PG5901B Series

Industrial M2M Cellular Protocol Gateway

FEATURE HIGHLIGHTS

- Supports Modbus TCP/RTU/ASCII, DNP3, IEC61850, IEC60870-5-101/104, and Ethernet/Serial in client/server master/slave modes.
- Optional Full-License version for simultaneous transformation of multiple protocols.
- 4G Cellular Protocol Gateway with extensive LTE Band support, including:
  - EU Model: 2100/1800/850/2600/900/800 MHz (B1/B3/B5/B7/B8/B20)
  - US Model: 1900/1700/850/700/600 MHz (B2/B4/B5/B12/B13/B14/B66/B71)
- Industrial-grade hardware for operating in harsh environments
- 1 x 10/100/1000Mbps Ethernet port
- 1 x RS-232/485 port – baud rate up to 921.6 Kbps
- 2 x High speed USB 2.0 ports
  - Management via SMS, Web Browser and Windows Utility
  - VPN over PPTP, IPSec or OpenVPN for secure communications

PRODUCT DESCRIPTION

With Its powerful architecture and industrial-grade hardware, PG5901B provides seamless protocol conversion for devices in industrial network operations. With its rugged construction, PG5901B is designed to perform in the most demanding of industries – including power distribution, oil and gas, manufacturing, and agriculture. As a highly reliable and fault-tolerant Industrial Protocol Gateway, also features integrated 4G connectivity, making it ideal for any industry looking to implement devices at remote locations for smart grid operations. Serial reach can also be extended with the Gateway's redundant Ethernet.

Performance

Its rugged, reliable hardware features high EMC protection, wide temperature operation, and programming and installation flexibility in one device, while its advanced performance protects your data over the Internet with secure PPTP, IPsec or OpenVPN tunnels, with its powerful CPU providing up to 37.9Mbps* softwareassisted AES encryption.

Configuration

The device can be easily configured using eNode Designer, a user-friendly Windows utility based on Java. The tool allows users to assign various protocols to different ports, define serial port settings, and define protocolspecific parameters, such as data point mapping. eNode uses a project file to represent the system as a whole, with eNode modules representing individual network devices and protocol applications for individual configuration – such as defining where data point information enters and leaves the eNode Designer system.

An additional highlight of ATOP protocol gateways is the ability to enable multiple protocols simultaneously. In contrast to conventional gateways, which require predefinition of a single master and slave protocol each, the Full-License model allows users to transform multiple incoming protocols in our protocol base to others compatible with the output side, achieving powerful protocol conversion functions, flexible operations, and easier maintenance.

