

Masoneilan™ and Consolidated™

Process Control and Pressure Relief
Valve Solutions for Floating Production
Storage and Offloading (FPSO)





The right solutions
in the right places.

Baker Hughes Masoneilan and Consolidated Process Control and Pressure Relief Valves for FPSO Oil and Gas Processing

Solutions

At Baker Hughes, we understand how important it is to have the right solutions in the right places, especially in tough settings like floating, production, storage, and offloading (FPSO) vessels. Offshore oil and gas processing facilities demand process control and safety systems that meet intense performance challenges.

Innovation

Baker Hughes offers Masoneilan process control and Consolidated pressure relief valve solutions for offshore oil and gas production. Combining innovation with decades of experience, our valves, instrumentation, positioners, and valve management technologies come together for customized, high-performance solutions in harsh conditions.

Technology

From managing extreme temperature and pressure fluctuations to reducing damaging noise and vibrations, Masoneilan and Consolidated valve systems perform in severe FPSO separation, compression, dehydration, and auxiliary process applications.

FPSO

Process Control and Safety Relief Challenges

Separation

Key to FPSO oil and gas processing is separating the multiphase production stream into gas, liquid hydrocarbons, and water. The extracted hydrocarbon liquid goes through several processing stages to remove impurities before it is transported for on-shore processing. Typical valve challenges for separation processes include:

- High noise levels from pressure letdown
- Dirty service conditions with gas, hydrocarbon liquid, water, and sand
- Corrosive chemicals present such as H₂S, CO₂, or chlorides
- High-flow pressure drop causing cavitation and erosion

Dehydration

Another important function in FPSO processing is gas dehydration where water and hydrocarbon liquids are fully removed from the gas. The gas is then used for fuel gas or recompressed and injected back into the well bore. Valves used for dehydration must meet specific criteria, and careful consideration should be given to several factors. Typical valve selection factors for dehydration applications include:

- Amount of entrained water in the amine
- Flash potential of the water
- Piping configuration

Hydrocarbon resources extracted today can be more difficult to process than in the past—and processing on floating platforms presents additional challenges. Sand and caustic chemicals can contribute to valve corrosion and surface erosion. In addition, high noise and vibration can cause equipment damage and lead to safety hazards. Selecting the right process control equipment plays an important role in addressing difficult FPSO applications.



Compression

Gas compression is a critical part of preparing extracted gas either for on-shore use, powering the vessel, or injection into the well bore. Once separated from the hydrocarbon liquid and water, the gas then goes through the compression phase. It involves multiple process stages, including high-pressure and low-pressure compression depending upon its intended use. Typical valve challenges around compressor stations include:

- High noise levels
- Fast stroking speeds to prevent surge
- Control accuracy
- Easy maintenance

Auxiliary

The auxiliary function of FPSO oil and gas processing intersects the process flow at several points, including treating water extracted from the well production stream. From surge flow control to pump recirculation and chemical injection, the auxiliary steps are important to keeping operations running smoothly. Some of the main challenges that auxiliary valves must address include:

- Cavitation and erosion from high-pressure drops
- Dirty conditions with sand in the water
- Corrosive service conditions depending upon the water type
- Low-pressure drop at higher flows requires higher Cvs
- Vibration from high velocity fluid flow



Baker Hughes

Masoneilan and Consolidated Solutions for FPSO Challenges

Masoneilan Process Control and Severe Service Valves

With valves configured for severe service and corrosive applications, Masoneilan globe and rotary valves offer performance in FPSO applications.

Consolidated Pressure Relief Valves

Consolidated safety valves and safety relief valves help relieve pressure in critical offshore applications.



41005 Series Globe and Angle Cage-Guided Control Valve



49000 Series Globe and Angle Control Valve V-LOG Energy Management Trim



84, 85, 86 Series Cylinder Actuator

Compact Valve Design

Both the Masoneilan and Consolidated assemblies are compact, low weight, and low profile for easy handling and installation in the space-limited offshore environments.

Materials of Construction

Our valves are available in a wide range of materials to help address corrosion and erosion challenges in FPSO applications.

Energy Management Trims

Our valves are available in many specialized trims to meet the requirements specific to each stage of separation and compression processes. Our trim options include Masoneilan Variable Resistance Trim (VRT™) that channels flow through a tortuous path and the V-LOG™ trim that redirects flow through a high-resistance path.

Noise Attenuation

Masoneilan valves are available with Lo-dB™, and V-LOG technologies to help moderate high noise levels on FPSO vessels.

Actuators and Regulators

Masoneilan actuators and regulators help valve performance. Pneumatic valve, diaphragm, and piston actuators offer valve control. Regulators offer pressure reduction, back pressure, and differential pressure for a range of media from air and liquid to saturated and superheated steam.



