

Power Design Report

**Lena Road
From State Road SR 70
To State Road SR 64**

Project Number 148400103



Prepared for Florida Power & Light

By:

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Introduction

The purpose of this report is to validate the ITS electrical design shown on the plans. The following calculations provide the basis for all the conductor, conduit, and equipment sizes and ratings shown on the plans and specifications. The power system design shall be in conformance to the National Electrical Code (NFPA 70), the National Electrical Safety Code (IEEE C2), and Florida Power & Lighting requirements and in accordance with FL Chapter 61G15-33 Responsibility Rules of Professional Engineers Concerning the Design of Electrical Systems.

Voltage Drop Analysis

Voltage drop calculations are used to size the ITS system conductors. The conductor sizes are selected to limit the voltage drop from service to device to 5% or less so that the electrical equipment in the cabinet can operate within its allowable voltage range.

The equation used to determine voltage drop is as follows:

$$\% \text{ Voltage Drop} = (2 * L * R * I / 1000) / E * 100\%$$

L = Length of circuit in linear feet

R = Conductor resistance as shown in

Table 1

I = Amperage

E = System voltage

R Value in PVC	
Wire Size	R
#6	0.51
#4	0.321
#3	0.238
#2	0.254
#1/0	0.127
#2/0	0.101
#3/0	0.0797
#4/0	0.0626
250	0.0535

Table 1: NEC R Values for Conductors

ITS Equipment Loads

The assumed power requirements for the ITS equipment used in the project are listed in Table 2.

	CCTV Camera	MVDS	Video Encoder	Full DMS: Walk-In VF-2020-96x400-20-RGB	T-DMS: Front Access VF-2420-20-RGB	Bluetooth TTS	WWDS	Ethernet Switch	Serial Device Server	350W UPS	2000W UPS	Receptacle	Ventilation Fan	Cabinet Light
Volt-Amps (VA)	60	8.1	12	5520	3840	5	22	20	1.5	286	880	1800	18	20
	Amperage (A)													
120V	0.5	0.0675	0.1	46	32	0.042	0.183333	0.16667	0.0125	2.38333	7.33333	15	0.15	0.16667

Table 2: ITS Device Loads

Table 3 below shows the devices in each equipment cabinet.

LENA ROAD ITS CABINETS AND DEVICES																			
CABINET	Distribution Voltage	CCTV	MVDS	Video Encoder	Full DMS: Walk-In VF-2020-96x400-20- RGB	T-DMS: Front Access VF-2420-20-RGB	Bluetooth TTS	WWDS	Ethernet Switch	Serial Device Server	350W UPS	2000W UPS	Receptacle	Ventilation Fan	Cabinet Light	Total VA	Total Amps	125% Total VA	125% Total Amps
CABINET 1 (STA. 223+ 00)	120	1	1				1		1	1	1	1	1	1	1	2219	18.49	2774	23.12

Table 3: ITS Cabinet Loads

Service Locations

The proposed design consists of a Florida Power & Lighting location at one MVDS and CCTV pole for this project. The service point location on the plan sheet is shown at the end of this report.

Service Point 1

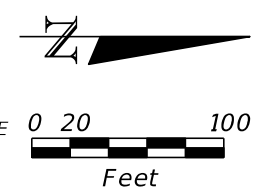
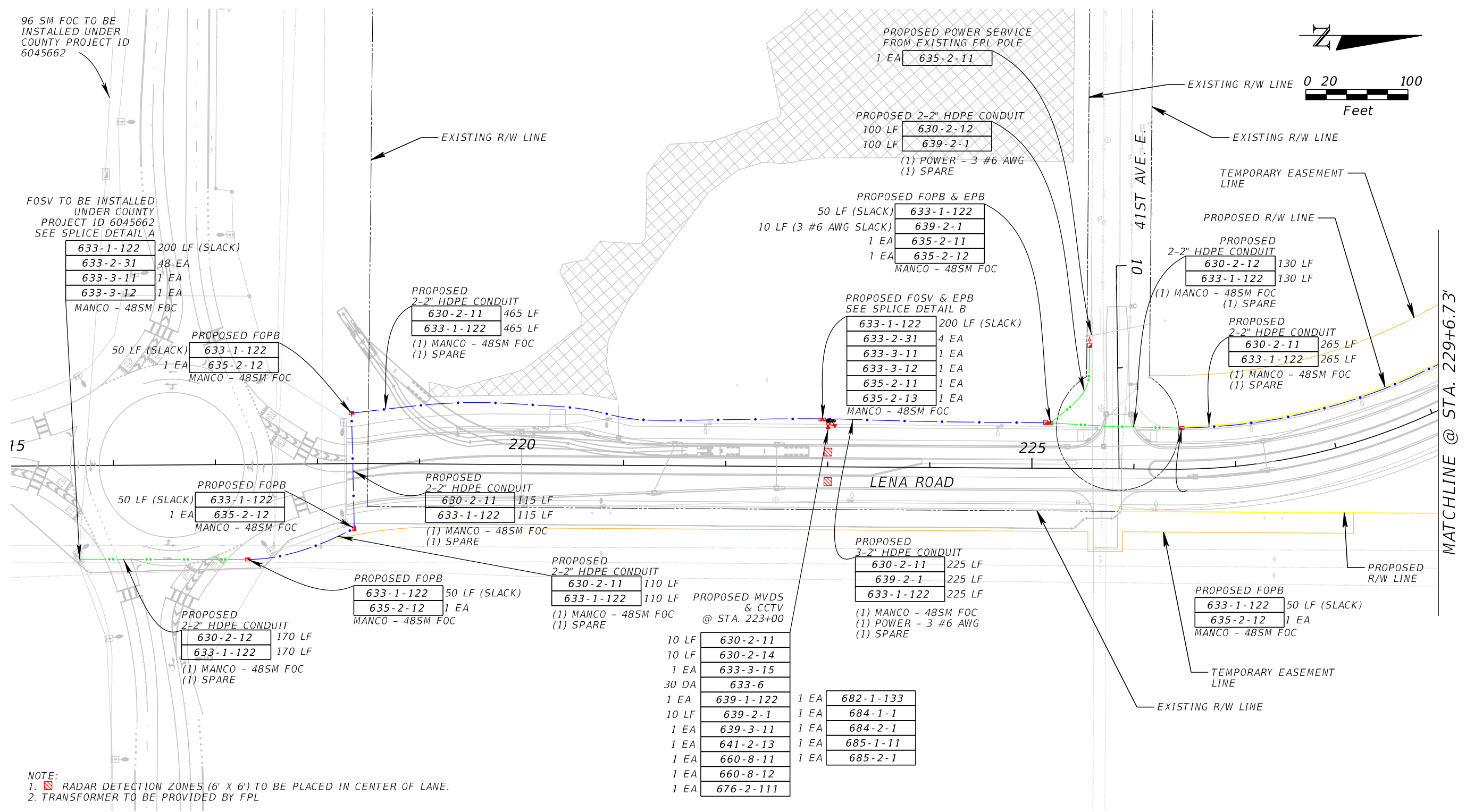
This is a proposed 120V service located at approximately STA. 225+60. It serves only one ITS device. The voltage drop calculation shown is from FPL power pole to the ITS device cabinet.

PROPOSED 120V SP NEAR STA. 223+00, CIRCUIT 1					
Cabinet	Voltage	V.D.	Distance (ft.)	Amps (A)	Wire
Cabinet 1 (STA. 223+00)	114.52	5.48	335	18.49	#6
Total V.D. %					4.56

Table 4: Service Point 1 Voltage Drop Calculations

96 SM FOC TO BE INSTALLED UNDER COUNTY PROJECT ID 6045662

FOSV TO BE INSTALLED UNDER COUNTY PROJECT ID 6045662 SEE SPLICE DETAIL A



633-1-122	200 LF (SLACK)
633-2-31	48 EA
633-3-11	1 EA
633-3-12	1 EA
MANCO - 48SM FOC	

PROPOSED FOPB	
50 LF (SLACK)	633-1-122
1 EA	635-2-12
MANCO - 48SM FOC	

PROPOSED 2-2" HDPE CONDUIT	
465 LF	630-2-11
465 LF	633-1-122
(1) MANCO - 48SM FOC	
(1) SPARE	

PROPOSED FOPB & EPB	
50 LF (SLACK)	633-1-122
10 LF (3 #6 AWG SLACK)	639-2-1
1 EA	635-2-11
1 EA	635-2-12
MANCO - 48SM FOC	

PROPOSED FOSV & EPB SEE SPLICE DETAIL B	
200 LF (SLACK)	633-1-122
4 EA	633-2-31
1 EA	633-3-11
1 EA	633-3-12
1 EA	635-2-11
1 EA	635-2-13
MANCO - 48SM FOC	

PROPOSED 2-2" HDPE CONDUIT	
130 LF	630-2-12
130 LF	633-1-122
(1) MANCO - 48SM FOC	
(1) SPARE	

PROPOSED 2-2" HDPE CONDUIT	
265 LF	630-2-11
265 LF	633-1-122
(1) MANCO - 48SM FOC	
(1) SPARE	

PROPOSED FOPB	
50 LF (SLACK)	633-1-122
1 EA	635-2-12
MANCO - 48SM FOC	

PROPOSED 2-2" HDPE CONDUIT	
115 LF	630-2-11
115 LF	633-1-122
(1) MANCO - 48SM FOC	
(1) SPARE	

PROPOSED FOPB	
50 LF (SLACK)	633-1-122
1 EA	635-2-12
MANCO - 48SM FOC	

PROPOSED 2-2" HDPE CONDUIT	
110 LF	630-2-11
110 LF	633-1-122
(1) MANCO - 48SM FOC	
(1) SPARE	

PROPOSED MVDS & CCTV @ STA. 223+00	
10 LF	630-2-11
10 LF	630-2-14
1 EA	633-3-15
30 DA	633-6
1 EA	639-1-122
10 LF	639-2-1
1 EA	639-3-11
1 EA	641-2-13
1 EA	660-8-11
1 EA	660-8-12
1 EA	676-2-111

PROPOSED 3-2" HDPE CONDUIT	
225 LF	630-2-11
225 LF	639-2-1
225 LF	633-1-122
(1) MANCO - 48SM FOC	
(1) POWER - 3 #6 AWG	
(1) SPARE	

1 EA	682-1-133
1 EA	684-1-1
1 EA	684-2-1
1 EA	685-1-11
1 EA	685-2-1

PROPOSED FOPB	
50 LF (SLACK)	633-1-122
1 EA	635-2-12
MANCO - 48SM FOC	

NOTE:
 1. [Symbol] RADAR DETECTION ZONES (6' X 6') TO BE PLACED IN CENTER OF LANE.
 2. TRANSFORMER TO BE PROVIDED BY FPL

MATCHLINE @ STA. 229+6.73'

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

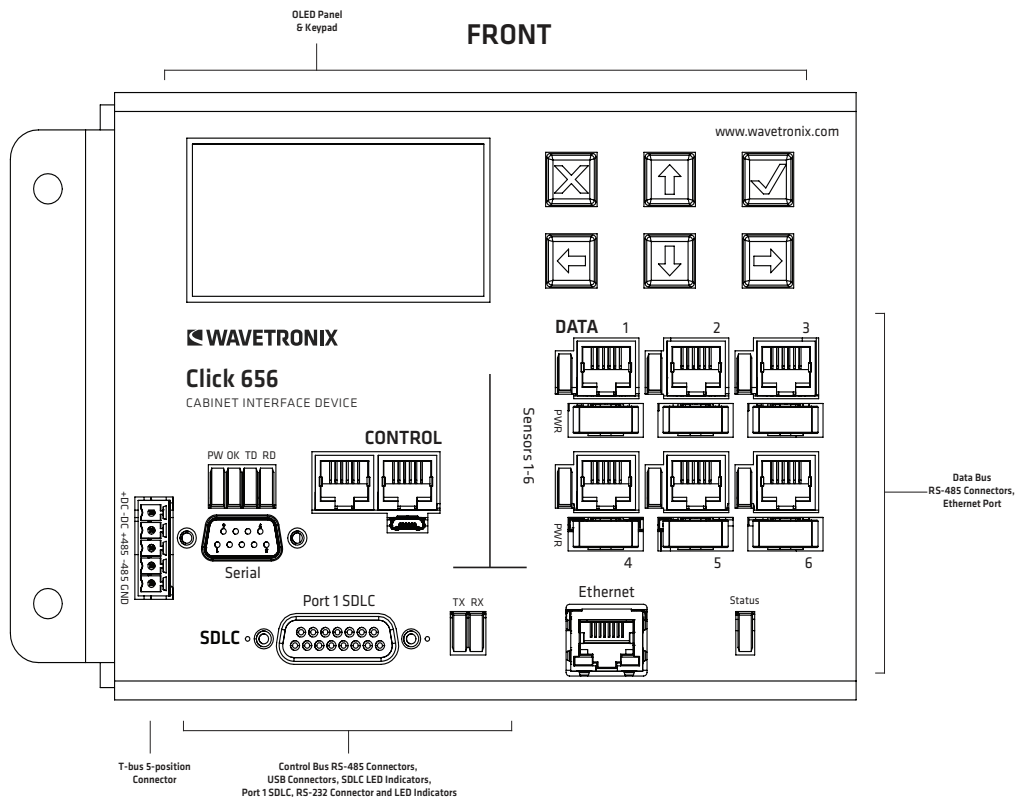
	<p>© 2023 KIMLEY-HORN AND ASSOCIATES, INC. 201 NORTH FRANKLIN STREET, SUITE 1400, TAMPA, FL 33602 PHONE: (813) 635-5514 WWW.KIMLEY-HORN.COM</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>KHA PROJECT</td><td>148400100</td></tr> <tr><td>DATE</td><td>JULY 2023</td></tr> <tr><td>SCALE</td><td>AS SHOWN</td></tr> <tr><td>DESIGNED BY</td><td>YL</td></tr> <tr><td>DRAWN BY</td><td>KCH</td></tr> <tr><td>CHECKED BY</td><td>NRH</td></tr> </table>	KHA PROJECT	148400100	DATE	JULY 2023	SCALE	AS SHOWN	DESIGNED BY	YL	DRAWN BY	KCH	CHECKED BY	NRH	<p>MANATEE COUNTY LENA ROAD</p>	<p>LICENSED PROFESSIONAL</p> <p>NICOLE R. HECK, P.E. FL LICENSE NUMBER 84306</p>	<p>ITS PLAN (1)</p>	<p>SHEET NUMBER</p> <p>T-9</p>			
KHA PROJECT	148400100																				
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Cabinet interface device

The Click 656 provides support for SmartSensor Matrix and Advance in one compact case. This module communicates directly to the controller through SDLC, and supports contact closure devices as well. It also provides power, surge protection, and Ethernet connectivity for all sensors.



- Provides power, connectivity, and surge protection for up to six SmartSensors
- Sends sensor detection data directly to controller through the SDLC port
- Provides up to 64 detector channels via SDLC communications
- Can also be used to send sensor detection data to contact closure cards
- Provides an Ethernet port for network connectivity
- Has a power switch for each sensor, allowing you to easily turn them off one by one
- Has multiple configuration connections for communicating from your computer to the connected sensors:
 - USB
 - RJ-11 jacks for RS-485
 - DB-9 connector for RS-232
 - T-bus port
- Can be easily installed in standard 19" cabinet or used on a shelf
- Can be used in place of preassembled backplates and other cabinet devices



Technical specifications

Included components

- Click 656
- AC power cord
- Extra fuse
- Terminal blocks for attaching to cable
- Ethernet cable

Physical

- Weight: 6 lbs. (2.72 kg)
- Physical dimensions: 6.6 in. × 5.125 in. × 7.3 in. (16.8 cm x 13 cm x 18.5 cm)
- Ambient operating temp: -29°F to 165°F (-34°C to 74°C)
- Humidity: up to 95% RH

Mounting

- Shelf-mount
- 19" rack-mount

Power

- Power supply voltage: 100 to 240 VAC
- AC frequency: 50–60 Hz
- Max power: 112 W @ 80°C
- 24 VDC output on sensor connectors

Connections and communication

- Power
 - AC input: IEC AC input
- Ethernet
 - One RJ-45 10/100 Ethernet jack on the front of the device
- SDLC
 - One SDLC port on the front of the device
- Six terminal block connectors on back of device for connecting to sensors
 - Cable terminal points for sensor power and RS-485 communications
 - Matching terminal blocks are included with Click 656
 - Matches terminal blocks used for cable termination with Wavetronix intersection preassembled backplates
- Six RJ-11 jacks on faceplate of device for connecting to contact closure devices
 - Communicate via RS-485
 - Jacks make up physical interface of data bus on device and are for sending detection data from sensors on to contact closure devices such as rack cards (which are not included)
 - Communicate with rack cards via jumper cables
- Six communication ports on faceplate make up physical interface of control bus and are for connecting to the sensors to configure them

Ordering information

Click 656
102-0451

Accessories

102-0462 – Click 656 3U Mounting Shelf

310-0411 – SDLC Cable

310-0413 – SDLC Y Cable

102-0449 – 4-port SDLC Hub

Contact us

801.734.7200
sales@wavetronix.com
www.wavetronix.com

- DB-9 port for communicating via RS-232
- Two RJ-11 jacks for communicating via RS-485
- USB micro-B connector
- T-bus port for connecting to a T-bus; allows Click 656 to send DC power and RS-485 communications to other devices connected to a T-bus

Other features

- Four multicolored LEDs with activity indicating functions:
 - Red LED (PW) illuminates when device has power
 - Blue LED (OK) extinguishes if device has been disabled by surges
 - Green LED (TD) illuminates when data is transmitted on the control bus
 - Yellow LED (RD) illuminates when data is received on the control bus
- Each data bus RJ-11 jack on the faceplate corresponds to one sensor and has the following features:
 - Switch for turning the power to that sensor on and off
 - LED for indicating when that sensor has power
- Switch for turning power on and off to entire device
- OLED panel and keypad for on-site device configuration
- Web interface for device discovery and output configuration using web browser
- Device supports connecting up to six SmartSensors to the controller, providing up to 64 detector channels via SDLC communications

NEMA TS2-2003 testing

- Complies with the applicable standards stated in the NEMA

TS2-2003 Standard

- Test results available for each of the following tests:
 - Shock pulses of 10 g, 11 ms half sine wave
 - Vibration of 0.5 Grms up to 30 Hz
 - 300 V positive/negative pulses applied at one pulse per second at minimum and maximum AC supply voltage
 - Stored at -49°F (-45°C) for 24 hours
 - Stored at 185°F (85°C) for 24 hours
 - Operation at -29.2°F (-34°C) and 89 VAC
 - Operation at -29.2°F (-34°C) and 135 VAC
 - Operation at 165.2°F (74°C) and 135 VAC
 - Operation at 165.2°F (74°C) and 89 VAC

FCC testing

- FCC-compliant

Testing

- Passes manufacturer's test before shipping

Surge immunity

- Surge immunity sensor ports: IEC/EN 61000-4-5 level 4
- Surge immunity AC input: IEC/EN 61000-4-5 level 3

Extended support

- Extended support options are available from Wavetronix; contact a Wavetronix representative for more information

Warranty

- Two-year warranty against material and workmanship defect

Bid specifications

1.0 General. This item shall govern the purchase and installation of a cabinet interface device (CID) equivalent to the Wavetronix Click 656. Test results and other documentation demonstrating performance and capabilities shall be provided.

