

The background of the entire page is a photograph of an offshore oil rig at sunset. The rig is silhouetted against a bright orange and yellow sky. A tall derrick with a red flame at the top is prominent on the right. The rig's structure, including platforms and cranes, is reflected in the dark water below. The overall mood is industrial and dramatic.

JC
VALVES

The quality option

**Functional Safety
for Final Elements**



WE MAKE VALVES SINCE 1968

JC Fábrica de Válvulas S.A.U, established in 1968, is a multinational company specialised in the manufacture and sale of high quality industrial valves.

The expertise and know how acquired over the years coupled with the continued investments in the design of valves, has made JC a world renowned company in the field of valve applications.

TTV-JC WORLD WIDE

TTV-JC provides world wide coverage thanks to the strategic locations of its factories and offices in Canada, Mexico, Brasil, Russia, Middle East, South Africa, India, Singapore, China and Spain.

QUALITY ASSURANCE

JC Valves are designed and produced to meet the major international standards and we take great care and put a lot of emphasis on QUALITY, which provides our customers with a total guarantee and trouble free operation of their process.

And in addition, we take great care to make our facilities and our products Environment friendly.

GLOBAL SERVICES

JC Fabrica de Valvulas S.A.U offers its customers a world wide service, from technical advice to choose the right valve up to the design and manufacture of custom built valves to meet special service requirements.

Our R+D department is always ready to find solutions for severe applications and our global distribution network offers quick availability of JC valves and an efficient after sales service.

MARKET SECTORS

JC develops and designs valves for all applications, but the main focus is in Oil & Gas, Chemical, Petrochemical, Pulp & Paper and Energy sectors.



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VALVES

Safety is the most important issue, whether it is related to our daily lives or industrial sector. Risk cannot be reduced to zero, so absolute safety cannot be achieved, however can be reduced to a tolerable level. The release of the new international standard to functional safety IEC 61508, helps to reduce these risks to an acceptable level.

BUT WHAT IS THE DEFINITION OF RISK IN THE MODERN ENGINEERING SYSTEMS?

RISK

=

PROBABILITY
of hazardous event will occur

×

CONSEQUENCES
of hazardous event

SIL FIGURES

The measures required to reduce a risk can sometimes be very simple, but also extremely complex. Based on a hazard and risk analysis, the hazards can be determined from a plant and its control systems.

IEC 61508 defines appropriated methods for achieving functional safety for associates' plants systems.

The probability of dangerous failure on demand (PFDavg) is used for system in low demand mode. As well, when we calculate the PFDavg, we consider the proof interval, repair time and the architecture of the components and many others factors according to IEC61508.

LOW DEMAND MODE: TARGET FAILURE MEASURES

SIL	PFD	Max. accepted failure of the SIS
SIL 1	$> 10^{-2}$ to $< 10^{-1}$	Max. 1 dangerous failure per 10 demands
SIL 2	$> 10^{-3}$ to $< 10^{-2}$	Max. 1 dangerous failure per 100 demands
SIL 3	$> 10^{-4}$ to $< 10^{-3}$	Max. 1 dangerous failure per 1000 demands
SIL 4	$> 10^{-5}$ to $< 10^{-4}$	Max. 1 dangerous failure per 10000 demands

Failure measures for a safety function operated in low demand mode.

WHAT IS A SAFETY INSTRUMENTED SYSTEM?

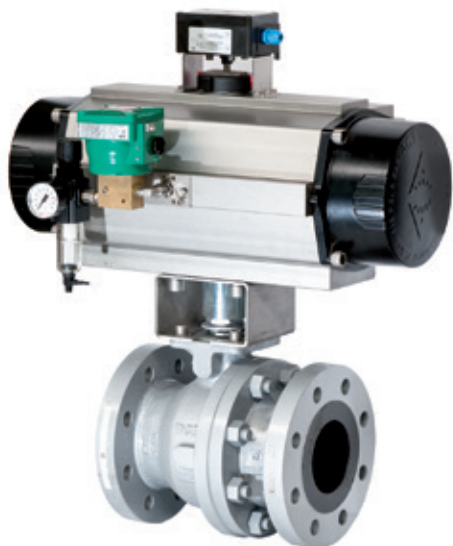
The growing complexity in automation, demands more capability and advanced methodology. Safety Instrumented System (SIS) provides a protective layer around the process systems by implementing one or more Safety Instrumented Functions (SIF).

