IEC61850-3 certified Industrial Embedded Computer, with up to 16 Serial Ports

FEATURE HIGHLIGHTS

- IEC 61850-3 certified for easy setup in IEC 61850-3 substations
- Ideal for IoT and IIoT applications; supports Node-RED apps and dashboard
- Wide -40°C~85°C temperature range; Industrial EMC protection
- 6 x 10/100Mbps RJ45 ports or 6 x 100Mbps SFP Slots
- Up to 16 x RS-232/422/485 ports − selectable baud rate up to 921.6 Kbps
- 3 kV optional isolation on the serial ports
- Internal SD Card slot
- ATOP customized Linux SDK environment with reliable APIs
- Redundant Power Input for fault protection: either 24~48 VDC or High-Voltage AC/DC (100~240VAC or 100~370VDC)
- Rugged metal housing in 1U Rack-mount (rack-mount kit included)
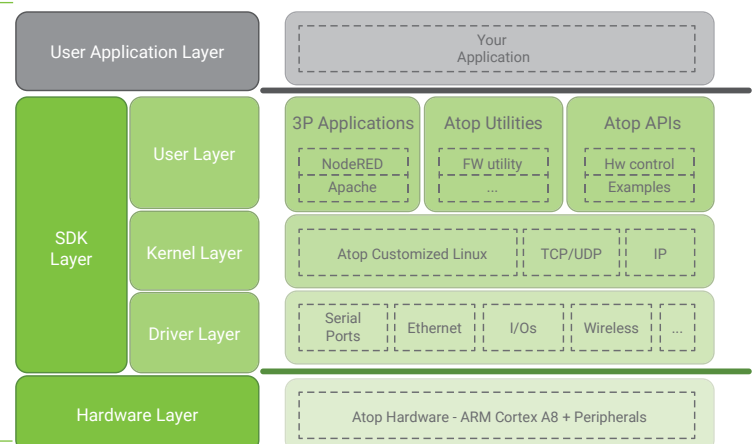
PRODUCT DESCRIPTION

Providing connectivity for the Internet of Things

ATOP's Industrial Embedded Computer is your ideal flexible Gateway to the Internet of Things, specifically tailored for advanced Power Substation applications. It provides Serial, Ethernet connectivity and interfaces that can unlock your potential. Based on your specific application, it allowing almost any serial device to be connected, providing and retrieving the data you need to and from the cloud, no matter what provider you're using.

Programmability

Write your customized application in C language and Run it on its powerful Industrial low-power 1GHz ARM Cortex A8 TI Sitara AM3352 CPU. Make flexible use of your peripherals, no matter storage, Serial, or USB are needed.

The device is available as a Standard SDK or Node-RED version. The Node-RED version, embedding a Node-RED SD-card, adds to the powerful hardware platform, the possibility add the ATOP-Customized Node-RED environment and an user-friendly Device Configuration UI. Node-RED, an open source Building-Block programming environment, will allow you to build your IoT application from an user-friendly, hardware-tailored application design environment and dashboard.

User Application Layer	Your Application		
	3P Applications	Atop Utilities	Atop APIs
SDK Layer — User Layer	NodeRED Apache	FW utility ...	Hw control Examples
Kernel Layer	Atop Customized Linux	TCP/UDP	IP
Driver Layer	Serial Ports	Ethernet	I/Os	Wireless	...
Hardware Layer	Atop Hardware - ARM Cortex A8 + Peripherals		

Rugged and flexible for advanced developments

SE5900A/SE5908A/SE5916A embed *high EMC protection, wide temperature operation*, programming and installation flexibility in one device. The *IEC61850-3 certified hardware* makes it the most advanced Computing option, while the dual power supply provides additional redundancy in case of power failure. High-Voltage option makes the device suitable for High-Voltage AC or DC inputs (100~240 VAC or 100~370VDC) that are common in substation environments., without additional cabling and power supply.