2.0 Product description. The CID shall be a module that provides power and surge protection and that communicates with contact closure devices, ethernet, and controllers through SDLC. The CID shall be shipped with the AC power cord, Ethernet cable, and terminal blocks necessary for wiring it, as well as with an extra fuse.

3.0 Physical. The CID shall not exceed 6 lbs. (2.72 kg) in weight.

The CID shall not exceed 6.6 in. × 5.125 in. × 7.3 in. (16.8 cm x 13 cm x 18.5 cm) in its physical dimensions.

The CID shall operate in the temperature range of -29°F to 165°F (-34°C to 74°C) and in humidity up to 95% RH.

4.0 Mounting. The CID shall be either rack-mounted in a standard 19" rack or shelf-mounted.

5.0 Power. The power supply voltage of the CID shall be 100 to 240 VAC. Its AC frequency shall be 50–60 Hz and the maximum power shall be 112 W at 80°C.

The CID's sensor connectors shall output 24 VDC.

6.0 Connections and communication. The CID shall include the following connections for power and communication:

6.1 Power. The CID shall have an IEC AC input.

6.2 Terminal block connectors. The CID shall have six terminal block connectors for connecting to sensors. These connectors shall be for terminating cables that carry power and RS-485 communications to and from the sensors.

6.3 Data RJ-11 connectors. The CID shall have six RJ-11 jacks for sending detection data from sensors to contact closure devices such as rack cards via jumper cables. This data shall be sent via RS-485. These jacks shall make up the physical interface of a dedicated data bus.

6.4 Control connectors. The CID shall have six other communication ports. These ports shall make up the physical interface of a dedicated control bus and shall allow users to connect to the sensors and configure them.

- DB-9 port for communicating via RS-232
- Two RJ-11 jacks for communicating via RS-485
- USB micro-B connector
- T-bus port for connecting to a T-bus

6.5 Ethernet connector. The CID shall have an RJ-45 10/100 Ethernet port to allow connection to a local network.

6.6 SDLC port. The CID shall have an SDLC port for direct connection to a traffic controller.

7.0 Other features. The CID shall have the following other features:

7.1 LEDs. The CID shall have four multicolored LEDs with activity-indicating functions:

- An LED that indicates when the device has power
- An LED that indicates if the device has been disabled by surges
- An LED that indicates when data is being transmitted on the control bus
- An LED that indicates when data is being received on the control bus.

7.2 Data RJ-11 jack features. The four jacks that make up the physical interface of the data bus (and that each correspond to one sensor) shall have a switch for turning their corresponding sensor off and an LED that indicates when that sensor has power.

7.3 Power switch. The CID shall have a switch for turning power off for the entire device.

7.4 OLED panel with keypad. The CID shall have a OLED panel on the device with a keypad for device configuration.

7.5 Web interface. The CID shall have a web interface for device configuration, accessible through a web browser from a network-connected device.

7.6 Configuration. The CID configuration shall support connecting up to six detectors to the controller, providing up to 64 detector channels via SDLC communications.

8.0 NEMA TS2-2003 testing. The CID shall comply with the applicable standards stated in the NEMA TS2-2003 Standard. Test results shall be made available for each of the following tests:

- Shock pulses of 10g, 11 ms half sine wave
- Vibration of 0.5 Grms up to 30 Hz
- 300 V positive/negative pulses applied at one pulse per second at minimum and maximum AC supply voltage
- Cold temperature storage at -49°F (-45°C) for 24 hours
- High temperature storage at 185°F (85°C) for 24 hours
- Low temp, low DC supply voltage at -29.2°F (-34°C) and 89 VAC
- Low temp, high DC supply voltage at -29.2°F (-34°C) and 135 VAC
- High temp, high DC supply voltage at 165.2°F (74°C) and 135 VAC
- High temp, low DC supply voltage at 165.2°F (74°C) and 89 VAC

9.0 FCC testing. The CID shall be FCC-compliant.

10.0 Testing. Before shipping, each CID shall have passed a manufacturer's test.

11.0 Surge immunity. The sensor ports of the CID shall conform to IEC/EN 61000-4-5 level 4 standards; the AC input of the CID shall conform to IEC/EN 61000-4-5 level 3 standards.

12.0 Extended support. Extended support options shall be available. Contact the manufacturer's representative for more information.

13.0 Warranty. The CID shall be warranted to be free from material and workmanship defects for a period of two years from date of shipment.

AUTODOME IP starlight 7000 HD

www.boschsecurity.com



BOSCH

Invented for life



- ▶ High-resolution, 720p HD PTZ camera with high-performance 30x zoom lens for capturing fine details in scenes with extremely low illumination level
- ▶ Intelligent Tracking and alarm rules engine with on-board Intelligent Video Analytics (IVA)
- ▶ Enhanced system flexibility with dual recording options (iSCSI, SD card) and dual power source options (High Power over Ethernet (High PoE) / 24 VAC)
- ▶ Fully configurable quad streaming with individually configurable streams, based on Bosch's Common Product Platform (CPP4)
- ▶ Easy and intuitive installation with multiple preconfigured user modes that allow users to select the camera configuration that is ideal for their applications

The AUTODOME IP starlight 7000 HD is an easy to install, high-speed PTZ dome camera, in a field-proven indoor/outdoor pendant housing or indoor in-ceiling housing, that delivers unmatched picture quality and network performance day and night with superb high-definition (HD) 720p50/60 video and 30x optical zoom.

The camera provides complete network-based control of all dome functionality including pan/tilt/zoom operation, presets, tours and alarms as well as web-based configuration of all dome settings. It also provides direct network video streaming using H.264 compression / bandwidth throttling to efficiently manage bandwidth and storage requirements while delivering outstanding image quality.

Functions

High-performance PTZ camera with starlight technology

Extreme low-light sensitivity makes this camera an exceptional performer in all lighting conditions. In low light, the camera automatically switches from color to monochrome by removing the IR filter to boost sensitivity, while maintaining superior image quality. For operation in the darkest conditions, automatic control of shutter speeds increases sensitivity by more than 50 times.

Starlight models have a 720p50/60 HD imaging platform with starlight technology. The camera produces detailed video images in scenes with limited ambient lighting, without any motion blur associated with cameras that use slow shutters. The camera has been tuned to deliver high-quality HD video in both day and night operation.

Sodium vapor lamp white balance

The camera is an exceptional performer when capturing video under a sodium vapor lamp (a street lamp or tunnel lamp, for example). Images under these conditions may have a yellowish tint, which can make identification difficult. In the Sodium Vapor White Balance mode, the camera automatically compensates for the light from a sodium vapor lamp to restore objects to their original color.

Intelligent Defog

Users can configure the mode to be active continuously, or to activate automatically when the video analytics in the camera detect fog and add light to the video image (and then deactivate when the fog clears or the scene changes).

Five (5) pre-programmed user modes

Five pre-programmed but configurable user modes, optimized with the best settings for a variety of typical applications, make on-site programming easy and user-friendly. Users select from the menu the mode that best defines the environment in which the camera is installed:

- Outdoor – General day-to-night changes with sun highlights and street lighting
- Indoor – Ideal mode for indoor applications where lighting is constant and not changing
- Low light – Optimized for sufficient details at low light
- Motion – Monitoring traffic or fast moving objects; motion artifacts are minimized
- Vibrant – Enhanced contrast color reproduction and sharpness

Users have the ability to customize these modes, if necessary, for the specific requirements of the site.

Image Stabilization

As PTZ cameras continue to increase their optical zoom capabilities, image stabilization becomes critical to eliminate movement caused by unstable camera mounts. Minor movement of the camera mount can shift the field of view by a large distance when the camera is zoomed to a high value. This can render images unusable. The camera incorporates an Image Stabilization algorithm that allows the camera to detect continuous vibration. If it detects vibration, the camera dynamically corrects the shaky video in both the vertical and horizontal axis, resulting in exceptional image clarity and a stable field of view on the monitor.

Superior privacy masking

The camera provides 24 individual, easy to configure privacy masks, with up to 8 displayed in the same scene. As the camera is zoomed, each mask changes size smoothly and quickly, ensuring that the covered object cannot be seen in most cases.

Sophisticated alarm responses

The camera supports advanced alarm control that uses sophisticated rules-based logic to determine how to manage alarms. In its most basic form, a “rule” could

define which input(s) should activate which output(s). In a more complex form, inputs and outputs can be combined with pre-defined or user-specified commands to perform advanced camera functions.

PTZ drive and mechanism

The AUTODOME 7000 supports 256 pre-positions and two styles of Guard Tours: Preset and Record/Playback. Users can configure the preset standard tour with as many as 256 sequential pre-positions, with a configurable dwell time between pre-positions. The AUTODOME Series also provides support for two recorded tours, which are recorded macros of an operator’s movements, including pan, tilt, and zoom activities, and can be played back with the click of a button.

Pan and tilt preset repeatability are accurate to within ± 0.1 degrees to ensure that the correct scene is captured every time. The camera delivers variable pan/tilt speeds from a crawl speed of only 0.1 degrees per second to a full 400 degrees per second. The camera is capable of pan speeds of 400 degrees per second and tilt speeds of 300 degrees per second between prepositions. The camera provides a tilt angle 18 degrees above the horizon, and a pan range of up to 360 degrees continuous rotation.

Content Based Imaging Technology

Content Based Imaging Technology (CBIT) is used to radically improve image quality in all lighting conditions and to identify areas for enhanced processing. The camera examines the scene using intelligent video analytics and provides feedback to re-tune the image processing. This provides better detail in the areas that matter and better all-round performance. The Intelligent Defog technology, for example, allows you to view video clearly through a foggy scene or can improve contrast in dark areas of a scene.

Intelligent Dynamic Noise Reduction reduces bandwidth and storage requirements

The camera uses Intelligent Dynamic Noise Reduction (IDNR) which actively analyzes the contents of a scene and reduces noise artifacts accordingly.

The low-noise image and the efficient H.264 compression technology combine to provide clear images while reducing bandwidth and storage by up to 30% compared to other H.264 cameras. This results in reduced-bandwidth streams that still retain a high image quality and smooth motion. The camera provides the most usable image possible by cleverly optimizing the detail-to-bandwidth ratio.

Bitrate optimized profile

The average typical optimized bitrate in kbits/s for various frame rates is shown in the table:

IPS	720p	480p
60	2600	2000

30	1300	1000
15	1100	800
10	1000	700
5	600	450
2	270	200

Actual bitrate may vary depending on the scene complexities and encoding configurations.

Intelligence

With built-in Intelligent Video Analysis (IVA), the camera reinforces the concept of Intelligence at the Edge. IVA is Bosch's state-of-the-art intelligent video content analysis technology. With IVA, the camera reliably detects and analyzes moving objects while suppressing unwanted alarms from spurious sources in the image. IVA also allows the camera to detect multiple object behaviors including idle and removed objects, loitering, multiple line crossing, and trajectories. IVA supports BEV (Bird's-Eye-View) People Counter and Assisted Self-Calibration. Configurable detection filters improve reliability and reduce operator work load.

Intelligent Tracking

The camera utilizes the built-in Intelligent Video Analytics (IVA) to follow an individual or an object continuously. Objects detected by IVA in a stationary position activate the Intelligent Tracking feature, which controls the pan/tilt/zoom actions of the camera to keep the tracked object in the scene. The new tracking feature is based on robust flow detection algorithms which can reliably track moving objects even under challenging scenes. The tracking and detection reliability can be enhanced further with virtual masking for scenes with a lot of background "noise" such as trees or other objects creating constant motion in the scene. The camera supports three modes for Intelligent Tracking.

- **Auto mode:** When configured in this mode, the camera actively analyzes the video to detect any moving object. If it detects movement, it begins to track the object. This mode is most useful for scenarios where no motion is expected in the scene.
- **Click mode:** In this mode, users can click an object moving in the live video image to enable the camera to track the movement of the selected object. This mode is most useful for scenarios where normal scene activity is expected.
- **IVA-triggered mode:** In this mode, the camera continuously analyzes the scene for IVA alarms or IVA rule violations. If an IVA rule is violated, it triggers the advanced tracking feature of the camera to start following the object / person that triggered the alarm. This unique combination of robust IVA and Intelligent Tracking allows the camera to track moving objects of interest without getting distracted by other moving objects in the scene.

Virtual masking

The camera offers Virtual Masking, which gives users flexibility to mask parts of the scene which should not be considered for flow analysis to trigger Intelligent Tracking. This allows users to mask from IVA/Tracking any background motion (moving trees, pulsating lights, and busy roads) in the scene without blocking the motion from the video.

Common product platform (CPP4)

The camera has an advanced, efficient H.264 encoder (CPP4) embedded for high quality HD streaming video and very efficient streaming and network capabilities. The new platform supports simultaneous streaming of individually configurable HD streams, and allows a choice of HD resolution in combination of SD resolutions.

Advanced streaming

The camera offers advanced streaming capabilities so that you can configure the camera to take advantage of the latest network technology.

The camera is designed on the most efficient and powerful H.264 encoding platform capable of delivering high-quality HD video with very low network load. The new intelligent encoding capabilities drops the bandwidth consumption to extremely low levels if the camera detects no motion in the scene.

The camera is capable of quad streaming which allows the camera to be configured to deliver independent, configurable streams for live viewing, recording, or remote monitoring on constrained bandwidths.

Recording and storage management

A memory card (SD (Secure Digital), SDHC (Secure Digital High Capacity), or SDXC (Secure Digital eXtended Capacity)) can be used for local alarm recording or for scheduled local recording to improve the overall recording reliability. Recording management can be controlled by the Bosch Video Recording Manager (VRM), or the camera can use iSCSI targets directly without any recording software.

ONVIF conformant

The camera conforms to the ONVIF (Open Network Video Interface Forum) specification which guarantees interoperability between network video products regardless of manufacturer. The ONVIF Profile S specification allows easy integration with other conformant devices and VMS. ONVIF conformant devices are able to exchange live video, audio, metadata, and control information, and ensure that they are automatically discovered and connected to network applications such as video management systems.

Video management system support

The camera ships with Bosch Video Client (BVC), an easy-to-use software from Bosch that is suitable for midsize installations. For large enterprise systems,

AUTODOME cameras can be used with Bosch Video Management System (BVMS), which allows enhanced video management and viewing capabilities. In addition, the camera is supported/integrated into all of the leading third party video management systems.

Ease of installation and servicing

The camera has been designed for quick and easy installation; a key feature from Bosch CCTV products. All housings feature recessed screws and latches for increased tamper resistance. Indoor/outdoor pendant housings are rated to provide IP66 protection and offer an operating temperature range down to -40 °C (-40 °F). The indoor/outdoor pendant comes fully assembled with a sunshield and ready for wall or pipe applications with the proper mounting hardware (sold separately). In addition, the camera models with both pendant and in-ceiling housing come equipped with a low-impact, high-resolution acrylic bubble for enhanced image clarity. You can easily convert the outdoor pendant for indoor applications by removing the sunshield. Bosch offers a full complement of hardware and accessories (sold separately) for wall, corner, mast, roof, pipe mount, and in-ceiling applications for indoor and outdoor environments, which allow the camera to be adapted easily to individual site requirements.

Dual power options

All models can be powered by a High Power-over-Ethernet (Bosch High PoE)-compliant network using a Bosch High PoE Midspan (sold separately) over a single network cable and/or a 24VAC power supply. When powered using High PoE or PoE+ (IEEE 802.3at class 4) configuration, only a single cable connection is required to power and to control the camera while also viewing images from the camera. For additional system reliability, users also have the option to connect the 24 VAC power supply to the camera while using High PoE.

Fiber Optic Kit

Bosch offers the optional VG4-SFPCKT, a unique media converter module for use with various Bosch devices. This media converter module is designed to accept a wide-range of 10/100 Mbps SFP modules for use with Multimode or Single-mode optical fiber with LC or SC connectors. The media converter module along with the SFP module is user-installed directly into the camera's power supply box to provide an integrated fiber optic solution.

Easy upgrade

Remotely upgrade the camera whenever new firmware becomes available. This ensures up-to-date products, thus protecting investment with little effort. As with all Bosch products, the camera is designed using the industry's best design process and is subjected to the most stringent testing standards such

as HALT (highly accelerated life testing), which pushes the limits of products to ensure reliability throughout their lifetime.

Certifications and approvals

HD standards

Complies with the SMPTE 296M-2001 Standard in:

- Resolution: 1280x720
- Scan: Progressive
- Color representation: complies with ITU-R BT.709
- Aspect ratio: 16:9
- Frame rate: 50 and 60 frames/s

Electromagnetic Compatibility (EMC)	Complies with FCC Part 15, ICES-003, and CE regulations, including latest versions of EN 50130-4, EN 55022:2006 inc. AL:2007, EN 61000-3-3, EN 61000-6-1, EN 61000-6-2, and EN 50121-4 (Railway applications)
Product Safety	Complies with UL, CE, CSA, EN, and IEC Standards 60950-1 & 22
Environmental	In-ceiling: IP54, Plenum rated (with acrylic bubble) IK10 rating when using optional bubble VGA-BUBBLE-IK10 (sold separately) Indoor/Outdoor Pendant: IP66, NEMA 4X
ONVIF Conformance	EN 50132-5-2



Notice

Conformity to EN 50130-4
One of the following power supply units is required to conform to the EN 50130-4 standard: VG4-A-PSU0, VG4-A-PSU1, VG4-A-PSU2, VG4-A-PA0, VG4-A-PA1, or VG4-A-PA2.

Parts included

In-Ceiling

Quantity	Item
1	AUTODOME IP starlight 7000 HD In-Ceiling camera with tinted acrylic bubble and white trim ring
1	Interface box
1	Optional black trim ring
1	Ceiling gasket (for IP54 conformance)
1	Product DVD (which includes complete Operation Manual)
1	Packet of printed Safety literature

Outdoor Pendant

Quantity	Item
1	AUTODOME IP starlight 7000 HD Pendant camera with clear acrylic bubble and sunshield
1	Packet of printed Safety literature
1	Product DVD (which includes complete Operation Manual)
1	Packet of printed Safety literature

Notes:

–The pendant can be converted to an indoor pendant by removing the sunshield.

–Mounting hardware and accessories are available separately.

Technical specifications**AUTODOME IP starlight 7000 HD camera**

Imager	1/3-type Exmor CMOS sensor
Effective Picture Elements (Pixels)	1305 x 1049 (1.37 MP)
Lens	30x Zoom 4.3 mm to 129 mm F1.6 to F4.7
Field of View (FOV)	2.1° to 59°
Focus	<i>Automatic with manual override</i>
Iris	<i>Automatic with manual override</i>
Digital Zoom	12x

Sensitivity / Minimum Illumination (typical)	30 IRE	50 IRE
Day Mode (Color)		
Fixed shutter 1/30, High Sensitivity mode On	0.052 lux	0.166 lux
Fixed shutter 1/30, High Sensitivity mode Off	0.26 lux	0.66 lux
SensUp On (max. ¼), High Sensitivity mode On	0.0082 lux	0.033 lux
Night Mode (Black and white)		
Fixed shutter 1/30, High Sensitivity mode On	0.0103 lux	0.041 lux
Fixed shutter 1/4, High Sensitivity mode On	0.00129 lux	---
SensUp On (max. ¼), High Sensitivity mode On	0.00065 lux	0.00205 lux

Note: In Black and White (Night) mode / low light situations, High Sensitivity turns on automatically.

