

LCOS 10.94

R&S®LANCOM 1650E

Secure Internet access over Gigabit Ethernet



Small and medium-sized businesses often need secure and reliable access to the Internet as well as allowing mobile employees or branch offices to connect to the company headquarters. With the R&S®LANCOM 1650E and excellent R&S®LANCOM IPsec and WireGuard VPN, you can easily connect your sites. The connection to any DSL, cable, and fiber-optic modems offers the maximum flexibility with regard to the Internet lines available at the site. The SD-WAN functions of the branch router in combination with the R&S®LANCOM Management Cloud (R&S®LMC) not only simplify your network management, but also accelerate and automate the administration, monitoring, and rollout of your network components.

- ▶ Secure SD-WAN – centralized cloud management with secure network separation, automated provisioning, and intelligent path control
- ▶ Flexible connection of external modems via Gigabit Ethernet
- ▶ 3 integrated VPN channels
- ▶ Network virtualization with 2 networks on one device (ARF)
- ▶ Extended protection with the content filter of the R&S®LANCOM Security Essentials Option

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WAN connectivity via Gigabit Ethernet

The Internet Access Router enables flexible connection of external provider modems via Gigabit Ethernet, offering maximum independence with regard to the Internet connections available at the site.

Reliable, intelligent site connectivity with Secure SD-WAN

Secure SD-WAN enables centrally managed and secure networking of all sites. In combination with the R&S® LANCOM Management Cloud (R&S® LMC), it allows company-wide security and access policies to be implemented, while rollouts, configurations, and updates are automated and accelerated. Encrypted Auto VPNs, High Scalability and Advanced Mesh VPNs, Dynamic Path Selection, as well as active/active WAN with load balancing ensure resilient, fail-safe connections.

Multi-layered security – automatically integrated

A SPI firewall is integrated into the LCOS operating system ex works (Built-in Security). Secure network segmentation is provided via ARF and VLAN, while PQ-PSKs protect against “store-now-decrypt-later” attacks and prepare for quantum resistance.

Encrypted communication via VPN

The gateway enables secure Internet connections for mobile employees, home offices, and locations via 3 integrated VPN channels (IPsec and WireGuard).

Individually upgradeable security with content filter

The R&S® LANCOM Security Essentials Option enhances the router with a cloud-based web and content filter that protects against phishing, ransomware, and malicious websites. Thanks to its unlimited number of users, the option is ideally suited for growing networks.

