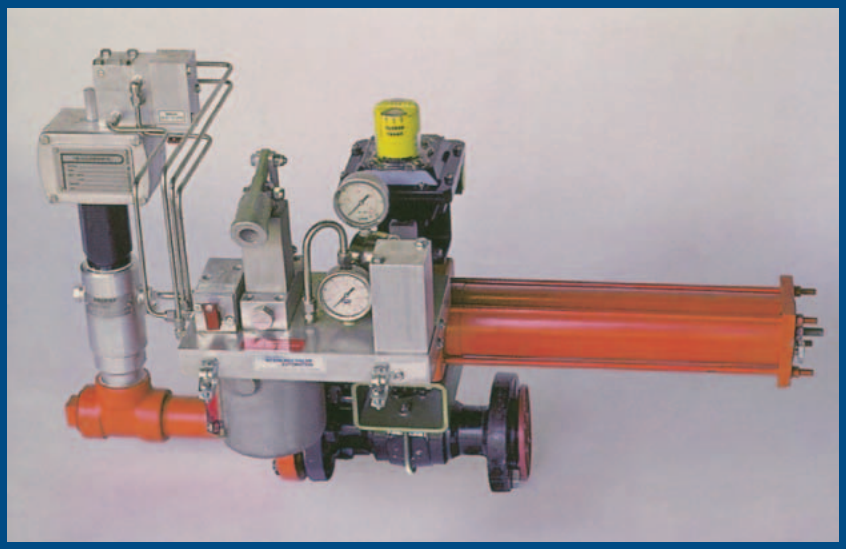
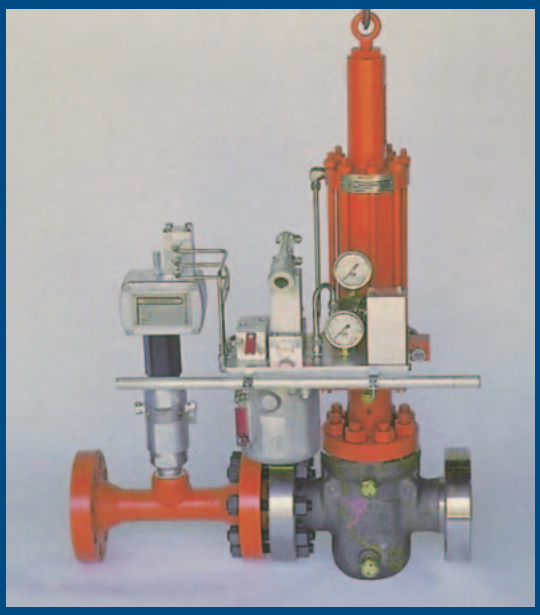
BETTIS
Actuators & Controls
A Daniel Industries Company