A SIS is composed with one or more sensors, logic solvers and final elements. Once SIF is designed, SIL verifications calculations determine and will provide the desired risk reduction.





Safety Integrity Level



TTV-JC Valve Group is able to supply valves and actuators with a complete SIL loop calculation for the final elements.

The achieved Safety Integrity Level (SIL) of an entire Safety Instrumented Function (SIF) design must be verified by the designer via calculation of Probability of Failure on Demand Average (PFDavg), considering the architecture, proof test interval, proof test effectiveness, any automatic diagnostics, average repair time and the specific failures rates of all equipment included in the SIF.

Each subsystem must be checked to assure compliance with minimum Hardware Fault Tolerance (HFT) requirements.


WHAT WE OFFER?

TTV-JC Valve Group manufactures valves and actuators for on-off applications. We can supply the final elements loops for SIF, with a full SIL calculations including valves, actuators, solenoid valve, pneumatic ancillaries, brackets and couplings, limit switch boxes, etc.

These SIL calculations are based and can be inspected and verified by a third inspection company TÜV.



EXAMPLE OF SIL ASSEMBLY CERTIFICATE

SIL Assembly Certificate 

No.: 73447 3/18

Product Valve / Indicator (Subtotal)

Type designation

Type	Series	Brand	SE Certificate No.
Valve	Fig. 8100	JC Valves (SIL)	960/10/2014/001/1
Actuator	AS2000 120	ACTRIS (SIL)	1/100/2017
Solenoid	100A	Thomson (SIL)	960/10/2014/001/1

Codes and standards IEC 61508 Parts 1, 2 and 3-7:2010

Intended application Safety Function: Close on demand

The assembly (valve/actuator/solenoid) is suitable for use in safety instrumented system e.g. SIS. The IEC 61508-6 up to SIL 2 (low demand mode). Under consideration of the minimum required hardware fault tolerance (HFT) the assembly may be used in a redundant architecture up to SIL 3.

Specific requirements The instructions of the associated installation, Operating and Safety Manual shall be considered.

Results of Assessment

Route of Assessment	Route of Sub-system	Type of Sub-system	Mode of Operation	Low Demand Mode	HFT	SIL
Valve	AS2000 120	100A	100A	100A	100A	100A

Design

Parameter	Value	Unit	Value	Unit	Value	Unit
Probability of Failure on Demand (PFD)	1.0E-05		1.0E-05		1.0E-05	
Probability of Failure on Demand (PFD)	1.0E-05		1.0E-05		1.0E-05	
Mean Time To Failure (MTTF)	1.0E+05	h	1.0E+05	h	1.0E+05	h
Average Probability of Failure on Demand (PFDavg)	1.0E-05		1.0E-05		1.0E-05	
Average Probability of Failure on Demand (PFDavg)	1.0E-05		1.0E-05		1.0E-05	

Origin of Values

The calculations of the assembly are based on the data provided by the manufacturers of each component and that appear in the corresponding data sheets.

Systematic Capability


The development and manufacturing process and the functional safety management applied by the manufacturer in the relevant manufacturing phase of the product have been audited and assessed as suitable for the manufacturing of products for use in applications with maximum safety integrity level SIL 3 (IEC 61508).

Periodic Test and Maintenance

The given values require periodic tests and maintenance as described in the different safety manuals. The operator is responsible for the consideration of specific external conditions (e.g. ensuring of material quality, media, temperature, time of impact), and adequate test cycles.

Other considerations

The connection between valve and actuator does not intervene in the safety function because its design is governed by specific regulations (EN 10002 for couplings, brackets).

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