# EBSD Subsystem Requirement

## Control Sub-sytem Requirements.

### Data Storage Management

The Control Subsystem shall manage data storage efficiently, allowing for easy retrieval and backup. Rationale: This requirement ensures data integrity and accessibility, as outlined in the EBSD 300 Product Requirements Specification.

### System Initialization

The Control Subsystem shall initialize all components upon startup to ensure readiness. Rationale: This ensures that all system components are operational from the start, as specified in the EBSD 300 Product Requirements Specification.

### External Data Processing

The Control Subsystem shall process incoming external data in real-time. Rationale: This ensures timely data handling and system responsiveness, as outlined in the EBSD 300 Product Requirements Specification.

### Warning System Activation

The Control Subsystem shall activate warning systems when predefined thresholds are exceeded. Rationale: This ensures user safety and system protection, as specified in the EBSD 300 Product Requirements Specification.

### File Transfer Protocols

The Control Subsystem shall support multiple file transfer protocols, including USB and LAN. Rationale: This ensures versatile data transfer options, as outlined in the EBSD 300 Product Requirements Specification.

### Communication Interface Support

The Control Subsystem shall support communication through USB interfaces. Rationale: This ensures basic communication capabilities, as specified in the EBSD 300 Product Requirements Specification.

### Power Management

The Control Subsystem shall manage power consumption to not exceed 430 W. Rationale: This ensures energy efficiency and compliance with power specifications, as outlined in the EBSD 300 Product Requirements Specification.

### Temperature Monitoring

The Control Subsystem shall continuously monitor internal temperatures to prevent overheating. Rationale: This ensures system reliability and longevity, as specified in the EBSD 300 Product Requirements Specification.

### Pressure Adaptation

The Control Subsystem shall adapt to pressure changes within the specified range of 9.5 to 16.0 psia. Rationale: This ensures system functionality under varying pressure conditions, as outlined in the EBSD 300 Product Requirements Specification.

### Humidity Control

The Control Subsystem shall maintain performance in environments with 30-90% relative humidity. Rationale: This ensures system reliability in different humidity conditions, as specified in the EBSD 300 Product Requirements Specification.

### Vibration Resistance

The Control Subsystem shall resist vibrations up to 1g. Rationale: This ensures system stability in vibrational environments, as outlined in the EBSD 300 Product Requirements Specification.

### Shock Absorption

The Control Subsystem shall absorb shocks up to 15g. Rationale: This ensures system durability under shock conditions, as specified in the EBSD 300 Product Requirements Specification.

### Radiation Protection

The Control Subsystem shall protect against ionizing radiation as per SEE standards. Rationale: This ensures system reliability in radiation-prone environments, as outlined in the EBSD 300 Product Requirements Specification.

### Oxygen Environment Operation

The Control Subsystem shall operate in enriched oxygen environments up to 30% concentration. Rationale: This ensures system functionality in specific atmospheric conditions, as specified in the EBSD 300 Product Requirements Specification.

### Rear Panel Connectivity

The Control Subsystem shall provide connectivity through rear panel ports including Ethernet and USB. Rationale: This ensures comprehensive connectivity options, as outlined in the EBSD 300 Product Requirements Specification.

### Front Panel Accessibility

The Control Subsystem shall provide easy access to front panel interfaces for user convenience. Rationale: This ensures user-friendly design and accessibility, as specified in the EBSD 300 Product Requirements Specification.

### Design Customization

The Control Subsystem shall allow for design customization to meet specific user needs. Rationale: This ensures flexibility and adaptability in system design, as outlined in the EBSD 300 Product Requirements Specification.

### Failure Detection

The Control Subsystem shall detect and report failures in real-time. Rationale: This ensures timely maintenance and system reliability, as specified in the EBSD 300 Product Requirements Specification.

### Usability Enhancement

The Control Subsystem shall enhance usability through intuitive interface design. Rationale: This ensures ease of use and user satisfaction, as outlined in the EBSD 300 Product Requirements Specification.

