# ELKHART BRASS MFG. CO., INC.

Installation, Operating, and Maintenance Instructions

## *Industrial SPITFIRE® Electric Remote Control Monitor*

## *Model 8394053*

22 March 2010

# TABLE OF CONTENTS

## I. PRODUCT SAFETY

**Important:**
Before installing and operating this equipment, read & study this manual thoroughly. Proper installation is essential to safe operation. In addition, the following points should be adhered to in order to ensure the safety of equipment and personnel:

1. All personnel who may be expected to use this equipment must be thoroughly trained in its safe and proper use.

2. Before flowing water from this device, check that all personnel (fire service and civilian) are out of the stream path. Also, check to make sure stream direction will not cause avoidable property damage.

3. Become thoroughly familiar with the hydraulic characteristics of this equipment, and the pumping system used to supply it. To produce effective fire streams, operating personnel must be properly trained.

4. Whenever possible, this equipment should be operated from a remote location. Do not needlessly expose personnel to dangerous fire conditions.

5. Open water valve supplying this equipment slowly, so that the piping fills slowly, thus preventing possible water hammer occurrence.

6. After each use, and on a scheduled basis, inspect equipment per instructions in section VI.

7. Any modifications to the enclosure will destroy the NEMA 4 or 4X rating and void warranty coverage of the enclosure and all components within.

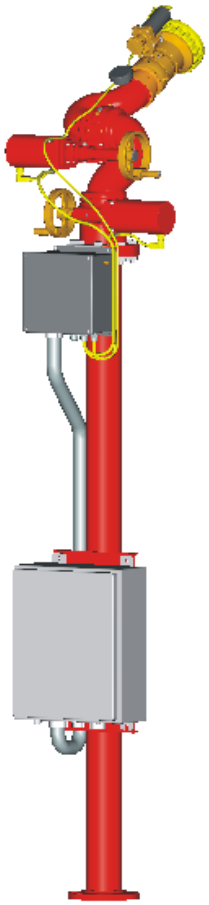
8. All equipment must be installed in accordance with local codes (NFPA 70 or EN/IEC 60079-14) as appropriate and in areas where equipment classification is suitable

9. Always remove electrical power from system prior to working on controls.

**WARNING**: Do not attempt to disconnect or work on any electrical equipment in this system unless power is removed or the area is known to be non-hazardous.

# II. SYSTEM FEATURES AND COMPONENT DESCRIPTIONS

## A. 8394053 Industrial Electric SPITFIRE® Monitor



CE CERTIFIED TO ATEX 94/9/EC

All brass and stainless steel constructed monitor with vaned 4" water way. Powered by two 120- VAC, 60-Hz., 1-phase, Synchronous Motors. Inlet of monitor is supplied with 4"-150# flat face ANSI flanged base. Discharge of monitor is supplied with a 3.5-N. H. Threaded male outlet. Monitor stops are factory set at 346º (+173º to -173º +from front center) horizontal and 135º (+90º to -45º) vertical movement. Monitor is provided with a cat. #284-B Brass Stream Shaper, Satin Brass with 3.5-NH Threaded outlet. Engagable override hand wheels are provided for manual vertical and horizontal movements. Hand wheel will not rotate when monitor is operated electrically. Monitor weight is approximately 300-lbs.

Monitor is rated at 200-PSI maximum working pressure and 2000-GPM maximum flow.

ATEX certified Stainless Steel Motor Cable Junction Box with bracket to attach to monitor flange base is included with monitor.

Monitor Motor features are:

- No brushes or arcing devices.
- Meets NEC (NFPA 70) Article 501 requirements for use in Class 1, Groups "A,B, C & D," Division-2 & Article 505 - Class I, Zone 2, AEx nA IIC T4 hazardous location areas.
- Constant torque and current output in start, running, and stall.
- Will not cause damage or increase in current when motor is stalled.
- NEMA 4 (IP-67) rated.
- Instantaneous start, stop and reverse.
- Residual (Power Off) torque is always present.
- Long life and exceptional reliability.

**WARNING**: **Do not take cover off the Vertical or Horizontal Monitor Motors.** If cover is/has been removed, the warranty is void and the service life of the motor is significantly reduced.

## B. Industrial Electric Operated X-STREAM® Nozzles

- CE Certified to ATEX 94/9/EC(Group II, Category 3).
- All brass and stainless steel constructed nozzle with tip movement powered by a 120-VAC, 60-Hz., 1-phase Synchronous Motor. Supplied with 3.5" N. H. Threaded swivel inlet. Engagable Override knob is provided for manual tip adjustment from straight stream to wide fog.

Motor features are:

- No brushes or arcing devices. Meets NEC (NFPA 70) Article 501 requirements for use in Class I, Groups "B, C & D," Division-2 & Article 505 - Class I, Zone 2, AEx nA IIC T4 hazardous location areas.
- Constant torque and current output in start, running, and stall.
- Will not cause damage or current increase when motor is stalled.
- NEMA 4 (IP-67) rated.
- Instantaneous start, stop and reverse.
- Residual (Power Off) torque is always present.
- Long life and exceptional reliability.

Optional Nozzles are:

**SM-1000BE-HL** Nozzle (flows from 300-GPM @ 60-PSI to 1000-GPM @ 82-PSI)
**SM-1250BE-HL** Nozzle (rated flow is 1250-GPM @ 86-PSI)
**SM-2000BE-HL** Nozzle (rated flow is 2000-GPM @ 86-PSI)
(See Nozzle flow graphs in section IX on page 23)

### C. Control System (Typical System)

1. Motor Control Box**:**
   - NEMA #4X Stainless Steel Enclosure. Requires 120-VAC, 60-Hz., Single Phase power source.
   - AC power ON / OFF Selector switch. AC Power ON pilot light.
   - AC/DC Power supply with 24-VDC output for controls.
   - All control relays to have 24-VDC coil inputs.
   - 37mA relay inputs are for: Monitor (UP, DOWN, LEFT, & RIGHT), Nozzle (STRAIGHT & FOG) and Water Valve (OPEN & CLOSE).
   - Conduit knockouts and hubs supplied by customer unless otherwise specified.
   - Meets (NFPA 70) NEC: 2005, Article 501 - Class I, Groups "B, C, & D," Division 2 & Article 505 - Class I, Zone 2, AEx nA IIC T4 requirements.
   - CE Certified to ATEX 94/9/EC(Group II, Category 3).

2. Control Box:
   NEMA #4X (IP-66) controls to operate one thru six monitors includes:
   - Control power (ON / OFF) switch and pilot light.
   - Water Valve (OPEN / CLOSE) push button switches and pilot lights, one set per monitor.
   - Nozzle (STRAIGHT / FOG) spring return switch.
   - Monitor (UP / DOWN / LEFT / RIGHT) spring return switch.
   - Conduit knockouts and hubs supplied by customer unless otherwise specified.
   - Meets (NFPA 70) NEC: 2008, Article 500 - Class I, Groups "B, C, & D", Division 2 & Article 505 - Class I, Zone 2, AEx nA IIC T4 requirements.

3. Junction Box:
   - NEMA #4X (IP-66) water tight, corrosion resistant ATEX certified & UL Listed, enclosure with terminals, for hazardous locations.
   - Provided with Stainless Steel, 1½" N.P.T. female Conduit Hub.
   - Three motor cables with Stainless Steel cord grips mounted in bottom of enclosure and terminated to terminals inside.
   - Junction Box is supplied with bracket to be installed at flanged base of monitor, using two of the eight flange bolts for mounting.
   - CE Certified to ATEX 94/9/EC( Group II, Category 3).

## III. CONTROL SYSTEM SPECIFICATIONS

### A. Electrical Requirements:

| | |
|---|---|
| Nozzle Motor | 120 VAC, 60 Hz., 1 Phase, 0.30 - Amps current. |
| Monitor Motors | 120 VAC, 60 Hz., 1 Phase, 0.90 - Amps current per motor. |
| Control Power | 24 VDC, and 37mA current per input (typically 7 for monitor and 1 valve). |
| Main Power | 120 VAC, 60 Hz., 1 Phase, to be terminated at Motor Control Box. Current to be supplied at Motor Control Box is 6-Amps minimum. |

### B. ATEX Product Marking:

CE Ex II 3 G c T4

## IV. INSTALLATION INSTRUCTIONS

### A. Component Mounting

1. Monitor Installation

1.1. Attach 4" 150 lbs. Flat Face class ANSI pattern companion flange to water supply pipe so that bolt pattern will allow monitor to be installed with the "straight ahead" position properly aligned. Alignment is correct when the "straight ahead" direction is centered between adjacent flange bolt holes.

1.2. Install Monitor Assembly on water supply flange to match up to 4"-150 lbs. Flat Face ANSI flange on inlet of Monitor with flange gasket between flanges. Install motor cable junction box and secure inlet flange with eight 5/8-11 UNC Grade 5 hex. head bolts. Torque bolts to 60-70 ft.-lbs.

1.3. Standpipe must be structurally strong enough to withstand reaction forces of the nozzle when discharging a straight stream at 90º of the standpipe tower. The formula for calculating nozzle reaction is: REACTION FORCE = 0.0505 x G.P.M. x √ P.S.I.

1.4. The inlet pressure at base of monitor must be high enough to allow for pressure loss through monitor. To accomplish this use the pressure loss for G.P.M. flowing and add to nozzle pressure. See monitor hydraulic data in section IX.

1.5. Install junction box bracket on top of monitor flange, aligning two holes in bracket with flange mounting holes on rear of monitor. Secure bracket to monitor with two of the flange bolts.

⚠ **IMPORTANT**: When installing monitor on a raised face flange or a wafer type butterfly valve, it is critical that bolts be tightened uniformly to prevent cocking of the monitor relative to the flange or valve. If the monitor becomes cocked, (see Fig. I) the monitor cast flanged base will fracture and fail when the bolts on the "high" side are tightened.

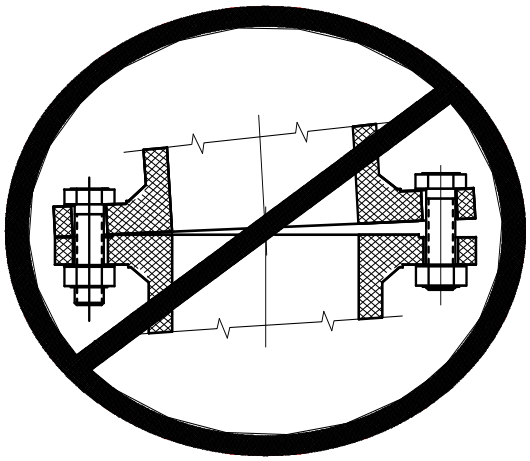


**Fig. I**

2. Nozzle Installation

2.1. Install Nozzle on outlet of monitor Stream Shaper (Model #284-B). Position nozzle so that motor is located on top of nozzle or to the left side as seen from monitor end. Tighten the Stream Shaper to Monitor with spanner wrench. Then tighten nozzle swivel base to Stream Shaper.
2.2. Install cable plug to receptacle on nozzle motor, aligning locator key in plug with key in receptacle. Screw swivel down tight on male thread of receptacle.

