

SecFlow-1v

Ruggedized Multiservice Gateway



- Enhanced security capabilities: stateful firewall, VPNs, automated PKI and optional SCADA-aware firewall
- Resilient HSPA+/LTE cellular network uplink for maximum service continuity and built-in GNSS for location reporting
- Reduced OPEX with secure Zero Touch provisioning
- Hosting of third-party software for customized applications (edge computing)
- SCADA protocol gateway for IEC-101, IEC-104, Modbus-RTU/TCP, and DNP3 protocols
- Option for second cellular modem, WiFi, or LoRaWAN
- Embedded, isolated DC power supply
- Enhanced EMI and immunity according to IEC 61850-3, IEEE 1613*, EN 50121-4
- Certified for use in AT&T wireless network

SecFlow®-1v is a multiservice gateway optimized for industrial IoT and other mission-critical applications, a member of RAD's SecFlow suite of ruggedized Ethernet products.

In addition to its communication capabilities, SecFlow-1v is an open platform suitable for quick introduction of new capabilities, by hosting third-party software, using Linux containers.

SecFlow-1v features four GbE Copper ports with PoE options and one GbE SFP port, two serial RS-232 ports or one RS-232 and one RS-485/2W port, and a cellular modem with two SIM cards for maximum link resiliency.

SecFlow-1v is equipped with serial interfaces for connectivity of legacy RTUs with new IP-based IED systems. SecFlow-1v gateway converts legacy IEC-101 protocol to IP-based IEC-104, Modbus-RTU to Modbus/TCP and encapsulated DNP3 serial to DNP over IP, enabling seamless communication from IP SCADA to both old and new RTUs. This provides a single box solution for multi-service applications and smooth migration to all-IP networks.

In addition to its cellular uplink that provides wireless connection towards the network, SecFlow-1v can be equipped with additional wireless technologies. When equipped with WiFi, SecFlow-1v acts as an access point, aggregating several users, such as on-site technicians or sensors, saving the need for wired connection or multiple costly cellular connections from each device.

When equipped with LoRaWAN radio, SecFlow-1v aggregates multiple low-power low-bandwidth sensors/meters deployed over a wide area. This provides an ideal solution for rural and other non-dense areas saving CAPEX and OPEX.

The gateway is designed for installation under harsh environmental conditions. It features DIN-rail mount, IP30 protection level, wide operating temperature range (-40°C to 75°C) without fans, and EMI immunity (IEC 61850-3, IEEE 1613 and EN 50121-4).

SecFlow-1v supports several powering options that all use an embedded isolated DC power supply, to meet the harsh environmental requirements.

MARKET SEGMENTS AND APPLICATIONS

SecFlow-1v addresses Industrial IoT, for example:

- Distributed automation in secondary substations
- Smart meter and sensors concentration
- Water resources management
- Industry 4.0
- Smart and safe cities
- Out-of-band management using cellular uplink
- Smart retail

INTEROPERABILITY

SecFlow-1v operates with RAD SecurityGateway, SecFlow-1, SecFlow-2, and with third party VPN aggregators.

ROUTER AND VPN SERVICES

SecFlow-1v features static routing, RIPv2, OSPF, BGP, VRF and NAT/NAT-Traversal.

The device features a VPN gateway with two operation modes:

- Inter-site connectivity using IPsec or Open VPN tunnels
- Remote user access, using SSH

** This feature will be released in a future version.*

Inter-site VPN-based encrypted link ensures L3 transparent connection of the Ethernet networks sites.

For remote access, the router uses an SSH-encrypted tunnel, with user authentication and specific access authorization.

LAYER-2 SWITCH

SecFlow-1v provides local switching capabilities with and without VLAN support, maintaining 2K MAC addresses and 16 broadcast domains (VLAN IDs).

QoS:

- Ingress policer, egress shaper
- Classification based on: Port, 802.1p, IPv4 DSCP
- Scheduling
 - Four priority queues
 - Strict and Weighted Round Robin (WRR)

MANAGEMENT AND SECURITY

The device can be managed via the SecFlow web-based interface (HTTP/HTTPS).

