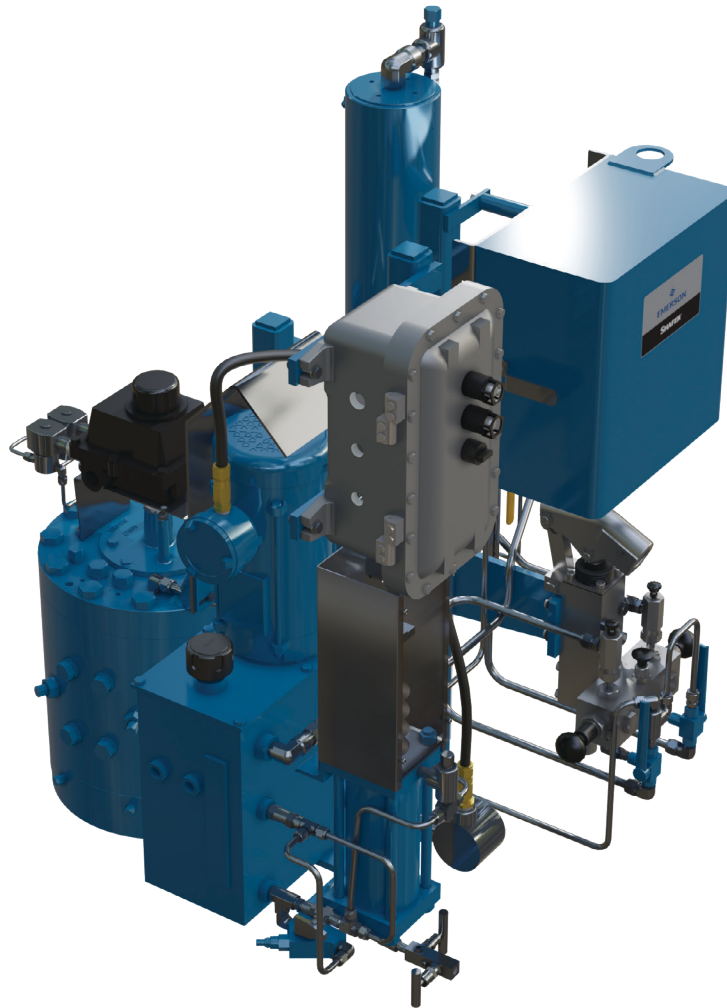


Shafer ECAT

Emission Controlled Actuator Technologies



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Section 1: Introduction

1.1 Scope

This manual is offered as a guide to be used along with locally approved and safe practices to install, operate, service and maintain the ECAT system. Carefully follow the instructions in this manual and make sure you install the system correctly and according to your requirements.

1.2 General Information

1.2.1 Overview

The ECAT is a self-contained, quarter-turn, valve actuator that combines proven technologies from Emerson's Valve Automation. The actuator has been designed for critical shutdown applications where reliability is crucial.

The ECAT utilizes a hydraulic accumulator, pressurized with the pipeline gas, as a stored energy source in order to actuate the actuator / valve open or closed. The self-contained system contains an electric motor, gear pump, and reservoir. Pressure switches for alarming and return line hydraulic filtration is available as an option.

1.2.2 Operation

After initial start-up and commissioning procedures have been accomplished, the electric driven hydraulic pump will keep the power header and all accumulators pressurized to the appropriate pressure with no intervention from operations personnel.

1.2.3 Maintaining Pressure

Any loss of pressure in the power header line or accumulators, whether caused by external leakage or actuator movement, will cause the thermal-volume controller rod to move down. This movement operates the motor control switch to the "Motor On" position, automatically starting the electric driven hydraulic pump. The pump will run until the hydraulic fluid in the power header line and all accumulators has been replenished. When the header and accumulator have been filled, the thermal-volume controller rod will rise and operate the motor control switch to the "Motor Off" position. There is no need for the pump to be started or stopped by operations personnel.

1.2.4 Mechanically Operated Components

The only mechanically operated components on the ECAT system are the motor control switch located on the thermal volume controller. This switch detects the position of the thermal-volume controller and relays the information back to the control. The control then starts or stops a motor as needed. The switch does not require adjustment or maintenance.