PressureGuard™ Self-Contained Hydraulic Emergency Shutdown Systems



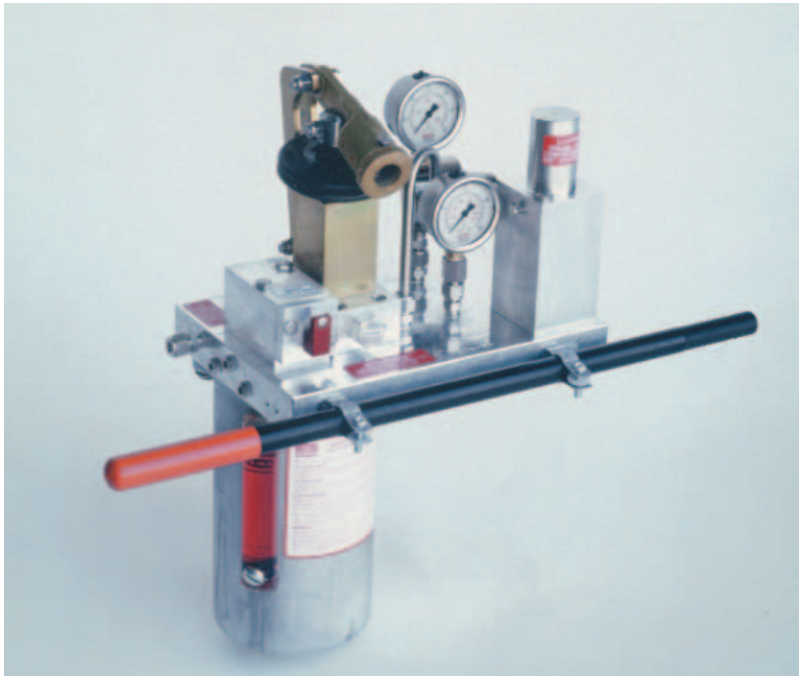


Self-Contained Hydraulic Emergency Shutdown Systems

The Company

Bettis has been providing quality valve actuation and control for more than 40 years, establishing itself as a pioneer and innovator in this industry, with products specifically engineered to your application. Today, we are the world's leading independent manufacturer of pneumatic and hydraulic valve actuators. Bettis products are used in almost every facet of the energy industry—oil and gas production, pipeline and processing.

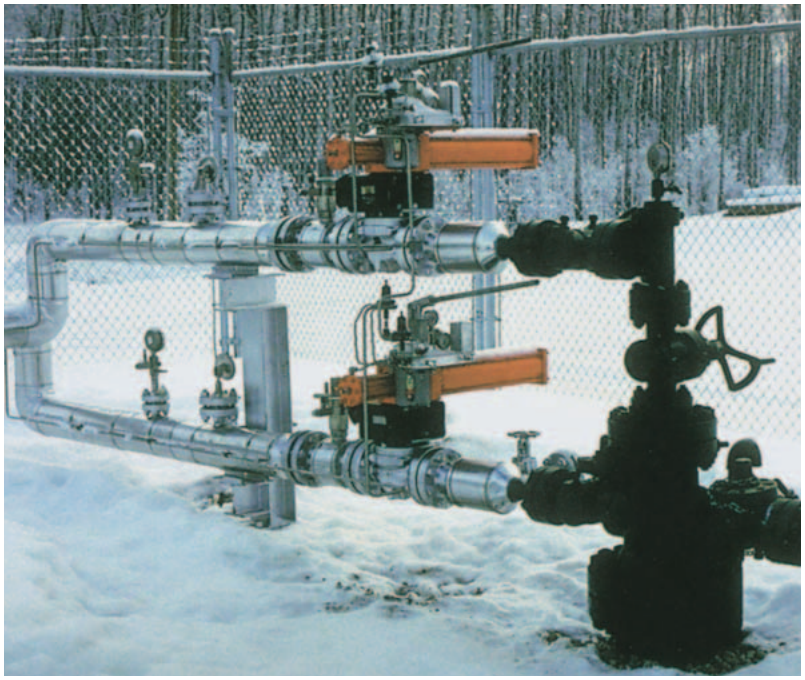
Our headquarters near Houston, Texas has more than 145,000 square feet of manufacturing capacity. We also operate modern manufacturing facilities in Edmonton, Canada; Fareham, England; Cincinnati, Ohio and Villemomble, France. We have been awarded the IS0 9001 designation indicating full compliance with worldwide standards for quality and documentation.