APPLICATION

The **IoT** (Internet of Things) or **IIoT** (Industrial Internet of Things) is a trending topic these days. It's all about bringing devices, sensors, actuators, data and commands to the cloud, with the ultimate goal to improve the quality of life, the services Smart Cities can offer, saving energy or saving money. This requires two things: to vehiculate the collected data to the cloud in a format that can be recognized and processed and to process, compute and analyze all this amount of data in real time.

It is not a concept far from reality. Imagine you'd like to bridge a Modbus Sensor to the cloud. And you'd like to have the application running on the cloud to be able to process multiple sensors' data, and to trigger some event in some specific stations along the network. You may also have the need to override the cloud control and manage the application locally. Any application has its story.
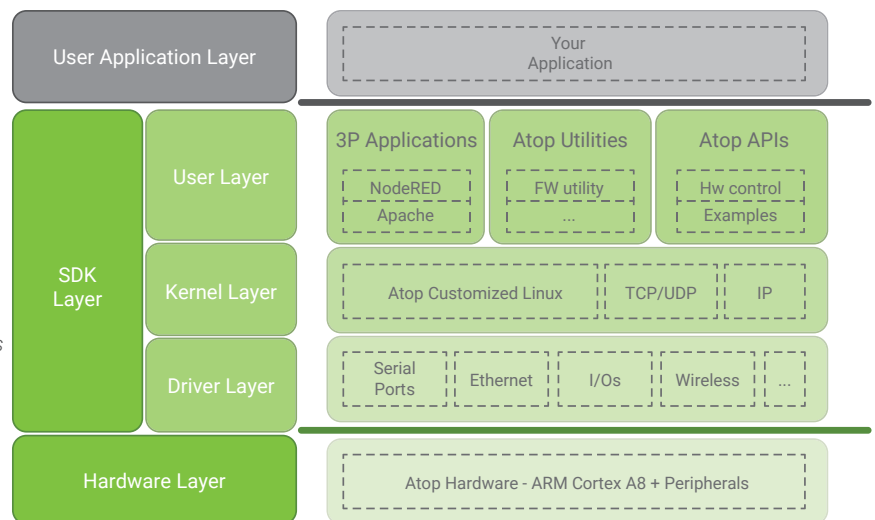
Here at ATOP, we understand these different needs and we are providing you different working models, based on what your needs are.

Use the Standard SDK, programmable embedded computer if:

- You are familiar with Linux OS
- You have ANSI C programming skills
- Your application is strictly time/ performance sensitive
- Your application has very critical exception handling requirements

Our SDK products provide:

- *Ported, proven and tested peripherals (such as Relay, Ethernet, Serial, etc.) and integrated drivers*
- *ATOP customized Linux Kernel and network protocols*
- *Ported, debugged and proven third party applications*
- *Utilities and APIs to control the hardware in an easy and effective way*
- *Example of source code*

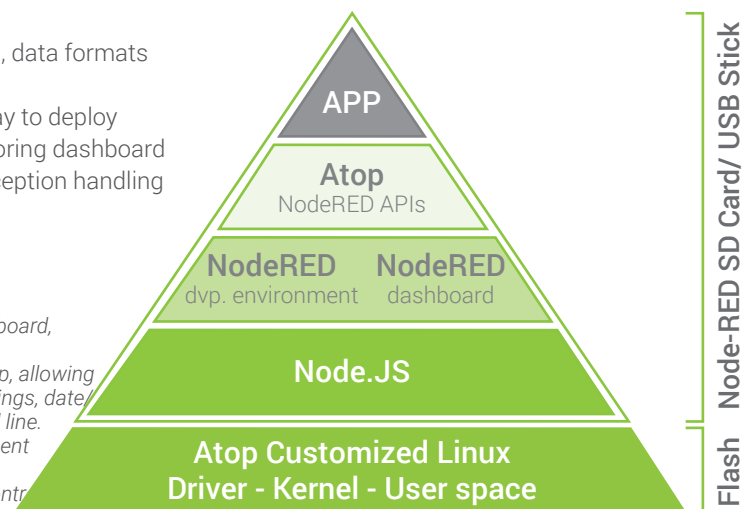| User Application Layer		Your Application
SDK Layer	User Layer	3P Applications / Atop Utilities / Atop APIs — NodeRED, Apache / FW utility, ... / Hw control, Examples
	Kernel Layer	Atop Customized Linux / TCP/UDP / IP
	Driver Layer	Serial Ports / Ethernet / I/Os / Wireless / ...
Hardware Layer		Atop Hardware - ARM Cortex A8 + Peripherals

