

DEP SPECIFICATION

INSTALLATION OF ON-LINE INSTRUMENTS

DEP 32.37.10.11-Gen.

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DESIGN AND ENGINEERING PRACTICE



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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the installation of on-line instruments.

This DEP is a revision of the DEP of the same number, dated September 2012; see (1.5) regarding the changes.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorisation to any documents, data or information to which the DEPs may refer.

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 word **should** indicates a recommendation.

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

1.3.2 Specific definitions

Term	Definition
Direct Mounting	A mounting concept, whereby an on-line instrument (with or without manifold) is mounted directly on and supported by the process connection(s). NOTE: This mounting concept is sometimes referred to as 'close coupled'. This term is, however, also used in the literal sense for instruments mounted on a separate stand in the direct vicinity of the process connection(s). To avoid confusion, the term 'close coupled' is no longer used in this DEP.
Electrical Engineering	Term used in this DEP to identify activities or devices/components which are considered outside the responsibility of the typical Instrument Engineering discipline serving a project. It is not intended to preclude a particular project from reassigning responsibilities, but primarily to identify areas which may otherwise be overlooked.
Impulse Line(s)	Components used to connect an on-line instrument to its process connection. It includes but is not limited to tubing, fittings and manifold blocks plus components for filling, flushing, sealing, purging, heating, insulation, venting, draining, mounting and supporting.
Mechanical Engineering	Term used in various parts of this DEP to identify activities or devices/components that are considered outside the responsibility of the typical Instrument Engineering discipline serving a project. It is not intended to preclude a particular project from reassigning responsibilities, but primarily to identify areas that may otherwise be overlooked.
On-Line Instrument	Instruments connected to process and utility lines or equipment via small [maximum DN 50 (NPS 2)] block valves. They are subjected to the pressures of the piping systems or equipment on which they are installed. The block valves are referred to as primary isolation valves in the context of this DEP. Instruments with diaphragm seals are also considered to be on-line instruments, if they are connected to process and utility lines or equipment via primary isolation valves of any size.
Remote Mounting	A modular mounting concept, whereby an on-line instrument (with or without manifold) is installed on a dedicated instrument mounting support and connected with the process connection via tubing, capillary or pipe.
Very Toxic	See definition in DEP 00.00.01.30-Gen.

1.3.3 Abbreviations

Term	Definition
HF	Hydrofluoric Acid
IPF	Instrument Protective Function, now known as SIF (Safety Instrumented Function)
LRV	Lower Range Value; the lowest quantity that a device is adjusted to measure
MTBF	Mean Time Between Failure
MVC	Measurement, Validation and Comparison
NPT	Nominal Pipe Thread
SCE	Safety Critical Element
SS	Stainless Steel
TCoO	Total Cost of Ownership
UNS	Unified Numbering System
URV	Upper Range Value; the highest quantity that a device is adjusted to measure

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section number is shown in brackets (). Other documents referenced by this DEP are listed in (8).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a revision of the DEP of the same number, September 2012. The following are the main, non-editorial changes.

Section/Clause	Change
2.1	Restructured requirements, moved requirement from 2.2.1 and removed duplicate text
2.2.2	Restructured requirements to clarify. Changed title of section. Removed duplicate text.
2.2.3	Restructured requirements and identified non-normative text.
2.3	Restructured requirements and identified non-normative text.
3.1	Restructured requirements, identified non-normative text and removed redundant text.
3.3	Restructured requirement.
4.1	Retitled section. Restructured requirements. Identified non-normative text.
4.2.1	Restructured requirements. Identified non-normative text.
4.2.2	Clarified the use of should and shall. Restructured requirements. Identified non-normative text.
4.3	Moved section away from previous section. Restructured requirements.
4.4	Restructured requirements.
4.5	Restructured requirements and identified non-normative text.
4.6	Restructured requirements.
5.1	Restructured requirements and clarified non-normative text.
5.2	Restructured requirements
5.3	Identified non-normative text.
5.4	Restructured requirements and identified non-normative text.
5.5	Restructured requirements
5.6	Restructured requirements.
5.7	Restructured requirements.
5.8	Identified non-normative text and removed redundant text.
5.9	Restructured requirements
5.10	Restructured requirements and added non-normative text.
5.11	Restructured requirements.
6.1	Restructured requirements.
6.2.2	Restructured requirements.
6.3.2.2	Restructured requirements.
6.4	Restructured requirements.

