

Valve Actuator Selection Guide

Pneumatic • Hydraulic • Gas/Hydraulic • Electric • Rotary • Linear • Accessories

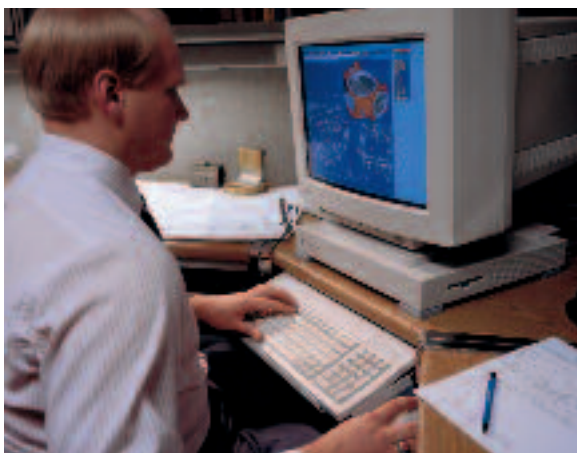




A typical gas pipeline application using the familiar Bettis orange actuators



Bettis has company-trained technicians available for field service



Computer design allows Bettis to offer the most current product technology

The Company

Bettis was established in 1929 as an oilfield supply company and manufacturer's representative. The company later evolved into a manufacturing organization, becoming a pioneer in the valve actuator business. Today, Bettis is part of the world's leading manufacturer of pneumatic and hydraulic valve actuators – Emerson Process Management. Bettis products are used in almost every energy-related industry, including oil and gas transmission, petrochemical and petroleum refining. Other significant markets include chemical; power industry including nuclear; pulp and paper; food and beverage; pharmaceutical; HVAC and water systems.

Since Bettis' inception, it has continually expanded both its physical capacity and its product lines. The Bettis world manufacturing center in Waller, Texas, near Houston, houses more than 145,000 square feet (13,470 square meters) of covered manufacturing, research, engineering, training and office facilities. The company's Canadian facility in Edmonton has undergone three expansions to 95,000 square feet (8,825 square meters). To better serve its customers, Bettis has a knowledgeable worldwide sales and distribution network that is unmatched in the industry.

Bettis' mission statement serves as a guideline for all that we do. It reads; We will continue to be a world class leader in the engineering, manufacturing and marketing of automation products and related services that met or exceed the expectations of our customers, employees and stockholders. We will operate and invest in people, products and facilities to meet financial objectives, while providing a safe work place, fulfilling employment and improving the environment and communities in which we work.

Bettis is a part of Emerson Process Management Valve Automation, a business unit of Emerson. St. Louis-based Emerson NYSE-EMR is a global manufacturer with market and technology leadership in the areas of process control, industrial automation, electronics and a broad range of industrial, commercial and consumer products.

The Product

Bettis manufactures a complete line of valve actuators, including linear, quarter-turn scotch-yoke, rack and pinion, and electric, for your automation requirements. These actuators, available in spring-return and double-acting configurations, powered by compressed gas, hydraulic and electric sources, provide the widest range of torques and thrust available in the industry. Actuator outputs range from 45 pound-inches (5 Nm) to more than six million pound-inches (678,000 Nm) of torque and 200 lbs. (890 N) to 450,000 lbs. (2,001,600 N) thrust with stroke lengths exceeding 60 inches (154 cm).

Bettis guarantees the minimum torque outputs and thrust values. Bettis actuator housings are totally enclosed to protect personnel from moving parts, minimize the possibility of component misalignment and prevent mechanical damage. External field-adjustable stops allow accurate valve positioning at both the open and the closed positions. Corrosion and wear protection extends the actuator life and provides resistance to the effects of harsh environments and aging.