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| Layer 2 features | |
|--|---|
| VLAN | 4.096 IDs based on IEEE 802.1q, dynamic assignment |
| Multicast | IGMP-Snooping, MLD-Snooping |
| Protocols | ARP-Lookup, LLDP, ARP, Proxy ARP, BOOTP, DHCP |
| Layer 3 features | |
| Firewall | Stateful inspection firewall including paket filtering, extended port forwarding, N:N IP address mapping, paket tagging, support for DNS targets, user-defined rules and notifications |
| Quality of Service | Traffic shaping, bandwidth reservation, DiffServ/TOS, packetsize control, layer-2-in-layer-3 tagging, support for 8 QoS queues (6 free configurable) |
| Security | Intrusion Prevention, IP spoofing, access control lists, Denial of Service protection, detailed settings for handling reassembly, session-recovery, PING, stealth mode and AUTH port, URL blocker, password protection, programmable reset button |
| PPP authentication mechanisms | PAP, CHAP, MS-CHAP, and MS-CHAPv2 |
| High availability / redundancy | VRRP (Virtual Router Redundancy Protocol) |
| Router | IPv4-, IPv6-, IPv4/IPv6 dual stack |
| SD-WAN Application Routing | SD-WAN Application Routing in connection with the R&S®LANCOM Management Cloud |
| SD-WAN dynamic path selection | SD-WAN dynamic path selection in connection with the R&S®LANCOM Management Cloud |
| SD-WAN Zero Touch Deployment | Zero touch commissioning of the device in conjunction with the R&S®LANCOM Management Cloud |
| Router virtualization | ARF (Advanced Routing and Forwarding) up to separate processing of 2 contexts |
| IPv4 services | HTTP and HTTPS server for configuration by web interface, DNS client, DNS server, DNS relay, DNS proxy, dynamic DNS client, DHCP client, DHCP relay and DHCP server including autodetection, NTP client, SNTP server, policy-based routing, Bonjour-Proxy, RADIUS |
| IPv6 services | HTTP and HTTPS server for configuration by web interface, DHCPv6 client, DHCPv6 server, DHCPv6 relay, DNS client, DNS server, dynamic DNS client, NTP client, SNTP server, Bonjour-Proxy, RADIUS |
| Dynamic routing protocols | RIPv2 |
| IPv4 protocols | DNS, HTTP, HTTPS, ICMP, NTP/SNTP, PPPoE (server), RADIUS, RADSEC (secure RADIUS), RTP, SNMPv1,v2c,v3, TFTP, TACACS+, IGMPv3 |
| IPv6 protocols | NDP, stateless address autoconfiguration (SLAAC), stateful address autoconfiguration (DHCPv6), router advertisements, ICMPv6, DHCPv6, DNS, HTTP, HTTPS, PPPoE, RADIUS, SMTP, NTP, Syslog, SNMPv1,v2c,v3, MLDv2, NPTv6 (NAT66), VRRPv3 |
| WAN operating mode | VDSL, ADSL1, ADSL2 or ADSL2+ additional with external DSL modem at an ETH port |
| WAN protocols | PPPoE, Multi-PPPoE, GRE, EoGRE, PPTP (PAC or PNS), L2TPv2 (LAC or LNS), L2TPv3 with Ethernet-Pseudowire and IPoE (using DHCP or no DHCP), RIP-1, RIP-2, VLAN, IPv6 over PPP (IPv6 and IPv4/IPv6 dual stack session), IP(v6)oE (autokonfiguration, DHCPv6 or static) |
| Tunneling protocols (IPv4/IPv6) | 6to4, 6in4, 6rd, Dual Stack Lite, 464XLAT |
| Security | |
| Intrusion Prevention | Monitoring and blocking of login attempts and port scans |
| IP spoofing | Source IP address check on all interfaces: only IP addresses belonging to the defined IP networks are allowed |
| Access control lists | Filtering of IP or MAC addresses and preset protocols for configuration access |
| Denial of Service protection | Protection from fragmentation errors and SYN flooding |
| General | Detailed settings for handling reassembly, PING, stealth mode and AUTH port |
| Password protection | Password-protected configuration access can be set for each interface |
| Two-factor authentication | Two-factor authentication (2FA) for local device management via WEBconfig, SSH or Telnet with external Authenticator application |