3. Motor Control Box (MMCB) Installation
3.1. This enclosure should be located 100 feet maximum distance to the Monitor Junction Box.
3.2. The enclosure to be installed a minimum of three feet above grade and in the vertical position, on a rigid structure. Installation is normally at the base of the riser.

4. Control Box Installation
4.1. If used for a local control the single monitor control box is to be mounted on a rigid stand, approximately 3 to 4 feet above grade so operator can visually see monitor and nozzle when operating controls. The 1-Monitor Control Box weighs approximately 32 lbs.
4.2. This enclosure has four mounting pads with 0.31inch diameter holes. Mounting hole centers are 10 inches horizontal x 12 ¾ inches vertical.

## B. Interconnecting & Wiring Control System

1. Motor Control Box (MMCB) to Monitor Junction Box
1.1. Install conduit between Motor Control Box and Junction Box, located at flanged base of monitor. Junction boxes are provided with 1½" NPT Conduit Hubs.
1.2. If water valve is not installed at base of monitor, ten conductors are required.
1.3. Reference guide for wire size:
18 – AWG wire for up to 40 feet from monitor.
16 – AWG wire for up to 80 feet from monitor.
14 – AWG wire for up to 100 feet from monitor.
1.4. If water valve is provided at base of monitor, fourteen conductors are typically required. Wire size to be determined by length of conductors and current draw of valve operator supplied.

**WARNING!!!** If water valve operator is provided and has arching devices in its enclosure, an explosion proof seal fitting must be provided at valve operator conduit connection when used in a hazardous location. This will seal the flame path between water valve and junction box. This must be done to maintain certification of Motor Control Box.

2. Control Box to Motor Control Box
2.1. Install conduit between Motor Control Box (MMCB) and 1-Monitor Control Box.
2.2. A minimum of 10 conductors is required per monitor.
2.3. Wire size recommended for distance as follows:
18 – AWG wire for cable run up to 750 feet (0.47 voltage drop at 750 feet)
16 – AWG wire for cable run up to 1500 feet (0.48 voltage drop at 1500 feet)
14 – AWG wire for cable run up to 2500 feet (0.50 voltage drop at 2500 feet)
12 – AWG wire for cable run up to 3500 feet (0.43 voltage drop at 3500 feet)

3. Main Power to Motor Control Box
   3.1. Install conduit from main power distribution breaker box to Motor Control Box.
   3.2. Pull three conductor cables for 1 phase supply, wire sized to supply a minimum of 6-amps at 120-VAC.

## V. OPERATING INSTRUCTIONS (TYPICAL HARDWIRED ILLUSTRATION)

**One Monitor Control:**

This control box has one set of switches and pilot lights to operate one monitor and nozzle.

1. Monitor functions (UP & DOWN / LEFT & RIGHT) are operated with spring return switches. This is accomplished by using the proper selector/pushbutton switches to move the monitor the direction desired. When switch is released, switch will return to original (off) position and monitor movement will stop.
2. Nozzle function (STRAIGHT / FOG) is operated with a spring return switch. This is accomplished by using the proper selector/pushbutton switch for the STRAIGHT or FOG position. When switch is released, lever will return to original (off) position and nozzle tip movement will stop.
3. Water Valve Switches are momentary close, normally open contact pushbutton switches that will latch and break latch relay in Motor Control Box to open or close water valve.
4. Pilot Light (BLUE) to indicate that water valve is open.
5. Pilot Light (RED) to indicate that local control power is on. When this light is ON, controls can be operated from this Local Control Box.
6. Control Power Switch is a 2-position (ON/OFF) selector switch that turns control power "ON" or "OFF" to monitor control panel.

**Monitor and Nozzle Manual Override:**

1. Vertical Manual Override – Push hand wheel in to engage override. While holding hand wheel in, turn clockwise to raise nozzle and counter-clockwise to lower nozzle.
2. Horizontal Manual Override – Push hand wheel in to engage override. While holding hand wheel in, turn clockwise to move monitor right and counter-clockwise to move monitor left.
3. Nozzle Manual Override – Push knob in and hold to engage override. Turn knob clockwise to move nozzle tip in direction of fog and counter-clockwise to move nozzle tip in direction of straight stream.

When Monitor operation is completed, move monitor and nozzle to designated park position and shutoff control power switches on control panels.

# VI. MAINTENANCE INSTRUCTIONS

**Monthly inspection and maintenance:**

1. Check all Indicator lights and replace bulbs if not operable.
2. Cycle all monitor functions (left, right, up, down, straight, and fog) to insure that complete system is fully functional.

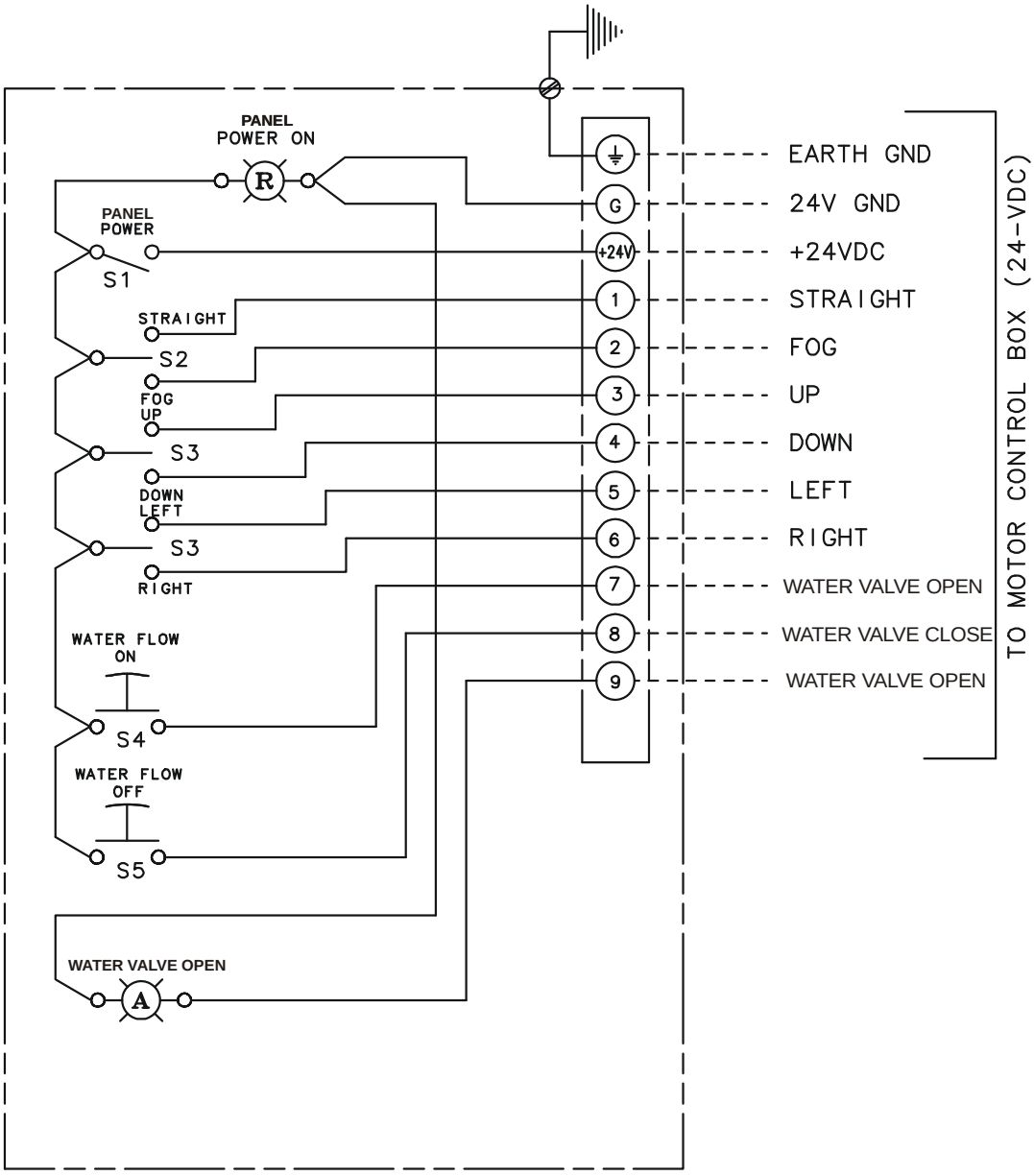
**ATTENTION**: When cycling the monitor through the motions (up, down, left and right), be sure to exercise the system a minimum of 2 (two) complete cycles. This will help move the grease inside the monitor for better coverage and long time use/durability.

**Six-month inspection and maintenance:**

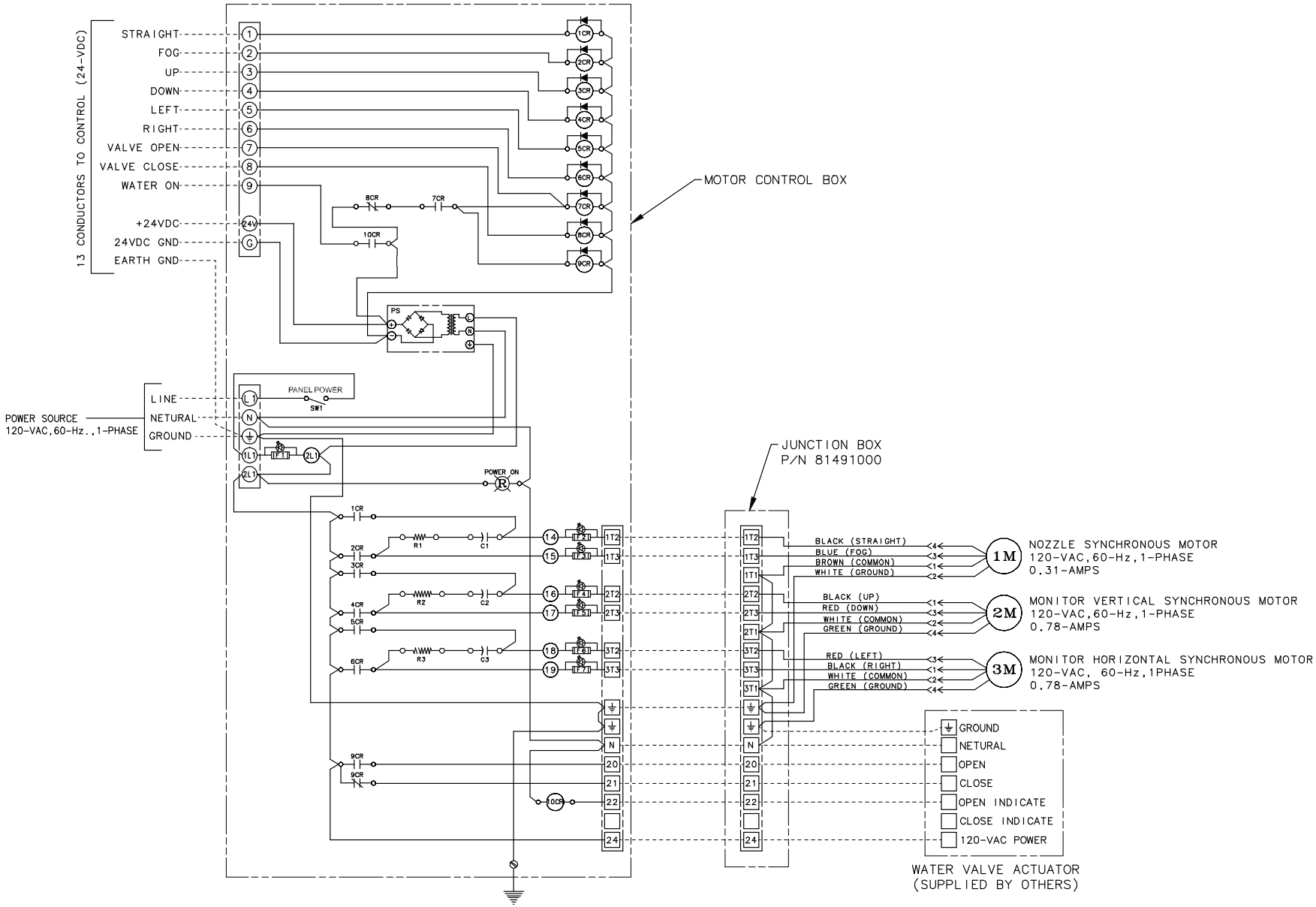
1. Grease monitor ball races through grease fittings located at each swivel joint. Recommended grease for Industrial SPITFIRE Monitors is MOBILITH SHC – 100, High Performance Synthetic Grease. Temperature range: -40º F (-26º C) to 400º F (250º C) or equal. Greasing procedures are as follows:
   a. In the lower grease fitting apply approximately 5-7 pumps of grease.
   b. In the upper grease fitting apply approximately 2-3 pumps of grease.
2. Check motor control cables for wear and connectors for damage.
3. Check motor cables for binding through full movement of monitor and nozzle.
4. Check all painted surfaces for chips or scratches and repaint as required.
5. Visually check all electrical equipment in control boxes.

