

Bettis™ PressureGuard™ Self-Contained Hydraulic Emergency Shutdown Systems

For Rotary or Non-API 6A Linear Valves

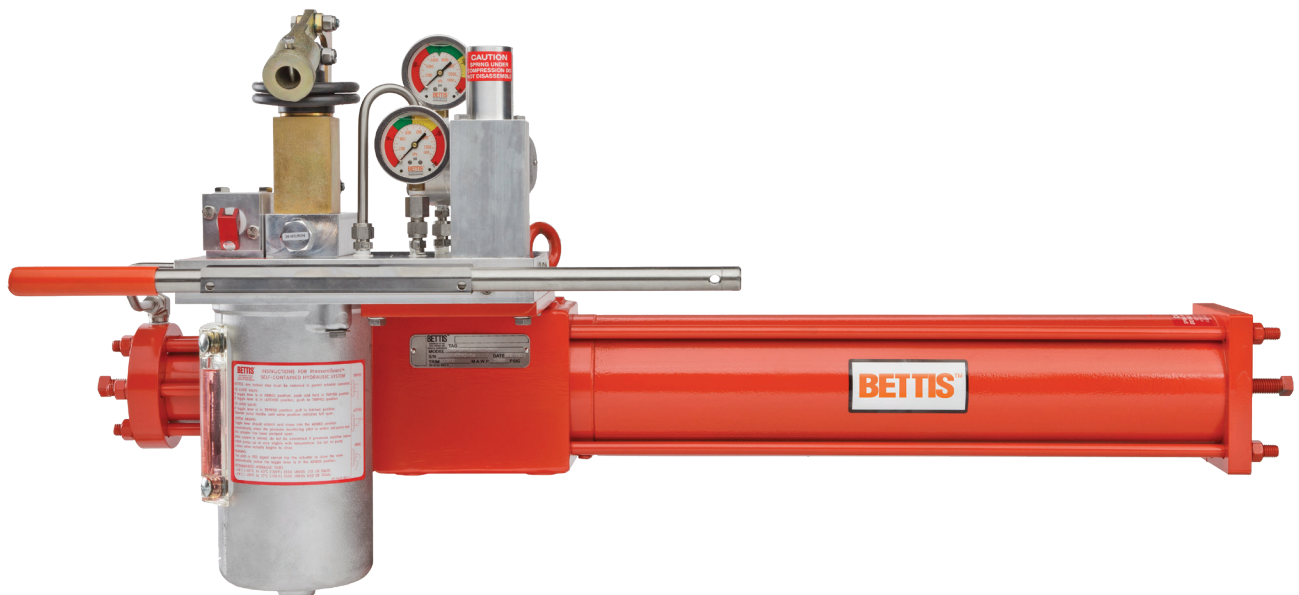


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Section 1: Safety Warning

All personnel involved should read and understand all applicable sections of this manual before attempting to install, operate, service, or perform maintenance on any operators. Adhere to any tags, warning labels, or instructions presented on the operator. These may provide more specific and significant information regarding the operator than this general manual can.

It is the responsibility of the user to ensure proper safety. Always take necessary precautions and utilize proper personal protective equipment when dealing with compressed air, compressed hydraulic fluid, pinch points, and electricity.

It is necessary to rig and lift valve and operator separately. Service personnel need to ensure the lifting capacity of the crane/hoist/rigging is appropriate for the desired load.

Block the power gas supply and depressurize the system before attempting to install or service. Isolate the power gas from controls if the operator is supplied with control system.

Caustic gases and fluids may be contained in the operators and valves in most applications. Vent all poisonous or flammable gases and store all liquids in a safe location to prevent personnel injury. Discharge at sonic velocity may occur when venting or releasing pressure; service personnel must utilize proper hearing protection.

The following are general instructions since there are variations of linear operators and valves. It is critical to install the operator properly so that performance and safety are guaranteed. Any technicians using the following instructions must be trained and knowledgeable regarding valve operators and valves.

It is required to go through the above instructions which will help to prevent personnel injury, property damage, and damage to operator.

Safety notices (warning, caution, and note) are presented in this manual in three forms:

⚠ WARNING:

If not observed, user incurs a high risk of severe damage to operator and/or fatal injury to personnel.

⚠ CAUTION:

If not observed, user may incur damage to operator and/or injury to personnel.

NOTE:

Advisory and informational comments provided to assist maintenance personnel to perform maintenance procedures.

Please refer to the applicable section for details and further information.

Section 2: Introduction

2.1 General Service Information

BETTIS™ PressureGuard™ is a self-contained hydraulic Emergency Shutdown (ESD) system. It is designed to provide reliable valve shutdown on production wellheads in remote locations where automatic local valve ESD is required, but a power source is not available and/or local supervision is minimal.

Available as a complete, tailored-solution, BETTIS™ PressureGuard™ usually consists of a self-contained hydraulic module, a hydraulic operator, and application-specific shutdown trigger accessories. PressureGuard™ systems can be configured for rotary hydraulic operators for use with ball, plug, and other quarter-turn valves, as well as non-6A linear-operated valves. A variety of shutdown trigger controls including pressure pilots, solenoid valves, and a temperature-sensing fusible plug are available to suit application requirements. Instructions for installing BETTIS™ PressureGuard™ system are provided in Section 5. (*Installation*).

