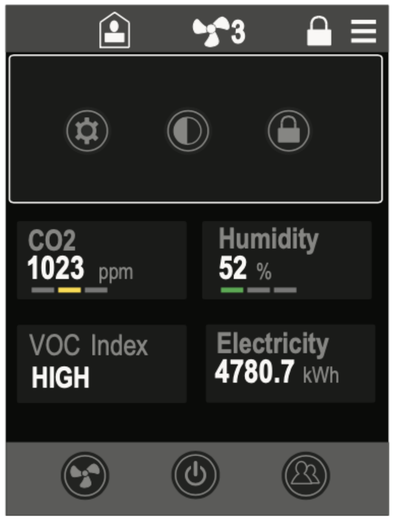
Senticon
SENTIENT CONTROL SOLUTIONS

TDR20/QDR20 Room Interface – Configurable User Interface

TOUCHSCREEN DISPLAY
(SKIN COLOUR SELECTABLE)

Menu Icon - Press For Settings, Dim and Lock

Additional Icons Displayed after Pressing Menu



Action Bar with Buttons

TOP MENU BUTTONS

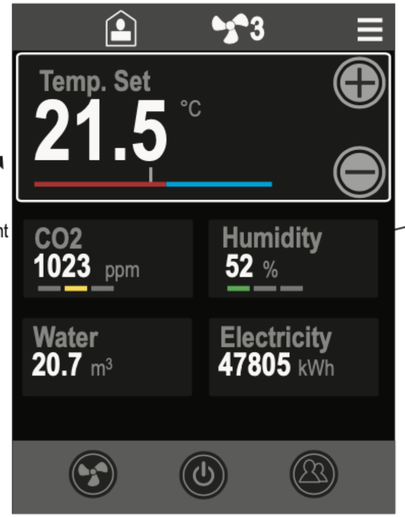
- Menu Icon (Access to settings, screen lock and dimming)
- Access to Configuration
- Button to Dim (no backlight)
- Button to Lock Screen (no access)

ACTION BAR BUTTONS

- Fan Speed Selection Button
- Mode Selection Button
- Boost (Timed) Button

STATUS BAR ICONS

- Menu Icon (Access to settings and dimming)
- Fan Speed Indication
- Occupied / Unoccupied / Night - Off
- Screen Locked
- Heating / Cooling
- Limit Function / Frost Mode
- Condensation



Setpoint Adjustment view displayed

Text 'Set' indicating setpoint (press to change)

MAIN DISPLAY LOCATIONS

- Alarm Indication
- Descriptive Text Indication (Low / Normal / High)

Senticon
SENTIENT CONTROL SOLUTIONS

TDR20/QDR20 Room Interface – Model Selection

Part Number		SKU# Number					
Example	TDR20-MOD-TS-RH-W	2000	1	02	01	00	02
Product Name		Product Code		Product Options			
TDR20	Touchscreen Room Display, Temperature Measurement	2000					
QDR20	Touchscreen Room Display, Temperature and CO2 Measurement	2100					
Serial Communication							
MOD	Modbus RS485		1				
User Interface							
	No Display			00			
TS	Colour Capacitive Touchscreen			02			
Measurement Options							
	No Extra Measurements				00		
RH	Relative Humidity				01		
RH-VOC	Volatile Organic Compound and Humidity				02		
OE	Passive Infrared Movement (PIR)				03		
RH-OE	Relative Humidity and Movement (PIR)				04		
RH-VOC-OE	VOC, Relative Humidity and Movement (PIR)				05		
Mounting Options							
	Standard Wall Surface or Junction Box					00	
F	SlimLine Flush Mounting on Junction Box					30	
Colour Options							
B	Black						01
W	White						02

Part Number	Description	SKU# Number
Accessories		
USB-C-CAB-6	6m USB-C Male to USB-C Male for Room Intrerface Units, Black	8510 0 00 0005 01
USB-C-EXT-6	5m USB-C Female to USB-C Male Extension Cable, Black	8520 0 00 0006 01