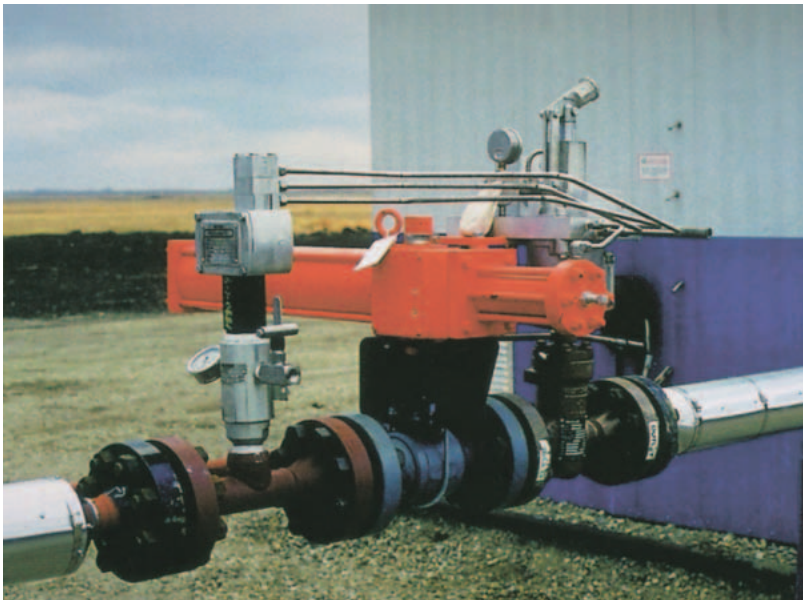
The Product

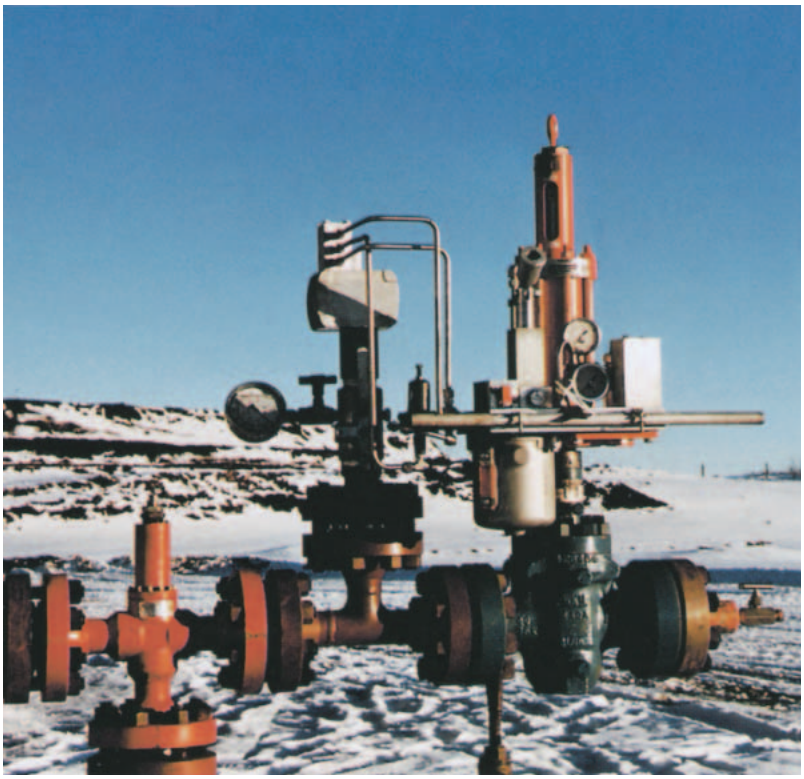
The PressureGuard™ Self-Contained Hydraulic Emergency Shutdown Systems are designed to provide reliable valve shutdown capability when an external power source is either not available or not dependable. The PressureGuard system has proven to be highly successful in years of field service under some of the most demanding operating and environmental conditions. The module can be used with either rotary or linear spring-return hydraulic operators to provide a fail-safe system adaptable to ball, plug and other quarter-turn valves as well as reverse-acting gate and other linear operated valves.

The PressureGuard system offers built-in temperature compensation and pressure relief. It provides the foundation for a flexible system utilizing a variety of available sensing and control options.



