

DEP SPECIFICATION

INSPECTION AND FUNCTIONAL TESTING OF INSTRUMENTS

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DESIGN AND ENGINEERING PRACTICE

DEM1



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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for inspection and testing of instruments and systems. This DEP applies to new and modified instruments and systems, before and after installation. It also covers requirements for storage and hydrotesting of instrumentation systems in the field. It defines activities and requirements to confirm that instrumentation conforms to the Principal's requirements and is installed and functioning according to the approved engineering/construction drawings and data.

This DEP also addresses the development of a Quality Plan for instrumentation.

The following stages of activities are covered in this DEP:

- Factory Acceptance Test (FAT) and Site Acceptance Test (SAT);
- pre-installation inspection;
- post-installation inspection;
- pre-loop check;
- loop check;
- full function testing;
- hydrotest and line flushing support activities;
- process tubing leak test;
- pre-start-up activities.

This DEP contains mandatory requirements to mitigate process safety risks in accordance with Design Engineering Manual (DEM) 1 - Application of Technical Standards.

This is a revision of the DEP of the same number dated February 2018; see (1.5) regarding the changes.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

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This DEP is intended for use in facilities related to oil and gas production, gas handling, oil refining, chemical processing, gasification, distribution and supply/marketing. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process shall be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases, the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The capitalised term **SHALL [PS]** indicates a process safety requirement.

The word **should** indicates a recommendation.

The word **may** indicates a permitted option.

1.3.2 Specific definitions

Term	Definition
Calibration	Adjustment of an instrument's ZERO and SPAN by observing the changes in its output caused by manual changes to its input. Both the input and output signals are monitored with test equipment that is more accurate than the instrument being calibrated. Calibration also includes setting switch set points by using test equipment.
Calibration Check	Testing of an instrument's calibration during the pre-loop and loop check processes. This is done with test equipment monitoring the instrument's inputs and outputs.
Commissioning, Foundation Fieldbus	Putting into service the Foundation Fieldbus devices, and downloading the offline configuration to these devices. Electronically, the device is placed into service, and could still require operational activation as part of the Process Commissioning and Startup.
Configuration	Manual or bulk entry of engineered parameters or programs into a microprocessor-based device (e.g., Foundation Fieldbus device).
Configuration Download	Data transfer of engineered parameters or programs from an electronic file into a microprocessor-based device (e.g., Configuring a Foundation Fieldbus or HART device from a portable PC or DCS Data Management System).
Equipment Package	Single or combined units of equipment supplied by a Supplier which include instrumentation or to which instrument requirements could apply.
Factory Acceptance Test (FAT)	A set of predefined test procedures conducted at the Manufacturer/Supplier's works after the system has been assembled, and before the system is shipped to Principal's site. The FAT is when the system is demonstrated to meet the functional, integrity and performance requirements. It is not the tests that the Manufacturer/Supplier is expected to carry out prior to the visit by the Principal for the FAT.

Term	Definition
Field Inspection	Verifying that field instruments are installed and configured according to the Principal's requirements.
Fieldbus™	Digital, two-way, multi-drop communication link among intelligent measurement and control devices. It serves as a local area network (LAN) for advanced process control, remote input/output and high speed factory automation applications.
Fire and Gas System	The fire and gas system includes the following components: • Detectors (fire, smoke, flammable and toxic gas, acoustic leak); • A logic solver; • Panel(s); • Human Machine Interface in a manned control centre, and where appropriate a second HMI at mustering point (where mustering point is in different location) or Emergency Response Centre if separate from control centre; • Direct outputs, such as fire suppressants, audible and visible alarms; • Interfaces to other systems, e.g., SIS, DCS; • FGS Engineering Station.
Function Test	Simulation of the transmitter process variable input to demonstrate the operation of the loop. Control valves are function tested in a similar manner by manually moving the appropriate controller output and observing the actual valve position. A function test is not a calibration check.
HART®	The Highway Addressable Remote Transducer Protocol (HART) is a digital industrial automation protocol and is considered a de-facto standard for digital communications with 4-20 mA smart process instrumentation.
Human Machine Interface (HMI)	The combination of software and hardware elements that determine the nature of human interactions with equipment and people in the workplace span of control through command inputs and data outputs. The HMI includes both visual and audio interfaces.
Inputs and Outputs (I/O)	Inputs and Outputs to a system (e.g., package control system or integrated control system). Typical I/O types include 4–20 mA analog input/output, 24 VDC discrete input/output, and are to/from field instrumentation or other systems.
Inspection of Instruments	Verification that instruments and instrument systems comply with requirements.
Instrument Asset Management System (IAMS)	DCS-based asset management system that facilitates configuration, diagnostics and troubleshooting on Smart field devices.