Senticon
SENTIENT CONTROL SOLUTIONS

Communications - BMS and IoT Ready Solutions

Room Controller and Sensor Range – Communication

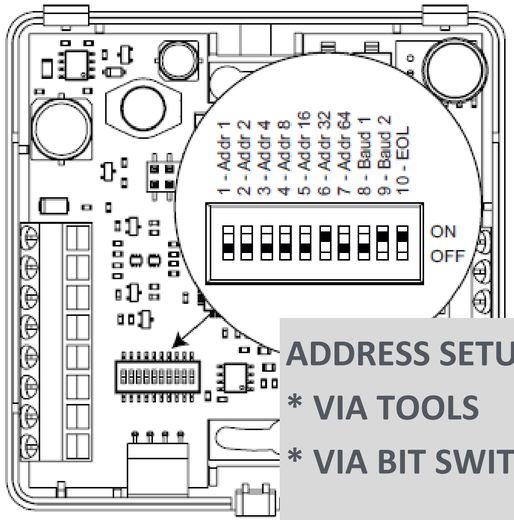
Modbus

- Over-voltage Protected RS485
- Access to all parameters over the network
- Set Device Address and Baud Rate Via Tools
- Set Address via Bit Switch
- Up to 90 Devices Per Network

BACnet

- Over-voltage Protected RS485
- Standard Network Variable Support
- Full Configuration Using Device Configuration Object Parameters
- COV (Change-of-Value) Support
- Set Device ID, MAC Address and Baud Rate Via Tools
- Set Address via Bit Switch
- B-ASC Device Profile Support

BACnet Prorocol Revision	1.19
Product Description:	Smart Room Sensors
BACnet Standard Device Profile:	BACnet Application Specific Controller (B-ASC)
BACnet Interoperability Blocks Supported:	Data Sharing - ReadProperty-B (DS-RP-B) Data Sharing - ReadPropertyMultiple-B (DS-RPM-B) Data Sharing - WriteProperty-B (DS-WP-B) Data Sharing - COV-B (DS-COVU-B) Device Management - DynamicDeviceBinding-B (DM-DDB-B) Device Management - DynamicObjectBinding-B (DM-DOB-B) Device Management - DeviceCommunicationControl-B (DM-DCC-B)



ADDRESS SETUP:

*** VIA TOOLS**

*** VIA BIT SWITCH**

Senticon
SENTIENT CONTROL SOLUTIONS

Senticon
SENTIENT CONTROL SOLUTIONS

LoraWan Wireless Technology

LoraWan Wireless Technology (Long Range Wide Area Network)

Long Range and Low Power Consumption; in buildings 100+ meters, up to 2-5km in Urban Environment

Open Communication Standard

Robust Communication – not susceptible to interference from WiFi, BLE, GMS, LTE etc.