Additional Camera Settings

Gain Control	Auto/Manual/Max
Aperture Correction	Horizontal and vertical
Electronic Shutter Speed (AES)	1/1 sec to 1/10000 sec (22 steps)
Dynamic Range	90 dB typical
Signal-to-Noise Ratio (SNR)	>50 dB
Backlight Compensation (BLC)	On/Off
White Balance	2000 K to 10,000 K ATW, AWB Hold, Extended ATW, Manual, Sodium Lamp Auto, Sodium Lamp
Day/Night	Monochrome, Color, Auto
Defog mode feature	Improves visibility when viewing foggy or other low-contrast scenes.

Mechanical

	In-Ceiling	Pendant
Pan Range	360° cont.	360° cont.
Tilt Angle	1° above horizon	18° above horizon
Pre-position Speed	Pan: 400°/s Tilt: 300°/s	Pan: 400°/s Tilt: 300°/s
Pan/Tilt Modes		
• Turbo Mode (Manual Control)	Pan: 0.1°/s – 400°/s Tilt: 0.1°/s – 300°/s	
• Normal Mode	0.1°/s-120°/s	0.1°/s-120°/s
Preset Accuracy	± 0.1° typ.	± 0.1° typ.

Electrical

	In-Ceiling	Pendant
Input Voltage	21-30 VAC, 50/60 Hz; (class II) High PoE (with Bosch Midspan (NPD-6001A); required to power the heater) PoE+ (IEEE 802.3at, class 4 standard) (when used indoors, not powering the heater)	
Power Consumption, typical	24 W / 44 VA	60 W / 69 VA (heaters on) or 24 W / 44 VA (heaters off / without heater connected in power supply box for indoor applications)

Surge Suppression

Protection on Alarm Inputs	Peak current 17 A, peak power 300 W (8/20 µs)
Protection on Alarm Outputs	Peak current 2 A, peak power 300 W (8/20 µs)
Protection on Relay Output	Peak current 7.3 A, peak power 600 W (10/1000 µs)
Protection on Power Input (Dome)	Peak current 7.3 A, peak power 600 W (10/1000 µs)
Protection on Power Output (Arm Power Supply)	Peak current 21.4 A, peak power 1500 W (10/1000 µs)
10/100 Ethernet Data Lines	Peak current 14 A, peak power 200 W (8/20 µs)

Software Control

Camera Setup/ Control	Via web browser (such as Internet Explorer version 7.0 or later), Bosch Configuration Manager, Bosch Video Management System (BVMS), Bosch Recording Station (BRS), or Bosch Video Client (BVC)
Software Update	Network firmware upload

Network

Communications Protocols	Standard Bosch IP protocol, including ONVIF and SNMP v1
Standards / Video compression	H.264 (ISO/IEC 14496-10), M-JPEG, JPEG
Streaming	Four (4) streams with individually configurable frame rate and resolution: <ul style="list-style-type: none"> Two (2) independently configurable H.264 recording streams Two (2) non-recording streams (profiles)
Stream 1 (recording)	Options are: <ul style="list-style-type: none"> H.264 MP 720p50/60 fixed; H.264 MP SD

Note: The options available for Stream 1 depend on the value in the **Max. frame rate** field in the Installer Menu in camera configuration.

Stream 2 (recording)	Options vary depending on Stream 1 selection. Options with "H.264 MP 720p50/60 fixed" selected for Stream 1: <ul style="list-style-type: none"> Copy Stream 1 H.264 MP SD; H.264 MP 720p6/7 fixed; H.264 MP upright (cropped); H.264 MP D1 4:3 (cropped); Option with "H.264 MP SD" selected for Stream 1: H.264 MP SD
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Non-recording profiles	Two (2) streams, I-frame only Options are: <ul style="list-style-type: none"> HD Image Optimized; HD Balanced; HD Bit Rate Optimized; SD Image Optimized; SD Balanced; SD Bit Rate Optimized; DSL Optimized; 3G Optimized
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Resolution (H x V)

720p HD	1280 x 720
432p SD	768 x 432
288p SD	512 x 288
144p SD	256 x 144

Protocols	IPv4, IPv6, UDP, TCP, HTTP, HTTPS, RTP/RTCP, IGMP V2/V3, ICMP, ICMPv6, RTSP, FTP, Telnet, ARP, DHCP, APIPA (Auto-IP, link local address), NTP (SNTP), SNMP (V1, MIB-II), 802.1x, DNS, DNSv6, DDNS (DynDNS.org, selfHOST.de, no-ip.com), SMTP, iSCSI, UPnP (SSDP), DiffServ (QoS), LLDP, SOAP, Dropbox, CHAP, digest authentication
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Ethernet	10BASE-T/100BASE-TX, auto-sensing, half/full duplex
Encryption	TLS 1.0, SSL, DES, 3DES, AES
Ethernet connector	RJ45
Connectivity	ONVIF Profile S, Auto-MDIX
GOP Structure	IP, IBP, IBBP
Data Rate	9.6 kbps to 6 Mbps
Overall IP Delay	240 ms (typical)

Audio	
- Standard	G.711, 8 kHz sampling rate L16, 16 kHz sampling rate AAC, 16 kHz sampling rate
- Signal-to-Noise Ratio	>50 dB
- Audio Streaming	Bidirectional (full-duplex)

Local Storage

Memory Card Slot	User-supplied SD/SDHC/SDXC memory card (maximum 2TB – SDXC)
Recording	Continuous recording of video and audio, alarm/events/schedule recording

Fiber Optic Kit**VG4-SFPSCKT**

Description	Fiber Optic Ethernet Media Converter kit ⁶ . Requires a small form-factor pluggable (SFP) module (sold separately).
Data Interface	Ethernet
Data Rate	10/100 Mbps IEEE 802.3 Compliant Full Duplex or Half Duplex Electrical Port Full Duplex Optical Port
Compatible Receiver	CNFE2MC
Installation	Installed inside a VG4-A-PA0, VG4-A-PA1, VG4-A-PA2, VG4-A-PSU1, or a VG4-A-PSU2 power supply box with supplied mounting hardware

6. Kit available separately and must be installed inside the AUTODOME power supply box.

SFP Modules

Description	Interchangeable modules available for use with MMF or SMF optical fiber.
Data Interface	Ethernet
Data Rate	10/100 Mbps IEEE 802.3 Compliant

Mechanical

Dimensions (LxWxH)	
• SFP-2 and SFP-3	55.5 x 13.5 x 8.5 mm (2.2 x 0.5 x 0.3 in.)
• SFP-25, SFP-26	63.8 x 13.5 x 8.5 mm (2.5 x 0.5 x 0.3 in.)
Weight (all SFP modules)	0.23 kg (.05 lb)

	Type	Connector	Wavelength (transmit / receive)	Max. Distance
SFP-2	MMF	Duplex LC	1310 nm / 1310 nm	2 km (1.2 miles)
SFP-3	SMF	Duplex LC	1310 nm / 1310 nm	20 km (12.4 miles)
SFP-25	MMF	Single SC	1310 nm / 1550 nm	2 km (1.2 miles)
SFP-26	MMF	Single SC	1550 nm / 1310 nm	2 km (1.2 miles)

Fiber Compatibility

Optical Fiber Compatibility, MMF	50/125 µm MMF. For 50/125 µm fiber, subtract 4 dB from the specified optical budget value. Must meet or exceed fiber standard ITU-T G.651.
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Optical Fiber Compatibility, SMF	8–10/125 µm SMF. Must meet or exceed fiber standard ITU-T G.652.
Optical Distance Specifications	Specified transmission distances are limited to the optical loss of the fiber and any additional loss introduced by connectors, splices, and patch panels. The modules are designed to operate over the entire optical loss budget range, so they do not require a minimum loss in order to operate.

Miscellaneous

Sectors/Titling	16 independent sectors with a 20-character title/sector
Masking	24 individually configurable privacy masks
Pre-positions	256, each with a 20-character title
Guard Tours	Two (2) types of tours: <ul style="list-style-type: none"> Recorded tours – two (2) Preset tour – one (1), consisting of up to 256 scenes, consecutively
Supported Languages	English, Chinese, Dutch, French, German, Italian, Japanese, Polish, Portuguese, and Spanish

User Connections

Power, Camera	RJ-45 10/100 Base-TX Ethernet (High Power-over-Ethernet (High PoE)) or PoE+ (IEEE 802.3at, class 4 standard) 21-30 VAC, 50/60 Hz
Power, Heater	RJ-45 10/100 Base-TX Ethernet (High Power-over-Ethernet (High PoE)) 21-30 VAC, 50/60 Hz
Video and Control	RJ-45 10/100 Base-TX Ethernet
Alarm Inputs (7)	2 supervised; 5 non-supervised Programmable for "normally open" or "normally closed"
Alarm Outputs (4)	1 dry contact relay; 3 open collector/transistor outputs 32 VDC @ 150 ma max.
Audio	1 x mono line in, 1 x mono line out <ul style="list-style-type: none"> Signal line in: 12 kOhm typical, 1 Vrms max Signal line out: 1 Vrms at 1.5 kOhm, typical

Environmental

	In-Ceiling (with acrylic bubble)	Pendant (with acrylic bubble)
Ingress Protection Rating/ Standard	IP54, Plenum rated	IP66, NEMA 4X

Operating Temperature (with heater wired)	-10 to +40 °C (+14 to +104 °F)	-34 to +74 °C (-30 to +165 °F) (in accordance with NEMA TS 2-2003 (R2008), section 2.1.5.1) -40 to +55 °C (-40 to +131 °F) (continuous operation)
Operating Temperature (without heater wired)		-10 to +55 °C (+14 to +131 °F) (continuous operation)
Storage Temperature	-40 to +60 °C (-40 to +140 °F)	-40 to +60 °C (-40 to +140 °F)
Operating Humidity	0% to 90% RH, non-condensing	0% to 100% RH, condensing ⁷

⁷ For outdoor pendants only, condensing humidity implies moisture can condense to water droplets.

Note: TS2 conformance applies to outdoor models only.

Construction

Dimensions	See dimensional drawings
Weight	
<ul style="list-style-type: none"> In-ceiling 	2.59 kg (5.71 lb)
<ul style="list-style-type: none"> Indoor/Outdoor Pendant 	3.07 kg (6.77 lb)
Bubble Size	153.1 mm diameter (6.03 in.)
Construction Material	
<ul style="list-style-type: none"> Housing 	In-ceiling: Magnesium Pendant: Cast aluminum
<ul style="list-style-type: none"> Bubble 	In-ceiling: HD High-resolution acrylic Pendant: High-resolution acrylic
Standard Color	White (RAL 9003)
Standard Finish	Powder coated, sand finish

Mounts/Accessories

Bubbles

In-ceiling

Clear HD high-resolution acrylic	VGA-BUBHD-CCLA
Tinted HD high-resolution acrylic (Included with in-ceiling camera models.)	VGA-BUBHD-CTIA

Pendant

Clear high-resolution acrylic (Included with pendant camera models.)	VGA-BUBBLE-PCLA
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Tinted high-resolution acrylic	VGA-BUBBLE-PTIA
Clear rugged IK10-rated nylon	VGA-BUBBLE-IK10

Polycarbonate bubbles are not recommended for use with HD products because of optical degradation.

Pendant Arm Mounts

Wall Arm (No Transformer)	VG4-A-PA0
Wall Arm (120/230 VAC Transformer)	VG4-A-PA1 / VG4-A-PA2
Pendant Arm with Wiring	VGA-PEND-ARM
Mounting plate for VGA-PEND-ARM	VGA-PEND-WPLATE
Trim skirt for VG4 Series Power Supplies	VG4-A-TSKIRT

Optional Mounting Plates for Arm Mounts

Corner Mounting Plate	VG4-A-9542
Mast (Pole) Mounting Plate	VG4-A-9541

Pendant Pipe Mounts

Pipe Mount Cap	VG4-A-9543
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Pendant Roof Mounts

Roof (Parapet) Mount (VG4-A-9543 Pipe Mount Cap required. Available separately.)	VGA-ROOF-MOUNT (1.5-inch NPT tapered male threads)
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Optional Mounting Plates for Roof Mounts

Flat Roof Adapter for Parapet Mount	LTC 9230/01
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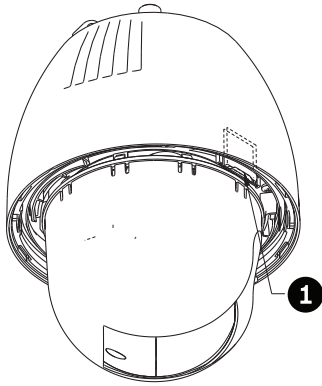
In-ceiling Support Kits

Bracket for suspended or drop ceilings	VGA-IC-SP
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Power Supplies

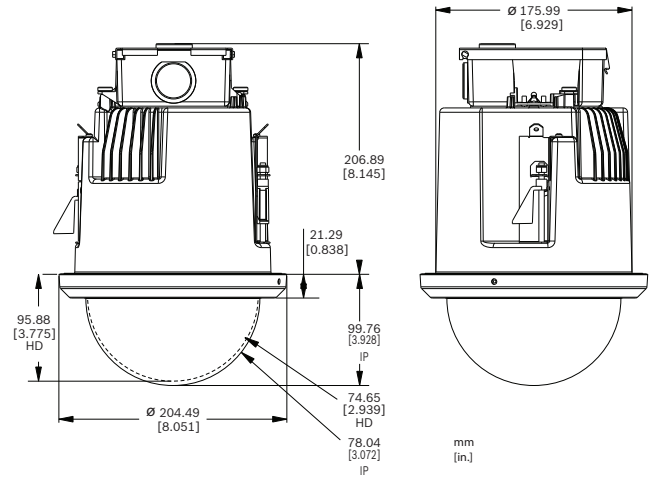
High PoE Midspan 60W, single port, AC in	NPD-6001A
Outdoor Power Supply Box, no transformer	VG4-A-PSU0
Outdoor Power Supply Box (120/230 VAC Transformer)	VG4-A-PSU1 / VG4-A-PSU2
Fiber Optic Kit	VG4-SFPCKT

Dimensional Drawings

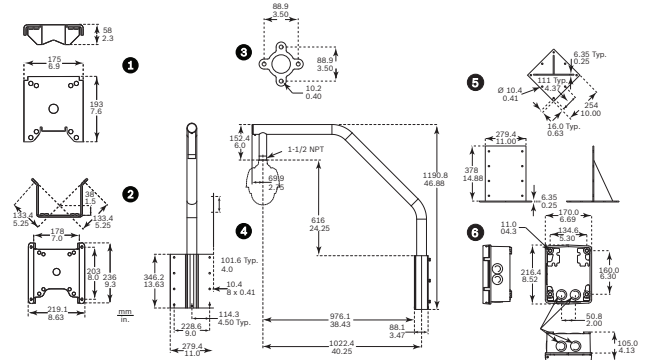
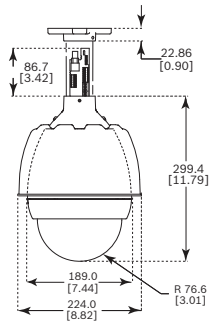


AUTODOME 7000 – Slot for SD card

1 Slot for SD card

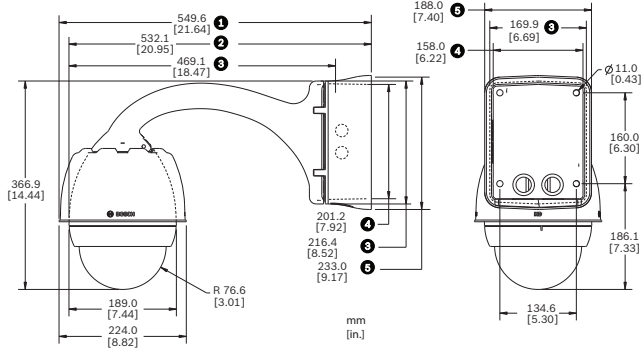


AUTODOME 7000 Dimensions – In-ceiling



AUTODOME Dimensions - Mounts

- 1 Mast Mount
- 2 Corner Mount
- 3 Pipe Mount
- 4 Roof Mount
- 5 Roof Mount Adapter
- 6 Power Supply for Pipe and Roof Mounts



AUTODOME 7000 Dimensions – Pendant, Pipe

- 1 Power supply box and sunshield
- 2 Sunshield removed
- 3 Mounting plate
- 4 Power supply box
- 5 Trim skirt

Ordering information

VG5-7130-EPC4 AUTODOME starlight 7000 HD camera, 720p60, 30x zoom, pendant, with clear bubble

Superb quality indoor/outdoor IP PTZ dome camera. 720p HD resolution; 30x optical zoom; IVA; PoE; iSCSI/SD; multiple pre-programmed user modes; H. 264 quad-streaming (CPP4); IP66; pendant mount, clear bubble.

Order number **VG5-7130-EPC4**

VG5-7130-CPT4 AUTODOME starlight 7000 HD camera, 720p60, 30x zoom, in-ceiling, tinted bubble

Superb quality indoor IP PTZ dome camera. 720p HD resolution; 30x optical zoom; IVA; PoE; iSCSI/SD; multiple pre-programmed user modes; H.264 quad-streaming (CPP4); IP66; in-ceiling mount, tinted bubble.