12400 Series Digital Level Transmitter

SIL2-certified Digital Level Transmitters/ Controllers

Masoneilan instruments from Baker Hughes include level transmitters that operate according to fully proven buoyancy and torque-tube principles as well as electro pneumatic transducers that offer flexibility in valve equipment communication. Also, Masoneilan pneumatic pressure boosters were developed for valve response and speed in high capacity applications.



SVI II AP Digital Valve Positioner

Digital Valve Positioners

Masoneilan SVI™ II AP and SVI FF digital valve positioners from Baker Hughes offer valve control in both HART and Foundation Fieldbus communications protocols.



SVI II ESD SIL3 Partial Stroke Test Device

Emergency Shutdown Valve Automation

The Masoneilan SVI II ESD Device from Baker Hughes is the SIL3-certified latest technology in emergency shutdown valve automation and in-service valve partial stroking. It is designed using the proven electronic and pneumatic technology from the SVI II AP valve positioner.



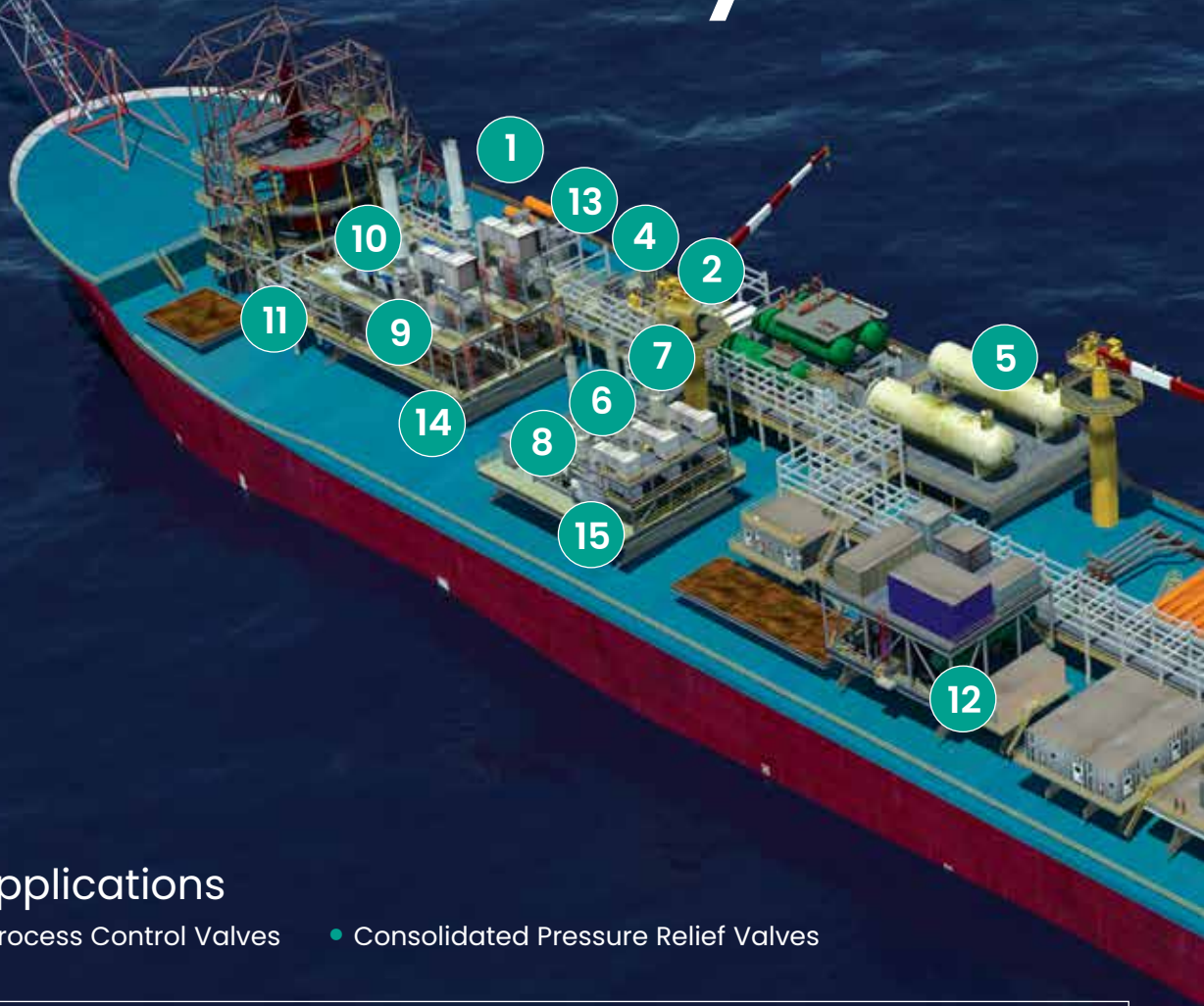
ValScope PRO Diagnostics Software

Valve Asset Management Tools

EVT™ PRO and *ValScope™ PRO* diagnostics and *ValvKeep™* valve asset management software help customers maintain efficient maintenance schedules, an important aspect of continuous at-sea operations.