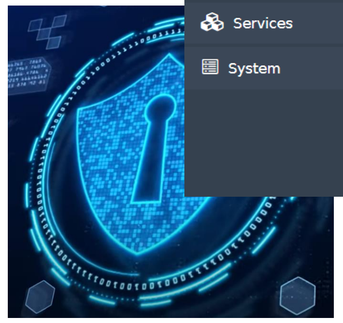
Suitable for Wide Range of Applications

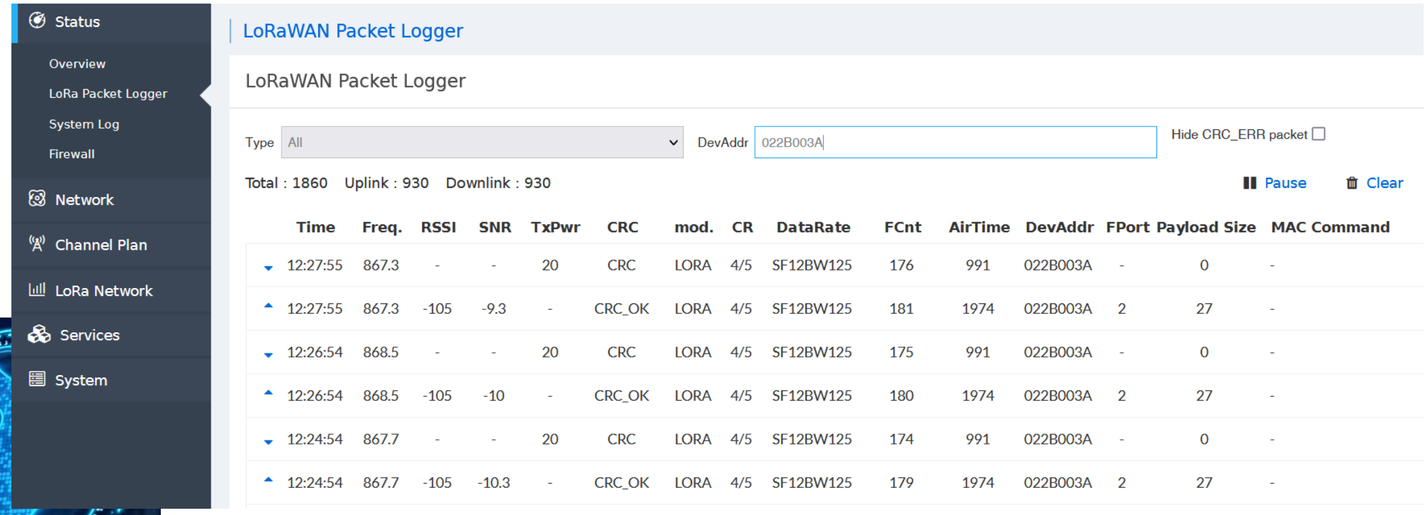
Private Network (no ongoing license fees) vs. Public Network e.g. Orange France, Digita Finland (ongoing subscription fees)

Security Written into Protocol

- End to End Data Encryption using AS-128bit for Secure Data Messaging
- Mutual End-Point and Data Origin Authentication

Spreading Factor (SPF) – message automatically split smaller parts if communication distance is becoming limitation





Time	Freq.	RSSI	SNR	TxPwr	CRC	mod.	CR	DataRate	FCnt	AirTime	DevAddr	FPort	Payload Size	MAC Command
12:27:55	867.3	-	-	20	CRC	LORA	4/5	SF12BW125	176	991	022B003A	-	0	-
12:27:55	867.3	-105	-9.3	-	CRC_OK	LORA	4/5	SF12BW125	181	1974	022B003A	2	27	-
12:26:54	868.5	-	-	20	CRC	LORA	4/5	SF12BW125	175	991	022B003A	-	0	-
12:26:54	868.5	-105	-10	-	CRC_OK	LORA	4/5	SF12BW125	180	1974	022B003A	2	27	-
12:24:54	867.7	-	-	20	CRC	LORA	4/5	SF12BW125	174	991	022B003A	-	0	-
12:24:54	867.7	-105	-10.3	-	CRC_OK	LORA	4/5	SF12BW125	179	1974	022B003A	2	27	-

Senticon
SENTIENT CONTROL SOLUTIONS

LoraWan Private Network Structure

End Devices e.g. Senticon Controllers, Water Meters, Energy Meters, Sensors

Class A – Battery Powered, Connection on Transmission, Uplink Messages

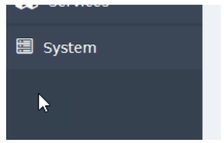
Class C – Locally Powered, Permanently Connected, Ideal both Uplink and Downlink Messages

Gateways – Convert LoraWan Wireless Message to LoraWan Message to Ethernet – IP Network

Application Servers – Converts the LoraWan Message to ‘BMS Compliant Message’ such as BACnet IP or Modbus TCP