Section/Clause	Change
6.5	Restructured requirements.
6.5.2	Deleted section
7.1	Restructured requirement
7.2	Restructured requirements.
7.3	Restructured requirements
7.4	Restructured requirement.

1.6 COMMENTS ON THIS DEP

Comments on this DEP may be submitted to the Administrator using one of the following options:

Shell DEPs Online (Users with access to Shell DEPs Online)	Enter the Shell DEPs Online system at https://www.shelldeps.com Select a DEP and then go to the details screen for that DEP. Click on the "Give feedback" link, fill in the online form and submit.
DEP Feedback System (Users with access to Shell Wide Web)	Enter comments directly in the DEP Feedback System which is accessible from the Technical Standards Portal http://swwww.shell.com/standards . Select "Submit DEP Feedback", fill in the online form and submit.
DEP Standard Form (other users)	Use DEP Standard Form 00.00.05.80-Gen. to record feedback and email the form to the Administrator at standards@shell.com .

Feedback that has been registered in the DEP Feedback System by using one of the above options will be reviewed by the DEP Custodian for potential improvements to the DEP.

1.7 DUAL UNITS

This DEP contains both the International System (SI) units, as well as the corresponding US Customary (USC) units, which are given following the SI units in brackets. When agreed by the Principal, the indicated USC values/units may be used.

1.8 NON NORMATIVE TEXT (COMMENTARY)

Text shown in italic style in this DEP indicates text that is non-normative and is provided as explanation or background information only.

Non-normative text is normally indented slightly to the right of the relevant DEP clause.

2. GENERAL

2.1 INTRODUCTION

1. This DEP should be used in conjunction with DEP 32.31.00.32-Gen.

The best hook-up arrangement for each on-line instrument is determined on the basis of the specifications given in (4) and (5) and the additional requirements of (6) and (7) on sealing, purging, heating and insulation.

2. The hook- up arrangement shall be selected based on normal and abnormal process operating and climatic condition.
3. Selection of the hookup concept shall be made in define phase of project.
4. Instrument sealing and purging shall only be used if alternative hook-ups arrangements are less attractive from a TCoO, measurement accuracy or maintenance point of view.
5. To obtain acceptable response times, the kinematic viscosity of liquids in impulse lines shall be kept below 200 cSt under all normal and abnormal conditions for remote mounted instruments.
Instruments installed with remote seals and capillary type filled lines are not subject to this requirement due to the response of the instrument and sealed fluid being acceptable (as designed and recommended by the instrument Manufacturer).
6. In locations where freezing may occur, the water-filled parts of sensing lines and the instrument shall be winterised (i.e., heated and insulated), see (7).
7. Metric tubing (minimum 10 mm OD) and compression fittings should be used for new projects.
8. The application of US Customary sized tubing (1/2 in OD for USA and 3/8 in for Canada) and related compression fittings shall be restricted to locations that have standardised on US Customary sizes,.
9. Compression fittings shall comply with all of the following:
 - a. all compression fittings in new projects, including those supplied with equipment packages, of the same size, make and type.
10. Requirements for the size, make and type will be provided by the Principal.
 - a. the fittings and tubing installed by skilled personnel, strictly in accordance with the Manufacturer's instructions;
 - b. the impulse lines pressure tested after installation, see (4.5).

For impulse lines for sample take-off and transport for on-line process stream analysis refer to DEP 32.31.50.10-Gen.

