

GENERAL SPECIFICATION

INSTRUMENTATION

GS EP INS 140

Instrumentation for monitoring packages
--

01	11/2018	Integration of wireless, alignment with GS EP INS 101
00	10/2015	First issue
Rev.	Date	Purpose of the revision

Owning entity: DSO/IP/TEC	Managing entity: DSO/IP/TEC/INS
Other Approving entity(ies):	

General Specification		GS EP INS 140
Instrumentation for monitoring packages		
Rev.: 01	Effective date: 11/2018	Page: 2 of 27

Contents

1. Scope	4
2. Reference documents	4
3. Terminology and Definitions	5
3.1 Abbreviations	5
4. Package Definition	6
4.1 P4 Type Package.....	6
5. General Instrumentation Principles.....	7
5.1 Environmental Conditions	7
5.2 Hazardous Area Protection	7
5.3 Instruments	8
5.4 Cabling	8
5.5 Wireless instrumentation	9
5.6 Electrical	10
5.7 Earthing	10
5.8 Electro Magnetic Interference Protection.....	10
5.9 Specific Requirements for Marine Classification.....	10
6. Unit Control Panel (UCP)	10
6.1 Programmable Logic Controllers and PC/Servers	11
6.2 Input / Output Modules.....	11
6.3 Interface Architecture Requirements	11
6.4 Communication Link with PDS	12
6.5 Cybersecurity	12
6.6 Remote Maintenance and Diagnostic (RMD)	13
7. Specific Engineering Requirements	13
7.1 Life Cycle and Obsolescence Management	13
8. Package Vendor Scope of Work	14
8.1 General.....	14
8.2 Engineering and Design.....	14

General Specification		GS EP INS 140
Instrumentation for monitoring packages		
Rev.: 01	Effective date: 11/2018	Page: 3 of 27

8.3	Scope of Supply	15
9.	Test Requirements	15
9.1	Testing Methodology.....	15
9.2	Testing Preparation.....	15
9.3	Factory Acceptance Test	17
9.4	Integrated Factory Acceptance Test (IFAT).....	18
9.5	Site Acceptance Test at Yard/Worksite and Site	19
	Bibliography.....	20
Appendix 1	Typical Scope of Work - Supply	21
Appendix 2	Typical Scope of Work - Engineering	22
Appendix 3	General UCP / ICSS / Other systems Architecture	26
Appendix 4	Typical wireless architectures for P4 packages with data transfer via PDS/PI ...	27

General Specification		GS EP INS 140
Instrumentation for monitoring packages		
Rev.: 01	Effective date: 11/2018	Page: 4 of 27

1. Scope

This specification defines the minimum requirements for the design, engineering and execution of the instrumentation for monitoring systems for onshore and offshore oil and gas installations.

This document should be read in conjunction with [GS EP INS 110](#).

2. Reference documents

The reference documents 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 addendums, is the latest revision published at the effective date of this document.

Reference	Title
Directive 2014/34/EU	European Directive 2014/34/EU (26/02/2014) on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres
IEC 60079-14	Explosive atmospheres - Part 14: Electrical installations design, selection and erection
IEC 61000-5	Electromagnetic compatibility (EMC) - Part 5: Installation and mitigation guidelines
IECEx	International Electrotechnical Commission System for Certification to Standards relating to Equipment for use in Explosive Atmospheres (IECEx System)

Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and addendums, is the latest revision published.

Reference	Title
GS EP ELE 011	Electrical Requirements for Packaged Units
GS EP ELE 079	Electrical Apparatus for Potentially Explosive Gas Atmospheres
GS EP EXP 131	Design and installation of Process Data Server - Creation and administration of Asset Model using Field Share method
GS EP INS 101	Instrumentation Design
GS EP INS 102	Instrumentation Identification
GS EP INS 103	Instrumentation Database Management
GS EP INS 106	Instrument Installation

General Specification		GS EP INS 140
Instrumentation for monitoring packages		
Rev.: 01	Effective date: 11/2018	Page: 5 of 27

Reference	Title
GS EP INS 109	Instrument cabinets
GS EP INS 110	Instrumentation for package units
GS EP INS 115	Instrument Earthing
GS EP INS 116	Instrument Cables
GS EP INS 118	Instrument Troubleshooting Loop Diagrams (TSLDs)
GS EP INS 135	Cybersecurity Requirements for Industrial Information Systems (SII)
GS EP TEC 007	Obsolescence and Lifetime Cycle Management