Under normal conditions, BETTIS™ PressureGuard™ maintains the valve in its operational position by resisting the spring force with hydraulic fluid pressure. In an event requiring automatic ESD valve operation, the PressureGuard™ employs a control component to shift hydraulic fluid from the valve operator to an internal reservoir. Without fluid pressure, the compressed spring in the operator moves the valve to its shutdown position. Further information on the operation of BETTIS™ PressureGuard™ is provided in Section 4 (*Operation*).

Through robust design and quality construction, minimal maintenance is required of BETTIS™ PressureGuard™. The ESD system is shipped fully-lubricated and serviced. Depending upon service type, a varying degree of maintenance is required and will be detailed subsequently in Section 6. (*Maintenance*). Troubleshooting guide is also provided in Section 6.2. (*Troubleshooting*) in an unlikely event the ESD system displays a problem.

Additional drawings and valve-specific information is provided in Appendix C (*List of Drawings*).

2.2 Definition of Terms

The abbreviations included in this IOM manual are listed in the table below:

Table 1. Definition of Terms

Abbreviated Term	Definition
IOM	Installation, Operation, and Maintenance
SCH	Self-Contained Hydraulic
ESD	Emergency Shutdown
GVO	Gate Valve Operator Series
FS	Fail Safe
SR	Spring Return
HP	High Pressure
LP	Low Pressure
MAWP	Maximum Allowable Working Pressure
ID	Inside Diameter
OD	Outside Diameter

2.3 Scope

This manual is a resource for technicians involved in the installation, operation, and maintenance of Bettis™ PressureGuard™. It serves as a guide and must be thoroughly understood prior to any work on the operators such as installation, operation, or maintenance. For any questions, please contact the manufacturer.

Section 3: Storage Instructions

Proper storage is required when the operator will not be used immediately.

1. Remove all dirt, dust, grease, and contaminants from any exposed, unpainted surface (for example, Drive Rod OD, Yoke ID) by using a soft cloth dampened with an appropriate oil based solvent. Avoid using abrasive material when cleaning rod surfaces.
2. Lightly grease any exposed, unpainted surfaces.
3. Any plastic plugs used to plug the pressure ports during assembly should be removed and replaced with steel plugs. All controls should also be plugged with steel plugs.

NOTE:

Sealants such as pipe dope or Teflon tape should be applied to steel plug threads.

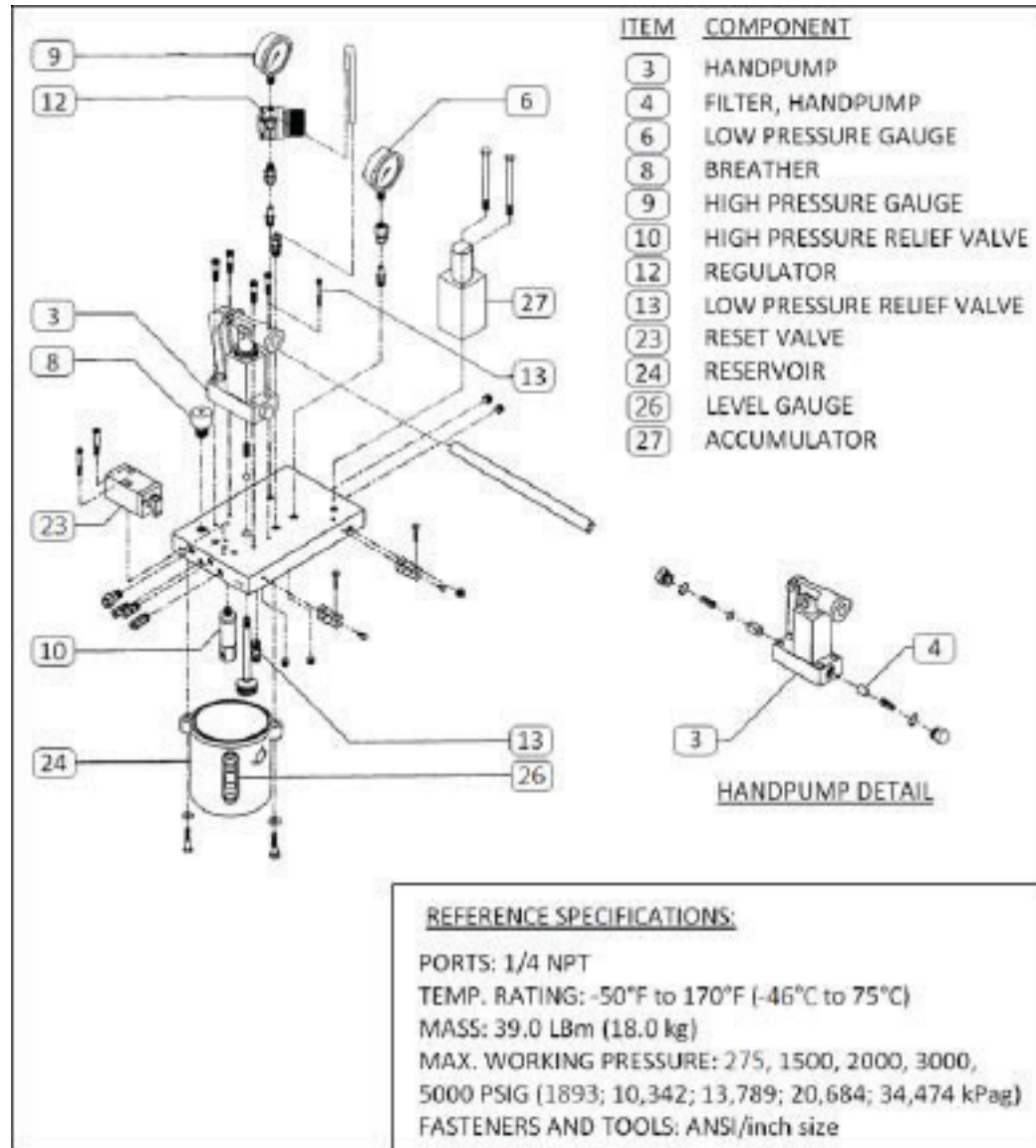
4. Lightly lubricate all exposed threads and unpainted surfaces (for example, mounting surfaces).
5. Cover the PressureGuard™ to prevent accumulation of dirt and debris.
6. Repeat the storage steps listed above to ensure the proper storage condition (in case the PressureGuard™ will be moved and stored again).

