

## FEATURE HIGHLIGHTS



- Dual 10/100 Mbps Ethernet port, with optional PoE PD or 100/1000 Mbps SFP Slot
- 4-port RS-232/422/485, baud rate up to 921.6 Kbps
- IP30 Metal housing with Aluminum heat sink
- Strong EMC protection, works in environments from -40 to 85°C
- Same hardware platform for different protocol conversion (Modbus TCP/RTU/ASCII, DNP3.0 TCP or serial, IEC 60870-5-101, IEC 60870-5-103, IEC 60870-5-104, IEC 61850)
- User friendly configuration with a Java-Based Windows utility
- Embedded PPTP, IPsec VPN or OpenVPN for enhanced security
- LAN Redundancy through embedded RSTP Protocol

## PRODUCT DESCRIPTION

The PG59XX Series is a highly reliable and fault tolerant Industrial Protocol Gateway. Its powerful architecture provides seamless conversion between the different protocols Ethernet or Serial based. The serial devices communicating on different protocols could be integrated into the system and extend its reach over the gateway's redundant Ethernet. This device is designed to work in most demanding industries such as power substations, power generation, oil and gas, farming and manufacturing.

The configuration carried out through a use friendly, Java- Based Windows Utility called eNode Designer. It allows configuring target platforms, set device properties and protocol data point mapping. To do so, a project file representing the system should be created. This will include devices and the protocol applications running on them. The configuration is completely dependent on the "eNode Module" which represents that device or application – but may include things such as changing the communication port settings and defining where data point information enters and leaves the eNode Designer system.

PG59XX Series embeds an additional layer of security, allowing the devices to be deployed in topologies that request data to flow through the Internet and preventing sensitive control and monitoring data to be readable from malicious activities. IPsec VPN encryption, configurable in both peer-to-peer and peer-to-side modes will make sure the data passing is encrypted through a strong 128, 192 or 256-bit AES encryption.