### Diagnostic Capabilities

The Control Subsystem shall provide diagnostic capabilities for system health monitoring. Rationale: This ensures proactive maintenance and system reliability, as specified in the EBSD 300 Product Requirements Specification.

## Thermal Current Sensing Sub-system Requirements.

### Temperature Measurement Accuracy

The Thermal Current Sensing Subsystem shall measure temperature with an accuracy of ±0.1°C. Rationale: This ensures precise thermal data collection, as outlined in the Simcenter documentation for accurate thermal metrics.

### Real-Time Data Processing

The Thermal Current Sensing Subsystem shall process temperature data in real-time. Rationale: This ensures timely monitoring and response to thermal changes, as specified in the Simcenter documentation.

### Non-Destructive Testing

The Thermal Current Sensing Subsystem shall perform non-destructive thermal testing. Rationale: This ensures the integrity of the device under test, as outlined in the Simcenter documentation.

### JEDEC Standard Compliance

The Thermal Current Sensing Subsystem shall comply with JEDEC 51 standards for thermal testing. Rationale: This ensures industry-standard compliance, as specified in the Simcenter documentation.

### Thermal Transient Response

The Thermal Current Sensing Subsystem shall measure thermal transient response accurately. Rationale: This ensures detailed thermal analysis, as outlined in the Simcenter documentation.

### Data Logging Capability

The Thermal Current Sensing Subsystem shall log temperature data for analysis and reporting. Rationale: This ensures comprehensive data collection for further analysis, as specified in the Simcenter documentation.

### Automated Calibration

The Thermal Current Sensing Subsystem shall support automated calibration for accuracy. Rationale: This ensures high precision in thermal measurements, as outlined in the Simcenter documentation.

### High-Volume Testing Support

The Thermal Current Sensing Subsystem shall support high-volume testing for production environments. Rationale: This ensures efficiency in mass production, as specified in the Simcenter documentation.

### Thermal Impedance Profiling

The Thermal Current Sensing Subsystem shall generate thermal impedance profiles for components. Rationale: This ensures detailed thermal characterization, as outlined in the Simcenter documentation.

### Integration with Simulation Models

The Thermal Current Sensing Subsystem shall integrate with thermal simulation models for enhanced accuracy. Rationale: This ensures comprehensive thermal analysis, as specified in the Simcenter documentation.

### Power Cycling Test Support

The Thermal Current Sensing Subsystem shall support power cycling tests to assess component reliability. Rationale: This ensures system durability under operational conditions, as outlined in the Simcenter documentation.

### Temperature Threshold Alerts

The Thermal Current Sensing Subsystem shall provide alerts when temperature thresholds are exceeded. Rationale: This ensures timely intervention to prevent overheating, as specified in the Simcenter documentation.

### Data Interface Compatibility

The Thermal Current Sensing Subsystem shall be compatible with standard data interfaces for easy integration. Rationale: This ensures seamless data transfer and integration, as outlined in the Simcenter documentation.

### Remote Monitoring Capability

The Thermal Current Sensing Subsystem shall support remote monitoring of thermal data. Rationale: This ensures flexibility and accessibility in data monitoring, as specified in the Simcenter documentation.

### Energy Efficiency

The Thermal Current Sensing Subsystem shall operate with minimal power consumption. Rationale: This ensures energy efficiency and cost-effectiveness, as outlined in the Simcenter documentation.

### Environmental Adaptability

The Thermal Current Sensing Subsystem shall adapt to varying environmental conditions without performance degradation. Rationale: This ensures reliability in diverse operating environments, as specified in the Simcenter documentation.

### System Diagnostics

The Thermal Current Sensing Subsystem shall perform self-diagnostics to ensure operational integrity. Rationale: This ensures system reliability and reduces downtime, as outlined in the Simcenter documentation.