Indoor environment is the ideal storage condition for BETTIS™ PressureGuard™. For additional information on storage, please contact the manufacturer.

Section 4: Operation

Before operating BETTIS™ PressureGuard™ system, it is critical to know its components and understand what they do. Refer to Figure 1. (*SCH Module Portion of BETTIS™ PressureGuard™*), Figure 3. (*BETTIS™ PressureGuard™ Schematic*), and Table 2. (*BETTIS™ PressureGuard™ Components and Descriptions*) for components in BETTIS™ PressureGuard™ system.

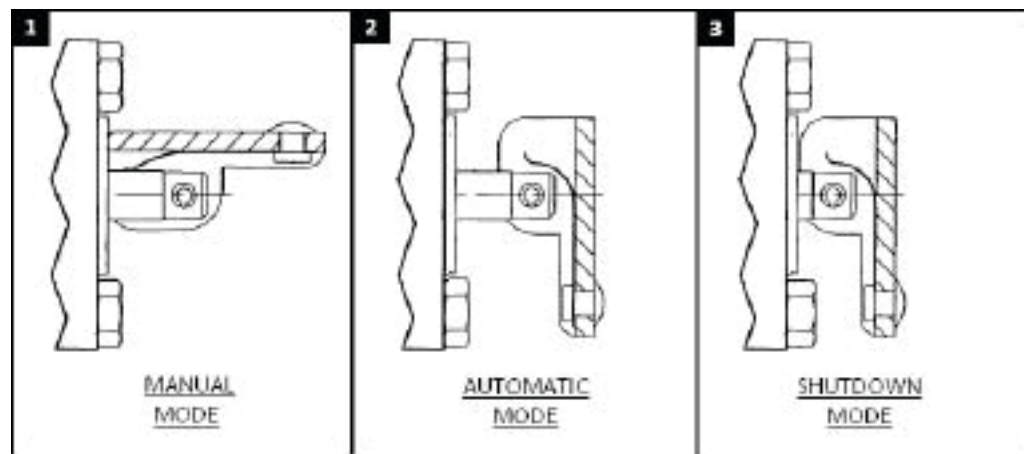
Figure 1 SCH Module Portion of BETTIS™ PressureGuard™



4.1 Manual Mode

1. Lift/pull the toggle on the Reset Valve (23) and latch it in the upward position (pane #1 of Figure 2. *(Three Modes of Reset Valve)*).
2. Stroke the Handpump (3) to pressurize the SCH module and begin applying pressure to the operator's Piston (refer to Appendix C *(List of Drawings)* for diagrams of typical rotary and linear operators) to move the valve to its operational position.

Figure 2 Three Modes of Reset Valve



3. The resistance of the Handpump (3) to pumping will increase noticeably when the valve reaches its full operational position. Pump approximately one-half of additional stroke at this point. The High Pressure Gauge (9) will read above the minimum operating pressure of the operator, and if so equipped, its needle will rest in the middle of the green band.
4. At this point, hydraulic fluid pressure in the SCH module and operator cylinder opposing the operator spring forces to hold the line valve in position.

NOTE:

Plug the Low Pressure Port (L) if the signal device is not connected to the manifold to prevent fluid loss from the manifold. Follow the instructions above to operate the unit.

4.2 Automatic Mode

The primary mode for BETTIS™ PressureGuard™ is its Automatic Mode. This is the mode in which the system is to be set in the field when technicians are not actively inspecting or maintaining wellhead components or resetting the system.

1. BETTIS™ PressureGuard™ enters and stays in Automatic Mode after step #4 in the preceding section is completed as long as signal device(s) (for example, Pressure Pilot (14)) are satisfied and Solenoid Valve(s) (20) (if any) are returned to normal operating condition.
2. In Automatic Mode, the Reset Valve (23) toggle will extend past its latched position from Manual Mode and will hang loosely (pane #2 of Figure 2. *(Three Modes of Reset Valve)*).

4.3 Shutdown Mode

There are several ways in which BETTIS™ PressureGuard™ can move the valve and enter in shutdown mode.

1. Manual Shutdown

Technician can manually close the valve by pushing down the toggle on the Reset Valve (23) or switching the Selector Valve to “**Manual**”. Manually initiated shutdown mode will usually be used for servicing the pipeline of BETTIS™ PressureGuard™ system.

2. Signal Devices

- a. If the Pressure Pilot (14) senses that the pipeline pressure is outside the customer’s defined setpoints, it will release holding pressure from the operator, letting the operator’s spring move the valve to its shutdown position.
- b. If the Solenoid Valve(s) (20) receives an electrical signal, it will also release holding pressure from the operator, letting the operator’s spring move the valve to its shutdown position.