1.2.5 Relieving Pressure on the Fluid

High-pressure hydraulic fluid can be safely routed back to the reservoir from the accumulator or actuator units by opening the main accumulator Bypass valve located on the reservoir. Opening this valve will allow the pressurized fluid in the system to be common to the reservoir. This valve should be opened slowly to prevent the high-pressure fluid from foaming due to the velocity through the hand valve. A hydraulic thermal relief valve is piped in parallel to this hand valve for the purpose of relieving excess hydraulic pressure in case the control malfunctions or ambient temperature conditions exceed design limits.

1.2.6 Fluid Level in Reservoir

The reservoir tank is provided with a stainless steel sight glass level viewer.

1.2.7 Functional Description

The following is a functional description of the ECAT System for valve actuators and a brief explanation of the main components that make this ECAT system unique. Throughout this explanation numbers which appear in parenthesis () correspond to item numbers on Schematic Diagram 11547-S.

The ECAT system provides energy for operation of valve actuators during normal operation as well as emergency shutdown. This energy is hydraulic power stored in the Accumulator (76). When required, the Accumulator (76) pushes the hydraulic fluid into the power oil header line. The power oil header line supplies the actuator power for operation.

The hydraulic fluid leaving the valve actuator will pass through the return oil header line back into the Oil Reservoir (60) creating a closed loop system.

The Accumulator (76) gets its power from high-pressure pipeline gas pushing on the accumulator's piston.

The hydraulic fluid, stored in the Accumulator (76), originates from the Oil Reservoir (60). Fluid is drawn from the Oil Reservoir (60) and through the suction line by a Hydraulic Pump (67). The hydraulic pump (67) forces the fluid through the discharge line and into the Accumulator (76).

The ECAT system has one electric motor driven Hydraulic Pump (67). The pump is controlled by a motor control switch operated by the Thermal-Volume Controller (77). While in operation, if the Thermal-Volume Controller (77) moves a small amount actuating the Motor Start / Stop Switch (78) to the "On" position, the electric motor driven Hydraulic Pump (67) will start to run. The pump will operate until the Thermal-Volume Controller moves and actuates the Motor Start / Stop Switch (78) to the "Off" position.

1.2.8 Product Attributes

- Easy installation – ECAT actuator is a totally self-contained system and designed for compactness and adaptable to new or existing valves
- Designed for Bettis™ or Shafer hydraulic double-acting actuator and controls, including the handpump
- Shafer™ hydraulic control technology
- Multiple input power options with either AC or DC
- Local open / close control
- Fast speed of operation to fail-safe position if required
- Accumulator suitable for hydraulic and natural gas service
- Operating pressures up to 2220 psi with standard components

1.3 Safety Information

Safety notices in this manual detail precautions the user must take to reduce the risk of personal injury and damage to the equipment. The user must read these instructions in their entirety. Failure to observe these safety notices could result in serious bodily injury, damage to the equipment, void of the warranty. Take special notice of all tags, warning labels and instructions presented on the actuator. These may provide more specific and significant information regarding the actuator than this general manual.

It is the responsibility of the user to ensure proper safety practices are utilized. Always take necessary precautions and use proper protective equipment when dealing with compressed gasses, compressed hydraulic fluid, pinch points and electricity.

Safety notices are presented in this manual in three forms (Warning, Caution and Note) as follows:

WARNING

Alerts user of potential danger; failure to follow the warning notice could result in serious personal injury or death.

CAUTION

Identifies precautions the user must take to avoid personal injury or equipment damage.

NOTE:

Highlights information critical to the user's understanding of the ECAT system installation or operation.

1.4 Abbreviation Definitions

Abbreviations used in this manual and their definitions are listed in the table below:

Table 1. Abbreviation Definitions

Abbreviation	Definition
IOM	Installation Operation Manual
ESD	Emergency Shutdown
FS	Fail-safe
DA	Double-Acting
MAWP	Maximum Allowable Working Pressure
MOP	Maximum Operating Pressure
MCC	Motor Control Center
LS	Limit Switch
PS	Pressure Switch
NC	Normally Closed
NO	Normally Open
CCW	Counterclockwise
CW	Clockwise
OL	Overload
PPE	Personal Protective Equipment
GA	General Arrangement Drawing
SOV	Solenoid Valve
NO	Normally Open
NC	Normally Closed

Section 2: Installation

2.1 Preparation

2.1.1 Delayed Usage

If for any reason the actuator is not to be installed immediately, Emerson Process Management recommends the following procedures. Failure to comply, with recommended procedures, could lead to actuator malfunction and possibly void the warranty. For storage procedures exceeding one year, consult Emerson Process Management for further recommendations.