For specifications and pricing information on any Bettis actuator, contact Bettis headquarters, its manufacturing facilities or any of its more than 200 Valve Automation Centers (VACs), distributors and agents worldwide. We can be reached on the internet at www.Bettis.com

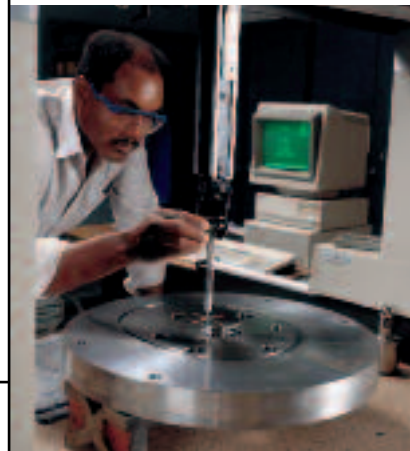
Quality

Bettis prides itself on its comprehensive Total Quality Management approach, instituted to assure its product users that each actuator has been thoroughly tested and closely examined before it leaves the plant. Numerous checks are performed throughout the manufacturing process, with both Bettis and purchased materials receiving scrutiny. Our principal facilities in Waller, and Edmonton have each been awarded the ISO 9001 designation after extensive plant audits, indicating full compliance with worldwide standards for documentation and quality practices.

Bettis products are specifically engineered for their intended application. All are designed and engineered using sophisticated computer design systems. Our experienced VACs, sales engineers and distributors provide us with the comprehensive information to make sure you receive the best products for your requirements.



Bettis actuators in service at a major coal gasification plant



Both Bettis machined parts and purchased parts are checked closely before use



Gas/oil actuators undergoing final inspection before shipping



D-Series

- Pneumatic rack and pinion actuators
- Automates ball, butterfly, plug valves and any other 90° rotating mechanisms
- Unique three-point suspension system to counteract side-loading forces
- Dual stroke adjustment range from 65 to 96 degrees
- NAMUR mounting allows for close coupling
- Changeable splined inserts for universal mounting to a variety of valves without need for brackets
- Exclusive two-component polyurethane epoxy coating, standard for corrosion resistance
- Modular spring design to facilitate 40 to 120 psig supply air (3 to 8 Bar)
- Output torques
 - Spring-return 7,939 lb-in (897 Nm)
 - Double-acting 22,379 (2,528 Nm)
- Standard operating temperatures — -4°F to +175°F (-20°C to +80°C)

Reference Brochure #25.10

CBA-Series



- PED 97/23/EC compliant
- Pneumatic scotch-yoke actuators
- Automates ball, butterfly, plug valves and any other 90° rotating mechanisms
- IP66 and IP67M for water ingress protection as per IEC 60529
- Pneumatic output torques:
 - Double-acting models — to 11,515 lb-in (1,301 Nm) Break
 - Spring-return models — to 4,269 lb-in (482 Nm) Spring End
- Standard pneumatic operating pressures to 150 PSIG (10 BAR)
- Standard operating temperature is -20°F to +200°F (-29°C to +93°C)
 - Optional trims available:
 - 0°F to +350°F (-18°C to +177°C)
 - 40°F to +150°F (-40°C to +66°C)
- Economical jackscrew manual override available to ensure reliable valve control in the event of the power loss. Jackscrew also acts as a stop adjustment screw.
- Symmetrical mounting pads allow field reversal of spring-return actuator failure mode with no disassembly required (CW or CCW)

Reference Brochure #20.00-4 (Pneumatic)

CBA 300-Series

- PED 97/23/EC compliant
- Pneumatic scotch-yoke actuators
- Compact and lightweight for automating virtually any quarter-turn (90-degree) rotating mechanism
- Water ingress protected, meeting both IP66 and IP67M specifications
- Has NAMUR topworks for standardization and direct or close coupling of accessory hardware
- ISO/DIN bottom mounting allows close coupling or actuator directing mounting to the valve topworks
- Output torques:
 - Double-acting models — to 20,337 lb-in (2,333 Nm)
 - Spring-return models — to 10,457 lb-in (1,182 Nm) Spring End
- Standard operating pressures to 150 PSIG (10 BAR) Pneumatic
- Standard operating temperature is -20°F to +200°F (-29°C to +93°C)
- Optional trims available for continuous high temperature operation from 0°F to +350°F (-18°C to +177°C) and low temperatures to -40°F to 150°F (-40°C to +66°C)
- Bi-directional travel stops standard. Jackscrew manual override and Extended Travel Stops are optional.

Reference Brochure #22.00

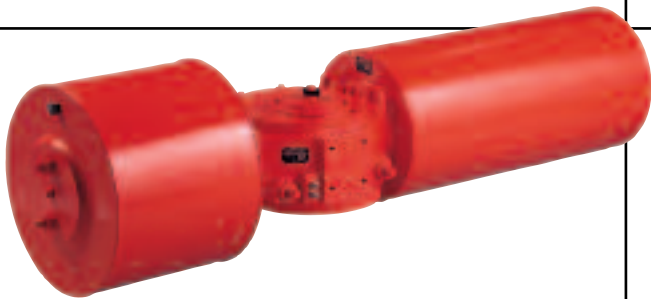


HD-Series

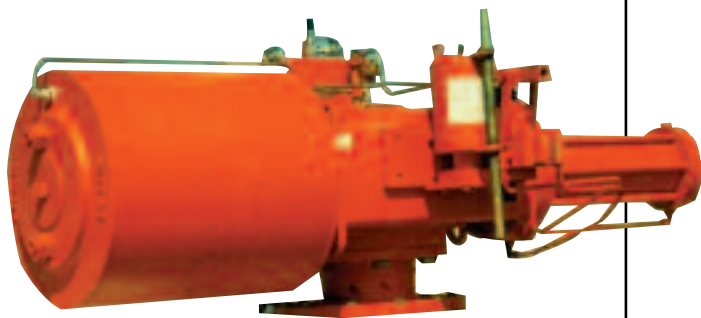
- PED 97/23/EC compliant
- Pneumatic and hydraulic scotch-yoke actuators
- Automates ball, butterfly, plug valves and any other 90° rotating mechanisms
- IP66 for water ingress protection as per IEC 60529
- Output torques:
 - Double-acting models — to 50,331 lb-in (5,687 Nm) Break
 - Spring-return models — to 18,044 lb-in (2,039 Nm) Spring End
- Standard operating pressures:
 - Pneumatic — to 200 PSIG (14 BAR)
 - Hydraulic — to 3,000 PSIG (207 BAR)
- Standard operating temperature is -20°F to +200°F (-29°C to +93°C)
 - Optional trims available:
 - 0°F to +350°F (-18°C to +177°C)
 - 40°F to +150°F (-40°C to +66°C)
- Mechanical and hydraulic manual overrides are available

Reference Brochure #30.00-1B (Pneumatic)





G-Series Pneumatic Spring-Return (shown)



G-Series Pneumatic Double-Acting with Hydraulic Override (shown)

G-Series (Robotarm II™)

- PED 97/23/EC compliant
- Pneumatic and hydraulic scotch-yoke actuators
- Automates ball, butterfly, plug valves, as well as louvers, dampers and other 90° rotating mechanisms.
- **Five year standard warranty**
- **Powr-Swivl™** — compensates for side load deflection, thus reducing wear on the rod, bearings and seals which increases cycle life.
- **Tension-Lok™** — positively locks the spring module in place under load, a major safety feature.
- **Acculine™ Shaft Drive** — eliminates damage to switch and positioner seals or bearings due to shaft drive misalignment, helping to ensure classification integrity.
- Shaft driven accessory interface conforms to NAMUR standard. One size fits all
- Interchangeable modules may be inventoried, serviced and tested independently, a major service advantage.
- Compact, optimum center of gravity, shorter and lighter than previous similar models
- MSS and ISO valve mounting as standard. When applicable this eliminates special mounting adaption by allowing for direct mounting to valve.
- Predictive maintenance — replaceable bearings and soft goods allow replacement based on wear ratings and service conditions
- Highly corrosion resistant to atmospheric and power gas contaminants
- Submersible, consult factory
- Meets IP66 and IP67M for water ingress protection making the G-Series almost impervious to contamination from process and atmospheric conditions.
- Output torques (guaranteed minimum):
 - Double-acting models — to 6,000,000 lb-in (678,000 Nm)
 - Spring-return models — to 3,000,000 lb-in (339,000 Nm)
- Standard operating pressure:
 - Pneumatic: 40 to 200 PSIG (3 to 14 BAR)
 - Hydraulic: 500 to 5,000 PSIG (34 to 345 BAR)
- Standard operating temperature is -20°F to +200°F (-29°C to +93°C). Optional trims available:
 - 0°F to +350°F (-18°C to +177°C)
 - 50°F to +180°F (-46°C to +82°C)

Reference Brochure #35.00

TorqPlus™ EM-Series

- Quality TorqPlus electric motor actuators automate quarter-turn applications — ball, butterfly and plug valves; dampers and vents
- Guaranteed output torques from 100 lb-in to 10,000 lb-in (11 Nm to 1,130 Nm)
- Maximum duty cycle — standard motor duty cycle for actuators with torques as low as 350 lb-in through 10,000 lb-in torques is 100%. Other torques available with 75% duty cycle but, none less than 50% in all available motor voltages
- CSA certified enclosures are offered in both a non-hazardous (type 4) and a combination non-hazardous plus hazardous (type 4 & 7) construction
- Modular design allows an almost endless possibility of control options and field modifications
- Operating speeds are available from 2 seconds to 60 seconds per 90° rotation
- Operating temperatures range from -40°F to +140°F (-40°C to +60°C)
- Compact design provides a maximum output torque in the smallest package

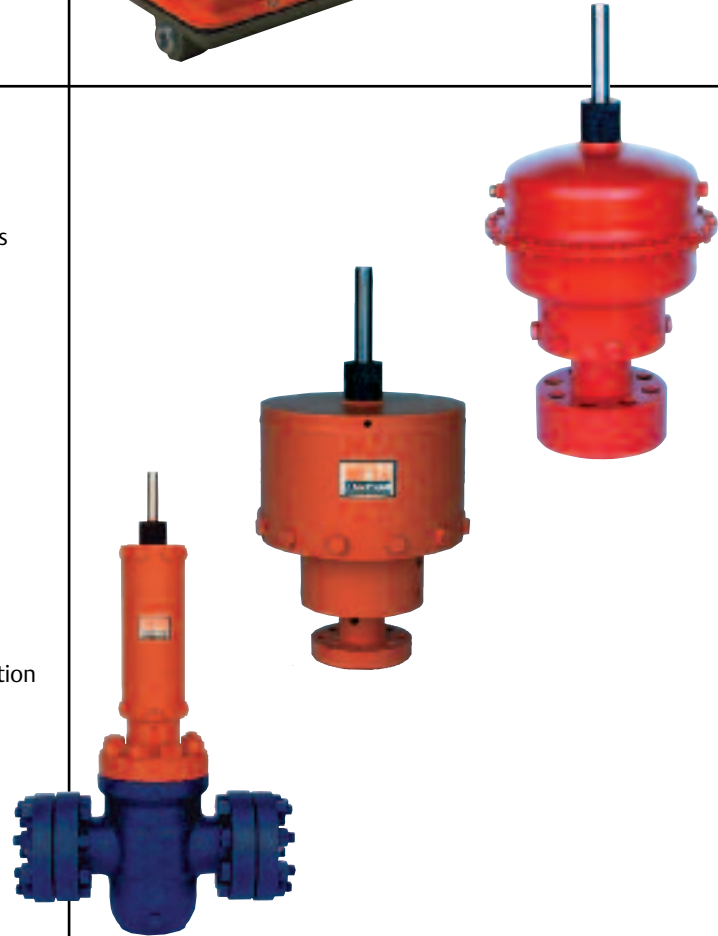
Reference Brochure #87.00



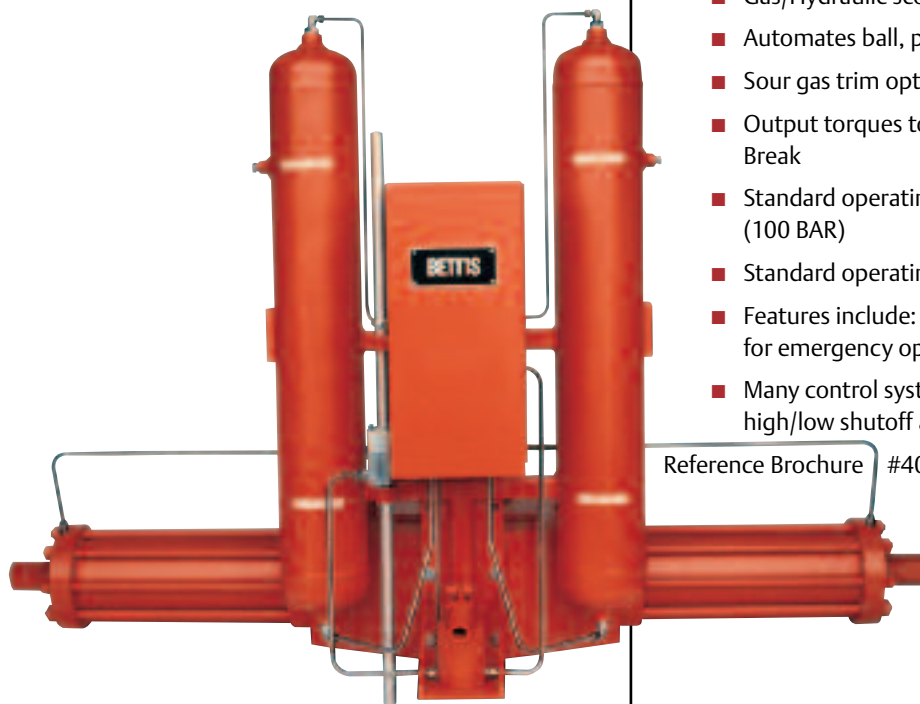
WellGuard™ Diaphragm and Piston

- Diaphragm and piston control fluid powered linear actuators
- Designed to be used in conjunction with Bettis valve bonnets
- Provide open and close actuation for API 6A through-conduit reverse-acting gate valves for wellheads and production flow lines
- Also used for 6D and ANSI B16.34 valves
- Compatible for either sweet or sour service
- Available in sizes 10" thru 18" diameters (pneumatic) and 5" thru 8" (hydraulic) (1 13/16" thru 4 1/6" API valve sizes)
- Suitable for wide temperature range: -50°F (-46°C) to +150°F (+65°C)
- Lightweight with simple design
- Visual indication provided to easily assess valve position
- Easily maintained without need for specialized tools
- Integral, tamper-resistant relief valve protects from over-pressurization
- Designed to be interchangeable with Bettis linear hydraulic and pneumatic actuators

Reference Brochure #49.20 (DWG Pneumatic Diaphragm)
 #49.30 (PWG-IO Pneumatic Piston with Override)
 #49.40 (HWG-HL Hydraulic Piston)
 #49.50 (PWG Pneumatic Piston)



Gas/Hydraulic Series



- Gas/Hydraulic scotch-yoke and linear actuators
- Automates ball, plug and gate valves utilizing line gas pressure
- Sour gas trim optional
- Output torques to 6,000,000 lb-in (678,000 Nm) Break
- Standard operating pressure to 1,440 PSIG (100 BAR)
- Standard operating temperature is -50°F to +150°F (-46°C to +66°C)
- Features include: zero-leakage piston and rod seals; manual pump for emergency operation
- Many control system options are available including remote control, high/low shutoff and linebreak

Reference Brochure #40.00-1

GVO Linear Actuators



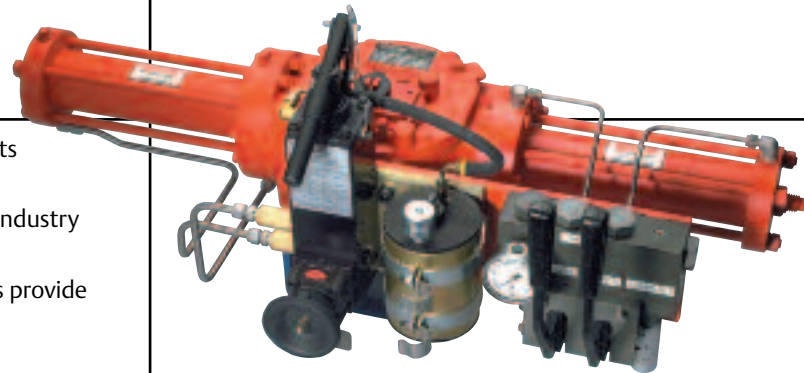
- Wide variety of models in pneumatic, hydraulic, spring-return and double-acting
- Automates most types of rising stem valves- slab, wedge, knife and expanding gate, rising stem ball and dampers
- Suitable for direct acting and reverse acting gate valves
- Field proven for safety shutdown and control applications
- Optional materials of construction for sour service
- Options include limit switches, relays, solenoids, pressure pilots, dampeners and manual overrides
- Standard operating temperature -50°F to +150°F (-46°C to +66°C)
- Supply pressures (low) 150 psig MOP to (high) 1500 psig MOP
- Thrusts: 55,000 lbs to 300,000 lbs (pneumatic)
86,000 lbs to 760,000 lbs (hydraulic)
- Cylinder diameters:
3 1/2" to 48" single and 18" to 36" tandem (pneumatic)
4" to 24" single (hydraulic)

Reference Brochure #71.00

GTD-Series Direct Gas

- An integrated package of field-proven control components for direct high pressure natural gas service
- Features Bettis G-Series new generation technology and industry recognized Shafer controls
- Xylan™ cylinder coating and surface conversion processes provide excellent corrosion resistance
- Enclosed heavy-duty cast ductile iron housing
- Water ingress protection to IP67M assures no internal corrosion
- NAMUR standard accessory mounting
- Rated for continuous operation to 1,500PSIG

Reference Brochure #36.00



LineGuard™ Electronic Linebreak Detection System

- Self-contained monitoring and linebreak detection device providing data acquisition and supervisory control of a single actuator
- Offers 3-way protection by monitoring pressure continuously to record rate of pressure drop, low pressure and high pressure
- Four types of archival logs are stored in battery-backed memory
- Has a combination of fixed and configurable I/O to best fit the application (6 to 12 points depending on base model)
- Communicates via 2 RS232 serial port with provision for RS-422 and RS-485
- Two-line or four-line x 20 character per line LCD display (depending on base model)
- Compact, NEMA 4x weatherproof and corrosion proof enclosure
- Deltamatic™ pneumatic linebreak detection system also available (Reference Brochure #41.00)

Reference Brochure #44.10



Multiport Flow Selector

- Allows diversion of fluids from a single flow line to a test outlet or sampling device
- Can manifold as many as eight simultaneous flow lines
- Can be operated manually or electrically
- Electric operators can be supplied with AC motors, 12 or 24 VDC motors with mechanical limit switches or with Bettis Multiport Electronic Controller (MEC)
- Constructed to applicable parts of API 599
- Optional sour gas trim
- Field adjustable seal, with stainless steel scraper
- Available in various line flange sizes and ANSI ratings
- Available with a variety of internal coatings, overlays and seal materials for adverse service conditions

Reference Brochure #72.00

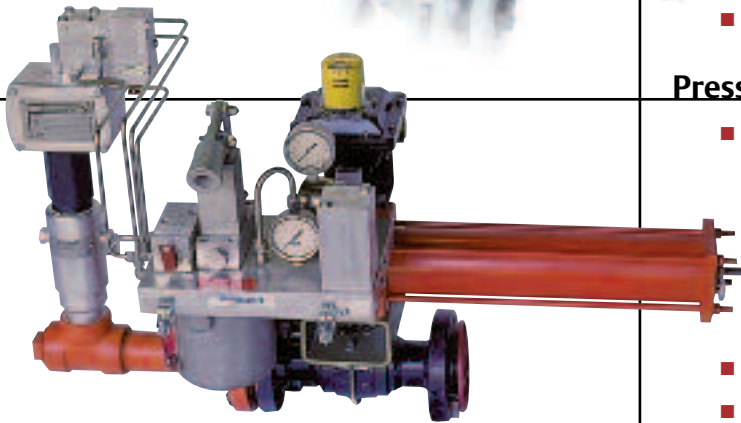


SIL-PAC™



- Valve automation solution for safety systems
- Integrates Bettis G- or CBA-Series actuator, Fisher FIELDVUE™ digital valve controller and appropriate valve in a single package
- Failure modes and Effects Diagnostics Analysis (FMEDA) shows it is suitable for SIL 3 applications
- PED97/23/EC compliant
- Allows on line partial-stroke testing and diagnostics
- Provides for lower costs for acquisition, ownership and labor
- Single source responsibility

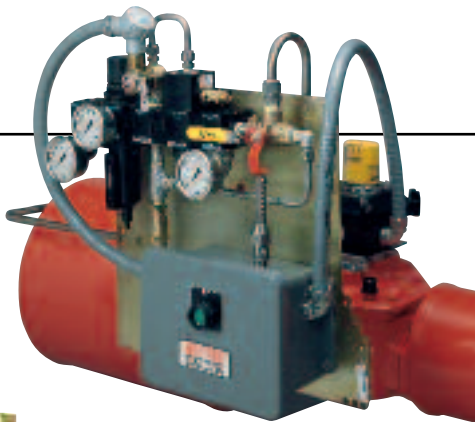
PressureGuard™



- Self-contained remote hydraulic emergency shutdown system for wellheads and pipelines
- Adaptable to quarter-turn or linear operated valves
- Provides reliable valve operation when external power source is undependable or unavailable
- Eliminates H2S and other gas emissions
- Modular design for easy maintenance
- Adaptable for use with SCADA systems
- Field proven in extreme climates

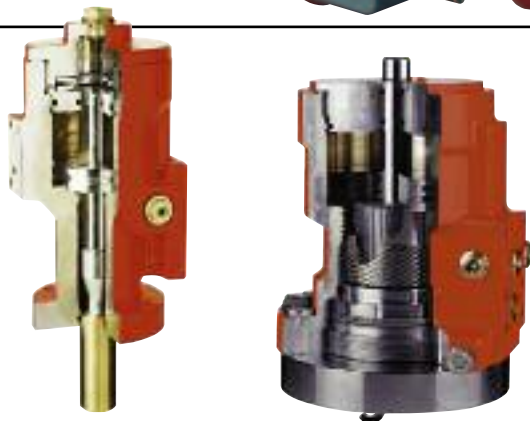
Reference Brochure #45.00

Bettisystems™



Bettis has pre-engineered and documented a series of commonly required control systems. These approved systems utilize standard components, reduce lead times and simplify purchasing, installation and startup. Bettis can custom-design these systems.

BHH/BL Hydraulic Actuators



A broad line of compact, reliable hydraulic helical spline quarter-turn and linear actuators for use in rugged environments.

- Have high water ingress protection IP-68
- Double-acting and spring-return configurations
- Small footprint for use in tight areas
- Adapts and mounts to all types of valves
- Integrated crossover valve

Pressurematic® High/Low Pressure Pilots

- Pressure sensory devices used to monitor pipeline or process pressure
- Suitable for high or low pressure shutdown using pneumatic or hydraulic signal
- Field adjustable high and low pressure set points
- Maximum working pressures to 6000 PSIG
- Manual or automatic reset on pilot valve
- Special trim and seal options available

Reference Brochure # 46.00



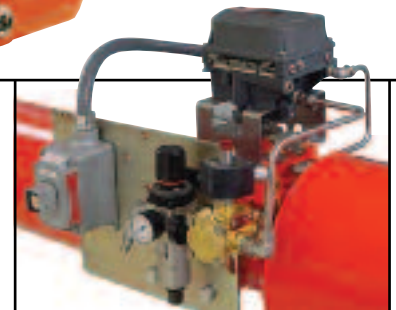
BettiSwitch II

- Valve position monitoring
- High visibility visual indication
- NAMUR and VDE/VDI mounting as standard
- Meets UL and CENELEC requirements
- Kwik Set™ switch position setting
- Corrosion resistant and explosion proof



Pneumatic Positioners

- Pneumatic or electric
- Low air consumption
- High accuracy
- Single- or double-acting



Gear Operators

- Manual override gear operators for use with CBA and D-Series spring-return actuators (shown)
- Declutchable gear operators for use with D-Series double-acting and CBA-Series double-acting actuators
- Gear operators produce full rated torque of the actuator
- Drive adaptors direct couple to CBA and D-Series actuators
- Valve mounting side of the gear operator matches the configuration of the CBA and D-Series actuator. This allows the addition or removal of the gear operator with no need to change or modify existing valve mounting hardware.