For easy and safe deployment, RAD offers Zero Touch provisioning thus reducing OPEX and providing a simple way to securely deploy thousands of elements in the network.

SecFlow-1v also supports a variety of access protocols, including CLI and TFTP/SFTP.

SCADA-Aware Firewall*

SecFlow-1v supports SCADA-aware firewall, providing network-based distributed security, especially designed for critical infrastructure SCADA applications (IEC-104, DNP3-TCP, and Modbus-TCP). The device monitors SCADA commands, using deep packet inspection, to validate whether they fit the intended application purpose.

Remote Terminal Unit/Programmable Logic Controller

Ordering options with Programmable Logic Controller (PLC) present an all-in-one-box solution from a single source for distribution automation, industrial automation, building automation, etc., supporting Modbus, DNP3, IEC-104 and BACnet SCADA masters. The devices can be programmed using:

- Ladder logic in accordance with EC 61131-3
- Instruction List (IL)
- Functional Block Diagram (FBD)
- Sequential Function Chart (SFC)
- Structured Text (ST)

SecFlow-1v devices with PLC module offer comprehensive cyber security relying on stateful firewall or SCADA firewall (optional), VPNs such as IPsec and OpenVPN, automated PKI, as well as RADview management with SIEM. Zero Touch provisioning allows secure service activation and maintenance, with low OPEX.

** This feature will be released in a future version.*

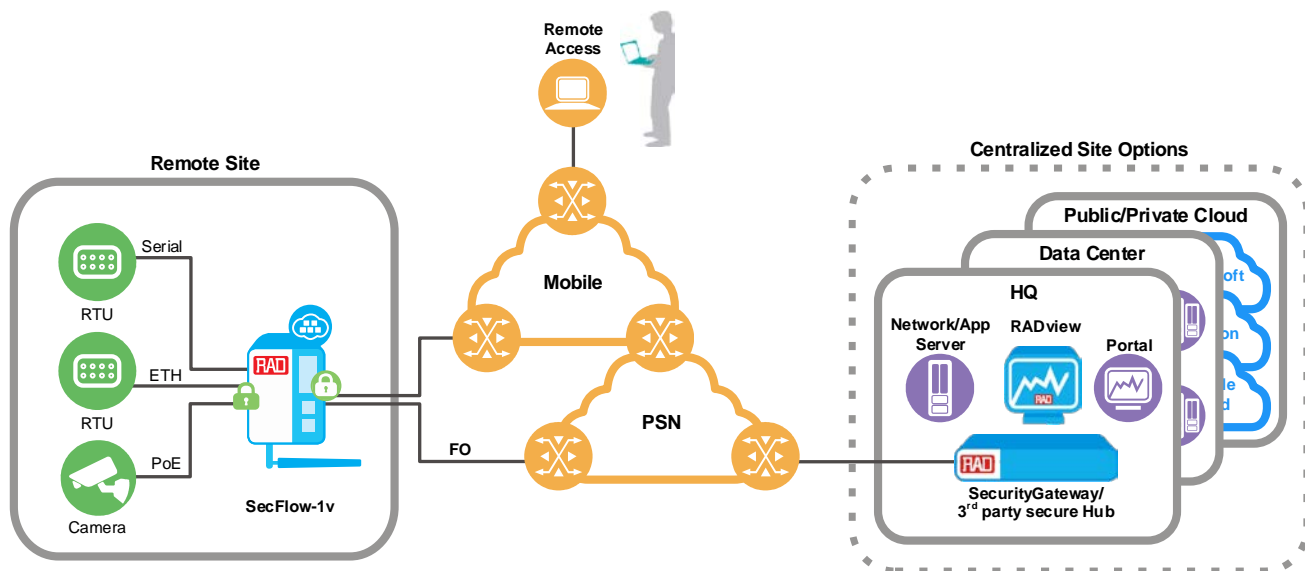


Figure 1. Industrial IoT Backhaul

Specifications

CAPACITY

Memory	1 GB RAM (unless otherwise specified)
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ETHERNET INTERFACES