As shipped from the factory, the ECAT system is an inherently weatherproof unit, providing that all compartment covers and cable entry plugs remain intact. The actuator should be immediately stored in a clean, dry warehouse, free from vibration and rapid temperature changes, until it can be installed and energized.

If the actuator must be stored outside, store it off the ground at an elevation sufficient to prevent it from being immersed in water or buried in snow. Check for any unpainted or exposed metal surfaces and make sure they are protected with a coating of grease to prevent any corrosion. Cover the system to prevent damage from site debris.

2.1.2 Tools and Materials Required

To complete these procedures, you will need the following documentation for the ECAT Actuator and items indicated in the table below:

- General Arrangement Drawing
- Bill of Material
- ECAT System Schematic
- System Wiring Diagram

Table 2. Tools and Material Requirements

Tools and Material Requirements
Primary Power Source for the ECAT (check the ECAT System Electrical Diagram for requirements)
Supplemental quantity of hydraulic fluid, if needed (See Section 2.7, Hydraulic Fluid and ECAT specification, for required fluid type)
Hand Tools: complete complement of open end (SAE and metric) wrenches, screw drivers Philips and flat blade and a set of hex wrenches
Chains and lifting straps that are inspected and certified for the weight of the ECAT system (check shipping weights)
Sealant for all cable and conduit entries (approvable by the National Electric Code or your country standard and applicable local codes)

2.2 Valve Preparation

- 2.2.1 Remove Valve Gearing if equipped.
- 2.2.2 If valve is equipped with stops, remove valve stem extension housing. Examine the valve stops to ensure no foreign material is present that would restrict normal travel of the valve. Some valves are equipped with inspection ports in the valve housing for ease in examining the stops.
- 2.2.3 Check alignment of stem key slot to the position of the valve. Normally with the valve in the open position, the key slot is in line with the run of the pipeline. With the valve in the closed position, the key slot should be 90° to the run of the valve.
- 2.2.4 The ECAT Actuator may be mounted to the valve at any time regardless of whether the valve is under pressure.

2.3 Actuator Preparation

- 2.3.1 Once the ECAT Actuator is uncrated and cleaned for installation, check to ensure there will be no interference with piping or other structure when the actuator is properly mounted to the valve.
- 2.3.2 Check that all mounting materials such as fasteners, adapters, brackets etc. are on hand and ready for use.
- 2.3.3 Check the actuator and valve to see that they are in the same relative position, that is either open or closed. If the actuator must be moved, use the Handpump provided.
- 2.3.4 It is critical that the accumulator is charged with natural gas pipeline pressure prior to operating the equipment. Refer to Section 2.8 for charging instructions.

NOTE:

Failure to charge the accumulator may cause the accumulator to not function properly.

2.4 Lifting the ECAT System

NOTE:

All ECAT Considerations

When handling any ECAT actuator, be aware of tubing, accessories, handpump, accumulators, and control enclosures. Straps and chains can become entangled and cause damage to these components.

NOTE:

Do not use hydraulic tubing and electrical cable for lifting.

⚠ CAUTION

Be sure to use appropriately rated crane / hoist and straps / chains to raise and lower the actuator.

2.4.1 Shafer Rotary Vane Actuator Lifting

Use the integrated lifting eyes only to lift and move the ECAT system.

