

Technical Information

RTU2020 Process Controller Specification



**SC03-300-110**

**Release 110**

**August 2015, Version 1.0**

Revision History

Revision	Date	Description
1.0	August 2015	R110 release

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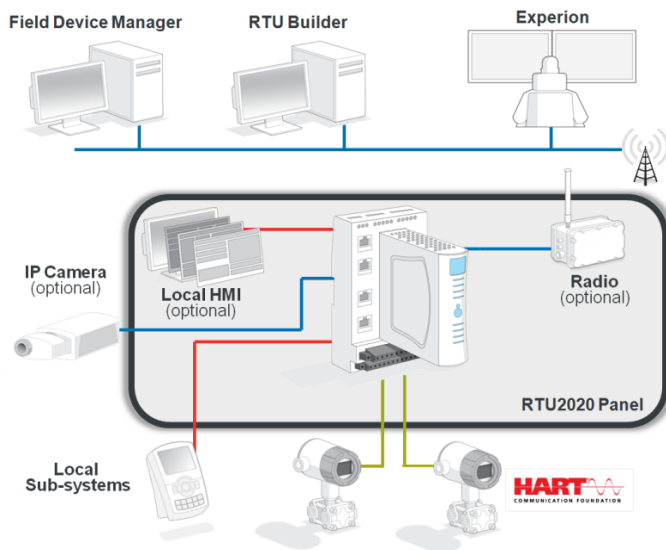
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# 1. Introduction

This document provides technical information for the Honeywell RTU2020 process controller. Further product descriptions can be found in the Product Information Note. Detailed planning, installation and configuration information is available in the product user guides.

## 1.1. RTU2020 Overview

RTU2020 is a modular, powerful and scalable process controller capable of all remote automation and control applications. It is designed to communicate with any SCADA system but when combined with Experion<sup>®</sup> PKS and its radically simplified SCADA configuration with superior operator experience, it solves the most challenging remote automation requirements.



**Figure 1 – Sample RTU2020 System Architecture**

The key features of the RTU2020 include:

- Lowest power consumption in its category at a typical 1.8W
- Temperature range -40 to 75°C (-40 to 167°F). Up to 75°C, not 70°C like other units
- High reliability with well designed thermal paths
- HART enabled onboard I/O. No extra hardware required. Digital HART data & diagnostics are available locally for use in RTU program and remotely via HART IP
- HART-IP allowing remote asset management of HART devices via Honeywell's Field Device Manager
- Efficient wiring and configuration saving installation and maintenance time
- Modern, powerful CPU
- Transient Suppression on every I/O channel and every communication port
- A powerful IEC 61131-3 programming environment
- Liquids and gas calculations in the same controller
- Flexible communication options
- Industry standard protocols of Modbus & DNP3

## 1.2. Document Scope

This document provides specifications for the following components:

- RTU2020 Controller
- RTU2020 I/O Modules
- RTU Builder

### 1.3. Definitions

- **IOTA, Input Output Termination Assembly:** An assembly that holds the IOM and the connections for field wiring. The IOTA contains only passive devices.
- **IOM, Input Output Module:** A device that contains most of the electronics required to perform a specific I/O function. The IOM plugs onto the IOTA.
- **CPM, Control Processor Module:** A device that contains most of the electronics required to perform the function of a process controller. A CPM plugs onto an IOTA designed for the CPM. The CPM may optionally include the functionality of an IOM.

## 2. Specifications

### 2.1. RTU2020 Controller

The RTU2020 family has an innovative modular hardware design with processor modules that plug onto IOTAs that contain only passive devices such as cable connectors and an expansion I/O connector allowing expansion I/O modules to connect without any further infrastructure.