Fiber	1 x 1000FX, SFP socket
Copper	4 x 10/100/1000BASE-T
PoE (optional)	2 x 30W, 4 x 15W, 1 x 60W*
Max Frame Size	1.5 kB

SERIAL INTERFACES

Isolation	Non-isolated/Isolated (for specific ordering options)
Serial Interface	2 x RS-232 ports 1 x RS-232 + 1 x RS-485 ports

BRIDGE

Compliance	IEEE 802.1Q
Max. Number of Concurrent VLANs (Broadcast domains)	16
MAC Address Table	2K
Operation Mode	VLAN-aware learning bridge

MODEMS

Dual SIM Cellular Modem	LTE bands HSPA+/EVDO networks (technology backward compatible)
FOTA	Firmware upgrade Over the Air
Configurable Cellular Authentication	PAP, CHAP
Certification	Verizon Wireless* PTCRB certification
SIM Card	Mini SIM, 25 mm x 15 mm (0.98 in x 0.59 in) Form factor: 2FF
WiFi Module	IEEE 802.11ac/a/b/g/n Dual band 2.4GHz or 5GHz (software selectable) Up to 8 users
LoRaWAN Modem	433MHz/868MHz/915MHz/923MHz bands SX1301 base band processor emulating 49 x LoRa demodulators, 10 parallel demodulation paths 8 uplinks channel and 1 downlink channel 2 x SX125x Tx/Rx front-ends high/low

Tx power up to 25 dBm, Rx sensitivity down to -139 dBm @ SF12, BW 125 kHz

UDP packet forwarder

LoRaWAN Server (optional) As per specification v1.0.4

Table 1. Modem Frequency Bands

LTE Ordering Code	Modem Category and Frequency Bands
L1	CAT 4 EMEA/Korea/Thailand LTE FDD: B1/B3/B5/B7/B8/B20 LTE TDD: B38/B40/B41 WCDMA: B1/B5/B8 GSM: B3/B8
L2	CAT 4 North America (AT&T) LTE FDD: B2/B4/B12 WCDMA: B2/B4/B5
L3	CAT 4 Australia/New Zealand/Taiwan/Brazil LTE FDD: B1/B2/B3/B4/B5/B7/B8/B28 LTE TDD: B40 WCDMA: B1/B2/B5/B8 GSM: B2/B3/B5/B8
L4	CAT 4 North America, Verizon wireless + AT&T LTE LTE FDD: B2/B4/B5/B12/B13/B14/B66/B71 WCDMA: B2/B4/B5

NETWORKING

VPN	L3 mGRE DMVPN L3 IPsec VPN OpenVPN client
Gateway	SCADA gateway for IEC101/104, Modbus RTU/TCP and DNP3

QUALITY OF SERVICE (QOS)

Policing	Per port ingress policer, L1 rate, CIR
Egress Queues	4 queues per port
Queue Mapping	Per ingress port; p-bit mapping, dscp mapping
Scheduling	Strict Priority / WRR
Shaping	Per port egress shaper, L1 rate, CIR

ROUTER

Protocols	RIPv2, OSPFv2, BGP, VRF, IPv4, IPv6, NAT, NAT-T
Static routing	

*This feature will be released in a future version.

