

GENERAL SPECIFICATION

INSTRUMENTATION

GS EP INS 141

Analysers

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1. Scope

This specification defines the minimum requirements for the design, manufacture, and execution of analysers and process sampling systems for onshore and offshore oil & gas installation.

This specification does not address the requirements of laboratory analysers or portable analysers dedicated to safety or environmental surveys.

2. Reference Documents

The equipment shall satisfy the requirements and regulations of the country of installation and specific standards referred to in this specification.

Where national regulations exist, their provisions and those of the standards and codes to which they refer shall apply, supplementing or amending the provisions of this document.

The reference document listed below form an integral part of this General Specification.

External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the effective date of this document.

Reference	Title
ASTM D3230	Standard Test method for Salts in Crude Oil (Electrometric Method)
Directive 94/9/EC	European Directive 94/9/EC (23/03/94) on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres
EEMUA Pub. 138	Design and Installation of on-line analyser systems
IEC 61285	Industrial Process Control - Safety of Analyser Houses
IECEX	IEC System for Certification to Standards relating to Equipment for use in Explosive Atmospheres (IECEX System)
ISA-RP76.0.01	Analyser System Inspection and Maintenance

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Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published in the applicable yearly collection.

Reference	Title
GS EP COR 350	External protection of offshore and costal structures and equipment by painting
GS EP COR 351	External protection of structures and equipment by painting. Floating structures
GS EP COR 354	External protection of onshore structures and equipment by painting
GS EP ELE 011	Electrical requirements for packaged units
GS EP ELE 081	Lighting
GS EP ELE 161	Electrical cables
GS EP INS 101	Instrumentation Design
GS EP INS 102	Instrumentation Identification
GS EP INS 106	Instrument Installation
GS EP INS 109	Instrument cabinets
GS EP INS 110	Instrumentation for package units
GS EP INS 114	Instrument Tubing and Fittings
GS EP INS 115	Instrument Earthing
GS EP INS 116	Instrument Cables
GS EP INS 135	Cyber Security requirements for design and supply of ICSS and Package Systems
GS EP INS 143	Fire and Gas Detectors and Associated Detection Systems
GS EP PVV 112	Piping material classes
GS EP SAF 228	Liquid drainage
GS EP SAF 312	Fire and Gas detection systems

3. Terminology and Definitions

There are five types of statements in this specification, the “shall”, “should”, “may”, “can” and must” statements. They are to be understood as follows:

Shall Is to be understood as mandatory. Deviating from a “shall” statement requires derogation approved by Company.

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Should	Is to be understood as strongly recommended to comply with the requirements of the specification. Alternatives shall provide a similar level of protection and this shall be documented.
May	Is to be understood as permission.
Can	Is to be understood as a physical possibility.
Must	Expresses a regulatory obligation.
Company	TOTAL E&P or any TOTAL E&P subsidiary.
Contractor	Any Party that has signed a Contract with Company for the Engineering, Procurement, Construction, and Installation in part(s) or in full of a project.
Vendor	The package Vendor sub-contracted by the Contractor or by Company.
Supplier	The Party that manufactures or supplies equipment, either individually or as a packaged unit for the project.

3.1 Definitions

The following definitions apply:

Analyser House	A building with a specific closed room containing one or more analysers connected to process installation, together with associated auxiliary devices. Either natural or forced ventilation is used. Maintenance of the analysers is carried out from within the house.
Analyser Cabinet	A small simple housing in which analysers are installed singly or grouped together and with its associated sampling system. Maintenance is made from outside the cabinet.
Analyser Transmitter	Analyser installed in the field as would be a simple instrument in an isolated case. Generally the case of simple analyser types (Ph-meter, conductivity meter...). The enclosure can be thermally controlled to protect the analyser from environmental conditions.
On line Analysis	An analysis that is completely in-line or in direct contact with the process without requiring the extraction and transport of a process sample.
Sample Probe	A device installed at sample take-off, which purpose is to extract a small portion of sample from the process material.
Sample Take-off	Region where samples are removed from a process stream and either enters the sampling system or is manually collected.
Sample Transport	A system used to transport a sample from the sample point to the analyser.
Secondary Transport	A circulating loop that is applied to reduce the time lag caused by components such as filters, coalescers, etc.

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3.2 Abbreviations

The following terms and abbreviations are used in this document.

ADAS	Analyser Data Acquisition System
CCR	Central Control Room
ESD	Emergency Shut Down
FAT	Factory Acceptance Test
FGS	Fire and Gas System
FID	Flame Ionisation Detector
FPD	Flame Photometer Detector
GRP	Glass Reinforced Polyester
HVAC	Heating, Ventilation and Air-Conditioning
ITR	Instrument Technical Room
PCS	Process Control System
PGC	Process Gas Chromatograph
PLC	Programmable Logic Controller
PSS	Process Safety System
SAT	Site Acceptance Test
SCS	Sample Conditioning System
SIL	Safety Integrity Level
SPCS	Sample Pre-Conditioning System
UCP	Unit Control panel
UPS	Uninterruptible Power Supply

4. General Requirements

An on-line process analyser system is defined as a set of equipment enabling the physicochemical properties or composition of a product in a process to be measured on-line.

An analyser system generally comprises of:

- The analyser system integration:
 - Enclosure (case, cabinet, housing...)
 - Supply and distribution of utilities
 - Cabling, junction box, interface with ICSS and other systems
 - Safety protective functions (ESD, FGS...)
 - Ventilation (if any), heating, air-conditioning (if any).