For Wellheads and Pipelines



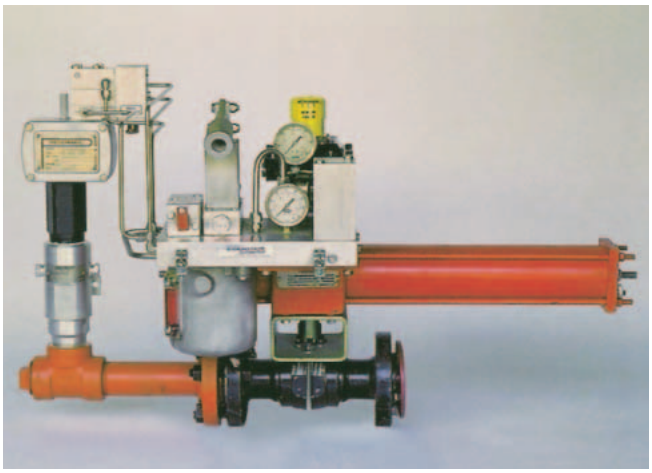


Features and Benefits

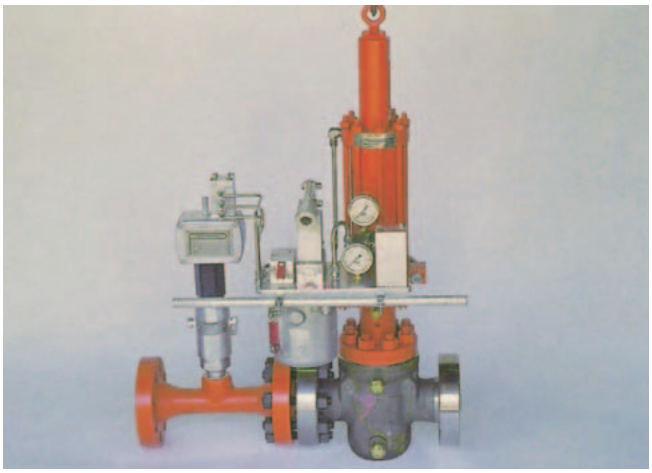
The PressureGuard Self-Contained Emergency Shutdown System offers its users unique product features and significant operating benefits. Among them are:

- Suitable for remote, unmanned, unpowered and critical service
- Adaptable to either quarter-turn or linear operated valves
- Field-proven in extreme climatic conditions
- Standard hydraulic model for all valve sizes and configurations
- Emergency shutdown module can be local or remote mounted to customer specifications
- Eliminates requirements for plant air, fuel gas, electricity or expensive nitrogen backup systems
- Eliminates the emission of hazardous gases such as H_2S
- Eliminates corrosion problems associated with the use of fuel gas as a supply medium
- Minimum of working parts
- Modular design to simplify trouble-shooting and maintenance
- High pressure, zero leakage control
- Adaptable for use with SCADA systems, telemetry control or other remote signals as required by the user
- Fail safe design
- Backed by worldwide service and support from Bettis and its authorized agents

