

APPLICATION NOTES:

Meeting Terminal Requirements for Fuel Loading



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EN13922 COMPLIANCE WITH IEC61508 – OVERFILL PREVENTION AND GROUNDING VERIFICATION

SYSTEM OVERVIEW

The ATEX Directive (ATEX) sets out the minimum safety requirements for equipment used in explosive atmospheres. However, it does not assess the safety function of the system. The latest revision of BS EN13922:2020 now requires safety-critical components, such as overfill prevention sensors and loading gantry control monitors, to meet a minimum of safety integrity level 1 (SIL 1) according to IEC 61508 functional safety standard. It requires only self-declaration by the manufacturer, with no independent certification. IEC 61508 functional safety standards focus on the ability of the system to correctly perform its safety function, which should be certified by an accredited functional safety agency.



The spill of hazardous liquids and the potential ignition of explosive atmospheres from static electricity pose two of the biggest hazards and risks in tank truck loading operations. Without provisions to prevent loss of containment and/or accumulation and uncontrolled discharge of static electricity, the risk of these hazards is often unacceptable due to the potentially severe consequences.

To mitigate the risk, overfill prevention and grounding verification systems are utilized. They normally consist of one or more sensors, a logic controller, and a final control element to ensure operations remain safe, efficient, and profitable. It is vital to have a solution that provides automatic protection by preventing spills, which can negatively impact personnel safety, the environment, and financial liability.



APPLICATION NOTES

To reduce risk, electronic safety systems designed to provide automatic protection against the above-mentioned hazards are selected and implemented.

SAFETY DIRECTIVES AND FUNCTIONAL SAFETY

Overfill prevention and static grounding systems for tank truck loading should comply with the following directives and standards:

ATEX Directive (ATEX)

ATEX sets out the minimum safety requirements for equipment used in explosive atmospheres and is based on the IECex standards. Its purpose is to ensure equipment, such as overfill sensors and control monitors, cannot pose an ignition risk in an explosive atmosphere. ATEX does not assess the safety function of the system, i.e., its ability to detect liquid product and stop product flow.

BS EN13922 Overfill Prevention Systems for Liquid Fuels

BS EN 13922:2020 overfill prevention systems for liquid fuels sets out the minimum requirements for the design of the system and components. This requires only self-declaration by the manufacturer. Independent certification is not required on the ability of the system to perform its safety function.

The latest revision of BS EN13922:2020 now requires safety-critical components, such as overfill prevention sensors and loading gantry control monitors, to meet a minimum safety integrity level 1 according to IEC 61508 functional safety standard.

IEC 61508 Functional Safety

Functional safety standards focus on the ability of the system to correctly perform its safety function, i.e., detect the hazard and apply automatic protection, and ensure under fault condition that the system fails in a predictable and safe manner. An accredited functional safety agency should conduct a functional safety certification to provide impartial assessment of the safety system's design and performance.

This safety standard defines four levels of safety integrity, with each level (1 to 4) providing a magnitude of risk reduction. The higher the safety integrity level, the lower the probability that the safety system will fail to carry out the required safety function.

Functional safety assesses both systematic failures resulting from inadequate design, processes, and procedures by the manufacturer, as well as random hardware failures like electronic component failure.



Systematic failures are assessed by conducting failure modes effects and diagnostic analysis and surveillance audits on the equipment manufacturer's internal processes and procedures. A safety integrity level (SIL) is awarded for systematic capability. The higher the rating for systematic capability, the less probability of systematic failures in design by the manufacturer.

Random hardware failures are assessed by proven in-use data and by conducting a failure mode effects and diagnostics analysis to assess hardware design and failure rates of electronic components. A safety integrity level is awarded, and the failure rates are published for each system component.

The publishing of failure rate data for each safety-critical component allows end users to specify systems based on safety integrity and risk reduction.

The entire safety system should be verified to ensure the necessary safety integrity level and targeted risk reduction has been met. Probability of failure on demand should be calculated using the failure rates of each system component and other factors, such as proof testing. System components assessed and certified to IEC 61508 validate the equipment manufacturer's declared level of safety, risk reduction, and reliability for their system—and provides a level of assurance to the user.

Specifying systems with IEC 61508 functional safety certification ensures compliance with the minimum requirements set out in EN13922:2020, requiring overfill sensors and control monitors must meet and, if possible, exceed safety integrity level 1.

