WELLHEAD CONTROL SYSTEM – EH36 SERIES

EMBRACE THE POWER OF THE LATEST TECHNOLOGICAL SOLUTION

FOR THE CONTROL OF:
» SUB-SURFACE SAFETY VALVE (SCSSV)
» SURFACE MASTER VALVE (SSV-A)
» SURFACE WING VALVE (SSV-B)
» DIVERTER VALVE
» EQUALIZING VALVE
» FLOW CONTROL VALVE

VALUE – ADDED FEATURES:
» Fail Safe Design
» High CV Valve
» No Pneumatic Supply Needed
» NAS 1638 Class 6 Compliant
» Competitively Priced vs. Conventional Pneumatic System
» Eliminate Source Fluctuation & Throttling Effect During Shutdown

Product Brochure
EH36 SERIES ▶ PC2PIH SERIES ▶ PC2HIH SERIES ▶ ELPC – 2HIH SERIES ▶ EDC – 1HIH Series
**Eagle Control Matic** EH36 Series of Wellhead Control Systems is the ultimate solution to your Demand of Technological Excellence. Synonymous to the art of Innovation, Reliability with Stringence in Quality and conforming to International Health, Safety and Environmental Standards, our Wellhead Control System has continuously proven to be the preferred choice in the Oil & Gas Industries for its reputation of incorporating Superior Engineering Design Capability with minimum cost and maximum productivity.

**WELLHEAD CONTROL SYSTEM**

- **EH36 Series**

**THE ULTIMATE SOLUTION FOR THE OIL & GAS INDUSTRIES**

**INTRODUCING THE TECHNOLOGY**

**THE SYSTEM OPERATION**

**Eagle Control-matic** EH36 Series is a fail-safe integrated Low Powered Microprocessor Based Electro-Hydraulic Actuating Wellhead Control System. Its is compactly designed for 36 control modules which can be isolated, removed and interchanged between modules. The multi-well operated wellhead control panel, is a stand alone unit with its control logics for ESD, PSD, Opening & Closing Sequencing and Shutdown Delays programmed into its locally mounted RTU. The operation of the panel is through touch-screen operator panel mounted on the front of the RTU panel.

The panel’s RTU is linked to the platform DCS via RS-485 where the status of the panel hydraulic supply headers, hydraulic reservoir level, SSVs and SCSSVs will be available for remote monitoring and if necessary remote activation of ESD, PSD or Closing of any well strings.

The panel RTU is programmed for 2 types of facilities shutdown which will cause the wellhead valves to respond as follow:

**PSD »** This will activate the closure of all SSV-As, SSV-Bs, SDV, Diverter Equalizing Valve and Flow Control Valve in response to process upsets signals received.

**ESD »** This will activate the closure of all the SSVs and SCSSVs in respond to fire detected, gas detected, loss of instrument gas pressure or by operator action.

**Base Model** : WHEH/27M9S/SC08-10-0.25-100/S05-06-2.6-30/W05-06-2.6-30/A-12/10-5/A3/A

**Extended Model** : 17SD03-04-0.1-30/6CV03-04-0.1-30/AN/D2/20DI-20DO-10AI-10AO/ACU-NAS

**FEATURES**

- 316L Stainless Steel TECO Panel
- 316L Stainless Steel TECO Hydraulic Reservoir
- Hydraulic Power Generating Unit
- High Pressure High Flow Hydraulic Filtration Unit
- Hydraulic Energy Storage Accumulator Rack
- Main Header Analog Pressure Transmitting Unit
- Choke Valve Hydraulic Supply Unit
- Wellhead Control Modules
- Diverter Valve Control Module
- SDV Control Module
- Equalization Valve Control Module
- Flow Valve Control Module
- Remote Terminal Unit (RTU)
- Human Machine Interface (HMI)
- Explosion-proof Air-Conditioning
- Nitrogen Intensifier Unit (optional)
- Hydraulic Cleanliness Filtration Unit (optional)

**BENEFITS**

- Eliminates the need for pneumatic supplies
- Eliminates the low pressure hydraulic pilot system
- Reduce massive cabling between the WHCP and PCS/SIS
- Utilizing High Pressure Pilot Solenoid Valve
- Block before bleed valve operation
- Snap acting operation
- High Flow
- Reduce tubing & fittings from the Low Pressure Pilot System
- Field proven design
- Specific timing control by the PMCS via RTU eliminating the use of the conventional flow control valve design
- Interchangeable module design will enable any faulty modules to be removed and replaced with a spare module at a minimum downtime.
- NAS 1638 Class 6 hydraulic cleanliness compliant
- Low Operating Cost and Minimum Spare Parts Inventory

* denotes Advanced Technology

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2
“Integrated Microprocessor Based Electro-Hydraulic Actuated” Wellhead Control System Configuration.

**CRITERIA:**
- Control System sized for: 36
- Active Wellhead Control Modules: 10
- Spare slots for Wellhead Control Modules: 02
- Active Diverter Valve Control Modules: 12
- Spare slots for Diverter Valve Control Modules: 04
- Active SDV Control Modules: 03
- Spare slot for SDV Control Modules: 03
- Active Equalizing Valve Control Modules: 01
- Active Flow Control Valve Control Modules: 01
- Choke Valve Hydraulic Distribution for: 06

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**Diagram Details:**
- **Hydraulic Energy Storage Accumulator Rack**
- **220 VAC, 50Hz Power Supply**
- **Hydraulic line to SSV-A**
- **Hydraulic line to SSV-B**
- **24 VDC Power Supply**
- **To DCS**
- **Hydraulic line to Flow Control Valve**
- **Hydraulic line to SSV**
- **Hydraulic line to SCSSV**
- **Diverter Valve** (Bettis G01001.5-M11)
- **SDV** (Bettis G01001.7-SR4-CW)
- **Equalizing Valve** (Bettis G01001.7-SR4-CW)
- **Flow Control Valve** (Bettis G01001.7-SR4-CW)
- **HP and IP Power Generating Unit**
- **Hydraulic Energy Storage Accumulator Rack**
- **380 VAC, 3p+N, 50Hz Power Supply**
- **RTU Section**
WELLHEAD CONTROL SYSTEM
– EH36 Series

THE SYSTEM FEATURES – Hydraulic Power Section

A. TECO Hydraulic Reservoir

• The fully welded hydraulic supply reservoir which is mounted at the top of the panel is constructed from 3mm thick 316L stainless steel, sized for 36 modules operation. The supply reservoir is equipped with a filter-breather for filtering during filling, level sight glass for local visual indication, flame arrester for avoiding any possible cause of fire or explosion at the tank from external sources of ignition, inspection cover for reservoir inspection & cleaning and drain valve to drain the reservoir during cleaning.

• A HART protocol differential pressure transmitter mounted at the side of the reservoir facilitates remote monitoring of the hydraulic level and stop the pump when low-low reservoir level is detected.

B. Hydraulic Power Generating Unit

• The Hydraulic Power Generating System comprises of 2 main header namely the High Pressure Header (HP) and Medium Pressure Header (MP).

• The MP & HP Header shall consist of 2 nos. of motor driven check ball design hydraulic piston pump, 1 duty and 1 standby, with isolation valve arrangement to permit on line repair and replacement. Each hydraulic pump suction side will have a 0.8mm screen strainer for hydraulic fluid straining before entering the pump suction port. At each pump discharge side, a pressure safety valve sized to the pump flow rate to provide over-pressure protection and a 2-1/2” dial stem mounted pressure gauge with blow-out plug for local pressure monitoring is provided.

• An additional check valve in additional to the check ball in the pump is also installed to prevent any possible back flow of the discharge hydraulic back to the pump. Each of the MP Hydraulic Pump is sized to charge the energy storage accumulators at the MP header from 1200 psig to 1600 psig in 5 minutes and from 0 psig to 1200 psig in 10 minutes. Similarly, each HP Hydraulic Pump is sized to charge the energy storage accumulators at the HP header from 3600 psig to 4800 psig in 5 minutes and from 0 psig to 3600 psig in 10 minutes. An optional manual hand pump facility for HP header hydraulic back-up is provided for manual pumping of HP pressure when the electric driven pumps fails.

C. High Pressure High Flow Hydraulic Filtration System - with DP Filter Status Monitoring

• The MP header will provide the required hydraulic supply pressure to operate the WVs, SSVs and SSIVs while the HP header will provide the required hydraulic supply pressure to operate the SCSSVs and Down hole Choke Valves. To ensure the hydraulic on each MP and HP header is free from impurity for problem-free hydraulic valve operation and prolong the system components life span, a set of high pressure high flow Tee-Type Filter for each header is provided to filter the pump discharged hydraulic to a cleanliness level of NAS 1638 Class 6 or better.

• Isolation block valve arrangement to permit on line cleaning and replacement of the filter is provided to ensure easy filter maintenance without disrupting the panel operation to monitor the filter element clogging status at each MP and HP header, a differential pressure transmitter with local indication for each header is installed in parallel to the set of filters.

Eagle Control - Matic™
THE SYSTEM FEATURES – Hydraulic Power Section

D. Choke Valve Hydraulic Supply Unit - Optional

- A Choke Valve header distribution sized to provide hydraulic pressure for 6 nos. of Master-Flo Surface Stepping Actuator Choke Valve, is generated by tapping the pressure from the IP Header through dual hydraulic regulation facility with isolation block valve arrangement for online maintenance.
- To facilitate manual shutdown intervention, the Choke Valve header will consist of a local supply isolation selector which will allow the operator to isolate the header supply pressure and return the hydraulic from the choke valves back to the hydraulic reservoir thereby closing all choke valves.

D. Hydraulic Energy Storage Accumulator Rack

- In order to maintain continuous operation in the event of pump failure, a set of hydraulic accumulators, sized to open 1 WV, 1 SSV & 1 SSIV for 2 cycles operation are provided at the MP header.
- Similarly a set of accumulator, sized to open 1 SCSSV & 1 Down hole Choke Valve for 2 cycles operation is also be provided at the HP header for the same operation purpose.
- Each accumulator installation is provided with isolation and draining facility to permit on line maintenance of any accumulator without disrupting the operation of the panel. To satisfy international code of practice, all hydraulic accumulators are "U"-Stamped and designed to meet ASME Code Section VIII Div 1.

E. Main Header Analog Pressure Transmitting Unit

- In order to enable the operator to monitor the header pressure, the panel front of the Hydraulic Power Section will have 2-1/2" dial safety gauges with blow-out plug to provided local pressure monitoring of the IP header, HP header and Choke Valve header.
- Remote monitoring of all the headers will also be possible from the HART protocol pressure transmitter sending its signal to the panel RTU.
THE SYSTEM FEATURES – Module Section

A. General

• The module section shall consist of 2 types of modules each type shall have its module housing design typically such that it can be removed and interchanged between module of the same types.