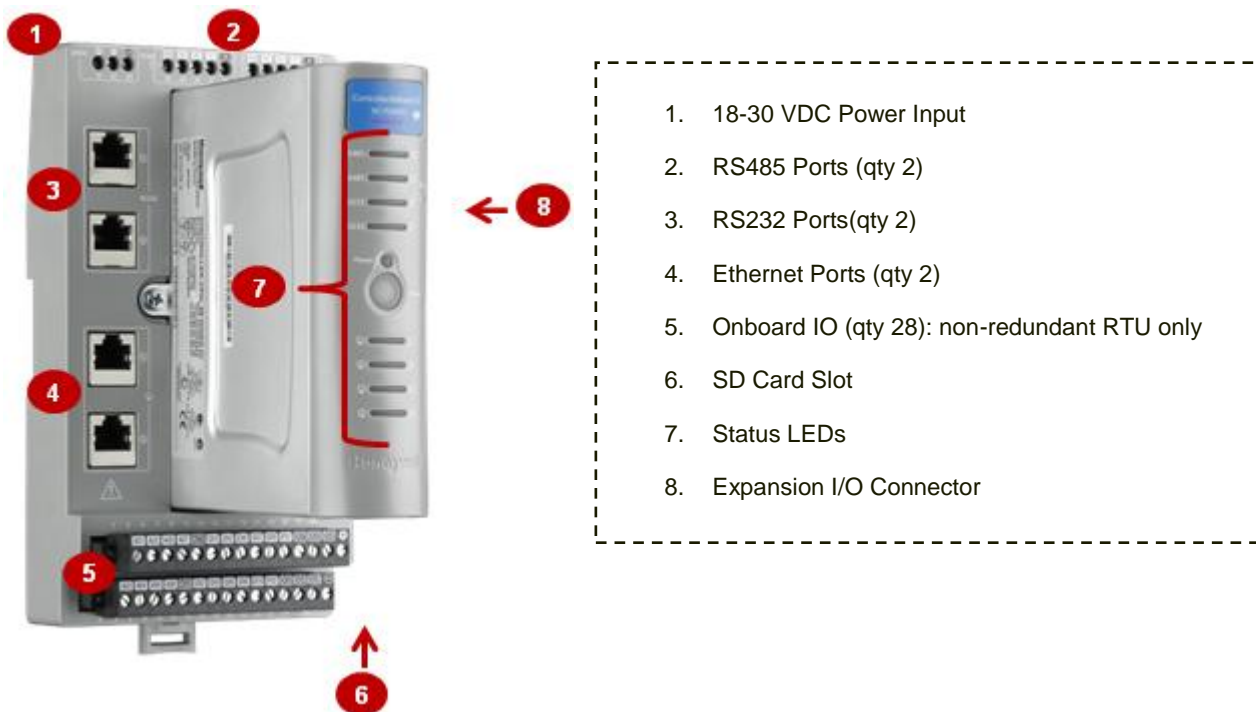


Figure 2 –RTU2020 Hardware Summary

### 2.1.1. Performance

Item	Specification
Processor	Dual Core ARM® Cortex™-A9 Core (32 bit) 667 MHz
Dynamic memory (RAM)	128 Megabytes
Program memory (Flash)	32 Megabytes
Nonvolatile memory	4Mbits
Nonvolatile memory data life	20+ years (no battery required)
Real-time clock resolution	1 ms
Execution cycle time	>= 50 ms
Time Synchronization	Simple Network Time Protocol (SNTP) or DNP3
Programming port	Ethernet port
SD card support	32GB Class 6 / Class 10 industry standard

### 2.1.2. Datalog Support

Item	Specification
Datalog Media	Flash memory or optional SD Card
Datalog rate	Configurable: 1 second, 5 seconds, 10 seconds, 1 minute, 5 minutes, 10 minutes and 1 hour
Datalog Timestamp resolution	1 ms

### 2.1.3. Communication Capabilities

RTUs need to efficiently manage unreliable, low bandwidth networks. They need to communicate as a slave device to a remote SCADA system, often over a redundant link on two different mediums; but also as a master to local subsystems like gas chromatographs and smart drives. RTU2020 covers all the scenarios by supporting SCADA protocols such as Modbus and DNP3.

