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Industrial IT

Industrial Router & Firewall IRF3000 series

Extended Technical Data Sheet

IRF34xx

Variants	LAN	Wireless
IRF3401	4 x RJ45 1000 Mbit/s	-
IRF3421	4 x RJ45 1000 Mbit/s	4G LTE EU
IRF3421	4 x RJ45 1000 Mbit/s	4G LTE USEMEA

IRF38xx

Variants	LAN	Wireless
IRF3801	8 x RJ45 1000 Mbit/s	-
IRF3821	8 x RJ45 1000 Mbit/s	4G LTE EU
IRF3821	8 x RJ45 1000 Mbit/s	4G LTE USEMEA

Ethernet access	4x/8 x RJ45 1000Base-TX FD
Power Supply	24 VDC ± 20 %, max. 1600mA @ 24 VDC Requirements for the power supply unit: • Class PS2 acc. to IEC 62368-1 – or – Limited Power Source (LPS) acc. to IEC 60950-1 • Short circuit current: < 8 A • For devices with UL approval: NEC Class 2
Digital Input & Output	2 x / 5 x Digital Input 1 x / 4 x Digital Output 24 VDC input – for activation of the “CUT” function, for example, with a SPS or per key switch (max. 16 mA) 24 VDC alarm output for status signaling to a SPS or display (max. 1 A) Outgoing signal triggered by a filter rule or ICMP monitoring
SCM-Card Slot	For ADS-TEC memory- and smartcards
USB	USB 2.0 Type-A port – for firmware and configuration updates; accessible for use within a Docker container USB Device Server (USB over IP)
Housing	Rugged aluminum die-cast case for top hat rail mounting VESA 75 adapter option
Memory Card (SIM)	Optional: Saves the complete configuration and enables easy replacement of the unit.
microSD	Optional: microSD Card with UHS-II interface
WWAN	Optional: LTE via external antenna
GPS	Optional: GPS via connection of an external antenna
Realtime Clock (RTC)	Supercap-buffered RTC integrated, approx. 1 week durability
Weight	Approx. 1 kg
Vibration	IEC 60068-2-6
Shock	IEC 60068-2-27
EMC	ETSI EN 301 489-1 V2.2.3 ETSI EN 301 489-52 V1.2.1 EN 55032:2015 +AC:2016 +A1:2020 +A11:2020 EN IEC 61000-6-2:2019

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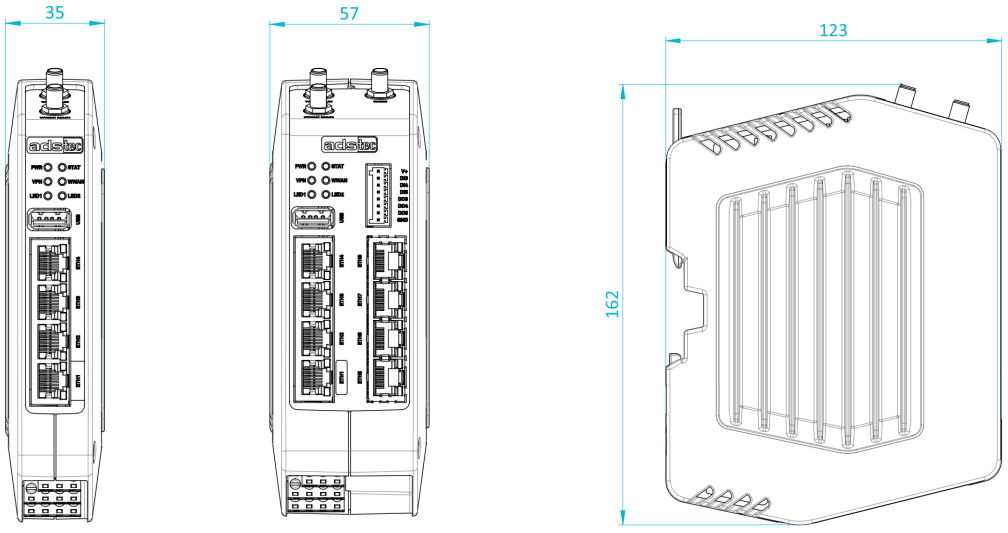
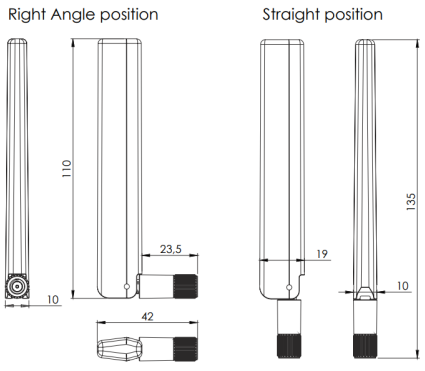
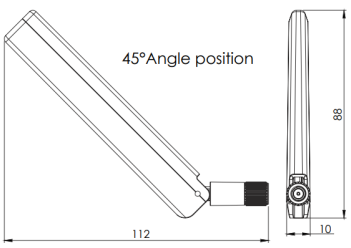
Operating Temperature	-26...+70 °C
Storage Temperature	-40...+85 °C
Humidity	5 ... 90 %, no condensation
Protection Class	IP 20 for switching cabinet mounting
Fastening method	35 mm DIN-rail mounting Optional: VESA 75 with additional accessory