2.2 DESIGN CONCEPTS

This DEP covers the requirements for two distinct design concepts:

- *Remote mounting concept, as example given in Figure 1.*
- *Direct mounting concept, as example given in Figure 2.*

Figure 1 Example of remote mounting concept

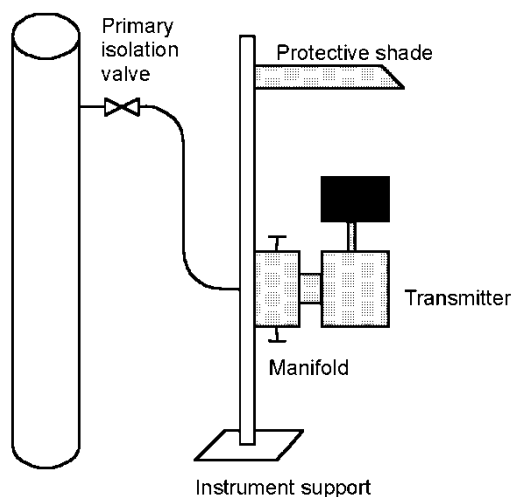
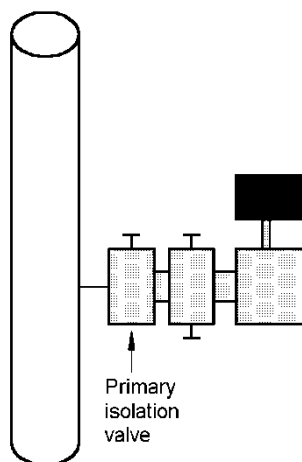


Figure 2 Example of direct mounting concept



2.2.1 Remote mounting concept

The process is connected to the manifold and instrument through tubing with compression fittings. Maintenance requirements have dominated the design of the remote mounting concept. The concept is based on a need for permanent access and includes facilities for in situ testing and calibration.

Typical hook-up arrangements with MESC-coded component listings are available for liquid, gas and steam applications as given in Standard Drawings S 37.001.

2.2.2 Direct and close mounting concept

2.2.2.1 General

1. In the direct mounting concept, the on-line instrument and its manifold are mounted directly on and supported by the process connection(s).
2. Piping DEPs shall be followed for direct mounting of instruments.5

2.2.2.2 Close mount concept

1. Close mount concept utilises an instrument stand that is attached to the process pipe with short run of tubing to the transmitter (typically less than 1 m (3 ft)).
Close mount installation has the advantages of the direct mounting installation (e.g., low cost, short impulse lines, reduced plugging, ability to rod out, minimal issues with filling the seal leg, reduced cost of tracing) without the issues of the direct mounting design.
2. Close mount installation shall only be used where pipe specification allow mounting an instrument stand on the piping and the access to the instrument meets the "limited accessibility" criteria in DEP 32.31.00.32-Gen. Appendix C.
3. If the pipe is insulated, then the design shall incorporate an "over the insulation design" or mount the transmitter remotely.
It is not acceptable to break the barrier of the insulation due to corrosion under insulation (CUI).
4. Where piping has been determined to be critical by corrosion engineering, instrument stands shall not be placed on uninsulated critical pipe.

2.2.3 Comparison of design concepts

2.2.3.1 General

2.2.3.2 Accessibility

For maintenance purposes, permanent and easy access used to be the dominant factor in selecting the physical location of remote mounted instruments. Long impulse lines and additional ladders/platforms were the result.

The location of a direct mounted instrument is fully determined by the physical location of the process connection, which typically provides limited freedom for positioning.

Major improvements in MTBF, MVC techniques and remote diagnostics via 'intelligent' communication (e.g., Smart Instrumentation connection to an Instrument Asset Management System (IAMS) have drastically reduced the need for on-the-spot maintenance of modern field instruments.

Minimum accessibility requirements are specified in DEP 32.31.00.32-Gen.

2.2.3.3 Performance and maintenance aspects

The compactness of the direct mounting concept brings the sensor closer to the process which improves the measurement accuracy and makes the measurement less susceptible to the improper functioning of heating and insulation. Shorter runs and fewer fittings reduce vulnerability to damage and leaks.