**WARNING**: Do not attempt to disconnect or work on any electrical equipment in this system unless power is removed or the area is known to be non-hazardous.

# VII. BASIC ELECTRICAL DRAWINGS



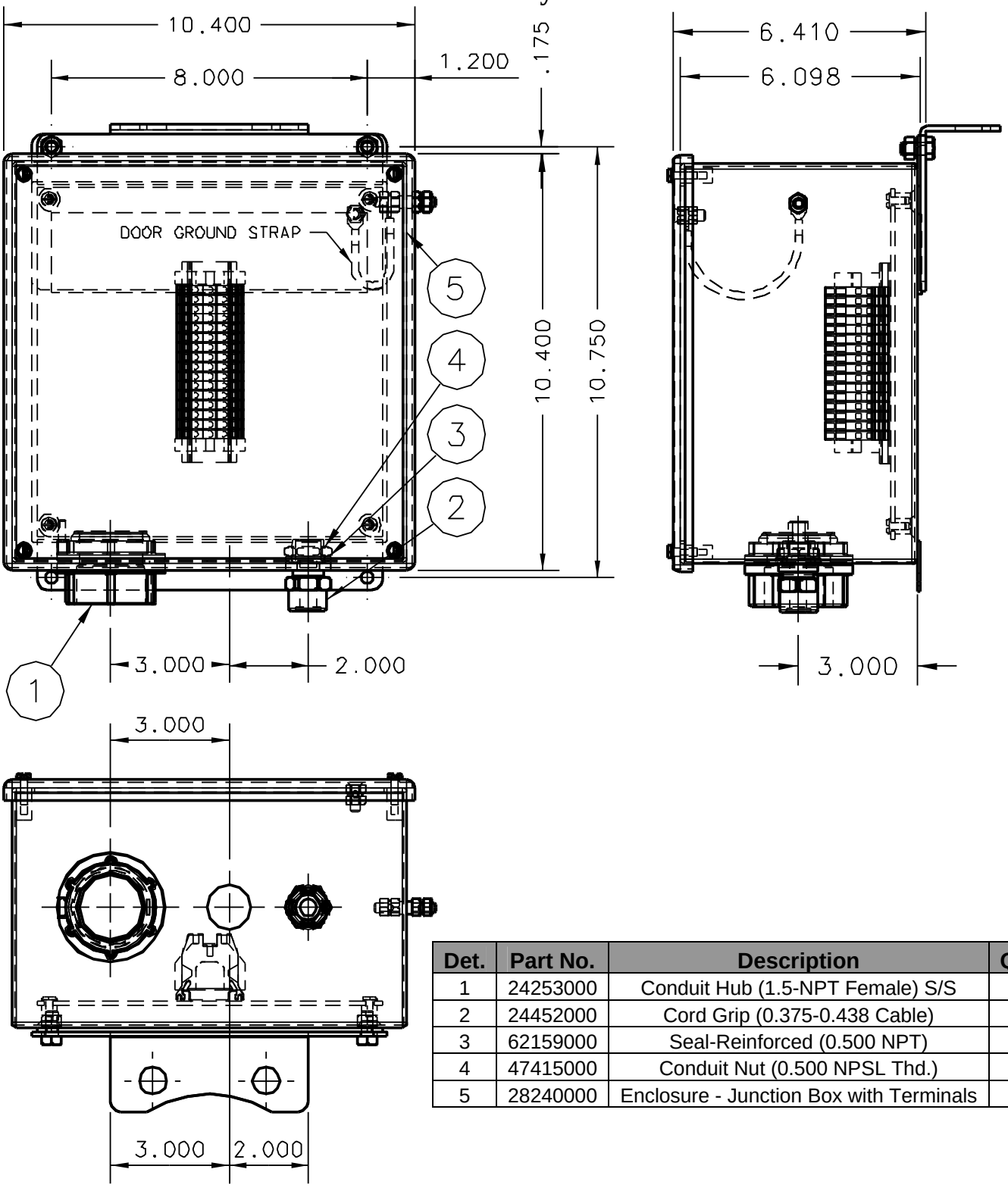

**Typical One Monitor Control Box Hardwired Diagram**
**Illustration 1**




Typical Motor Control Box and Junction Box Hardwired Diagram
Illustration 2

# VIII. PART DRAWINGS

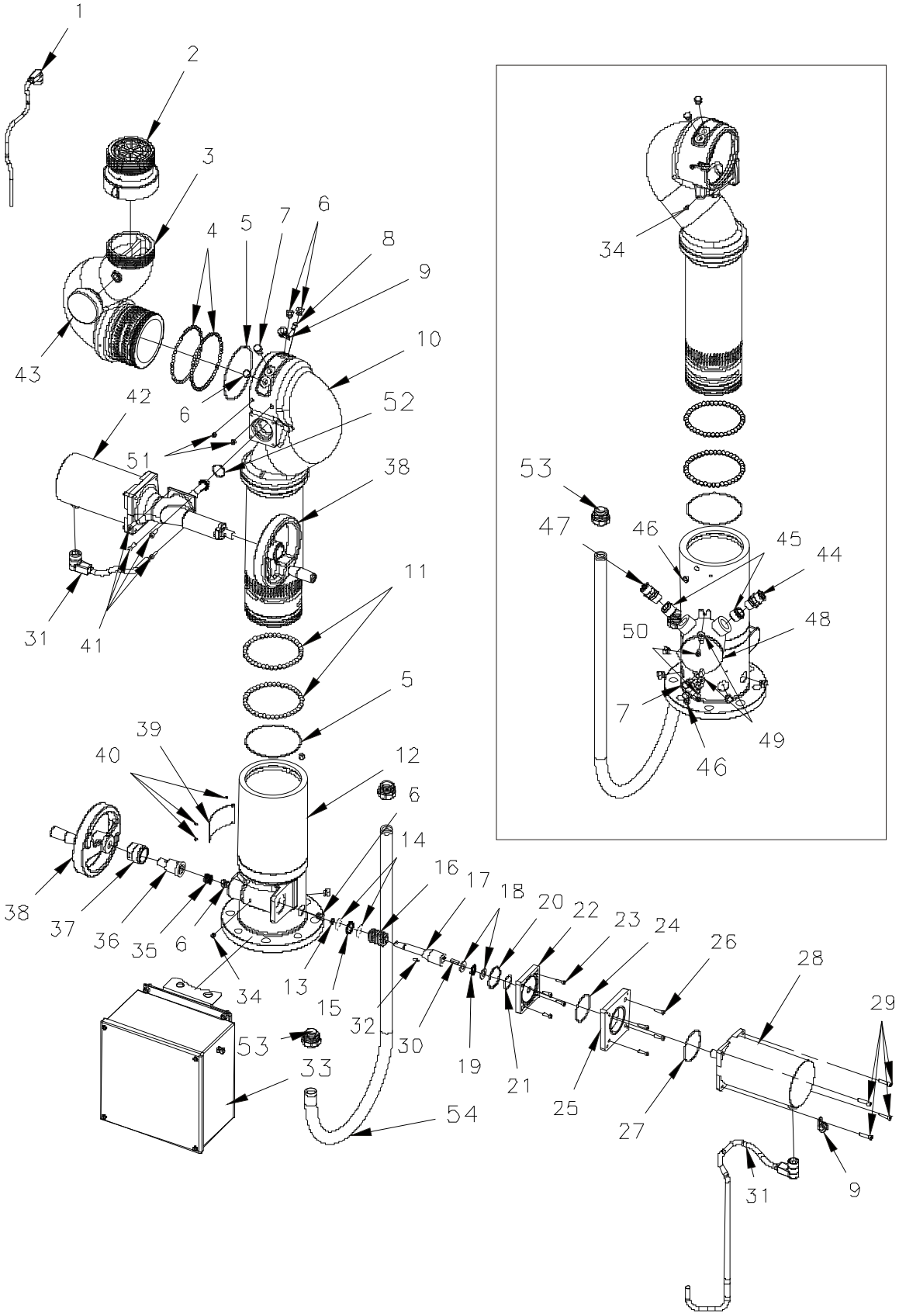
## 1. Motor Cable Junction Box Assembly




| Det. | Part No. | Description | Qty. |
|---|---|---|---|
| 1 | 24253000 | Conduit Hub (1.5-NPT Female) S/S | 1 |
| 2 | 24452000 | Cord Grip (0.375-0.438 Cable) | 1 |
| 3 | 62159000 | Seal-Reinforced (0.500 NPT) | 1 |
| 4 | 47415000 | Conduit Nut (0.500 NPSL Thd.) | 1 |
| 5 | 28240000 | Enclosure - Junction Box with Terminals | 1 |

