19" Managed Substation Automation Switch

RedFox 5728 Series

- **High performance and configurable**
  - 28 Gigabit ports with up to 24 SFP fibre ports
  - Powerful CPU and switchcore
  - Advanced WeOS functionality
- **Designed for demanding energy applications**
  - Single or dual power supply
  - Withstand voltage interruptions up to 50 ms
  - IEC 61850-3 and IEEE 1613 Class 2 approval
- **Robust and reliable for long service life**
  - MTBF up to 710.000 hours (Telcordia)
  - -40 to +70 °C without ventilation holes
  - Ultra-robust IP40 19" rack mount housing
- **Unique future proof industrial networking solutions**
  - Transparent to PRP, GOOSE, SV and MMS
  - Advanced Cyber Security feature set
  - IEEE 1588v2 Precision Time Protocol (PTP)

KEMA Labs

EN 50121-4 Railway Trackside

EN 61000-6-2 Industrial Immunity

EN 61000-6-4 Industrial Emission

EN 61000-6-5 Immunity Power Station & Substation Environments

EN 61010-1 Safety Industrial Equipment

IEC 61850-3 Substation Automation

IEEE 1613 Substation Automation

RedFox 5728 takes communication reliability for substations to a new level. We know that in critical substation automation applications, even the loss of a single piece of data can disturb the operations, and that is why RedFox 5728 brings the highest reliability to your network. Withstanding the toughest environmental conditions, including the high EMI levels derived from load switching and lightning strikes and extreme ambient temperatures, RedFox-5728 ensures 100% uptime, no matter what.

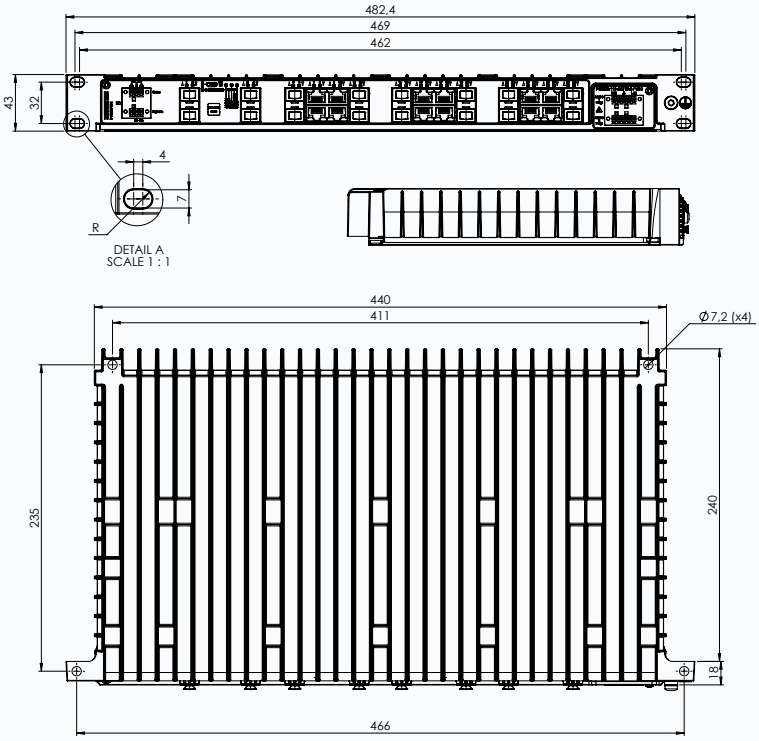
IEC 61850-3 and IEEE 1613 standards define the requirements and test levels for networking devices. They specify two different device reliability classes: Class 1 devices, which allow for communication errors; and Class 2 devices, which do not allow loss of a single transmission package even during the highest electro magnetic disturbances (EMI). RedFox 5728 meets or exceeds all test levels for Class 2 fulfilment, attaining KEMA type test gold certification, ensuring zero down-time, communication losses, delays or errors.

Superior build quality, the exclusive use of industrial grade components and extensive in-house testing results in class-leading MTBF and extended service life. Designed to run efficiently from either one or two power inputs, with dual internal power supplies fully isolated from each other and all other interfaces. The 28-port switch has all connectors located at the front for easy access and a range of different port configurations, customizable with SFP transceivers.

