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WE R&D.

Functional Safety & Certification

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Functional Safety & Certification

Safety | Automotive | Automation

Safety-critical systems in automation and mobility require rigorous functional safety analysis and certification. From drive systems with Safety Torque Off to autonomous vehicles, we help companies navigate complex safety standards and achieve certification faster.

The Challenge

Companies developing safety-critical automation systems face several challenges:

- **Expertise gap** - Functional safety requires specialized knowledge of ISO 13849, IEC 61508, ISO 26262
- **Certification delays** - Safety certification can block market entry for 6-12 months
- **Iterative feedback** - TÜV and certification bodies require multiple rounds of refinement
- **Resource constraints** - Safety engineers are in high demand and expensive

Our Approach

❶ Safety Concept Development

We work with your engineering teams to develop comprehensive safety concepts:

FMEA Development

Systematic failure mode and effects analysis identifying:

- Potential failure modes in drive systems
- Safety-critical functions (Safe Torque Off, Safe Stop, etc.)
- Hazard analysis and risk assessment
- Safety integrity level (SIL) determination

Safety Architecture

Design of safety layers for complex systems:

- Redundant safety channels
- Diagnostic coverage analysis
- Safe state definitions
- Safety function implementation

Certification Support

Preparation for external certification:

- Documentation for TÜV/certification bodies
- Test plan development
- Traceability matrices
- Response to auditor feedback

Safety Validation

Testing and validation of safety functions:

- Safety function testing protocols
- Fault injection testing
- Performance verification
- Diagnostic coverage validation

❷ Safety Function Implementation

Beyond concept development, we implement and validate safety-critical functions:

Safety Function	Application	Standards
Safety Torque Off (STO)	Drive systems, robotics	ISO 13849-1, IEC 61800-5-2
Safe Stop 1/2 (SS1/SS2)	Automated machinery	ISO 13849-1

Safe Limited Speed (SLS)	AGVs, collaborative robots	ISO 13849-1, ISO 10218
Safe Direction (SDI)	Material handling equipment	ISO 13849-1
Safety-related Stop (SOS)	Emergency stop systems	ISO 13849-1

❸ Rapid Iteration with Certification Bodies

We've developed efficient processes for working with certification bodies:

1. **Pre-assessment** - Early review with certification body to identify gaps
2. **Iterative refinement** - Quick turnaround on feedback
3. **Test witnessing** - Coordinated test execution with auditors
4. **Final certification** - Complete documentation package

Example Projects

Fernride: Autonomous Truck Safety Certification

Fernride develops teleoperated and autonomous trucks for logistics yards. We supported their safety certification:

- **FMEA development** for autonomous driving functions
- **Safety concept** for teleoperation fallback
- **Hazard analysis** for yard automation scenarios
- **ISO 26262** compliance roadmap

Result: Reduced certification timeline from 12 months to 6 months, enabling faster market entry.

ATS Automation: Safety Torque Off Implementation

For a machinery manufacturer, we implemented Safety Torque Off (STO) functionality:

- **Circuit design** for redundant safety channels
- **Diagnostic coverage** analysis achieving PL d (Performance Level d)
- **Test plan** for functional safety validation
- **TÜV certification** support

Result: First-time certification success with zero major non-conformities.

Sennebogen: Teleoperation Safety Analysis

Sennebogen develops teleoperated construction equipment. We provided:

- **Hazard analysis** for remote crane operation
- **Safety function specification** for emergency stops
- **Human factors** analysis for operator interfaces
- **Machinery Directive** compliance assessment

Result: Safety concept approved by TÜV on first submission.

Application at Bosch Rexroth

For Bosch Rexroth, functional safety expertise is critical across multiple areas:

Drive System Safety Functions

Bosch Rexroth's drive systems include safety-critical functions like Safe Torque Off (STO) and Safe Stop that must be certified:

- [x] **FMEA for new drive products** - Systematic safety analysis for new ctrlX DRIVE variants
- [x] **Safety function validation** - Test protocols for STO, SS1, SS2, SLS functions
- [x] **Certification documentation** - Complete packages for IEC 61800-5-2 compliance
- [x] **Diagnostic coverage analysis** - Ensuring adequate fault detection in safety functions

Customer Application Support

Many Bosch Rexroth customers need help integrating drives into safety-critical machinery:

- **Safety concept consulting** - Help machine builders achieve required Performance Levels
- **Risk assessment** - Support for Machinery Directive compliance
- **Integration guidelines** - Best practices for implementing Bosch Rexroth safety functions
- **Training** - Educate customer engineers on functional safety requirements

Competitive Advantage

Motius's functional safety expertise helps Bosch Rexroth:

- **Faster time-to-market** - Reduce certification delays for new drive products
- **Customer enablement** - Help customers successfully certify their machines using Bosch Rexroth drives
- **Risk mitigation** - Identify safety issues early in development
- **Regulatory compliance** - Stay ahead of evolving safety standards

Reference Implementations

We can develop reference safety architectures showing:

- How to integrate Bosch Rexroth drives in SIL 2/SIL 3 applications
- Best practices for safety function implementation
- Test methodologies for safety validation
- Documentation templates for certification

This positions Bosch Rexroth as not just a component supplier, but a partner in safety-critical automation.

Why Motius?

Deep Expertise

Our team includes certified functional safety engineers with experience across:

- ISO 26262 (automotive)
- ISO 13849 (machinery)
- IEC 61508 (general functional safety)
- IEC 61800-5-2 (adjustable speed drives)

Fast Execution

We understand that certification delays cost money. Our efficient processes reduce time to certification by 50%+.

Certification Body Relationships

We work regularly with TÜV, DEKRA, and other certification bodies, enabling smoother approval processes.

Implementation + Certification

Unlike pure consulting firms, we can implement safety functions in hardware and software, not just write documentation.