**Motor Cable Junction Box Assembly**
**Part Number 81493001**
**Illustration 3**

## 2. Model Number 8394053 Monitor



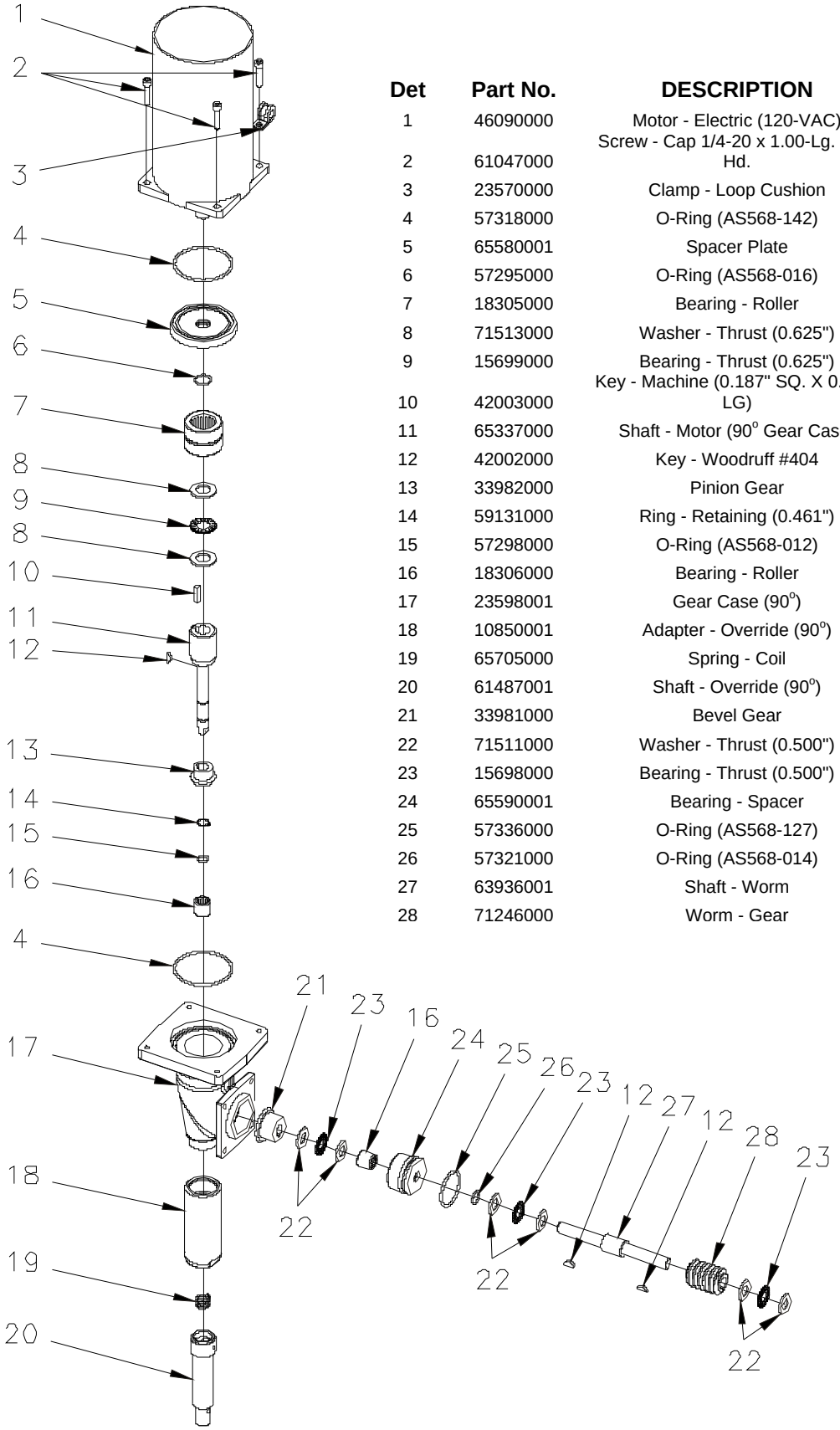

**8394053 Monitor Parts Drawing**
**Illustration 4**

## INDUSTRIAL SPITFIRE 8394053

| INDEX # | PART # | QTY. | DESCRIPTION |
|---|---|---|---|
| 1 | 23053000 | 1 | CABLE-CORDSET (NOZZLE) |
| 2 | 2529002 | 1 | CAT. #284-B STREAM SHAPER |
| 3 | 81187001 | 1 | OUTLET BODY SUB-ASSEMBLY |
| 4 | 15027000 | 124 | BALL BEARINGS S/S (0.250 DIA.) {62-BALLS PER RACE} |
| 5 | 57452000 | 2 | O-RING (AS568-158) 4.737 I.D. X 0.103 C/S |
| 6 | 51863000 | 8 | PLUG - STOP (HEX BRASS) |
| 7 | 65075001 | 2 | SCREW - (CAM) DRIVE |
| 8 | 65141000 | 1 | S/S SOCKET HEAD CAP SCREW - 0.250-20 X 0.375 LG |
| 9 | 23570000 | 3 | CLAMP-LOOP CUSHIONED |
| 10 | 81523001 | 1 | INLET BODY SUB-ASSEMBLY |
| 11 | 15009000 | 84 | BALL BEARINGS S/S (0.375 DIA.) {42-BALLS PER RACE} |
| 12 | 81524001 | 1 | FLANGED EXTENDED BASE ASSY. (4"-150# ANSI FLAT FACE FLANGE) |
| 13 | 57298000 | 1 | O-RING (AS568-012) 0.364 I.D. X 0.070 C/S |
| 14 | 71511000 | 2 | THRUST WASHER (0.500 DIA.) |
| 15 | 15698000 | 1 | THRUST BEARING (0.500 DIA.) |
| 16 | 71246000 | 1 | WORM (GEAR) 1.0-P.D., 12-PITCH |
| 17 | 65334001 | 1 | SHAFT-WORM (OVERRIDE) |
| 18 | 71513000 | 2 | THRUST WASHER (0.625 DIA.) |
| 19 | 15699000 | 1 | THRUST BEARING (0.625 DIA.) |
| 20 | 57334000 | 1 | O-RING (AS568-133) 1.799 I.D. X 0.103 C/S |
| 21 | 57327000 | 1 | O-RING (AS568-024) 1.114 I.D. X 0.070 C/S |
| 22 | 11720001 | 1 | ADAPTER - MOTOR FLANGE |
| 23 | 61037000 | 4 | S/S SOCKET HEAD CAP SCREW - #10-24 X 0.500 LG |
| 24 | 57383000 | 1 | O-RING (AS568-141) 2.300 I.D. X 0.103 C/S |
| 25 | 11748001 | 1 | ADAPTER - MOTOR (42-FRAME) |
| 26 | 64085000 | 4 | S/S SOCKET HEAD CAP SCREW - #10-24 X 0.750 LG |
| 27 | 57318000 | 1 | O-RING (AS568-142) 2.363 I.D. X 0.103 C/S |
| 28 | 46090000 | 1 | MOTOR - ELECTRIC (120-VAC) |
| 29 | 61047000 | 4 | S/S SOCKET HEAD CAP SCREW - 0.250-20 X 1.000 LG |
| 30 | 42003000 | 1 | KEY - 0.187 SQ. X 0.750 LG. |
| 31 | 23050000 | 2 | CABLE-CORDSET (MONITOR) |
| 32 | 42002000 | 1 | WOODRUFF KEY #404 (0.500 DIA. X 0.125 -THK.) |
| 33 | 81493001 | 1 | JUNCTION BOX & BRACKET ASSEMBLY |
| 34 | 31011000 | 2 | GREASE FITTING (DRIV-IN) S/S |
| 35 | 65705000 | 1 | SPRING - COIL S/S |
| 36 | 61488001 | 1 | SHAFT - OVERRIDE (HORIZONTAL) |
| 37 | 10851001 | 1 | ADAPTER - OVERRIDE |
| 38 | 81174001 | 2 | HANDWHEEL & SPINNER ASSY (6.000 DIA. W/ 0.625 BORE) |
| 39 | 44546000 | 1 | LABEL - IDENTIFICATION |
| 40 | 61215100 | 4 | S/S SCREW - DRIVE #4 X 0.187 LG RD. HD. TYPE U |
| 41 | 61041000 | 4 | S/S SOCKET HEAD CAP SCREW - 0.250-20 X 0.625 LG |
| 42 | 81612001 | 1 | 90 DEG. GEAR DRIVE & MOTOR ASSEMBLY |
| 43 | 33587000 | 1 | GAUGE - PRESSURE (0-300 PSI) {READS PSI & BAR} |
| 44 | 24451000 | 1 | CORD GRIP (0.312-0.375 DIA. CABLE) |
| 45 | 10921000 | 2 | REDUCER (0.750" X 0.500") ALUMINUM |
| 46 | 61268000 | 2 | SET SCREW - SLT HD. (BRASS) 0.500-20 X 0.250 LG |
| 47 | 24452000 | 1 | CORD GRIP (0.375-0.438 DIA. CABLE) |
| 48 | 28357000 | 1 | UL/ATEX JUNCTION BOX (NEMA 4X, 7, 9) |
| 49 | 71611000 | 2 | FLAT WASHER (0.281 DIA.) |
| 50 | 61040000 | 2 | S/S SOCKET HEAD CAP SCREW - 0.250-20 X 0.500 LG |
| 51 | 61248000 | 2 | SET SCREW - SLT HD. (BRASS) 0.375-24 X 0.250 LG |
| 52 | 57429000 | 1 | O-Ring (AS568-032) 1.864 I.D. X 0.070 C/S |
| 53 | 24173000 | 2 | Conduit Hub 0.750-NPT Stainless Steel |
| 54 | 24254001 | 1 | 0.750" Liquid-Tite Conduit |

**8394053 Monitor Parts List**
**Illustration 4 (continued)**

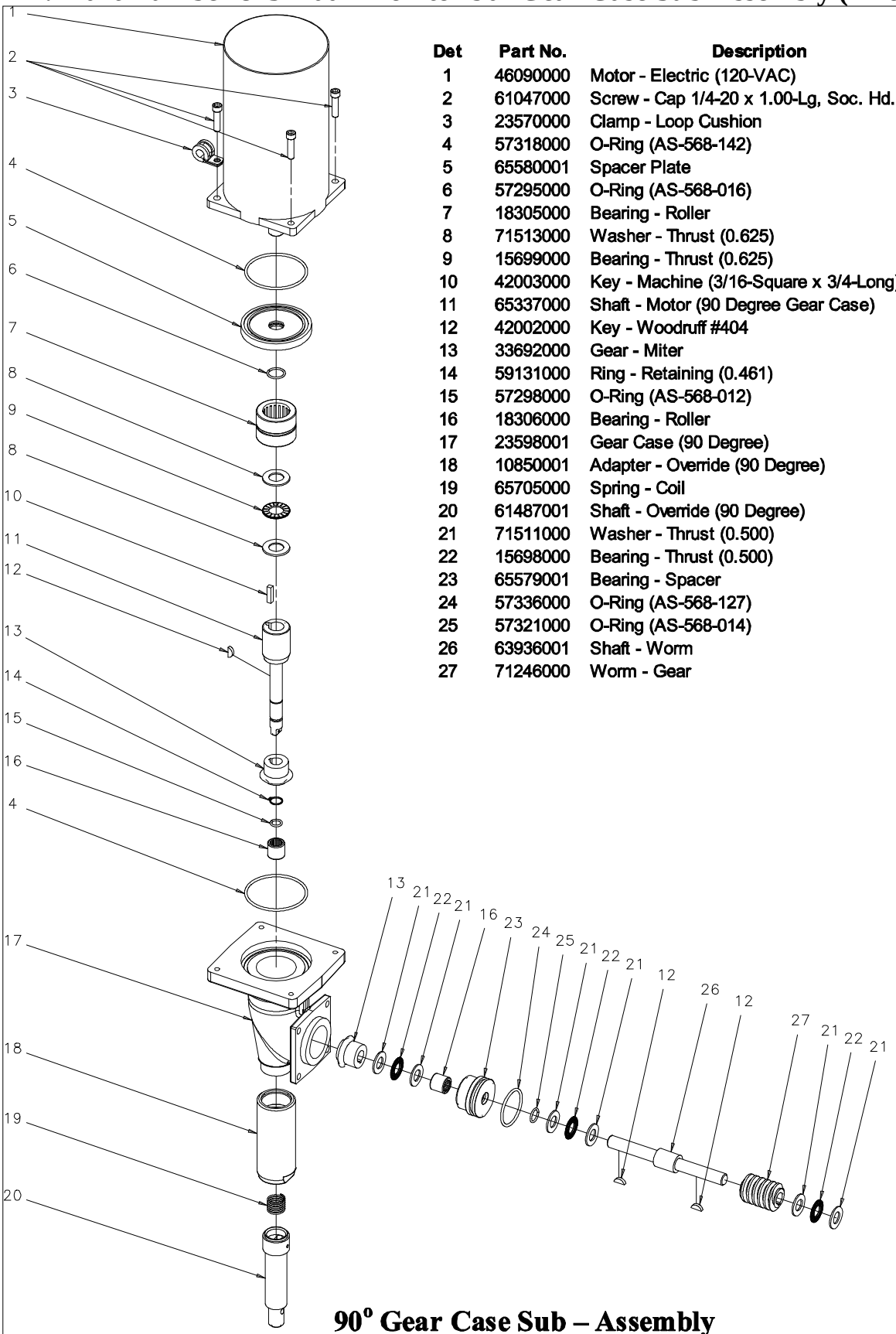
# 3. Part Number 81612001 Monitor 90° Gear Case Sub-Assembly




| Det | Part No. | DESCRIPTION | QTY |
|---|---|---|---|
| 1 | 46090000 | Motor - Electric (120-VAC) | 1 |
| 2 | 61047000 | Screw - Cap 1/4-20 x 1.00-Lg. Soc. Hd. | 4 |
| 3 | 23570000 | Clamp - Loop Cushion | 1 |
| 4 | 57318000 | O-Ring (AS568-142) | 2 |
| 5 | 65580001 | Spacer Plate | 1 |
| 6 | 57295000 | O-Ring (AS568-016) | 1 |
| 7 | 18305000 | Bearing - Roller | 1 |
| 8 | 71513000 | Washer - Thrust (0.625") | 2 |
| 9 | 15699000 | Bearing - Thrust (0.625") | 1 |
| 10 | 42003000 | Key - Machine (0.187" SQ. X 0.750" LG) | 1 |
| 11 | 65337000 | Shaft - Motor (90° Gear Case) | 1 |
| 12 | 42002000 | Key - Woodruff #404 | 3 |
| 13 | 33982000 | Pinion Gear | 1 |
| 14 | 59131000 | Ring - Retaining (0.461") | 1 |
| 15 | 57298000 | O-Ring (AS568-012) | 1 |
| 16 | 18306000 | Bearing - Roller | 2 |
| 17 | 23598001 | Gear Case (90°) | 1 |
| 18 | 10850001 | Adapter - Override (90°) | 1 |
| 19 | 65705000 | Spring - Coil | 1 |
| 20 | 61487001 | Shaft - Override (90°) | 1 |
| 21 | 33981000 | Bevel Gear | 1 |
| 22 | 71511000 | Washer - Thrust (0.500") | 6 |
| 23 | 15698000 | Bearing - Thrust (0.500") | 3 |
| 24 | 65590001 | Bearing - Spacer | 1 |
| 25 | 57336000 | O-Ring (AS568-127) | 1 |
| 26 | 57321000 | O-Ring (AS568-014) | 1 |
| 27 | 63936001 | Shaft - Worm | 1 |
| 28 | 71246000 | Worm - Gear | 1 |

**90° Gear Case Sub-Assembly**
**Illustration 5**

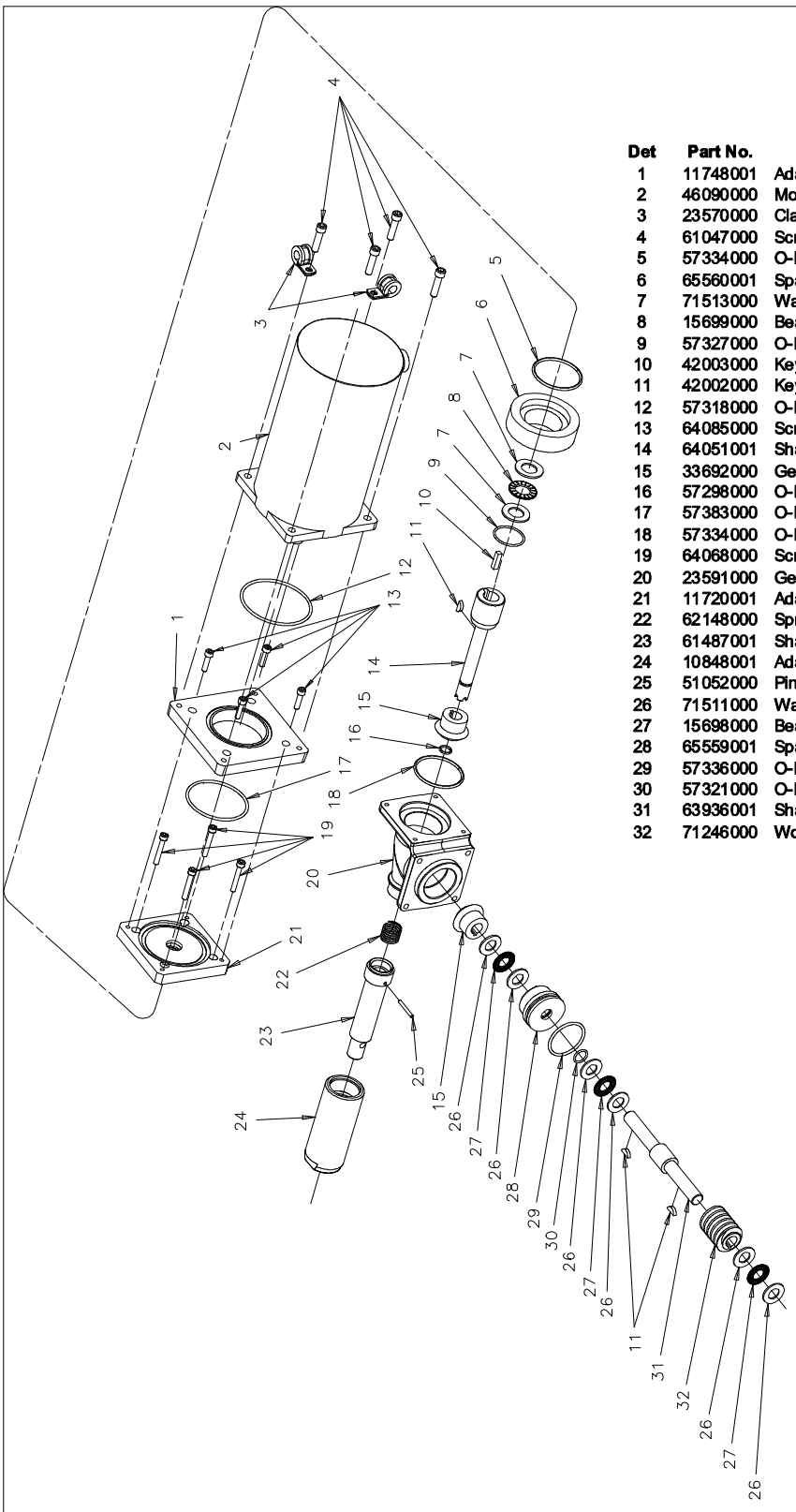
## 4. Part Number 81572001 Monitor 90° Gear Case Sub-Assembly (Prior to 2010)




| Det | Part No. | Description | Qty |
|---|---|---|---|
| 1 | 46090000 | Motor - Electric (120-VAC) | 1 |
| 2 | 61047000 | Screw - Cap 1/4-20 x 1.00-Lg, Soc. Hd. | 4 |
| 3 | 23570000 | Clamp - Loop Cushion | 1 |
| 4 | 57318000 | O-Ring (AS-568-142) | 2 |
| 5 | 65580001 | Spacer Plate | 1 |
| 6 | 57295000 | O-Ring (AS-568-016) | 1 |
| 7 | 18305000 | Bearing - Roller | 1 |
| 8 | 71513000 | Washer - Thrust (0.625) | 2 |
| 9 | 15699000 | Bearing - Thrust (0.625) | 1 |
| 10 | 42003000 | Key - Machine (3/16-Square x 3/4-Long) | 1 |
| 11 | 65337000 | Shaft - Motor (90 Degree Gear Case) | 1 |
| 12 | 42002000 | Key - Woodruff #404 | 3 |
| 13 | 33692000 | Gear - Miter | 2 |
| 14 | 59131000 | Ring - Retaining (0.461) | 1 |
| 15 | 57298000 | O-Ring (AS-568-012) | 1 |
| 16 | 18306000 | Bearing - Roller | 2 |
| 17 | 23598001 | Gear Case (90 Degree) | 1 |
| 18 | 10850001 | Adapter - Override (90 Degree) | 1 |
| 19 | 65705000 | Spring - Coil | 1 |
| 20 | 61487001 | Shaft - Override (90 Degree) | 1 |
| 21 | 71511000 | Washer - Thrust (0.500) | 6 |
| 22 | 15698000 | Bearing - Thrust (0.500) | 3 |
| 23 | 65579001 | Bearing - Spacer | 1 |
| 24 | 57336000 | O-Ring (AS-568-127) | 1 |
| 25 | 57321000 | O-Ring (AS-568-014) | 1 |
| 26 | 63936001 | Shaft - Worm | 1 |
| 27 | 71246000 | Worm - Gear | 1 |