For resilient operations in substations not only is the most robust hardware needed, but also the most robust software. Available with both layer 2 and layer 3 functionality, RedFox 5728 is powered by the next generation WeOS operating system, which ensures continuous operation and support for an expanding range of protocols and features. Intuitive set-up and configuration enable easy and cost-efficient installation and removes the need for specialized IT support or training. Recognizing the growing sophistication of cyberattacks, an extensive suite of cyber security tools is also available.

Specifications - RedFox 5728

Dimensional drawing



Housing	
Dimensions (W x H x D)	482.4 x 43 x 258 mm (18.99 x 0.12 x 10.16 inches)
Housing	Full metal
Weight	3.8 kg

Interface	Ports	Fibre SFP	Copper RJ-45
RedFox-5728-(E-)F4G-T24G-LV	28	4	24
RedFox-5728-(E-)F4G-T24G-LVLV	28	4	24
RedFox-5728-(E-)F4G-T24G-HV	28	4	24
RedFox-5728-(E-)F4G-T24G-HVHV	28	4	24
RedFox-5728-(E-)F16G-T12G-LV	28	16	12
RedFox-5728-(E-)F16G-T12G-LVLV	28	16	12
RedFox-5728-(E-)F16G-T12G-HV	28	16	12
RedFox-5728-(E-)F16G-T12G-HVHV	28	16	12
RedFox-5728-(E-)F24G-T4G-LV	28	24	4
RedFox-5728-(E-)F24G-T4G-LVLV	28	24	4
RedFox-5728-(E-)F24G-T4G-HV	28	24	4
RedFox-5728-(E-)F24G-T4G-HVHV	28	24	4
Console	USB 2.0 device interface		
Digital I/O	1 x digital in, 1 x digital out		
Micro SD	Secure Digital 2.0		

Power parameters		
Rated voltage	LV and LVLV models: 24 to 48 VDC HV and HVHV models: 110 to 240 VAC, 50-60 Hz, 110-240 VDC	
Operating voltage	LV and LVLV models: 18 to 60 VDC HV and HVHV models: 85 to 264 VAC, 47-63 Hz, 85 to 264 VDC	
Rated current (incl. transceivers) HV = single power supply HVHV = two individual power supplies	RedFox-5728-(E-)F4G-T24G-LV RedFox-5728-(E-)F4G-T24G-LVLV	1.08 A at 24 VDC 0.54 A at 48 VDC
	RedFox-5728-(E-)F4G-T24G-HV RedFox-5728-(E-)F4G-T24G-HVHV	0.13 A at 240 V AC/DC 0.26 A at 110 V AC/DC
	RedFox-5728-(E-)F16G-T12G-LV RedFox-5728-(E-)F16G-T12G-LVLV	1.22 A at 24 VDC 0.61 A at 48 VDC
	RedFox-5728-(E-)F16G-T12G-HV RedFox-5728-(E-)F16G-T12G-HVHV	0.15 A at 240 V AC/DC 0.30 A at 110 V AC/DC
	RedFox-5728-(E-)F24G-T4G-LV RedFox-5728-(E-)F24G-T4G-LVLV	1.30 A at 24 VDC 0.65 A at 48 VDC
	RedFox-5728-(E-)F24G-T4G-HV RedFox-5728-(E-)F24G-T4G-HVHV	0.16 A at 240 V AC/DC 0.34 A at 110 V AC/DC
Isolation	Galvanic isolation to all ports	

Environmental		
Operating temperature	-40 to +70 °C (-40 to +158 °F)[a.]	
Storage and transport temperatures	-50 to +85 °C (-58 to +185 °F)	
Ingress protection	IP40	
Humidity (operating)	5-95% relative humidity	
Altitude	2000 m/80 kPa	
MTBF 1) MIL-HDBK-217F 2) Telcordia	RedFox-5728-(E-)F4G-T24G-LV RedFox-5728-(E-)F4G-T24G-LVLV RedFox-5728-(E-)F4G-T24G-HV RedFox-5728-(E-)F4G-T24G-HVHV RedFox-5728-(E-)F16G-T12G-LV RedFox-5728-(E-)F16G-T12G-LVLV RedFox-5728-(E-)F16G-T12G-HV RedFox-5728-(E-)F16G-T12G-HVHV RedFox-5728-(E-)F24G-T4G-LV RedFox-5728-(E-)F24G-T4G-LVLV RedFox-5728-(E-)F24G-T4G-HV RedFox-5728-(E-)F24G-T4G-HVHV	1) 344.000 hours, 2) 645.000 hours 1) 274.000 hours, 2) 514.000 hours 1) 316.000 hours, 2) 678.000 hours 1) 269.000 hours, 2) 549.000 hours 1) 356.000 hours, 2) 674.000 hours 1) 282.000 hours, 2) 532.000 hours 1) 353.000 hours, 2) 710.000 hours 1) 295.000 hours, 2) 570.000 hours 1) 371.000 hours, 2) 870.000 hours 1) 291.000 hours, 2) 647.000 hours 1) 386.000 hours, 2) 931.000 hours 1) 318.000 hours, 2) 703.000 hours