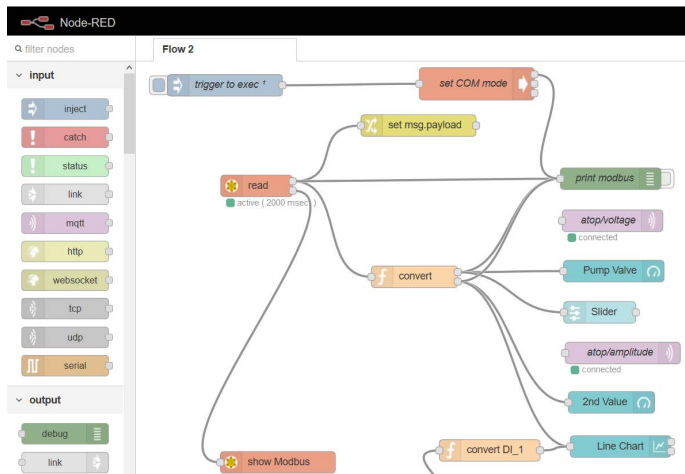## Use ATOP's Node-RED version with the embedded SD-card if:

- You're hands-on, with a good understanding of protocols, data formats
- You have some basic Javascript knowledge
- You're looking for a simple, user-friendly and effective way to deploy your applications to the cloud, with a user friendly monitoring dashboard
- You don't have strict performance requirements, and exception handling is not critical