Figure 1 ECAT System Mounted on the Shafer Rotary Vane Actuator

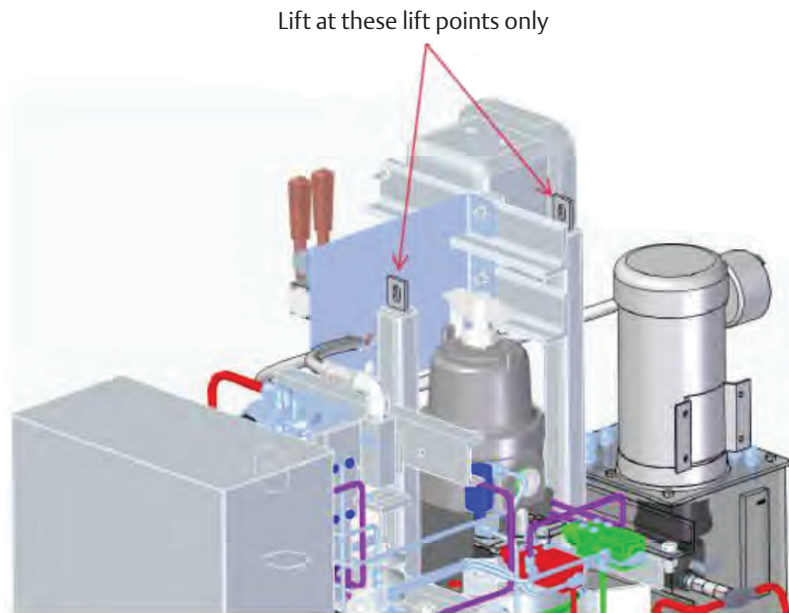
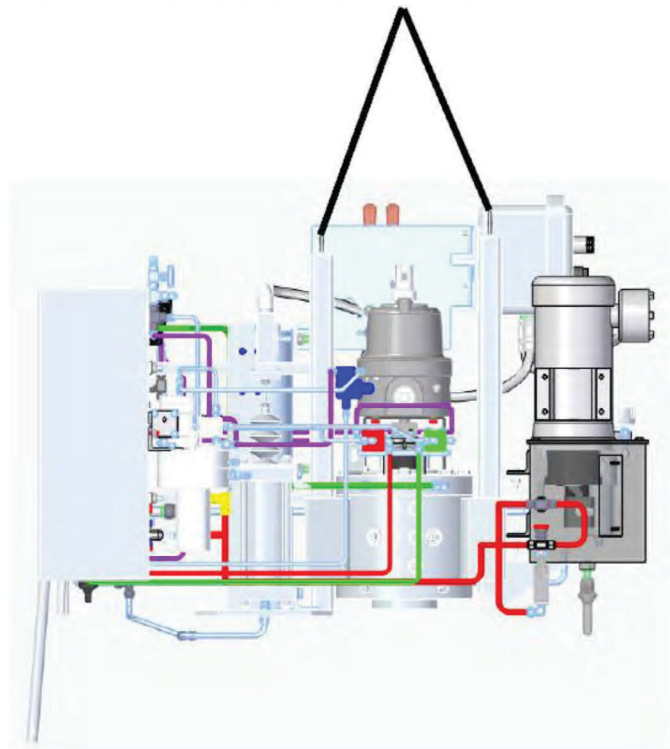


Figure 2 ECAT System Mounted on the Shafer Rotary Vane Actuator



⚠ CAUTION

Never lift the actuator with a valve attached. Always handle actuator / valve assemblies by attaching lifting equipment to the valve only.

2.5 Installing the ECAT Actuator on the Valve

The actuator will be bolt-mounted directly to a bracket or adaptor that will be bolted securely to the mounting flange top works of the valve.

- 2.5.1 Check to see that the dimensions of the bracket or adaptor are suitable for use with the valve mounting flange and stem.
- 2.5.2 Check valve direction of rotation and the actuator direction of rotation to see they match (for example: CW = close, CCW = open).
- 2.5.3 Check to see the actuator and valve are in the same relative position (see 2.3.3).
- 2.5.4 Check all mounting surfaces, they must be clean and free of debris to permit proper fit up.
- 2.5.5 Prior to mounting, grease the coupling bore and the bore of the actuator.

NOTE:

Do not apply grease to the mounting flange surfaces on the valve or the adaptor.

- 2.5.6 Install the stem key and grease it (keys may be held in place with tape).
- 2.5.7 Install the coupling onto the stem and stem key.
- 2.5.8 Install the coupling key and grease it.
- 2.5.9 Carefully align the coupling and key to the bore and keyway in the actuator and slide the actuator onto the coupling until the adapter (bracket) bottoms out on the valve bonnet.
- 2.5.10 Use the required fasteners to firmly attach the adapter to the valve bonnet. Tighten the fasteners to their manufacturer's recommended maximum torque (dry or lubricated).

2.6 Setting the Stroke Limit Stops

Refer to the installed actuator installation and operation manual for specific instructions on setting the actuator stops.