Shutdown initiated by the signal device(s) will likely be an ESD event.

The Reset Valve (23) toggle will be unlatched and flattened against the valve body (pane #3 of Figure 2. *(Three Modes of Reset Valve)*) regardless of how shutdown occurs. Returning the valve to its operational position can only be accomplished manually and will require a technician to go to the valve and reset BETTIS™ PressureGuard™.

Section 5: Installation

Figure 3 BETTIS™ PressureGuard™ Schematic.

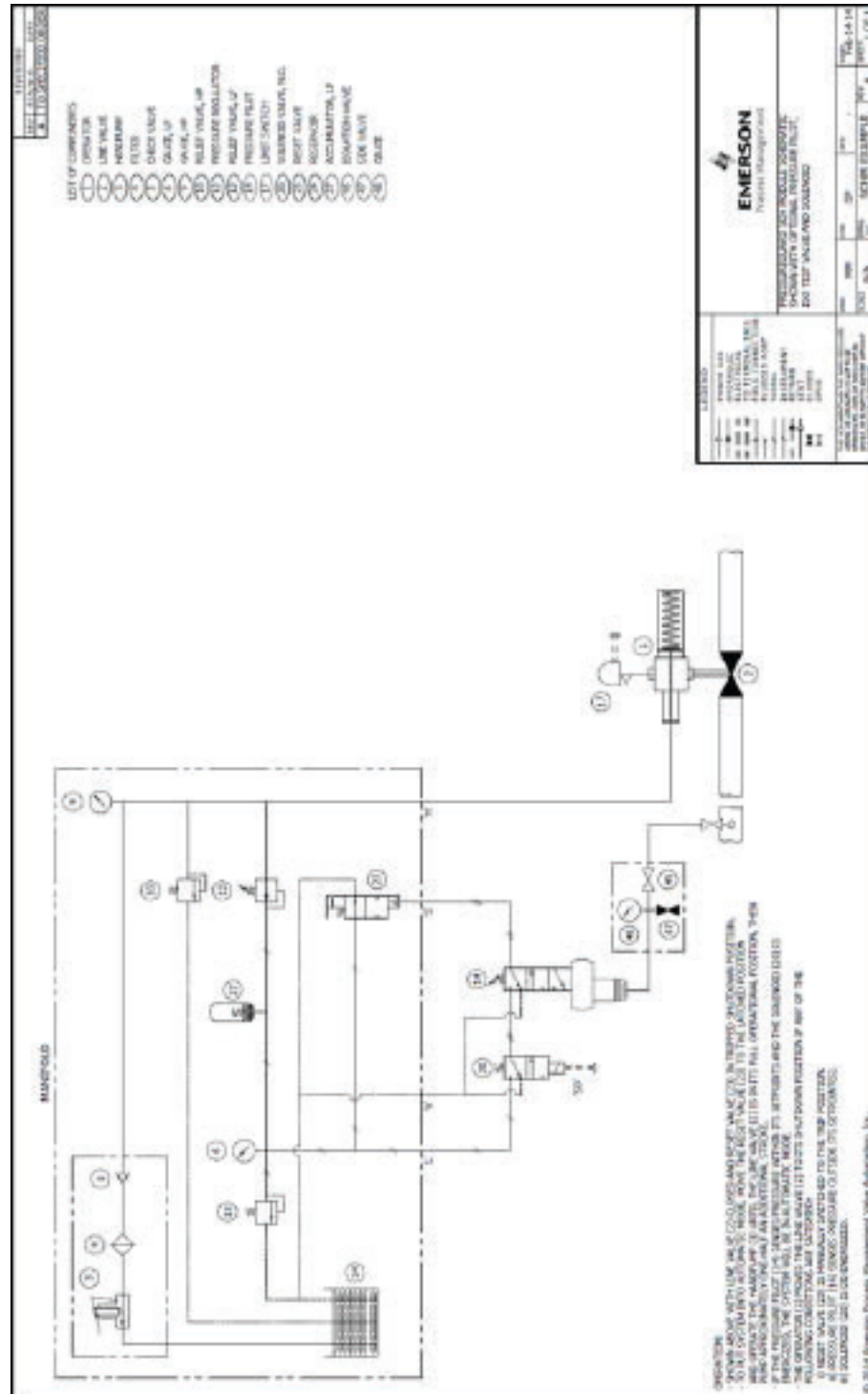


Table 2. BETTIS™ PressureGuard™ Components and Descriptions

Item	Component	Description
1	Operator	Rotary or linear (shown) hydraulic operator.
2	Line Valve	Ball, plug, and others, quarter turn or non-6A linear valve (shown).
3	Handpump	Used to manually pressurize BETTIS™ PressureGuard™ and open a valve.
4	Filter	Filters hydraulic fluid before entering Handpump (3) and controls.
5	Check Valve	Holds high pressure when Handpump (3) is stroked.
6	Gauge, LP	Stainless steel liquid-filled gauge shows the control pressure (low-range).
8	Breather	Ventilates Reservoir (24) as volume changes.
9	Gauge, HP	Stainless steel liquid-filled gauge shows the operator pressure (high-range).
10	High-Pressure Relief Valve	A high-pressure relief valve protects the operator and control system from overpressurization caused by thermal expansion.
12	Pressure Regulator	Regulates the hydraulic fluid pressure in the control circuit.
13	Low-Pressure Relief Valve	A low-pressure relief valve protects control circuit from overpressurization caused by thermal expansion.
14*	Pressure Pilot	Directly monitors pipeline pressure and can trip ESD.
ns*	Selector Valve	Allows selection of automatic command (via Pressure Pilot (14) and/or Solenoid Valve (20)) or manual command (by technician at BETTIS™ PressureGuard™ using Reset Valve (23) and/or Handpump (3)).
20*	Solenoid Valve, N.C.	Allows remote command of ESD.
23	Reset Valve	A latching trip relay reset valve provides quick closing speeds. A manual reset function for local reopening of the valve and manual closing function.
24	Fluid Reservoir	Contains the hydraulic fluid for the operator Cylinder and controls.
26	Fluid Level Gauge	For visual indication of the hydraulic fluid level and condition.
27	Accumulator	Prevents cyclic transfer due to temperature change of fluid from high pressure operator supply circuit to the low pressure control circuit, and thereby prevents temperature induced creep of the operator.
-*	Isolation Test Valve	Typically used to isolate the pressure from the pipeline to the sensing device (Pressurematic™).

* = Optional component, per customer specification.
ns = Not shown.

5.1 SCH Installation

Please refer to Figure 3. (*BETTIS™ PressureGuard™ Schematic*) for an example of ESD system. While not necessarily a typical configuration, Figure 3. (*BETTIS™ PressureGuard™ Schematic*) illustrates the connections, operating method, and a variety of sensing and control options available from BETTIS™ PressureGuard™ system.

The Self-Contained Hydraulic (SCH) module is fully-lubricated, filled with hydraulic fluid, and adjusted as-delivered from the factory. An aviation grade hydraulic fluid (UNIVIS HVI 13 or equivalent) is used in all operator systems, unless a different fluid is requested by the customer. The SCH module is usually factory installed on the operator, but can be field installed by the user.

NOTE:

Any hydraulic or electrical connections that need to be made in the field will be tagged at the factory.

Typical specifications of available SCH modules include:

- Medium pressure SCH module with HP-2SC Handpump:
275 [psi] MAWP
 - Includes 0 to 600 [psi] HP gauge and 0 to 200 [psi] LP gauge.
 - HP Relief set at 275 [psi].
 - LP Relief set at 140 [psi].
 - Regulator set at 90 to 100 [psi].

- High pressure SCH modules with HP-2SC or BHP 3 Handpumps available for several pressures:
2000 [psi] MAWP
 - Includes 0 to 2000 [psi] HP gauge and 0 to 200 [psi] LP gauge.
 - HP Relief set at 1500 to 1750 [psi].
 - LP Relief set at 140 [psi].
 - Regulator set at 90 to 100 [psi].
3000 [psi] MAWP
 - Includes 0 to 3000 [psi] HP gauge and 0 to 200 [psi] LP gauge.
 - HP Relief set at 2000 to 3000 [psi].
 - LP Relief set at 140 [psi].
 - Regulator set at 90 to 100 [psi].

- Additional higher pressure SCH modules are available. Please consult factory for details.

Common components of a low and high pressure systems include:

- Reset Valve requiring 40 to 60 [psi] on the signal port to sustain auto mode. The reset valve may also be referred to as ‘pilot to close valve’, ‘toggle valve’, or ‘manual pilot valve’.
- Solenoid valve with voltage of 12 [VDC], 24 [VDC], 125 [VDC], or 120 [VAC] with MAWP 150 [psi] to be specified by user.
- High/Low pressure pilot upper block connected to the Self-Contained Hydraulic module with an operating pressure from 60 to 5000 [psi]. Process sensing pressure MAWP depends on the manufacturer.
- Standard reservoirs are:
 - Cast aluminum (for volumes less than or equal to 200 [cu-in]).
 - Fabricated steel (for volumes greater than 200 [cu-in] and optional in place of cast aluminum).

NOTE:

Advise the model and serial number of equipment when requesting for parts.

To install in the field, first mount the SCH to the operator using the provided brackets and mounting bolts. Second, make the hydraulic connections per the schematic in Figure 3. (*BETTIS™ PressureGuard™ Schematic*) and the factory-placed tagging.

Ports on the manifold assembly will be identified as:

- (H)** High-pressure hydraulic supply to the operator.
- (L)** Low-pressure hydraulic supply for monitoring/devices.
- (S)** Low-pressure hydraulic signal for Reset Valve (23) from monitoring/ESD devices.
- (V)** Vent or return line to allow off-panel devices to return the hydraulic oil to reservoir.

Depending upon customer specifications, the control portion’s Solenoid Valve(s) (20), if applicable, have been factory installed and tubed and are ready for electrical connections.

Also, depending upon customer specifications, a Pressure Pilot (14) may be included and require tubing to a pressure signal line. The breather/fill port of the Reservoir (24) may be plugged with a metal or plastic plug: if so, remove and replace with the Breather (8) provided in the bag attached to the unit.

NOTE:

Check all hydraulic connections for leak.

5.2 Operator Installation

BETTIS™ PressureGuard™ system is usually delivered from the factory with the SCH module installed on the operator. In this case, install the system per the instructions provided in the Installation, Operation, and Maintenance manual applicable to the type of operator in the system. Please refer to Table 3. (*Operators and IOM Manuals*) for this information.

Table 3. Operators and IOM Manuals

Operator Type	Installation, Operation, and Maintenance Manual Number
E-Series Rotary and Linear Operators	I-0004
Rotary Gas / Hydraulic Operator	I-0006
Linear Gas / Hydraulic Operator	I-0021
Gate Valve Operator Type GVO-LP-FS/SR	E-90090003

Make the electrical and hydraulic connections required by the SCH module after installing the operator with its integrated SCH module.