FPSO Process Key



Process Applications

- Masoneilan Process Control Valves
- Consolidated Pressure Relief Valves

Separation

- Inlet Flow/Pressure Control
- Slug Catcher
- Back Pressure Control
- Thermal Relief
- LP Separator
- High Pressure Separator
- Water Letdown
- Production Choke
- Vent to Flare
- Venting Relief
- HP Flare Scrubber

Dehydration

- Lean Glycol
- Level Control
- Rich Glycol Letdown
- Back Pressure Control
- Thermal Relief
- Pressure Relief

Compression

- Scrubber Level Control
- Compressor Recycle
- Wellhead Injection
- Gas Injection
- Steam Pressure Control
- Lube Oil Temperature Control
- Pressure Relief
- HP Anti-Surge
- LP Anti-Surge
- Hot Gas Bypass

Auxiliary

- Surge Flow Control
- Pressure Control
- Pump Recirculation
- Gas Lift
- Safety Relief
- Chemical Injection
- Water Injection
- Gas to Flare

Separation

1. Flare Scrubber
2. Vapor Recovery and Low-Pressure
3. Gas-Oil-Water Separation
4. Chemicals Storage

Dehydration

5. Crude Oil Treatment, Desalting
6. Electrostatic Oil Treater
7. Electrostatic Oil Desalter

Compression

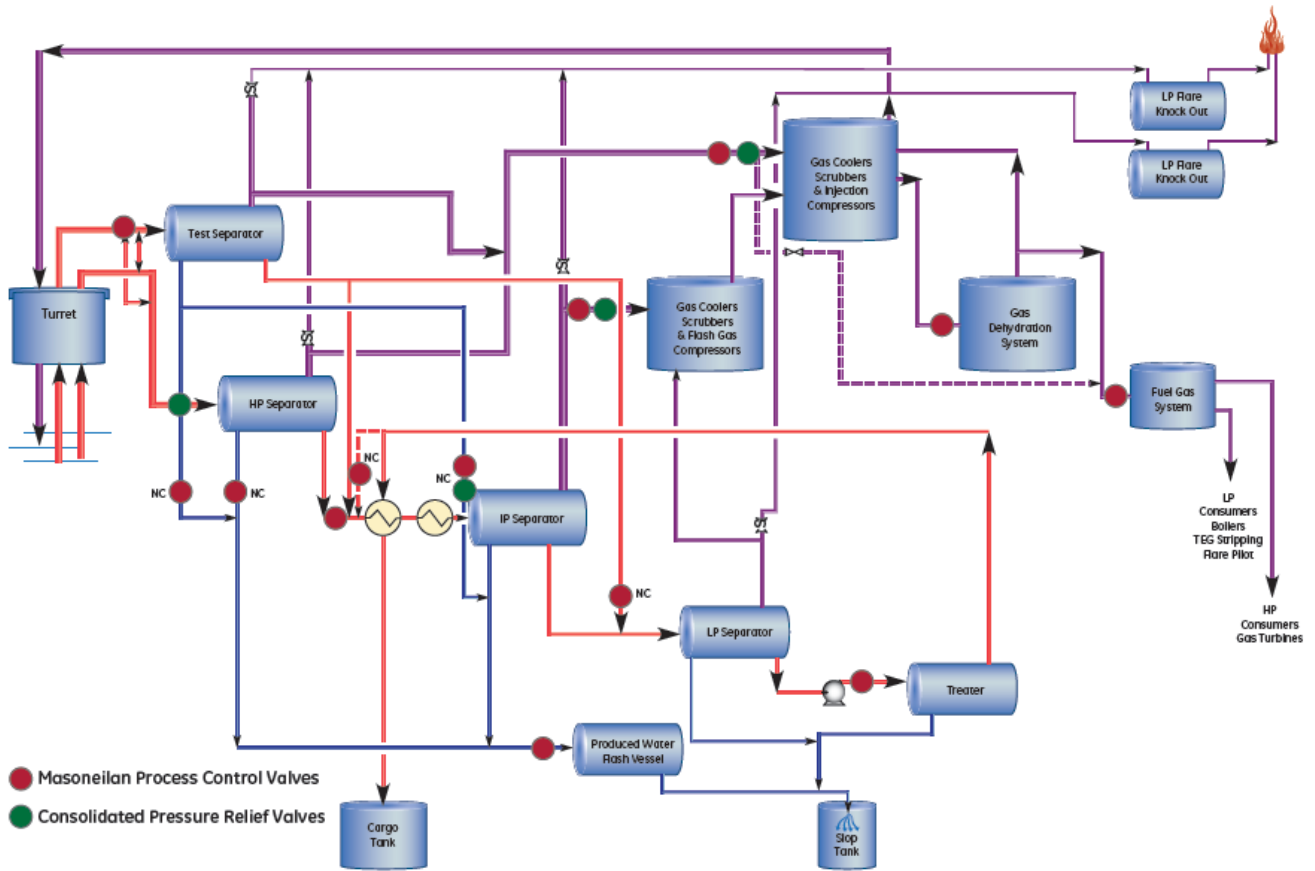
8. High-Pressure Gas-Injection Compressors
9. Intermediate-Pressure Gas-Lift Compressors
10. High-Pressure Compressors
11. Gas-Turbine Compressor Drivers

