

DEP SPECIFICATION

INSTRUMENTS FOR MEASUREMENT AND CONTROL

DEP 32.31.00.32-Gen.

February 2019

DESIGN AND ENGINEERING PRACTICE



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The information set forth in these publications is provided to Shell companies for their consideration and decision to implement. This is of particular importance where DEPs may not cover every requirement or diversity of condition at each locality. The system of DEPs is expected to be sufficiently flexible to allow individual Operating Units to adapt the information set forth in DEPs to their own environment and requirements.

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All administrative queries should be directed to the DEP Administrator in Shell GSI.

TABLE OF CONTENTS

1.	INTRODUCTION	5
1.1	SCOPE	5
1.2	DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS	5
1.3	DEFINITIONS	5
1.4	CROSS-REFERENCES	7
1.5	SUMMARY OF MAIN CHANGES.....	7
1.6	COMMENTS ON THIS DEP	7
1.7	DUAL UNITS.....	8
1.8	NON NORMATIVE TEXT (COMMENTARY).....	8
2.	GENERAL REQUIREMENTS	9
2.1	SELECTION OF INSTRUMENTS	9
2.2	UNITS OF MEASUREMENT	11
2.3	INSTRUMENT NAMEPLATES AND WARNING PLATES	11
2.4	INTEGRAL AND RECEIVING INDICATORS	12
2.5	LOCATION AND ACCESSIBILITY	12
2.6	PROTECTIVE SHADES	12
2.7	LOCAL PANELS AND CUBICLES	12
3.	MECHANICAL AND MATERIAL REQUIREMENTS	13
3.1	PRESSURE AND TEMPERATURE LIMITS OF PRESSURE-CONTAINING PARTS	13
3.2	SELECTION OF MATERIALS OF WETTED PARTS.....	13
3.3	INSPECTION AND CERTIFICATION.....	14
3.4	INSTRUMENT PROCESS CONNECTIONS	14
4.	INSTRUMENT PERFORMANCE SPECIFICATION	14
4.1	UNCERTAINTY	14
4.2	ELECTROMAGNETIC COMPATIBILITY (EMC)	16
5.	INSTRUMENT FUNCTIONAL SPECIFICATION.....	16
5.1	RANGE AND SPAN OF ANALOG INSTRUMENTS	16
5.2	SIGNAL TRANSMISSION AND POWER SUPPLY.....	17
5.3	DIAGNOSTICS	18
5.4	ELECTRICAL SAFETY IN POTENTIALLY EXPLOSIVE ATMOSPHERES	18
6.	INSTRUMENT PHYSICAL SPECIFICATION	20
6.1	AMBIENT CONDITIONS	20
6.2	CORROSION CONSIDERATIONS	20
6.3	INGRESS PROTECTION	20
7.	FLOW INSTRUMENTS	21
7.1	SELECTION.....	21
7.2	DIFFERENTIAL PRESSURE FLOW METERS.....	21
8.	LEVEL INSTRUMENTS	22
8.1	INSTRUMENT CONNECTIONS.....	22
8.2	SELECTION.....	22
8.3	POINT LEVEL.....	23
9.	PRESSURE INSTRUMENTS	23
10.	TEMPERATURE INSTRUMENTS	24
10.1	GENERAL	24
10.2	THERMOWELLS	24
10.3	RESISTANCE ELEMENTS	24
10.4	THERMOCOUPLES	24
10.5	TEMPERATURE TRANSMITTERS.....	24
11.	MACHINE MONITORING.....	25
12.	FLAME DETECTION.....	25

13. REFERENCES 26

1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the selection and specification of instruments used for measurement and control both in downstream facilities (e.g., refineries, chemical plants, gas plants) and exploration and production facilities.

The intended audience of this document are Shell staff, contractors, system integrators and Manufacturer/Suppliers of instruments and instrument systems.

This DEP does not cover all possible types of instruments and measuring principles. It is intended to cover the most commonly used types only.

Control valves and accessories such as positioners, solenoid valves and limit switches are covered in DEP 32.36.01.17-Gen.

Fire, gas and smoke detection systems are covered in DEP 32.30.20.11-Gen.

Custody transfer is covered in DEP 32.32.00.11-Gen.

This is a revision of the DEP of the same number dated February 2018; see (1.5) regarding the main 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 authorization 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** indicate a requirement.

The word **should** indicate a recommendation.