**90° Gear Case Sub – Assembly**
**Illustration 6**

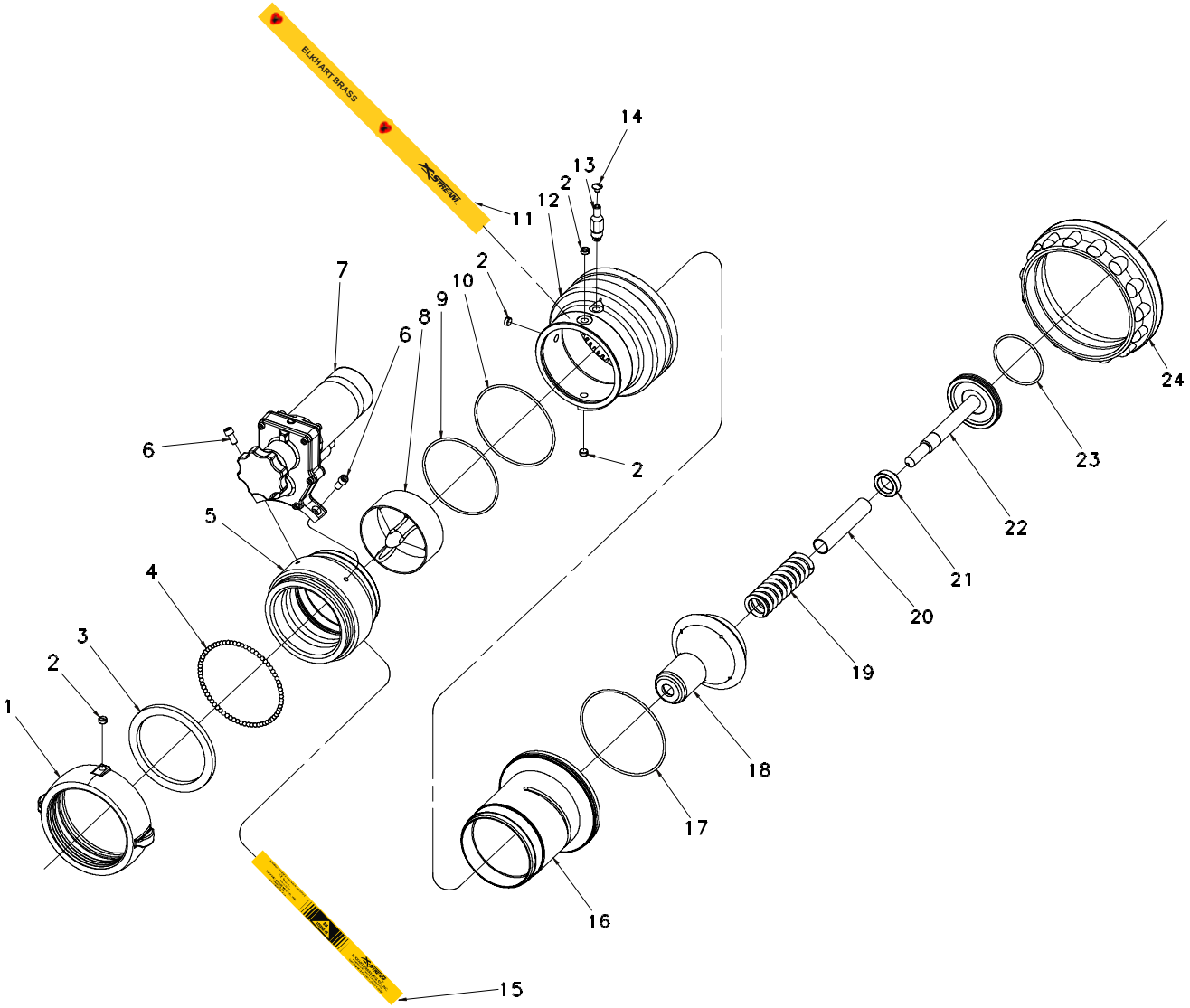
## 5. Part Number 81417001 90° Gear Case Sub-Assembly



| Det | Part No. | Description | Qty |
|---|---|---|---|
| 1 | 11748001 | Adapter - Motor (42 Frame) | 1 |
| 2 | 46090000 | Motor - Electric (120-VAC) | 1 |
| 3 | 23570000 | Clamp - Loop Cushion | 2 |
| 4 | 61047000 | Screw - Cap 1/4 - 20 x 1.00-Lg., Soc. Hd. | 4 |
| 5 | 57334000 | O-Ring (AS568-133) | 1 |
| 6 | 65560001 | Spacer - Flange | 1 |
| 7 | 71513000 | Washer - Thrust (0.625) | 2 |
| 8 | 15699000 | Bearing - Thrust (0.625) | 1 |
| 9 | 57327000 | O-Ring (AS568-024) | 1 |
| 10 | 42003000 | Key - Machine (3/16-Square x 3/4-Long) | 1 |
| 11 | 42002000 | Key - Woodruff #404 | 3 |
| 12 | 57318000 | O-Ring (AS568-142) | 1 |
| 13 | 64085000 | Screw - Cap #10-24 x 0.750-Lg., Soc. Hd. | 4 |
| 14 | 64051001 | Shaft - Motor (90 Degree Gear Case) | 1 |
| 15 | 33692000 | Gear - Miter | 2 |
| 16 | 57298000 | O-Ring (AS568-012) | 1 |
| 17 | 57383000 | O-Ring (AS568-141) | 1 |
| 18 | 57334000 | O-Ring (AS568-133) | 1 |
| 19 | 64068000 | Screw - Cap #10-24 x 1.1250-Lg., Soc. Hd. | 4 |
| 20 | 23591000 | Gear Case (90-Degree) | 1 |
| 21 | 11720001 | Adapter - Motor Flange | 1 |
| 22 | 62148000 | Spring - Coil | 1 |
| 23 | 61487001 | Shaft - Override (90-Degree Drive) | 1 |
| 24 | 10848001 | Adapter - Override (90-Degree Drive) | 1 |
| 25 | 51052000 | Pin - Dowel (0.125-Dia. X x1.000-Lg.) | 1 |
| 26 | 71511000 | Washer - Thrust (0.500) | 6 |
| 27 | 15698000 | Bearing - Thrust (0.500) | 3 |
| 28 | 65559001 | Spacer - Bearing (Brass) | 1 |
| 29 | 57336000 | O-Ring (AS568-127) | 1 |
| 30 | 57321000 | O-Ring (AS568-014) | 1 |
| 31 | 63936001 | Shaft - Worm | 1 |
| 32 | 71246000 | Worm (Gear) | 1 |

**90° Gear Case Sub-Assembly**
**Illustration 7**

## 6. Model Number SM-1000BE-HL Nozzle

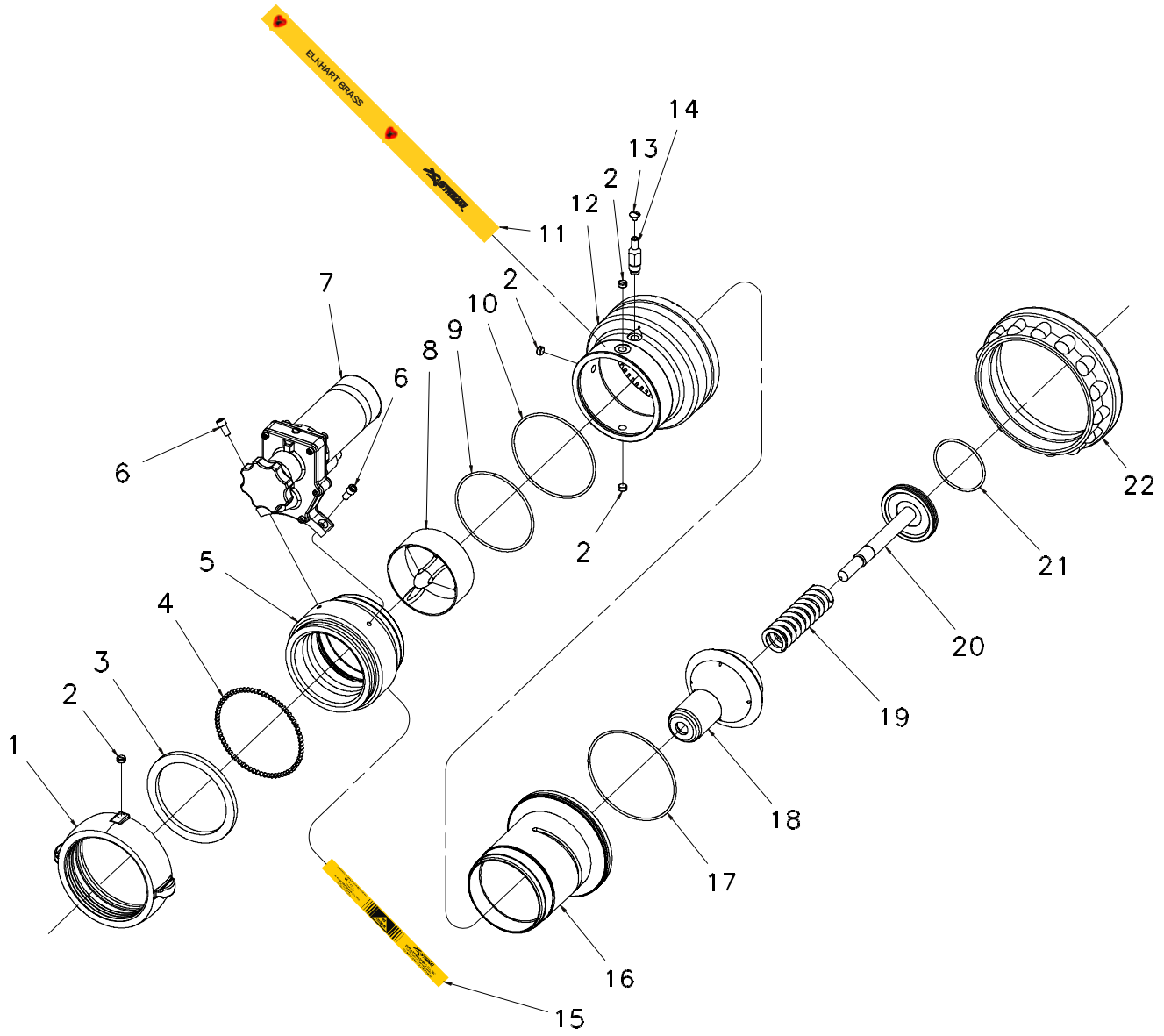



| Det | Part No. | Description | Qty |
|---|---|---|---|
| 1 | 63311002 | Swivel - B/G, 3.5-NHT | 1 |
| 2 | 61222000 | Screw-Set(3/8-24 x 3/16-Lg) | 4 |
| 3 | 33186000 | Gasket - Rubber (3.5-NHT) | 1 |
| 4 | 15016000 | Ball (0.187-Dia.) Brass | 71 |
| 5 | 11778001 | Adapter - Fine Thd. x B/G | 1 |
| 6 | 61040000 | Screw - Cap (¼-24 x ½-Lg.) | 2 |
| 7 | 81407001 | Nozzle Actuator Assembly | 1 |
| 8 | 63425001 | Base – Stem S/S | 1 |
| 9 | 57436000 | O - Ring (AS568 - 154) | 1 |
| 10 | 57503000 | O - Ring (AS568 - 155) | 1 |
| 11 | 44365000 | Label – Tip | 1 |
| 12 | 66394001 | Tip - Nozzle | 1 |

| Det | Part No. | Description | Qty |
|---|---|---|---|
| 13 | 17838001 | Bracket - Push Rod | 1 |
| 14 | 61078001 | Screw - Cap (Truss Head) | 1 |
| 15 | 44533000 | Label – Identification | 1 |
| 16 | 17165001 | Body - Nozzle | 1 |
| 17 | 57447000 | O - Ring (AS568 - 156) | 1 |
| 18 | 69047001 | Stem - Nozzle | 1 |
| 19 | 62136000 | Spring - Compression | 1 |
| 20 | 65557001 | Spacer - Flow Limiter | 1 |
| 21 | 65556001 | Spacer - Spring | 1 |
| 22 | 81146001 | Piston Sub - Assembly | 1 |
| 23 | 57318000 | O - Ring (AS568 - 142) | 1 |
| 24 | 33665000 | Bumper - Knobby | 1 |