#### Ethernet

Item	Specification
Number of ports	2, ANSI/IEEE 802.3
Independent networks	2. Can be on same or different Subnets

Item	Specification
Network connection	shielded RJ45 connector, auto-crossover
Network port speed	10/100BaseTx, auto-detecting
Isolation	1500 Volts RMS 1 minute, 60 Hz
Transient Voltage Suppression	600W peak pulse power capability at 10×1000µs waveform, repetition rate:0.01%
Message response time (typical)	100ms
Diagnostic LEDs on each port	Yes
Concurrent connections	64
Distance supported	100m
Protocols	TCP/IP, ARP, UDP, ICMP, DHCP, Modbus TCP, Enron Modbus, DNP3 TCP, HART-IP

#### Serial

Item	Specification
Number of Ports	2 x RS232 ports and 2 x RS485 ports
Baud rate supported	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
RS232 Port 1 and 2	RJ45 (TD, RD, CTS, RTS, CD, DTR, DSR/RI, GND), full duplex
RS232 distance	15m
RS485 Port 1 and 2	Screw terminals (GND, 485+, 485-, termination, chassis), 2-wire half-duplex
Maximum number of slaves connected to RS485 network	32
RS485 distance	1200m
RS485 termination	120ohm
Protocols	Modbus RTU Master, Modbus RTU Slave, Modbus ASCII Master, Modbus ASCII Slave, Enron Modbus Slave
Diagnostic LEDs on each port	Transmit Data (Tx) & Receive Data (Rx)
Transient Voltage Suppression	600W peak pulse power capability at 10×1000µs waveform, repetition rate:0.01%

**DNP3 Protocol**

Item	Specification
Device Function	Outstation (Slave)
Protocol Compliance Level <sup>1</sup>	Level 3+
Capacity of events buffered	Flash memory: 80,000 events or Optional SD Card: 500,000 events
Data monitoring by multiple DNP3 Masters	Yes, on separate ports
Report by Exception Capability	Yes
Ethernet support	Yes, Configurable TCP port number - default 20000
Serial support	No
Check Before Operate (CBO) support	Yes
Note 1 – See RTU2020 DNP Device Profile Document (DPD) for complete details	

**Modbus Protocol**

Item	Specification
Device Function	Master and Slave
Multi-Master support	Yes
Ethernet support	Modbus TCP, Configurable TCP port number - default 502
Serial support	Modbus RTU or ASCII

**Enron Modbus Protocol**

Item	Specification
Device Function	Slave
Ethernet support	Enron Modbus TCP, Configurable TCP port number - default 503
Serial support	Enron Modbus RTU or ASCII



## HART-IP Protocol

Used by Honeywell's Field Device Manager for instrument asset management of RTU2020 connected HART devices.

Item	Specification
Device Function	Read system capacity of RTU Read RTU and HART devices identity information HART command pass through to the connected HART devices HART delayed response mechanism to maximize system performance
Ethernet support	HART-IP protocol, Version 7, based on TCP/IP Configurable TCP port number, default 5094 Support single Honeywell Field Device Manager connection
Serial support	No

### 2.1.4. Watchdog

Item	Specification
CPU watchdog	CPU automatically resets if error is detected; status LED flashes error code

## 2.2. RTU2020 I/O Modules

RTU2020 I/O Modules come in two forms: onboard I/O and expansion I/O.



Both the onboard I/O module and mixed I/O module have the following mix of I/O channels.

- Analog Input (HART) 8
- Analog Output (HART) 2
- Digital Input 10
- Digital Output 6

- Pulse Input (High Speed) or Digital Input 2

Details of each type of I/O are listed in tables below.

### 2.2.1. Analog Input Channel Parameters

Item	Specification
Number of Channels	8
Standard Input Range	4~20mA or 1-5VDC, software configurable
Input Type	Single end
Short circuit protection	Yes
Isolation	No
Transient Voltage Suppression	600W peak pulse power capability at 10×1000μs waveform, repetition rate:0.01%
A/D resolution	16bit
Full scale accuracy	± 0.1% at 25°C ±0.2% from -40°C to 75°C
Repeatability	+/-0.05%
Temperature Coefficient	0.005% per Deg C
Differential Non Linearity	< 1 L.S.B
Normal Mode Rejection Ratio (NMRR)	Greater than 49dB at 60Hz
Input impedance (voltage mode)	1Mohm
Max HART Multi-drop Connection	One device per channel
Supported Device Wiring	2 wire, 3 wire, 4 wire devices

### 2.2.2. Analog Output Channel Parameters

Item	Specification
Number of Channels	2
Output Range	4-20mA
Output Type	Source
D/A resolution	12bit

