ISP - Intelligent Subsea Positioner

Val Controls® A/S
 Intelligent valve control based on the latest know-how concerning digital technology for advanced positioners and switchboxes suited for pneumatic and hydraulic actuators. Our key task is to assist valve and actuator manufactures in finding the most optimal solution for control and/or monitoring of their product. We discover the best solutions for hazardous areas and harsh environments combined with cost reduction potentials on power.

Product development strategy
- Energy saving
- Process saving
- Resource saving
- User friendly

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Val Controls develops and manufacture Intelligent Subsea Positioners. They are used for valve positioning and have an integrated microprocessor with very flexible software, so the positioner fits almost any hydraulic rotary, linear, double-acting, spring return and stepping actuator on the market.

The ISP is controlled via 4-20mA or CANopen which also can be used to replace the application software even when the ISP is mounted at the seabed and in operation.

The subsea positioner offers several advantages.

- CANopen communication protocol
- Certified CAN boot loader to replace application software while in operation
- Submersible 1100 meters or deeper
- Spring return and double acting actuator control
- Estimated design life: 30 years
- Design temp. range: -20°C/85°C
- Custom enclosure and connections
- Fully redundant
- ESS tested

The subsea positioner has been designed to be very reliable and the software has been tested according to very though demands.
General function description

The ISP uses Solenoid Operated on/off Valves, SOV, to move the actuator to the requested set point. It has 2 outputs to control SOV’s and the ISP is designed for low power subsea solenoid valve of any manufacture. It fits almost any subsea solenoid operated valve on the market.

The desired position of the valve is sent to the ISP via the 4-20mA control loop or CANopen communication protocol. The actual position is measured by the ISP via a 4-20 mA sensor. The set point and position signal is compared and the actuator is moved to the requested position.

On the right side of this page there are shown some examples of how typical hydraulic control systems can be designed. All our typical designs controls 2 solenoid operated valves. The positioner is also easily adapted to any already existing control systems or other designs.
**Thermal and vibration test (ESS test)**

Environmental stress screening (ESS) refers to the process of exposing a newly manufactured or repaired product or component (typically electronic) to stresses such as thermal cycling and vibration in order to force latent defects to manifest themselves by failure during the screening process. The surviving population, upon completion of screening, can be assumed to have a higher reliability than a similar unscreened population.

This process can be used to take the product to failure to determine how well the product performs under extreme conditions. For example, the reliability of solder joints can be tested using mechanical shock testing, one of many ESS processes. Mechanical shock is part of an ESS test plan that has great impact on solder joints, where failure can be critical. Mechanical shock testing simulates the sudden applied force or change of movement through handling, shipment, and field use. Some effects of mechanical shock are: 1) components detached from the printed circuit board; 2) cracks in the solder joints; and 3) multi-leaded component leads detached.

All Val Controls Subsea positioners go through an ESS test as described below, to verify that each unit is capable of surviving the harsh environment on the sea bed.

**Vibration, endurance**

20 - 80 Hz: +3 dB/oct, 80 - 350 Hz: 0.04 g²/Hz, 350 - 2000 Hz: -3 dB/oct., 6 grms, 10 min

Ref.: ISO/DIS 13628-6, chapter 11.3.5.2 and also EN/IEC 60068-2-64

**Thermal cycling**

+85 °C/-20 °C, min. 5 °C/min, 30 min. dwell, 10 cycles

Ref.: ISO/DIS 13628-6, chapter 11.3.5.2 and also EN/IEC 60068-2-14

**High temperature operation (full load)**

+85 °C, 48 hours (NB! Forced circulation of air required)

Ref.: ISO/DIS 13628-6, chapter 11.2.5.3 and also EN/IEC 60068-2-2
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References

Project name: Ormen Lange
Location: Norway
Total number: 26 units
Project description: The positioner which was designed for the Ormen Lange gas field in the Norwegian Sea in 2007. The positioner communicates with the control system using CANopen protocol and the software has a bootloader which means that when the system is installed on the sea bed, the application software can be updated without any stop in production if needed.
Application: MEG injection valve. Due to the location and water depth, the water vapour in the hydrocarbon gas can freeze and requires MEG injection – a type of antifreeze – to prevent hydrate formation. Once the MEG is injected into the gas well it is then re-generated by circulating it onshore, where it is then filtered back offshore.

Project name: Gorgon
Location: Australia
Total number: 20 redundant units
Project description: The positioners are for the Greater Gorgon Project, 200km off the west coast of Australia. Containing 40 trillion cubic feet of natural gas, it is one of the most significant oil and gas projects in the world. The positioner for the Gorgon gas field is designed to be fully hardware redundant. The positioner communicates with the control system using CANopen protocol and the software has a bootloader which means that when the system is installed on the sea bed, the application software can be updated without any stop in production if needed.
Application: MEG injection valve. Due to the location and water depth, the water vapour in the hydrocarbon gas can freeze and requires MEG injection – a type of antifreeze – to prevent hydrate formation. Once the MEG is injected into the gas well it is then re-generated by circulating it onshore, where it is then filtered back offshore.

Project name: Gryphon and Dumbarton
Location: Great Britain
Total number: 2 units
Application: Multiport selector.
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Hardware features
The IHP range comes with the following in- and out-puts.

<table>
<thead>
<tr>
<th>Model</th>
<th>Analogue</th>
<th>CAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analogue input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-20mA control loop</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Position feedback - 4-20mA</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Analogue output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-20mA transmitter loop</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Digital inputs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply to unit</td>
<td>24VDC</td>
<td>24VDC</td>
</tr>
<tr>
<td>Digital outputs</td>
<td>● / 2</td>
<td>● / 2</td>
</tr>
<tr>
<td>Max power consumption per output</td>
<td>12W @24VDC</td>
<td>12W @24VDC</td>
</tr>
<tr>
<td>Communication protocols</td>
<td>CANopen communication</td>
<td>●</td>
</tr>
<tr>
<td>Design</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

Software features
The IHP range comes with the following software functions.

<table>
<thead>
<tr>
<th>Model</th>
<th>Subsea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic regulator functions</td>
<td>●</td>
</tr>
<tr>
<td>Manual calibration</td>
<td>●</td>
</tr>
<tr>
<td>Intelligent valve positioning</td>
<td>●</td>
</tr>
<tr>
<td>User interface</td>
<td>●</td>
</tr>
<tr>
<td>Manual control of valves and actuator</td>
<td>●</td>
</tr>
<tr>
<td>Error handling</td>
<td>●</td>
</tr>
<tr>
<td>Standards</td>
<td>●</td>
</tr>
<tr>
<td>Compliance to CiA301, CiA302, CiA404</td>
<td>●</td>
</tr>
</tbody>
</table>