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.
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 Company TOTAL E&P has signed a Contract with for the Engineering, Procurement, Construction, and Installation of a part of a project.
Vendor	The Package Vendor sub-contracted by the Contractor or by Company.
Package	Prefabricated process or utility self-contained unit, generally able to operate on its own, supplied fully tested and ready for immediate installation

3.1 Abbreviations

EWS	Engineering WorkStation
FAT	Factory Acceptance Test
FPSO	Floating Production Storage and Offloading
FPU	Floating Production Unit
FSO	Floating Storage Offloading
HMI	Human Machine Interface

ICSS	Integrated Control and Safety System
IFAT	Integrated Factory Acceptance Tests
I-IOT	Internet of things for industrial purpose
IS	Intrinsically Safe
OEM	Original Equipment Manufacturer
OPC	OLE for Process Control
OWS	ICSS Operator Work Station
PC	Personal Computer
PCS	Process Control System
PDS	Process Data Server
PLC	Programmable Logic Controller
RMD	Remote Maintenance and Diagnostic
SAT	Site Acceptance Test
SIE	Enterprise Information System
SII	Industrial Information System
UCP	Unit Control Panel
UPS	Uninterruptible Power Supply

4. Package Definition

Four types of packages are considered:

- P1, P2 and P3 packages are generally process and utility packages and are defined in **GS EP INS 110**
- P4 packages are monitoring systems and are defined by this General Specification.

4.1 P4 Type Package

Monitoring packages are systems comprising of their own instruments and Unit Control Panel, or using I-IOT technology, for the sole purpose of monitoring of equipment, structures, pipelines, umbilicals, risers or reservoirs as well as environmental and integrity conditions.

- These packages shall not perform any control or safety functions.
- The P4 packages are not related to the supervision, control and safeguarding of the facility.
- The P4 packages shall not have data communication interface with ICSS.

Generally, measurement data is collected to monitor and analyse the integrity of equipment over a long term basis. This data should not be made available on the ICSS Operator Work Stations (OWS). However, some P4 packages may, on an exceptional basis, require to alert operators about a specific event. This will be carried out by a hardwired signal to the PCS.

General Specification		GS EP INS 140
Instrumentation for monitoring packages		
Rev.: 01	Effective date: 11/2018	Page: 7 of 27

P4 packages normally comprise of instruments connected to a UCP without a field equipment package. In specific cases small field units are required and these are defined in the specific package unit specification.

Systems such as Overall Flow metering System, Vibrations Analysis System, etc. shall not be treated as P4 packages, since they are based solely on software treatment of process & condition measurements.

5. General Instrumentation Principles

For more detail, refer to [GS EP INS 101](#).

5.1 Environmental Conditions

Instruments and instrument equipment shall be suitably designed for permanent operation under the prevailing environmental conditions of the installation location or as specified by project particular Design Conditions.

Environmental conditions comprise climatic exposure, vibrations, temperature conditions, humidity, potential gaseous ambiance from produced fluids (e.g. H₂S), salt laden and corrosive atmosphere. It should be noted that the environmental conditions at the fabrication yard may be different to those of the final site location. Therefore, the fabrication yard storage and installation conditions shall also be taken into account.

5.2 Hazardous Area Protection

All equipment must comply with the requirements of the hazardous area in which they are installed. Refer to [GS EP ELE 079](#) for detailed requirements about hazardous areas definitions and protection methods.

ATEX European [Directive 2014/34/EU](#) shall strictly apply in European Countries and associated countries (e.g. Norway, Iceland).

ATEX European [Directive 2014/34/EU](#) or [IECEx](#) standards shall apply in other countries.

All field instruments and instrument equipment (i.e. Junction Boxes, Outdoor Control Panels/cabinets etc.) shall be certified for zone 1 as a minimum.

Should this be proved impossible, field instruments and instrument equipment certified for zone 2 may be installed on a case-by-case basis, subject to Company written agreement. They shall be de-energized in case of gas detection.

Particular care will be taken for signals, hardwired and networked, between buildings to ensure full electrical isolation of the building is achieved when required by the Safety Concept.

The requirements of hazardous area protection for any outdoor cabinets shall be as defined in [GS EP INS 109](#).

For category 3 equipment, as per ATEX European Directive classification, certification by Manufacturer is not accepted. A "declaration of conformity" shall be delivered by a Notified Body.

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

Use of protection mode Ex p and Ex n should be limited to specific applications and subject to a case by case study and Company written approval.