Order number **VG5-7130-CPT4**

Accessories

High PoE Midspan, 60 W, single port, AC in
High Power, 60 W Single Port PoE Midspan with AC in
Order number **NPD-6001A**

VG4-A-PSU0 24 VAC Power Supply Unit
Power supply, 24 VAC input, for a PTZ camera in the AUTODOME Series. White, aluminum enclosure with cover, rated IP66 and IK 08. 100 W output. Optional trim skirt (sold separately).
Order number **VG4-A-PSU0**

VG4-A-PSU1 120 VAC Power Supply Unit
Power supply with transformer, 120 VAC input, for an AUTODOME or MIC7000 Series PTZ camera. White, aluminum enclosure with cover, rated IP66 and IK 08. 100 W output. Optional trim skirt (sold separately).
Order number **VG4-A-PSU1**

VG4-A-PSU2 230 VAC Power Supply Unit
Power supply with transformer, 230 VAC input, for an AUTODOME or MIC7000 Series PTZ camera. White, aluminum enclosure with cover, rated IP66 and IK 08. 100 W output. Optional trim skirt (sold separately).
Order number **VG4-A-PSU2**

VG4-A-PA0 Pendant Arm Mount
Pendant arm mount with power supply box for an AUTODOME Series camera, no transformer, white
Order number **VG4-A-PA0**

VG4-A-PA1 Pendant Arm Mount with 120 VAC Transformer
Pendant arm mount with power supply box for an AUTODOME Series camera with a 120 VAC transformer, white
Order number **VG4-A-PA1**

VG4-A-PA2 Pendant Arm Mount with 230 VAC Transformer
Pendant arm mount with power supply box for an AUTODOME Series camera with a 230 VAC transformer, white
Order number **VG4-A-PA2**

VGA-PEND-ARM Pendant Arm with Wiring
Compatible with an AutoDome Series pendant housing
Order number **VGA-PEND-ARM**

VGA-PEND-WPLATE Mounting Plate
Mounting plate for VGA-PEND-ARM, compatible with an AutoDome Series camera
Order number **VGA-PEND-WPLATE**

VGA-ROOF-MOUNT Roof Mount
Roof parapet mount, white
(VG4-A-9543 Pipe Mount Cap required. Available separately.)
Order number **VGA-ROOF-MOUNT**

LTC 9230/01 Flat Roof Mount Adapter
For mounting a unit in an upright position on a flat surface for roof parapet mount VGA-ROOF-MOUNT
Order number **LTC 9230/01**

VG4-A-9541 Pole Mount Adapter
Pole mount adapter for an AUTODOME pendant arm or a DINION imager, designed for poles with a diameter of 100-380 mm (4-15 in.), white
Order number **VG4-A-9541**

VG4-A-9542 Corner Mount Adapter
Corner mount adapter for an AUTODOME pendant arm or a DINION imager
Order number **VG4-A-9542**

VG4-A-9543 Pipe Mount
Pipe mount, white, for an AutoDome Series pendant housing
Order number **VG4-A-9543**

VGA-IC-SP In-ceiling Support Kit
Suspended ceiling support kit for dome cameras. Aperture Ø177 mm (Ø7 in); maximum supported weight 11.3 kg (25 lb)
Order number **VGA-IC-SP**

VGA-SBOX-COVER Cover for AutoDome Power Supply Boxes
Order number **VGA-SBOX-COVER**

VG4-A-TSKIRT Trim Skirt for AutoDome Power Supply Boxes
Trim skirt for the following AutoDome Series power supply boxes:
VG4-A-PSU0, VG4-A-PSU1, and VG4-A-PSU2
Order number **VG4-A-TSKIRT**

VGA-BUBBLE-PCLA Clear High-resolution Bubble for a Pendant Housing
Low-impact acrylic bubble
Order number **VGA-BUBBLE-PCLA**

VGA-BUBBLE-PTIA Tinted High-resolution Bubble for a Pendant Housing
Low-impact acrylic bubble
Order number **VGA-BUBBLE-PTIA**

VGA-BUBHD-CCLA Clear HD High-Resolution Acrylic Bubble for In-Ceiling AUTODOME cameras
Order number **VGA-BUBHD-CCLA**

VGA-BUBHD-CTIA Tinted HD High-Resolution Acrylic Bubble for In-Ceiling AUTODOME cameras
Order number **VGA-BUBHD-CTIA**

VGA-BUBBLE-IK10 IK10 Bubble for pendant housing
IK10-rated bubble qualified for use with AUTODOME 7000 HD cameras with pendant housings
Order number **VGA-BUBBLE-IK10**

VG4-SFPCKT Fiber Optic Ethernet Media Converter Kit

Ethernet media converter video transmitter/data receiver fiber optic kit for AUTODOME cameras and for MIC-IP-PSU for MIC analog cameras.

Order number **VG4-SFPCKT**

SFP-2 Small Form-factor Pluggable Optical Interface

SFP Fiber Optic Module, Multi-mode, 1310 nm, 2 km (1.2 miles), 2 LC connectors

Order number **SFP-2**

SFP-3 Small Form-factor Pluggable Optical Interface

SFP Fiber Optic Module, Single-mode, 1310 nm, 20 km (12.4 miles), 2 LC connectors

Order number **SFP-3**

SFP-25 Small Form-factor Pluggable Optical Interface

SFP Fiber Optic Module, Multi-mode, 1310/1550 nm, 2 km (1.2 miles), 1 SC connector

Order number **SFP-25**

SFP-26 Small Form-factor Pluggable Optical Interface

SFP Fiber Optic Module, Multi-mode, 1550/1310 nm, 2 km (1.2 miles), 1 SC connector

Order number **SFP-26**

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FXM 350

Rugged UPS Module



- 350W/VA UPS module designed to operate in extreme environments; providing maximum flexibility while ensuring critical loads remain protected and running during power outages and other power disturbances
- Unsurpassed flexibility with dual 120VAC & 24VAC outputs
- Wide range Automatic Voltage Regulation (AVR) lengthens battery life by providing protection without transferring to backup mode during voltage surge or sag
- Local and remote monitoring and control via USB port and Ethernet SNMP interface
- Temperature compensated battery charging protects batteries from overcharging at extreme temperatures, extending the life of the battery
- Independently programmable control and report dry contacts allow monitoring and controlling of key functions

Alpha® FXM is a line of rugged UPS power modules used worldwide in the most demanding environments where clean backup power is needed.







Designed to perform in the most extreme demanding environments, Alpha® FXM units ensure equipment in security, communications, traffic, industrial environments, and many other critical applications remain safe and protected from power disturbances. Thanks to its powerful programmable battery charger, the FXM is capable of providing the runtime you need. All FXM models are available in 120VAC and 230VAC.

Alpha® FXM family of uninterruptible power supplies (UPS) are designed to provide clean and reliable backup power. Featuring an automatic voltage regulation (AVR), each FXM UPS provides power stability in varied power conditions without using batteries as well as the ability to switch to emergency backup power while maintaining critical loads. The factory installed SNMP card allows remote programming, monitoring and automatic e-mail notification via a web browser.

FXM 350 Rugged UPS Module

Consult your Alpha representative for P/N configurations

Electrical	
120VAC Model	
Battery String Voltage:	48VDC or 24VDC
Nominal Voltage:	120VAC
Frequency:	60/50Hz ±5% (auto-detection)
Input:	Voltage Range (w/o transferring to battery mode): 88 to 152VAC Current: <ul style="list-style-type: none"> FXM350-24: 5.3A FXM350-48: 5.7A
Output:	Waveform: Pure sinewave Nominal Voltage: Dual 120VAC, 24VAC Voltage Regulation: ±10% on line mode, ±2% on inverter mode Power at 55°C: 350W/VA Total <ul style="list-style-type: none"> 24VAC: 260W/VA (max) 120VAC: 350W/VA (max) Frequency: Output frequency = Input frequency
230VAC Model	
Battery String Voltage:	24VDC
Nominal Voltage:	230VAC
Frequency:	60/50Hz ±5% (auto-detection)
Input:	Voltage range (w/o transferring to battery mode): 151 to 282VAC Current: 2.7A
Output:	Waveform: Pure sinewave Nominal voltage: 230VAC, 24VAC Voltage regulation: ±10% on line mode, ±2% on inverter mode Power at 55°C: 350W/VA Total <ul style="list-style-type: none"> 24VAC: 260W/VA (max) 120VAC: 350W/VA (max) Frequency: Output frequency = Input frequency
Communication Interface	
Display:	2 x 20 backlit alpha-numeric LCD
Ports:	USB-B Female: Local Communication RJ45: Remote Communication RJ11: Battery Temperature Compensation
Indicators:	Solid Green: Line Mode Flashing Green: Inverter Mode Flashing Red: Alarm Solid Red: Fault
Dry Contacts:	2 x Programmable NO/NC (250VAC, 1A), 2 user inputs
Factory Default:	<ul style="list-style-type: none"> C1: On Battery C2: Low Battery S1: Self Test S2: User Input
Optional Signals Assembly:	3 x Programmable NO/NC (250VAC, 1A), 2 user inputs
Mechanical	
Mounting:	19" or 23" rack with the addition of ears for rack mounting
Dimensions:	mm: 88.14H x 342W x 198D inches: 3.5H x 13.46W x 7.8D
Weight:	8.62kg (19lbs)

Environmental	
Operating Temp Range*:	-40 to 74°C (-40 to 165°F)
Humidity:	Up to 95% (non condensing)
Altitude (m/ft):	Up to 3700 (12,000)**
Audible Noise @ 25°C:	45dBa @ 1 meter (39in)
MTBF (hours):	150K + as per Telcordia SR-332, 100% duty cycle, full load
BTU/Hr:	Normal mode 9W/30.7BTU/hr Backup mode 110W/675 BTU/hr
Performance	
Typical Output Voltage THD:	<3% (resistive load)
Typical Efficiency:	>96% (resistive load)
Typical Transfer Time:	<5ms
Load Crest Factor:	3:1 (load dependent)
Power Connector Options	
120VAC Model	
Input	Output
Standard  Terminal Block	Standard  Terminal Block
230VAC Model	
Standard  Terminal Block	Standard  Terminal Block
Agency Compliance	
Electrical Safety:	UL1778, CSA C22.2 No. 107.3, EN60950-1
Marks:	 
EMI:	CFR47, Part 15 Subpart B, Class A; CES-003 Class A; ENG2040-2
*Derates after 55°C (131°F) **Derates 2°C per 300m (1000ft) above 1400m (4500ft) ***CE applies to 230VAC version only	



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SIEMENS



RUGGEDCOM RSG920P

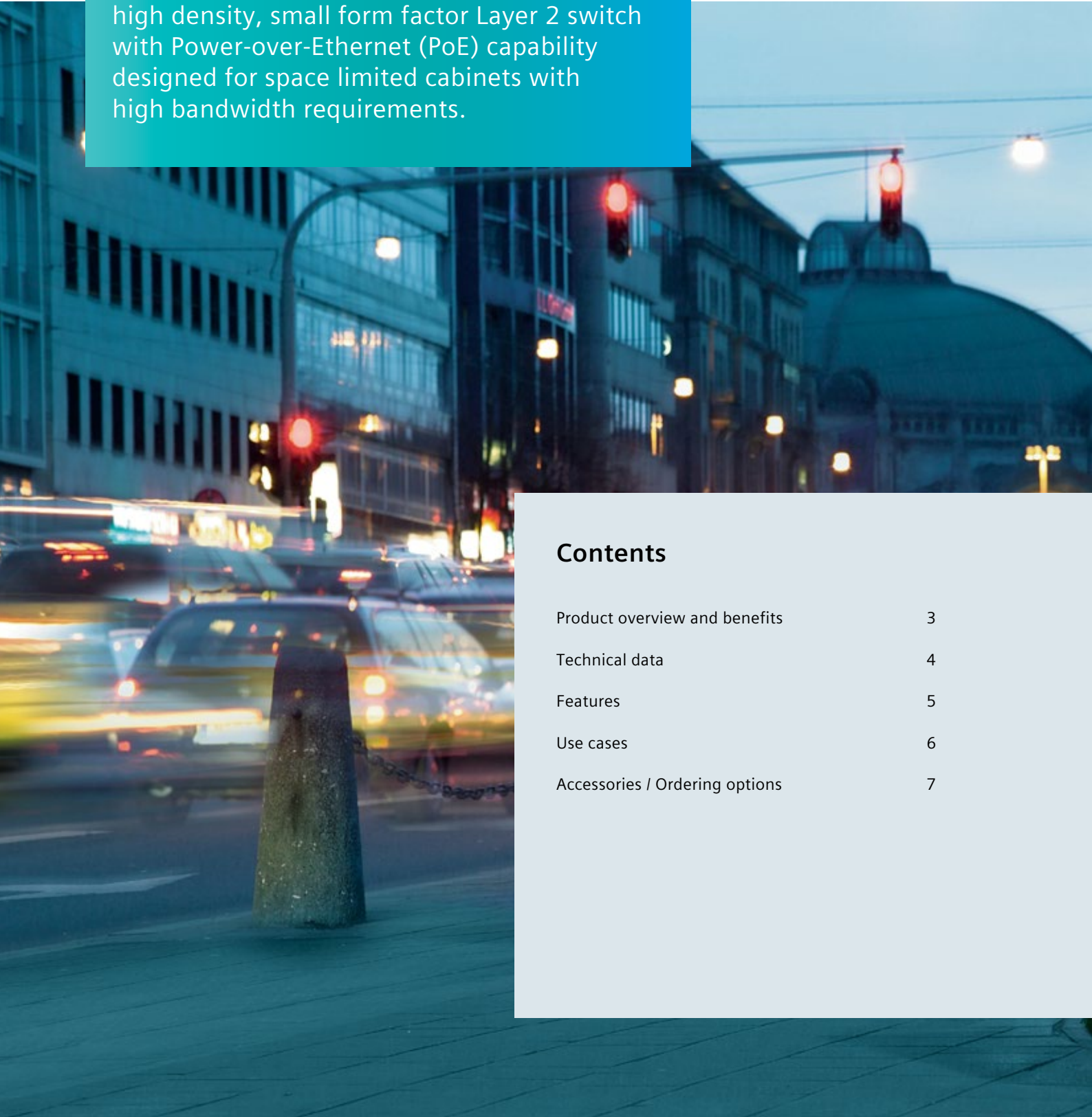
Compact High Density Gigabit Switch

Brochure

03/2017

Purchase from Multicom  www.multicominc.com | 800-423-2594

The RUGGEDCOM RSG920P is a rugged, high density, small form factor Layer 2 switch with Power-over-Ethernet (PoE) capability designed for space limited cabinets with high bandwidth requirements.



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Product overview and benefits	3
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Accessories / Ordering options	7

Product overview and benefits

The RUGGEDCOM RSG920P is a rugged, high density, Ethernet switch designed to operate in harsh environments with widely varying climatic and environmental conditions. Tested and certified to withstand extreme temperature, vibration and shock, the RUGGEDCOM RSG920P offers exceptional reliability for industrial applications such as transportation systems and oil and gas applications.

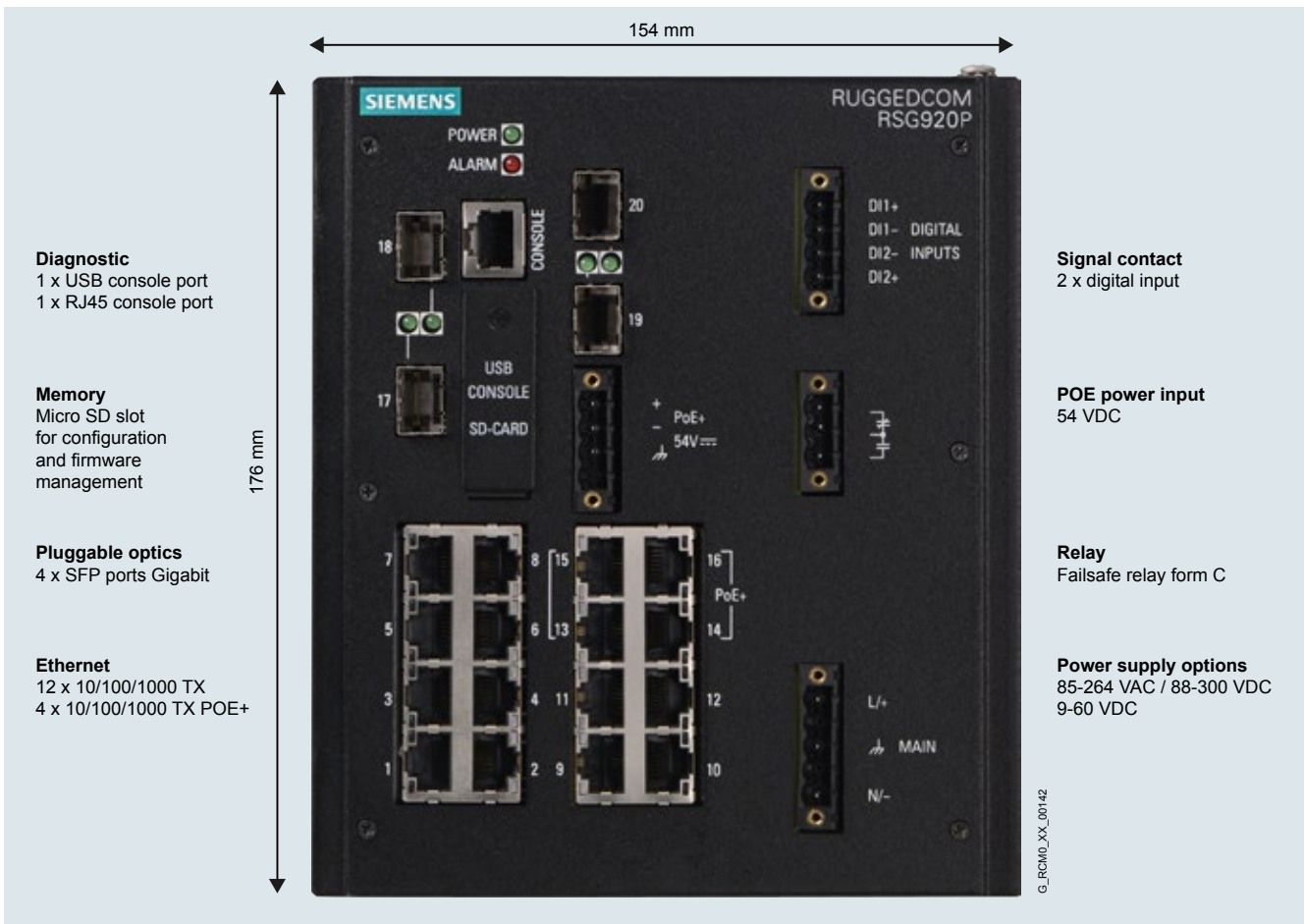
With 20 Gigabit Ethernet ports, the RUGGEDCOM RSG920P is suitable for applications that require high bandwidths and is ready to accommodate future network expansions. 4 SFP slots provide ultimate flexibility in uplink distances and bandwidth with support for Gigabit as well as Fast Ethernet fiber SFP. The small form factor of the RUGGEDCOM RSG920P allows deployment in space limited cabinets and on DIN rails.

With a capability of 4 Power-over-Ethernet (PoE) interfaces supplying up to 120 W (30 W per port) of power, the RUGGEDCOM RSG920P can accommodate various PoE devices such as cameras, intercom devices, Wireless LAN Access Points and Bluetooth sensors. The Smart Power Management for PoE gives higher priority to the most important devices in a network when power demand exceeds supply.

Benefits

- Meet the growing demand for Ethernet in roadside and wayside cabinets without the need for multiple devices
- Reduce cabling costs and simplify camera, radio and peripheral device connectivity by supplying power and Ethernet in one cable
- Get the capacity of a 19" switch in very space limited environments
- Benefit from easy in-field configuration and upgrade

Technical data



Technical data	
Ethernet interfaces	
RJ45	16 x 10/100/1000 Mbps
SFP FO (small form-factor pluggable)	4 x 100/1000 Mbps
Switch performance	
Maximum bandwidth	20 Gbps full duplex
Switching method	Store and forward
Power-over-Ethernet	
Number of ports	4
Supported specifications	IEEE 802.3af, IEEE 802.3at
Bandwidth	10/100/1000 Mbps
Combined max power output	120 W (Max. 30 W/port)
Power supply characteristics	
Supported input voltage ranges	85 – 264 VAC / 100 – 300 VDC
PoE input voltage	44 - 57 VDC (IEEE 802.3af), 50 – 57 VDC (IEEE 802.3at)
Power consumption	< 30 W
Mechanical specifications	
Dimensions (W x H x D) in mm	154 mm x 152 mm x 176 mm
Weight	4.7 kg
Mounting	DIN rail and panel mount
Ambient conditions	
Operating temperature	-40° C to +85° C
IP rating	IP40

Features

Software

The RUGGEDCOM RSG920P runs Rugged Operating System (ROS®) and delivers high performance switching.

ROS® supports the standard network technologies, such as Rapid Spanning Tree Protocol (RSTP), Multiple Spanning Tree Protocol (MSTP), Remote Monitoring (RMON), Simple Network Management Protocol (SNMP) and others, including proprietary protocol enhancements such as Siemens eRSTP (enhanced Rapid Spanning Tree Protocol) and Fast Root Failover (FRF).