Class C End Device

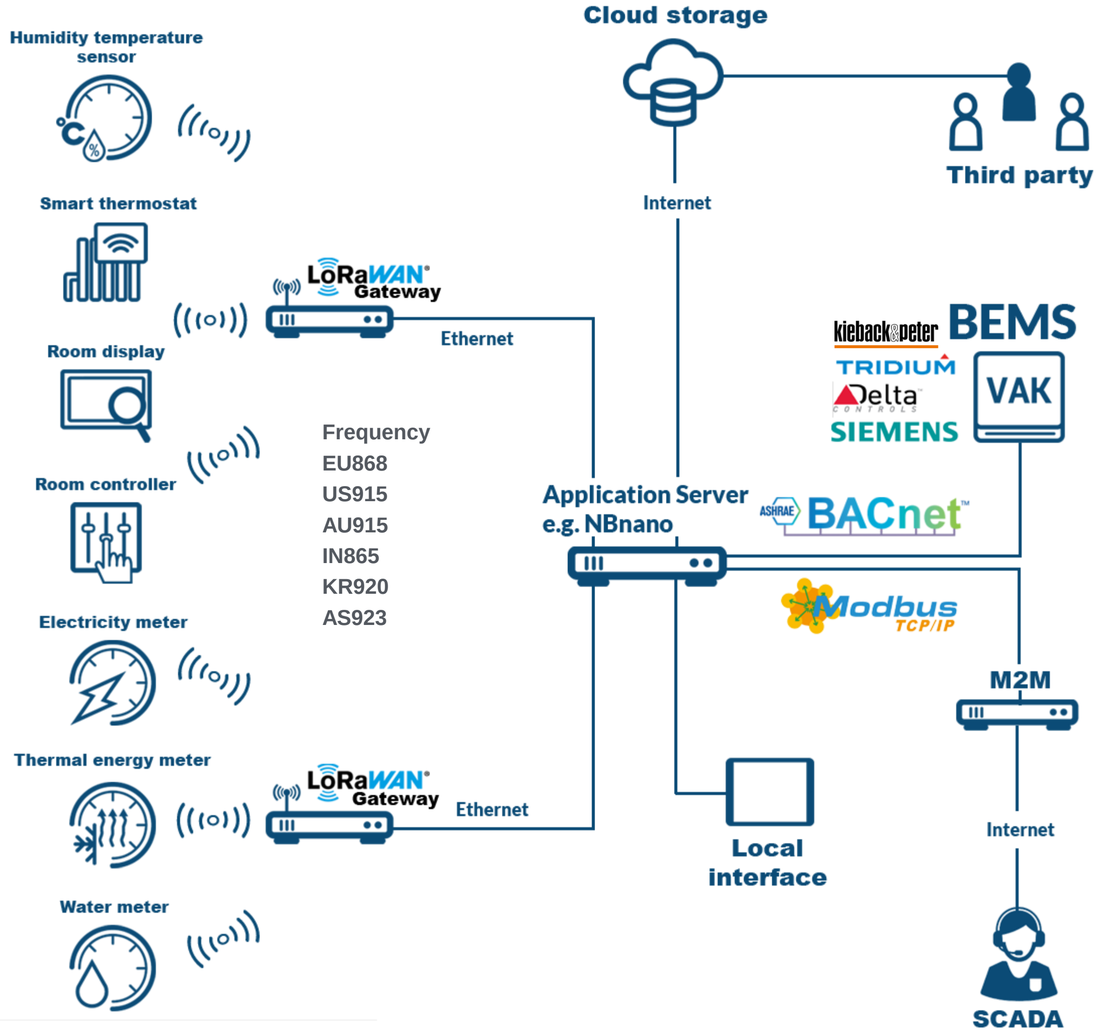
Senticon TCR/QCR/TVR/QVR Controllers



Configurable Uplink (Read) Message

Configurable Downlink (Write) Message

2023/08/21 17:19:42	Uplink	3c 64 01 1d 01 1d 00 61 01 92 00 61 01 1d 01 1d 00 00 01 1d 01 1d 01 1d 01 1d 23
2023/08/21 17:18:44	Uplink	3c 64 01 1d 01 1d 00 60 01 91 00 60 01 1d 01 1d 00 00 01 1d 01 1d 01 1d 01 1d 23
2023/08/21 17:17:56	Downlink	3e 44 03 5c 00 e3 03 7a 02 a6 00 02 00 03 23