Design



Quarter-Turn

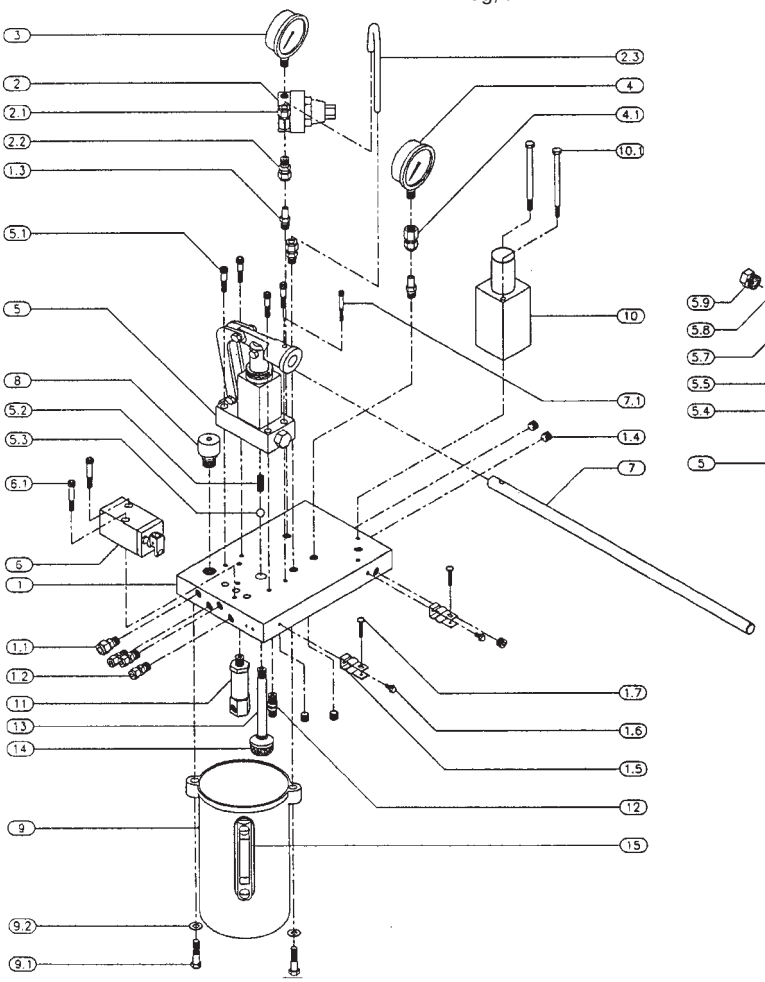


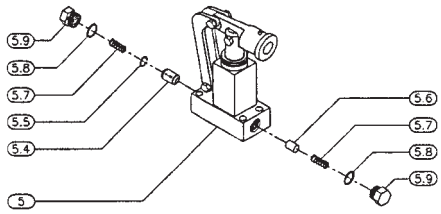
Linear

Exploded View

Item Description

1 Manifold
1.1 Tube Fitting, 3/8 diameter (female)
1.2 Tube Fitting, 1/4 diameter (female)
1.3 Tube Fitting, 3/8 diameter (male)
1.4 Plug, 1/4 NPT
1.5 Handle Clip
1.6 Bolt, Handle Clip
1.7 Screw, Handle Clip
2 Regulator
2.1 Elbow Fitting 3/8 diameter (female)
2.2 Tube Fitting, 3/8 diameter (female)
2.3 Tubing, 3/8 diameter
3 High Pressure Gauge
4 Low Pressure Gauge
4.1 Tube fitting, 3/8 diameter (female)
5 Handpump
5.1 Bolt, Handpump
5.2 Spring, Handpump, Suction Check Valve
5.3 Ball, Handpump, Suction Check Valve





HANDPUMP DETAIL

5.4 Discharge Check, Handpump
5.5 O-Ring, Handpump, Discharge Check
5.6 Filter, Handpump
5.7 Spring, Handpump
5.8 O-Ring Handpump, End Plug
5.9 End Plug, Handpump
6 Manual Pilot Valve
6.1 Bolt, Pilot Valve
7 Handpump Handle
7.1 Bolt, Handle
8 Filler/Breather
9 Reservoir
9.1 Bolt, Reservoir
9.2 Washer, Reservoir
10 Accumulator
10.1 Bolt, Accumulator
11 High Pressure Relief Valve
12 Low Pressure Relief Valve
13 Riser
14 Suction Strainer
15 Level Gauge
16 Boot, Handpump (Not Shown)

Operation

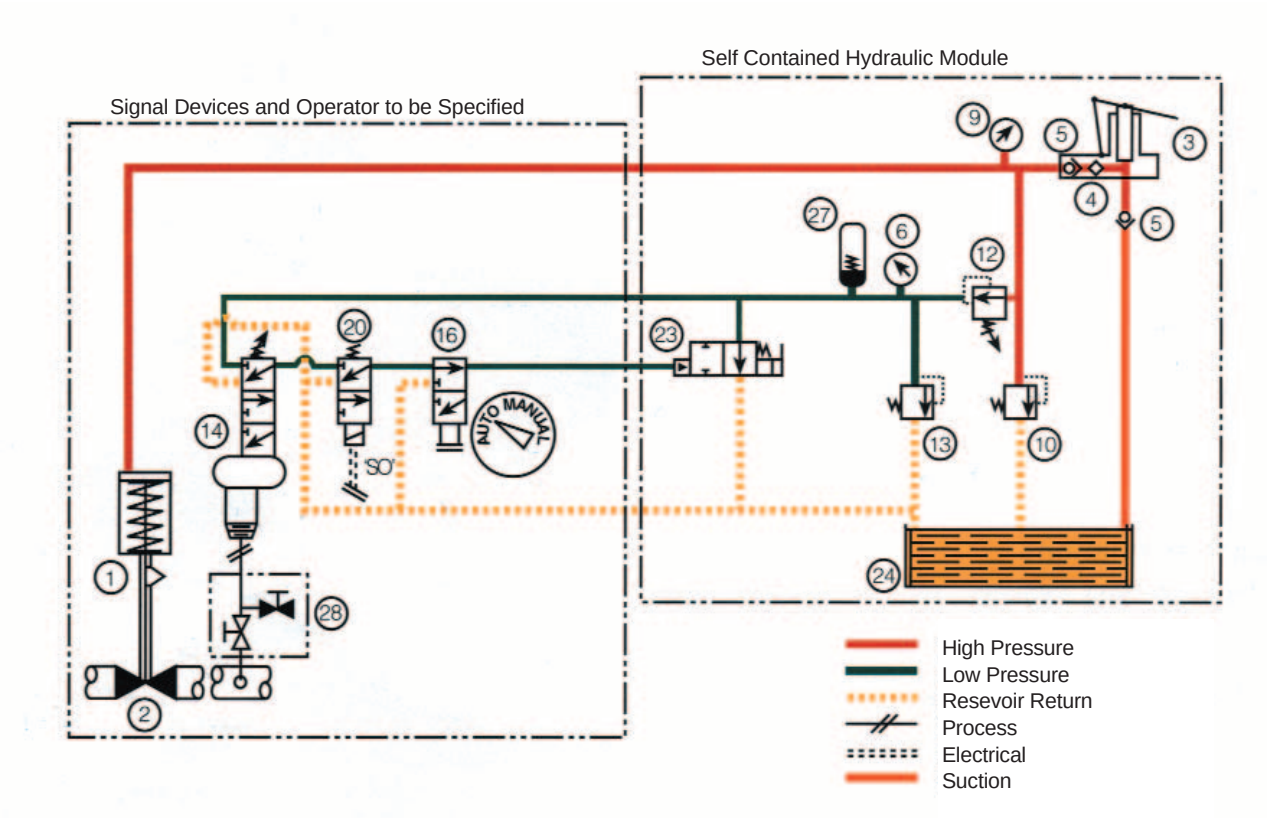
The PressureGuard self-contained hydraulic module operates in tandem with the Bettis actuator and control signal devices. The diagram below shows the line valve closed and the reset valve (23) unlatched.