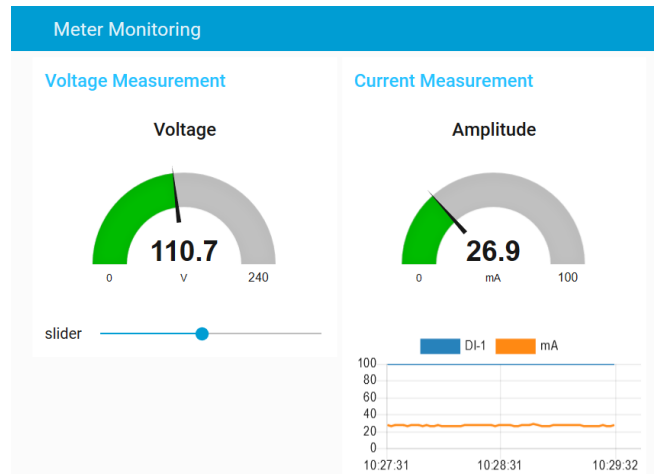*Our Node-RED version provides:*

- *Node-RED visual application development environment and dashboard, with automatic start on device boot-up, Node.JS based*
- *ATOP-customized dedicated Web-UI for user friendly device set-up, allowing you to create VPN tunnels, set-up the network or the Cellular settings, date/ time, diagnostics and much mode without using Linux command line.*
- *Different level of security to allow developers to access development environment and users to access dashboard only*
- *Customized Node-RED APIs (blocks) that will allow you to fully contr ATOP powerful hardware and control relays, Buzzer, diagnostics and much more*
- *Integrated Modbus and MQTT stacks, for seamless communication with field devices and cloud*
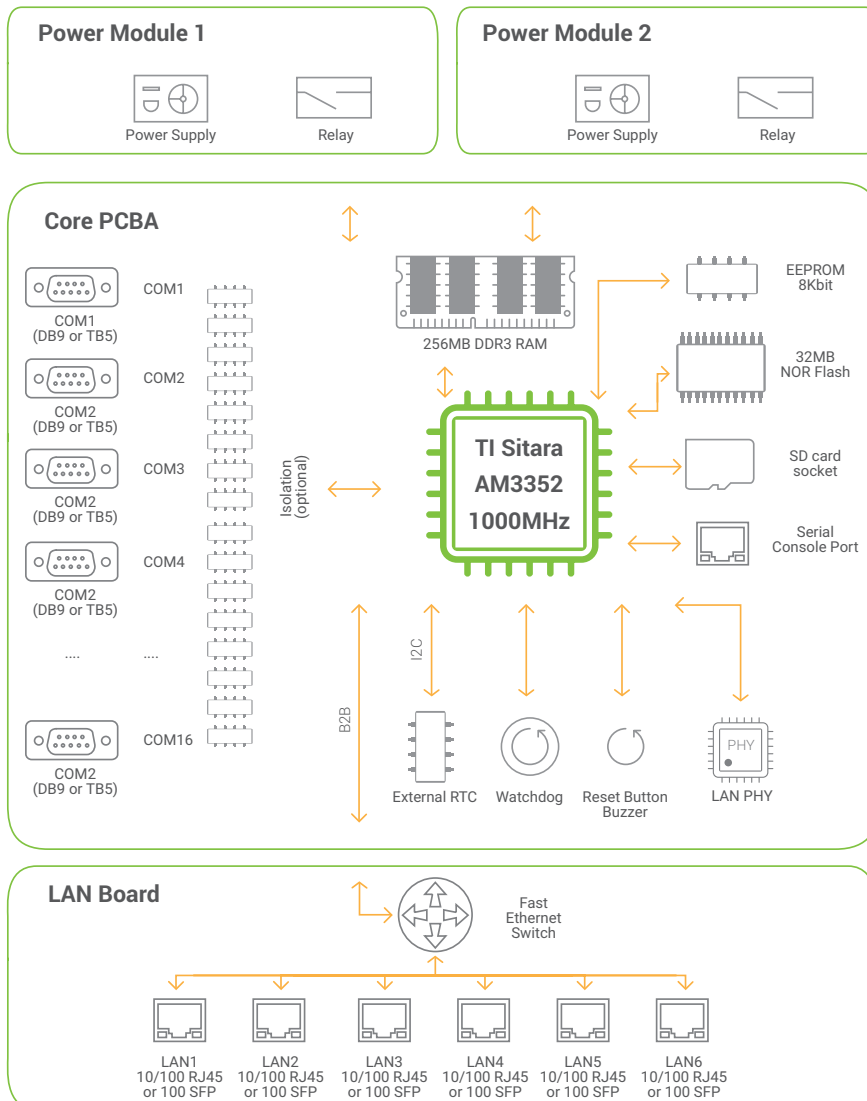- *Integrated AWS, Azure, Google and IBM Bluemix Nodes.*

APP

Atop
NodeRED APIs

NodeRED
dvp. environment   NodeRED
dashboard

Node.JS

Atop Customized Linux
Driver - Kernel - User space

Node-RED SD Card/ USB Stick   Flash

NodeRED development enrivonment

NodeRED dashboard

BLOCK DIAGRAM

Power Module 1

Power Supply   Relay

Power Module 2

Power Supply   Relay

Core PCBA

COM1
COM1 (DB9 or TB5)

COM2
COM2 (DB9 or TB5)

COM3
COM2 (DB9 or TB5)

COM4
COM2 (DB9 or TB5)

....

COM16
COM2 (DB9 or TB5)

Isolation (optional)

256MB DDR3 RAM

EEPROM 8Kbit

32MB NOR Flash

SD card socket

Serial Console Port

TI Sitara AM3352 1000MHz

I2C

B2B

External RTC   Watchdog   Reset Button Buzzer   LAN PHY

LAN Board

Fast Ethernet Switch

LAN1 10/100 RJ45 or 100 SFP
LAN2 10/100 RJ45 or 100 SFP
LAN3 10/100 RJ45 or 100 SFP
LAN4 10/100 RJ45 or 100 SFP
LAN5 10/100 RJ45 or 100 SFP
LAN6 10/100 RJ45 or 100 SFP