LoraWan Smart Room Controllers

LoraWan Wireless Communications

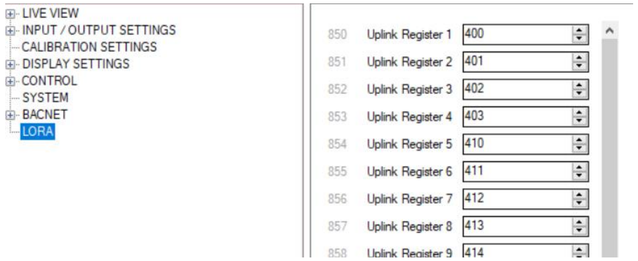
All controllers and sensors have LoraWan wireless capability
Extend LoraWan by using sensors as LoraWan user interface or LoraWan I/O
Long Range Communications, out of sight > 500m, buildings > 50m
Both read and write any data from the devices
Unique Configurable LoraWan Payload Downlink and Uplink Messages (measurements, setpoints, outputs)
LoraWan application server for BMS and IoT integration (Modbus TCP, BACNet IP)
Use multiple gateways to distribute the architecture

Default Uplink Message (12 Parameters)

Temperature
Humidity
CO2
VOC
Universal Input 1
Universal Input 2
Analogue Output Y1
Analogue Output Y2
Analogue Output Y3
Analogue Output Y4
Calculated 6-Stage Loop Setpoint
Auxiliary Loop Setpoint

Default Downlink Message (6 Parameters)

Nominal Setpoint for 6-Stage Control Loop
Auxiliary Loop Setpoint
Parameter 3
Parameter 4
Parameter 5
Parameter 6



Senticon
SENTIENT CONTROL SOLUTIONS

LoraWan vs. Wired Networks

Where to use LoraWan Wireless Controllers?

	LoraWan Wireless	Wired Networks (BACnet and Modbus)
BENEFITS	Ideal for Retrofit where Cabling is Difficult Cost Saving on Wiring Easier Placement of Devices Metering Equipment Available with LoraWan	Reliable Communications (regardless of room reconfiguration) Installers are Familiar with Technologies Faster Messaging (seconds)
DISADVANTAGES	Requires Gateway and Application Server to BMS May need Site Survey Building Reconfiguration may Reduce Wireless Efficiency Slower Messaging (Minutes)	Requires Cabling Between Rooms Cabling Mistakes

Project References

Dalarna High School
Falun, Sweden

153 x TCR11./QC11 Room Temperature and CO2 Controller

Sokos Hotel Puijonsarvi
Kuopio, Finland

170 x TCR10/QCR10 Modbus Touchscreen Room Temperature Controllers

Radisson Plaza Hotel
Helsinki, Finland

309 x TCR11 Room Temperature Controllers

London School of Economics
London, UK

100 x QER10 Room CO2 and Temperature Sensor and User Interface (window control - replaces KNX, ongoing site wide)

Tikkurilantie Office Building
Vantaa, Finland

160 x TCR10/QCR10 LoraWan Room Temperature and CO2 Controllers

Old People’s Home
Halmstad, Sweden

200 x TCR10/QCR10 Modbus Room Temperature and CO2 Controllers with Humidity and Occupancy Sensor

Senticon
SENTIENT CONTROL SOLUTIONS

Project References .. continued

Thule US Air Force Based
Greenland, Denmark

240 x TCR11 Room Temperature Controllers

Women's Correctional Facility
Tennessee, USA

75 x TCR86 Lorawan Roof Top Unit Controllers

Primary/Secondary School
Halmstad, Sweden

80 x TCR11/QCR11 BACnet Room Temperature and CO2 Controllers

Centralhuset Office Building
Uppsala, Sweden

25 x QCR11 Room CO2 and Temperature Controllers

Koy Iiris Office Building
Helsinki, Finland

400 x TCR04/QCR04 Compact Room Temperature and CO2 Controllers

Ruka Vacation Cottages
Ruka Ski Resorts, Finland

QCR11 Room CO2 Controller for monitoring and control

Senticon
SENTIENT CONTROL SOLUTIONS

Thank You .