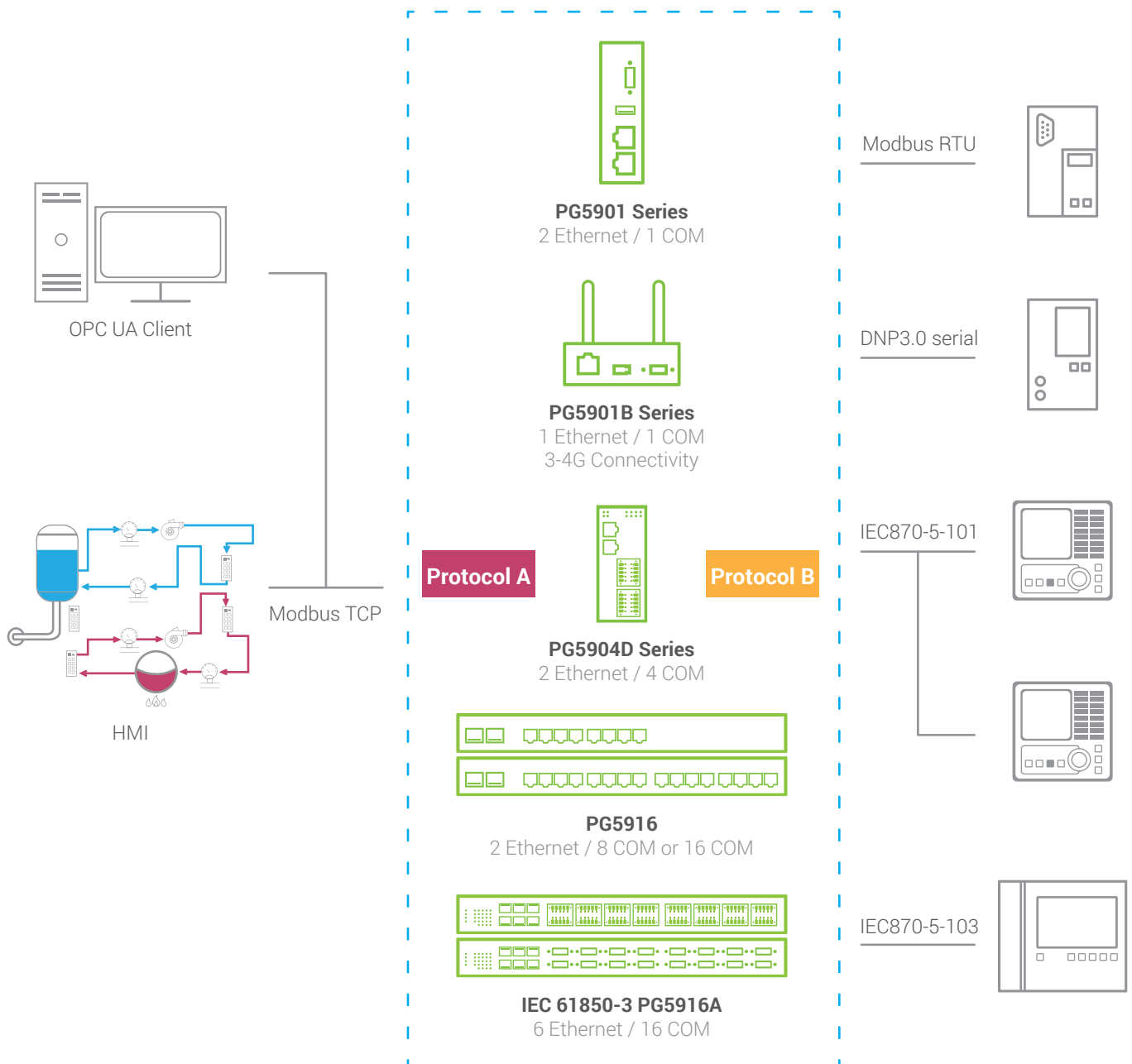
# APPLICATION

## Features

The protocol gateway's embedded protocol stacks allow

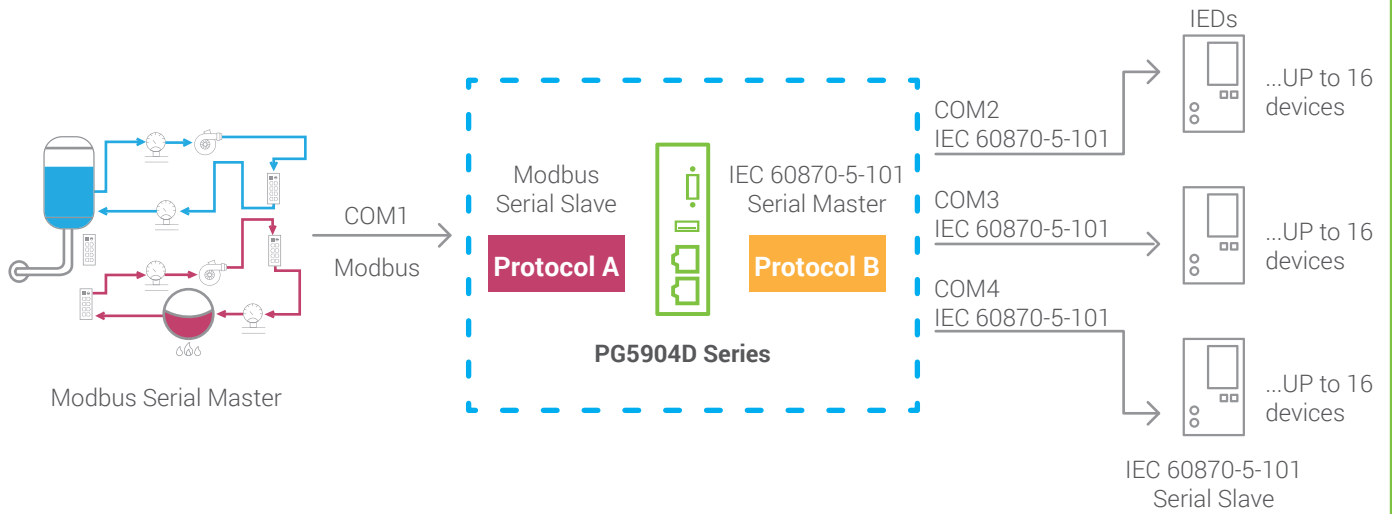
- Seamless conversion
- Exception/error Management
- Unsolicited event management for the protocols requiring them (such as DNP3)
- High performance
- Low cost

## General Architecture



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

### Example



The example shows how to Easily connect a Modbus Serial HMI, through Atop's Protocol Gateway to an IEC60870-5-101 Serial slave IED. The host HMI has the role of a Modbus Serial Master while the end-device to be accessed is an IEC 60870-5-101 Serial slave. Atop's protocol Gateway acts towards the HMI seamlessly as a Modbus Serial Slave, answering the poll commands or the write commands required by the Host by its virtual Modbus ID. Meanwhile, it acts as a IEC 60870-5-101 Serial Master with regard to the end-device whose IEC60870-5-101 address is mapped to the virtual Modbus ID that the HMI is accessing.