CHALLENGES

Design and manufacture key components to meet SIL requirements that normally consist of one or more sensors, a logic controller, and a final control element:

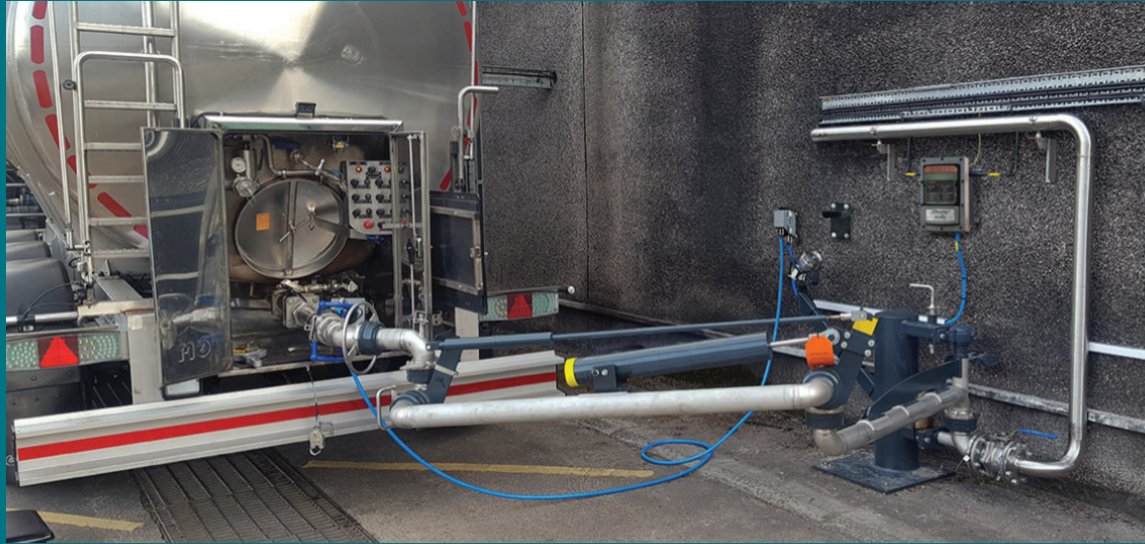
- The sensor detects the hazard, such as the level of liquid product in a tank truck compartment.
- The logic controller processes the signal from the sensor and decides what action to take.
- The control element—such as a loading pump, control valve, or preset meter—controls the flow of product into the tank truck compartment.

SOLUTIONS

The Scully system provides two safety-critical functions:

1. Detect liquid product filling beyond the safe fill level of the tank truck compartment to prevent loss of containment and resulting product spill.
2. Verify and monitor the static grounding connection to prevent the accumulation and uncontrolled discharge of static electricity in explosive atmospheres.





Scully overfill prevention sensors are mounted in each tank truck compartment through an aperture in the man lid assembly and are set at a predetermined safe level.

Static grounding connections are also made to the tank truck chassis to prevent the accumulation of static electricity during the loading process.

Each overfill sensor is wired to the socket at ground level and provides the connection interface to the Scully Intellitrol® control monitor on the loading gantry via a plug and cable assembly.

The Scully Intellitrol® automatically and continuously monitors each overfill prevention sensor and the static grounding connection during the loading process 30 times per second.

Scully has been assessing and certifying against IEC 61508 for several years. The Intellitrol®2 controller and its sensors are certified as SIL 2 capable devices and certain configurations of our ST-15 tank truck overfill system are certified as SIL 3 capable.

KEY BENEFITS

Under any unsafe condition, such as wet sensor condition, loss of grounding, or component failure within the critical electronic circuitry, the system will stop product flow and shutdown the loading process. This automatic protection prevents both potential spills that can impact the environment and financial liability, and the ignition of explosive atmospheres from the uncontrolled discharge of static electricity, thereby ensuring operations remain safe, efficient, and profitable.



IMPLEMENTATION

Scully employs a consultative approach and provides customized solutions to meet each terminal's unique needs and satisfy their requirements (e.g., loading capacity, regional certification requirements). This includes a site survey, equipment determination, project scope, and costs to deliver a turnkey proposal.

SUMMARY

Safety systems are vital in protecting people and the environment, ensuring operations are safe, efficient, and profitable. Equipment manufacturers and end users should strive to design, manufacture, and specify systems to the highest possible levels of safety and certification.

For more information on Intellitrol®2 and other Scully systems, visit www.scully.com or click below:

[Intellitrol®2 Webpage](#)

[Intellitrol®2 Datasheet](#)

[All Scully Product Resources](#)



Scully Signal Company has over 85 years of Overfill Prevention Systems and electronic liquid handling experience, providing the ultimate dependability, service, and safety.

Contact us today for support or questions about your terminal equipment, overfill prevention, grounding, and safety needs.

To learn more, visit: www.scully.com

For product information, call: 1-800-272-8559

Email Scully International Headquarters at: sales@scully.com