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Data Sheet

RTU/PLC

Inputs	6 x digital inputs, max DC input voltage 24 VDC 6 x analog inputs as ordering options: <ul style="list-style-type: none"> 0-5 VDC 0-12 VDC 0-24 VDC
Outputs	6 x digital outputs: <ul style="list-style-type: none"> relay-based ordering option: 3 pins; NO/COM/NC , 250 VAC/8 A max, 400 VDC/8 A max solid state relay-based ordering option for Class I/DIV 2 certified (Hazloc) devices: 2 pins; NO/COM , 100 VAC/100 mA max, 140 VDC/100 mA max
Web GUI	
Northbound to SCADA Masters	Modbus, DNP3, IEC-104, BACnet
Masters	Up to 5 concurrent masters Modbus TCP DNP3 TCP or BACnet TCP IEC-104
Additional I/O Points	Up to 400 Split between 2 Modbus-RTU
Slaves	Up to 10 Modbus-TCP slaves

MANAGEMENT

Control Port	RS-232 interface, RJ45 connector
DHCP	DHCP client DHCP server for WiFi clients
Protocols	TFTP/SFTP Web-based interface using HTTPS or HTTP
Options	CLI with password-protected access SMS commands USB 2.0 host for software upload* SD memory card*

TIMING

Timing	Local time setting SNTP
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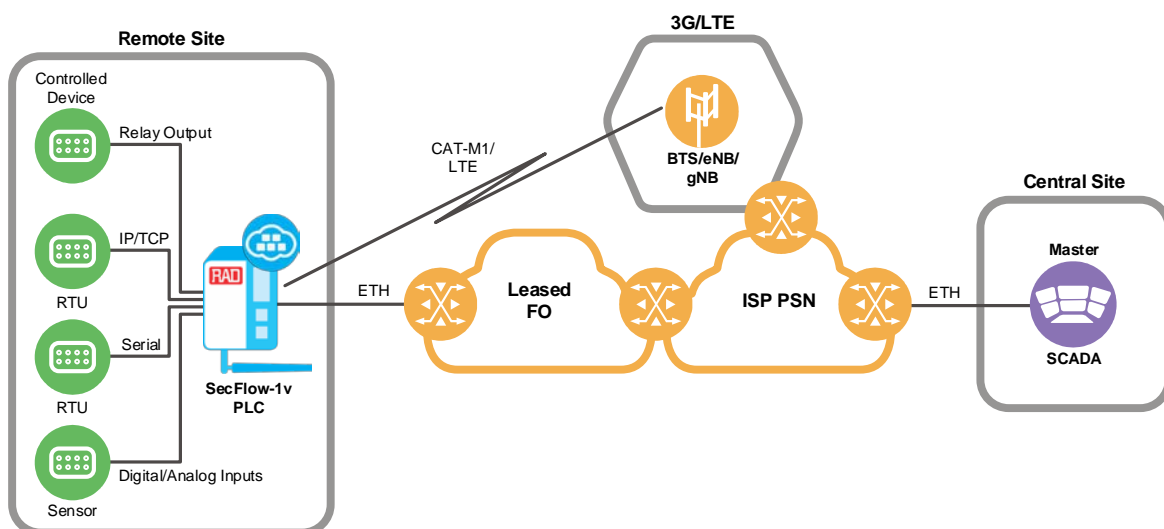


Figure 2. Automation Gateway with PLC/RTU

SECURITY

Firewall	Stateful firewall SCADA-aware firewall
Login	Login lockout
ACL	ACL with MAC white list
TACACS+	Multiuser TACACS+
IPsec	AES128 and AES256 GCM encryption PKI with X.509 certification IKEv1, IKEv2, SHA2 Interoperability with SCEP server 2012 and higher

RESILIENCY

Routing	Dynamic routing, OSPFv2, BGP
Cellular ISP Redundancy	SIM cards backup or dual modem support
IPsec VPN Redundancy	Policy-based Route-based

MONITORING

GNSS	GPS – American (default) Galileo – European
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DIAGNOSTICS

Interface Counters	Per port
Syslog	
SNMPv3	GET and traps
LEDs	Including alarm indication
Dry Contacts	2-in and 2-out
SMS	Status indication

GENERAL

Compliance	Enhanced EMI and immunity according to EN 50121-4 IEC 61850-3 IEEE 1613*
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Environment

Storage Temperature	-40 to 85°C (-40 to 185°F)
Operating Temperature	Enclosure 1: -40 to 65°C (-40 to 149°F) Enclosure 2: -40 to 75°C (-40 to 167°F) w/o PoE -40 to 65°C (-40 to 149°F) with PoE Enclosure 3: -40 to 60°C (-40 to 140°F)
Humidity	Up to 90%

Note: The actual chassis and operating temperature depend on the ordering options.

