

GENERAL SPECIFICATION

INSTRUMENTATION

GS EP INS 138

Electric Actuators for On/Off Valves

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1. Scope

This document defines the minimum requirements for the design, construction and supply of electrical motor-operated valve actuators and associated control panels for both onshore and offshore oil and gas installations.

2. Reference documents

The equipment shall satisfy the requirements 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 General Specification.

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
ANSI/ISA 96.02.01	Guidelines for the Specification of Electric Valve Actuators
API STD 6DX	Petroleum and natural gas industries - Mechanical integrity and sizing of actuators and mounting kits for pipeline valves
Directive 2014/34/UE	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
EN 10204	Metallic Products - Type of Inspection Documents
EN 15714 (Parts 1; 2)	Industrial valve actuators - Parts 1; 2
IEC 60034-1	Rotating electrical machines - Part 1: Rating and performance
IEC 60529	Degrees of protection provided by enclosures (IP code)
IECEX	IEC System for Certification to Standards relating to Equipment for use in Explosive Atmospheres (IECEX System)
ISO 12490	Petroleum and natural gas industries - Mechanical integrity and sizing of actuators and mounting kits for pipeline valves
ISO 5210	Industrial valves - Multi-turn valve actuator attachments
ISO 5211	Industrial valves - Part-turn actuator attachments

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

Reference	Title
GS EP COR 350	External protection of offshore and coastal 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 001	Electrical design criteria
GS EP ELE 031	Design of earthing and bonding systems for Offshore Installations
GS EP ELE 079	Electrical apparatus for potentially explosive gas atmospheres
GS EP ELE 111	Induction motors
GS EP INS 000	Contractor Document Requirements
GS EP INS 101	Instrumentation Design
GS EP INS 102	Instrumentation Identification
GS EP INS 109	Instrument cabinets
GS EP INS 110	Instrumentation for package units
GS EP INS 115	Instrument Earthing
GS EP INS 135	Cybersecurity Requirements for Industrial Information Systems (SII)
GS EP PVV 154	Ball Valves
GS EP PVV 155	Gate, Globe and Check Valves

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.

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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

For the purpose of this specification, the definitions given in [EN 15714-1](#) and [API STD 6DX](#) shall apply.

3.2 Abbreviations

The following terms and abbreviations will be used in this document.

ATEX	Atmosphères Explosibles - European Union Directive 2014/34/UE
FAT	Factory Acceptance Test
GS	Company's General Specification
HMI	Human Machine Interface
IEC	International Electrotechnical Commission
ICSS	Integrated Control and Safety System
IFAT	Integrated Factory Acceptance Test
IP	Ingress Protection
ISO	International Standards Organization
ITR	Instrument Technical Room
MCU	Motor Control Unit
MOV	Motor Operated Valve
PCS	Process Control System
MAST	Maximum Allowable Stem Torque/thrust
UCP	Unit Control panel

4. General Requirements

4.1 Generalities

Electric actuators operated valves, designated as Motor Operated Valves (MOV), shall only be permitted for use with process On/Off valves.

They will normally be operated via facility Process Control System (PCS) or packages UCP's.

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Electric actuators shall be self-contained units, comprised of an electric motor, reduction gearing, limit and/or torque switches, motor control unit and handwheel for manual override.

The MOV, consisting of the valve and its actuator, shall be provided as a complete unit. The actuator shall be assembled on the valve, fully wired and tested with the control functions at the valve Supplier's premises.

Valve Supplier shall be fully responsible for the integration and performance of the complete valve and actuator assembly.

Functional, design and construction requirements shall be fully detailed in the Project Particular Specification for "On/Off Valve Control Panels and Actuators" as defined by **GS EP INS 000**.

An individual actuator data sheet shall be prepared by the Contractor (or package Vendor) for each actuated valve. In addition, the actuated valve data sheet shall combine the valve data sheet in **GS EP PVV 154** or **GS EP PVV 155** as relevant, and the actuator data sheet.

A functional schematic diagram, based on actuator typical schematics in Appendix 1, shall be attached to the data sheet.