Software features

- Quality of service (802.1p) for traffic prioritization
- NTP time synchronization (client and server)
- Smart power management for PoE interfaces
- Port rate and Broadcast Storm Limiting
- Port configuration, status, statistics, mirroring
- Simple Management interface through WebUI and console interface
- Single file configuration ensures easy installation and configuration control

Cyber security

Cyber security is an important issue in many industries where advanced automation and communications networks play a crucial role in mission critical applications and where high reliability is of paramount importance. Key RUGGEDCOM RSG920P features that address security issues at the local area network level include:

- Passwords – support for multiple access levels with separate credentials for each level
- SSH / SSL – extends capability of password protection to add encryption of passwords and data as they cross the network
- Enable / disable ports – capability to disable ports so unauthorized devices can't connect to unused ports
- SNMPv3 – encrypted authentication and access security
- HTTPS – for secure access to the web interface
- 802.1x – to ensure only permitted devices can connect to the device
- MAC address authentication – control access to devices that do not support RADIUS

Hardware

The RUGGEDCOM RSG920P has been specifically designed and certified for industrial applications such as transportation systems and oil and gas applications.

Power Supply

- Integrated power supply
- Universal high-voltage range: 100 – 300 VDC or 85 – 264 VAC

Configuration interfaces

The RUGGEDCOM RSG920P is equipped with a USB interface which enables easy in field configuration and upgrading. Storing application data, firmware and device configuration for commissioning and field maintenance is simple with the Micro SD card slot.

Digital Input

The RUGGEDCOM RSG920P offers 2 digital inputs to connect to external devices such as cabinet doors monitors, motion detectors and other sensors. The status of the input can be read through SNMP.

Harsh environments

As with all RUGGEDCOM products, Highly Accelerated Life Testing (HALT) has been used in the early stages of product development – to detect any design or performance issues.

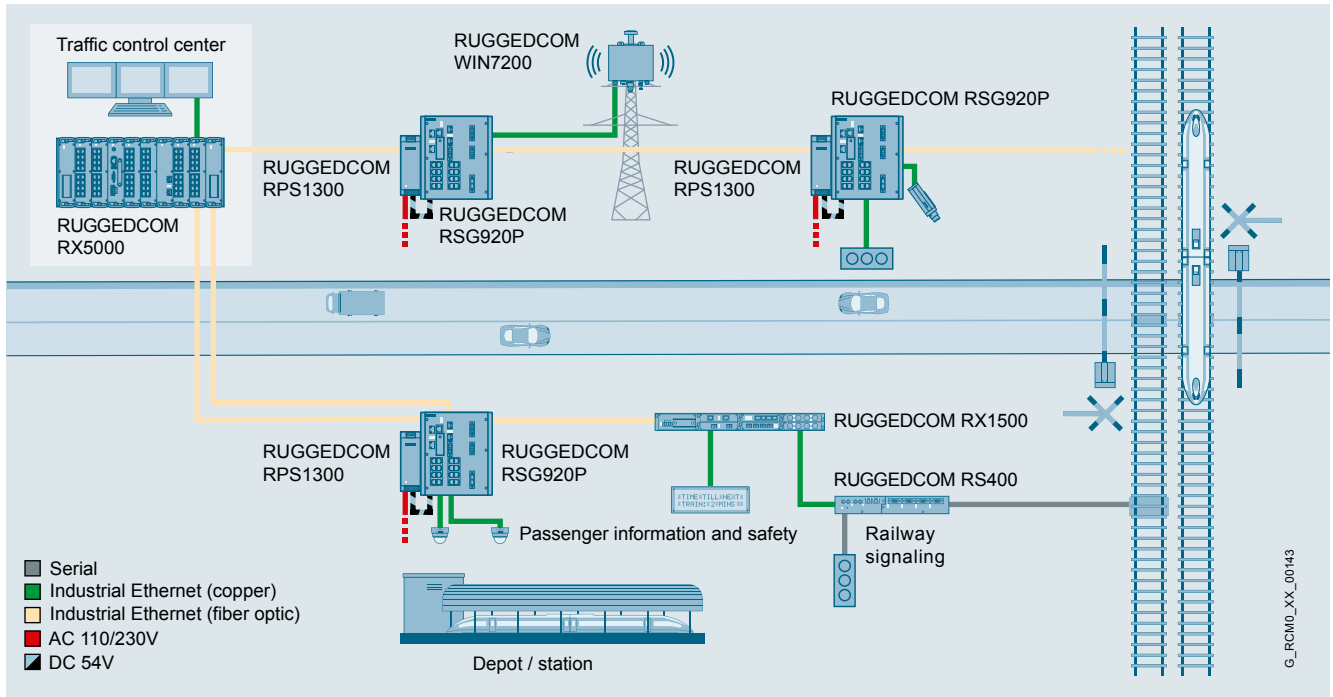
- Temperature: -40° C to +85° C – no fans
- Safety: CSA/UL 60950
- Vibration: IEC 60255-21-1, Class 2
- Shock: IEC 60255-21-2, Class 2
- Humidity: IEC 60068-2-30, up to 95% relative humidity

Certifications

- IEC 61000-6-2 (industrial environments)
- NEMA TS-2 (traffic control equipment)
- EN 50121-4 (railway applications)
- IEC 61850-3 (electric substations)
- IEEE 1613 (electric substations)

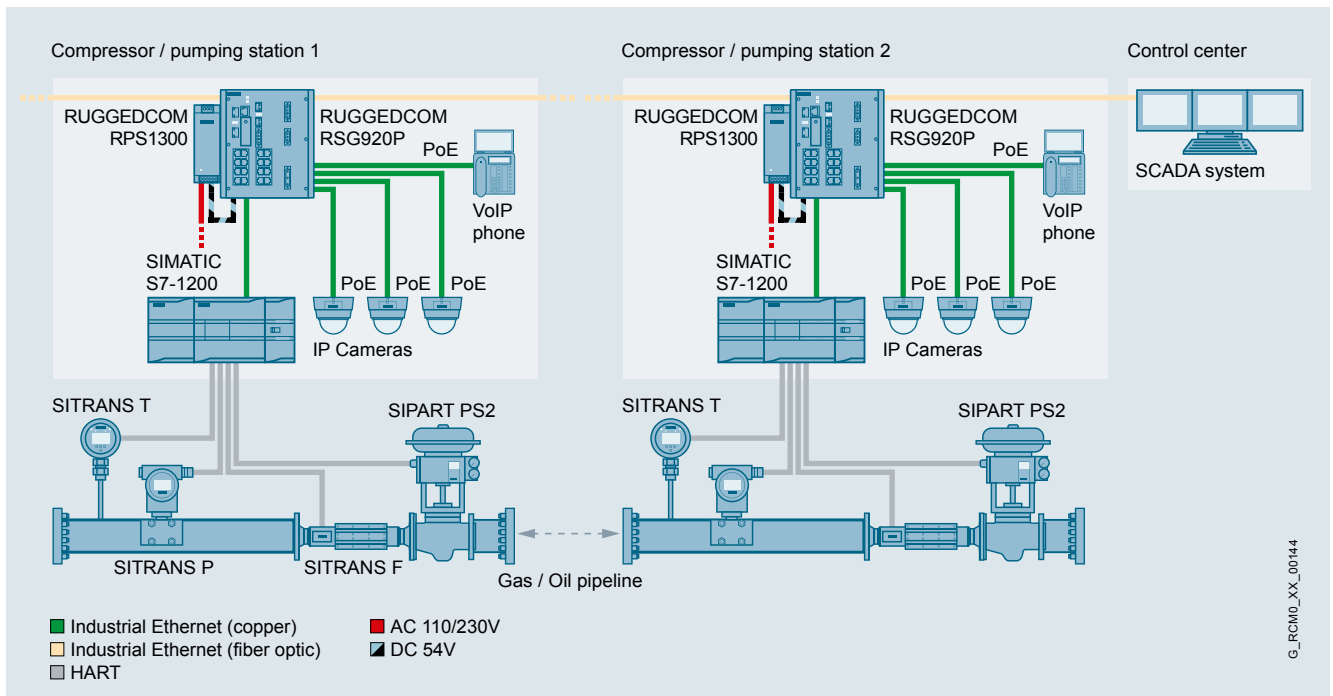
Use cases

Multimodal transportation networks



Connecting devices in multimodal transportation networks is made easy with the RUGGEDCOM RSG920P, a multipurpose switch that offers a tremendous amount of flexibility in a standard configuration.

Connecting compressor and pumping stations along oil pipelines



The RUGGEDCOM RSG920P is ideal for the field level where growing demands for Ethernet connectivity exists.

Accessories



The Power-over-Ethernet ports of the RUGGEDCOM RSG920P are powered by an external power supply. The RUGGEDCOM RPS1300 is the companion power supply of the RUGGEDCOM RSG920P capable of providing enough power to all 4 Power-over-Ethernet ports simultaneously.

Power supply characteristics

Input voltage range	85 – 132 / 170 – 264 VAC
Output voltage range	48 – 54 VDC
Active power supplied	140 Watt

Mechanical specifications

Dimensions (W x H x D)	42 mm x 134 mm x 42 mm
Mounting	DIN rail mount

Ambient conditions

Operating temperature	-40° C to +75° C
IP rating	IP20

Ordering options

Product	Article number								
RUGGEDCOM RSG920P	6GK6092-0PS2	.	-	0	.	A	.	-	Z
RUGGEDCOM RSG920PNC	6GK6092-0PS1	.	-	0	.	A	.	-	Z
Power supply									
Low voltage (9-60 VDC)				1					
High voltage (85 – 264 VAC / 88 – 300 VDC)				3					
Mounting kit									
No mounting option						A			
DIN rail mounting kit						B			
Panel mounting kit						C			
Manufacturing modification									
Standard								0	
Conformal coating								1	
Explosive atmospheres modification								2	

SFP options on uplink ports	Port 17	Port 18	Port 19	Port 20
SFP, blank	A00	B00	C00	D00
SFP, 100 FX, multimode LC, 1310 nm, 2 km	A01	B01	C01	D01
SFP, 100 FX, singlemode LC, 1310 nm, 20 km	A02	B02	C02	D02
SFP, 1000 SX, multimode LC, 850 nm, 500 m	A03	B03	C03	D03
SFP, 1000 LX, singlemode LC, 1310 nm, 10 km	A04	B04	C04	D04
SFP, 1000 LX, singlemode LC, 1310 nm, 25 km	A05	B05	C05	D05
SFP, 1000 LX, singlemode LC, 1310 nm, 70 km	A06	B06	C06	D06

Examples	Order code
RUGGEDCOM RSG920PNC with high voltage power supply + panel mounting kit + port 17-19 with SFP, 1000 LX, singlemode LC, 1310 nm, 25 km + port 20 with SFP, blank.	6GK6092-0PS13-OCA0-Z A05 + B05 + C05 + D00
RUGGEDCOM RSG920P with high voltage power supply + DIN mounting kit + conformal coating + port 17 with SFP, 1000 LX, singlemode LC, 1310 nm, 10 km + port 18-20 with SFP, blank.	6GK6092-0PS23-OCA1-Z A04 + B00 + C00 + D00



Brochure Edition
01/2022

RUGGED COMMUNICATION

RUGGEDCOM Ethernet Layer 2

Compact switch family





RUGGEDCOM Ethernet switches are specifically designed to operate reliably in harsh industrial environments.

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I Common benefits and features

RUGGEDCOM's compact layer 2 Ethernet switch portfolio features a wide selection of managed and unmanaged rugged devices designed for reliable, error-free communications performance in harsh environments. These switches operate on ROSTM (Rugged Operating System) and include variants with 10 Gigabit uplinks, high power PoE ports and HSR/PRP support. All RUGGEDCOM devices meet or exceed specifications set by recognized industry standards for mission-critical, real-time control applications, e.g., IEC 61850-3, IEEE 1613 for substation communications, NEMA TS-2 for intelligent transportation systems, EN 50155, EN 50121 for rail, etc.

Common benefits

Maximum network availability and high reliability even in harsh environments

Zero Packet Loss™ technology for error-free performance despite high levels of electromagnetic interference (EMI) and high-speed network fault recovery (RSTP and eRSTP) ensures high availability of the network. Fault tolerant topologies (HSR/PRP) with zero second failover time are also available when using variants with redundant network access features.

Rugged design that ensures low total cost of ownership

Passive cooling across a wide operating temperature range of -40 °C to +85 °C and no mechanical rotating components minimize risk of failures and provide a high MTBF (Mean Time Between Failures).

Functional features that simplify maintenance

Compact form factor and standard mounting options allow easy in-field installation in space-constrained cabinets. Removable storage media for configuration changes and firmware upgrade make it easy for on-site configuration and maintenance.

Secure and future-proof networks that maximize the return on your capital investment

Long-haul fiber optics with high bandwidth, high port density, and cybersecurity features in RUGGEDCOM switches make them well-suited for industrial networks with an increasing number of end-devices and evolving requirements, providing maximum return on CAPEX.

Common features

Management	Layer 2	Cybersecurity	Advanced (select models)
Web-based, secure console (via SSH)	RSTP (IEEE 802.1D-2004), eRSTP™ (Enhanced Rapid Spanning Tree)	Multi-level user passwords	HSR and PRP Redundancy Protocols (IEC 62439-3)
Command Line Interface (CLI)	For models with ROS 5.x, MSTP (IEEE 802.1Q-2005), and MRP (IEC 62439-2)	Secure File Transfer Protocol (SFTP)	IEEE 1588v2 time synchronization
Serial console	QoS (Quality of Service) IEEE 802.1p	Web-based management using SSL	Static layer 3 IP switching
Plain ASCII format configuration file with encryption option	Class of Services (CoS) and DSCP (Differentiated Services)	RADIUS and TACACS+ authentication service for device management	Removable memory storage for configuration backup and firmware upgrade
SNMP v1/v2c/v3	VLAN (IEEE 802.1Q) and double VLAN-tagging (QinQ)	IEEE 802.1X port-based Network Access Control with PEAP (Protected Extensible Authentication Protocol) and EAP-TLS	
Remote monitoring (RMON)	Link aggregation (IEEE 802.3ad), Link Layer Discovery Protocol (LLDP) IEEE 802.11AB	SSL certificates in X.509v3 or PEM format; RSA key pair 1024-bit, 2048-bit, 3072-bit; or NIST P-256, P-384 or P-521	
Syslog, logging, and alarms	IGMPv1, IGMPv2, IGMPv3 snooping for multicast filtering	SSH public/private key in PEM format, DSA 1024-bit, 2048-bit, 3072-bit; or RSA key pair 1024-bit, 2048-bit, 3072-bit	
Modbus slave	GMRP, GVRP	Port rate limiting	
MMS Bridge Object Model (IEC 61850-90-4)	Port mirroring, port configuration, status, and statistics	Broadcast storm limiting	
	NTP, SNTP	Quarantine and Guest VLAN	
	DHCP Snooping and DHCP Relay (Option 82)		
	Dynamic ARP Inspection		

I RUGGEDCOM technology

RUGGEDCOM products have been specifically designed and tested to withstand the demands of harsh environments.

Rugged rated

Highly Accelerated Life Testing (HALT) is used in the early stages of product development to detect any design and performance issues. Highly Accelerated Stress Screening (HASS) is performed on all RUGGEDCOM products, in order to ensure that customers get their orders free of manufacturing errors and random defects.

RUGGEDCOM products provide reliable and error-free operation in harsh electrical installations with high EMI.

Operation in industrial temperature range

- -40 °C to +85 °C normal operation
- Passive cooling – no fans

High availability

- Integrated single or redundant power supplies
- Universal high-voltage range: 88 – 300 V DC or 85 – 264 V AC
- Low voltage: 12 V DC, 24 V DC, or 48 V DC

Durable installations

- Full metal enclosure
- Heavy duty mounting
- Industrial terminal blocks for power and I/O connection

Zero Packet Loss™

The proliferation of IP networking technology from the office to industrial environments for use in real-time, mission critical control applications requires a level of immunity to electromagnetic interference (EMI) well beyond what is currently delivered by commercial grade networking products. In fact, even the EMI immunity requirements prescribed by IEC 61000-6-2 (generic standards – immunity for industrial environments) are inadequate for many environments.

One such environment is the electric utility substation, where EMI levels can be significantly higher than those in the generic industrial environment defined in IEC 61000-6-2. In order to address this risk, both the IEC and IEEE have developed and issued standards addressing EMI immunity requirements for communications networking equipment in electric utility substations.

In response to these requirements, RUGGEDCOM technology withstands all of the EMI type tests required by IEC 61850-3 without experiencing any communications loss or delays. Products featuring this technology also qualify as IEEE 1613 Class 2 error-free devices. This innovation is known as Zero Packet Loss™ technology and it is designed to provide the same level of EMI immunity and reliability as protective relays.



IEC 61850

The IEC standard for communications in substations is composed of ten parts, which outline a complete framework for substation automation, including EMI (electromagnetic interference), immunity, and environmental requirements (IEC 61850-3) for communications networks in substations.

The EMI immunity requirements of IEC 61850-3 are derived from IEC 61000-6-5 (Immunity for Power Station and Substation Environments), which defines a set of potentially destructive EMI type tests designed to simulate both continuous and transient EMI phenomena in the substation.

This standard has a minimum requirement that the networking equipment must operate without any physical damage, reset, or latch-up while being subjected to a variety of destructive EMI immunity type tests.

IEEE 1613

IEEE 1613 specifies ratings, environmental performance, and testing requirements for communications networking devices installed in electric power substations.

Within the standard, two classes of devices are defined, based on the outcome of a specific set of potentially destructive EMI type tests (EMI stress) designed to simulate EMI phenomena in the substation. These type tests are derived from the same type tests applied to mission critical protective relays (i.e., C37.90.).

Class 1 – these devices are allowed to experience data errors, loss, or delays when exposed to EMI stress.

Class 2 – these devices must provide error-free (i.e., no data errors, delays, or loss) operation when exposed to EMI stress.

Neither class of device may experience any permanent damage under EMI stress.

The RUGGEDCOM family qualifies as IEEE 1613 Class 2 error-free devices.



RUGGEDCOM i800

The RUGGEDCOM i800 family includes compact Ethernet switches that allow users to choose from managed or unmanaged, regular or extended temperature, fiber-optic or copper interfaces, and Fast or Gigabit Ethernet.