2.7 Hydraulic Fluid

The ECAT actuators are shipped with the reservoir filled to operation level. Before commissioning and periodically afterwards, check to ensure the fluid level is correct. The reservoir is equipped with a sight gauge. Should hydraulic fluid need to be added or replaced, use only factory approved hydraulic fluid.

This specification covers hydraulic fluids which are approved by engineering for use in the ECAT system at a temperature range from -50 °F to 140 °F (-46 °C to 60 °C).

2.7.1 Approved Fluids

Standard Fluid [use with -20 °F to 140 °F (-29 °C to 60 °C) applications]

ConocoPhillips Megaflow™ AW HVI Hydraulic Oil 22

Shell Tellus S2 V 22

Mobil DTE 10 Excel™ 22

Low Temperature Fluid [use with -50 °F to 140 °F (-46 °C to 60 °C) applications]

Mobil Univis™ HVI 13

Although other brands of fluid matching the same specifications may be used, to maintain the warranty and ensure trouble free operation, always check with the factory before substituting any other fluid.

2.8 Accumulator

2.8.1 Introduction

The ECAT Actuator is equipped with a hydraulic accumulator. As the accumulator utilizes the pressurized pipeline gas, the ECAT will be in an unpressurized state when shipped from the factory.

When using this procedure, refer to the ECAT Actuator General Arrangement drawing and Hydraulic Schematic for the unit being worked on. Schematics shown in this document are for illustration purposes only.

WARNING

This unit contains high-pressure hydraulic fluid and high pressure pipeline gas. Exercise caution when performing any type of maintenance. Wear proper safety attire and required personal protective equipment, including safety glasses.

2.8.2 Pipeline Gas connections – Refer to schematic 11547-S

- a. Locate Upstream Isolation Valve (90) and Downstream Isolation Valve (91) (optional) for upstream and downstream pipeline gas connections, called out on the General Arrangement Drawing and Hydraulic Schematic (see Figure 3).
- b. Close the Upstream Isolation Valve (90) and Downstream Isolation Valve (91) (optional) remove the pipe plugs.

NOTE:

Connection to the Downstream Isolation Valve (91) is optional. The isolation valves NPT thread size will vary based on actuator model size.

- c. Open Accumulator Hydraulic Isolation Valve (74) and Thermal Volume Controller Hydraulic Isolation Valve (75).
- d. Connect the pipeline gas to isolation valves (90) and (91).
- e. Ensure the Pneumatic Blow Down Valve (87) is closed.
- f. Ensure Pneumatic Isolation Valve (Lockable) (83) is open.
- g. Slowly open isolation valves (90) and (91).
- h. Slowly open Pneumatic Blow-Down Valve (87) to purge the pneumatic side of the control of air. Close valve (87).

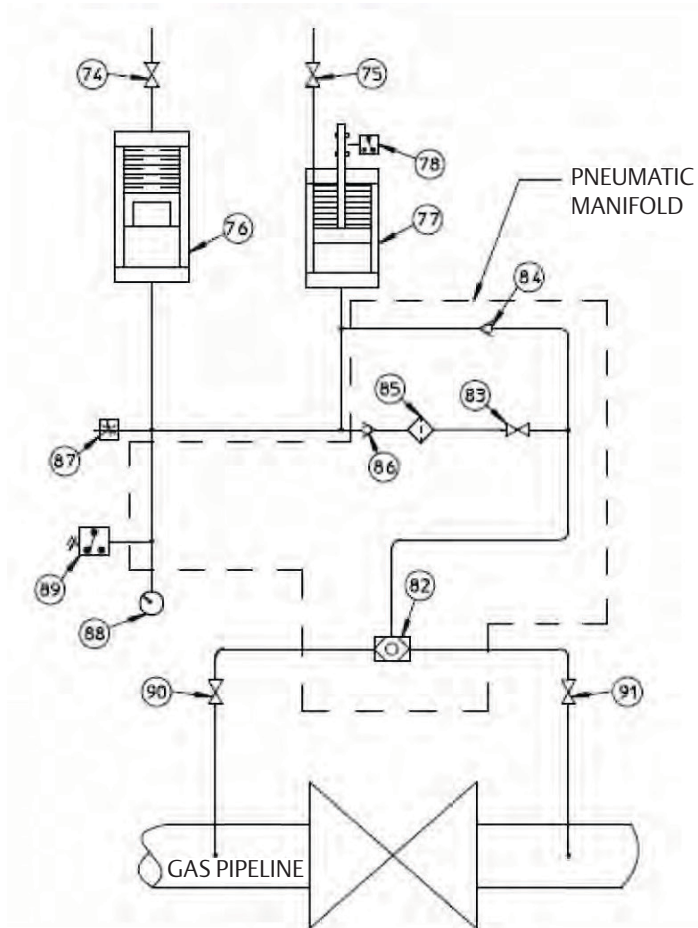
NOTE:

The pneumatic side of the ECAT is pressurized and the isolation valves (90) and (91) should remain open until maintenance of the ECAT is required.

