

SecFlow-1v

Ruggedized Multiservice Gateway



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- 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

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.*



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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).

- Per-port ingress rate limiting
- Per-port storm control policer

QoS:

- 4 priority queues
- Classification based on:
 - Port
 - 802.1p
 - IPv4 DCSP
- Scheduling
 - Strict priority
 - Mix of 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)

* This feature will be released in a future version.

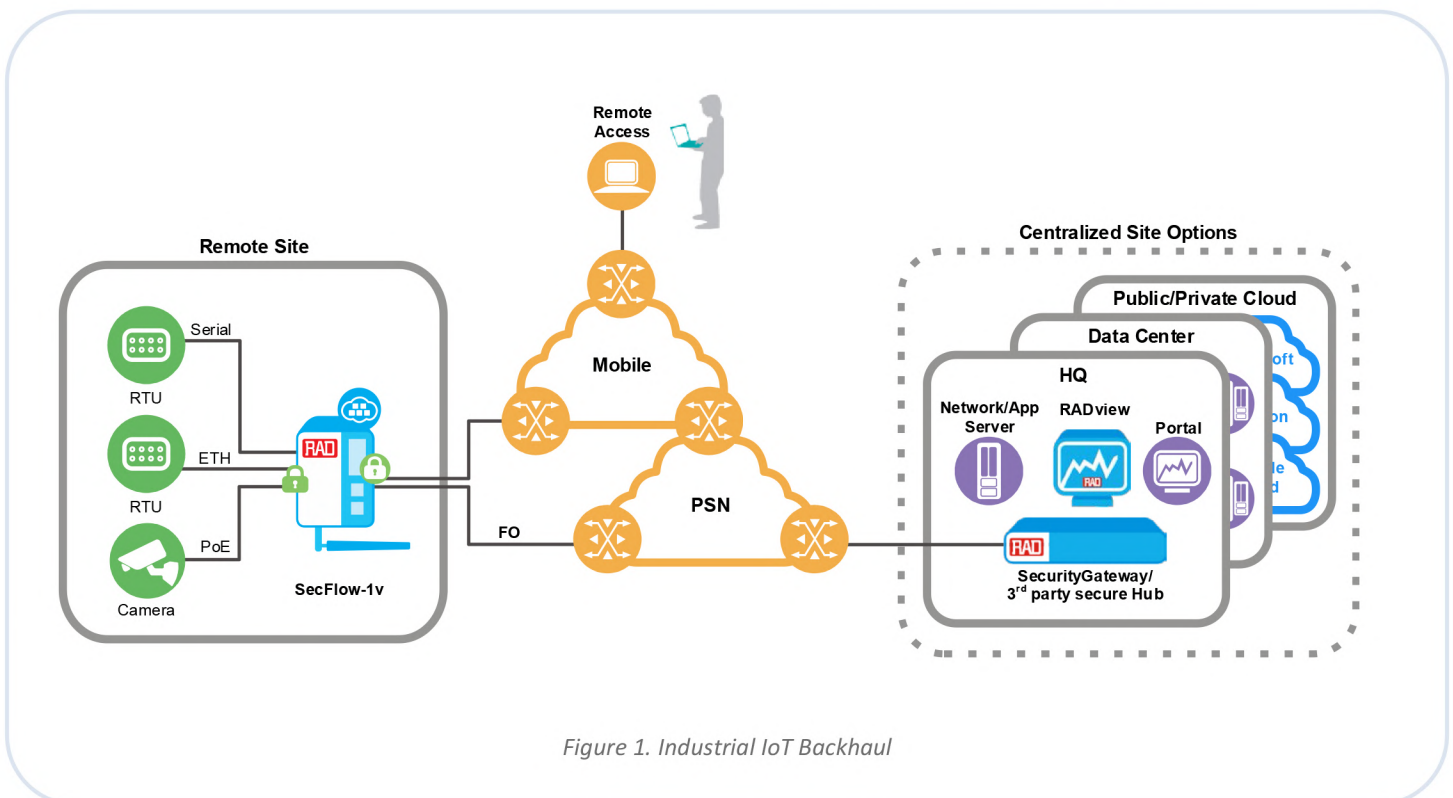


Figure 1. Industrial IoT Backhaul

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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.

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 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
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LoRaWAN Server (optional)	As per specification v1.0.4
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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	

RTU/PLC*

Inputs	6 x digital inputs: 0V/5V, 20mA 6 x analog inputs: 0-5V, 20mA (max)
Outputs	6 x digital outputs
Relay contacts	NO/NC 250VAC/8A max 30VDC/8A max 250VDC, 0.28A max

Web GUI

Northbound to SCADA Masters	Modbus, DNP3, IEC-104, BACnet
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*This feature will be released in a future version.

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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

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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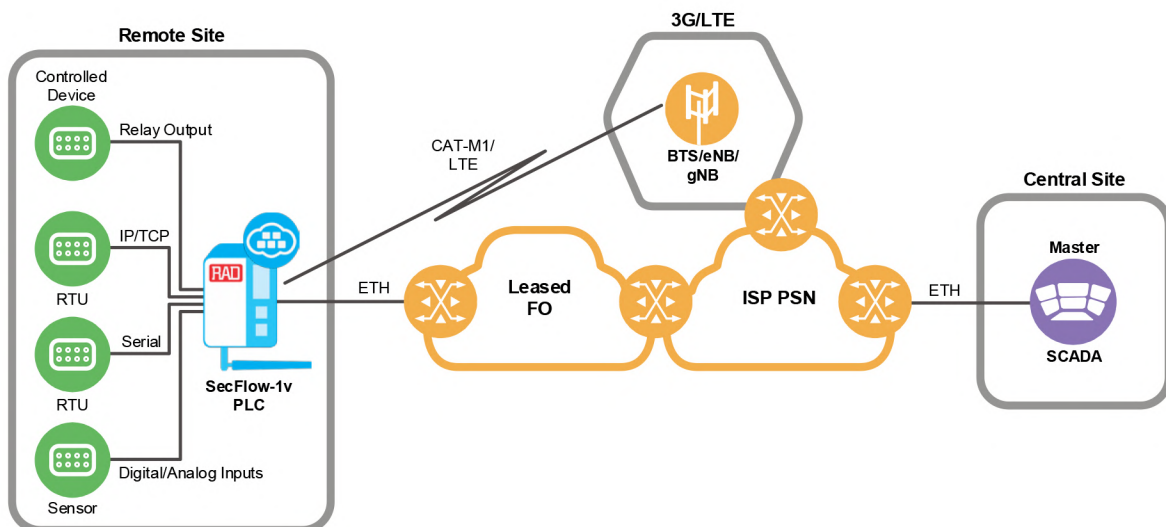


Figure 2. Automation Gateway with PLC/RTU

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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)
Enclosure 1	-20 to 65°C (-4 to 149°F)
Enclosure 2	-40 to 75°C (-40 to 167°F)
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 1. 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

Ordering

Legend

SF-1V/Ex/@/#/\$/%/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
#	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).

*	GNSS	
	G	Integrated GPS
&	WiFi Interface	
	WF	Wireless LAN
^	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

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

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LRx	LoRaWAN Modem – see Table 2
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;
	<i>Note: LR1(LR2,LR3,LR4) means that any of LR1/LR2/LR3/LR4 options can be ordered.</i>
PLC	Programmable Logic Controller – see Table 3
PLC	6 digital inputs, 6 digital outputs, 6 analog inputs, 5 VDC
!	uCESP Container
CSP	RS232 control signals (DTR and DCD) on S1 port managed by the uCESP container

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/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
- SF-1V/E2/12V/4U1S/2RSM
- SF-1V/E2/48V/4U1S/POE
- SF-1V/E2/48V/4U1S/POE/2RS
- SF-1V/E2/48V/4U1S/POE/2RS/HSP
- SF-1V/E2/48V/4U1S/POE/2RS/HSP/G/WF
- SF-1V/E2/48V/4U1S/POE/2RS/L1(2,3,4)
- SF-1V/E2/48V/4U1S/POE/2RS/L1(2,3,4)/L1(2,3,4)
- SF-1V/E2/48V/4U1S/POE/2RS/L1(2,3,4)/G/WF
- SF-1V/E2/48V/4U1S/POE/2RS/L1(2,3,4)/G/L1(2,3,4)
- SF-1V/E2/48V/4U1S/POE/2RS/L1/G/LR1
- SF-1V/E2/48V/4U1S/POE/2RS/L1/G/LR2
- SF-1V/E2/48V/4U1S/POE/2RS/L3/G/LR6
- SF-1V/E2/48V/4U1S/POE/2RS/L4/G/LR4
- SF-1V/E2/48V/4U1S/POE/2RSM/L1/G/LR2
- SF-1V/E2/48V/4U1S/POE/2RS/L1(2,3,4)/WF
- SF-1V/E2/48V/4U1S/2PA/2RS
- SF-1V/E2/WDC/4U1S/2PA/2RS/HSP
- SF-1V/E2/WDC/4U1S/2PA/2RS/L1(2,3,4)
- SF-1V/E2/WDC/4U1S/2RS/HSP/G/HSP
- SF-1V/E2/WDC/4U1S/2RS/L1(2,3,4)/G/L1(2,3,4)

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

LoRaWAN Package

Select one SecFlow-1v with an LRx modem and one antenna from the [Table 2](#).

PLC Package

Select one SecFlow-1v with PLC capability and one SW package from the [Table 3](#).

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.

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

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

Table 2. LoRaWAN Packages

LoRaWAN Modem	SecFlow-1v Device	Antenna
Modem 1	SF-1V/E2/48V/4U1S/ POE/2RS/L1/G/LR1	SF-ANT-LORA433-1DBI-SMA
Modem 2	SF-1V/E2/48V/4U1S/ POE/2RS/L1/G/LR2	SF-ANT-LORA868-2DBI-SMA
		SF-ANT-LTE700-7DBI-MGNT
Modem 4	SF-1V/E2/48V/4U1S/ POE/2RS/L4/G/LR4	SF-ANT-LORA868-2DBI-SMA
		SF-ANT-LTE700-7DBI-MGNT

Table 3. PLC Packages

SecFlow-1v Device	Software Package
SF-1V/E3/48V/4U1S/ POE/2RS/L1(2,3,4)/PLC	SF-1V-SW/PLC
	SF-1V-SW/PLC/SCDFW/IDS

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Data Sheet

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

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-ANT4G-2M

Outdoor antenna for SecFlow 4G cellular modem, 2m connecting cable, 3dBi, 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 antenna for SecFlow-1v LTE options and for LoRaWAN 868 MHz

SF-ANT-LORA433-1DBI-SMA

Outdoor antenna for LoRaWAN 433 MHz modem options

SF-ANT-LORA868-3DBI-SMA

Outdoor antenna for LoRaWAN 868 MHz modem options, 3 dBi

Software

For PLC options:

SF-1V-SW/PLC*

Software package for SecFlow-1v, PLC - 6 digital inputs, 6 digital outputs, 6 analog inputs

SF-1V-SW/PLC/SCDFW/IDS*

Software package for SecFlow-1v, PLC - 6 digital inputs, 6 digital outputs, 6 analog inputs, SCADA firewall for IEC-104, DNP3-TCP, MODBUS-TCP, Tap mode for IDS

For regular options (non-PLC or LoRa):

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

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