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

1.3.2 Specific Definitions

Term	Definition
Adjusted span	Algebraic difference between the Lower Range Value and the Upper Range Value (what the instrument is adjusted to measure). It is a value.
In-line instruments	All instruments and components that are directly mounted in process and utility lines or equipment and are subject to the pressures and temperatures of the host system (e.g. coriolis and vortex flow meters, primary elements of differential pressure flow meters). This definition includes instruments that are connected to equipment or piping systems without a primary isolation valve (e.g., extended diaphragm seals).
Marine Environment	Oceans, seas, bays, estuaries, and other major water bodies including the land up to one kilometre of the mean high water mark.
Measuring range	Range defined by LRL and URL within which the limits of uncertainty of the measuring instrument are specified (the capability of the instrument).
Modbus	Industrial networking system that uses serial master-slave communication links. Modbus is the most common protocol in the Process Control Domain (PCD) to interface between systems. Almost all (legacy) systems are provided with Modbus interface cards.
Off-line instruments	All instruments and components that are not in direct contact with any process medium or that are not connected to any process/utility line or equipment (e.g. thermocouples and RTDs in a thermowell, clamp-on ultrasonic flow meters, nucleonic level measurements and local receiving indicators)
On-Line Instruments	Instruments connected to process and utility lines or equipment via primary isolation valves. They are subjected to the pressures of the piping systems or equipment on which they are installed. Instruments with diaphragm seals are considered to be on-line instruments if they are connected to process and utility lines or equipment via primary isolation valves of any size. Examples are pressure transmitters, pressure gauges, level measurements using a measuring chamber, instrument impulse line components and analyser sampling systems.
Piping class	Assembly of piping components, suitable for a defined service and design limits, in a piping system. Piping classes for refining and chemicals and piping classes for exploration and production are contained in DEP 31.38.01.14-Gen.
Uncertainty class	Code used to identify the type of application of a measuring instrument which determines the required uncertainty limit.

1.3.3 Abbreviations

Term	Definition
BPCS	Basic Process Control System

Term	Definition
EMC	Electromagnetic Compatibility
FGS	Fire, Gas and Smoke detection system
GWR	Guided Wave Radar
HART	Highway Addressable Remote Transducer
IPF	Instrumented Protective Function, now known as SIF (Safety Instrumented Function)
LRL	Lower Range Limit
LRV	Lower Range Value
SIF	Safety Instrumented Function
SIS	Safety Instrumented System
PAS	Process Automation System (consisting of BPCS, SIS and FGS)
PEFS	Process Engineering Flow Scheme
PLC	Programmable Logic Controller
URL	Upper Range Limit
URV	Upper Range Value

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section or clause number is shown in brackets (). Other documents referenced by this DEP are listed in (13).

1.5 SUMMARY OF MAIN CHANGES

This is a revision of the DEP of the same number dated February 2018. This is an administrative update only to correct references to DEPs that have been involved in either a merge or a split.

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.
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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 REQUIREMENTS

2.1 SELECTION OF INSTRUMENTS

2.1.1 General

1. The selection process for instruments shall be documented in the project specification for future reference.

The selection of an instrument for a specific application is an iterative process, carried out as a joint effort of process and instrument engineers, with input where necessary from materials engineers, rotating equipment engineers and heat transfer engineers.

2.1.2 Required information

2.1.2.1 General

1. Information required for instrument selection shall be entered on instrument data sheets with sections describing general application data, process data and instrument details.

2.1.2.2 Application

1. Application data shall include at least the following:
Additional information could be necessary, depending on the type of instrument and service.
 - a. purpose of the instrument (i.e., intended use);
 - b. fluid description;
 - c. fluid phases;
 - d. operating pressure and temperature: minimum, normal and maximum;
 - e. density and viscosity at operating pressure and temperature;
 - f. expected conditions under normal as well as alternative operating modes and abnormal operating conditions (e.g., start-up, commissioning, regeneration, and emergency);
 - g. specific application aspects (e.g., possible bi-directional or pulsating flow, continuous/batch operation, vibration, pressure surges and hydraulic noise);
 - h. required uncertainty class as described in (4.1).
2. Flow measurement; additional application data shall include:
 - a. flow rate: minimum (turndown), normal and maximum;
 - b. vapour pressure;
 - c. orientation of the line (horizontal or vertical).
3. Temperature measurement additional application data shall include the following:
 - a. Maximum flow rate (for thermowell wake frequency).

2.1.2.3 Service conditions

1. Service condition data shall include at least the following:
Additional information could be necessary, depending on the type of instrument.
 - a. design pressure and min/max temperatures as specified in (3.1);
 - b. corrosiveness, erosiveness, toxicity.
2. The following service condition data should be considered depending on the type of instrument and service: