



PETRONIC

valves and actuators

subsea electric actuators

BENEFITS



ENVIRONMENTALLY FRIENDLY
no leaks, zero discharge



ADVANCED DIAGNOSTIC
continuous monitoring - partial
stroking test - torque limiting



RELIABILITY
25 years of operational life - SIL 2
certified in High Demand Mode



SAFETY FIRST
overall risk mitigation of the plant



PROJECT COST SAVINGS
no hydraulic umbilicals and no HPU



POWER EFFICIENCY
avoiding hydraulic pressure drops
and providing power consumption
optimization

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MAIN FEATURES

SMART CONTROL CHARACTERISTICS

- ▶ Start/Stop torque control
- ▶ Continuous positioning
- ▶ Speed setting and control
- ▶ Max output torque limiting device
- ▶ Feed-back control position
- ▶ Speed control shaping to power consumption optimization

INTERCONNECTIONS UTILITIES

- ▶ Serial connection for test bench interface
- ▶ Different communication protocols available:
Canbus (SIIS Level 2 - Fault tolerant),
CANopen, MODBUS, TCP/IP, ETHERNET

DIAGNOSTIC CHARACTERISTICS

- ▶ Continuous voltage and current supply monitoring and control
- ▶ Partial stroking test
- ▶ Motor high temperature self-protection

MECHANICAL CHARACTERISTICS

- ▶ Nominal torque: 2.700 Nm ISO 13628-8 class 4 (different setting upon request)
- ▶ Nominal motor torque: 10 Nm
- ▶ Nominal motor speed: 1000 rpm

ELECTRIC CHARACTERISTICS

- ▶ Nominal voltage 24 VDC (range 12-36 VDC)
- ▶ Stand-by power consumption: 16W
- ▶ Different output torque on request

EXECUTION

- ▶ Stand-alone
- ▶ Back-up battery

ENVIRONMENTAL CONDITION

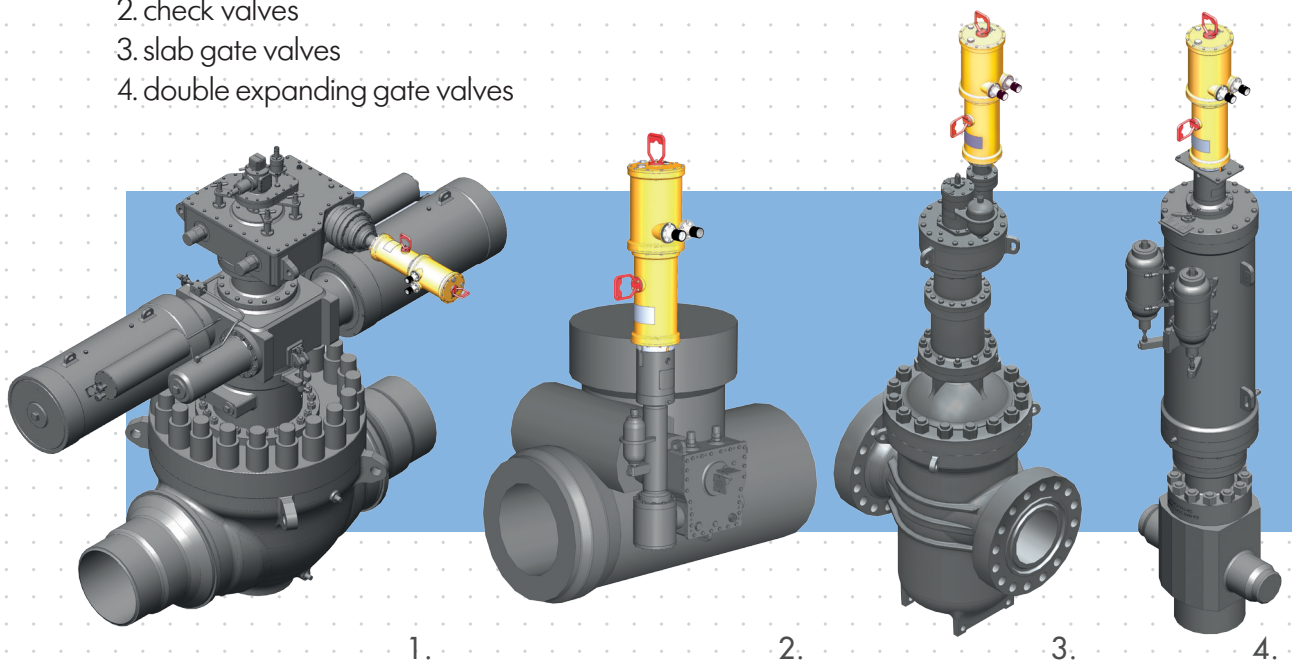
- ▶ Pressure compensated electronic design: 300 bar (tested up to 450 bar) for 12.000 cycles
- ▶ Working temperature from -10°C to +65°C

qualification tests PERFORMED

- ▶ Functional test - ISO 13628
- ▶ Endurance Test (10.000 cycles) - ISO 13628
- ▶ Hyperbaric and Endurance Test (12.000 cycles@450 bar) - ISO 13628
- ▶ Motor Driver Board Test
- ▶ Mother Board Test
- ▶ Power Board Test
- ▶ Controller Board Test
- ▶ Electronic-Motor System Test
- ▶ Thermal Analysis Test
- ▶ PR2 Qualification Test (-10°C to +65°C) API 6A and API 17D
- ▶ Environmental Compatibility Test
- ▶ Vibration and Shock Test
- ▶ Electromagnetic Compatibility Test
- ▶ PETRONICEROV Reliability Analysis

petronic ADAPTABILITY

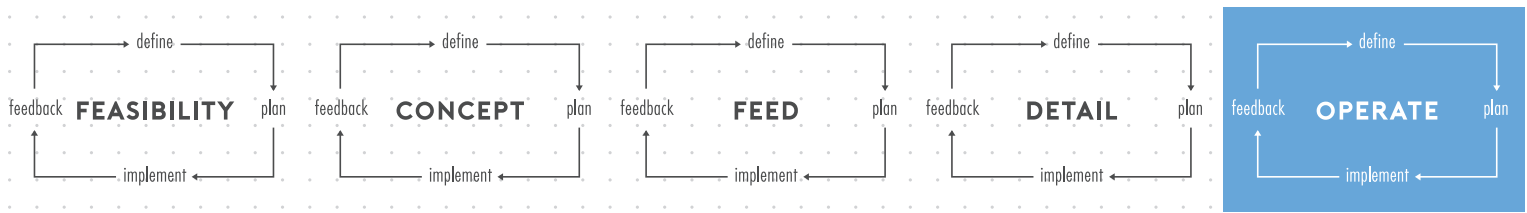
1. ball valves
2. check valves
3. slab gate valves
4. double expanding gate valves



petronic development approach

API RP 17N/ISO 13628-13

Recommended practice for subsea production
system reliability and technical risk management

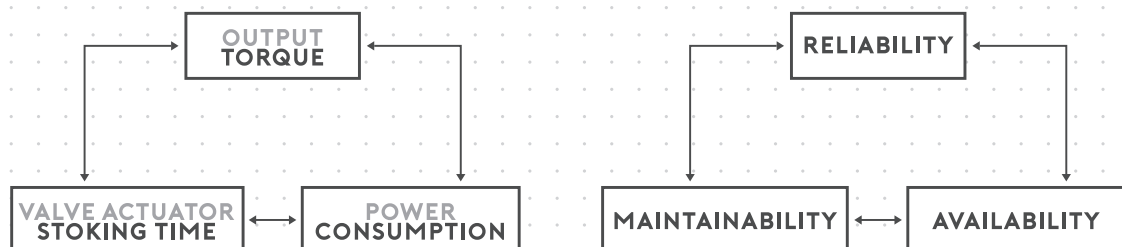
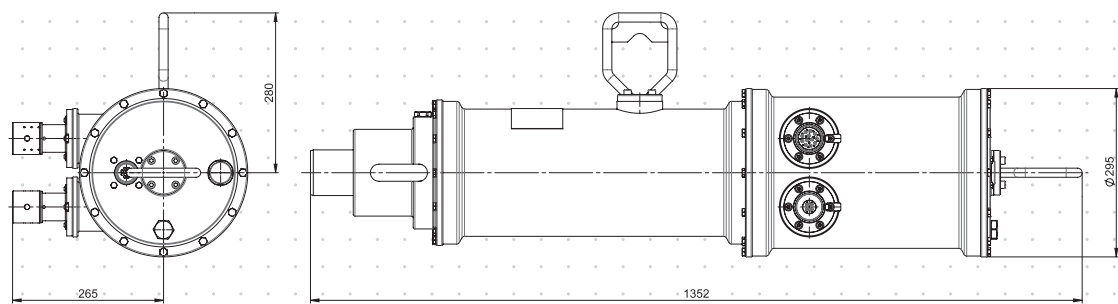


sizes and performances

TO MEET EVERY REQUIREMENT

Petronic subsea electric actuator is ergonomic,
modular designed and fully customizable.

Different model sizes are available to meet
project specifications and Client's requirements

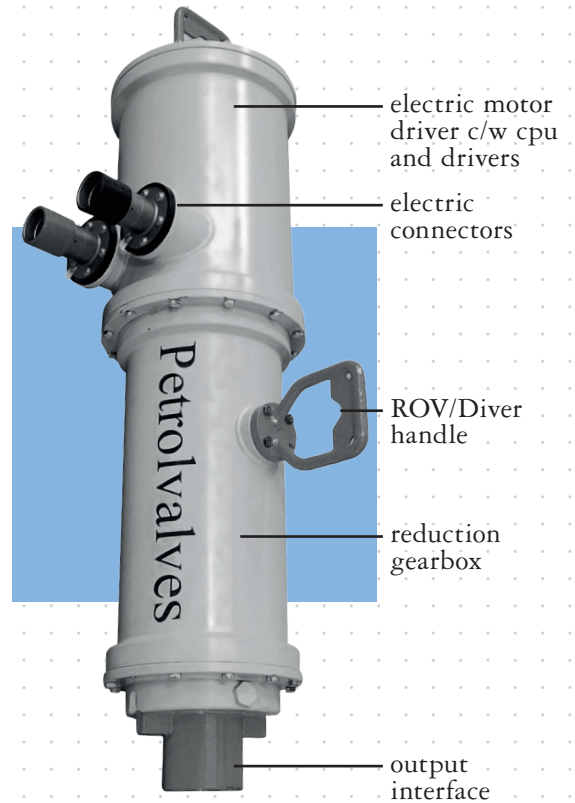


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ADVANTAGES

Subsea electric actuation offers several advantages:

- ▶ Environmentally friendly
- ▶ Overall project cost reduction
- ▶ Real-time feedback
- ▶ Power efficient
- ▶ Pollution emission free
- ▶ Certified SIL in accordance with IEC 61508: 2000



sil calculation

AND RELIABILITY ANALYSIS

SAFETY INTEGRITY LEVEL	
safety integrity levels for high demand mode of operation (IEC 61508-1 table 3)	
safety integrity level	probability of a dangerous failure per hour
SIL 4	$\geq 10^{-9}$ to $< 10^{-8}$
SIL 3	$\geq 10^{-8}$ to $< 10^{-7}$
SIL 2	$\geq 10^{-7}$ to $< 10^{-6}$
SIL 1	$\geq 10^{-6}$ to $< 10^{-5}$
table 3 "safety integrity levels for high demand mode of operation"	

HARDWARE FAULT TOLERANCE			
architectural constraints on type A* safety-related subsystems (IEC 61508-2 table 2)			
SAFE FAIL FRACTION	HTF		
	0	1	2
$< 60\%$	SIL 1	SIL 2	SIL 3
$60\% \div 90\%$	SIL 2	SIL 3	SIL 4
$90\% \div 99\%$	SIL 3	SIL 4	SIL 4
$> 99\%$	SIL 3	SIL 4	SIL 4
table 2 "architectural constraints on type A* safety-related subsystems"			



MANUFACTURING PLANT

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