

GENERAL SPECIFICATION

Process

GS EP ECP 101

Glycol (TEG) package unit

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1. Scope

1.1 Purpose of the specification

This specification details Company's minimum requirements for the design, manufacture and performance of Tri Ethylene Glycol (TEG) gas dehydration package units.

This general specification does not remove the responsibility of the Vendor who will outline in his technical proposal any deviation to the clauses of this specification and will guarantee the unit performance in the long run.

1.2 Applicability

This document is concerned with glycol package units with conventional regeneration process to be installed either offshore or onshore. It does not cover other gas dehydration technologies. It does not cover either licensed TEG regeneration units. Specific requirements from licensors generally prevail.

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
API RP 14C	Recommended Practice for Analysis, Design, Installation and Testing of Basic Surface Safety Systems for Offshore Production Platforms
GPSA	Engineering Data Book – FPS Volume 2 – Section 20
Wichert charts	Oil & Gas Journal (O&GJ, October 27, 2003, pp 64–66)

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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 ECP 103	Process sizing criteria
GS EP ELE 011	Electrical requirements for packaged units
GS EP INS 110	Instrumentation for package units
GS EP MEC 028	Rotating Machine Package Specification - Positive Displacement Motopump according to API Standard 674
GS EP PJC 703	Contractor final documentation requirements
GS EP PVV 415	Design and fabrication of air cooler
GS EP PVV 521	Fire Tube Boilers
GS EP PVV 813	Skid mounted units for static equipment
GS EP SAF 216	Area classification
GS EP SAF 227	Safety rules for fired heaters
GS EP SAF 228	Liquid drainage
GS EP SAF 261	Emergency Shutdown and Emergency De-Pressurisation (ESD & EDP)
GS EP SAF 262	Pressure protection relief and hydrocarbon disposal systems
GS EP SAF 311	Rules for the selection of active fire protection systems
GS EP STR 103	Design and fabrication of skids and equipment supporting structures

3. General

3.1 Terminology and definitions

There are five types of statement 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 the same level of protection or performance and shall be documented.
May	Is to be understood as permission.
Can	Is to be understood as a physical possibility.
Must	Expresses a regulatory obligation

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3.2 Acronyms

BDV	Blow Down Valve
ESD	Emergency Shutdown Diagram
F&G	Fire and Gas
LAH	Level Alarm High
LAL	Level Alarm Low
LCV	Level Control Valve
LSHH	Level Safety High High
LSLL	Level Safety Low Low
NLL	Normal Liquid Level
NPSH	Net Positive Suction Head
P&ID	Piping and Instrumentation Diagram
PFD	Process Flow Diagram
PSV	Pressure Safety Valve
TEG	Tri Ethylene Glycol
TSHH	Temperature Safety High High

3.3 Qualifications

Deviations from this General Specification are itemized with full details of proposed alternatives under the heading "Exemptions to Specification" in Vendor's proposal for Company evaluation.

3.4 Site environmental conditions

{Rule 1:

The equipment shall be designed to ensure that Vendor's guarantees can be met over the entire temperature range and environmental conditions as described in the package specification.}

In offshore installations, sea conditions require special attention.

3.5 Utilities

All available utilities (electrical power, fuel gas, instrument air, nitrogen etc.) on the field are as stated in the package specification.

{Rule 2:

Vendor shall include in his technical offer all utility requirements (operating conditions, quality, battery limit conditions, etc.).}

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3.6 Area classification

{Rule 3:

The equipment shall be suitable for operation in hazardous area Zone 2, Group IIB, Temperature Class T3 as a minimum.}

Reference is made to **GS EP SAF 216**, **GS EP ELE 011** and **GS EP INS 110**.

4. Vendor's scope of supply

4.1 General

Typical Vendor's scope of supply includes as a minimum the following items:

- Engineering services for detailed engineering.
- Procurement activities, material and equipment supply.
- Fabrication and shop erection.
- Shop testing and services of personnel required during testing.
- Inspection, Quality assurance/Quality control.
- Spare parts for commissioning and initial start up.
- Special tools for installation and maintenance if any.
- Packing and marking.
- All documents requested in the purchase requisition which can include additional documents requested by a third party for certification.
- Pre-commissioning, commissioning and start up procedures.
- Operating and maintenance manuals.
- Mechanical and performance guarantees.

4.2 Main equipment

Vendor's scope of supply includes the following main groups of equipment:

- Feed gas treatment system
- Dehydration column
- Dry gas treatment system
- Glycol regeneration skid

4.2.1 Feed gas treatment system

The feed gas treatment system is a two stage unit located upstream the dehydration column. It consists of:

- 1) A knockout drum for bulk liquid removal.

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2) A filtration and coalescing system for fine solids and liquid droplets removal.

{Rule 4:

The scope of supply shall include at least the filter-coalescer.}

It may exclude the knock-out drum if its function is provided by other means.

4.2.2 Dehydration column

{Rule 5:

The scope of supply shall include a gas dehydration column equipped with its internals.}

Instrumentation and valves should be provided as per package specification.

4.2.3 Dry gas treatment system

In order to minimize glycol losses, a dry gas treatment system can be added. It generally consists of a filter-coalescer and a cooler.

4.2.4 Glycol regeneration skid

{Rule 6:

Equipment for the regeneration skid shall include as a minimum:

- One flash drum.
- Two cartridge filters (one stand-by).
- One slipstream activated carbon filter.
- One Still Column.
- One condenser.
- One reboiler.
- Rich/lean glycol heat exchanger(s).
- One surge drum.
- N+1 glycol circulation pumps (one stand-by).
- One final lean glycol cooler.
- **Chemical injection skid for pH control.}**

The regeneration skid may as well include:

- One stripping column / one stripping gas injection point (or tie-in provision).
- One glycol make-up facility.
- One closed drain drum with one recycle pump.
- One antifoam chemical injection skid.
- One snuffing system for fire tube option.