Physical

Table 2. Dimensions and Weight

	Enclosure 1 (E1)	Enclosure 2 (E2)	Enclosure 3 (E3)
Height mm (in)	138 (5.43)	157.2 (6.19)	146 (5.74)
Width	53.3 (2.1)	82.8 (3.25)	91.2 (3.59)
Depth	123.3 (4.85)	150 (5.9)	132.6 (5.22)
Weight	0.88 kg (1.94 lb)	1.4 kg (3.1 lb)	1.6 kg (3.5 lb)

Power

Power Supply	Embedded isolated power supply 12V: 11–30 VDC 48V: 44–57 VDC (Dual power inlet) WDC: 20–60 VDC (Dual power inlet)
Power Consumption	Enclosure 1: < 10 W Enclosure 2: < 17 W (regular operation / no PoE) < 77 W (60W for PoE) Enclosure 3: < 17 W

**This feature will be released in a future version.*

Ordering

Legend

SF-1V/Ex/@/R/#/\$/%/Lx/*/Lx/&/^/LRx/PLC/!

Ex	Chassis	
E1	E1 enclosure	
E2	E2 enclosure	
E3	E3 enclosure	
@	Power Supply	
12V	12 VDC (11–30 VDC)	
48V	48 VDC (44–57 VDC)	
WDC	Wide-range 20–60 VDC	
R	Random-access memory (RAM)	
2R	2GB	
#	Ethernet Ports	
4U1S	1 x 1000FX, 4 x 10/100/1000BASE-T ports	
\$	Power over Ethernet (PoE)	
POE	PoE on 4 x 10/100/1000BASE-T	
2PA	PoE on 2 x 10/100/1000BASE-T for RAD's Airmux and standard PoE for the remaining 2 x 10/100/1000BASE-T ports	
%	Serial Ports	
2RS	2 x RS-232 ports	
2RSM	1 x RS-232 port, 1 x RS-485 port	
Lx	Cellular Ports	
HSP	HSPA+ (high-speed packet access) modem, 3.5 Gb	
L1	LTE modem for Europe	
L2	LTE modem for North America AT&T	
L3	LTE modem for Oceania and Latin America	
L4	LTE modem for North America, Verizon wireless + AT&T	

Notes:

- L1(2,3,4) means that any of L1/L2/L3/L4 options can be ordered.
- In options with dual modems, both modems are of the same type (HSP, L1, L2, L3, or L4).
- The cellular modem is supplied with two matching antennas (see **Supplied Accessories**).

*	GNSS	
G	Integrated GPS	
Note: The GPS modem is supplied with one antenna (see Supplied Accessories).		
&	WiFi Interface	
WF	Wireless LAN	
Note: The WiFi modem is supplied with two matching antennas (see Supplied Accessories).		
^	Ruggedized Options	
RG	extended temperature, IEC 61850-3 and IEEE-1613 compliant	
RL	EN 50121-4 certified	
GO	extended temperature, Class I/DIV 2 certified	

LRx LoRaWAN Modem

LR1	LoRaWAN modem with 8 channels and frequency scheme according to EU433
LR2	LoRaWAN modem with 8 channels and frequency scheme according to EU868
LR3	LoRaWAN modem with 8 channels and frequency scheme according to AU915
LR4	LoRaWAN modem with 8 channels and frequency scheme according to US915
LR6	LoRaWAN modem with 8 channels and frequency scheme according to AS923

Note: The LoRaWAN modem is supplied with one matching antenna.

PLC Programmable Logic Controller

PLC	6 digital inputs, 6 digital outputs, 6 analog inputs, 5 VDC
PLC12	6 digital inputs, 6 digital outputs, 6 analog inputs, 12 VDC
PLC24	6 digital inputs, 6 digital outputs, 6 analog inputs, 24 VDC
PLCGO	Class I/DIV 2 certified (Hazloc) - 6 digital inputs, 6 digital outputs, 6 analog inputs 5 VDC, solid-state relay-based
PLCGO12	Class I/DIV 2 certified (Hazloc) - 6 digital inputs, 6 digital outputs, 6 analog inputs 12 VDC, solid-state relay-based
PLCGO24	Class I/DIV 2 certified (Hazloc) - 6 digital inputs, 6 digital outputs, 6 analog inputs 24 VDC, solid-state relay-based

Note: PLC software is included upon ordering the /PLC ordering option.

! uCESP Container

CSP	RS232 control signals (DTR and DCD) on S1 port managed by the uCESP container
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* This feature will be released in a future version.

RECOMMENDED CONFIGURATIONS

SF-1V/E1/12V/4U1S/2RS/HSP
 SF-1V/E1/12V/4U1S/2RS/HSP/G
 SF-1V/E1/12V/4U1S/2RS/L1(2,3,4)
 SF-1V/E1/12V/4U1S/2RS/L1(2,3,4)/G
 SF-1V/E1/12V/4U1S/2RSM/HSP
 SF-1V/E1/12V/4U1S/2RSM/L1(2,3,4)
 SF-1V/E1/WDC/4U1S
 SF-1V/E1/WDC/4U1S/2RS/RL
 SF-1V/E1/WDC/4U1S/2RS/HSP
 SF-1V/E1/WDC/4U1S/2RS/L1(2,3,4)
 SF-1V/E2/12V/4U1S/2RS/HSP/G/WF
 SF-1V/E2/12V/4U1S/2RS/HSP/G/HSP
 SF-1V/E2/12V/4U1S/2RS/L1(2,3,4)/L1(2,3,4)
 SF-1V/E2/12V/4U1S/2RS/L1(2,3,4)/G/L1(2,3,4)
 SF-1V/E2/12V/4U1S/2RS/L1(2,3,4)/G/WF
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 SF-1V/E2/12V/4U1S/2RSM
 SF-1V/E2/48V/4U1S/POE
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 SF-1V/E2/48V/4U1S/POE/2RS/L3/G/LR6
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 SF-1V/E2/WDC/4U1S/L1/WF
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 SF-1V/E2/WDC/4U1S/2RS/HSP/WF
 SF-1V/E2/WDC/4U1S/2RS/HSP/G/HSP
 SF-1V/E2/WDC/4U1S/2RS/L1(2,3,4)/G/L1(2,3,4)

SF-1V/E2/WDC/4U1S/2RSM
 SF-1V/E3/48V/4U1S/POE/2RS/L1(2,3,4)/PLC
 SF-1V/E3/48V/4U1S/POE/2RSM/L1(2,3,4)/PLC12
 SF-1V/E3/48V/4U1S/POE/2RSM/L1(2,3,4)/PLC24
 SF-1V/E3/WDC/2R/4U1S/2RS/L4/G/L4/PLC
 SF-1V/E3/WDC/2R/4U1S/2RS/L4/G/PLC
 SF-1V/E1/12V/4U1S/2RS/L1(4)/G/RG*
 SF-1V/E1/12V/4U1S/2RSM/L1(4)/G/RG*
 SF-1V/E1/WDC/4U1S/2RS/L1(L4)/G/RG*
 SF-1V/E1/WDC/4U1S/2RS/CSP*
 SF-1V/E1/WDC/4U1S/2RS/L1/CSP*
 SF-1V/E1/WDC/4U1S/2RSM/L1/G/RG*
 SF-1V/E2/WDC/4U1S/2RS/L1(2,3,4)/RG*

Please contact RAD Sales for more details on future products.