External Dimensions







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Configuration and Monitoring	
Web interface	• Online help tooltips for all important options • German/English language support • Access via HTTPS • Free definition of unlimited user accounts with detailed access (write) control for any configuration option • Custom Menu configurable
SNMP	Protocols: SNMPv3 SNMPv3 read and write username/password and Pre-Shared-Key are configurable Supported SNMP MIBs: MIB-2, Groups: • system • interfaces • at • ip • tcp • udp • snmp ADS-TEC general MIB ADS-TEC firewall MIB
API	Software APIs from JSON RPC 2.0 to low level “adsdp” suitable even for microcontrollers.
Modbus/TCP	The native Modbus/TCP interface enables the control of the device by a PLC. The following functions are imaged in the registers: Cut & Alarm, status request & acknowledgment IPsec, on/off switchable generally OpenVPN, separate status request and activation / deactivation of the 10 possible OpenVPN connections
Eventlog/Syslog	Eventlog can be sent to syslog server, saved on an external USB device or accessed via web interface
Auditlog	**Anomaly:** Detects and records network anomalies (e.g. ARP spoofing, IP conflicts) **Configuration:** Logs all configuration changes for full traceability of administrative actions **Device:** Records external interface events such as USB insert/remove and link state changes **Packet Filter:** Logs forwarded traffic hits on firewall rules with audit enabled **Remote Service:** Tracks VPN requests and state changes for remote access monitoring **Authentication:** Records login attempts, session timeouts, and user logout events Auditlog can be sent to syslog server
Remote Capture	Remote capture interface for usage with Wireshark. Allows packet analysis with Wireshark through „rpcapd“. With this feature you can use every interface on the firewall as a remote capture interface on an additional diagnostics Windows PC.
Configuration Backup	Setups can be stored in files and read back
Reboot Scheduler	Timer can be set to reboot the device
Port Mirroring	Any IRF Ethernet port can be configured as a mirror destination to receive traffic from an Ethernet switch’s mirror port for traffic analysis, either within a Docker container or via remote Wireshark