**Be careful!** – all gateway functions listed in the datasheet refer to the "Gateway" role, and not which "host" or "slave" the gateway is connected to. In this example, the SKU shown is "MBSS-01SM" (Modbus Serial Slave to IEC 60870-5-101 Serial Master)

## PROTOCOL AVAILABILITY

Protocol Availability Matrix for PG5904D 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	n/a
	DNP3	50ES-DNEC	n/a	MBES-DNEC	04ES-DNEC	DNSS-DNEC	MBSS-DNEC	n/a
	Modbus TCP	50ES-MBEC	DNES-MBEC	n/a	04ES-MBEC	DNSS-MBEC	n/a	n/a
	IEC 60870-5-104	50ES-04EC	DNES-04EC	MBES-04EC	n/a	DNSS-04EC	MBSS-04EC	n/a
Serial Master	DNP3	50ES-DNSM	DNES-DNSM	MBES-DNSM	04ES-DNSM	DNSS-DNSM	MBSS-DNSM	01SS-DNSM
	Modbus RTU/ASCII	50ES-MBSM	DNES-MBSM	n/a	04ES-MBSM	DNSS-MBSM	n/a	01SS-MBSM
	IEC 60870-5-101	50ES-01SM	DNES-01SM	MBES-01SM	04ES-01SM	DNSS-01SM	MBSS-01SM	n/a
	IEC 60870-5-103	50ES-03SM	DNES-03SM	MBES-03SM	04ES-03SM	DNSS-03SM	MBSS-03SM	01SS-03SM

## PROTOCOL SPECIFICATION

### IEC61850 Server/ Client

Supported Functions	<ul style="list-style-type: none"> <li>• Generic access to the data (Read, Write)</li> <li>• Clock Synchronization</li> <li>• 8 Logical Devices per Port</li> <li>• GOOSE (Generic Object Oriented Substation Event) <ul style="list-style-type: none"> <li>– a GOOSE message will be generated by the gateway automatically upon event(*)</li> </ul> </li> <li>• (*)Being other protocols not Real-Time, there is no guarantee that GOOSE message is generated within 1 ms from the event itself.</li> </ul>
Supported Control Type of commands	<ul style="list-style-type: none"> <li>• Direct-with-Normal-Security Select Before Operate (SBO)-with-Normal-Security</li> <li>• Direct-with-Enhanced Security Select Before Operate (SBO)-with-Enhanced-Security</li> </ul>
Implemented Protocol Subsets	<ul style="list-style-type: none"> <li>• IEC 61850-6 (Substation Configuration Language Description: SCL)</li> <li>• IEC 61850-7-1 (Principles and Models)</li> <li>• IEC 61850-7-2 (Abstract Communication Service) <ul style="list-style-type: none"> <li>• Interface: ACSI</li> </ul> </li> <li>• IEC 61850-7-3 (Common Data Classes: CDC)</li> <li>• IEC 61850-7-4 (Logical Nodes and data Object Classes)</li> <li>• IEC 61850-8-1 (Mapping to Manufacturing Message Specification: MMS)</li> <li>• Edition 1 &amp; Edition 2 are both Supported</li> </ul>

### DNP3 Server/ Client/ Master/ Slave

General Specifications	<ul style="list-style-type: none"> <li>• Serial Mode or Ethernet with TCP or UDP Mode</li> <li>• Server side supports serving up to 5 client in TCP Mode</li> <li>• Client side in a single RS-485 port, supports connecting up to 16 IEDs</li> <li>• Client side supports connecting up to 16 IEDs</li> <li>• Maximum Fragment size 2048 octets</li> <li>• Protocol implementation with configurable parameters conforms to IEEE Std 1815-2012 level 2</li> </ul>
Supported Functions	<ul style="list-style-type: none"> <li>• Time Synchronization generic access to the data(Read, Write)</li> <li>• Commands with or without preselection (Select, Operate, Direct Operate)</li> <li>• Transmission of time-tagged events</li> <li>• Counter management (Immediate Freeze, Freeze and Clear)</li> <li>• Self-address</li> </ul>
Supported DNP3 Object Library	<ul style="list-style-type: none"> <li>• Binary Inputs up to 8000 pts</li> <li>• Binary Outputs up to 2000 pts</li> <li>• Double Inputs up to 4000 pts</li> <li>• Analog Inputs up to 250 pts</li> <li>• Analog Outputs up to 250 pts</li> <li>• Counters up to 250 pts</li> </ul>