Item	Specification
Full scale accuracy	$\pm 0.2\%$ at 25°C $\pm 0.3\%$ from -40°C to 75°C
Repeatability	$\pm 0.1\%$ of full scale
Temperature Coefficient	0.01% per Deg C of FSD
Differential Non Linearity	< 1 L.S.B
Load resistance (@ 24 V)	50-600ohm
Max HART Multi-drop Connection	One device per channel
Short circuit protection	Yes
Transient Voltage Suppression	600W peak pulse power capability at 10×1000μs waveform, repetition rate:0.01%

### 2.2.3. Digital Input Channel Parameters

Item	Specification
Number of Channels	10
Input type	Sink (dry contact)
Input Isolation	No
Transient Voltage Suppression	600W peak pulse power capability at 10×1000μs waveform, repetition rate:0.01%
Input Voltage range	24VDC, +/-10%, external power supply
Guaranteed ON voltage	12VDC
Guaranteed OFF voltage	4VDC
Short Circuit Protection	Yes
Filter	Yes

### 2.2.4. Digital Output Channel Parameters

Item	Specification
Number of Channels	6
Maximum Output Power	24 VDC, 80 mA load per channel, external power supply

Item	Specification
Output Type	Sink (voltage free)
Isolation	No
Output voltage range	24 VDC, +/-10%
On-State Voltage	Max 1 VDC, load current @ 80mA max
Off-State Voltage	24 V, typical
Max. off state leakage	100uA
Short circuit protection	Yes
Transient Voltage Suppression	600W peak pulse power capability at 10×1000μs waveform, repetition rate:0.01%
Typical on resistance	0.8 ohm

### 2.2.5. Pulse Input Channel Parameters

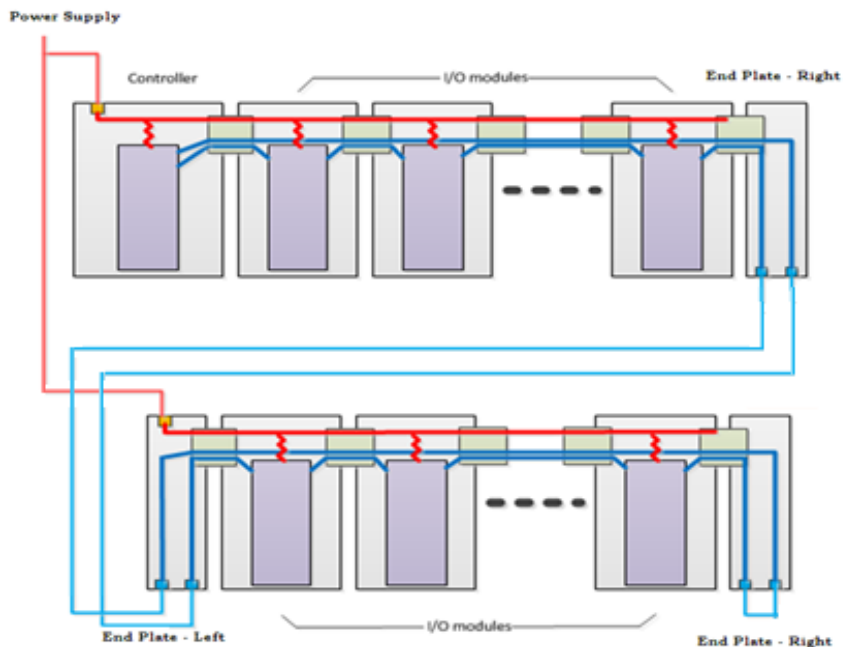
Item	Specification
Number of Channels	2
Input Isolation	No
Transient Voltage Suppression	600W peak pulse power capability at 10×1000μs waveform, repetition rate:0.01%
Input Type	Sink
Input Voltage range	5 ~10Volt peak to peak
Input frequency	0 to 10kHz
Input Impedance	97 kohm
Minimum high level single width	40us
Guaranteed ON voltage	4.5V
Guaranteed OFF voltage	1.5V
PI configuration	As pulse input or digital input
Accumulator rate	Accumulator and rate functions
Filter	Configurable
Short Circuit Protection	Yes

### 2.2.6. Scalability Parameters

Item	Specification
Max number of expansion I/O modules	9
Max number of expansion I/O rows	3
Max number of expansion I/O modules per row	9

## 2.3. RTU2020 End Plates

Expansion I/O modules are connected to the controller through a ring redundancy network which is terminated at the end of a row with a right end plate and Ethernet cable. Additional rows can be added and start with a left end plate and end with a right end plate.



### 2.3.1. Expansion Cable

To add additional rows of expansion I/O modules, Ethernet cables are connected between the left and right end plates to complete a ring network. The table below provides specifications for this cable.

Item	Specification
Cable type	CAT-5 (Straight/Cross)

Item	Specification
max cable length	100 meters

## 2.4. Electronic Flow Metering

In the oil & gas industry, Electronic Flow Metering (EFM) records and stores custody transfer information by accurately measuring and recording the energy transferred from one location to another location. RTU2020 is designed to work as electronic flow metering device for gas.

Item	Specification
Standards	API MPMS 21.1(Gas) AER Directive 17
Maximum number of meter runs	4
Protocol to extract data logs	Enron Modbus Slave (Serial / Ethernet)

## 2.5. RTU Builder

RTU Builder is RTU2020's configuration tool to design, configure, program and maintain your RTU investment.

### 2.5.1. RTU Builder Capabilities

Item	Specification
IEC 61131-3 programming	Yes
Languages Supported	Ladder Diagram (LD) Function Block Diagram (FBD) Structured Text (ST) Instruction List (IL) Sequential Function Chart (SFC)
Communication Medium to RTU	Ethernet
Bulk Replication of Program	Yes
Remote Download of Program	Yes
Remote Reboot	Cold or Warm Reboot
Remote Firmware Upgrade	Yes
Remote Diagnostics	Yes
Remote Data Log File Upload	Yes

### 2.5.2. Function Block Libraries

RTU Builder provides a range of function block libraries.

Item	Specification
Function Block Libraries <sup>1</sup>	Standard IEC61131-3 Metering Calculation Honeywell Control HART Modbus Unit Conversion Utility
HART Library	HART Function Codes Supported: Command 03      Read Dynamic Variables And Loop Current Command 48      Read Additional Device Status
Metering Calculation Library	AGA 3              Orifice Meter AGA 5              Volume to Energy Calculation AGA 7              Turbine Meter AGA 8              Gas Compressibility AGA 9              Ultrasonic Meter AGA 11             Coriolis Meter API 11.1           Volume Correction Factor API 11.2.2/M      Compressibility Factors API 11.2.4           Temperature Correction API 11.2.5           Correction Factor for pressure ISO 6976           Natural gas: calorific value density, relative density and Wobbe Index ISO 5167            Pressure differential devices such as orifice plates and venturis
Note 1 – See RTU2020 User's Guide (RTDOC-X283) Appendix for complete Function Block Library details	

### 2.5.3. RTU Builder Hardware Requirements

Item	Specification
Typical Processor	Pentium or compatible processor (2 GHz)
RAM	1 GB
Hard Drive	5 GB available space

Item	Specification
Communication Medium to RTU	Ethernet
Operating System	Windows 7 Professional SP1, 32-bit or 64-bit Windows 2008 Server R2, 32 bit or 64 bit
Display color settings	True color (32-bit)
Resolution	Recommended resolution: 1280x800 or above Optimal resolutions: 1920x1080, 1366x768, 1280x1024 and 1280x800
Installation Media	Via CD-ROM drive

## 2.6. General

### 2.6.1. Power Requirements

Power is supplied to the controller and I/O modules through the power input terminals on the controller IOTA and the left end plate, (when used). The relevant specifications at each power input terminals are detailed below.

Item	Model Number	SC-UCMX01	SC-TEPL01
	Description	Controller with onboard IOM	Left End Plate
Rated input voltage		24 VDC $\pm$ 25%	24 VDC $\pm$ 25%
Input voltage range		18 to 30 VDC	18 to 30 VDC
Maximum ripple voltage		120 mVpp	120 mVpp
Maximum rated input current		1.20 A at 30 VDC (controller plus 9 IOMs)	1.02 A at 30 VDC (9 IOMs)

### 2.6.2. Power Consumption

The tables below are provided for the purpose of sizing power systems. Three different scenarios are provided with each having various controller options configured. Select the scenario most suited and interpolate values when required.