### User-Friendly Interface

The Thermal Current Sensing Subsystem shall provide a user-friendly interface for easy operation. Rationale: This ensures ease of use and user satisfaction, as specified in the Simcenter documentation.

### Data Security

The Thermal Current Sensing Subsystem shall ensure data security during transmission and storage. Rationale: This ensures the protection of sensitive thermal data, as outlined in the Simcenter documentation.

### Scalability

The Thermal Current Sensing Subsystem shall be scalable to accommodate future expansion needs. Rationale: This ensures long-term usability and adaptability, as specified in the Simcenter documentation.

## Power Driver Subsystem

### Voltage Regulation

The Power Driver Subsystem shall regulate output voltage within ±5% of the specified value. Rationale: This ensures stable power delivery to connected components, as outlined in the EBSD 300 Product Requirements Specification.

### Current Limiting

The Power Driver Subsystem shall limit output current to prevent overcurrent conditions. Rationale: This protects the system and connected components from damage, as specified in the EBSD 300 Product Requirements Specification.

### Thermal Protection

The Power Driver Subsystem shall include thermal protection to prevent overheating. Rationale: This ensures system reliability and longevity, as outlined in the EBSD 300 Product Requirements Specification.

### Short Circuit Protection

The Power Driver Subsystem shall provide short circuit protection to prevent damage. Rationale: This ensures system safety and integrity, as specified in the EBSD 300 Product Requirements Specification.

### Power Cycling Capability

The Power Driver Subsystem shall support power cycling tests to assess component reliability. Rationale: This ensures system durability under operational conditions, as outlined in the Simcenter documentation.

### Efficiency Optimization

The Power Driver Subsystem shall operate with an efficiency of at least 90%. Rationale: This ensures energy efficiency and cost-effectiveness, as specified in the Simcenter documentation.

### Remote Control Support

The Power Driver Subsystem shall support remote control for power management. Rationale: This ensures flexibility and accessibility in power management, as outlined in the Simcenter documentation.

### Load Regulation

The Power Driver Subsystem shall maintain load regulation within ±2% under varying load conditions. Rationale: This ensures consistent power delivery, as specified in the EBSD 300 Product Requirements Specification.

### Startup Sequence Control

The Power Driver Subsystem shall control the startup sequence to prevent inrush current. Rationale: This protects the system from potential damage during startup, as outlined in the EBSD 300 Product Requirements Specification.

### Overvoltage Protection

The Power Driver Subsystem shall provide overvoltage protection to prevent damage. Rationale: This ensures system safety and integrity, as specified in the EBSD 300 Product Requirements Specification.

### Fault Detection

The Power Driver Subsystem shall detect and report faults in real-time. Rationale: This ensures timely maintenance and system reliability, as outlined in the EBSD 300 Product Requirements Specification.

### Data Logging Capability

The Power Driver Subsystem shall log power data for analysis and reporting. Rationale: This ensures comprehensive data collection for further analysis, as specified in the Simcenter documentation.

### Scalability

The Power Driver Subsystem shall be scalable to accommodate future expansion needs. Rationale: This ensures long-term usability and adaptability, as outlined in the Simcenter documentation.

### Energy Storage Integration

The Power Driver Subsystem shall integrate with energy storage systems for backup power. Rationale: This ensures continuous power supply during outages, as specified in the Simcenter documentation.

### Environmental Adaptability

The Power Driver Subsystem shall adapt to varying environmental conditions without performance degradation. Rationale: This ensures reliability in diverse operating environments, as outlined in the Simcenter documentation.

### User-Friendly Interface

The Power Driver Subsystem shall provide a user-friendly interface for easy operation. Rationale: This ensures ease of use and user satisfaction, as specified in the Simcenter documentation.

### Data Security

The Power Driver Subsystem shall ensure data security during transmission and storage. Rationale: This ensures the protection of sensitive power data, as outlined in the Simcenter documentation.