Auxiliary

12. Utilities and Water-Treatment Module
13. Chemical Storage
14. Gas Scrubbers
15. Water-Injection Pump
16. Gas-Turbine Generators



FPSO Process Flow Diagram



High - Pressure Gas - Injection Compressors



Intermediate - Pressure Gas - Lift Compressors



Crude Oil Treatment, Desalting

Separation

Featured Solutions

Gas Wellhead Control

Masoneilan 77000 Series Axial Flow, Multi-Stage Trim Valve

The 77000 Series valve was developed for extremely high pressure applications that require multiple pressure letdown stages and an expanding downstream area in the trim to accommodate compressible flow expansion. By directing the flow through a series of expanding stages, the trim design helps reduce the pressure of dirty gases and flashing/multiphase liquids.



77000 Series
Multi-stage
Control Valve

Multiphase Applications

Consolidated 1900 Series Universal Media Valve

The 1900 Series Universal Media valve is certified for both liquid and vapor to change from one medium to another without adjustments, whether you have a multiphase process, or multiple processes running at the same temperature and pressure with different media.



1900 UM Series
Safety Relief Valve

Dehydration

Featured Solutions

High Pressure Letdown Masoneilan LincolnLog™

The leading cause of poor control valve performance and premature failure in high pressure liquid letdown service is cavitation. The LincolnLog anti-cavitation control valves can be custom engineered with as many as 10-stages of pressure reduction for applications with extreme pressure drops in excess of 8000 psi (550 Bar).



78400/18400 Series LincolnLog
Severe Service Control Valve

Remote Diagnostics and Monitoring

ValVue™ Suite Valve Aware™

ValVue is online diagnostic software that monitors the health of control valves for efficient process control.



Smart Valve Interface (SVI) II Advanced Performance Digital Valve Positioner

The SVI II AP positioner is a scalable HART positioning and control solution that offers control valve operations with simple setup and commissioning. The high capacity design of the Masoneilan SVI II AP positioner enables control of the compressor antisurge valve.



SVI II AP Digital Valve Positioner

Compression Featured Solutions

Compressor Anti-Surge Systems

The Masoneilan compressor anti-surge package is suited for FPSO compressor demands. The custom package can manage fluid velocity with as many as 40 stages of pressure reduction and can fully stroke in as little as 0.5 seconds.



General Service Valves

Baker Hughes line of Masoneilan process control valves and Consolidated pressure relief valves include general service solutions for offshore applications. To support the varying process conditions, these products are available in a wide range of sizes, pressure ratings (ASME/API), and materials.



1900 Series
Safety Relief Valve



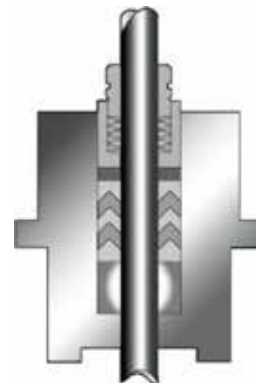
35002 Series *Camflex*[™]
Rotary Control Valve



21000 Series
Globe Style Control Valve

EF Seal Low Emissions Packing System

Addressing growing environmental concerns about industrial plant fugitive emissions, we offer low emissions packing options for globe and rotary valve designs to meet various global and regional regulatory requirements.