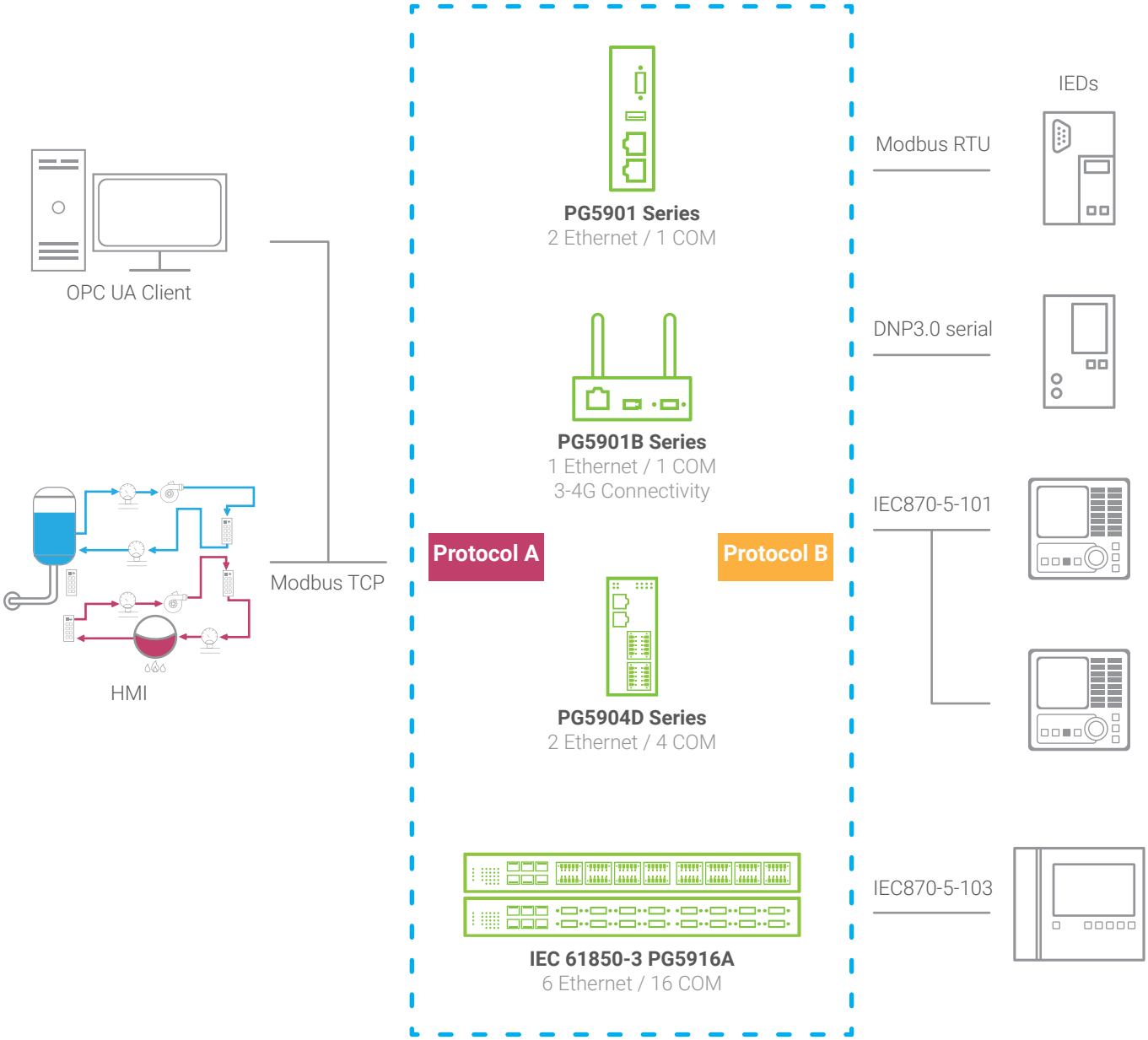
APPLICATION

Features

The protocol gateway's embedded protocol stacks allow

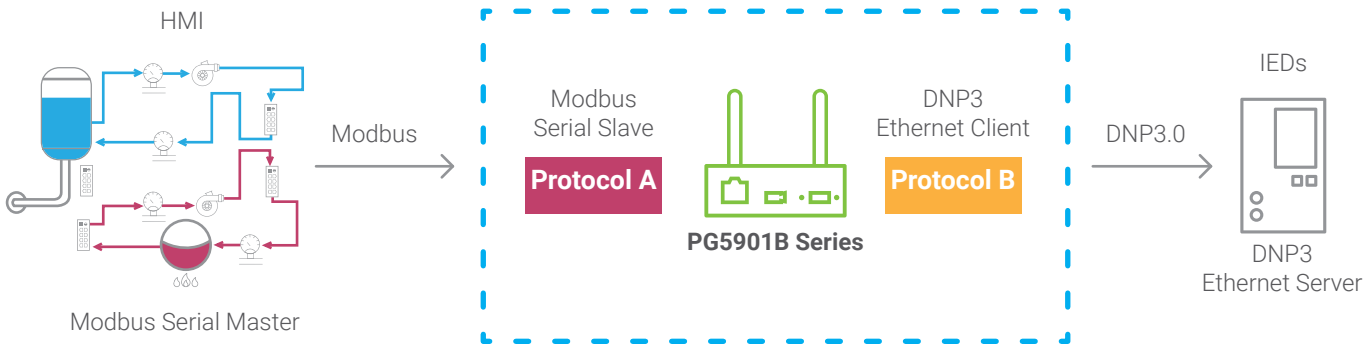
- Seamless conversion
- Exception/error Management
- Unsolicited event management for the protocols requiring them (such as DNP3)
- High performance
- Low cost