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{Rule 7:

The glycol regeneration skid shall comply with the following requirements:

- Be skid-mounted on steel structure, with all necessary access/maintenance platforms, stairways, handrails and walkways.
- Be equipped with a drip pan with a specific valve drain piped (2" minimum) at the edge of the skid at the lowest point. The drain pipe is terminated with a flange.}

Reference is made to **GS EP SAF 228** requirements for design of open and closed drain connections.

Reference is made to **GS EP PVV 813** requirements for skid mounted units.

4.3 Miscellaneous

Vendor's scope of supply includes the following items:

- All on-skid pipework, pipe supports and valves for process, utilities, drains, vents and relief systems and lifting equipment (beams, slings, shackles etc.).
- Ladders and/or platform brackets.
- Adequate supports and structure to minimize piping, valves, vessels, structure and instrumentation vibration in accordance with Vendor's vibration study.
- All instruments, instrument supports, instrument cabling, instrument air headers, cable and/or pipe trays, unit control panels.
- Internal earthing loop, lighting system and heat tracing (where necessary).
- Painting of complete package.
- Thermal insulation material and/or personnel protection means as necessary.
- Check points for corrosion inspection through the insulation.
- Lifting devices for maintenance.
- Provision for fire-fighting systems as defined in the project-specific data sheet or Safety Concept.

Reference is made to **GS EP PVV 813** requirements for skid mounted units.

Reference is made to **GS EP STR 103** requirements for the design and fabrication of skids and equipment supporting structures.

Reference is made to **GS EP INS 110** requirements for the instrumentation of package units.

Reference is made to **GS EP ELE 011** requirements for electrical design.

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4.4 Interfaces

{Rule 8:

Vendor shall:

- Provide all materials and equipment completely assembled and ready for hook-up.
- End all on-skid process and utilities pipework with a flange at the skid edge.}

For other interfaces at glycol package battery limits, refer to **GS EP ELE 011** and **GS EP INS 110**.

5. Vendor guarantees

{Rule 9:

The following figures and performance data shall be guaranteed by Vendor:

- **Treated gas water dew point**
The water content of the treated gas for all loads between turndown¹ and design capacity as defined in the package specification.
- **Feed gas filter-coalescer performance**
 - Maximum pressure drop across the filter of 0.1 bar in clean conditions.
 - Removal of 99% of solid particulates with a diameter greater than 1 micron.
 - Removal of 99 % of liquid droplets with a diameter greater than 0.3 microns.
 - Maximum liquid content of the outlet gas of 5 liters per 10⁶ Nm³ of gas or 5 ppm wt.
- **Pressure drop/Temperature increase in the dehydration column**
 - Maximum pressure drop through the dehydration column of 0.5 bar at design conditions.
 - Maximum gas temperature increase in the dehydration column of 3°C for the normal glycol inlet temperature.
 - Operating temperature of lean glycol above hydrocarbon dew point.
- **Glycol process losses – glycol make-up**
The overall process glycol losses² for the design conditions.
- **Utilities consumption**
Utilities consumption (electrical power, fuel gas, instrument air, nitrogen etc.) and stripping gas flow rate (if any) specified for the design conditions.}

Note 1: Turndown ratio of 30% of the normal operating capacity is considered unless the package specification requires a lower ratio.

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Note 2: The overall process glycol losses include all forms of glycol loss by entrainment and vaporisation during normal operation (liquid carry-over, TEG vapour loss in treated gas, overhead gases of flash drum and Still Column etc.) but exclude small leaks from valves, pump packing etc. and maintenance drains. Breakdown of losses by entrainment and vaporisation and thermodynamic model used to determine vapour losses is expected from vendor.

Entrainment losses should be lower than 10 liters/10⁶ Sm³ (0.07 USG/MMSCF) for the dehydration column and 4.3 liters/10⁶ Sm³ (0.03 USG/MMSCF) for the regeneration skid.

All the guaranteed values should be recorded during a formal performance test. The test duration should be sufficient for a proper assessment of the unit performance in the long term, including glycol make-up rate and operating costs.

6. Safety requirements

Reference is made to the project Safety Concept for requirements regarding the F&G and fire fighting systems.

It is a general philosophy to minimize the number of flanges on glycol piping.

6.1 F&G detection and fire-fighting

Regarding the supply and installation of fire detectors and fixed fire-fighting equipment, reference is made to [GS EP SAF 311](#) and [GS EP INS 110](#).

The detection signals are transmitted to the main Fire & Gas system in the control room.

6.2 Requirements for PSV, emergency shutdown and depressurisation means

Reference is made to [GS EP SAF 261](#) requirements for Emergency Shutdown and Emergency depressurisation (i.e: BDVs).

Reference is made to [GS EP SAF 262](#) requirements for Pressure protection relief and hydrocarbon disposal systems.

6.3 Fire heater

In case a fire heater is selected as TEG reboiler, the number of flanges on fuel gas piping is minimized. Instruments on reboiler and glycol flash drum, drain points (process and instruments) and flanges are located as far as practicable from the combustion air intake.

Reference is made to [GS EP SAF 216](#) for layout requirements.

Reference is made to [GS EP SAF 227](#) for requirements regarding fire heater gas detection, fire-fighting and snuffing systems and layout.

7. Process design criteria

Reference is made to [GS EP ECP 103](#) for process sizing criteria.

Reference is made to [API RP 14C](#) for PID's preparation and ESD logic definition.

{Rule 10:

All materials shall be submitted to Company corrosion specialist for approval.}