• The 2 types of modules are mainly:
  1. Production Wellhead Control Module
  2. Water Injection Wellhead Control Module

B. Production Wellhead Control Module

• There are 8 nos. of active Wellhead Control Modules with allocation for 8 nos. of spare slots for future addition. Each module shall consist of 4 nos. of high pressure pilot, 24VDC, low powered hydraulic solenoid valve for WV, SSV, SSIV & SCSSV Open/Close control, 4 nos. of thermal safety relieving facilities for relieving of access pressure along each WV, SSV, SSIV & SCSSV actuating line caused by thermal expansion of the hydraulic fluid, 4 nos. of panel mounted 2-1/2” dial safety gauges with blow-out protection for local monitoring of each WV, SSV, SSIV & SCSSV hydraulic control line, 4 nos. of 316SS hermetically sealed pressure switches for remote status monitoring of each WV, SSV, SSIV & SCSSV status and 9 nos. of EEx’d’e’ certified panel mounted pushbutton for Open / Close initiation for WV, SSV, SSIV & SCSSV and initiation of Well Shutdown.

• Module isolation facility shall also be provided for the hydraulic supply line, tee off from the MP and HP header, to the individual module. Hydraulic back flow prevention facility will also be provided at the hydraulic supply line to each module WV, SSV, SSIV and SCSSV to prevent the loss of pressure from the rest of the modules when any 1 of the module is pressurized. This facility will also be provided at the hydraulic return line to prevent the back flow of returned hydraulic when the module is drawn out.

C. Water Injection Wellhead Control Module

• There are provision for 4 nos. of Water Injection Wellhead Control Modules as spare slots for future addition. Each module shall consist of 4 nos. of high pressure pilot, 24VDC, low powered hydraulic solenoid valve for WV, SSV, SSIV & SCSSV Open/Close control, 4 nos. of thermal safety relieving facilities for relieving of access pressure along each WV, SSV, SSIV & SCSSV actuating line caused by thermal expansion of the hydraulic fluid, 4 nos. of panel mounted 2-1/2” dial safety gauges with blow-out protection for local monitoring of each WV, SSV, SSIV & SCSSV hydraulic control line, 4 nos. of 2.3.5 316SS hermetically sealed pressure switches for remote status monitoring of each WV, SSV, SSIV & SCSSV status and 9 nos. of EEx’d’e’ certified panel mounted pushbutton for Open / Close initiation for WV, SSV, SSIV & SCSSV and initiation of Well Shutdown.

• Module isolation facility shall also be provided for the hydraulic supply line, tee off from the MP and HP header, to the individual module. Hydraulic back flow prevention facility will also be provided at the hydraulic supply line to each module WV, SSV, SSIV and SCSSV to prevent the loss of pressure from the rest of the modules when any 1 of the module is pressurized. This facility will also be provided at the hydraulic return line to prevent the back flow of returned hydraulic when the module is drawn out.
THE SYSTEM FEATURES – Module Section

A. SCSSV Activate to Close

Closing Sequence
During shutdown operation, the closing of the well shall also be in sequence by inter-locking logic with time delay controlled by the RTU. The well delay logic in the RTU shall close the SSV-A first, subsequently the SSV-B will close after a time delay of 30 sec when SSV-A depressurized and finally the SCSSV will close after another 30 sec when the SSV-B depressurized. The control will similarly take the hydraulic line pressure switch signal as the valve close confirmation signal before starting the delay timer to close the next actuator valve.

B. SCSSV Activate to Open

Opening Sequence
During normal operation, the opening of the well shall be in sequence by operator activation with inter-locking logic controlled by the RTU. The well inter-locking logic in the RTU shall allow the SCSSV to open first, subsequently the SSV-B and finally the SSV-A. The control will take the hydraulic line pressure switch signal as the valve open confirmation signal before allowing the subsequent valve to be pressurized for opening.
### Closing Sequence

During shutdown operation, the closing of the well shall also be in sequence by inter-locking logic with time delay controlled by the RTU. The well delay logic in the RTU shall close the SSV-A first, subsequently the SSV-B will close after a time delay of 30 sec when SSV-A depressurized and finally the SCSSV will close after another 30 sec when the SSV-B depressurized. The control will similarly take the hydraulic line pressure switch signal as the valve close confirmation signal before starting the delay timer to close the next actuator valve.

### Opening Sequence

During normal operation, the opening of the well shall be in sequence by operator activation with inter-locking logic controlled by the RTU. The well inter-locking logic in the RTU shall allow the SCSSV to open first, subsequently the SSV-B and finally the SSV-A. The control will take the hydraulic line pressure switch signal as the valve open confirmation signal before allowing the subsequent valve to be pressurized for opening.
THE SYSTEM FEATURES – Module Section

E. SSV-B ACTIVATE TO CLOSE

Closing Sequence
During shutdown operation, the closing of the well shall also be in sequence by inter-locking logic with time delay controlled by the RTU. The well delay logic in the RTU shall close the SSV-A first, subsequently the SSV-B will close after a time delay of 30 sec when SSV-A depressurized and finally the SCSSV will close after another 30 sec when the SSV-B depressurized. The control will similarly take the hydraulic line pressure switch signal as the valve close confirmation signal before starting the delay timer to close the next actuator valve.

Legend
A – Solenoid Valve
B – Manual Isolation Valve
C – Manual SCSSV Hyd. Selector Valve
D – 316SS Pressure Switch
E – Pressure Gauge
F – Thermal Safety Valve
G – Check Valves
H – Isolation Ball Valves

– Hydraulic Supply Line
– Hydraulic Return Line
– Hydraulic Tubing

F. SSV-B INITIATE TO OPEN

Opening Sequence
During normal operation, the opening of the well shall be in sequence by operator activation with inter-locking logic controlled by the RTU. The well inter-locking logic in the RTU shall allow the SCSSV to open first, subsequently the SSV-B and finally the SSV-A. The control will take the hydraulic line pressure switch signal as the valve open confirmation signal before allowing the subsequent valve to be pressurized for opening.

Legend
A – Solenoid Valve
B – Manual Isolation Valve
C – Manual SCSSV Hyd. Selector Valve
D – 316SS Pressure Switch
E – Pressure Gauge
F – Thermal Safety Valve
G – Check Valves
H – Isolation Ball Valves

– Hydraulic Supply Line
– Hydraulic Return Line
– Hydraulic Tubing
THE SYSTEM FEATURES – Module Section

Type ‘B’ Module – Diverter Valve Control Module

- There shall be 12 nos. of active Diverter Valve Control Modules with allocation for 4 nos. of spare slots for future addition. Each module shall consist of 2 nos. of 2.3.2 high pressure pilot, 24VDC, low powered hydraulic solenoid valve for Open (XVO) & Close (XVC) control of the double acting Diverter Valve. For each XVO and XVC hydraulic control line, a 2.3.3 thermal safety valve for relieving of access pressure along each actuating line caused by thermal expansion of the hydraulic fluid and a 2.3.4 panel mounted 2-1/2” dial safety gauges with blow-out plug for local hydraulic pressure monitoring will also be provided.

- Panel mounted manual isolation facility for each XVO & XVC actuating line will also be available for local operator isolation and closing of the Diverter Valve. 2.3.6 isolation facility shall also be provided for the hydraulic supply line, tee off from the IP header, to the individual module.

- Back flow prevention facility will be provided at the hydraulic supply line to prevent the loss of pressure from the rest of the modules when 1 of the module is pressurized. 2.3.8 Similar facility will also be installed at the hydraulic return line to prevent the back flow of returned hydraulic when the module is drawn out.

Closing Sequence
During closing operation, the closing of the double acting Diverter Valve shall be by operator activation with inter-locking logic controlled by the RTU. The inter-locking logic in the RTU shall activate the XVC solenoid while de-energizing the XVO solenoid upon initiation to close the Diverter valve.

Opening Sequence
During normal operation, the opening of the double acting Diverter Valve shall be by operator activation with inter-locking logic controlled by the RTU. The inter-locking logic in the RTU shall activate the XVO solenoid while de-energizing the XVC solenoid upon initiation to open the Diverter valve.
THE SYSTEM FEATURES – Module Section

'C' Module - SDV Control Module, Equalization Control Valve Control Module & Flow Control Valve Control Module

- There shall be 3 nos of active SDV Control Modules, 1 no. of Equalization Control Valve Control Module and 1 no. of Flow Control Valve Control Module with allocation for 3 nos. of spare slots for future addition. Each module shall consist of a high pressure pilot, 24VDC, low powered hydraulic solenoid valve for the process valve single acting actuator control, a thermal safety valve for relieving of access pressure along each process valve actuating line caused by thermal expansion of the hydraulic fluid, a panel mounted 2-1/2” dial safety gauges with blow-out plug for local monitoring of each process valve hydraulic control line pressure, pressure switches for remote status monitoring of each process valve status and a panel mounted manual isolation facility for each process valve actuating line for local operator isolation and valve closing.

- Similar isolation facility shall also be provided for the hydraulic supply line, tee off from the IP header, to the individual module.

- Back flow prevention facility will also be provided at the hydraulic supply line to prevent the loss of pressure from the rest of the modules when 1 of the module is pressurized.

- Similar facility will also be installed at the hydraulic return line to prevent the back flow of returned hydraulic when the module is drawn out.

SDV CONTROL MODULE, EQUALIZING VALVE CONTROL MODULE, FLOW CONTROL VALVE CONTROL MODULE

Closing Sequence
During closing operation, the closing of the single acting SDV, Equalizing Valve or Flow Control Valve shall be by operator activation via the RTU.

Opening Sequence
During normal operation, the opening of the single acting SDV, Equalizing Valve or Flow Control Valve shall be by operator activation via the RTU.
THE SYSTEM FEATURES – Interface Junction Box

A. Hardware

- The junction box shall be an increased safety EEx’e’ certified type fabricated from Glass Reinforced Polyester (GRP) material.
- 316SS materials can also be provided upon request.
- All cable glands used for termination shall be of brass material, EEx’e’ certified.
- Suitable 316SS cable trays shall also be provided for cable routing of field cables to the junction box.

B. Controls

- The electrical signals from the level transmitter, pressure transmitters and pressure switches shall be connected to the SIS through the junction box, where it will perform the necessary interlocking, delay and shutdown functions, and sent out the necessary output 24VDC signals to activate the corresponding solenoid valves.

The controls perform by the SIS will consist of:

Motor Control
- Control of motor Start/Stop from MP and HP header pressure transmitter and hydraulic reservoir level transmitter signals

Wellhead Control Module
- Wellhead Control Module sequential opening operation upon initiation to open at the panel mounted pushbutton shall be as follow:
  1) Opening of SCSSV
  2) Opening of SSV (after a user defined time delay)
  3) Opening of WV (after a user defined time delay)

- Wellhead Control Module sequential closing operation upon operator initiation to shutdown at the panel mounted pushbuttons shall be as follow:
  1) Closing of WV
  2) Closing of SSV (after a user defined time delay)
  3) Closing of SCSSV (after a user defined time delay)
**THE SYSTEM FEATURES – Panel Construction**