General Architecture



* Protocol A and Protocol B - Please refer to Protocol Availability Matrix and order information

Application Example - Modbus Serial HMI to DNP3.0



In this example, a Modbus Serial HMI is easily connected to a DNP3 IED through Atop's Protocol Gateway. The host HMI's role is a Modbus Serial Master while the end-device to be accessed is a DNP3.0 Ethernet Server Slave. To the host HMI, Atop's Protocol Gateway acts seamlessly as a Modbus Serial Slave, answering the polling commands and write commands that come from the by using a virtual Modbus ID. Simultaneously, Atop's Protocol Gateway acts as a DNP3 Ethernet Client to any end-device whose DNP3 address is mapped to the virtual Modbus ID that the HMI is accessing.

WARNING
All gateway functions listed in the datasheet refer to the "Gateway" role, and not which "host" or "slave" the gateway is connected to. The SKU shown in this example is "MBSS-DNEC" (Modbus Serial Slave to DNP3.0 Ethernet Client).

PROTOCOL AVAILABILITY

Protocol Availability Matrix for Conventional PG5901B Series

Protocol B		Protocol A						
		Ethernet Server				Serial Slave		
		IEC 61850	DNP3	Modbus TCP	IEC 60870-5-104	DNP3	Modbus RTU/ASCII	IEC 60870-5-101
Ethernet Client	IEC 61850	n/a	DNES-50EC	MBES-50EC	04ES-50EC	DNSS-50EC	MBSS-50EC	01SS-50EC
	DNP3	50ES-DNEC	n/a	MBES-DNEC	04ES-DNEC	DNSS-DNEC	MBSS-DNEC	01SS-DNEC
	Modbus TCP	50ES-MBEC	DNES-MBEC	n/a	04ES-MBEC	DNSS-MBEC	n/a	01SS-MBEC
	IEC 60870-5-104	50ES-04EC	DNES-04EC	MBES-04EC	n/a	DNSS-04EC	MBSS-04EC	01SS-04EC
Serial Master	DNP3	50ES-DNSM	DNES-DNSM	MBES-DNSM	04ES-DNSM	n/a	n/a	n/a
	Modbus RTU/ASCII	50ES-MBSM	DNES-MBSM	n/a	04ES-MBSM	n/a	n/a	n/a
	IEC 60870-5-101	50ES-01SM	DNES-01SM	MBES-01SM	04ES-01SM	n/a	n/a	n/a
	IEC 60870-5-103	50ES-03SM	DNES-03SM	MBES-03SM	04ES-03SM	n/a	n/a	n/a

Full-License PG5901B Series

Users can run single or multiple protocol(s) in both Protocol A and Protocol B sides.

PROTOCOL SPECIFICATION

IEC61850 Server/ Client	
Supported Functions	• Generic access to the data (Read, Write) • 8 Logical Devices per Port • GOOSE (Generic Object Oriented Substation Event) – a GOOSE message will be generated by the gateway automatically upon event(*) • (*)Being other protocols not Real-Time, there is no guarantee that GOOSE message is generated within 1 ms from the event itelf.
Supported Control Type of commands	• Direct-with-Normal-Security Select Before Operate (SBO)-with-Normal-Security • Direct-with-Enhanced Security Select Before Operate (SBO)-with-Enhanced-Security
Implemented Protocol Subsets	• IEC 61850-6 (Substation Configuration Language Description: SCL) • IEC 61850-7-1 (Principles and Models) • IEC 61850-7-2 (Abstract Communication Service • Interface: ACSI • IEC 61850-7-3 (Common Data Classes: CDC) • IEC 61850-7-4 (Logical Nodes and data Object Classes) • IEC 61850-8-1 (Mapping to Manufacturing Message Specification: MMS) • Edition 1 & Edition 2 are both Supported