[a.] Depending on SFP types used

Approvals	
EMC	EN 50121-4/IEC 62236-4, Railway signalling and telecommunications apparatus EN/IEC 61000-6-2, Immunity industrial environments EN/IEC 61000-6-4, Emission industrial environments EN/IEC 61000-6-5, Immunity power station and substation environments
EMI	FCC Part 15.105 class A
Substation Automation	IEEE 1613, Testing Requirements for Communications Networking Devices Installed in Electric Power Substations IEC 61850-3, Communication networks and systems for power utility automation – Part 3: General requirements
Marine	DNV GL rules for classification - Ships and offshore units
Safety	EN/IEC/UL 61010-1, Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements EN/IEC/UL 61010-2-201, Safety requirements for electrical equipment for measurement, control and laboratory use - Part 2-201: Particular requirements

Switch properties	
Number of VLAN	64
Priority queues	8

Software	
WeOS	WeOS 5; westermo.com/solutions/weos
WeConfig	westermo.com/solutions/weconfig

Warranty	
Validity	5 years

Ordering information	
Art. no.	**Description**
3641-4350	RedFox-5728-F4G-T24G-LV
3641-4355	RedFox-5728-F4G-T24G-LVLV
3641-4550	RedFox-5728-F4G-T24G-HV
3641-4555	RedFox-5728-F4G-T24G-HVHV
3641-4360	RedFox-5728-F16G-T12G-LV
3641-4365	RedFox-5728-F16G-T12G-LVLV
3641-4560	RedFox-5728-F16G-T12G-HV
3641-4565	RedFox-5728-F16G-T12G-HVHV
3641-4620	RedFox-5728-F24G-T4G-LV
3641-4630	RedFox-5728-F24G-T4G-LVLV
3641-4640	RedFox-5728-F24G-T4G-HV
3641-4650	RedFox-5728-F24G-T4G-HVHV
3641-4250	RedFox-5728-E-F4G-T24G-LV
3641-4255	RedFox-5728-E-F4G-T24G-LVLV
3641-4450	RedFox-5728-E-F4G-T24G-HV
3641-4455	RedFox-5728-E-F4G-T24G-HVHV
3641-4260	RedFox-5728-E-F16G-T12G-LV
3641-4265	RedFox-5728-E-F16G-T12G-LVLV
3641-4460	RedFox-5728-E-F16G-T12G-HV
3641-4465	RedFox-5728-E-F16G-T12G-HVHV
3641-4720	RedFox-5728-E-F24G-T4G-LV
3641-4730	RedFox-5728-E-F24G-T4G-LVLV
3641-4740	RedFox-5728-E-F24G-T4G-HV
3641-4750	RedFox-5728-E-F24G-T4G-HVHV

Accessories	
3125-0150	PS-60, power supply, DIN-mounted (available for LV models)
100 Mbit transceivers 1 Gbit transceivers	westermo.com/products/accessories/sfp-transceivers

Specification WeOS 5

The WeOS operating system has been developed by Westermo for its current as well as future range of Ethernet hardware products. This layer 2 and layer 3 switching solution enables Westermo to create complex multimedia ring networks and routing solutions. WeOS not only provides solutions to many challenging industrial networking issues, but also helps to protect investments by ensuring the future availability of fully compatible solutions. WeOS is the core of our latest ranges of Ethernet hardware allowing complex multimedia ring networks and routing solutions to be created.

Westermo has many years of experience developing products for industrial applications. At the heart of all Westermo networking solutions is the need for ease of use. By standardising on a single operating system for all Westermo Ethernet products this helps to simplify the installation, operation and maintenance of individual devices and complete networks. Once a user is familiar with a Westermo product, that knowledge can be readily applied to all our other devices. A web screen simplifies the configuration of many functions, whilst a command line interface allows for fine tuning.