These tables only include power consumption data of the listed modules and do not include power consumption of any connected instruments, (transmitters, valves etc.), even if that power is provided through the I/O module terminals. Allow for instrument power consumption separately in your power system sizing calculations along with other components to be powered by the system, (e.g., network radio).



## Controllers

Model Number	Minimum Power Consumption where there are no expansion IOMs <sup>2</sup>	Maximum Power Consumption where there are no expansion IOMs <sup>3</sup>	Maximum Power Consumption where there are expansion IOMs <sup>4</sup>
SC-UCMX01	1.7 W	2.9 W	3.4 W
<p>Note 1 – All values exclude power consumption of any connected instruments.</p> <p>Note 2 – Input voltage 24Vdc; All I/O channels active; no serial ports active; Ethernet port 2 active; Ethernet ports 1 and 3 not active;</p> <p>Note 3 – Input voltage 24Vdc; All I/O channels active; 4 serial ports active; Ethernet ports 1 and 2 active; Ethernet port 3 not active;</p> <p>Note 4 – Input voltage 24Vdc; All I/O channels active; 4 serial ports active; Ethernet ports 1, 2 and 3 active; Does not include expansion IOMs.</p>			

## Other hardware

Model Number	Specification
SC-UMIX01	2.0 W
SC-TEPR01	0.0 W
SC-TEPL01	0.0 W
<p>Note 1 – All values exclude power consumption of any connected instruments.</p> <p>Note 2 – Input voltage 24Vdc; All I/O channels active;</p>	

## 2.6.3. Physical and Environment

### Dimensions and Weight

Model Number	Specification	
	Dimensions (mm) L x W x H	Weight (g)
SC-UCMX01	190 x 99 x141	700
SC-UMIX01	190 x 99 x141	680
SC-TEPR01	190 x 39 x 16	140
SC-TEPL01	190 x 39 x16	140

### Other

Unless specified separately, all RTU2020 hardware meets the following common specifications.

Item	Specification
Mounting	DIN rail (TH35-7.5)

Item	Specification
Operating Temperature	-40 to 75°C (-40 to 85°C storage)
Humidity	5% to 95% RH (non-condensing)

## 2.7. Standards and Approvals

### 2.7.1. Hazardous Locations Approvals

Certification	Approval Rating														
FM	Class I, Division 2, Group A,B,C,D; T4 <sup>1</sup> Class I, Zone 2, AEx/Ex nA IIC T4 Gc														
CSA	Class I, Division 2, Group A,B,C,D; T4 Class I, Zone 2, Ex nA IIC T4 Gc														
ATEX	II 3 G Ex nA IIC T4 Gc														
IECEX	Ex nA IIC T4 Gc														
<p>Note 1 - Classification of maximum surface temperatures for Group II electrical equipment are:</p> <table> <tr> <th>Temperature class</th><th>Maximum surface temperature °C</th></tr> <tr> <td>T1</td><td>450</td></tr> <tr> <td>T2</td><td>300</td></tr> <tr> <td>T3</td><td>200</td></tr> <tr> <td>T4</td><td>135</td></tr> <tr> <td>T5</td><td>100</td></tr> <tr> <td>T6</td><td>85</td></tr> </table>		Temperature class	Maximum surface temperature °C	T1	450	T2	300	T3	200	T4	135	T5	100	T6	85
Temperature class	Maximum surface temperature °C														
T1	450														
T2	300														
T3	200														
T4	135														
T5	100														
T6	85														

#### FM Standards

Title	Number	Issue Date
Electrical Equipment for Use in Hazardous (Classified) Locations, General Requirements	FM 3600	2011
Non-incendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Division 1 and 2, Hazardous (Classified) Locations	FM 3611	2004
Electrical and Electronic Test, Measuring and Process Control Equipment	FM 3810	2005
Electrical apparatus for explosive gas atmospheres. Part 0: General Requirements	ANSI/ISA-60079-0	2013
Explosive atmospheres Part 15: Equipment protected by type of protection “n”	ANSI/ISA-60079-15	2012