To open the valve

- Latch the reset valve so the actuator can be opened
- Operate the manual handpump to transfer hydraulic oil from a reservoir (24), compressing the actuator's spring and opening the valve to its normal operating position
- The PressureGuard system enters its automatic mode when the pilot (14) senses pressure buildup within set points and the solenoid (20) is energized

To close the valve

- The line valve closes when the hydraulic oil in the actuator's cylinder is released back to the reservoir, decompressing the spring and activating the valve. This occurs when:
  a) The reset valve (23) is released manually
  b) The pressure pilot (14) senses that the pressure is out of range
  c) The selector valve is switched to "manual"
  d) The solenoid (20) is de-energized



List of Components:

1	Operator	9	Gauge, HP	20	Solenoid Valve, N.C. (optional)
2	Line Valve	10	Relief Valve, HP	23	Reset Valve
3	Handpump	12	Pressure Regulator	24	Reservoir
4	Filter	13	Relief Valve, LP	27	Accumulator
5	Check Valve	14	Pressure Pilot (optional)	28	Isolation Test Valve (optional)
6	Gauge, LP	16	Selector Valve (optional)		

Pressurematic® High/Low Pressure Pilots

Description

The Pressurematic senses pipeline or process pressure and outputs a pneumatic or hydraulic signal, responding to high or low pressure conditions. Its set points are determined according to piston size, spring rate and mechanism adjustments. It operates under maximum working pressures to 6,000 psig with high set points to 4,450 psig and tow set points to 20 psig. Temperature limits are: process -46 to +200° C and ambient -46 to 100°C.

Features

- Field adjustable high and low pressure set points
- Manual or automatic reset on pilot valve
- Extended sensed pressure capability through interchangeable range springs
- Positive piston stop; limits piston travel against overpressure
- Secondary piston seat with safety vent
- Input connection 1½ or 2 NPT threaded or flanged
- Hex body for practical field installation
- Aluminum housing with seated cover
- Stainless steel or IMPREGLON coated carbon steel body
- Electroless nickel plated pressure piston with TFE seat, no diaphragm to rupture
- No brass or bronze components
- Special trim options, coatings and bellows piston for corrosive applications
- Nitrile seats standard, H-T fluoroelastomer seals optional for higher temperatures

Model Designations

Two types of Pressurematic

P-AR— Automatic reset pilot valve
P-MR— Manual reset pilot valve

Each is available In three series:

2000 — ⅝" diameter piston
2200 — 1¼" diameter piston
2400 — ⅜" diameter piston

Operating Characteristics

Series		2200	2000	2400	2000 Bellows
Type Automatic Reset		P-AR	P-AR	P-AR	P-AR
Manual Reset		P-MR	P-MR	P-MR	P-MR
M.A.W.P. (PSIG)		2800	3500	6000	2500
Range limit/Max span (PSIG) (PSIG)	High	820/430	3250/1670	6000/4450	1800/900
	Low	10/105	40/390	85/1120	50/250
Deadband (PSIG)	Min	25	55	160	50
	Max	95	265	775	200

Repeatability is ±2% of set point (or ±5 psi if greater). Information on range limits, spans and deadbands for the various combinations of series and range springs is available on request.

Options

ISO Test Valve

IS0 Test Valve

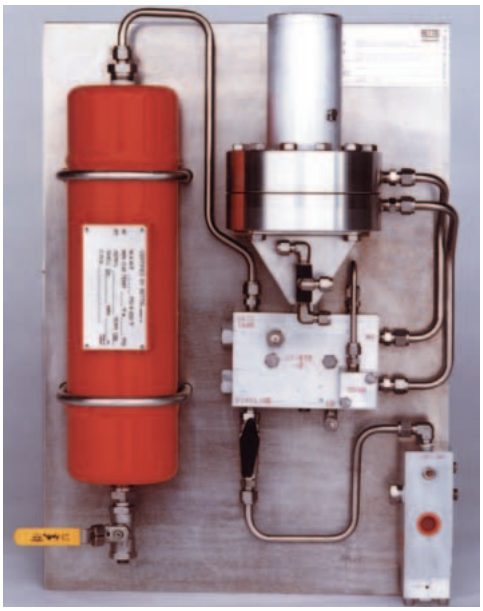
The IS0 Test Valve, used with the Pressurematic pilot enables its calibration without shutting down the flow line. its compact, safe, blowout-proof stem prevents removal when valve is under pressure. Has maximum working pressure of 3,000 psig and 6,000 psig with temperatures ranging from -46 to +65* C. Features include:

- Handle indicates position during quarter-turn operation
- Handle padlocks in either open or closed position
- Spring loaded stem seal compensates for wear and seat expansion/contraction
- Self-wiping action keeps seat, floating ball and closure clean
- Resilient seat seating lip floats with load, enabling low pressure seating and support at high pressure
- Flats on body for easy installation
- Slotted seats relieve upstream pressure, decreasing operating pressure and extending service life
- Options include sour service (NACE MR-01-75), other pressures and temperature ranges

Flow Tee

Flow Tee

- For use with IS0 Test Valve
- Pressure rated for designated service
- Available in a variety of materials
- Threaded NPT configuration available



R.O.D. Linebreak Detection System

Deltamatic™ Linebreak Detection Systems

Bettis' rate of drop linebreak detection systems are designed to monitor a gas pipeline and automatically send a pressure signal if a predetermined rate of pressure drop is exceeded. The compact system has a range of 5 to 120 psi/min and is usually used to detect a pipeline break and to provide automatic shutdown.

Features:

- Works on pipeline pressure. No electrical power required
- Allows normal pipeline pressure fluctuations without shutdown
- Can be retrofitted into an existing system with minimal effort
- Can be installed remotely or on actuator
- Rate of drop setting can be easily field adjusted
- Functions in extremely cold temperatures -50° F (-46: C)

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Headquarters
P.O. Box 508
Waller, TX 77484
U.S.A.
Tel: 281/463-5100
Fax: 281/463-5103

Bettis Canada Ltd.
4112-91 A Street
Edmonton, Alberta T6E 5V2
Canada
Tel: 780/450-3600
Fax: 780/450-1400

Bettis UK Ltd.
Brunel Way
Fareham, Hampshire PO15 5SA
England
Tel: 0148-988-5333
Fax: 0148-988-5200

Bettis France
30/36 Allee du Plateau
93250 Villemomble
France
Tel: 48 12 26 10
Fax: 48 12 26 19

Bettis GmbH
P.O. Box 1253
47477 Rheinberg
Germany
Tel: 049-2843-1575
Fax: 049-2843-1577

ISO 9001

Quality Certification Bureau Inc.