NOTE:

Check all hydraulic connections for leak.

Section 6: Maintenance

NOTE:

It is recommended to read this manual entirely prior to performing any maintenance work on BETTIS™ PressureGuard™.

Contact BETTIS™ for assistance should the technician have any questions or feel that a certain procedure cannot be performed safely.

⚠ CAUTION: BLEED OFF ALL CONTROL PRESSURE

Proper personal protective equipment should be worn at all times while working on the equipment. Operator assemblies contain pressurized fluids and compressed springs.

Do not attempt to remove any components or perform any service work with the operator under pressure. Bleed off all control pressure and disconnect control pressure supply lines before performing any service to the operator. Failure to do so could result in equipment damage or serious personal injury.

NOTE:

Keep all elastomers and/or replacement parts in original packaging until its ready to install. Inspect all parts (new or used) for burrs, sharp edges, or damages prior to reassembly. Special attention should be given to all sealing surfaces for damage. All parts should be clean and properly lubricated prior to reassembly.

6.1 Regular Maintenance

Regular maintenance (though rarely called for) is critical to ensure that BETTIS™ PressureGuard™ will function within its ESD capacity when needed.

1. SCH Maintenance

NOTE:

Perform routine maintenance on SCH module each autumn (at minimum) or more frequently if it better aligns with the requirements of the valve.

NOTE:

This product is only intended for use in large-scale fixed installations excluded from the scope of Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS 2).

1. Drain any accumulated moisture from Fluid Reservoir (24) by opening the drain plug.
2. Check, clean and/or replace the Filter Element(s) (4).
3. Check the Pressure Relief Valves' (10 and 13) setpoints and reset values.
4. Check the operation and calibration of the control equipment if possible using the Isolation Test Valve (28) (Pressure Pilot (14) and/or Solenoid (20)).
5. Top up the hydraulic fluid with compatible fluid.

Refer to BETTIS™ Pressurematic™ manual (document number 'I-0220', available from the factory or online at 'www.emerson.com').

2. Operator Maintenance

Routine maintenance is required for the operator to function as designed. Refer to the IOM manual for the specific type of operator in the system per Table 3. (*Operators and IOM Manuals*).

6.2 Troubleshooting

1. SCH Module Troubleshooting

Any visible leaks from the SCH module should draw troubleshooting focus.

NOTE:

Figure 3. (*BETTIS™ PressureGuard™ Schematic*) shows that the high pressure side of the system supplies the low pressure regulated side. Therefore, any leakage on the low pressure side will cause significant changes in high pressure gauge values in a short time period.

Depressurize the system before removing/disassembling any components on the manifold.

Vent/return lines will assist in tracing the leakage. This will be done without cycling the unit but with the pressurized removal of the reservoir and off-panel device.

To accomplish this:

1. Remove the vent line from the pilot/solenoid vent port. This isolates it from the SCH module and allows for observation of any oil leakage through the device. This checks poppet/spool and spool sleeve O-ring seal in operating positions.
2. Remove the reservoir from module to observe components (reliefs and reset valve) for oil leakage while under normal operating pressures.

3. Remove the filter plug, spring, and filter in Handpump sub plate to observe the backside of HP discharge. Check for leakage across and around it with high pressure being applied.
4. Remove the fitting and tubing or plug from module second vent port to observe any oil leakage due to manifold porosity between the LP channel and the Vent channel.
5. Remove the operator inspection cover/plate and/or tubing from the Cylinder plate port to observe any oil leakage across the Piston seal and the Piston center O-ring.

In case of pumping problems, access to pump suction valve is gained by removing the pump assembly from sub plate. Pumping difficulties usually result from dirty filter element, contaminated oil (water, methanol), or incorrect fluid type.

Failure of the regulator is indicated by pressure on the LP Gauge (9) exceeding the setpoint by more than 5 [psi].

2. SCH Module Troubleshooting

Refer to IOM manual listed in Table 3. (*Operators and IOM Manuals*) to assist in troubleshooting the specific operator portion of BETTIS™ PressureGuard™.

Section 7: Document Revision

Table 4. Revision Overview

ECN	DATE	REV		BY *	DATE
Released	March 2014	A	COMPILED	J. Quilon	March 2014
Reviewed			CHECKED		
Approved			APPROVED	E. Carrillo	April 2014

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2.

ITEM	PART NO.	DESCRIPTION	QUANTITY	UNIT
1	318-040	SCREW	1	1/4"
2	318-041	PIVOT	1	1/4"
3	318-042	WASHER	1	1/4"
4	318-043	WASHER	1	1/4"
5	318-044	WASHER	1	1/4"
6	318-045	WASHER	1	1/4"
7	318-046	WASHER	1	1/4"
8	318-047	WASHER	1	1/4"
9	318-048	WASHER	1	1/4"
10	318-049	WASHER	1	1/4"
11	318-050	WASHER	1	1/4"
12	318-051	WASHER	1	1/4"
13	318-052	WASHER	1	1/4"
14	318-053	WASHER	1	1/4"
15	318-054	WASHER	1	1/4"
16	318-055	WASHER	1	1/4"
17	318-056	WASHER	1	1/4"
18	318-057	WASHER	1	1/4"
19	318-058	WASHER	1	1/4"
20	318-059	WASHER	1	1/4"
21	318-060	WASHER	1	1/4"
22	318-061	WASHER	1	1/4"
23	318-062	WASHER	1	1/4"
24	318-063	WASHER	1	1/4"
25	318-064	WASHER	1	1/4"
26	318-065	WASHER	1	1/4"
27	318-066	WASHER	1	1/4"
28	318-067	WASHER	1	1/4"
29	318-068	WASHER	1	1/4"
30	318-069	WASHER	1	1/4"
31	318-070	WASHER	1	1/4"
32	318-071	WASHER	1	1/4"
33	318-072	WASHER	1	1/4"