### System Diagnostics

The Power Driver Subsystem shall perform self-diagnostics to ensure operational integrity. Rationale: This ensures system reliability and reduces downtime, as specified in the Simcenter documentation.

### Communication Interface Compatibility

The Power Driver Subsystem shall be compatible with standard communication interfaces for easy integration. Rationale: This ensures seamless data transfer and integration, as outlined in the Simcenter documentation.

### Redundancy Support

The Power Driver Subsystem shall support redundancy to ensure continuous operation. Rationale: This ensures system reliability and availability, as specified in the Simcenter documentation.

## General IO Subsystem

### Data Transfer Rate

The General IO Subsystem shall support a data transfer rate of up to 1 Gbps. Rationale: This ensures efficient data handling and meets the connectivity requirements outlined in the EBSD 300 Product Requirements Specification.

### USB Port Support

The General IO Subsystem shall include at least two USB 2.0 ports. Rationale: This provides necessary connectivity options for peripheral devices, as specified in the EBSD 300 Product Requirements Specification.

### Ethernet Connectivity

The General IO Subsystem shall include a Gigabit Ethernet port for network connectivity. Rationale: This ensures high-speed network access, as outlined in the EBSD 300 Product Requirements Specification.

### RS232 Interface

The General IO Subsystem shall include three RS232 ports for serial communication. Rationale: This provides compatibility with legacy systems, as specified in the EBSD 300 Product Requirements Specification.

### RS422/485 Support

The General IO Subsystem shall include one RS422 or RS485 port for industrial communication. Rationale: This ensures compatibility with industrial communication standards, as outlined in the EBSD 300 Product Requirements Specification.

### CAN Bus Connectivity

The General IO Subsystem shall include five CAN bus connections for automotive applications. Rationale: This ensures compatibility with automotive communication standards, as specified in the EBSD 300 Product Requirements Specification.

### Fiber Optic Interface

The General IO Subsystem shall include a fiber optic RX/TX port for high-speed data transfer. Rationale: This ensures high-speed and secure data transmission, as outlined in the EBSD 300 Product Requirements Specification.

### 28-Pin I/O Interface

The General IO Subsystem shall include a 28-pin I/O interface for custom applications. Rationale: This provides flexibility for custom connectivity needs, as specified in the EBSD 300 Product Requirements Specification.

### Hot-Swappable Ports

The General IO Subsystem shall support hot-swappable ports for easy maintenance. Rationale: This ensures minimal downtime during maintenance, as outlined in the EBSD 300 Product Requirements Specification.

### Data Security

The General IO Subsystem shall ensure data security during transmission and storage. Rationale: This protects sensitive data from unauthorized access, as specified in the Simcenter documentation.

### Remote Access Capability

The General IO Subsystem shall support remote access for monitoring and control. Rationale: This ensures flexibility and accessibility, as outlined in the Simcenter documentation.

### Environmental Adaptability

The General IO Subsystem shall operate effectively in varying environmental conditions. Rationale: This ensures reliability in diverse operating environments, as specified in the EBSD 300 Product Requirements Specification.

### Power Efficiency

The General IO Subsystem shall operate with minimal power consumption. Rationale: This ensures energy efficiency and cost-effectiveness, as outlined in the Simcenter documentation.

### System Diagnostics

The General IO Subsystem shall perform self-diagnostics to ensure operational integrity. Rationale: This ensures system reliability and reduces downtime, as specified in the Simcenter documentation.

### User-Friendly Interface

The General IO Subsystem shall provide a user-friendly interface for easy operation. Rationale: This ensures ease of use and user satisfaction, as outlined in the Simcenter documentation.

### Scalability

The General IO Subsystem shall be scalable to accommodate future expansion needs. Rationale: This ensures long-term usability and adaptability, as specified in the Simcenter documentation.

### Redundancy Support

The General IO Subsystem shall support redundancy to ensure continuous operation. Rationale: This ensures system reliability and availability, as outlined in the Simcenter documentation.