4.1.1 Electrical Supply

Electric motors should generally be supplied with 400 VAC - 3 phases in accordance with **GS EP ELE 001**.

4.1.2 Earthing

Motor-operated valve actuators shall be earthed in compliance to **GS EP ELE 031** and **GS EP INS 115**.

4.1.3 Environmental Conditions

MOV actuators and accessories shall be suitably designed for permanent operation under the prevailing environmental conditions of the installation location or as specified by project particular design conditions.

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.

4.2 Control Functions

Valves shall be remotely controlled from the ICSS, or locally from the Motor Control Unit or remote handstation.

At the minimum, the MOV control device shall enable controls as described in Table 1. Additional functions, e.g. partial stroke testing, may be specified in the actuated valve data sheet.

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Table 1 - MOV minimum control functions

	MOV
Control signal failure action	Stay Last
Open remote control	Yes
Close remote control	Yes
Open local command	Yes
Close local command	Yes

4.3 Valve Stroke Times

Typically and unless otherwise specified in the actuator data sheet, the stroking time will be 5 seconds per inch of valve body diameter in both direction.

4.4 Position Indicator

Actuators shall be furnished with a visible indicator to show open and closed positions, as required by [API STD 6DX](#).

This indicator shall remain available in case of loss of electrical power supply.

5. Actuator Design and Construction Requirements

Selection of the actuator manufacturer and validation of the model shall be the responsibility of the valve manufacturer.

Electric actuators shall be fully compliant with [EN 15714-2](#).

Electric actuator type and duty shall be defined on the actuator data sheet.

Action on loss of electric power or control shall be fail-locked (i.e. standard action as defined by [EN 15174-2](#)) unless defined otherwise in the data sheet. The method of achieving a specific failure position shall not use batteries.

Non-intrusive type actuators, as defined by [ANSI/ISA 96.02.01](#) shall be preferred.

Actuators shall be supplied as a complete unit, consisting but not limited to the following:

- Actuator enclosure or housing
- Separated terminal box
- Electric motor
- Reduction gearing
- Reversing contactor starter complete with local controls
- Turns and torque limitation facilities
- Electronic logic controls and monitoring facilities
- Valve position indicator

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- Drive coupling between the final drive gear and the valve stem
- Final drive gear assembly
- Valve stem drive nut/bushing, (for linear valves)
- Torque measurement device
- Travel limiting facility
- Control circuitry
- Gear case(s)
- Automatic de-clutchable handwheel
- Declutch lever.

All components of the actuator drive train shall be designed with adequate heat capacity for the actuator being operated at the specified motor duty cycle, travel times, and torque requirements.

Actuator enclosure or housing shall be, at the minimum, IP65 rated as per [IEC 60529](#) and certified for ATEX European Directives / [IECEX](#) in accordance with [GS EP INS 101](#) and [GS EP ELE 079](#).

Space heater shall be provided.

All shafts shall be mounted on ball or roller bearings.

The data sheets shall define the physical actuator position regarding valve body and fluid direction.

Actuator shall be suitable for installation and operation either in vertical or horizontal position, and valve / actuator stem adaptor shall be designed to allow the rotation of actuator position of 90°.

5.1 Actuator Sizing

Actuators shall be sized to provide at least 130% of maximum operating torque of the valve at any position of the stroke and in both directions. The actuator torques shall be defined according to [GS EP PVV 154](#) or [GS EP PVV 155](#) as relevant.

At the maximum power supply, the maximum output torque/thrust of each actuator should not exceed the maximum allowable valve stem torque/thrust (MAST). A torque/thrust limiting device, adjustable, shall be provided.

Supplier shall provide all actuator torque figures against required valve torques.

The actuators shall be sized to operate the valve within the specified time at the maximum differential pressure across the valve, and based upon those conditions.

5.2 Motor

Actuator motors shall be designed as an integral part of actuator and shall be sufficiently rated to achieve the desired performance, as shall be stated in particular project specification and/or data sheets.