Cert. Num. 93-13

Bettis Canada Ltd.
Edmonton, Alberta

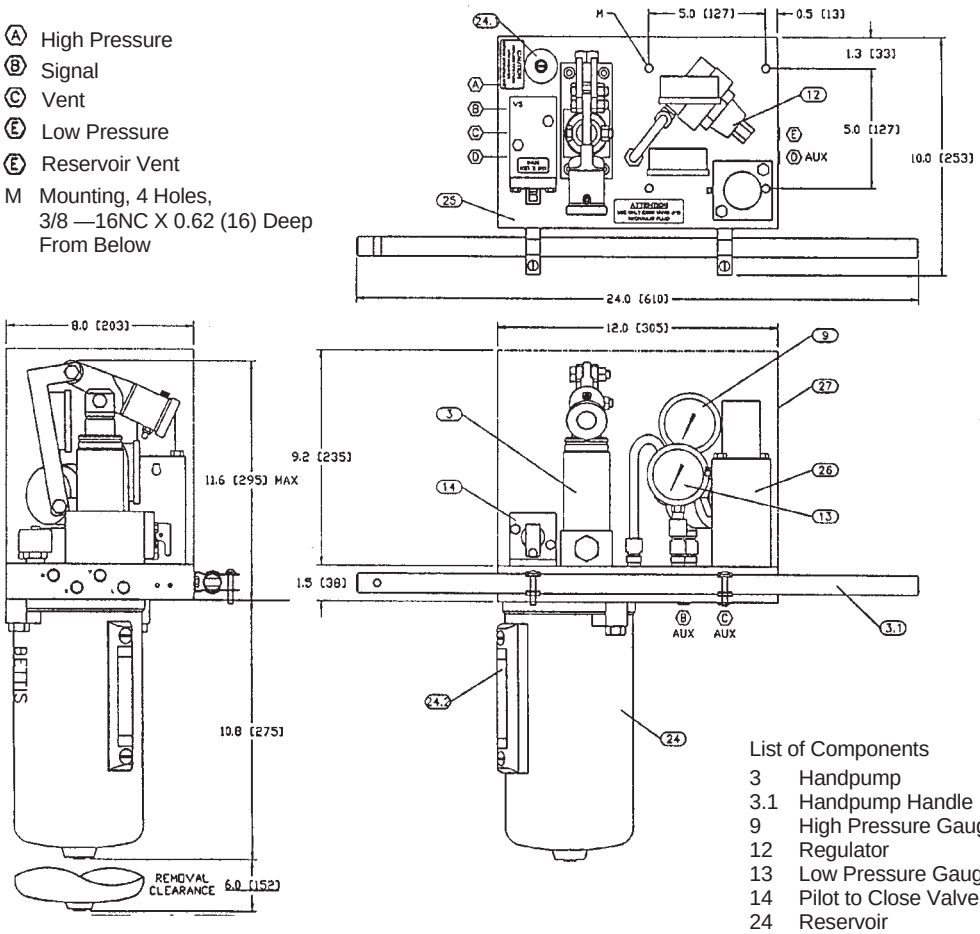
Accredited by
the Dutch Council
for certification

Order Information

To better provide the optimum PressureGuard System for your requirements, we need the following information:

- Minimum required and maximum allowable actuator working pressure (for existing actuator)
- Actuator hydraulic displacement (existing actuator)
- Pressure pilot setting (if any) high or low
- Signal voltage (if any)
- Operating temperature range
- Other climatic conditions (e.g. desert, tropical, marine)
- Required options and accessories

Ⓐ High Pressure
Ⓑ Signal
Ⓒ Vent
Ⓔ Low Pressure
Ⓔ Reservoir Vent
M Mounting, 4 Holes, 3/8 —16NC X 0.62 (16) Deep From Below



List of Components

3	Handpump
3.1	Handpump Handle
9	High Pressure Gauge
12	Regulator
13	Low Pressure Gauge
14	Pilot to Close Valve
24	Reservoir
24.1	Filler/Bleeder
24.2	Reservoir Level Gauge
25	Manifold
26	LP Accumulator
27	Cover (Optional)

Important: Due to Bettis' continuing commitment to engineered product advancement, product specifications and data presented herein are subject to change.

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