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| Security | |
|---|---|
| Alerts | Alerts via e-mail, SNMP traps and SYSLOG |
| Authentication mechanisms | PAP, CHAP, MS-CHAP and MS-CHAPv2 as PPP authentication mechanism |
| Adjustable reset button | Adjustable reset button for 'ignore', 'boot-only' and 'reset-or-boot' |
| High availability / redundancy | |
| VRRP | VRRP (Virtual Router Redundancy Protocol VRRPv2 and VRRPv3) for backup in case of failure of a device or remote station. |
| FirmSafe | For completely safe software upgrades thanks to two stored firmware versions, incl. test mode for firmware updates |
| Load balancing | Static and dynamic load balancing over up to 2 WAN connections. Channel bundling with Multilink PPP (if supported by network operator) |
| VPN redundancy | Backup of VPN connections across different hierarchy levels, e.g. in case of failure of a central VPN concentrator and re-routing to multiple distributed remote sites. Any number of VPN remote sites can be defined (the tunnel limit applies only to active connections). Up to 32 alternative remote stations, each with its own routing tag, can be defined per VPN connection. Automatic selection may be sequential, or dependant on the last connection, or random (VPN load balancing) |
| Line monitoring | Line monitoring with LCP echo monitoring, dead-peer detection and up to 4 addresses for end-to-end monitoring with ICMP polling |
| VPN | |
| IPSec over HTTPS | Enables IPSec VPN based on TCP (at port 443 like HTTPS) which can go through firewalls in networks where e. g. port 500 for IKE is blocked. Suitable for client-to-site connections and site-to-site connections. IPSec over HTTPS is based on the NCP VPN Path Finder technology |
| Number of VPN tunnels | Max. number of concurrent active WireGuard or IPSec, PPTP (MPPE) and L2TPv2 tunnels: 3. Unlimited configurable connections. |
| Hardware accelerator | Integrated hardware accelerator for 3DES/AES encryption and decryption |
| Realtime clock | Integrated, buffered realtime clock to save the date and time during power failure. Assures timely validation of certificates in any case |
| Random number generator | Generates real random numbers in hardware, e. g. for improved key generation for certificates immediately after switching-on |
| 1-Click-VPN Client assistant | One click function in LANconfig to create VPN client connections, incl. automatic profile creation for the R&S®LANCOM Advanced VPN Client |
| 1-Click-VPN Site-to-Site | Creation of VPN connections between R&S®LANCOM routers via drag and drop in LANconfig |
| IKE, IKEv2 | IPSec key exchange with Preshared Key or certificate (RSA signature, ECDSA-Signature, digital signature) |
| Certificates | X.509 digital multi-level certificate support, compatible with Microsoft Server / Enterprise Server and OpenSSL. Secure Key Storage protects a private key (PKCS#12) from theft. |
| Certificate rollout | Automatic creation, rollout and renewal of certificates via SCEP (Simple Certificate Enrollment Protocol) per certificate hierarchy |
| Certificate revocation lists (CRL) | CRL retrieval via HTTP per certificate hierarchy |
| OCSP Client | Check X.509 certifications by using OCSP (Online Certificate Status Protocol) in real time as an alternative to CRLs |
| XAUTH | XAUTH client for registering R&S®LANCOM routers and access points at XAUTH servers incl. IKE-config mode. XAUTH server enables clients to register via XAUTH at R&S®LANCOM routers. Connection of the XAUTH server to RADIUS servers provides the central authentication of VPN-access with user name and password. Authentication of VPN-client access via XAUTH and RADIUS connection additionally by OTP token |
| RAS user template | Configuration of all VPN client connections in IKE ConfigMode via a single configuration entry |
| Proadaptive VPN | Automated configuration and dynamic creation of all necessary VPN and routing entries based on a default entry for site-to-site connections. |
| Algorithms | 3DES (168 bit), AES-CBC and -GCM (128, 192 or 256 bit), RSA (1024-4096 bit), ECDSA (P-256-, P-384-, P-521-curves) and Chacha20-Poly 1305. OpenSSL implementation with FIPS-140 certified algorithms. MD-5, SHA-1, SHA-256, SHA-384 or SHA-512 hashes |
| Post-quantum security | Post-quantum Preshared Keys (PPK) for IKEv2 |