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Firewall/Filter	
Firewall in three Operating Modes	**Routing mode:** with stateful filtering of IPv4 traffic on two logical interfaces WAN and LAN, in this mode LAN is used as a 3-port/7 port switch and WAN as a single port interface **Extended routing mode:** all 4/8 Ethernet interfaces can be operated and filtered as independent IP interfaces **Transparent mode (bridged):** connects the ETH1 and ETH 2- 8 adapter directly to the LAN network and enables additional filtering on Layer 2, based on Ethernet criteria via VLAN, MAC addresses or protocol and thus a 4/8-port switch is the result
Firewall version	Stateful inspection
DNS based Filter	Host names can be used as Layer 3 filter criteria
Layer 2 Filter	Available Filter criteria: • Source and target interfaces (Layer2, for example, OpenVPN, LAN,...) • Source and target MAC address • Ethernet protocol number • With VLAN: VLAN ID and VLAN QoS Tag • With IP: Source and target IP address & network mask, IP protocol • With IP + TCP/UDP: Source and target ports, TCP flags or automatic configuration of the way back • Activities: Log, Drop, Accept, Cut, Alarm
Network groups	Grouping of single IP or DNS based addresses and network addresses to groups which can be used on Layer2 or on Layer3 filter rule sets.
Hardware groups	Grouping of MAC addresses to groups which can be used on Layer2 filter rule sets.

IP Addressing, Routing, NAT, and DHCP	
IPv4	• One IP address for management in transparent bridge mode, two IP addresses in IP router mode, up to 4/8 IP addresses in extended router mode • NAT (Masquerading), e.g. for outgoing traffic • All interfaces can be configured as DHCP clients. • The default gateway can be configured manually. • DNS with DHCP client according to RFC 2136 • PPPoE support for all IP interfaces for usage with DSL modems
IP Routing	Static net or host routes are configurable Dynamic routing according to RIPv2 and OSPF (basic functions) Log level can be configured additionally
IP Forwarding & Port Forwarding	Port Forwarding for TCP/UDP Ports or complete IP addresses using IP aliases. Including the following features: • Optional source or reverse NAT for forwarding to hide the original source. • Conditional source matching to enable a forward only for special addresses. • IP Forwarding with IP aliases on VPN channels like IPsec or OpenVPN to run additional virtual IPs on the VPN which will be forwarded to the local network. • No limitation on the number of forwards
1:1 NAT Network Mapping	Network mapping to resolve IP subnet conflicts by mapping complete IP subnets to virtual address spaces. • Map a single IP subnet to a complete virtual address space. • Directly couple two identical IP sub networks by mapping both to two different virtual address spaces. • Keep real IP sub network for the viewpoint of VPN channels. • Connect and map up to 8 identical IP sub networks with a single router
DNS Proxy	DNS based packet filter with a DNS proxy allows filtering by domain or sub-domain name instead of static IPs, providing granular access control
DHCP Server	DHCP server on WAN and/or LAN interfaces (up to 8 ETH interfaces), DNS and gateway are taken over dynamically if an interface is configured as DHCP client

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DHCP Relay	Enables the transmission of all DHCP queries to a central DHCP server.
Link Aggregation	The IRF3000 supports two kinds of bonding modes starting with version 2.1.0: Active Backup and 802.3ad / LACP based bonding. The Bonding option is meant for redundant Ethernet WAN Uplinks. Any number from 2-7 redundant links can be configured.

VPN Parameter	
Big-LinX	Big-LinX: Smartcard or Software certificate based OpenVPN with cloud services
OpenVPN	OpenVPN is an open source alternative to IPsec. The software is freely available for Linux, MacOS/X and Windows. • Configurable as TCP/IP client or server alternatively • Authentication with X.509 certificates • HTTP proxy tunnel support in client mode, proxy authentication: Basic, NTLM • Maximum of 10 different OpenVPN processes (client or server) • Each single configuration has a separate interface which can be used for packet filter rulesets • Layer2 Ethernet Tunnels for bridging industrial Ethernet protocols over IP networks Further supported OpenVPN parameters: • IP address assignment and assignment of static routes to OpenVPN clients • IP address acquirement from OpenVPN servers in client mode • OpenVPN tls-auth certificates can be uploaded via certificate management • Forwarding of local subnets to OpenVPN servers. This enables the server to present selectable temporary routes to the web interface user. • Radius Server authentication for Client authentication on server processes
IPsec Policy	IPsec Policies are mostly used to create VPNs with other VPN routers. • 64 different IPsec policies for Subnet-to-Subnet configuration or as a Road warrior IPsec Server • Every VPN policy can be configured as active or passive • IPsec can generally be started and stopped via Modbus/TCP. • Authentication via PSK or X.509 certificates • IPsec NAT traversal • IPsec Limit-MTU option • Hardware crypto engine for high data throughput
X.509 Certificate Management	Separate certificate management for verification of the validity of all existing certificates Upload function for client, CA, Open-VPN tls-auth and CRL certificates Preinstalled set of demo-certificates for quick function tests SCEP for automated certificate enrollment Automated self-signed device certificate for easy deployment via Sub-CA

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Signaling	
Ext. “CUT” Signal	Depending on input: • Configure Filter Rules • Disable the WWAN / Cellular Modem • Disable the Uplink Ethernet Port WAN
ALARM Signal	Releasing per: filter rule (can be combined with all rules targets like: Reject, Cut, Allow, etc.)
Ext. VPN KEY Signal	Start / Stop OpenVPN connections by external digital input signal
Acknowledging	The internal alarm signals can be acknowledged automatically with a configurable timer or manually via the web interface.

Edge Gateway/IIoT Functions	
Industrial Internet of Things (IIoT)	Easy setup for datasets with support of multiple sources and targets • Modbus/TCP interface: Enables the status request and control of VPN channels. Enables ModbusTCP for data collection • Modbus/RTU interface: Enables Modbus/RTU interface for data collection • OPC/UA: Enables OPC UA for data collection • Big-LinX data push: Enables data push with ADS-TEC WWH to Big-LinX • MQTT: Enables the sending of data to a defined target by MQTT

Time Synchronization Services	
Date & Time **NTP Relay**	• Three different remote NTP servers are configurable. • NTP server relay can be enabled to distribute the time in a local network. • Integrated RTC for high accuracy.
NTP (NTS-KE)	• Authenticated and integrity-protected NTP communication • Secure key negotiation via TLS • Support for client, server, and relay operation
GPS Time Server	IRF can be configured as an NTP server for the network, synchronizing system time to an external GPS/GNSS time signal

Edge Computing/Docker	
Docker Container Support	Integrated Docker environment for running containerized applications directly on the device. Support for standard-compliant Docker images
Rootless Docker	Secure container execution without root privileges using isolated namespaces
Docker Network Modes	Support for bridge, host, and user-defined networks for flexible and secure integration
Private Docker Registries	Connectivity to private image registries for secure deployment and version control of custom containers.
Container Management	Container management and control via web-based GUI and standard Docker CLI
Docker Peripherals	USB, RS485, Optional: CAN