Table 3. Typical ECAT Accumulator System

Part Number	Part Name
74	Accumulator Hydraulic Isolation Valve
76	Accumulator (Piston Type)
75	Thermal Volume Controller Hydraulic Isolation Valve
77	Thermal Volume Controller
83	Pneumatic Isolation Valve (Lockable)
87	Pneumatic Blow-Down Valve
90	Upstream Isolation Valve
91	Downstream Isolation Valve (Optional)

Figure 3



2.8.3 Pneumatic Fitting Leak Check

With pipeline pressure applied to the pneumatic side of the ECAT circuit, check to ensure there are no leaks at the fittings. Use a leak detection product such as Snoop liquid leak detector from Swagelok or comparable.

If any leaks are detected, close isolation valves (90) and (91) and open Pneumatic Blow-Down Valve (87) to vent all pressure from the circuit.

Repair any leaks present and repeat steps from Section 2.8.2.

⚠️ WARNING

This unit contains high-pressure hydraulic fluid and pipeline gas. Exercise caution when performing any type of maintenance. Wear proper safety attire and required personal protective equipment, including safety glasses. Ensure the accumulator has been drained of all hydraulic and pipeline gas pressure before attempting any repair.

Section 3: Electrical Connections

3.1 Main Electrical Connections

Refer to the project specific wiring diagram for the electrical connections to the MCC.

3.2 Sealing Cable / Conduit Entries

Seal the cable and conduit entries in accordance with the National Electric Code or your country standard and applicable local codes. All conduit entries should be sealed against the site environment. All unused conduit entries must be sealed with threaded metal plugs.

WARNING

Always verify electrical power is disconnected before opening the motor starter enclosure.

Section 4: Set-up / Start-up Procedure

In addition to this set-up / start-up procedure, the following documentation will be necessary to fulfill all set-up and start-up requirements.

1. General Arrangement drawing
2. Bill of Material
3. Schematic drawing
4. Wiring Diagram drawing

When using these instructions, refer to the schematic diagram, wiring diagram, general arrangement drawings for the ECAT and the certified bills of material.

Numbers in [] correspond to components labeled on the wiring diagram. Numbers in () correspond to components labeled on the schematic diagram. Information in (()) is descriptive.

When the ECAT is delivered to the job site, it has been both pressure and function tested. The oil reservoir was filled to operation level when it shipped from factory.

4.1 Preparation

4.1.1 Safety First

WARNING

Hydraulic Pressure

Ensure that test personnel and witnesses are properly informed of the hazards involved with high pressures and the proper safety barriers are employed. Never check for leakage using your fingers or hands. Fluid under high pressure can inject into the skin and cause severe damage or death. Always use an implement such as a piece of paper or shop rag.

WARNING

Safety Equipment

All personnel in the testing area must always wear safety glasses.

4.1.2 Material and Equipment for Start-up and Set-up

To complete this procedure, you will also need the following materials and equipment:

Table 4. Required Material and Equipment

Required Material and Equipment
Miscellaneous fittings, adapters and Hand Tools: complete complement of open end ((SAE and metric)) wrenches, screw drivers Philips and flat blade and a set of hex wrenches
Primary Power Source for the ECAT ((check the ECAT System Electrical Diagram for requirements))
Supplemental quantity of hydraulic fluid, if needed ((See Section 2.7, Hydraulic Fluid, and ECAT specification for required fluid type))

4.2 Initial Check of the Unit

- 4.2.1 Check to ensure all hydraulic tube fittings are tight. Vibration during shipment may have loosened connections.
- 4.2.2 Visually inspect the unit to make sure tubing, hand valves, gauges and other equipment have not been damaged.
- 4.2.3 Using the actuator control schematic drawing, verify that the Flow Control Valves are fully opened ((turn stem completely counterclockwise)).
- 4.2.4 Ensure System Bypass Hand valve (71) is closed.
- 4.2.5 Ensure the Accumulator Hydraulic Isolation Valve (74) and Thermal Volume Controller Hydraulic Isolation Valve (75) are open.
- 4.2.6 Ensure Power Oil Isolation Valve (73) is closed.