DNP3 Server/ Client/ Master/ Slave	
General Specifications	• Serial Mode or Ethernet with TCP or UDP Mode • Server side supports serving up to 5 client in TCP Mode • Client side in a single RS-485 port, supports connecting up to 16 IEDs • Client side supports connecting up to 16 IEDs • Maximum Fragment size 2048 octets • Protocol implementation with configurable parameters conforms to IEEE Std 1815-2012 level 2
Supported Functions	• Time Synchronization generic access to the data(Read, Write) • Commands with or without preselection (Select, Operate, Direct Operate) • Transmission of time-tagged events • Counter management (Immediate Freeze, Freeze and Clear) • Self-address
Supported DNP3 Object Library	• Binary Inputs up to 8000 pts • Binary Outputs up to 2000 pts • Double Inputs up to 4000 pts • Analog Inputs up to 250 pts • Analog Outputs up to 250 pts • Counters up to 250 pts

Modbus Server/ Client/ Master/ Slave	
General Specifications	• Support Modbus RTU and ASCII in Serial mode • Support Modbus in TCP mode • For Modbus Client in TCP mode, support connecting up to 64 Modbus servers • For Modbus Server in TCP mode, support serving up to 64 Modbus clients • Support maximum number of data points in read direction: 8000 pts • Support maximum number of commands in write direction: 4000 pts

Supported Function Codes	1: Read Coils 2: Read Discrete Inputs 3: Read Holding Registers 4: Read Input Registers 5: Write Single Coil 6: Write Single Register 15: Write Multiple Coils 16: Write Multiple Registers 43/14: Read Device Identification (server side only)
Supported Exception Codes	1: illegal function 2: illegal data address 3: illegal data value 4: server device failure 6: server device busy

IEC 60870-5-101 Master/ Slave	
General Specifications	• Protocol implementation with configurable parameters conforms to the IEC 60870-5-101 edition 2 specification • Process Information in Monitor and Control Direction • Balanced and Unbalanced Modes • CP24Time2a or CP56Time2a timestamp for monitor direction report
Supported Functions	• Station Initialization • Interrogation • Read Procedure • Cyclic Data and Spontaneous Transmission (Slave Side only) • Clock Synchronization • Transmission of Integrated Totals • Direct and SBO command
Supported Data Types	• Monitors Points: Each supports up to 1000 pts: Single Point, Double Point, Step Position, Bit String, Measured with Normalized Value, Measured with Scaled Value, Measured Short Floating Point Value, Integrated Totals • Control Points: Each supports up to 500 pts: Single Command, Double Command, Regulating Step Command, Set Point Command with Normalized Value, Set Point Command with Scaled Value, Set Point Command Short Floating Point, Bit string

IEC 60870-5-103 Master/ Slave	
General Specifications	• Protocol implementation with configurable parameters conforms to the IEC 60870-5-103:1997 • Every serial port supports only one IED • Process Information in Monitor and Control Direction • Unbalanced Modes
Supported Functions	• Station Initialization, Supports reset FCB and CU • General Interrogation • Clock Synchronization • Command Transmission • Test Mode • Blocking of Monitor Direction
Supported Information	• Monitor direction: * Status indications in monitor direction: from <16> to <30> * Supervision indications in monitor direction: <32>, <33>, from <35> to < 39>, <46>, <47> * Earth fault indications in monitor direction: from <48> to <52>

Supported Information	* Fault indications in monitor direction: from <64> to <93> * Auto-reclosure indications in monitor direction: from <128> to <130> * Measurands in monitor direction: from <144> to <148> • Control direction: General commands in control direction: from <16> to <19>, from <23> to <26>