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- The sampling system:
 - Sampling and recycle system on the process
 - System for sample transport
 - Sample conditioning system
 - Effluent collection, recycle, disposal system
 - Calibration, verification, validation, testing system for monitoring analytic results
 - Sample taking for laboratory analyses
 - System for utilities
 - Any cleaning apparatus
 - Any analysis work cell shut-off, blow-down device.
- The analyser itself, sensor and associated signal treatment.

Analyser shall be either installed in an analyser house, a cabinet or standalone (transmitter type analyser).

An analyser system can consist of one or several analysers. Throughout this document, the term « analyser » is used for one or several analysers.

4.1 Environmental Conditions

The equipment shall be suitably designed for permanent operation under the prevailing environmental conditions of the installation location. In addition the storage and installation conditions at a yard fabrication site shall be taken into account.

4.2 Hazardous Area Protection

All equipment must comply with the requirements of the specific hazardous area where they are installed.

Analysers shall comply with the requirements of **GS EP INS 101** and so ATEX European Directive 94/9/EC / IECEx standards shall be followed.

Preferred protection methods are Ex d, Ex e, Ex de, Ex i, Ex m, Ex me according to IEC standards.

Use of the protection methods Ex p and Ex n shall be limited to specific applications and subject to a case by case study and prior Company approval.

Analysers and their associated instruments shall be zone 1 certified. When this is technically not feasible they shall be zone 2 certified, installed outside zone 1 hazardous area, and electrically isolated upon gas detection.

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4.2.1 Analyser Houses

For Analyser and associated equipment installed in Analyser House, the area classification is determined by:

- Location of Analyser House: if it is located in a hazardous area, it must be classified accordingly.
- The products analysed or used inside the analyser house. If flammable products are analysed or used inside an analyser house, then the hazardous area classification shall be impacted. The amount of flammable material entering the analyser house shall be restricted to a minimum (sample flow and carrier gas flow required by the analysers).

4.3 Analyser System Common Instrument Requirements

All analyser systems - the analyser and its associated instruments shall be in accordance with **GS EP INS 101**.

Analysers shall be 4-20 mA, 24 VDC, with HART protocol wherever available. Where more data is required to be transmitted then serial links may be used from the analyser to PCS or UCP. This serial link shall comply with the requirements of **GS EP INS 110** for P3 packages.

Any analyser or associated instrument which is part of a safety instrumented function shall be certified suitable for SIL2 applications.

4.3.1 Cables

Signal and power cables shall be adequately separated to ensure integrity and prevent any form of interference. Instrumentation of analyser cables shall follow segregation principles as per **GS EP INS 101**.

Analyser signal cables shall comply with **GS EP INS 116**, whereas electrical cables shall comply with **GS EP ELE 161**.

4.3.2 Earthing

All analysers and associated equipment shall be grounded to protect personnel and equipment against electrical discharge as per **GS EP INS 115**.

4.3.3 Analyser Standardisation

Analyser standardisation requirements shall be addressed during Basic Engineering and shall take into consideration the project contractual strategy (i.e. different EPC contractors).

This will be considered for the whole plant, including package units, i.e. same technology, supplier and model for the same use.

Analysers shall only be from approved vendors.

4.4 Painting and Corrosion Protection

Where whole or parts of analysers and analyser equipment are required to be painted or coated, it shall comply as applicable, with the requirements of **GS EP COR 350**, **GS EP COR 351** and **GS EP COR 354**.

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Special care shall be taken to protect sensitive surfaces, analyser labels against sand blasting and paint during all painting operation.

4.5 Utilities

4.5.1 Instrument Air and Gases

Instrument air for analysers and analyser houses shall be provided by the plant instrument air system at a single connection point for each equipment.

Any requirement for vector gas, used for diverse applications, shall be detailed by analyser vendor including quality requirements and consumption.

4.5.2 Electrical

Analyser transmitters shall be powered from package UCP or ICSS 24 VDC.

When required for analyser cabinets or houses, the following supplies shall also be available in accordance with **GS EP ELE 011**.

- 230 VAC UPS (1phase with neutral; floating). It shall be used for analysers and devices of which power supply shut down can jeopardise analyser operation (i.e., local PLC, fiscal metering elements, vaporisation, etc.)
- 400/230 VAC (3 phases with neutral) (e.g. electrical tracing, lighting...)
- 400 VAC for motors with power consumption above 0.37 kWatts (e.g. for motors...)
- 400 VAC for Analyser House HVAC (one feeder for each HVAC).

Each feeder shall have one isolation switch (with phase and neutral disconnection) installed on the external face of the house or cabinet.

4.6 Specific Requirements for Marine Classification

For floaters (FSO, FPSO, FPU) used for the production of oil and gas offshore, analysers which are subject to marine classification - typically within the hull - shall be type approved by the project selected Classification Society.

Factory Acceptance Test of these analyser systems shall be witnessed by the project selected Classification Society.

5. Analyser System Integration

In order to ensure the correct operation of analyser systems the design has to take into account the overall integration of the analyser with its associated equipment. The design shall address the overall integration of analysers and analyser systems and address, as a minimum:

- Thermal fluctuations (day / night / summer / winter)
- Location of equipment in hazardous area.

Analyser systems shall be designed to ease maintenance and so facilitate the removal of each individual component for repair and replacement without dismantling other components.