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WWAN	
WWAN module	Integrated multi-band wireless module for high-speed wireless internet access: LTE EU or LTE USEMEA
Data speed	LTE EU: Peak download rate: 150 Mbit/s Peak upload rate: 50 Mbit/s LTE USEMEA: Peak download rate: 400 Mbit/s Peak upload rate: 150 Mbit/s
Frequency Bands	LTE EU: • LTE (FDD): Band 1 / 3 / 5 / 7 / 8 / 20 / 28 (23 ± 1 dBm) • LTE (TDD): Band 38 / 40 / 41 (23 ± 1 dBm) • UMTS (WCDMA): Band 1 / 5 / 8 (23 ± 1 dBm) • GSM / GPRS / EDGE: 850 (32.5 ± 1 dBm) / 900 (32.5 ± 1 dBm) / 1800 MHz (29.5 ± 1 LTE USEMEA: • LTE (FDD): Band 1 / 2 / 3 / 4 / 5 / 7 / 8 / 12 / 13 / 14 / 18 / 19 / 20 / 25 / 26 / 28 / 29 (Rx only) / 32 (Rx only) / 66 / 71 (23 ± 1 dBm) • LTE (TDD): Band 38 / 39 / 40 / 41 (23 ± 1 dBm) / 42 / 43 / 48 (22 ± 1 dBm) • UMTS (WCDMA): Band 1 / 2 / 4 / 5 / 6 / 8 / 9 / 19 (23 ± 1 dBm)
Antennas	LTE: 2 antennas are included in the scope of delivery Peak Gain (typ.): 617-960 MHz: -1.1 dBi 1427-2690 MHz: 0.5 dBi 3300-5000 MHz: 0.3 dBi 5150-5925MHz: 1.6 dBi Polarization: Vertical (linear)
Operating Modes	• Permanent connection • Manual connection control via API or SMS • Fallback connection with active TCP-Ping monitoring of target Hostname
Requirements for separate external LTE antennas	• Antenna system: External multi-band 2x2 MIMO antenna system • 2 x SMA connectors, MAIN and AUX (AUX = Diversity/MIMO) • Coaxial cable: nominal impedance of 50 ohms, e.g. RG174 • VSWR of Ant1 and Ant2: < 2:1 (recommended); < 3:1 (worst case) • Total radiated efficiency of Ant1 and Ant2: > 50% on all bands • Radiation patterns of Ant1 and Ant2: Nominally omni-directional radiation pattern in azimuth plane. • Envelope correlation coefficient between Ant1 and Ant2: < 0.4 on low Rx bands (up to 1500 MHz) < 0.2 on high Rx bands (over 1500 MHz) • Mean Effective Gain of Ant1 and Ant2 (MEG1, MEG2): ≥ -3 dBi • Isolation between antennas: > 10 dB

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GNSS specifications	LTE USEMEA: • Frequency range: GPS: 1575.42 MHz; GLONASS: 1602 MHz • Assisted GPS (A-GPS) SUPL1.0 • Assisted GNSS (A-GNSS) SUPL2.0 • gpsOneXTRA 3.0 with GPS + GLONASS support • Satellite channels: Maximum 54 ch. (16 GPS, 14 GLONASS, 12 Galileo, 12 BeiDou), simultaneous tracking • Protocols: NMEA 0183 V4.11 • Acquisition time (= Time to first fix): Hot start: 1 s; Warm start: 29 s; Cold start: 32 s • Accuracy: Horizontal: < 2 m (50%); < 5 m (90%); Altitude: < 4 m (50%); < 8 m (90%); Velocity: < 0.2 m/s • Sensitivity*: Tracking: -161 dBm; Acquisition (assisted): -158 dBm; Acquisition (standalone): -147 dBm *) Sensitivity is the lowest GNSS signal level for which the device can still detect an in-view satellite 50% of the time when in sequential tracking mode. • Operational limits: Altitude <6000 m or velocity <100 m/s. Either limit may be exceeded, but not both.
GNSS host software	• GPS daemon: gpsd (http://www.catb.org/gpsd/) • Cycle time: 1 s
GNSS connector	LTE USEMEA: • DC bias on GNSS connector to support an external active GNSS antenna: • max. 100 mA, bis 3.25 V (3.10 V typ) • Connector type: SMA (male connector on the housing side, male connector with union nut on the cable side) • Coaxial cable: nominal impedance of 50 ohms, e.g. RG174
GNSS antenna requirements	LTE USEMEA: • Frequency range: Narrow-band GPS: 1575.42 MHz ±2 MHz (minimum); Wide-band GNSS: 1559–1606 MHz (recommended) • Field of view (FOV): Omni-directional in azimuth; -45°...+90° in elevation • Polarization (average Gv/Gh): > 0 dB • Free space average gain (Gv+Gh) over FOV: > -6 dBi (preferably > -3 dBi) • Gain: Maximum gain and uniform coverage in the high elevation angle and zenith. Gain in azimuth plane is not desired. • Average 3D gain: > -5 dBi • Isolation between GNSS and LTE antennas: > 10 dB in all uplink bands • Typical VSWR: < 2.5:1 • Polarization: Any other than LHCP (left-hand circular polarized) is acceptable.

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