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| VPN | |
|-------------------------------------|---|
| NAT-Traversal | NAT-Traversal (NAT-T) support for VPN over routes without VPN passthrough |
| MOBIKE | IKEv2 VPN clients can seamlessly switch between different networks (e.g. from WLAN to mobile radio) without having to re-establish the VPN tunnel |
| WireGuard | Support of WireGuard |
| R&S® LANCOM Dynamic VPN | Enables VPN connections from or to dynamic IP addresses. The IP address is communicated via the ICMP or UDP protocol in encrypted form. Dynamic dial-in for remote sites via connection template |
| Dynamic DNS | Enables the registration of IP addresses with a Dynamic DNS provider in the case that fixed IP addresses are not used for the VPN connection |
| Specific DNS forwarding | DNS forwarding according to DNS domain, e.g. internal names are translated by proprietary DNS servers in the VPN. External names are translated by Internet DNS servers |
| Split DNS | Allows the selective forwarding of traffic for IKEv2 depending on the addressed DNS domain. |
| IPv4 VPN | Connecting private IPv4 networks |
| IPv4 VPN over IPv6 WAN | Use of IPv4 VPN over IPv6 WAN connections |
| IPv6 VPN | Connecting private IPv6 networks |
| IPv6 VPN over IPv4 WAN | Use of IPv6 VPN over IPv4 WAN connections |
| Radius | RADIUS authorization and accounting, outsourcing of VPN configurations in external RADIUS server in IKEv2, RADIUS CoA (Change of Authorization) |
| High Scalability VPN (HSVPN) | Transmission of multiple, securely separated networks within a VPN tunnel |
| Advanced Mesh VPN | On demand dynamic VPN tunnel establishment between branches |
| Performance | |
| Routing-Performance | Data regarding the overall routing performance can be found inside the R&S® NC tech paper "Routing-Performance" here . |
| VoIP | |
| SIP ALG | The SIP ALG (Application Layer Gateway) acts as a proxy for SIP communication. For SIP calls the ALG opens the necessary ports for the corresponding media packets. Automatic address translation (STUN is no longer needed). |
| Interfaces | |
| WAN: Ethernet | 10/100/1000 Mbps Gigabit Ethernet |
| Ethernet ports | 3 individual 10/100/1000 Mbps Ethernet ports; up to 3 ports can be operated as additional WAN ports with load balancing. Ethernet ports can be electrically disabled within LCOS configuration. The ports support energy saving according to IEEE 802.3az |
| Port configuration | Each Ethernet port can be freely configured (LAN, DMZ, WAN, monitor port, off). LAN ports can be operated as a switch or separately. Additionally, external DSL modems or termination routers can be operated as a WAN port with load balancing and policy-based routing. DMZ ports can be operated with their own IP address range without NAT |
| USB 2.0 host port | USB 2.0 hi-speed host port for connecting USB printers (USB print server), USB data storage (FAT file system); bi-directional data exchange is possible |
| Serial interface | Serial configuration interface / COM port (USB-C): 9,600 - 115,000 baud. |
| Management and monitoring | |
| Management | R&S® LANCOM Management Cloud, LANconfig, WEBconfig, R&S® LANCOM Layer 2 management (emergency management) |
| Management functions | Alternative boot configuration, voluntary automatic updates for LCMS and LCOS, individual access and function rights up to 16 administrators, RADIUS and RADSEC user management, remote access (WAN or (W)LAN, access rights (read/write) adjustable separately), SSL, SSH, HTTPS, Telnet, TFTP, SNMP, HTTP, access rights via TACACS+, scripting, timed control of all parameters and actions through cron job |
| FirmSafe | Two stored firmware versions, incl. test mode for firmware updates |