### Integration with Control Systems

The General IO Subsystem shall integrate seamlessly with control systems for coordinated operation. Rationale: This ensures system efficiency and performance, as specified in the EBSD 300 Product Requirements Specification.

### Labeling and Identification

The General IO Subsystem shall include clear labeling for identification and safety information. Rationale: This ensures ease of use and compliance with safety regulations, as outlined in the EBSD 300 Product Requirements Specification.

### Material Selection

The General IO Subsystem shall use materials that meet specified performance and safety standards. Rationale: This ensures durability and compliance with industry standards, as specified in the EBSD 300 Product Requirements Specification.

## Chassis Subsystem

### Structural Integrity

The Chassis Subsystem shall maintain structural integrity under all specified operating conditions. Rationale: This ensures the durability and safety of the system, as outlined in the EBSD 300 Product Requirements Specification.

### Modular Design

The Chassis Subsystem shall support a modular design to accommodate up to 10 plug-in units. Rationale: This ensures flexibility and scalability, as specified in the EBSD 300 Product Requirements Specification.

### Heat Dissipation

The Chassis Subsystem shall effectively dissipate heat to maintain optimal operating temperatures. Rationale: This ensures system reliability and performance, as outlined in the EBSD 300 Product Requirements Specification.

### Vibration Resistance

The Chassis Subsystem shall resist vibrations up to 1g. Rationale: This ensures system stability in vibrational environments, as specified in the EBSD 300 Product Requirements Specification.

### Shock Absorption

The Chassis Subsystem shall absorb shocks up to 15g. Rationale: This ensures system durability under shock conditions, as outlined in the EBSD 300 Product Requirements Specification.

### EMI Shielding

The Chassis Subsystem shall provide electromagnetic interference (EMI) shielding to protect internal components. Rationale: This ensures system integrity and performance, as specified in the EBSD 300 Product Requirements Specification.

### Corrosion Resistance

The Chassis Subsystem shall be resistant to corrosion in specified environmental conditions. Rationale: This ensures long-term durability and reliability, as outlined in the EBSD 300 Product Requirements Specification.

### Weight Optimization

The Chassis Subsystem shall be designed to minimize weight while maintaining structural integrity. Rationale: This ensures ease of handling and installation, as specified in the EBSD 300 Product Requirements Specification.

### Mounting Flexibility

The Chassis Subsystem shall support flexible mounting options for various installation environments. Rationale: This ensures adaptability to different use cases, as outlined in the EBSD 300 Product Requirements Specification.

### Cooling System Integration

The Chassis Subsystem shall integrate with the cooling system to maintain optimal temperatures. Rationale: This ensures system reliability and performance, as specified in the EBSD 300 Product Requirements Specification.

### Access Panels

The Chassis Subsystem shall include access panels for easy maintenance and component replacement. Rationale: This ensures ease of maintenance and reduces downtime, as outlined in the EBSD 300 Product Requirements Specification.

### Color Scheme

The Chassis Subsystem shall adhere to Siemens corporate color scheme for brand consistency. Rationale: This ensures brand recognition and consistency, as specified in the EBSD 300 Product Requirements Specification.

### Environmental Adaptability

The Chassis Subsystem shall adapt to varying environmental conditions without performance degradation. Rationale: This ensures reliability in diverse operating environments, as outlined in the EBSD 300 Product Requirements Specification.

### Noise Reduction

The Chassis Subsystem shall incorporate noise reduction features to minimize operational noise. Rationale: This ensures a quieter operating environment, as specified in the EBSD 300 Product Requirements Specification.

### Security Features

The Chassis Subsystem shall include security features to prevent unauthorized access. Rationale: This ensures the protection of internal components and data, as outlined in the EBSD 300 Product Requirements Specification.

### Grounding Provisions

The Chassis Subsystem shall include grounding provisions to ensure electrical safety. Rationale: This ensures compliance with safety standards, as specified in the EBSD 300 Product Requirements Specification.

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