General Specification		GS EP INS 140
Instrumentation for monitoring packages		
Rev.: 01	Effective date: 11/2018	Page: 8 of 27

The selected project protection method shall apply to the package unit.

The protection method should be selected by project during Basic Engineering will taking into account the context of the overall project (new standalone project, standardisation with other developments or existing facilities, etc.).

The enclosure related certification shall consider all internal components including additional parts for possible extension.

All instruments shall be installed in accordance with [IEC 60079-14](#). An IS loop calculation sheet shall be submitted for each installed IS instrument.

Technical rooms are usually pressurised and safe areas consequently.

Concerning the instruments installed outside hazardous areas (e.g. restricted area), the same type of instruments as those installed in hazardous areas should be selected, for standardisation of maintenance and operation, unless their quantity may justify different stock.

Ex components shall be provided with a permanent AISI 316 plate stating the ATEX/IECEx protection method and the relating code and shall be delivered with a conformity certificate issued by a Notified Body.

A unit certificate must be provided by a Notified Body for the complete unit assembly, irrespective of the individually certified components.

All work associated with hazardous area equipment shall be carried out by a competent person as per [IEC 60079-14](#).

Any modifications to Ex equipment shall be fully in compliance with the [IEC 60079](#) standard requirements and the equipment's certification.

5.3 Instruments

P4 packages will be provided with all their instruments, necessary hook-up accessories and data acquisition & processing units.

For instruments, junction boxes and cable glands requirement refer to [GS EP INS 101](#) and refer to [GS EP INS 106](#) for installation requirement.

It is noted that specialised monitoring instruments may have signal transmission protocol other than 4-20 mA.

For requirement related to tag number of the instruments and instrument equipment refer to [GS EP INS 102](#).

The package instrumentation shall be designed according to the environmental conditions.

5.4 Cabling

For instrument cables requirement refer to [GS EP INS 116](#).

For requirement related to segregation of signals in cables refer to [GS EP INS 101](#).

For requirement related to installation and segregation of cables in cable trays refer to [GS EP INS 106](#). P4 package shall follow the requirements of PCS.

General Specification		GS EP INS 140
Instrumentation for monitoring packages		
Rev.: 01	Effective date: 11/2018	Page: 9 of 27

When a special type of cable is required (i.e. fibre optic, non-standard multi-core arrangement cables, coaxial, etc.) it shall be specified and provided by the Vendor and submitted to Company for approval.

The cable length from package instrument to the final connection point at UCP is to be calculated by the Contractor. Vendor shall verify whether this length is compatible with the technical requirements.

5.5 Wireless instrumentation

As stated in **GS EP INS 101**, use of wireless instrument is not permitted for control and safety functions, time critical applications and any other critical safety application.

Wireless instrumentation may be considered for non-essential and non-critical monitoring application, non-real time services, application which do not require fast response time and application which may withstand unavailability.

Use of wireless instrumentation shall be subject to a specific study. This study shall include interoperability, interchangeability, cyber-security, reliability, availability/sustainability issues, risk analysis and shall address the following requirement:

Requirement for wireless instrumentation:

- **Authentication:** a mechanism of authentication shall ensure the identification of the wireless device connected in order to authorize the access to the system.
- **Encryption:** Data transmitted on the wireless network shall be encrypted.
- **Integrity:** The system shall ensure integrity of the data by detecting transmission error.
- Wireless instruments shall comply with cybersecurity requirement as defined in **GS EP INS 135**.
- **Radio transmission:** Specific study shall be performed to ensure the performance of the installation. This study requires involvement of specialized telecommunication competencies. Requirement related to engineering of radio transmission are applicable:
 - Radio propagation study: a radio coverage study is needed to ensure all wireless devices can be connected with acceptable propagation loss.
 - Frequency plan: working frequencies to be used must be compliant with applicable national regulation requirement and proposed to Company for application.
 - Interference: Radio interference study is to be performed to ensure that the system is not compromised by any other wireless system or electromagnetic interference. Coexistence between all concurrent wireless networks and radio networks will be ensured.
- **Battery lifetime:** duration of the battery life of the wireless devices (taking into account instrument update rate, the environment and temperature) shall be evaluated.
- **Device management system:** a management system shall be provided to monitor, configure and update the wireless devices.
- **Wireless network:** the wireless network shall be designed and scaled to support the traffic and required availability (redundancy, bandwidth, latency...).