IEC 60870-5-104 Server/ Client	
General Specifications	• Server side supports serving up to 5 client • Client side supports connecting up to 10 IEDs • Protocol implementation with configurable parameters conforms to the IEC 60870-5-104 specification edition 2 • Process Information in Monitor and Control Direction • CP56Time2a timestamp for Control Commands
Supported Functions	• Station Initialization • Interrogation • Read Procedure (Server side only) • Cyclic Data and Spontaneous Transmission (Server side only) • Clock Synchronization • Transmission of Integrated Totals • Direct and SBO command
Supported Data Types	• Monitors Points: Each supports maximum 1000 pts: Single Point, Double Point, Step Position, Bit String, Measured with Normalized Value, Measured with Scaled Value, Measured Short Floating Points Value, Integrated Totals. • Control Points: Each supports maximum 500 pts: Single Command, Double Command, Regulating Step Command, Set Point Command with Normalized Value, Set Point Command with Scaled Value, Set Point Command Short Floating Point, Bitstring. • Event Logging (Server Side only) Universal Event Buffer up to 20,000 Events

SPECIFICATIONS

Wireless Interface	
Standard	WCDMA/ DC-HSPA+/ LTE
Band Options	EU version: - FDD LTE: 2100/1800/850/2600/900/800MHz(B1/B3/B5/B7/B8/B20) - TDD LTE: 2600/2300/2500MHz(B38/B40/B41) - WCDMA: 2100/850/900MHz (B1/B5/B8)
	US version: - UMTS: 1900/1700/850/700/600bMHz(B2/B4/B5/B12/B13/B14/B66/B71) - WCDMA: 1900/1700/850MHz (B2/B4/B5)
Maximum 4G throughput	EU version: - LTE-FDD Max 150Mbps (DOWNLINK), Max 50Mbps (UPLINK) - LTE-TDD Max 130Mbps (DOWNLINK), Max 30Mbps (UPLINK) - DC-HSPA+ Max 42Mbps (DOWNLINK), Max 5.76Mbps(UPLINK) - WCDMA Max 384Kbps(DOWNLINK), Max 384Kbps(UPLINK)
	US version: - LTE-FDD Max 100Mbps (DOWNLINK), Max 50Mbps (UPLINK) - DC-HSPA+ Max 42Mbps (DOWNLINK) Max 5.76Mbps(UPLINK) - WCDMA Max 384Kbps(DOWNLINK) Max 384Kbps(UPLINK)

Network Interface	
Ethernet Port	1x 10/100/1000BASE-TX RJ-45
Compliance	IEEE 802.3 10BASE-T IEEE 802.3u for 100BASE-T(X) IEEE 802.3ab for 1000BASE-T
Serial Interface	
Connector	14-Pin 5.08mm Terminal Block (integrated with DI/DOs) or D-Sub9 connector
Port	1
Mode	1 port RS-232/485 (2-wire) software selectable
Baud Rate	1,200~921,600 bps
Parity	None, Odd, Even
Data Bits	7, 8
Stop Bits	1, 2
USB Interface	
Speed	USB 2.0
Connector	USB A Type *2
DI/DO Interface (IO model only)	
DI	2 channels photo coupler isolated digital input
DO	2 channels digital output. N.O.(2A@24VDC)
Internal Battery function (Battery model only)	
Battery function	Provide normal operation at least 10 seconds after power failure function
Power Characteristics	
Connector	3-Pin 5.08mm Lockable Terminal Block
Input Voltage	9-48 VDC
Power Consumption	0.65A@12VDC (Approx. 7.8W)
Power Redundancy	USB DC 5V Power Input
Reverse Polarity Protection	Yes
Mechanicals	
Housing	IP30 protection, metal housing
Dimensions(W x H x D)	32mm x 122mm x 92mm
Installation	DIN-Rail or Wall-Mount (optional kit)
Reset Button	Yes
Weight	400g
Environmental Limits	
Operating Temperature	-40°C ~ 70°C (-40°F ~ 158°F)
Storage Temperature	-40°C ~ 85°C (-40°F ~ 185°F)
Ambient Relative Humidity	5 ~ 95% RH, (non-condensing)
Software	
Protocols	IPv4, ARP, ICMP, TCP, UDP, DHCP Client, DNS Client, Telnet, HTTP, HTTPS, NTP, SMTP/TLS, SNMP v1/v2c/v3, Syslog, 802.1D-2004 RSTP, IPsec VPN peer-to-peer and peer-to-side, OpenVPN client/server (maximum VPN throughput of 37.9Mbps*), and PPTP
Additional features	Remote SMS monitoring
Security	VPN through IPsec tunneling (max 10 tunnels), OpenVPN, and PPTP on cellular or LAN
Network	NAT