RUGGEDCOM i800

Ethernet ports

- 8 x 10/100BASE-TX
- Fixed configuration

RUGGEDCOM i801

Ethernet ports

- 8 x 10/100BASE-TX + 1 x 1000BASE-X or 1 x 10/100/1000BASE-T
- Industry standard LC fiber-optic connectors
- Multimode and single-mode optical transceivers

RUGGEDCOM i802

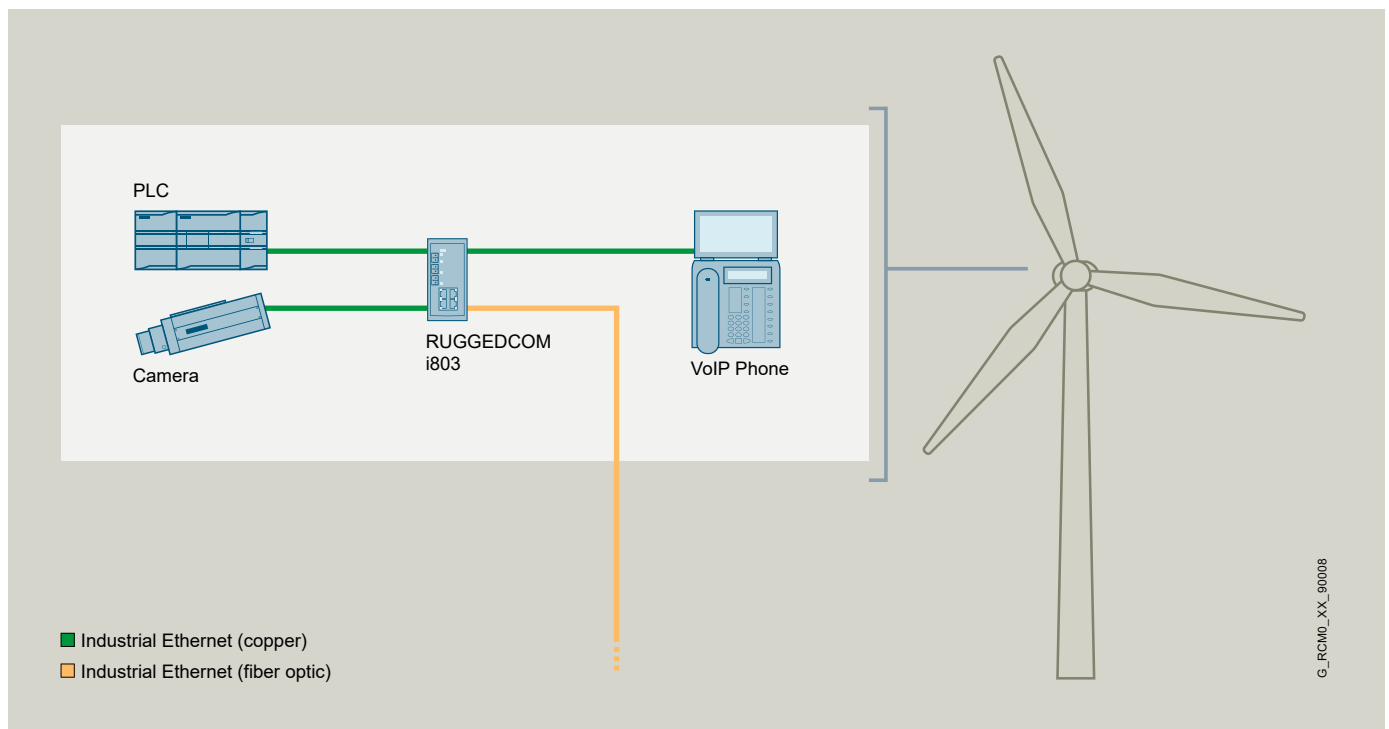
Ethernet ports

- 6 x 10/100BASE-TX + 1 x 100BASE-FX or 2 x 100BASE-FX or 2 x 1000BASE-X or 2 x 10/100/1000BASE-T
- Industry standard LC fiber-optic connectors
- Multimode and single-mode optical transceivers

RUGGEDCOM i803

Ethernet ports

- 4 x 10/100BASE-TX + 1 x 100BASE-FX + (2 x 1000BASE-X or 2 x 100BASE-FX)
- Industry standard LC fiber-optic connectors
- Multimode and single-mode optical transceivers



Inside the nacelle of a wind turbine, the RUGGEDCOM i802 enables connectivity for up to 6 Ethernet devices over copper and a backhaul over fiber-optic.

RUGGEDCOM RS900

The RUGGEDCOM RS900 is a 9-port, utility-grade, fully managed Ethernet switch, specifically designed to operate reliably in electrically harsh and climatically demanding environments.

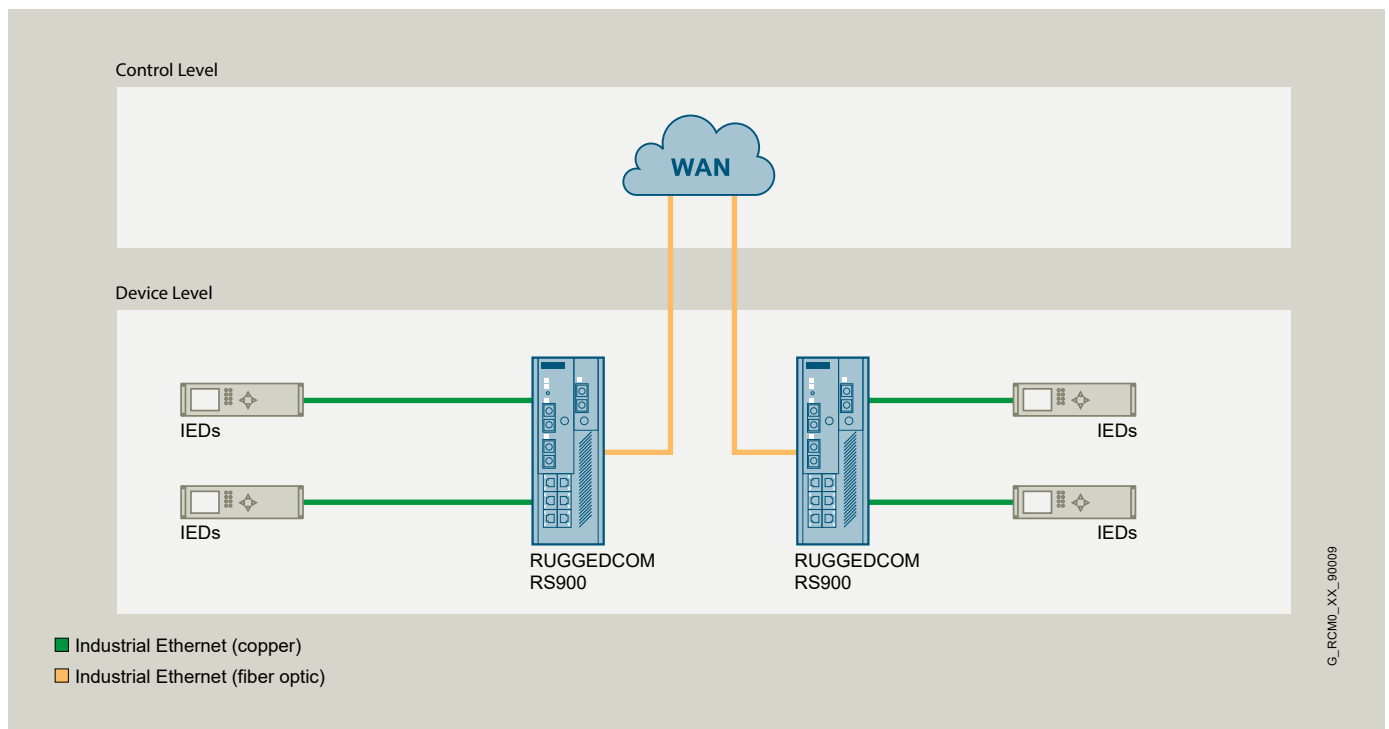


Ethernet ports

- Up to 9 ports: 6 x 10/100BASE-TX ports with 3 optional fiber or copper ports
- Industry standard fiber-optic connectors: LC, SC, ST, MTRJ
- Multimode and single-mode optical transceivers
- Long-haul optics allow distances up to 90 kms

Universal power supply options

- Fully integrated power supply
- Universal high-voltage input: 120 V AC/V DC and 230 V AC/V DC
- Dual low-voltage DC inputs: 12 V DC, 24 V DC, 48 V DC
- Terminal blocks for reliable, maintenance-free connections
- CSA/UL 62368 safety approved to +85 °C



The RUGGEDCOM RS900 makes it possible to remotely monitor field data using multiple types of communications.

RUGGEDCOM RS900G

The RUGGEDCOM RS900G is a utility-grade, fully managed 10-port Ethernet switch, providing two fiber-optic Gigabit Ethernet ports and eight Fast Ethernet copper ports.

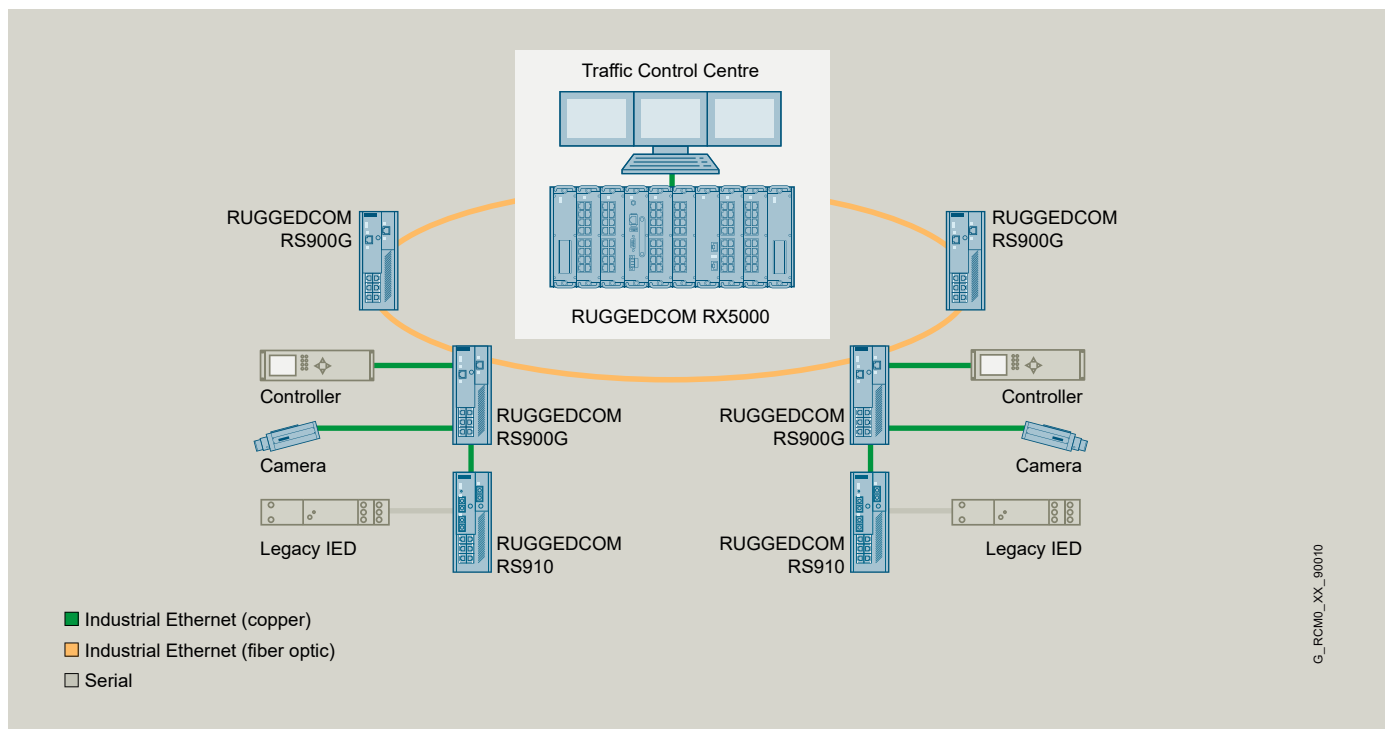


Ethernet ports

- 2 x fiber-optic Gigabit Ethernet ports (1000BASE-X)
- 8 x Fast Ethernet ports (10/100BASE-TX)
- Multiple fiber options (LC, SC, SFP pluggable optics)
- Long-haul optics allow Gigabit distances of up to 70 km

Universal power supply options

- Fully integrated power supply
- Universal high-voltage input: 120 V AC/V DC and 230 V AC/V DC
- Dual low-voltage DC inputs: 12 V DC, 24 V DC, 48 V DC
- Terminal blocks for reliable, maintenance-free connections
- CSA/UL 62368 safety approved to +85 °C



A reliable eRSTP ring network with Gigabit bandwidths can be achieved with the RUGGEDCOM RS900G.

RUGGEDCOM RS900GP

The RUGGEDCOM RS900GP is a utility-grade, fully managed 10-port Ethernet switch, providing two fiber-optic or copper Gigabit Ethernet ports and eight Fast Ethernet copper ports, each capable of supplying high power 802.3af/802.3at compliant Power-over-Ethernet (PoE).

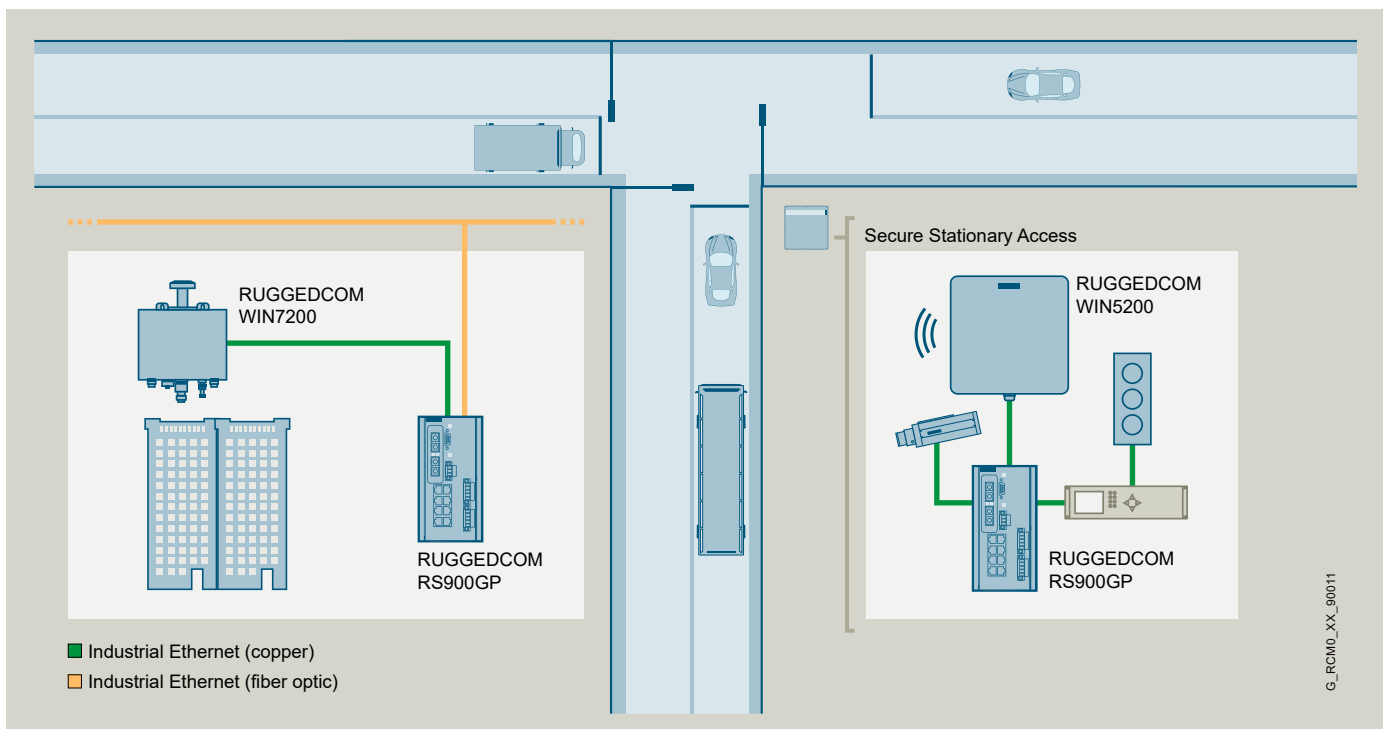


Ethernet ports

- 8 x Fast Ethernet ports (10/100BASE-TX), all external IEEE 802.3af/802.3at-compliant PoE
- Up to 2 fiber-optic Gigabit Ethernet ports (100BASE-FX/1000BASE-X)
- Up to 2 x 10/100/1000BASE-T copper ports
- Multiple fiber connector types (LC, SC, SFP pluggable optics)
- Long-haul optics allow Gigabit distances up to 70 km

Power-over-Ethernet (PoE)

- 8 x 10/100BASE-TX IEEE 802.3af/802.3at-compliant ports
- Data and power over a single Ethernet cable
- Auto-sensing ports provide power only to PoE end devices
- Compatible with RUGGEDCOM WIN products
- CSA/UL 62368 safety approved to +85 °C



Multiple Power-over-Ethernet devices are powered by the RUGGEDCOM RS900GP in the field.

RUGGEDCOM RSG907R

The RUGGEDCOM RSG907R is a compact Gigabit IEEE 1588 compatible Ethernet switch that supports High Availability Seamless Redundancy (HSR) and Parallel Redundancy Protocol (PRP) according to IEC 62439-3.



Ethernet ports

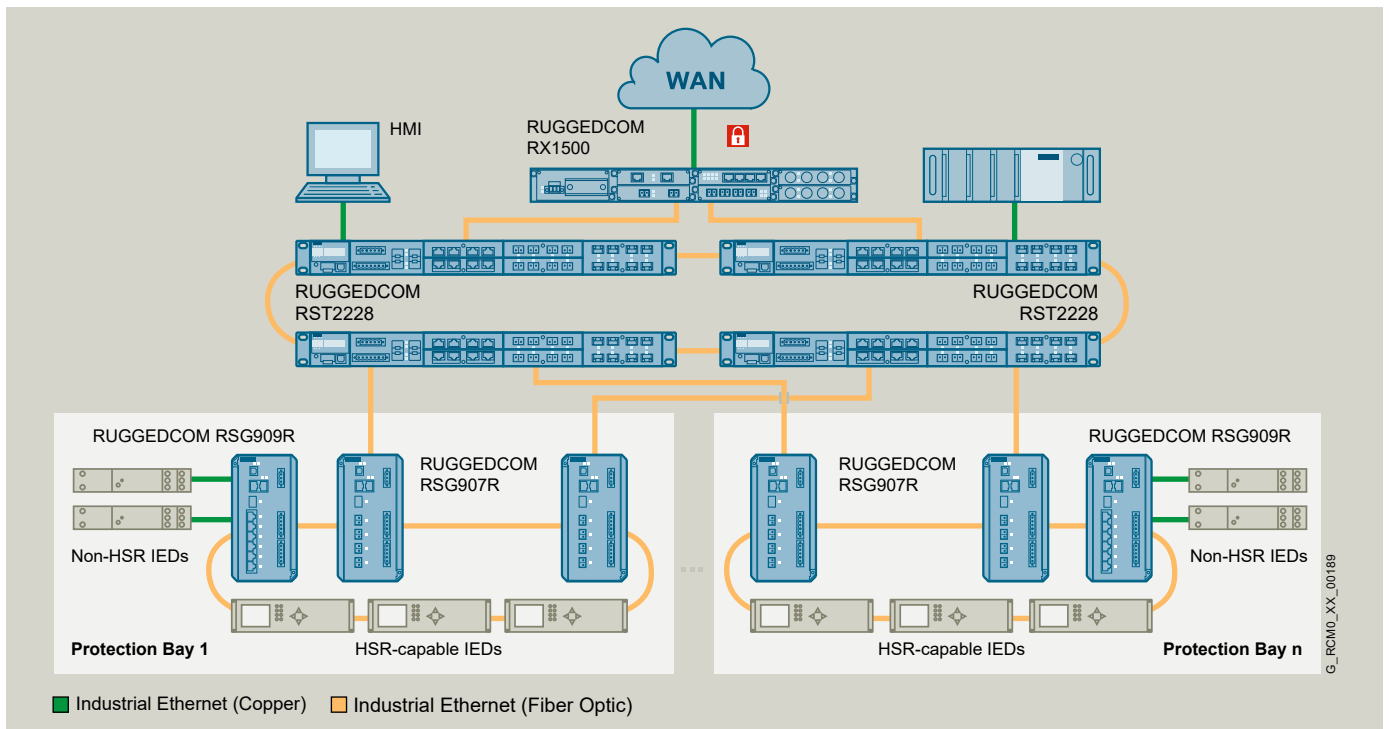
- 3 x RNA (Redundant Network Access) and coupler Ethernet ports according to IEC 62439-3 (100BASE-X)
- 4 x SAN (Single Attached Node) fiber optic ports (100BASE-FX)
- Multiple fiber connector types (SFP, LC)

Universal power supply options

- Fully integrated redundant power supply
- Universal high-voltage input: HI (100 – 240 V AC/100 – 300 V DC)
- Dual low-voltage DC inputs: 12/24/48 V DC (10 – 60 V DC)
- Terminal blocks for reliable, maintenance-free connections
- CSA/UL 62368 safety approved to +85 °C



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Two RUGGEDCOM RSG907R/RSG909R are used in each HSR bay ring for redundant coupling with PRP station level LANs.