(1) - (3) MOUNTING CONSTRUCTION
 (4) - (5) MOUNTING PARTS REPAIR KIT PART NO. 318-040-042
 (6) - (7) NOT SHOWN
 (8) - FASTENERS AND MAINTENANCE TOOLS ARE ANGLED IN SIZE

BEETIS
 HYDRAULIC EQUIPMENT
 1000 W. 10th St. S.
 Fargo, ND 58103-1000
 701.785.1111
 www.beetis.com

BEETIS CANADA LTD.
 1000 W. 10th St. S.
 Fargo, ND 58103-1000
 701.785.1111
 www.beetis.com

SPECIFICATIONS:
 TEMP. RATING: -50°F TO 175°F (-45°C TO 77°C)
 MAX. PRESS. 1275 PSI (8.8 MPa)
 MAX. FLOW 12.7 GPM (48 LPM)
 DISPLACEMENT: 2 CU. IN. (32.7 CC) PER CYCLE

PART NO. 318-040-042
 REV. 10/07
 DATE 10/07/07
 DRAWN BY 318-040-042

3.

ITEM	PART NO.	DESCRIPTION	MATERIAL	QTY	NOTE
1		BODY	AL 6061-T6	1	
2		O-RING, BODY	NITRILE	1	(Y)
3		O-RING, MANIFOLD	NITRILE	1	(Y)
4		PISTON	AL 6061-T6	1	
5		SPRING, PISTON	CR-V ALLOY	1	
6		O-RING, PISTON	NITRILE	1	(Y)
7		WEAR RING, PISTON	MOLYBARD	1	(Y)
8		POPPET	KEL-F	1	(Y)
9		DOWEL PIN, POPPET	SS 304	1	
10		SPRING, POPPET	SS 302	1	
11		CAP	AL 6061-T6/AN2	1	
12		BOLT	SS 304	4	
13		NAMEPLATE	AL 3003-H14	1	
14		DRIVE SCREW, NAMEPLATE	SS 301../304	3	
15		BASE	AL 6061-T6	1	
16		RETAINING RING	15-7 PH	1	
17		LOCK NUT, CAP	AL 6061-T6	1	

NOTE:
 - (Y) RECOMMENDED SPARE PARTS
 - FASTENERS AND MAINTENANCE TOOLS ARE ANSI/INCH
 - SHOWN ADJUSTED FOR APPROXIMATELY 150 PSIG SIGNAL PRESSURE

SPECIFICATIONS:
 SERVICE: HYDRAULIC FLUID
 TEMP. RATING: -50°F TO 150°F (-46°C TO 66°C)
 MAX. WORKING PRESSURE: 3000 PSIG (207 BARg)
 REGULATED PRESSURE RANGE: 0-200 PSIG (0-13.7 BARg)
 FLOW COEFFICIENT Cv = 0.07
 DYNAMIC SIGNAL SHIFT: -15% OF SUPPLY SHIFT

BETTIS
 BETA HYDRAULIC
 RH HYDRAULIC REGULATOR
 FOR GENERAL SERVICE
 ASSEMBLY AND SPECIFICATIONS

REV. BY: DATE: REF: 0050-2-0500
 INTERPRET: 000 445 (416)
 XX 432 (453)
 X 351 (421)

REV: 000-306
 0050-2-0500
 SCALE: 4:5 BY: AS (AK)
 V/B: 17230-1-S (REV. NO. C-0500)
 WEIGHT: 2.2 LB
 DATE: DEC-17-99
 REV: --

4.

ITEM	DESCRIPTION	MATERIAL	QTY	NOTE
101	BODY, RESET VALVE	AL 6061-T6	1	
102	O-RING, RESET VALVE	NITRILE	3	(Y)
103	CAPSCREW, RESET VALVE	SS 304	3	
104	SLEEVE RETAINER	AL 6061-T6	1	
105	CAPSCREW, SLEEVE RET	SS	2	
106	TOGGLE ASSEMBLY	AL 6061-T6/SS 301	1	
107	SLOTTED SPRING PDN	SS 420	1	
108	WASHER, TOGGLE	NITLON	1	(Y)
109	SPOOL, RESET VALVE	AL 6061-T6	1	
110	WASHER, SPRING	AL 6061-T6	1	
111	SPRING, RESET VALVE	SS 302	1	
112	O-RING, SLEEVE STON	NITRILE	1	(Y)
113	O-RING, SPOOL	NITRILE	1	(Y)
114	O-RING, SPOOL PISTON	NITRILE	1	(Y)
115	SLEEVE, RESET VALVE	TEFLON	1	
116	O-RING, SLEEVE HEAD	NITRILE	1	(Y)
117	O-RING, SLEEVE	NITRILE	1	(Y)

NOTE: (Y) RECOMMEND SPARE PARTS/REPAIR KIT
FASTENERS AND SERVICE TOOLS ARE ANSI/INCH SIZE

LATCHED
(MANUAL RESET)

