



## Certificate of Analysis

# MOGAS

## Failure Mode and Effect Diagnostic Analysis on C Series Severe Service Ball Valve

The C SERIES SEVERE SERVICE BALL VALVE is a metal seal, floating ball valve. It is designed to meet tight shut off requirements per MSS SP-61. The C SERIES SEVERE SERVICE BALL VALVE is classified as a Type A device according to IEC61508, having a hardware fault tolerance of 0.

The failure rates for the C SERIES SEVERE SERVICE BALL VALVE with tight shut off (TSO) requirements are:

$$\lambda_S = 0 * 10^{-9} \text{ failures per hour}$$

$$\lambda_D = 543 * 10^{-9} \text{ failures per hour}$$

When automatic partial valve stroke testing with full feedback is used, the following can be used:

$$\lambda_{DD} = 94 * 10^{-9} \text{ failures per hour}$$

$$\lambda_{DU} = 449 * 10^{-9} \text{ failures per hour}$$

The failure rates for the C SERIES SEVERE SERVICE BALL VALVE without TSO requirements (full stroke only required) are:

$$\lambda_S = 0 * 10^{-9} \text{ failures per hour}$$

$$\lambda_D = 174 * 10^{-9} \text{ failures per hour}$$

When automatic partial valve stroke testing with full feedback is used, the following can be used:

$$\lambda_{DD} = 94 * 10^{-9} \text{ failures per hour}$$

$$\lambda_{DU} = 80 * 10^{-9} \text{ failures per hour}$$

These failure rates are valid for the useful lifetime of the product, which is dependent on application conditions and specified for each valve by the manufacturer.

A user of the C SERIES VALVE can utilize these failure rates in a probabilistic model of a safety instrumented function (SIF) to determine suitability in part for safety instrumented system (SIS) usage in a particular safety integrity level (SIL). A full FMEDA report is available from MOGAS.



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