

## **S20 - Guideform Specification**

### **GE Reason S20 Industrial Managed Ethernet Switch**

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#### **Functional Specifications**

The Ethernet Switch shall be manageable supporting Layer 2 and Layer 3 functionalities, being ready for IEC 61850 networks (performance tested) and harsh environments (type testing). Packet switching shall be store-and-forward done totally by hardware, and functions for traffic isolation, prioritization and IP routing must be available. For time synchronization, it should support the IEEE 1588v2 Transparent or Boundary clock with hardware-based time stamping in all ports, achieving the sub-micro second accuracy in the network.

The Ethernet Switch shall support loop-based topologies using the RSTP (IEEE 802.1D) protocol, such as ring topology, with a fault recovery time less than 5 ms per hop. The device monitoring is mainly performed using the SNMP protocol, and a failsafe dry-contact relay shall be available to alarm an event.

Lastly, it shall deliver full cyber security features that help to comply with NERC CIP requirements by supporting core features, such as: password complexity and encryption, AAA server support (Radius/TACACS+), role based access control (RBAC) and firmware digitally signed.

The Ethernet Switch must comply with the following characteristics:

#### **Networking protocols and switching capacity**

1. Layer 2 and 3 functions;
2. Switching capacity up to 68 Gbps;
3. Store-and-forward packet switching done by hardware with a latency lower than 3µs;
4. MAC filtering with up to 8,192 MAC entries;
5. Logical network segregation via VLANs (IEEE 802.1Q) with up to 4,095 VLAN numbers;
6. Traffic prioritization using Quality of Service (IEEE 802.1p) with up to 8 Class of Service (CoS) levels;
7. Type-of-Service (ToS) including the Differentiated Service Code Point (DSCP) to set which priority the network should use for incoming IP frames;
8. SNMP network management v1, v2c and v3;
9. Spanning Tree Protocols (STP, RSTP and MSTP) for ring topologies, including loop detection and protection;
10. UltraRSTP (Rapid Spanning Tree Protocol - IEEE 802.1W) with fault recovery time less than 5 ms per hop (meeting IEC 61850-90-4 specifications);
11. Bridge Protocol Data Unit (BPDU) guard and filtering to prevent external interference in Spanning Tree networks;
12. IP Routing functionalities: RIP v1/v2, OSPF and static routing;
13. VRRP to eliminate a single point of failure in static routed environments;
14. IP Multicast filtering (IPMC): IGMP snooping for IPv4 and MLD snooping for IPv6;
15. Support to IPv4 and IPv6 protocols (Multicast, Unicast and Broadcast);

16. Storm detection and control (Multicast, Unicast and Broadcast storm types);
17. Port mirroring;
18. Remote monitoring through RMON;

### **Access Management**

19. User-friendly web interface through HTTP/HTTPS protocols using Ethernet interface;
20. Command Line Interface (CLI) through SSH/Telnet protocols using Ethernet interface or USB console interface;

### **Cyber Security Features**

21. Support RADIUS and TACACS+ remote AAA technology;
22. Role Based Access Control (RBAC) for local authentication of multiple users;
23. Factory default password must be different for each manufactured device;
24. Default password must be changed after first login;
25. Users passwords encrypted using SHA256 and must have at least 8 characters including lower/uppercase alphabetic, numeric and special nonalphabetic (e.g. #, \$, @, &). Passwords expire after a pre-defined period of time.
26. Security event logging local and centralized via log server;
27. Digitally signed firmware to ensure its authenticity, and checksum algorithm to check firmware integrity;
28. Secure communications using standardized protocols: SSH, SFTP and HTTPS;
29. Unused Ethernet ports and remote access protocols may be disabled;
30. Unsecure access management protocols disabled by default, such as Telnet and HTTP;
31. Possibility of disabling all remote access communication protocols;
32. It shall deliver full cyber security features that help to comply with NERC CIP requirements;

### **Time Synchronization**

33. IEEE 1588v2 Transparent or Boundary clock with hardware-based time stamping in all ports, achieving sub microsecond time accuracy;
34. Internal clock synchronization using up to 5 NTP time servers;
35. Operate as NTP server using 1588v2 as time source or another NTP server;
36. Real Time Clock and super capacitor that remain active for 2 days or more after powered-off.

### **Communication Interfaces and Alarming**

37. Up to 24 gigabit Ethernet ports;
38. Flexible design allowing SFP slots in all ports, to ensure interfaces swapping and future expansions;
39. Electrical RJ45 port type option, 10/100/1000 Mbps with automatic learning, auto-negotiation and automatic detection/treatment of polarity;

40. Optical LC port type option, 100 Mbps or 1000 Mbps, Multi-Mode for short distance communications and Single-Mode for distances up to 120km;
41. USB 2.0 communication port for local configuration;
42. Form C dry-contact relay for external signalization failsafe alarm;

### **Power Supply specification**

43. Full range power supplies:
  - a. High voltage model 125-250 Vdc / 110-240 Vac, 50/60 Hz
  - b. Low voltage model 24/48 Vdc,
44. Redundant power supply

### **Mechanical Design**

45. The solution design shall be fan-less and have no rotating parts;
46. The device shall be presented in a 1U case height format and 19" rack mounting.
47. The weight of the device unit shall be < 5 kg;

### **Environmental Conditions**

48. Operational temperature range: -40°C to +55°C (or -40°F to +131°F);
49. Temperature tested for 16h at -40°C and +85°C;
50. Relative humidity: from 5 to 95%, non-condensing;

### **Standards Compliance: Performance and Type tests**

51. The Ethernet Switch shall have performance certification for 61850 networks;
52. Fully compliance with environment and EMC requirements of IEC 61850-3 edition 2;
53. Fully compliance with environment and EMC requirements of IEEE 1613:2009 and its extension IEEE 1613.1:2013.
54. As minimum, the equipment shall meet the IEC 60255-27:2014 and UL 60950-1 standards to ensure product safety;
55. A declaration of conformity shall evidence compliance with EU directives, and the device shall display a CE mark.