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| Management and monitoring | |
|--------------------------------|---|
| automatic firmware update | configurable automatic checking and installation of firmware updates |
| Monitoring | R&S® LANCOM Management Cloud, LANmonitor, WLANmonitor |
| Monitoring functions | Device SYSLOG, SNMPv1,v2c,v3 incl. SNMP-TRAPS, extensive LOG and TRACE options, PING and TRACEROUTE for checking connections, internal logging buffer for firewall events |
| Monitoring statistics | Extensive Ethernet, IP and DNS statistics; SYSLOG error counter, accounting information exportable via LANmonitor and SYSLOG |
| IPerf | IPerf is a tool for measurements of the bandwidth on IP networks (integrated client and server) |
| SLA-Monitor (ICMP) | Performance monitoring of connections |
| Netflow | Export of information about incoming and outgoing IP traffic |
| SD-LAN | SD-LAN – automatic LAN configuration via the R&S® LANCOM Management Cloud |
| SD-WAN | SD-WAN – automatic WAN configuration via the R&S® LANCOM Management Cloud |
| Hardware | |
| Weight | 0,99 lbs (450 g) |
| Environment | Temperature range 0–40°C; humidity 0–95%; non-condensing |
| Housing | Robust synthetic housing, rear connectors, ready for wall mounting, Kensington lock; 210 x 45 x 140 mm (W x H x D) |
| Fans | None; fanless design without rotating parts, high MTBF |
| waste heat (max.) | 48 BTU/h |
| Power consumption (max./idle) | 12 watt / 6 watt |
| Declarations of conformity* | |
| Europe/EFTA | CE |
| Country of Origin | Made in Germany |
| *) Note | The full text of the specific Declaration of Conformity is available here |
| Scope of delivery | |
| Manual | Quick Installation Guide (DE/EN) |
| Cable | 1 Ethernet cable, 3 m |
| Power supply unit | External power adapter (230 V), NEST 12 V/2.0 A DC/S, coaxial power connector 2.1/5.5 mm, temperature range from -5 to +45° C, R&S® LANCOM item no. 111303 (EU) |
| Support | |
| Warranty extension | Free warranty extension up to 3 years (replacement service for defects) Find details here . The service and support conditions valid as of July 1, 2026, available at rs-nc.rohde-schwarz.com/fileadmin/pdf/LCS/ServiceSupportConditions/Rohde-Schwarz-Networks-and-Cybersecurity-GmbH-Service-and-Support-Conditions-20260701.pdf , apply. |
| Security updates | Up to 2 years after End of Sale of the device (but min. 3 years, see Link), can be extended by purchasing R&S® NC Support products |
| Software updates | Regular free updates including new features as part of the R&S® NC Lifecycle Management (Link) |
| Information on the EU Data Act | For details on product data and data on connected services, please refer to: Link |
| Manufacturer support | Available with R&S® NC products such as Support Access (for R&S® NC Community Partners only), Direct, or Premium |
| R&S® NC Replacement Basic S | Security updates until EOL (min. 5 years) and 5 years replacement service with shipment of the replacement device within 5 days after arrival of the defective device (8/5/5Days), item no. 10720 |