RUGGEDCOM RSG908C

The RUGGEDCOM RSG908C is an IEEE 1588 compatible Ethernet switch that provides four Gigabit SFP ports and four Fast Ethernet fiber ports.



Ethernet ports

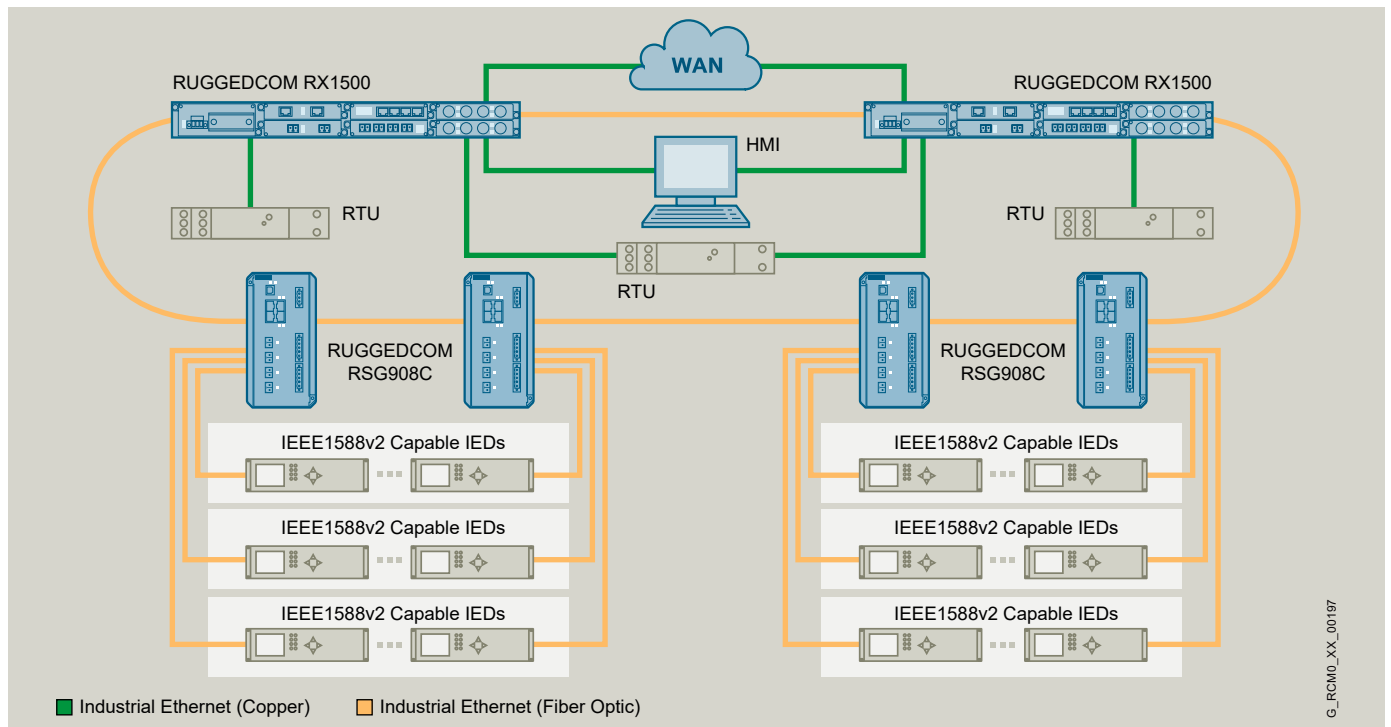
- 4 x Gigabit SFP ports (1000BASE-X)
- 4 x fiber optic ports (100BASE-FX)
- Multiple fiber connector types (SFP, LC)

Universal power supply options

- Fully integrated redundant power supply
- Universal high-voltage input:
HI (100 – 240 V AC/100 – 300 V DC)
- Dual low-voltage DC inputs:
12/24/48 V DC (10 – 60 V DC)
- Terminal blocks for reliable, maintenance-free connections
- CSA/UL 62368 safety approved to +85 °C



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The RUGGEDCOM RSG908C allows the aggregation of large fiber optic 100BASE-FX subrings of IEDs at protection bays into 1 Gbps fiber optic rings while providing IEEE 1588 timing.

RUGGEDCOM RSG909R

The RUGGEDCOM RSG909R is a compact Gigabit IEEE 1588 compatible Ethernet switch that supports High Availability Seamless Redundancy (HSR) and Parallel Redundancy Protocol (PRP) according to IEC 62439-3.



Ethernet ports

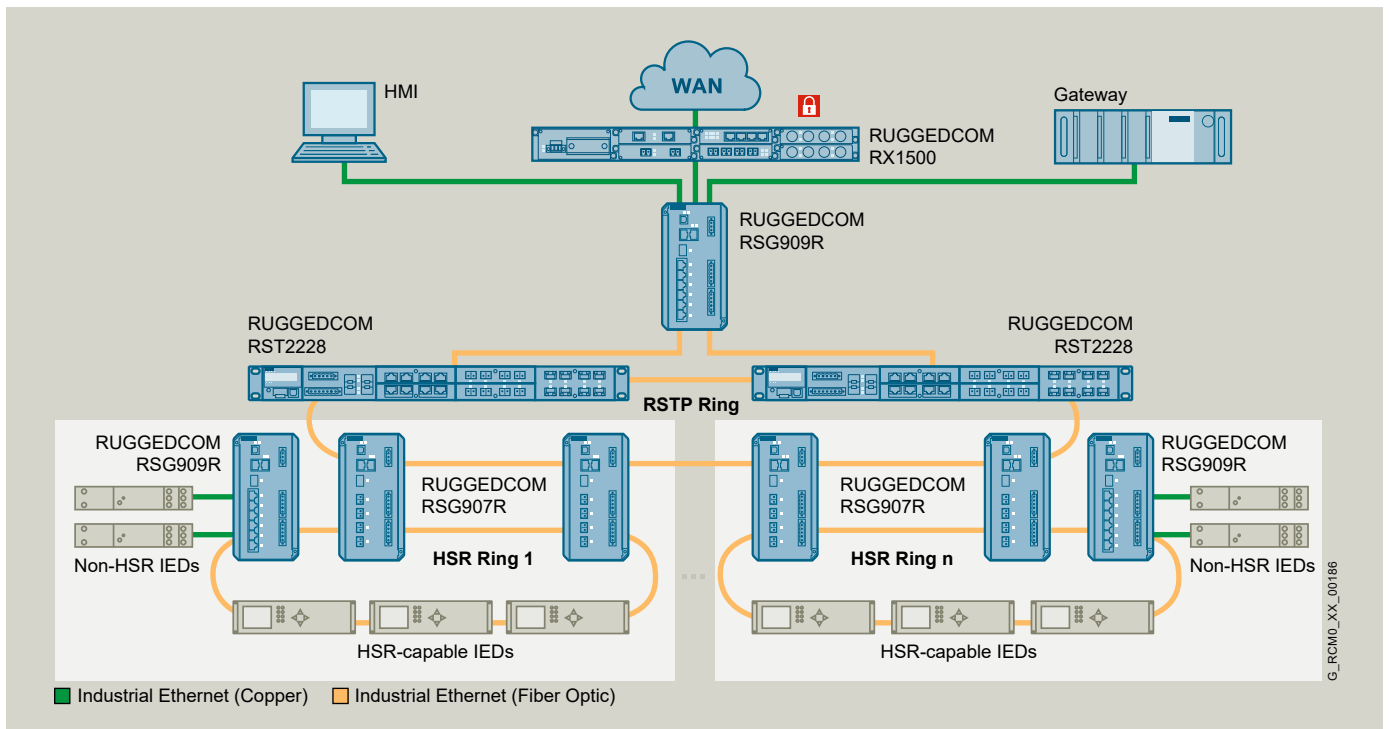
- 3 x RNA (Redundant Network Access) and coupler Ethernet ports according to IEC 62439-3 (1000BASE-X)
- 6 x SAN (Single Attached Node) copper ports (10/100/1000BASE-TX)
- Industry standard connectors: SFP, RJ45

Universal power supply options

- Fully integrated redundant power supply
- Universal high-voltage input: HI (100 – 240 V AC/100 – 300 V DC)
- Dual low-voltage DC inputs: 12/24/48 V DC (10 – 60 V DC)
- Terminal blocks for reliable, maintenance-free connections
- CSA/UL 62368 safety approved to +85 °C



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RUGGEDCOM RSG907R/RSG909R switches terminating each HSR ring can be directly connected to an RSTP network via their coupling ports.

RUGGEDCOM RSG910C

The RUGGEDCOM RSG910C is an IEEE 1588 compatible Gigabit Ethernet switch that provides four Gigabit SFP ports and four Gigabit copper ports.



Ethernet ports

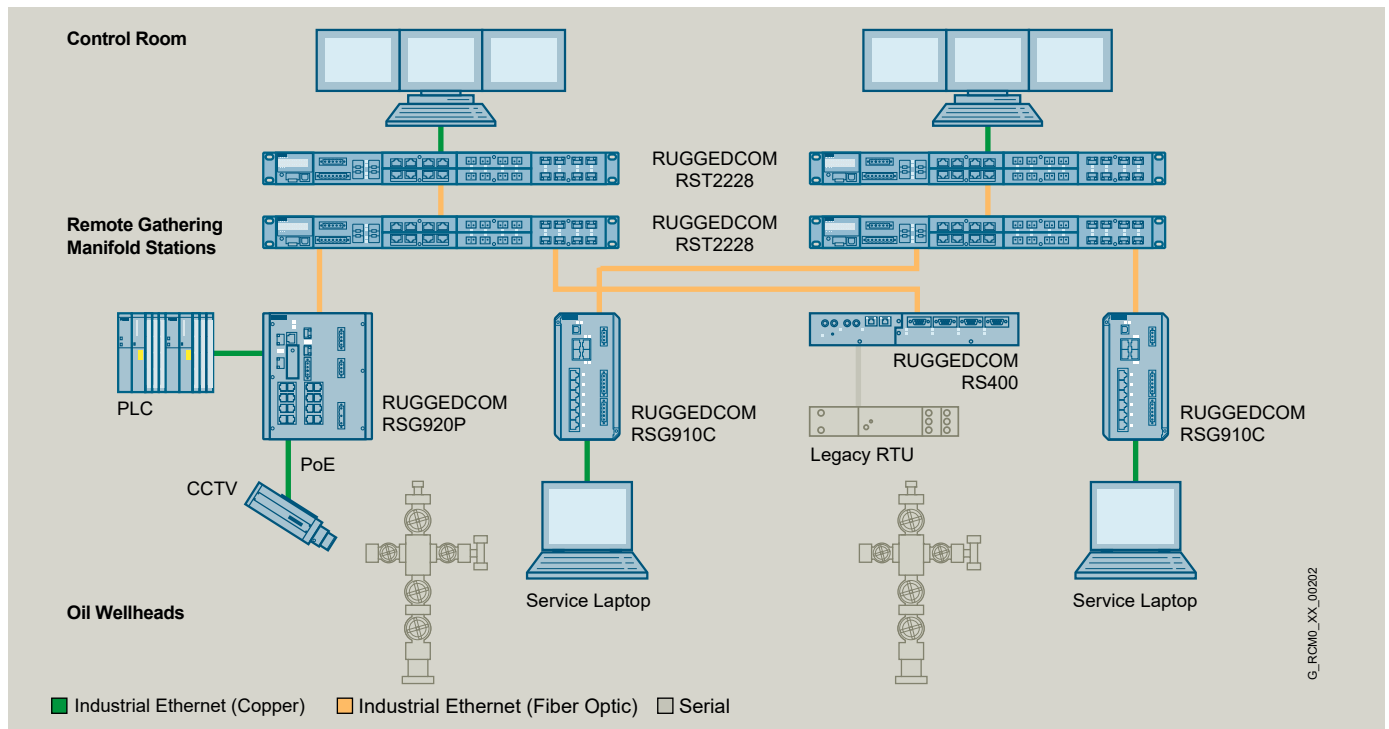
- 4 x Gigabit SFP ports (1000BASE-X)
- 6 x copper ports (10/100/1000BASE-TX)
- Multiple fiber connector types (SFP, LC)

Universal power supply options

- Fully integrated redundant power supply
- Universal high-voltage input:
HI (100 – 240 V AC/100 – 300 V DC)
- Dual low-voltage DC inputs: 12/24/48 V DC (10 – 60 V DC)
- Terminal blocks for reliable, maintenance-free connections
- CSA/UL 62368 safety approved to +85 °C



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Wellhead monitoring in onshore oil and gas production with the RUGGEDCOM RSG910C

RUGGEDCOM RSL910

The RUGGEDCOM RSL910 is a compact form factor rugged Ethernet switch with two EoVDSL2 uplinks and two SFP uplinks providing the flexibility to use legacy copper or optical infrastructure in harsh environments.

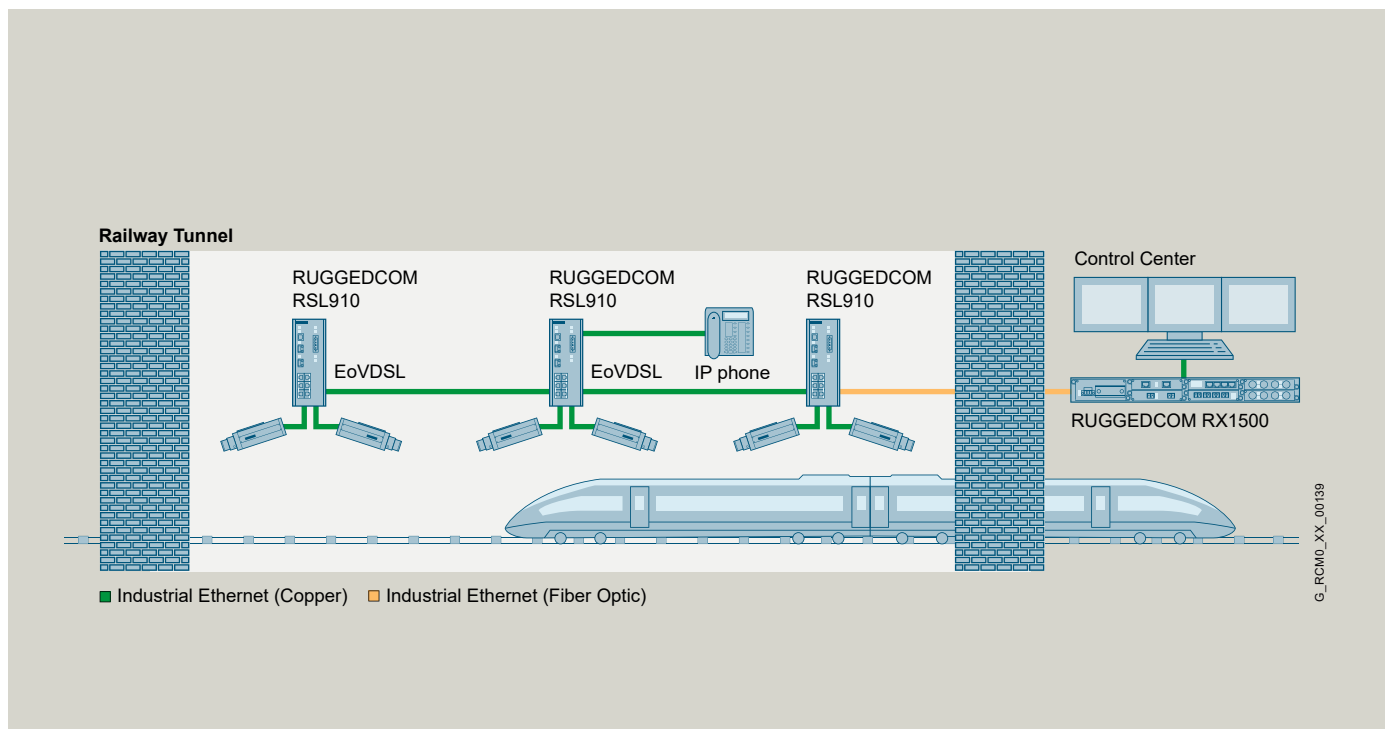


Ethernet ports

- 2 x SFP uplink ports supporting Fast Ethernet and Gigabit
- 6 x Fast Ethernet copper device ports

Ethernet over VDSL port characteristics

- 2 x EoVDSL2 uplink ports with terminal blocks
- Integrated power 24 V DC, 48 V DC, or HI voltage power supply
- RS232 console port and failsafe relay output
- CSA/UL 62368 safety approved to +85 °C



Railway tunnel monitoring using a combination of existing copper cabling and fiber optic backbone

RUGGEDCOM RST916P **NEW**

The RUGGEDCOM RST916P is a utility-grade, fully managed 16-port compact Ethernet switch with four SFP+ ports, twelve Gigabit Ethernet copper ports, and support for IEEE 802.3bt-compliant Power-over-Ethernet (PoE).