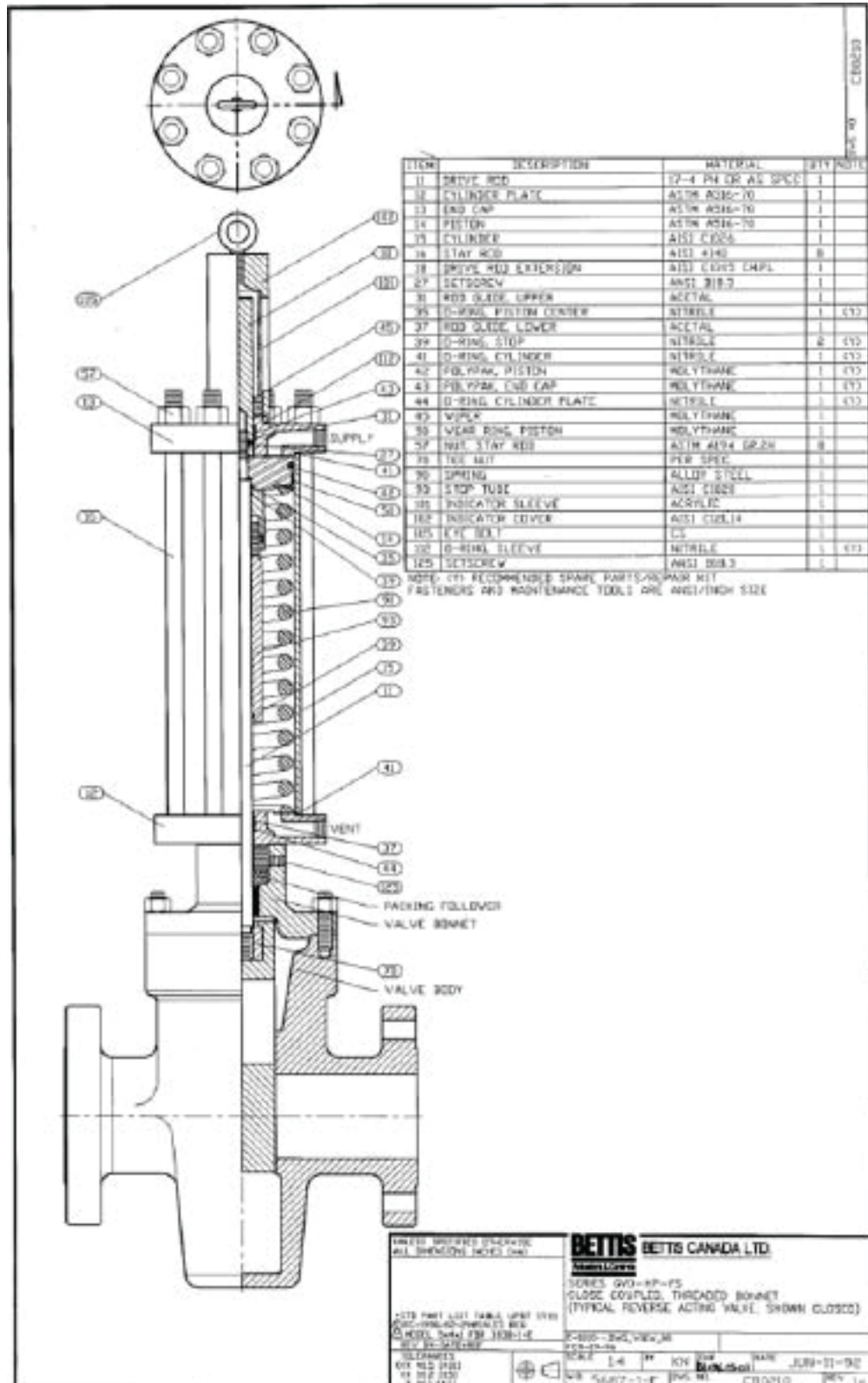
ARPEL
(AUTO-RUN)

BETIS BETIS CANADA LTD.
Avalon Drive
10000 10th Street, Unit 100
Edmonton, Alberta T6E 1K7
Canada

PT-2 V5 PILOT-TO-CLOSE VALVE
FOR SOHN

SCALE: 1:1 BY K.W. [Signature]
DATE: JUN-12-84
REV: C-0069

C.2 GVO-FS Operator Cutaway and Components



C.3 Quarter-Turn Operator Cutaway and Components

1.

QTY	PART NO.	DESCRIPTION	QUANTITY
1	1	1	1
1	2	2	1
1	3	3	1
1	4	4	1
1	5	5	1
1	6	6	1
1	7	7	1
1	8	8	1
1	9	9	1
1	10	10	1
1	11	11	1
1	12	12	1
1	13	13	1
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FIG. NO. 838104

NOTE:
- THE QUANTITY OF EACH PART VARIES DEPENDING ON MODEL. LISTED ABOVE ARE QUANTITIES FOR STANDARD EQUIPMENT.
- TO OBTAIN QUANTITIES FOR OTHER MODELS, CONTACT THE MANUFACTURER.
- TO OBTAIN QUANTITIES FOR OTHER MODELS, CONTACT THE MANUFACTURER.
- PARTS NOT SHOWN IN THIS DRAWING ARE NOT REQUIRED FOR ASSEMBLY OR MAINTENANCE. SEE THE ASSEMBLY AND MAINTENANCE MANUALS FOR DETAILS.

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