Sensors, Actuators & Instrumentation Installations

INDUSTRIAL COMPLIANCE GUIDE | Factories, manufacturing facilities and process environments

01 Scope and responsibilities

QUEST Electrical designs, installs, integrates and commissions industrial sensors, actuators and instrumentation, including temperature, pressure, level, flow, proximity and photoelectric devices, PLC I/O connections and process-control interfaces. The applicable compliance duties depend on the equipment, process and extent of modification.

02 Principal UK legal duties

- **Health and Safety at Work etc. Act 1974:** employers and duty holders must manage risks to employees and others affected by work activities.
- **Electricity at Work Regulations 1989:** electrical systems must be constructed, maintained and worked on to prevent danger, so far as reasonably practicable.
- **Provision and Use of Work Equipment Regulations 1998 (PUWER):** work equipment must be suitable, maintained and used safely; controls and protective measures must be appropriate.
- **Management of Health and Safety at Work Regulations 1999:** assess risks, establish safe systems and provide competent personnel.

03 Standards and engineering references

- **BS 7671:** applies to relevant electrical installation work, including power supplies and fixed wiring for field devices.
- **BS EN 60204-1:** relevant to electrical equipment of machinery and machine-control interfaces.
- **BS EN IEC 61439 series:** may apply to associated low-voltage assemblies, depending on panel design and scope.
- **BS EN ISO 13849-1 / BS EN IEC 62061:** relevant where instrumentation participates in safety-related control functions; select according to the machinery risk assessment.

Standards are applied according to the specific installation. Listing a standard does not mean every sensor or actuator requires certification to it.

Design, Installation & Integration

04 Risk assessment and specification

- Identify process hazards, machine movements, pressure/temperature exposure, environmental conditions and foreseeable failures.
- Select devices with appropriate measurement range, accuracy, response, materials, ingress protection and operating-temperature ratings.
- Check supply voltage, current demand, protection, cable routing, segregation and electromagnetic compatibility (EMC).
- For hazardous areas, obtain the DSEAR assessment and hazardous-area classification before selecting or installing equipment; use suitable Ex-rated equipment and competent personnel where required.

05 Instrumentation wiring and control interfaces

- Use suitable signal and power cables, screening/earthing arrangements, termination methods and mechanical protection for the environment.
- Verify analogue signal types (such as 4–20 mA or 0–10 V), digital I/O, polarity, scaling, communications and PLC/HMI mapping.
- Consider cable separation, noise sources, VFDs, grounding and interference when designing signal routes.
- Confirm actuator fail positions, power-loss behaviour and process response with the client and machinery designer.

06 Machinery safety and modifications

Emergency shutdowns, guard interlocks and other protective functions must be designed and validated as safety functions where the risk assessment requires them. A standard PLC input or ordinary process sensor should not be assumed to provide a safety-rated function. Modifications that substantially change machinery may trigger additional conformity-assessment responsibilities; the scope should be reviewed before work begins.

07 Installation in operating facilities

- Plan isolations, permits, access and commissioning windows with the site maintenance and production teams.
- Use safe isolation and lock-off procedures before electrical work; manage stored mechanical, pneumatic and hydraulic energy.
- Protect personnel from moving machinery, hot surfaces, pressurised systems and unintended start-up during testing.
- Document changes to panels, wiring, terminal numbering, PLC I/O and machine interfaces.

Verification, Records & Handover

08 Testing and commissioning

- Inspect installation quality, identification, cable support, earthing, enclosure integrity and suitability of installed devices.
- Complete applicable electrical inspection and testing and issue appropriate BS 7671 certification where required by the work.
- Check sensor ranges, analogue scaling, digital states, alarms, setpoints, actuator direction and fail-safe responses.
- Verify PLC/HMI/SCADA communications and perform documented functional tests against agreed acceptance criteria.
- Where safety-related functions are involved, carry out appropriate verification and validation against the risk assessment and safety requirements.

09 Documentation and ongoing maintenance

- Provide updated drawings, I/O schedules, instrument lists, calibration information where applicable, test records and commissioning results.
- Record defects, deviations, outstanding actions and responsibilities before handover.
- Set inspection, calibration and maintenance intervals based on process criticality, operating environment, manufacturer guidance and experience.
- Control future software and wiring changes through documented change management and backup procedures.

10 Industrial instrumentation compliance checklist

- Risk assessment and operating environment reviewed
- Equipment ratings and hazardous-area requirements confirmed
- Electrical installation and machinery interfaces assessed
- Signal wiring, protection, identification and EMC considered
- Safety functions separately assessed and validated where applicable
- Testing, functional verification and handover records completed

How QUEST Electrical can assist

QUEST Electrical supports industrial sensor and actuator installations, instrumentation wiring, PLC input/output integration, control-panel modifications, fault finding, testing and commissioning. Work can be coordinated around operational manufacturing facilities to minimise disruption.

Important: This guide provides general information only. Project-specific legislation, conformity obligations, equipment instructions and site risk assessments take precedence.