**SM-1000BE-HL Nozzle Parts List**
**Illustration 8**

## 7. Model Number SM-1250BE-HL Nozzle

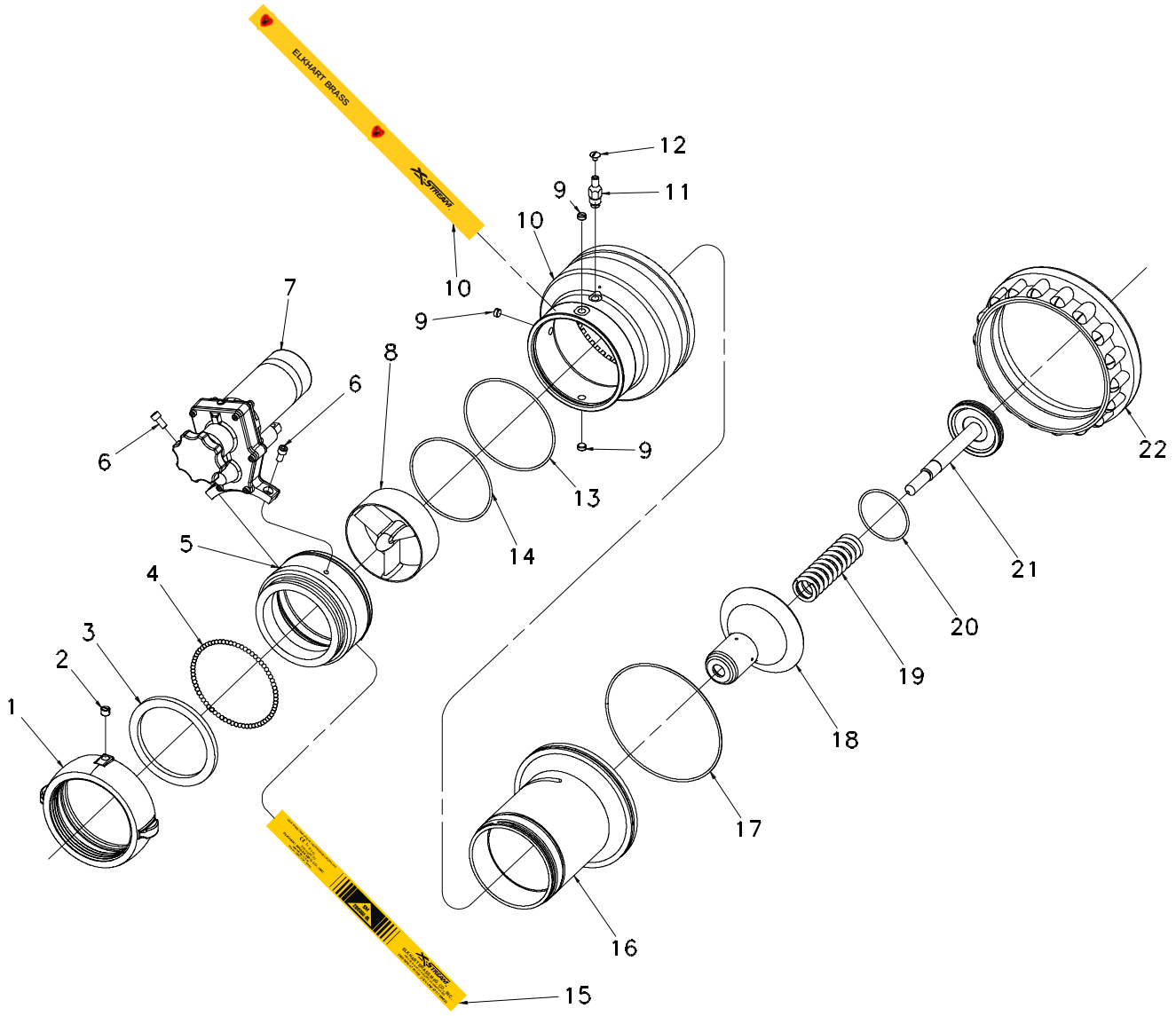



| Det | Part No. | Description | Qty |
|---|---|---|---|
| 1 | 63311001 | Swivel - B/G, 3.5-NHT | 1 |
| 2 | 61221000 | Screw-Set (3/8-24x5/16-Lg) | 1 |
| 3 | 33186000 | Gasket - Rubber, 3.5-NHT | 1 |
| 4 | 15016000 | Ball (0.187-Dia.) Brass | 71 |
| 5 | 11778001 | Adapter - Fine Thd. x B/G | 1 |
| 6 | 61040000 | Screw - Cap (¼-24 x ½-Lg.) | 2 |
| 7 | 81407001 | Nozzle Actuator Assembly | 1 |
| 8 | 63421001 | Base - Stem S/S | 1 |
| 9 | 57436000 | O - Ring (AS568 - 154) | 1 |
| 10 | 57503000 | O - Ring (AS568 - 155) | 1 |
| 11 | 44365000 | Label – Tip | 1 |

| Det | Part No. | Description | Qty |
|---|---|---|---|
| 12 | 66394001 | Tip - Nozzle | 1 |
| 13 | 61078001 | Screw - Cap (Truss Head) | 1 |
| 14 | 17838001 | Bracket - Push Rod | 1 |
| 15 | 44534000 | Label – Identification | 1 |
| 16 | 17165001 | Body - Nozzle | 1 |
| 17 | 57447000 | O - Ring (AS568 - 156) | 1 |
| 18 | 62187001 | Stem - Nozzle | 1 |
| 19 | 62136000 | Spring - Compression | 1 |
| 20 | 81146001 | Piston Sub - Assembly | 1 |
| 21 | 57318000 | O - Ring (AS568 - 142) | 1 |
| 22 | 33661000 | Bumper - Knobby | 1 |

**SM-1250BE-HL Nozzle Parts List**
**Illustration 9**

## 8. Model Number SM-2000BE-HL Nozzle

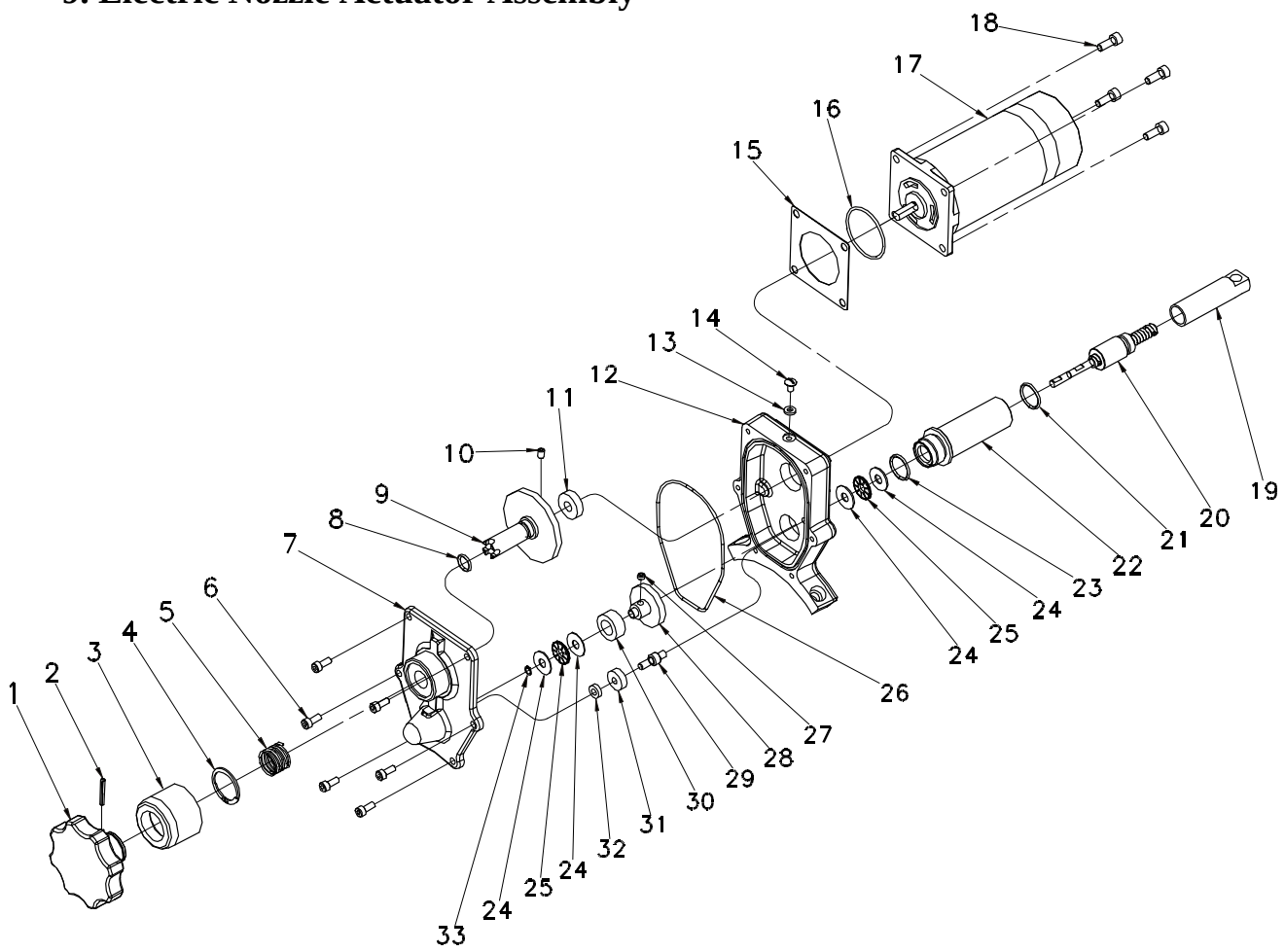



| Det | Part No. | Description | Qty |
|---|---|---|---|
| 1 | 63311001 | Swivel - B/G, 3.5-NHT | 1 |
| 2 | 61221000 | Screw-Set(3/8-24x5/16-Lg) | 1 |
| 3 | 33186000 | Gasket - Rubber, 3.5-NHT | 1 |
| 4 | 15016000 | Ball (0.187-Dia.) Brass | 71 |
| 5 | 11777001 | Adapter - Fine Thd. x B/G | 1 |
| 6 | 61040000 | Screw - Cap (¼-24 x ½-Lg.) | 2 |
| 7 | 81407001 | Nozzle Actuator Assembly | 1 |
| 8 | 63421001 | Base - Stem S/S | 1 |
| 9 | 61222000 | Screw-Set(3/8-24x3/16-Lg.) | 3 |
| 10 | 66388001 | Tip - Nozzle | 1 |
| | | | |
| 11 | 17837001 | Bracket - Push Rod | 1 |

| Det | Part No. | Description | Qty |
|---|---|---|---|
| 12 | 61078001 | Screw-Cap (Truss Head) | 1 |
| 13 | 57503000 | O - Ring (AS568 - 155) | 1 |
| 14 | 57524000 | O - Ring (AS568 - 157) | 1 |
| 15 | 44535000 | Label – Identification | 1 |
| 16 | 17160001 | Body - Nozzle | 1 |
| 17 | 57512000 | O - Ring (AS568 - 162) | 1 |
| 18 | 62187001 | Stem - Nozzle | 1 |
| 19 | 62136000 | Spring - Compression | 1 |
| 20 | 57318000 | O - Ring (AS568 - 142) | 1 |
| 21 | 81146001 | Piston Sub - Assembly | 1 |
| | | | |
| 22 | 33661000 | Bumper - Knobby | 1 |