Ethernet ports

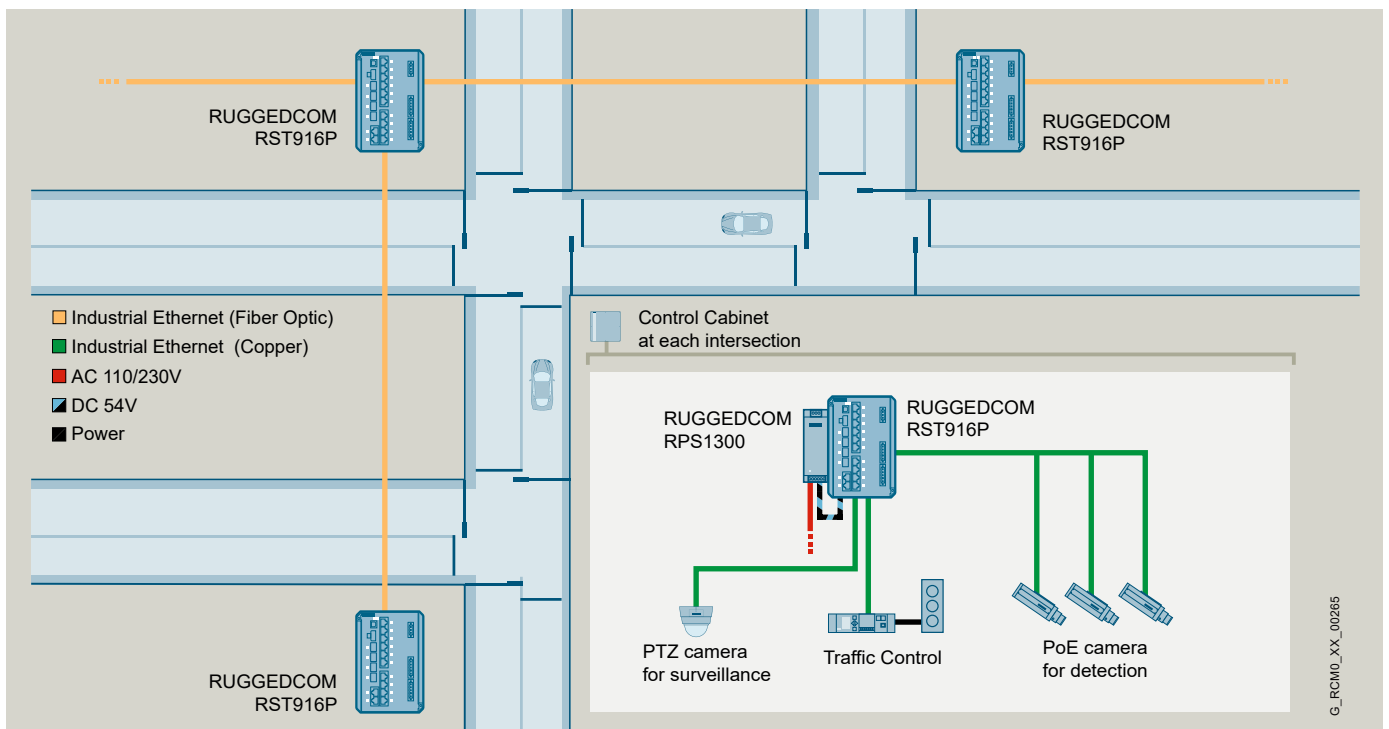
- 12 x 10/100/1000BASE-T RJ45 ports
- 4 x 10G BASE-X/1000BASE-X SFP+ (Small Form-factor Pluggable)
- Long-haul fiber optics allow Gigabit distances of up to 115 km

Power-over-Ethernet (PoE)

- Data and power over a single Ethernet cable
- 10 x 10/100/1000BASE-T IEEE 802.3bt-compliant PoE ports
- Maximum PoE power budget of 420 W per device, up to 60 W power output per port

Power supply characteristics

- 27 W maximum device power consumption
- Nominal voltage of 54 V DC
- CSA/UL 62368 safety approved to +85 °C



Connectivity for the smart intersection in intelligent traffic management systems

RUGGEDCOM RST916C NEW

The RUGGEDCOM RST916C is a fully managed 16-port carrier-grade compact Ethernet switch with four SFP+ ports and twelve Gigabit Ethernet copper ports. It also supports IEEE 1588v2 Precision Time Protocol (one step transparent clock).

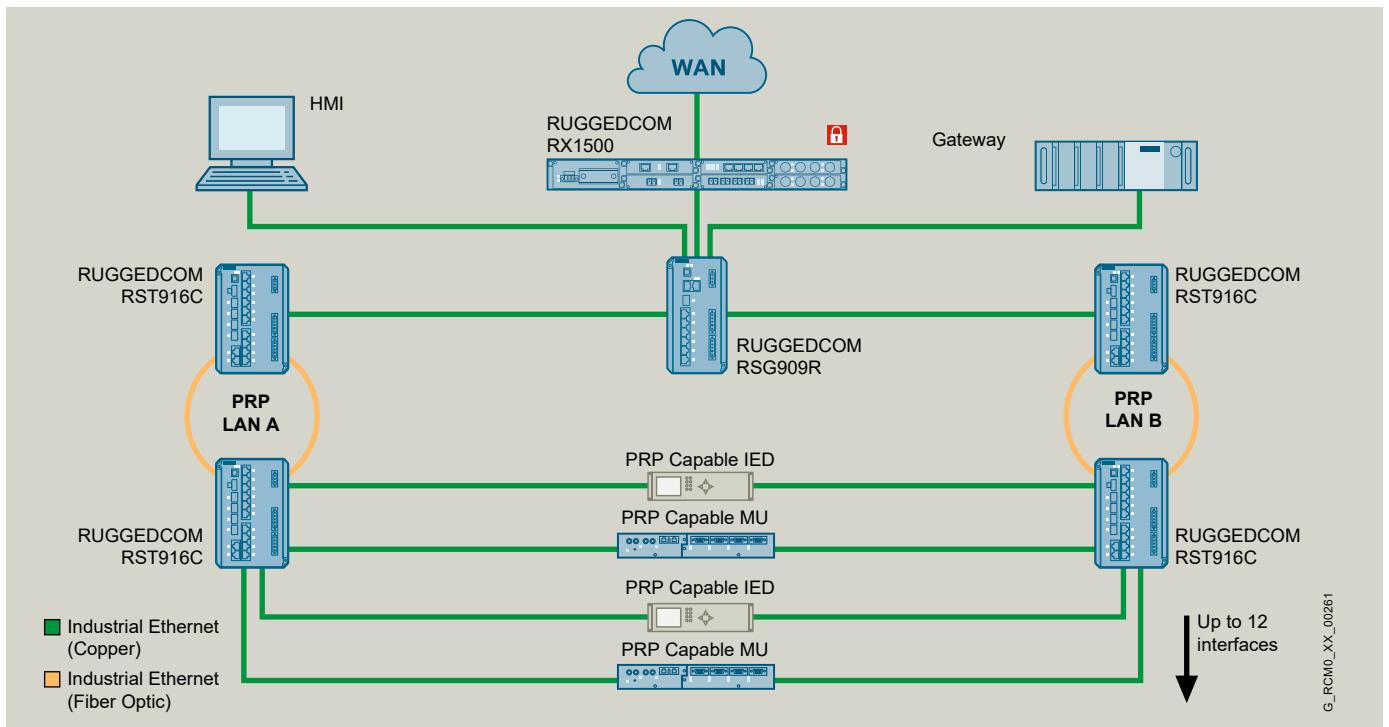


Ethernet ports

- 12 x 10/100/1000BASE-T RJ45 ports
- 4 x 10G BASE-X/1000BASE-X SFP+ (Small Form-factor Pluggable)
- Long-haul fiber optics allow Gigabit distances of up to 115 km

Power supply characteristics

- Redundant input power supply
- 27 W maximum device power consumption
- Support for both HI and LO voltages
- LV: 12/24/48 (10 – 60) V DC and HV: 88 – 300 V DC/85 – 264 V AC
- CSA/UL 62368 safety approved to +85 °C



IEEE 1588 compliant compact Gigabit switch with PRP networks

RUGGEDCOM RSG920P

The RUGGEDCOM RSG920P is a rugged, high density, small form factor layer 2 switch with Power-over-Ethernet (PoE) capability designed for space-constrained cabinets with high bandwidth requirements.



Ethernet ports

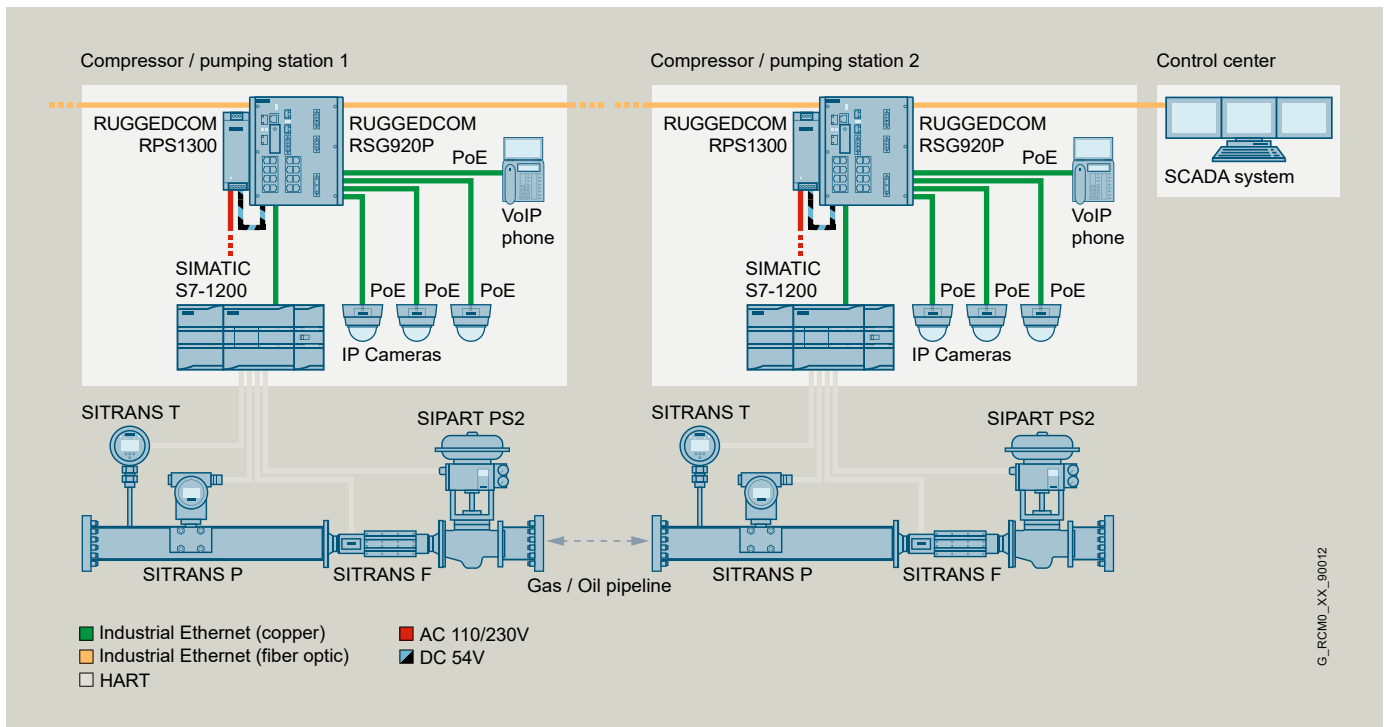
- RJ45: 16 x 10/100/1000BASE-T ports
- SFP: 4 x 100/1000 SFP ports

Power-over-Ethernet (PoE)

- 4 x 10/100/1000BASE-T ports
- Data and power over a single Ethernet cable
- Supports IEEE 802.3af, IEEE 802.3at
- 44 – 57 V DC (IEEE 802.3af),
50 – 57 V DC (IEEE 802.3at)
- 30 W per port power output

Power supply characteristics

- Support for various nominal voltages: 12 V DC, 24 V DC, 48 V DC, 120 V AC/ V DC, 230 V AC/ V DC
- 27 W maximum device power consumption
- CSA/UL 62368 safety approved to +85 °C



The RUGGEDCOM RSG920P is ideal for the field level where growing demands for Ethernet connectivity exist.

RUGGEDCOM RS940G

The RUGGEDCOM RS940G is a utility-grade fully managed Ethernet switch that provides up to eight Gigabit Ethernet ports. Six 10/100/1000BASE-T triple-speed copper ports are standard. Two additional Gigabit fiber or copper ports can be added.

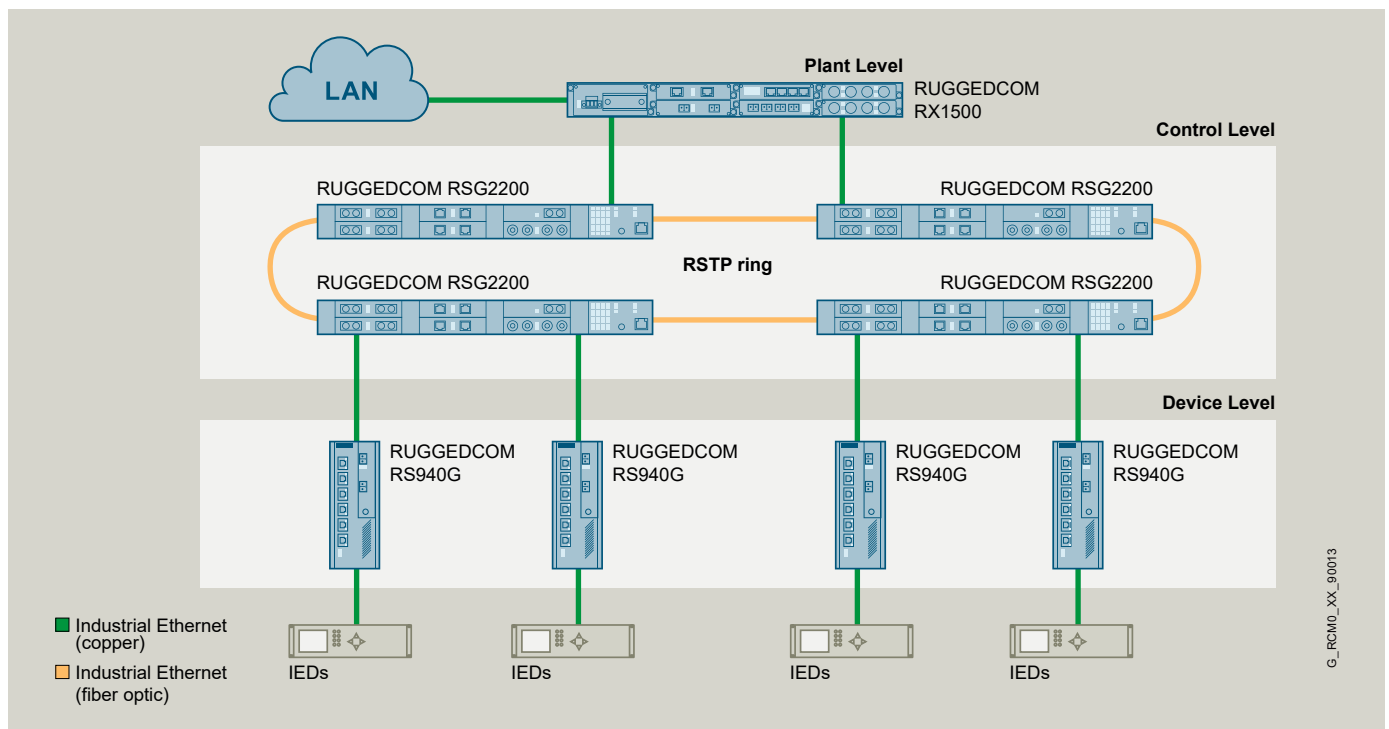


Ethernet ports

- 6 x 10/100/1000BASE-T triple-speed copper ports
- 2 optional fiber or copper Gigabit Ethernet ports
- Multiple fiber options (LC, SC, SFP pluggable optics)
- Long-haul optics allow Gigabit distances of up to 70 km

Universal power supply options

- Fully integrated power supply
- Universal high-voltage input: 120 V AC/ V DC and 230 V AC/DC
- Dual low-voltage DC inputs: 12 V DC, 24 V DC, 48 V DC
- Terminal blocks for reliable, maintenance-free connections
- CSA/UL 62368 safety approved to +85 °C



The RUGGEDCOM RS940G can connect up to 8 devices with Gigabit speeds on the device level.

RUGGEDCOM RPS1300

PoE Power Supply

Providing up to 140 watts of DC power to support up to four 802.3at ports or eight 802.3af ports, the RUGGEDCOM RPS1300 serves as a power source for all RUGGEDCOM Power-over-Ethernet (PoE) products.



Tested and certified according to the NEMA TS 2 standard, the RUGGEDCOM RPS1300 provides the ideal solution to provide PoE power for RUGGEDCOM devices in harsh conditions such as those experienced in roadside traffic cabinets due to its operating temperature range of -40 °C to +75 °C.

The RUGGEDCOM RPS1300 can fully support four PoE ports on the RUGGEDCOM RSG920P and RUGGEDCOM RS900GP at 30 W each or all eight PoE ports of the RS900GP at 15 W each. Up to three RUGGEDCOM RPS1300 devices can be cascaded together to provide sufficient power for the RUGGEDCOM RST916P PoE switch. This makes it ideal for applications involving PoE devices such as PTZ cameras, VoIP phones, and Bluetooth/Wi-Fi enabled sensors.



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Protect your investment for the long term

Now you can order eligible RUGGEDCOM products with an extended warranty term of 10 years. Choose option T10 at the time of order.



FastConnect™ Cabling System

Stringent demands are placed on the installation of cables in an industrial environment. Siemens offers FastConnect™, a system that fulfills all these requirements: on-site assembly – quick, easy, and error-free. For more information, visit:

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OVERVIEW

The 980 ATC Traffic Signal Controller uses state-of-the-art electronics to ensure reliability, endurance, and superb performance in all signal control applications. Based on the ATC and NEMA TS2 standards, the 980 ATC Controller includes advanced functionality for complex phasing, detector processing, coordination, preemption, communications, adaptive timing, and systems operation as a master or a secondary controller.



Pictured above: 980 ATC Type 1 Controller with Ethernet & USB

FEATURES & CAPABILITIES

FLASH FILE SYSTEM

Easily configure the 980 Controller to various firmware versions using a Flash File System, eliminating the need for obsolete EPROM technology. Perform a complete traffic controller firmware update in only seconds instead of minutes, saving valuable time in the field.

No hardware changes or EPROM replacements are required.

MASTER/SECONDARY

Operation in a Closed Loop System requires only one 980 Controller in the master cabinet. A single controller simultaneously provides both the master and secondary functions.

REAL-TIME CLOCK

The real-time clock maintains accurate timing by utilizing a “supercapacitor” and crystal-controlled circuitry, which allows for 0.005% accuracy.

DISPLAY

Easily input data using the backlit, 8-line by 40-character LCD screen with full-menu views. Temperature-compensating circuitry maintains optimum screen contrast and brightness for clear communication.

The menu-driven format helps eliminate the need for special codes or front panel identification characters.

MAINTENANCE

The 980 Controller’s modular design allows users to isolate sub-assembly level problems quickly.

Silk-screen printed circuit board components provide easy identification.

No specific tools or extender cards are needed for troubleshooting.

LEARN MORE AT TRAFFICWARE.COM

FEATURES & CAPABILITIES (CONTINUED)

NTCIP OBJECTS

NTCIP Standard objects and additional objects enhance the 980 Controller with new and standard ATC operating features.

Experience the ultimate flexibility in traffic control with sixteen phases, sixteen overlaps, ten compatible phases per phase, alternative programming by time-of-day.

KEYBOARD

Easily navigate the 980 Controller using a custom keypad containing four (4) red function keys, ten (10) white numeric keys, seven (7) cursor and menu navigation keys, and two (2) LCD contrast adjustment keys.

DIAGNOSTICS

Built-in diagnostics provide improved maintenance and simplified repairs, allowing operators to test all input and output signals, RAM devices, memory, LCD, keypads, etc.

COMMUNICATIONS

Four (4) EIA-232 ports and an optional FSK modem are available. These ports are keyboard programmable with selectable baud rates up to 115K with full and half-duplex options. Various communication configurations allow multiple interfaces to other cabinet devices: conflict monitor, preemption equipment, detectors, GPS, modems, notebooks, printers, etc. An RS-485 SDLC Port is available for applications using the NEMA TS2 Port 1 interface, and a USB 2.0 Full Speed interface is available for software updates and file transfer.

SPECIFICATIONS

Voltage:	89 to 135 VAC
Frequency:	60 +/- 3 Hz
Temperature:	-30° F to 165° F
Humidity:	95% max, non-condensing
Dimensions:	10.50"H x 14.75"W x 8.38"D