4.3 Initial Connections

Electrical connections should have been made to the MCC (Motor Control Center). If power is not connected, follow the instructions under Section 3, Electrical Connections, before continuing.

CAUTION

Before the actuator is stroked, ensure the reservoir has been filled with fluid to the proper level. (See Section 2.7, Hydraulic Fluid.)

4.4 Initial Pre-Charge

Refer to Section 2.8 Accumulator for the pre-charge setup of the ECAT.

4.5 Initial Reservoir Fill

Ensure the ECAT Oil Reservoir (60) is filled to the proper oil level. Remove the Hygroscopic Breather (61) if fluid needs to be added to the reservoir.

4.6 Hydrostatic Pressure / Function Test

The Accumulator has already been hydrostatic tested per A.S.M.E. requirements and does not require re-testing. This test is to discover if any leaks have developed in the hydraulic fittings during shipment.

- 4.6.1 Ensure Isolation Valves (90), (91) (optional) and (83) are open.
- 4.6.2 Ensure Accumulator Hydraulic Isolation Valve (74) and Thermal Volume Controller Hydraulic Isolation Valve (75) are open.
- 4.6.3 Ensure the Power Oil Isolation Valve (73) is closed.
- 4.6.4 Open the reservoir Isolation Valve (65).
- 4.6.5 Open the System Bypass Valve (71).

- 4.6.6 Verify all electrical connections are made per Section 3 of this procedure. Ensure the [Hand/Off/Auto] selector switch is set at Off. Turn main power on to the ECAT unit. The Power On light on the MCC should be illuminated.
- 4.6.7 Check rotation of the motors by jogging the [Hand/Off/Auto] selector switch to [Hand]. The motor must rotate clockwise when viewed from the back of the motor.
- 4.6.8 Turn the [Hand/Off/Auto] selector switch, on the MCC, to the [Auto] position. The motor will start-up and run.

CAUTION

Observe entire system for leakage and be prepared to stop the motor immediately should any develop. Make any needed corrective actions.

- 4.6.9 Allow the Electric driven Hydraulic Pump (67) to run several minutes circulating fluid from the reservoir through the System Bypass Valve (71) and back to the Reservoir (60) to eliminate most of the air in the hydraulic lines.
- 4.6.10 With the motor running, slowly close the System Bypass Valve (71). Check Hydraulic Pressure Gauge (79) to observe pressure build up in the hydraulic lines and fluid will start to fill the Accumulator.
- 4.6.11 Observe the Level Viewer (62) to ensure enough fluid is present to fill the Accumulator (76). In the event the fluid level drops to the trip point of the Level Switch (63), the Electric Motor (69) will stop. Add fluid to the Reservoir (60) if needed.
- 4.6.12 Allow the Pump to run filling the Accumulator until the Thermal-Volume Controller moves and trips the Motor Start / Stop Switch (78) stopping the Electric Motor.
- 4.6.13 Slowly open the System Bypass Valve (71) and relieve the pressure in the hydraulic lines until the electric Motor starts to run. Close the System Bypass Valve. Allow the motor to run until the pump fills the Accumulator and the Thermal-Volume Controller shuts the motors off.
- 4.6.14 Perform step 4.6.14. 3 to 4 times so that air can be worked out of the system. Allow the Electric Driven Pump (67) to run until it is stopped by the Motor Start / Stop Switch (78).
- 4.6.15 Maintain this pressure for 5 minutes while visually inspecting the hydraulic system for leaks. Corrective action must be taken for any leaks found.

CAUTION

Relieve system pressure before tightening any leaking fittings.

- 4.6.16 Turn the [Hand/Off/Auto] selector switch to [Off].
- 4.6.17 Open the System Bypass Hand Valve (71) and relieve the pressure in the hydraulic lines.
- 4.6.18 Close the System Bypass Hand Valve (71).

The hydrostatic test is now completed.