REGULATORY APPROVALS

Regulatory Approvals				
Safety	CB (IEC/EN62368-1 & IEC/EN60950-1), UL60950-1			
EMC	FCC Part 15, Subpart B, Class A EN301489-19, EN301489-52, EN301908-1, EN303413, ETSI EN300440-1/-2, EN 55024, EN 55032, EN61000-6-4,EN 61000-3-2, EN 61000-3-3, EN61000-6-2			
Test	**Item**		**Value**	**Level**
IEC 61000-4-2	ESD	Contact Discharge Air Discharge	±8KV ±15KV	4 4
IEC 61000-4-3	RD	80-1000MHz	10 V/m	3
IEC 61000-4-4	EFT	AC Power Port Signal Port	±2.0KV ±2.0KV	3 4
IEC 61000-4-5	Surge	AC Power Port Signal Port	Line-to Earth±2.0KV Line-to Earth±2.0KV	3 3
IEC 61000-4-6	CS	0.15-80MHz	10 Vrms	3
IEC 61000-4-8	PFMF	Enclosure	AC 50Hz 30A/m	3
			>95%,Reduction,0.5period 30%, Reduction,25 period >95%,Reduction,250 period	–
Shock	MIL-STD-810G Method 516.7			
Drop	MIL-STD-810G Method 516.7			
Vibration	MIL-STD-810G Method 514.7			
RoHS	Yes			
MTBF	20.88 years according to MIL-HDBK-217F (Model average)			
Warranty	5 years			

ORDERING INFORMATION

Hardware	
Model Name	**Description**
PG5901B-4G-US	Ind. Cellular Protocol Gateway with 1 Serial port, DB9, 4G, US
PG5901B-IO-4G-US	Ind. Cellular Protocol Gateway with 1 Serial port, TB14, 4G, 2 DI, 2 DO, US
PG5901B-IO-4G-GPS-US	Ind. Cellular Protocol Gateway with 1 Serial port, TB14, 4G, 2 DI, 2 DO, GPS, US
PG5901B-4G-B-US	Ind. Cellular Protocol Gateway with 1 Serial port, DB9,4G, Internal battery, US
PG5901B-IO-4G-B-US	Ind. Cellular Protocol Gateway with 1 Serial port, TB14,4G,2DI,2DO,Pwr Bank, US
PG5901B-IO-4G-GPS-B-US	Ind. Cellular Protocol Gateway with 1 Serial port, TB14,4G,2DI,2DO,GPS,Pwr Bank,US
PG5901B-4G-EU	Ind. Cellular Protocol Gateway with 1 Serial port, DB9, 4G, EU
PG5901B-IO-4G-EU	Ind. Cellular Protocol Gateway with 1 Serial port, TB14, 4G, 2 DI, 2 DO, EU
PG5901B-IO-4G-GPS-EU	Ind. Cellular Protocol Gateway with 1 Serial port, TB14, 4G, 2 DI, 2 DO, GPS, EU
PG5901B-4G-B-EU	Ind. Cellular Protocol Gateway with 1 Serial port, DB9,4G , Internal Battery, EU
PG5901B-IO-4G-B-EU	Ind. Cellular Protocol Gateway with 1 Serial port,TB14,4G,2DI,2DO,Pwr Bank, EU
PG5901B-IO-4G-GPS-B-EU	Ind. Cellular Protocol Gateway with 1 Serial port,TB14,4G,2DI,2DO,GPS,Pw Bank,EU

Optional Accessories

Model Name	Part Number	Description
UN315-1212(US-Y) LV6	505001511200003G	Y-Type (5.08 mm) power adaptor, 100-240VAC input, 1.25A @ 12VDC output, US plug, LV6.
UNE315-1212(EU-Y)LV6	505001511200013G	Y-Type (5.08 mm) power adaptor, 100-240VAC input, 1.25A @ 12VDC output, EU plug, LV6.
ADP-DB9(F)-TB5	59906231G	Female DB9 to Female 3.81mm TB5 Converter
WMK-315-Black	701000000000050G	Black Aluminum Wall Mount Kit

Protocols

SKU	Description
01SS-04EC	IEC 60870-5-101 Serial Slave to IEC 60870-5-104 Ethernet Client
01SS-50EC	IEC 60870-5-101 Serial Slave to IEC 61850 Client
01SS-DNEC	IEC 60870-5-101 Serial Slave to DNP3 Ethernet Client
01SS-MBEC	IEC 60870-5-101 Serial Slave to Modbus Ethernet Client
04ES-01SM	IEC 60870-5-104 Ethernet Server to IEC 60870-5-101 Serial Master
04ES-03SM	IEC 60870-5-104 Ethernet Server to IEC 60870-5-103 Serial Master
04ES-50EC	IEC 60870-5-104 Ethernet Server to IEC 61850 Ethernet Client
04ES-DNEC	IEC 60870-5-104 Ethernet Server to DNP3 Ethernet Client
04ES-DNSM	IEC 60870-5-104 Ethernet Server to DNP3 Serial Master
04ES-MBEC	IEC 60870-5-104 Ethernet Server to Modbus Ethernet Client
04ES-MBSM	IEC 60870-5-104 Ethernet Server to Modbus Serial Master
50ES-01SM	IEC 61850 Ethernet Server to IEC 60870-5-101 Serial Master
50ES-03SM	IEC 61850 Ethernet Server to IEC 60870-5-103 Serial Master
50ES-04EC	IEC 61850 Ethernet Server to IEC 60870-5-104 Ethernet Client
50ES-DNEC	IEC 61850 Ethernet Server to DNP3 Ethernet Client
50ES-DNSM	IEC 61850 Ethernet Server to DNP3 Serial Master
50ES-MBEC	IEC 61850 Ethernet Server to Modbus Ethernet Client
50ES-MBSM	IEC 61850 Ethernet Server to Modbus Serial Master
DNES-01SM	DNP3 Ethernet Server to IEC 60870-5-101 Serial Master
DNES-03SM	DNP3 Ethernet Server to IEC 60870-5-103 Serial Master
DNES-04EC	DNP3 Ethernet Server to IEC 60870-5-104 Ethernet Client
DNES-50EC	DNP3 Ethernet Server to IEC 61850 Ethernet Client
DNES-DNSM	DNP3 Ethernet Server to DNP3 Serial Master
DNES-MBEC	DNP3 Ethernet Server to Modbus Ethernet Client
DNES-MBSM	DNP3 Ethernet Server to Modbus Serial Master
DNSS-04EC	DNP3 Serial Slave to IEC 60870-5-104 Ethernet Client
DNSS-50EC	DNP3 Serial Slave to IEC 61850 Ethernet Client
DNSS-DNEC	DNP3 Serial Slave to DNP3 Ethernet Client
DNSS-MBEC	DNP3 Serial Slave to Modbus Ethernet Client
MBES-01SM	Modbus Ethernet Server to IEC 60870-5-101 Serial Master
MBES-03SM	Modbus Ethernet Server to IEC 60870-5-103 Serial Master
MBES-04EC	Modbus Ethernet Server to IEC 60870-5-104 Ethernet Client
MBES-50EC	Modbus Ethernet Server to IEC 61850 Ethernet Client
MBES-DNEC	Modbus Ethernet Server to DNP3 Ethernet Client

MBES-DNSM	Modbus Ethernet Server to DNP3 Serial Master
MBSS-04EC	Modbus Serial Slave to IEC 60870-5-104 Ethernet Client
MBSS-50EC	Modbus Serial Slave to IEC 61850 Client
MBSS-DNEC	Modbus Serial Slave to DNP3 Ethernet Client
FL	Allows a model to run single or multiple protocol(s) in both front-end to SCADA and back-end to IED sides