SPECIAL CONFIGURATIONS

Zero Touch Provisioning

PS-ZT-PRE_CONFIGURATION

One Zero Touch pre-configuration service package per each SecFlow-1v unit

and either of the following:

PS-ZT-STAGING

Local Zero Touch staging service package (one per project)

PS-ZT-ONSITE-STAGING

Onsite Zero Touch staging service package (one per project)

Please contact your local RAD partner for additional configuration options.

* This ordering option is part of RAD's roadmap. Regarding availability, follow updates of official rollout and release announcements.

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Data Sheet

SUPPLIED ACCESSORIES

SF-ANT-GPS-PAS-3DBI-MAG/3M

GPS passive antenna, 3m, for options with integrated GPS

SF-ANT-HSP-2DBI-SMA

HSP antenna, 2 dBi, for options with HSPA+ (high-speed packet access) modem

SF-ANT-LTE699-4DBI-SMA

LTE antenna, 4dBi, for options with LTEEx modems

SF-ANT-WIFI-DUALBAND-3DBI-SMA

WiFi dual band antenna, 3 dBi, for options with WiFi modem

OPTIONAL ACCESSORIES

CBL-RJ45/D9/F/6FT

Serial console and RS-232 data ports cable

CBL-RJ45/D9/F/DM

RJ45 to DB9 female shielded cable for /CSP option, 2m

CBL-SF-RJ45-RS485

RS485 open-ended shielded cable RJ45-DB

RM-DIN-SINGLE

Rack Mount adaptor for single DIN RAIL device

RM-DIN-19

19" Rack Mount adaptor for DIN RAIL device

USB holder kit

For SF-1V/E2/12V/4U1S/2RS/L4/G/GO ordering option

Power Supplies

SF-AC-48VDC-40W (to be used with non-POE options)

External DIN rail AC to 48 VDC power supply, 40 W, -20 to 60°C (-4 to 140°F); 20 W at 60°C (140°F) and above

SF-AC-48VDC-120W

External DIN rail AC to 48 VDC power supply, 120 W, -20 to 60°C (-4 to 140°F); 60 W at 65°C (149°F) and above

SF-24VDC-48VDC-240W

24 VDC to 48 VDC power supply, 240 W, -40 to 50°C (-40 to 122°F); 120 W at 65°C (149°F) and above

SF-AC-12VDC-40W

AC to 12 VDC power supply, 40 W, -20 to 60°C (-4 to 140°F); 20 W at 65°C (149°F) and above

Antennas

SF-ANT3G-2M

Outdoor antenna for SecFlow 3G cellular modem, 2m connecting cable, 2.2 dBi, 824-894 MHz/900 MHz/1800 MHz/1900 MHz

SF-ANT3G-5M

Outdoor antenna for SecFlow 3G cellular modem, 5m connecting cable, 2.2 dBi, 824-894 MHz/900 MHz/1800 MHz / 1900 MHz

SF-ANT4G-2M

Outdoor antenna for SecFlow 4G cellular modem, 2m connecting cable, 3 dBi, 699-960 MHz/1710-2170 MHz/2500-2690 MHz

SF-ANT4G-5M

Outdoor antenna for SecFlow 4G cellular modem, 5m connecting cable, 3 dBi, 699-960 MHz/1710-2170 MHz/2500-2690 MHz

SF-ANT-LTE700-7DBI-MGNT

Outdoor magnetic base antenna for SecFlow-1v LTE options and for LoRaWAN 868 MHz, 7 dBi

Software

SF-1V-SW/SCDFW/IDS*

Software package for SecFlow-1v, SCADA firewall for IEC-104, DNP3-TCP, MODBUS-TCP, Tap mode for IDS

SF-1V-SW/SCDFW/IDSIPS*

Software package for SecFlow-1v, SCADA firewall for IEC-104, DNP3-TCP, MODBUS-TCP, Inline for IDS and/or IPS

** This ordering option is part of RAD's roadmap. Regarding availability, follow updates of official rollout and release announcements.*

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