4.7 Final Start-Up Procedure

The system should already have the pipeline gas pressure applied to the pneumatic side of the system per Section 2.8. Verify the connections and pressure reading on Pneumatic Pressure Gauge (88).

The header lines up to Power Oil Isolation Valve (73) should be filled and purged of all air per Section 4.6.

Under normal operating conditions, the [Hand/Off/Auto] selector switch will be set to [Auto].

Refer to the Actuator and Control IOM for specific steps in operating the actuator and control in conjunction with the ECAT hydraulic system.

4.8 Optional Instrumentation

The ECAT system can be supplied with a Hydraulic Pressure Switch (Low System Pressure) (80) and/or Pneumatic Pressure Switch (Low Pressure) (89), Return Filter with Bypass and Indicator (66), or Downstream Isolation Valve (91) as an option.

Section 5: Troubleshooting

WARNING

To prevent personal injury, all hydraulic pressure must be relieved from the accumulator before opening any tube lines or attempting replacement operations below.

Of all the system components, the actuator itself is least likely to malfunction and require the most time and effort to service.

Table 5. Troubleshooting

Symptoms	Possible Reason
ECAT does not turn ON.	<ol style="list-style-type: none">1. Ensure voltage is adequate to the unit.2. Check to see that the electrical power is connected to the correct terminals.3. Circuit breaker is tripped off.
ECAT is ON, but motor does not run.	<ol style="list-style-type: none">1. Ensure the Hand/Off/Auto switch is in the proper position.2. Ensure the customer field power wiring is an adequate size.3. Power supply is insufficient.4. Check to see if thermal overload is tripped.5. Ensure the Motor Start / Stop Switch (78) is set properly.
ECAT motor runs, but fails to develop sufficient pressure to open the valve.	<ol style="list-style-type: none">1. Low fluid level in reservoir.2. Wrong motor shaft rotation.3. Manual bypass valve (71) is open.4. The System Hydraulic Relief Valve (72) is cracking open. Check to ensure setting set to factory setting.

Should any issue be experienced besides the symptoms noted above, please consult factory.

Important check points for automatic operation of the ECAT:

1. Ensure oil level is at the proper level.
2. Ensure bypass valve (71) is closed.

Section 6: Maintenance

6.1 Storage Procedures

The actuator should be immediately stored in a clean, dry warehouse, free from vibration and rapid temperatures changes, until it can be installed and energized. If the actuator must be stored outside, it should be stored off the ground at an elevation sufficient to prevent it from being immersed in water or buried in snow and covered to prevent damage from site debris.

If the actuator is not attached to a valve, the preferred orientation is with the motor and electrical compartment horizontal. Care should be taken to plug all open ports on the actuator and all controls to keep out foreign contaminants.

6.2 Service Interval

Routine maintenance is generally unnecessary. Normally recommended service interval for Shafer/Bettis actuators is five years or maximum actuator seal life cycle, whichever occurs first.

NOTE:

Storage time is considered as part of the Service Interval time.

It is recommended that Service Kits be ordered approximately three (3) months prior to scheduled maintenance to assure availability.

Observe the function of the Accumulator (76) and Thermal Volume Controller (77) on an annual service interval to ensure they are functioning properly and holding hydraulic pressure.

6.3 Lubrication Requirements

NOTE:

Lubricant, other than listed below should not be used without prior written approval of Emerson Product Engineering.

Hydraulic fluids, other than those listed below should not be used without prior written approval of Emerson Product Engineering.

Standard temperature service (-29 °C to 60 °C/-20 °F to 140 °F) use CONOCO Megaflow® AW HVI 22 Fluid, reference Section 2.7.1.

Low temperature service (-46 °C to 60 °C/-50 °F to 140 °F) use Mobil Univis™ HVI 13 fluid.

6.4 Recommended Annual Inspection

It is recommended the following components and features of the ECAT to be evaluated at least once a year.

- Check hydraulic fluid levels
- Check the pressure gauges
- Check bolts and fittings for tightness
- Check for external oil leaks
- Check the pneumatic fittings with a leak detection product such as Snoop liquid leak detector from Swagelok or comparable.
- Check handpump operation functions properly
- If/When possible, perform a function test (See Section 4.6 for instructions on how to perform a function test)
- Check accumulator and thermal volume controller function
- Check the breather on the hydraulic reservoir
- Check the return filter, if included

Qualified service personnel are available upon request. Please feel free to contact:

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