Low-E[™] Packing

Auxiliary Processes Featured Solutions

Water Injection Valves

Masoneilan 49000 Series V-LOG Low Noise, Anti-Cavitation Valve

The valve features an energy management trim for a severe service solution suited to high-pressure drop applications with potential damaging noise or cavitation problems.



49000 Series V-LOG
Low-Noise, Anti-Cavitation
Control Valve



Consolidated Pilot-Operated Safety Relief Valves

Consolidated Pilot-Operated Safety Relief Valves (POSRV) feature a modular design that offers a common platform over a wide range of applications for flexibility and reduced inventory and maintenance costs. The compact pilot design is well suited to offshore platforms where space is limited, and the tubeless design helps to reduce damage in harsh at-sea environments.

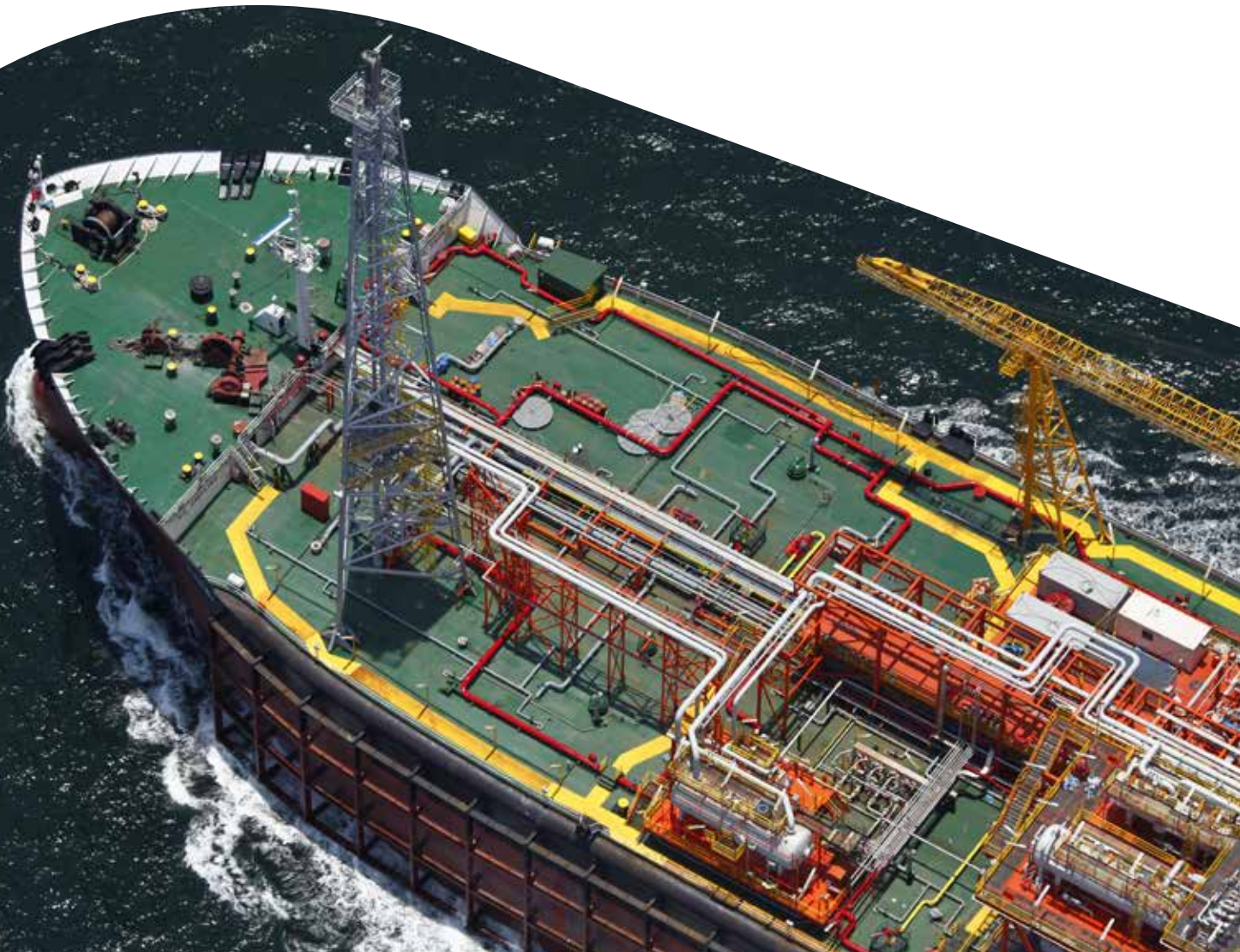


3900 Series
Pilot Operated
Safety Relief Valve



Solutions | Innovation | Technology

Customized high-performance
solutions in harsh conditions



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