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| Support | |
|--|--|
| R&S®NC Replacement Advanced S | Security updates until EOL (min. 5 years) and 5 years NBD advance replacement with delivery of the replacement device within one business day (8/5/NBD), item no. 10730 |
| R&S®NC Support Direct 24/7 S | Direct, prioritized 10/5 manufacturer support incl. 24/7 emergency hotline and security updates for the device, guaranteed first response times (SLA) of max. 30 minutes for reporting massive operational disruptions by telephone (priority 1) and max. 4 hours for all other concerns (priority 2), term-based for 1, 3, or 5 years (item no. 10752, 10753 or 10754) |
| R&S®NC Support Direct Advanced 24/7 S | Direct, prioritized 10/5 manufacturer support incl. 24/7 emergency hotline and security updates for the device, NBD advance replacement with delivery of the device on the next business day (24/7/NBD), guaranteed first response times (SLA) of max. 30 minutes for reporting massive operational disruptions by telephone (priority 1) and max. 4 hours for all other concerns (priority 2), term-based for 1, 3, or 5 years (item no. 10776, 10777 or 10778) |
| R&S®NC Support Direct 10/5 S | Direct, prioritized 10/5 manufacturer support and security updates for the device, guaranteed first response times (SLA) of max. 2 hours for reporting massive operational disruptions by telephone (priority 1) and max. 4 hours for all other concerns (priority 2), term-based for 1, 3, or 5 years.(item no. 10740, 10741 or 10742) |
| R&S®NC Support Direct Advanced 10/5 S | Direct, prioritized 10/5 manufacturer support and security updates for the device, NBD advance replacement with delivery of the device on the next business day (10/5/NBD), guaranteed first response times (SLA) of max. 2 hours for reporting massive operational disruptions by telephone (priority 1) and max. 4 hours for all other concerns (priority 2), term-based for 1, 3, or 5 years.(item no. 10764, 10765 or 10766) |
| Software | |
| Lifecycle Management | After discontinuation (End of Sale), the device is subject to the R&S®NC Lifecycle Management. Details can be found at: Link |
| IT Security made in Germany | The development and quality assurance take place in Germany in accordance with high security standards. The „IT Security made in Germany“ quality label of the German IT Security Association attests to the level of security achieved. |
| Options | |
| R&S®LANCOM Security Essentials | R&S®LANCOM Security Essentials B Option 1-Year (for R&S®LANCOM SD-WAN gateways of the 700, 800, 1600, 1700, 1800, IAP, and OAP series as well as WLAN controller R&S®LANCOM WLC-60), item no. 62168 |
| R&S®LANCOM Security Essentials | R&S®LANCOM Security Essentials B Option 3-Years (for R&S®LANCOM SD-WAN gateways of the 700, 800, 1600, 1700, 1800, IAP, and OAP series as well as WLAN controller R&S®LANCOM WLC-60), item no. 62169 |
| R&S®LANCOM Security Essentials | R&S®LANCOM Security Essentials B Option 5-Years (for R&S®LANCOM SD-WAN gateways of the 700, 800, 1600, 1700, 1800, IAP, and OAP series as well as WLAN controller R&S®LANCOM WLC-60), item no. 62170 |
| R&S®LANCOM BPjM Filter | R&S®LANCOM BPjM Filter Option, 5 years subscription, item no. 61418 |
| R&S®LANCOM All-IP Lizenz Option | Upgrade option for the operation of the R&S®LANCOM routers with All-IP connections, support of PBX systems and telephony devices as well as voice & fax services, incl. Voice Call Manager, item no. 61419 |
| R&S®LANCOM VoIP +10 Option | Upgrade for R&S®LANCOM VoIP router with 10 additional internal VoIP numbers (additionally up to 40) and 10 external SIP lines (additionally up to 55) item no. 61423 |
| R&S®LANCOM Management Cloud | |
| R&S®LANCOM Management Cloud | R&S®LMC-A-1Y License (1 Year), enables the management of one category A device for one year via the R&S®LANCOM Management Cloud, item no. 50100 |
| R&S®LANCOM Management Cloud | R&S®LMC-A-3Y License (3 Years), enables the management of one category A device for three years via the R&S®LANCOM Management Cloud, item no. 50101 |
| R&S®LANCOM Management Cloud | R&S®LMC-A-5Y License (5 Years), enables the management of one category A device for five years via the R&S®LANCOM Management Cloud, item no. 50102 |
| Accessories | |
| VPN Client Software | R&S®LANCOM Advanced VPN Client for Windows - single license, item no. 61600 |
| VPN Client Software | R&S®LANCOM Advanced VPN Client for Mac OS X, single license, item no. 61606 |

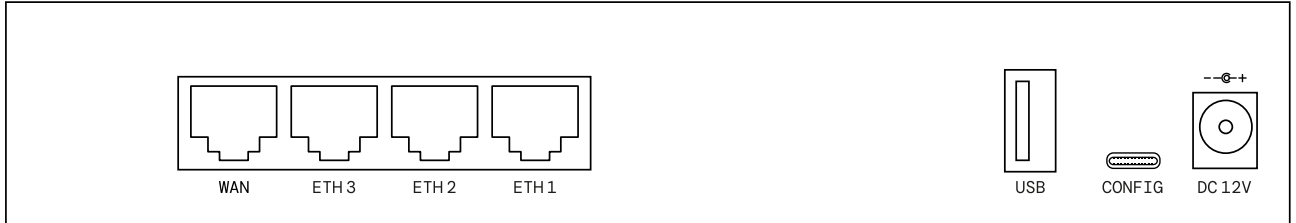
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Item number(s)

R&S® LANCOM 1650E (EU)

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Make ideas real