SPECIFICATIONS

Hardware Specifications	
CPU	Texas Instruments Sitara ARM Cortex A8 AM3352 1000MHz
Flash	32 MB NOR Flash (customizable upon request up to 128 MB)
RAM	256 MB DDR3 (customizable upon request up to 1 GB)
EEPROM	24LC64
Watchdog	ADM706
Real Time Clock (RTC)	Yes - with external chip
Buzzer	Yes
Console port	Yes - RJ45 Serial Console
Reset button	Yes
Network Interface	
Standards	IEEE 802.3 for 10BaseT IEEE 802.3u for 100BaseT(X) and 100BaseF(X)
Ethernet Ports	6x 10/100 BASE-T(X) RJ45 or 6x 100 BASE-F(X) SFP Slots (SFP version)
Ethernet Switch	Embedded 8-Ports Fast-Ethernet Switch (configurable). Each port can work as single Subnet or as Switch.
Serial Interface	
Connector	DB version: D-Sub9 (DB9) connector TB and SiS version: 5-Pin Terminal Block (5.08mm)
Ports	SE5900A: no serial ports SE5908A: 8-ports (RS-232 (supports only 5-pin mode)/RS-422/RS-485) SE5916A: 16-ports (RS-232 (supports only 5-pin mode)/RS-422/RS-485)
Serial Console	1x Serial Console port (RJ45)
Serial Port Isolation	3 kV (SiS version only)
Pull-high / Pull-low /Term. resistors	Software selectable.
Configuration	Baud Rate — 50 ~ 921,600bps Data Bits — 5, 6, 7, 8 Stop Bits — 1, 2 Flow Control — None, Xon/Xoff, RTS/CTS (RS-232 only)
Relay Output	
Relay Output	2x 1A@30VDC (Normal open)
Other interfaces	
USB ports	No
SD card	SD card slot (internal)
Software	
Bootloader	U-boot 2014.07
Linux kernel	Linux 3.14.26 (SDK version)
Linux toolchain	Linux 32 bits toolchain gcc (C/C++ PC cross compiler), glibc

Linux sample code	RS232, RS422, RS485, RTC, watchdog, LED, Relay output, Buzzer, network socket
Additional features (Node-RED version only)	Pre-installed Node-RED USB stick, with auto-run on startup Dedicated Web UI for device settings Integrated DHCP, IPv4, NTP/SNTP client, SNMP v1/v2c/v3, OpenVPN client/server, IPsec, and PPTP.
Power	
Input Voltage	Redundant 24-48 VDC or Redundant 100-240 VAC/ 100-370 VDC (HV Series)
Input Current	0.73 A @ 24 VDC 0.35 A @ 100 VAC 0.20 A @ 100 VDC
Power Consumption	Approximately 20 W
Connector	10-Pin Terminal Block
Power Redundancy	Yes
Reverse Polarity Protection	Yes
Environmental limits	
Operating Temperature Storage Temperature Ambient Relative Humidity	-40°C~85°C (-40°F~185°F) -40°C~85°C (-40°F~185°F) 5%~95%, 55°C (Non-condensing)
Mechanicals	
Housing	IP30 protection, SPCC metal housing
Dimensions(W x H x D)	440.6 x 44 x 309 mm (1U Rack-mount)
Installation	19" Rack-Mount (Kit included)
Weight	4,000g
Reset Button	Yes

DIMENSIONS & LAYOUT

Rear View
483,2
465,6
31,8
7

Top View
440,6

Front View

Side View
309
44
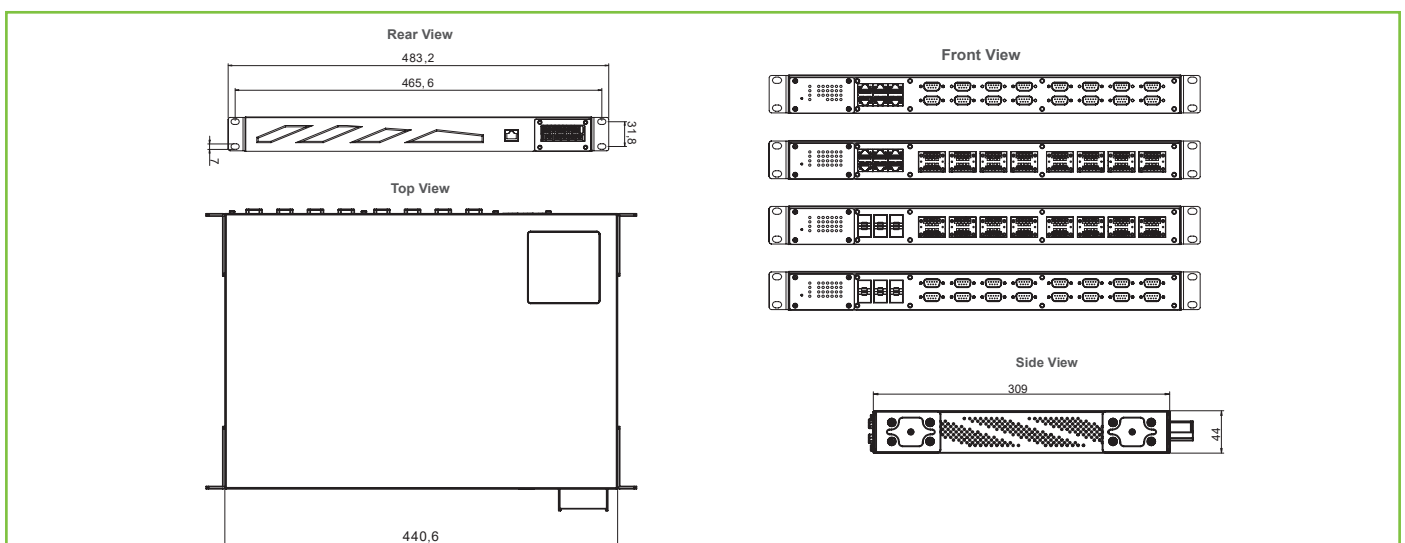
REGULATORY APPROVALS

Regulatory Approvals				
Safety	EN 61010-2-201			
EMC	FCC Part 15, Subpart B, Class B, EN 55032, Class B, EN 61000-6-2 Class B, EN 61000-3-2, EN 61000-3-3, EN 55024, EN 61000-6-4, IEC 61850-3 / IEEE 1613			
Test	**Item**		**Value**	**Level**
IEC 61000-4-2	ESD	Contact Discharge Air Discharge	±8kV ±15kV	4 4
IEC 61000-4-3	RS	Radiated (enclosure)	10 V/m	3
IEC 61000-4-4	EFT	AC Power Port DC Power Port Signal Port	±4.0KV ±4.0KV ±4.0KV	4 4 4
IEC 61000-4-5	Surge	AC Power Port AC Power Port DC Power Port DC Power Port Signal Port	Line-to Line±2.0KV Line-to Earth±4.0KV Line-to Line±1.0KV Line-to Earth±2.0KV Line-to Earth±2.0KV	4 4 3 3 4
IEC 61000-4-6	CS	AC Power Port DC Power Port Signal Port	10 V rms	3
IEC 61000-4-8	PFMF	Enclosure	100 A/m	5
IEC 61000-4-10	Damped Oscillatory Magnetic Field	Enclosure	100 A/m	5
IEC 61000-4-11	DIP	AC Power Port	-	-
IEC 61000-4-12	Damped Oscillatory	AC Power Port Signal Port	2.5 KV common, 1 KV differential 2.5 KV common, 1 KV differential	3 3
Shock Drop (Freefall) Vibration	MIL-STD-810F Method 516.5 MIL-STD-810F Method 516.5 MIL-STD-810F Method 514.5 C1 & C2			
RoHS II	Yes			
MTBF	SE5916A-6SFP-Sis-HV: 9.18 years; SE5916A-6SFP-Sis: 8.63 years			
Warranty	5 years			

ORDERING INFORMATION

Please note the following suffixes to be added to he chosen model name:
- SDK version suffix: (SDK)
- Node-RED version suffix: -NR

Ordering information

Model name	Description	Power	Ethernet	Serial
SE5900A-6SFP	Industrial Embedded Computer, 100BASE-FX SFP slot	24~48 VDC	6 (SFP)	-
SE5916A-6SFP	Ind. 16 Port Emb. Computer, 100BASE-FX SFP slot, DB9			16 (DB9)
SE5916A-6SFP-TB	Ind. 16 Port Emb. Computer, 100BASE-FX SFP slot, TB5			16 (TB)
SE5916A-6SFP-Sis	Ind. 16 Port Emb. Computer,100BASE-FX SFP,Isolated			16 (TB)
SE5908A-6SFP	Ind. 8 Port Emb. Computer, 100BASE-FX SFP slot, DB9			8 (DB9)
SE5908A-6SFP-TB	Ind. 8 Port Emb. Computer, 100BASE-FX SFP slot, TB5			8 (TB)
SE5908A-6SFP-Sis	Ind. 8 Port Emb. Computer, 100BASE-FX SFP,Isolated			8 (TB)
SE5900A-6SFP-HV	Industrial Embedded Computer, 100BASE-FX SFP slot	100/240 VAC or 100/370 VDC		-
SE5916A-6SFP-HV	Ind. 16 Port Emb. Computer, 100BASE-FX SFP slot, DB9			16 (DB9)
SE5916A-6SFP-TB-HV	Ind. 16 Port Emb. Computer, 100BASE-FX SFP slot, TB5			16 (TB)
SE5916A-6SFP-Sis-HV	Ind. 16 Port Emb. Computer, 100BASE-FX SFP,Isolated			16 (TB)
SE5908A-6SFP-HV	Ind. 8 Port Emb. Computer, 100BASE-FX SFP slot, DB9			8 (DB9)
SE5908A-6SFP-TB-HV	Ind. 8 Port Emb. Computer, 100BASE-FX SFP slot, TB5			8 (TB)
SE5908A-6SFP-Sis-HV	Ind. 8 Port Emb. Computer, 100BASE-FX SFP, Isolated			8 (TB)
SE5900A	Industrial Embedded Computer, 10/100BASET(X) RJ45	24~48 VDC	6 (RJ45)	-
SE5916A	Ind. 16 Port Emb. Computer,10/100BASET(X)RJ45, DB9			16 (DB9)
SE5916A-TB	Ind. 16 Port Emb. Computer,10/100BASET(X)RJ45, TB5			16 (TB)
SE5916A-Sis	Ind. 16 Port Emb. Comp.,10/100BASET(X)RJ45,Isolated			16 (TB)
SE5908A	Ind. 8 Port Emb. Computer,10/100BASE-T(X) RJ45, DB9			8 (DB9)
SE5908A-TB	Ind. 8 Port Emb. Computer,10/100BASE-T(X) RJ45, TB5			8 (TB)
SE5908A-Sis	Ind. 8 Port Emb. Comp.,10/100BASET(X) RJ45, Isolated			8 (TB)
SE5900A-HV	Industrial Embedded Computer, 10/100BASET(X) RJ45	100/240 VAC or 100/370 VDC		-
SE5916A-HV	Ind. 16 Port Emb. Computer,10/100BASET(X)RJ45, DB9			16 (DB9)
SE5916A-TB-HV	Ind. 16 Port Emb. Computer,10/100BASET(X)RJ45, TB5			16 (TB)
SE5916A-Sis-HV	Ind. 16 Port Emb. Comp.,10/100BASET(X)RJ45,Isolated			16 (TB)
SE5908A-HV	Ind. 8 Port Emb. Computer,10/100BASE-T(X) RJ45, DB9			8 (DB9)
SE5908A-TB-HV	Ind. 8 Port Emb. Computer,10/100BASE-T(X) RJ45, TB5			8 (TB)
SE5908A-Sis-HV	Ind. 8 Port Emb. Comp.,10/100BASET(X) RJ45, Isolated			8 (TB)

Optional Accessories

Model name	Part Number	Description
SDR-75-24	50500752240001G	75W/3.2A DIN-Rail 24VDC power supply 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
LM38-A3S-TI-N	50708051G	SFP Transceiver, 155Mbps, 1310nmLED, Multi-mode, 2km, 3.3V, -40~85C
LS38-A3S-TI-N	50709431G	SFP Transceiver, 155Mbps, 1310nmFP, Single-mode, 30km, 3.3V, -40~85C