WeOS Standard - Layer 2 protocols and functionality
Resilience and High Availability
FRNTv0/v2 flexible ring topologies (multiring, subrings and ring coupling), IEEE 802.1D/802.1w (RSTP), IEEE 802.1AX/802.3ad Link Aggregation (LACP and Static), IEC 62439-2 Media Redundancy Protocol (MRP; single instance or dual instances at MRP master)[a.]
Layer 2 Switching
IEEE 802.1D MAC Bridges, IEEE 802.1Q Static VLAN and VLAN Tagging, Q-in-Q Tunnelling, IEEE 802.1AB LLDP, IGMPv1/v2/v3 Snooping, Static Multicast MAC filters, MLDv1/v2 Snooping
Layer 2 QoS
IEEE 802.1p Class of Service with flexible classification (VLAN tag priority, IP DSCP/ToS, Port ID), MAC Authentication, IEEE 802.1X Port Access Control, Ingress and Egress Rate limiting
IP Host Services
Static IPv4/v6 Address, DHCP Client, DNS Client, DDNS, ZeroConf (mDNS and SSDP), NTP Client (NTPv4), IPv4/v6 Interfaces (Ethernet, VLAN, Loopback and Blackhole)
Network Servers
DHCP Server (including options 1, 3, 6, 7, 12, 15, 42, 61, 66, 68 and 82), DHCP Relay Agent (including options 54 and 82), DNS Proxy Server (DNS forwarder and Host records), NTP client/server (NTPv4), IEEE 1588/PTP Transparent Clock (including Power Profile v1/v2)
Management Tools
Westermo configuration tool WeConfig, Web interface (HTTP and HTTPS), Command Line Interface (CLI) via console port, SSHv2 and Telnet, Local and Central Authentication (RADIUS/TACACS+), Role Based Access Control (RBAC), Password Compliance Policy, SNMPv1/v2c/v3, Secure Copy (SCP) for remote file upload and download, Local file management (via HTTP, FTP, TFTP and SCP), Load/save files from/to external memory[b.], Configuration and Deployment using external memory[b.], Tech support button, Flexible alarm and event handling system, RFC5424/RFC3164 Syslog (log files and remote syslog server), Port monitoring
SNMP MIB Support (read-only)
RFC 1213 MIB-2, RFC 2819 RMON MIB, RFC 2863 Interface MIB, RFC 3433 Entity Sensor MIB, RFC 3635 Ether-like Interface MIB, RFC 4133 Entity MIB, RFC 4188 Bridge MIB, RFC 4318 RSTP MIB, RFC 4363 Q-BRIDGE MIB, RFC 4836 MAU MIB, IEEE 802.1AB LLDP MIB, IEEE 802.1AX LAG MIB, IEC 62439-2 MRP MIB, WESTERMO-DDM MIB (SFP), WESTERMO-EVENT MIB, WESTERMO-FRNT MIB, WESTERMO-INTERFACE MIB, WESTERMO-TCN MIB

[a.] Available as add-on-function. Please see your local Westermo sales contact to purchase a license for your product.

[b.] Only applicable for models with SD card slot

WeOS Extended - Layer 3 protocols and functionality[a.]
IP Host Services
IP Interfaces (SSL, VPN, GRE)
IP Routing and VPN
Static IP Routing, Floating Static Routes, Multinetting, Proxy ARP, Dynamic IP routing (OSPFv2, RIPv1/v2), VRRPv2/v3, Protocol Independent Multicast - Sparse-Mode (PIM-SM), Static Multicast Routing, Stateful Inspection Firewall, Firewall Hit Counters, IP Masquerading (NAT/NAPT), Port Forwarding, Stateless NAT (1-1 NAT), IPsec VPN (IKEv2 PSK), SSL VPN (Client and Server, Certificate Authentication, Pre-shared Key (PSK) Point-to-Point Mode, Layer-2 and Layer-3 VPN, Layer-2 VPN bridging, Address pool and address per CN, TLS Authentication), Generic Routing Encapsulation (GRE), Policy Based Routing, Equal-Cost Multi-Path (ECMP), OpenVPN Multipath TCP (MPTCP), Route monitor
SNMP MIB Support (read-only)
RFC 2787 VRRPv2 MIB, RFC 6527 VRRPv3 MIB

[a.] Products with software level WeOS Extended include all functionality listed for WeOS Standard