### A. TECO Panel

- The panel is constructed from 316L stainless steel 3-mm thick sheet, welded to internal 316 stainless steel angle frame.
- The panel shall be welded according to TECO’s welding syllabus TO/ME/WPS-100 such that there will not be any form of inclusion and warping.
- Surface finish shall be in accordance to TECO’s polishing syllabus TO/ME/POL-H4B to attain a 4B hairline finish. In consideration for client’s convenience during site installation, the panel plinth will be fabricated from 100mm carbon steel c-channel with offshore painted to black colour suitable for welding or bolting at site deck.
- A 6mm thick neoprene gasket will be provided for material isolation between the 316SS panel and carbon steel plinth.
- For ease of access to the internal components for removal and maintenance, hinged lift-off type doors with 316SS heavy duty handles with integral locks and associated locking mechanism shall be provided at the rear of the panel.
- All panel internal supports, module housing and component bracketry will be in 316SS material. For interfacing to the site tubing connection, bulkhead connectors will be located at the panel rear top and arranged such that isolation of one connection will not affect or shutdown the others.
- As for cable transit to the Junction Box, Multiple Cable Transit (MCT) will be used and installed at the panel side between the Wellhead Control Panel and the JB. In order to keep the panel base clean and free from any possible spillage of hydraulic oil, drip pans for draining will be provided.
- To facilitate the panel earthing, two (2) numbers of M10 316SS earth bosses will be welded to the panel plinth diagonally for site connection.
- Also provided for each door are M6 earth studs welded at the inside of the door for doors to panel earthing.
- 6 nos. of M22 size 316SS lifting lugs will be welded at the panel top to facilitate lifting of the panel for transportation purpose.

### B. Tubes & Fittings

- All tubing will be 316 stainless steel, seamless, bright finished, fully annealed to ASTM A269, ≥2.5% Molybdenum, Rockwell hardness 80.
- Imperial size. To provide easy accessibility and tracing of the installed tubing, all tubing shall be grouped and run in either horizontal or vertical plane, carefully grouped and clamped for rigidity.
- All tube routing installation shall be in accordance to Eagle Control-Matic’s tube routing syllabus SA/ME/TRG with Swagelok bending, cutting and de-burring tools to provide for the correct bends and fitting tightening.
- No Gap Gauge shall be used to check for all fitting tightening to ensure a leak-free installation. All threaded ends shall be NPT threads and tube fittings shall be 316 Stainless Steel, double ferrule, compression type Swagelok fittings.
WELLHEAD CONTROL SYSTEM
– EH36 Series

FUNCTIONAL LOOP DIAGRAM

ESD activated via Pushbutton at WHCP

ESD or Fire & Gas Detected via SIS

PSD Activated by Process via SIS

PSD activated via Pushbutton at WHCP

Close All SCSSVs

Close All SSVs

Stop All Hydraulic Pumps

Close All WVs

SYSTEM SPECIFICATION

Utilities:
• Field Panel Power Supply for RTU: 24 VDC
• Field Power Supply for Air Conditioner: 220 VAC, 1-ph, 50Hz, 500W
• Field Power Supply for Motors: 380 VAC, 3-ph+N, 50Hz, 2.2KW
• Hydraulic System
  - HP Hydraulic Header: 3,600 psig to 4,800 psig
  - MP Hydraulic Header: 1,200 psig to 1,600 psig
  - HP Relief Valves Set Pressure: 5,280 psig
  - MP Relief Valves Set Pressure: 1,760 psig
  - HP Hydraulic Accumulator Volume: 10 litres (for 1 SCSSV for 2 cycles operation)
  - MP Hydraulic Accumulator Volume: 100 litres
  - HP Hydraulic Pump: 2.21 lpm @ 1500 rpm (sized for recharging accumulator within 5 minutes)
  - MP Hydraulic Pump: 2.21 lpm @ 1500 rpm
  - Hydraulic Reservoir Volume: 684 litres
  - Hydraulic Fluid: Shell Tellus 32 (or equal grade)
• Connection line:
  - Actuator Return Header: 1" NPTF
  - SSV Hydraulic Control Line: 3/8" O.D.
  - SCSSV Hydraulic Control Line: 3/8" O.D.
  - Reservoir Drain: 1/2" O.D.
  - Panel Drain: 1" NPTF

Physical Data:
• Enclosure material: Stainless Steel 316L
• Enclosure Thickness: 3mm
• Hydraulic Reservoir Dimension: 1710(W) x 1000(D) x 400(H) mm
• Overall Panel Dimension: 4000(W) x 1000(D) x 2006(H) mm
• Overall Panel Dry Weight: 3,300 kg
• Overall Panel Operating Weight: 3,970 kg

Standards:
• Panel enclosure design in accordance to IP65 standard
• Hydraulic cleanliness to NAS 1638 Class 6 (minimum)
• All electrical devices shall be suitable for Zone 2 hazardous area application

Documentation:
• Control Schematic and Panel Design Drawings
• Utility Consumption Calculations
• Accumulator, Pump and Reservoir Sizing Calculation
• Factory Acceptance Test Procedure / Report
• Start-Up Manual
• Operating & Maintenance Manual
• Manufacturer Data Record
• Mill Certificates / Certificate of Compliance
• Instrument Calibration Certificates
• Functional Design Specification (optional)
# Eagle Control-Matic

## Wellhead Control System

**WELLHEAD CONTROL SYSTEM – EH36 Series**

**THE ULTIMATE SOLUTION FOR THE OIL & GAS INDUSTRIES**

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**Eagle Control-matic’s code**

<table>
<thead>
<tr>
<th>WH EH / 27MBS / S05B / 10 / 0.25 / 100 / 505 / 06 / 25 / 30 / W05 / 08 / 2.6 / 30 / A1 / 10 / S / A3 / A</th>
<th>Eagle Control-matic’s code</th>
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**Selection Chart – Base Model**

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<thead>
<tr>
<th>WH</th>
<th>Electro-Hydraulic</th>
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<tbody>
<tr>
<td>XY</td>
<td>No. of Active Modules Installed</td>
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<tr>
<td>XX</td>
<td>No. of Spare Modules</td>
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<tr>
<td>02</td>
<td>2,000 psig</td>
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<tr>
<td>05</td>
<td>5,000 psig</td>
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<td>03</td>
<td>3,000 psig</td>
</tr>
<tr>
<td>06</td>
<td>6,000 psig</td>
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</table>

**Sample Model Selection**

- WH EH / 27MBS / S05B / 10 / 0.25 / 100 / 505 / 06 / 25 / 30 / W05 / 08 / 2.6 / 30 / A1 / 10 / S / A3 / A

**Manufacturer’s Standard**

- ASME Code Section VIII Div 1
- P.E.D. 97/23/EC

**Accumulator Design Code**

- CSA EEx’d’ IIC
- ATEX Ex II 2 GD

**Pump Operating Voltage**

- 24VDC
- 110VAC, 1-ph, 50Hz
- 220VAC, 1-ph, 50Hz
- 380VAC, 3-ph, 50Hz

**Sample Model Selection**

- WH EH / 27MBS / S05B / 10 / 0.25 / 100 / 505 / 06 / 25 / 30 / W05 / 08 / 2.6 / 30 / A1 / 10 / S / A3 / A

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**Client-Selected Model**

- WH EH / 27MBS / S05B / 10 / 0.25 / 100 / 505 / 06 / 25 / 30 / W05 / 08 / 2.6 / 30 / A1 / 10 / S / A3 / A

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**Hazardous Area Cert. Compliant**

- Eagle Control-Matic™

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**Eagle Control-Matic™**

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**Wellhead Control System**

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**Wells & Cycles**

- X (to enter volume in litres)
- X (to enter in meter)
- X (to enter volume in litres)
- X (to enter in meter)

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**WH/M S / SC / S / SC**

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**Sample Model Selection**

- WH EH / 27MBS / S05B / 10 / 0.25 / 100 / 505 / 06 / 25 / 30 / W05 / 08 / 2.6 / 30 / A1 / 10 / S / A3 / A
### WELLHEAD CONTROL SYSTEM

**– EH36 Series**

**The Ultimate Solution for the Oil & Gas Industries**

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#### Selection Chart – Extended Model

<table>
<thead>
<tr>
<th>SDV Max. Pressure</th>
<th>SDV Min. Pressure</th>
<th>SDV Quantity</th>
<th>SDV &amp; WHCP Distance</th>
<th>Choke Valve Quantity</th>
<th>Choke Valve Min. Pressure</th>
<th>Choke Valve Max. Pressure</th>
<th>Choke Valve Swept Volume</th>
<th>Choke Valve &amp; WHCP Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000 psig</td>
<td>2,000 psig</td>
<td>3</td>
<td>3,000 psig</td>
<td>4</td>
<td>4,000 psig</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### (to enter volume in litres)

#### SDV Quantity

<table>
<thead>
<tr>
<th>No. of SDV</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000 psig</td>
<td>2,000 psig</td>
<td>3,000 psig</td>
<td>4,000 psig</td>
<td></td>
</tr>
</tbody>
</table>

### Choke Valve Quantity

<table>
<thead>
<tr>
<th>No. of Choke Valve</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000 psig</td>
<td>2,000 psig</td>
<td>3,000 psig</td>
<td>4,000 psig</td>
<td></td>
</tr>
</tbody>
</table>

### Analog Signal Type

- A (24VDC, 1-ph, 50Hz)
- H (HART Protocol)
- P (Profibus Protocol)
- N (Non-Intrinsically Safe)
- S (Intrinsically Safe)

### RTU Operating Voltage

- D2: 220VAC, 1-ph, 50Hz
- D1: 110VAC, 1-ph, 50Hz

### RTU External I/O Points

- X (no. of external Analog Output Points)
- X (no. of external Analog Input Points)
- X (no. of external Digital Output Points)
- X (no. of external Digital Input Points)

### Optional

- ACU (Class 1, Div 2, Ga B, C, D certified)
- NAS (NAS 1638 Class 6)
- H2S (NAS MR-01-75)
- GLY (Glycol Based Hydraulic)
- MIN (Mineral Oil Based Hydraulic)
- NIU (For quick charging of Hydraulic Accumulators)
- FILU (For Hydraulic Cleanliness Filtration)
- EXPLOSION-PROOF AIR CONDITIONER
- HYDRAULIC CLEANSNNESS FILTRATION UNIT
- H2S COMPATIBILITY
- HYDRAULIC COMPATIBILITY
- NITROGEN INTEGRATOR UNIT
- HYDRAULIC CLEANSNNESS ABATION UNIT

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**For any other special configuration not stated in this selection chart, kindly contact our factory for further information.**

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**Sample Model Selection**

**Client Selected Model**

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WELLHEAD CONTROL SYSTEM
– EH36 Series

THE ULTIMATE SOLUTION FOR THE OIL & GAS INDUSTRIES

SELECTION COMPONENT MANUFACTURER

**FEATURES:**
- **Shell:** Designed and Manufactured in accordance with ASME VIII Div 1 or BS.7201 : 1989. Material Carbon Steel or 316 Stainless Steel (optional).
- **Separator Bag:** Totally enclosed molded synthetic rubber bag in a range of materials. Integral steel stem fitted with gas valve assembly, sealing cap, ‘O’ ring, locknut and protective cap.
- **Fluid Port Assembly:** Poppet type assembly manufactured in carbon steel to international material specifications, complete with molded retaining ring, locking ring and bleed plug.
- **Full Material Traceability:** Chemical and mechanical test certification for all pressure parts to BSEN10204.3.1
- **Inspection:** In Accordance with PED97-23-EC.

**Bladder Accumulator**

**Electric Driven Hydraulic Pump**

**Hydraulic Solenoid Valve**

**Hydraulic Relief Valve:**

**FEATURES:**
- **Zero Leakage**
- **Dead-tight Seal Well Above 95% of Cracking Pressure**
- **Positive Reseal**
- **No Pressure Rise with Increasing Flow**

**Explosion Proof Air Conditioner**

**FEATURES:**
- **Wall Mounted**
- **Certified by CSA International for use in Class I, Division 2, Groups B, C, D hazardous (classified) locations.**
- **NEMA 12 cabinet.**
- **Thermostat on intrinsically safe circuit.**
- **3/4” NPT conduit connection and terminals or easy power wiring.**
- **Aluminum finned copper tube coils provide maximum transfer.**
- **Washable filter reduces inventory and maintenance costs.**

**Checkball Pump Operation**

**Bladder Accumulator**

**Powerful$$
WELLHEAD CONTROL SYSTEM
- EH36 Series

THE ULTIMATE SOLUTION FOR THE OIL & GAS INDUSTRIES

WHY SHOULD WE BE YOUR CHOICE?

Other services we Provide:

- Individual customer requirements met through tailored service agreements including 24 hour response.
- Engineering support.
- Project management.
- ‘Through-life’ support - customized to specification, time-scale & budget for both new and established installations.
- ‘Healthcare’ service contracts.
- Onshore workshop.

Maintenance

- Our maintenance commitments cover not only ‘hands on’ routines but can encompass all functions traditionally performed by the client: compliance to acceptable level of reliability, writing planned maintenance routines, scheduling work & reporting, performance monitoring, design & consultancy back-up, spares holding & procurement & providing full technical support.
- We ensure compliance of your systems to appropriate legislative standards.
- Optimization and retention of the integrity of the system.

Quality Assurance / Health & Safety

- A safety management system is in place & we operate in full compliance with all relevant safety legislation.
- Risk assessments have been undertaken for all our workshop operations, which incorporate health, safety & environmental controls.

Standards & Approvals

EC 60079 – Electrical Apparatus for Explosive Gas Atmospheres.
IEC 60332 – Test on electric cables under fire conditions
IEC 60529 – Classification of Degree of Protection Provide by Enclosures
IEEE – Institute of Electrical & Electronic Engineering
ISA – International Standard Automation
NAS 1638 – Cleanliness Requirements of Parts Used in Hydraulic Systems
API RP 14B – Design, Installation & Operation of Subsurface Safety Valve Systems
API RP 14C – Analysis, Design, Installation & Testing of Basic Surface Safety on Offshore Production Platforms

Our Clients

- Amerada Hess (Thailand) Limited
- Esso Petroleum Malaysia Inc.
- ExxonMobil Exploration & Production Malaysia Inc.
- Hoan Vu Joint Operating Company
- Japan Vietnam Petroleum Co. Ltd
- Murphy Sarawak Oil Co. Ltd.
- Petronas Carigali Sdn. Bhd.
- Petrofac Resources Malaysia
- Premier Petroleum Myanmar Limited
- Sabah Shell Petroleum Company
- Sarawak Shell Berhad
- Shell Chino Exploration & Production Co.
- Shell Philippines Exploration B.V.
- Talisman Malaysia Limited
- Toreador Turkey Limited
- Total Thailand, etc....

Cendor Field Development Project
Petrofac Resources, Malaysia

Talisman BR-C WHRP Project
Talisman Energy Limited, Malaysia

RBOP-A Wellhead Topsides Project
Petronas Carigali Vietnam Limited
The valve which has a common port will provide a through flow to either of the outlet ports by means of a manual selector handle.

The hermetically sealed SPDT switch is activated by means of a spring and isolation diaphragm, that can be set, sensing the pressure at the inlet port. Upon sensing the pressure above the set point, the switch will change its contact position. Similarly upon loss of pressure below the set point, the contact will change its contact position back to its original position.

The valve which has an internal spring, that can be set, will be compressed when pressure is applied to the inlet port. When the applied pressure is increased to more than the set pressure, the valve will open and vent the access pressure to its outlet port keeping the inlet pressure within the set limits. When the inlet pressure is restored to its normal level, the valve will close back to its original operating condition.

A low power solenoid together with an internal build-in pressure pilot provides the positive force to shift the valve position from normally closed position to normally open position. With the build-in spring inside the valve, the valve will be actuated when the solenoid is energized and returns to its original position when the solenoid is de-energized.

### What is NAS 1638?

National Aerospace Standard (NAS) 1638 is a particulate contamination coding system used in the fluid power industry to simplify the communication of data from particle counters. It converts the particle counts at various size ranges into convenient broad base classes.

NAS 1638 code as shown in Table 1 is based upon a fixed convenient broad base classes. A series of 14 classes was created covering particle size distribution of the contaminant over a size range of >5 to >100 µm. One class is double the contamination level.

<table>
<thead>
<tr>
<th>Class</th>
<th>Maximum Particles / 10ml in Specific Size Range (µm)</th>
<th>5 - 15</th>
<th>15 - 25</th>
<th>25 - 50</th>
<th>50 - 100</th>
<th>&gt;100</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>275</td>
<td>22</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>250</td>
<td>44</td>
<td>8</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>500</td>
<td>68</td>
<td>16</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1,000</td>
<td>116</td>
<td>32</td>
<td>6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2,000</td>
<td>236</td>
<td>63</td>
<td>8</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4,000</td>
<td>472</td>
<td>126</td>
<td>22</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>8,000</td>
<td>945</td>
<td>233</td>
<td>45</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>16,000</td>
<td>2,850</td>
<td>599</td>
<td>98</td>
<td>16</td>
<td></td>
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<tr>
<td>7</td>
<td>32,000</td>
<td>5,700</td>
<td>1,082</td>
<td>188</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>64,000</td>
<td>11,400</td>
<td>2,175</td>
<td>360</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>128,000</td>
<td>22,800</td>
<td>4,050</td>
<td>720</td>
<td>128</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>256,000</td>
<td>45,600</td>
<td>8,100</td>
<td>1,448</td>
<td>256</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>512,000</td>
<td>91,200</td>
<td>16,200</td>
<td>2,880</td>
<td>502</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>1,024,000</td>
<td>182,400</td>
<td>37,400</td>
<td>7,760</td>
<td>1,024</td>
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</tr>
</tbody>
</table>

### Gas Group Classification Code

<table>
<thead>
<tr>
<th>IEC</th>
<th>NEC</th>
<th>Gas or Vapor</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>A</td>
<td>Acetylene</td>
</tr>
<tr>
<td>I</td>
<td>B</td>
<td>Hydrogen</td>
</tr>
<tr>
<td>II</td>
<td>B</td>
<td>Ethylene</td>
</tr>
<tr>
<td>II</td>
<td>C</td>
<td>Ethyl Ether</td>
</tr>
<tr>
<td>II</td>
<td>C</td>
<td>Cyclopropane</td>
</tr>
<tr>
<td>II</td>
<td>C</td>
<td>Butadiene 1-3</td>
</tr>
<tr>
<td>II</td>
<td>D</td>
<td>Propane</td>
</tr>
<tr>
<td>II</td>
<td>D</td>
<td>Ethane</td>
</tr>
<tr>
<td>III</td>
<td>D</td>
<td>Butane</td>
</tr>
<tr>
<td>III</td>
<td>D</td>
<td>Isobutane</td>
</tr>
<tr>
<td>III</td>
<td>D</td>
<td>Pentane</td>
</tr>
<tr>
<td>III</td>
<td>D</td>
<td>Heptane</td>
</tr>
<tr>
<td>III</td>
<td>D</td>
<td>2-Octane</td>
</tr>
<tr>
<td>III</td>
<td>D</td>
<td>Methyl Ethyl</td>
</tr>
<tr>
<td>III</td>
<td>D</td>
<td>Methyl Alcohol</td>
</tr>
<tr>
<td>III</td>
<td>D</td>
<td>Ethyl Alcohol</td>
</tr>
</tbody>
</table>

### Temperature Classification Code

<table>
<thead>
<tr>
<th>Temperature In days °C</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IEC</td>
</tr>
<tr>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>100</td>
<td>15</td>
</tr>
<tr>
<td>120</td>
<td>14</td>
</tr>
<tr>
<td>135</td>
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<td>160</td>
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<tr>
<td>165</td>
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<td>180</td>
<td>13</td>
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<td>200</td>
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</tr>
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<td>215</td>
<td>12</td>
</tr>
<tr>
<td>230</td>
<td>12</td>
</tr>
<tr>
<td>260</td>
<td>12</td>
</tr>
<tr>
<td>280</td>
<td>12</td>
</tr>
<tr>
<td>300</td>
<td>12</td>
</tr>
<tr>
<td>450</td>
<td>11</td>
</tr>
</tbody>
</table>

### Area Classification Code

<table>
<thead>
<tr>
<th>Inflammable Material</th>
<th>Protection</th>
<th>Zone</th>
<th>Group</th>
<th>Division</th>
<th>Class</th>
<th>Subdivision</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Class 0/1</td>
<td>0</td>
<td>A</td>
<td>1 or 2</td>
<td>I</td>
<td>D</td>
</tr>
<tr>
<td>Oxygen &amp; Acetylene</td>
<td>Class 0/1</td>
<td>0</td>
<td>A</td>
<td>1 or 2</td>
<td>I</td>
<td>D</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>Class 0/1</td>
<td>0</td>
<td>A</td>
<td>1 or 2</td>
<td>I</td>
<td>D</td>
</tr>
<tr>
<td>Propane</td>
<td>Class 0/1</td>
<td>0</td>
<td>A</td>
<td>1 or 2</td>
<td>I</td>
<td>D</td>
</tr>
<tr>
<td>Cyclopropane</td>
<td>Class 0/1</td>
<td>0</td>
<td>A</td>
<td>1 or 2</td>
<td>I</td>
<td>D</td>
</tr>
<tr>
<td>Ethyl Ether</td>
<td>Class 0/1</td>
<td>0</td>
<td>A</td>
<td>1 or 2</td>
<td>I</td>
<td>D</td>
</tr>
<tr>
<td>Acetone</td>
<td>Class 0/1</td>
<td>0</td>
<td>A</td>
<td>1 or 2</td>
<td>I</td>
<td>D</td>
</tr>
<tr>
<td>Acetone, Acetone</td>
<td>Class 0/1</td>
<td>0</td>
<td>A</td>
<td>1 or 2</td>
<td>I</td>
<td>D</td>
</tr>
<tr>
<td>Acetone, Acetone</td>
<td>Class 0/1</td>
<td>0</td>
<td>A</td>
<td>1 or 2</td>
<td>I</td>
<td>D</td>
</tr>
<tr>
<td>Acetone, Acetone</td>
<td>Class 0/1</td>
<td>0</td>
<td>A</td>
<td>1 or 2</td>
<td>I</td>
<td>D</td>
</tr>
<tr>
<td>Acetone, Acetone</td>
<td>Class 0/1</td>
<td>0</td>
<td>A</td>
<td>1 or 2</td>
<td>I</td>
<td>D</td>
</tr>
<tr>
<td>Acetone, Acetone</td>
<td>Class 0/1</td>
<td>0</td>
<td>A</td>
<td>1 or 2</td>
<td>I</td>
<td>D</td>
</tr>
<tr>
<td>Acetone, Acetone</td>
<td>Class 0/1</td>
<td>0</td>
<td>A</td>
<td>1 or 2</td>
<td>I</td>
<td>D</td>
</tr>
</tbody>
</table>