Partial Stroke Test Device

- Rugged device allows mechanical periodic testing for proper operation of automation system without disrupting flow processes
- Available in either clockwise or counterclockwise configurations with 20 degrees of rotation
- Field changeable rotation to 15 degrees
- Totally enclosed and weatherproof



Bettis Technical Data Brochure & Website

For torque outputs, sizing information, displacements, weights and dimensional drawings, see Bettis' Technical Data Brochure, available in imperial and metric, or visit our website at www.Bettis.com



Bettis manufacturing facility in Waller, Texas

Contact Us: Emerson Process Management, Valve Automation facilities at your nearest location:

North & South America

18703 GH Circle
PO Box 508
Waller, Texas 77484
USA
T +1 281 727 5300
F +1 281 727 5353

2500 Park Avenue West
Mansfield, Ohio 44906
USA
T +1 419 529 4311
F +1 419 529 3688

9009 King Palm Drive
Tampa, Florida 33619
USA
T +1 813 630 2255
F +1 813 630 9449

4112-91A Street
Edmonton, Alberta T6E5V2
Canada
T +1 780 450 3600
F +1 780 450 1400

Av. Hollingsworth, 325
Iporanga
Sorocaba, SP 18087-105
Brazil
T +55 15 3238 3788
F +55 15 3228 3300

Europe

Asveldweg 11
7556 BT Hengelo(O)
The Netherlands
T +31 74 256 1010
F +31 74 291 0938

Siemensring 112
D-47877 Willich
Germany
T +49 2154 499 660
F +49 2154 499 6613

30/36 Allee du Plateau
93250 Villemomble
France
T +331 48 122610
F +331 48 122619

6 Bracken Hill
South West Industrial Estate
Peterlee, Co Durham
SR82LS, United Kingdom
T +44 191 518 0020
F +44 191 518 0032

3 Furze Court
114 Wickham Road
Fareham, Hampshire
PO167SH, United Kingdom
T +44 132 984 8900
F +44 132 984 8901

Middle East & Africa

2 Monteer Road, Isando
Kempton Park, 1600
South Africa
T +27 11 974 3336
F +27 11 974 7005

PO Box 17033
Jebel Ali Free Zone
Dubai,
United Arab Emirates
T +971 4883 5235
F +971 4883 5312

Asia Pacific

19, Kian Teck Crescent,
Singapore 628885
T +65 6262 4515
F +65 6268 0028

9/F Gateway Building
No.10 Ya Bao Road
Chaoyang District
Beijing, P.R. China
T +86 10 5821 1188
F +86 10 5821 1100

No 15 Xing Wang Road
Wuqing Development Area
Tianjin 301700
P.R. China
T +86 22 8212 3300
F +86 22 8212 3308

Lot 13111, Mukim Labu,
Kawasan Perindustrian Nilai
71807 Nilai, Negeri Sembilan
Malaysia
T +60 6 799 2323
F +60 6 799 9942

471 Mountain Highway
Bayswater, Victoria 3153
Australia
T +61 3 9721 0200
F +61 3 9720 0588

301, Solitaire Corporate Park
151, M.V. Road, Andheri(E)
Mumbai-400093,
Maharashtra, India
T +91 22 6694 2711
F +91 22 2825 3394

NOF Shinagawa Konan Building
1-2-5, Higashi-shinagawa
Shinagawa-Ku, Tokyo
140-0002 Japan
T +81 3 5769 6873
F +81 3 5769 6902

© 2008 Emerson Process Management. All rights reserved.

The Emerson logo is a trademark and service mark of Emerson Electric Co. "Brand mark listing" are marks of one of the Emerson Process Management family of companies. All other marks are property of their respective owners.

The contents of this publication are presented for information purposes only, and while every effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. All sales are governed by our terms and conditions, which are available on request. We reserve the right to modify or improve the designs or specifications of our products at any time without notice.

The color orange, U.S. Reg. No. 2,739,393, is a registered trademark of the Bettis Corporation.

BETTIS[®]

www.Bettis.com


EMERSON[™]
Process Management