### IEC 60870-5-103 Master/ Slave

General Specifications	<ul style="list-style-type: none"> <li>• Protocol implementation with configurable parameters conforms to the IEC 60870-5-103:1997</li> <li>• Master supports connecting up to 16 IEDs</li> <li>• Process Information in Monitor and Control Direction</li> <li>• Unbalanced Modes</li> </ul>
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Supported Functions	<ul style="list-style-type: none"> <li>• Station Initialization, Supports reset FCB and CU</li> <li>• General Interrogation</li> <li>• Clock Synchronization</li> <li>• Command Transmission</li> <li>• Test Mode</li> <li>• Blocking of Monitor Direction</li> </ul>
Supported DNP3 Object Library	<ul style="list-style-type: none"> <li>• Monitor direction: <ul style="list-style-type: none"> <li>* Status indications in monitor direction: from &lt;16&gt; to &lt;30&gt;</li> <li>* Supervision indications in monitor direction: &lt;32&gt;, &lt;33&gt;, from &lt;35&gt; to &lt;39&gt;, &lt;46&gt;, &lt;47&gt;</li> <li>* Earth fault indications in monitor direction: from &lt;48&gt; to &lt;52&gt;</li> <li>* Fault indications in monitor direction: from &lt;64&gt; to &lt;93&gt;</li> <li>* Auto-reclosure indications in monitor direction: from &lt;128&gt; to &lt;130&gt;</li> <li>* Measurands in monitor direction: from &lt;144&gt; to &lt;148&gt;</li> </ul> </li> <li>• Control direction: <ul style="list-style-type: none"> <li>General commands in control direction: from &lt;16&gt; to &lt;19&gt;, from &lt;23&gt; to &lt;26&gt;</li> </ul> </li> </ul>

### DNP3 Server/ Client/ Master/ Slave

General Specifications	<ul style="list-style-type: none"> <li>• Server side supports serving up to 5 client</li> <li>• Client side supports connecting up to 10 IEDs</li> <li>• Protocol implementation with configurable parameters conforms to the IEC 60870-5-104 specification edition 2</li> <li>• Process Information in Monitor and Control Direction</li> <li>• CP56Time2a timestamp for Control Commands</li> </ul>
Supported Functions	<ul style="list-style-type: none"> <li>• Station Initialization</li> <li>• Interrogation</li> <li>• Read Procedure (Server side only)</li> <li>• Cyclic Data and Spontaneous Transmission (Server side only)</li> <li>• Clock Synchronization</li> <li>• Transmission of Integrated Totals</li> <li>• Direct and SBO command</li> </ul>
Supported DNP3 Object Library	<ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> <li>• Event Logging (Server Side only) Universal Event Buffer up to 20,000 Events</li> </ul>

## HARDWARE SPECIFICATION

Network Interface	
Ethernet Port	2x 10/100BASE-T(X) RJ-45 or 2x 100/1000 SFP Slots
LAN-port Mode	Dual Subnets or LAN Redundancy
Compliance	IEEE 802.3 for 10BASE-T IEEE 802.3u for 100BASE-T(X) IEEE 802.3af for Power over Ethernet PD (PoE version only) IEEE 802.3u for 100BASE-X (SFP version only) IEEE 802.3z for 1000BASE-X (SFP version only)

Serial Interface	
Connector	1x2 5 pin 3.81mm Terminal Block, or D-sub9 connector
Ports	4
Mode	RS-232/422/485, software selectable
Baud Rate	1,200~921,600 bps
Parity	None, Odd, Even, Space, Mark
Data Bits	7,8
Stop Bits	1,2
Flow Control	None, Xon/Xoff, RTS/CTS
Isolation	3 KV
USB Interface	
Speed	USB 2.0
Connector	USB A Type *1
Power Characteristics	
Connector	Terminal Block
Input Voltage	12-48 VDC, or 48 VDC (supplied by PoE)
Power Consumption	0.65A @12 VDC (max.)
Power Redundancy	Yes
Reverse Polarity Protection	Yes
Relay Output	1A@30 VDC (normal open)
Mechanicals	
Dimensions(W x H x D)	55mm x 145mm x 113mm
Installation	DIN-Rail or Wall-Mount (optional kit)
Reset Button	Yes
Weight	1000g
Environmental Limits	
Operating Temperature	-40°C ~ 85°C (-40°F ~ 185°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, 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
Configuration	Web interface, Telnet, Device Management Utility (basic device settings) eNode Designer windows Utility (protocol conversion related settings)