### CSA Standards

Title	Number	Issue Date
Non-incendive Electrical Equipment for use in Hazardous Locations	CAN Std C22.2 No. 213 - M1987 (R2013)	1987 (R2013)
Electrical and Electronic Test, Measuring and Process Control Equipment	CAN/CSA-C22.2 No. 61010-1-12	2012
Electrical apparatus for explosive gas atmospheres. Part 0: General Requirements	CAN/CSA-C22.2 No. 60079-0:11	2011
Explosive atmospheres Part 15: Equipment protected by type of protection “n”	CAN/CSA-C22.2 No. 60079-15:12	2012

### ATEX Standards

Title	Number	Issue Date
Electrical apparatus for explosive gas atmospheres. Part 0: General Requirements	EN 60079-0	2012
Electrical apparatus for explosive gas atmospheres Construction, test and marking of type of protection “n” electrical apparatus.	EN 60079-15	2010

### IEC Standards

Title	Number	Issue Date
Electrical apparatus for explosive gas atmospheres. Part 0: General Requirements	IEC 60079-0	2011
Electrical apparatus for explosive gas atmospheres Construction, test and marking of type of protection “n” electrical apparatus.	IEC 60079-15	2010

## 2.7.2. CE Compliance Standards

### Low Voltage Directive (LVD)

Title	Number	Issue Date
Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements	EN 61010-1	2010

### Electromagnetic Compatibility (EMC) Directive

Title	Number	Issue Date

Title	Number	Issue Date
Electrical equipment for measurement, control and laboratory use - EMC requirements -- Part 1: General requirements	EN 61326-1	2013
Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement.	CISPR 11: 2009+A1	2010
Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16A per phase)	IEC 61000-3-2	2009
Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection	IEC 61000-3-3	2005
Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test	IEC 61000-4-2	2008
Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test	IEC 61000-4-3: 2006+A1:2007+A2	2010
Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test	IEC 61000-4-4: 2004+A1	2010
Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test	IEC 61000-4-5	2005
Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields	IEC 61000-4-6	2008
Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test	IEC 61000-4-8	2009
Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests	IEC 61000-4-11	2004

### 2.7.1. Other Standards

Item	Specification
Flammability	UL 94 V-0
EMC	C-Tick Mark
Conformal Coating	ANSI/ISA S71.04 Class G3
Vibration	IEC 60068-2-6: 1.0 g acceleration over 10–150 Hz; 0.5 g acceleration over 150–2000 Hz

## 3. Model Numbers

### 3.1. Hardware

To simplify the ordering process, RTU2020 has a limited number of model numbers to provide complete RTUs. For example, for one complete non-redundant Controller with Onboard Mixed I/O Module, only 1 model number is required, SC-UCMX01.

Model Number	Description
SC-UCMX01 <sup>1</sup>	Non-redundant Controller with Onboard Mixed I/O Module, 28 channels
SC-UMIX01 <sup>2</sup>	Mixed IO Module, 28 channels
SC-TEPR01	Expansion End Plate, Right
SC-TEPL01	Expansion End Plate, Left
Note 1 – Includes a complete Controller: CPM and IOTA	
Note 2 – Includes a complete IOM: IOM and IOTA	

### 3.2. Software Licenses

#### 3.2.1. Controller Resident

Model Number	Description
SP-IHARTP <sup>1</sup>	HART Protocol Enabler License
SP-MRUN01 <sup>2</sup>	Meter Run License, one (1)
Note 1 – HART enabler license required for each I/O module (onboard or expansion) where HART digital access is required	
Note 2 – Required per meter run per RTU for electronic flow meter functionality. Maximum meter runs supported per RTU is 4. If an RTU has 4 meter runs then 4 x SP-MRUN01 are required.	

#### 3.2.1. Configuration Tool Resident

Model Number	Description
SP-EBLDR1 <sup>1</sup>	RTU Builder, client license
SP-MCALC1 <sup>2</sup>	Metering Calculation Library, site license
Note 1 – One required for each computer (physical or virtual) RTU Builder is to be installed on. Can run both online and offline.	
Note 2 – One required per site. The library can be used with all instances of RTU Builder on the same site.	

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