## REGULATORY APPROVALS

Safety	EN61010-2-201, UL61010-2-201			
EMC	FCC Part 15, Subpart B, Class A EN 55032, EN 61000-3-2, EN 61000-3-3, EN 55024, EN61000-6-2, EN61000-6-4			
Test	Item		Value	Level
IEC 61000-4-2	ESD	Contact Discharge	±8KV	4
		Air Discharge	±15KV	4
IEC 61000-4-3	RS	80-1000MHz	10 V/m	3
IEC 61000-4-4	EFT	AC Power Port	±2.0KV	3
		Signal Port	±2.0KV	4
IEC 61000-4-5	Surge	AC Power Port	Line-to Line±1.0KV	3
		AC Power Port	Line-to Earth±2.0KV	3
		Signal Port	Line-to Earth±2.0KV	3
IEC 61000-4-6	CS	0.15-80MHz	10 Vrms	3
IEC 61000-4-8	CS	0.15-80MHz	10 Vrms	3
IEC 61000-4-11	CS	0.15-80MHz	10 Vrms	3
Shock	IEC 60068-2-27			
Drop	IEC 60068-2-32			
Vibration	IEC 60068-2-64			
RoHS	Yes			
MTBF	14.56 Years (according to MIL-HDBK-217F)			
Warranty	5 years			

## ORDERING INFORMATION

Hardware	
PG5904D-4P-DB	Industrial 4-Port Protocol Gateway, 10/100BASE-T(X), DB9
PG5904D-4P-TB	Industrial 4-Port Protocol Gateway, 10/100BASE-T(X), TB5
PG5904D-4P-Sis	Industrial 4-Port Protocol Gateway, 10/100BASE-T(X), Isolation
PG5904D-4P-PoE-DB	Industrial 4-Port Protocol Gateway, 10/100BASE-T(X) with PoE, DB9
PG5904D-4P-PoE-TB	Industrial 4-Port Protocol Gateway, 10/100BASE-T(X) with PoE, TB5
PG5904D-4P-PoE-Sis	Industrial 4-Port Protocol Gateway, 10/100BASE-T(X) With PoE, Isolation
PG5904D-4P-G-DB-SFP	Industrial 4-Port Protocol Gateway, 1000BASE-X with SFP Slot, DB9
PG5904D-4P-G-TB-SFP	Industrial 4-Port Protocol Gateway, 1000BASE-X with SFP Slot, TB5
PG5904D-4P-G-Sis-SFP	Industrial 4-Port Protocol Gateway, 1000BASE-X with SFP Slot, Isolation

### Optional Accessories

Model Name	Part Number	Description
SDR-75-24	50500752240001G	75W/3.2A DIN-Rail 24VDC power supply with 88~264VAC / 124~370VDC input
CBL-RJ45(8P)-DB9(F)-90-C	50891971G	8-pin RJ45-DB9 debug cable, 90cm
GDC-120	59906861G	120mm copper woven grounding cable
ADP-DB9(F)-TB5	59906231G	Female DB9 to Female 3.81mm TB5 Converter
WMK-450-Black	70100000000052G	Aluminum wall mount kit
LM28-C3S-TI-N	50708031G	SFP Transceiver,1250M,850nmVCSEL, Multimode, 550m,3.3V,-20~85C
LM38-C3S-TI-N	50709411G	SFP Transceiver,1250Mbps,1310nmFP, Multi-mode, 2km, 3.3V, -40~85°C
LS38-C3S-TI-N	50709391G	SFP Transceiver,1250Mbps,1310nmFP, Single-mode, 10km,3.3V,-40~85°C
LS38-C3L-TI-N	50709441G	SFP Transceiver,1250Mbps,1310nmDFB, Singlemode, 30km,3.3V,-40~85C
LM38-A3S-TI-N	50708051G	SFP Transceiver,155Mbps, 1310nmLED, Multi-mode, 2km, 3.3V, -40~85C
LS38-A3S-TI-N	50709431G	SFPTransceiver,155Mbps, 1310nmFP, Single-mode, 30km, 3.3V, -40~85C

### Protocols

01SS-03SM	IEC 60870-5-101 Serial Slave to IEC 60870-5-103 Serial Master
01SS-DNSM	IEC 60870-5-101 Serial Slave to DNP3 Serial Master
01SS-MBSM	IEC 60870-5-101 Serial Slave to Modbus Serial Master
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-01SM	DNP3 Serial Slave to IEC 60870-5-101 Serial Master
DNSS-03SM	DNP3 Serial Slave to IEC 60870-5-103 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-DNSM	DNP3 Serial Slave to DNP3 Serial Master
DNSS-MBEC	DNP3 Serial Slave to Modbus Ethernet Client
DNSS-MBSM	DNP3 Serial Slave to Modbus Serial Master
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-01SM	Modbus Serial Slave to IEC 60870-5-101 Serial Master
MBSS-03SM	Modbus Serial Slave to IEC 60870-5-103 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
MBSS-DNSM	Modbus Serial Slave to DNP3 Serial Master