**SM-2000BE-HL Nozzle Parts List**
**Illustration 10**

## 9. Electric Nozzle Actuator Assembly



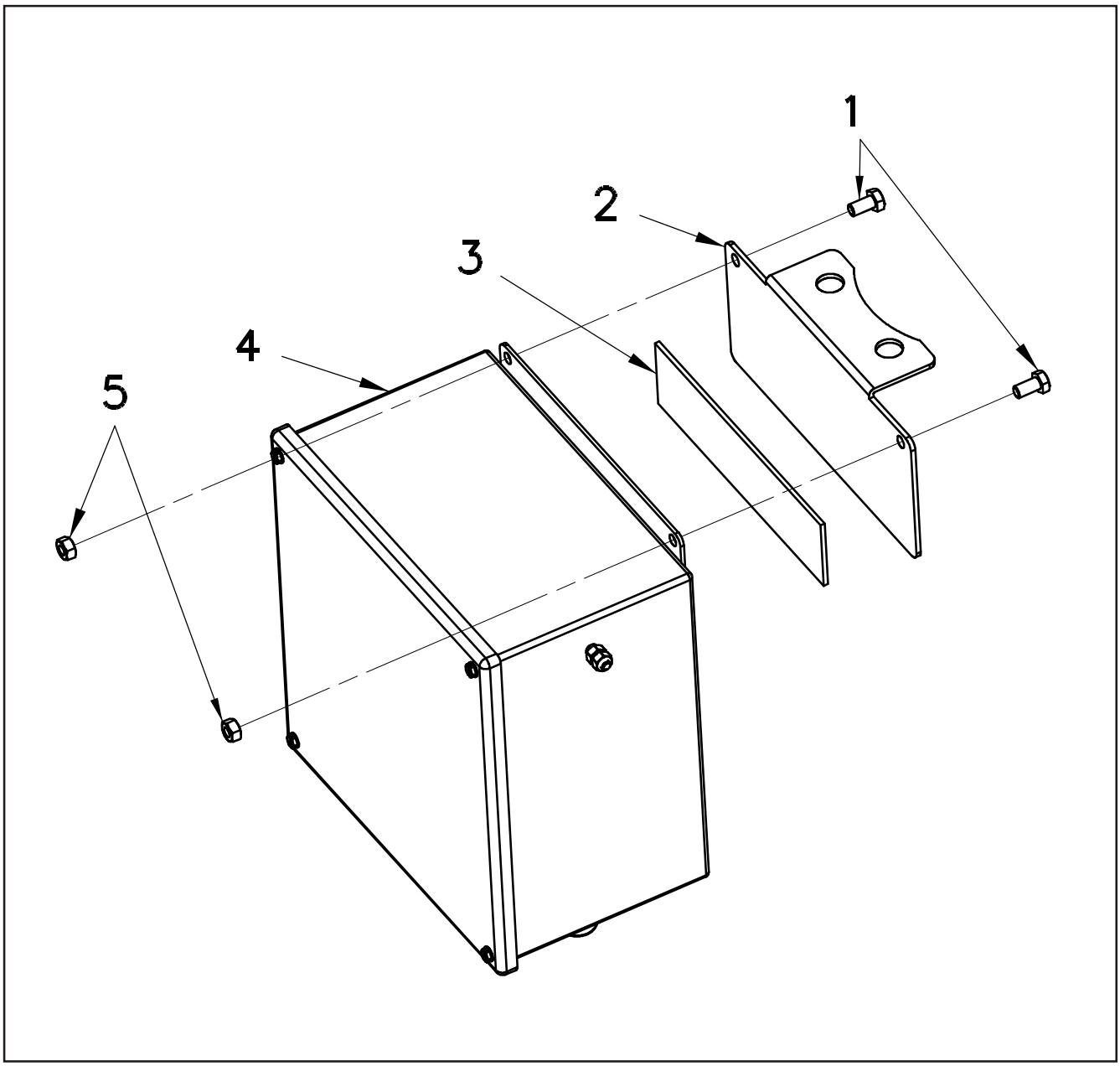

| Det | Part No. | Description | Qty |
|---|---|---|---|
| 1 | 42033001 | Knob – Override | 1 |
| 2 | 51256000 | Pin – Roll | 1 |
| 3 | 10812001 | Adapter – Override | 1 |
| 4 | 57621000 | Ring – Retainer | 1 |
| 5 | 62148000 | Spring – Coil | 1 |
| 6 | 63781000 | Screw-Cap (#8-32 x 3/8-Lg.) | 6 |
| 7 | 23646001 | Cover - Gear Case | 1 |
| 8 | 57298000 | O-Ring (AS568 - 012) | 1 |
| 9 | 33728001 | Spur Gear & Shaft Assembly | 1 |
| 10 | 63693000 | Screw-Set (#8-32 x ¼-Lg.) | 1 |
| 11 | 65568000 | Spacer – Gear | 1 |
| 12 | 23587001 | Gear Case | 1 |
| 13 | 33277000 | Gasket - Rubber (Neoprene) | 1 |
| 14 | 65127000 | Screw-Cap (#8-32 x ¼-Lg.) | 1 |
| 15 | 33806000 | Gasket - Insulator (Nylon) | 1 |
| 16 | 57521000 | O - Ring (AS568 - 028) | 1 |
| 17 | 46088000 | Motor - Electric (120-VAC) | 1 |

| Det | Part No. | Description | Qty |
|---|---|---|---|
| 18 | 61037000 | Screw-Cap (#10-24 x ½-Lg.) | 4 |
| 19 | 59086001 | Push Rod (Brass) | 1 |
| 20 | 65052000 | Epicyclical Ball Screw | 1 |
| 21 | 57295000 | O - Ring (AS568 - 016) | 1 |
| 22 | 67179000 | Tube - Push Rod | 1 |
| 23 | 57438000 | O - Ring AS568 – 018) | 1 |
| 24 | 71515000 | Washer - Thrust (0.250) | 4 |
| 25 | 17701000 | Bearing - Thrust (0.250) | 2 |
| 26 | 57522000 | O - Ring (AS568 - 042) | 1 |
| 27 | 65201000 | Screw-Set (#10-32 x 1/8-Lg.) | 1 |
| 28 | 33726000 | Gear – Spur | 1 |
| 29 | 61503000 | Shaft - Gear (Idler) | 1 |
| 30 | 17704000 | Bearing – Sleeve (Plastic) | 1 |
| 31 | 33727000 | Gear - Spur (Idler) .5-P.D. | 1 |
| 32 | 65552000 | Spacer - Idler Gear | 1 |
| 33 | 58937000 | Ring – Retainer | 1 |
| | | | |

**120-VAC Electric Nozzle Actuator Parts List**
**Part Number 81343001**

**Illustration 11**

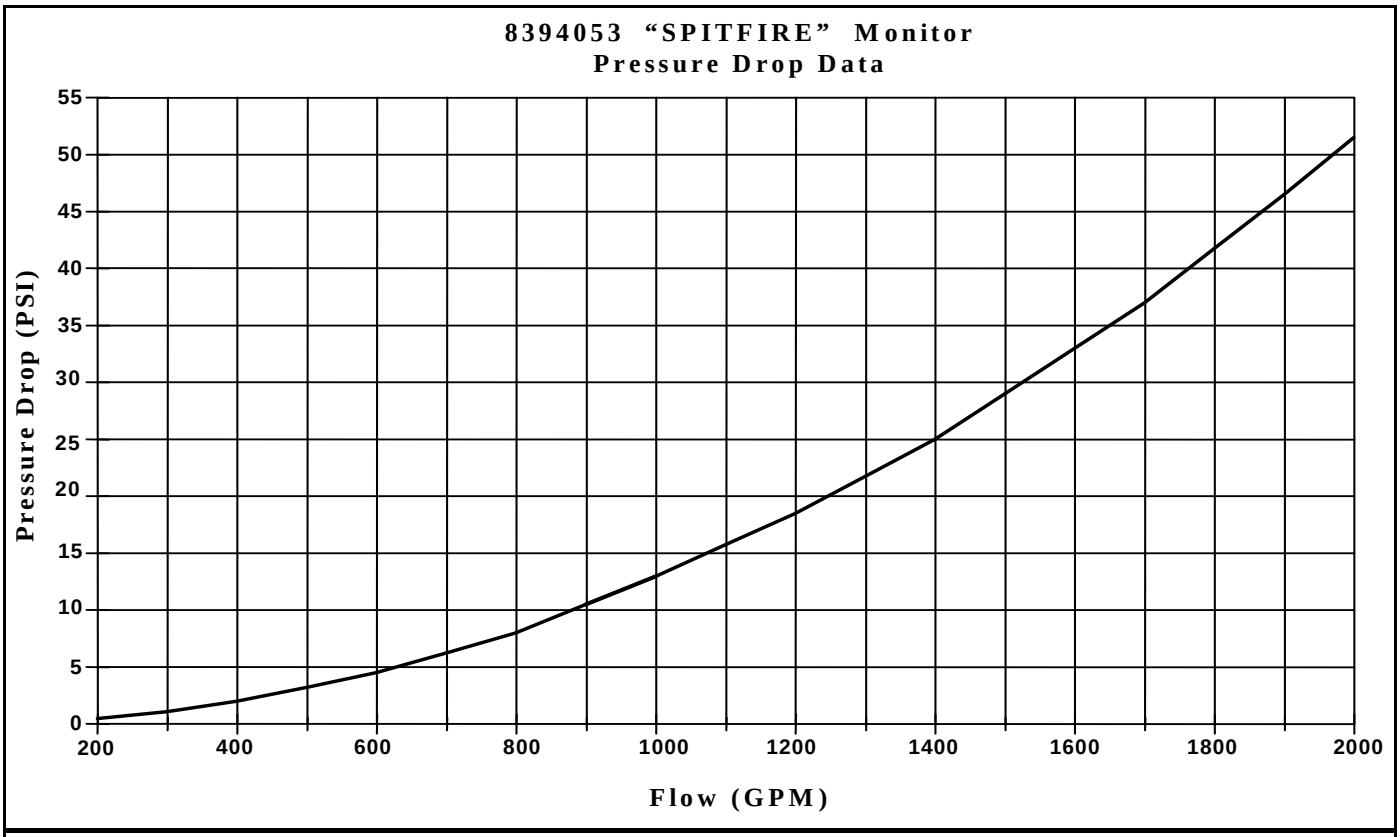
## 10. Junction Box & Bracket Assembly

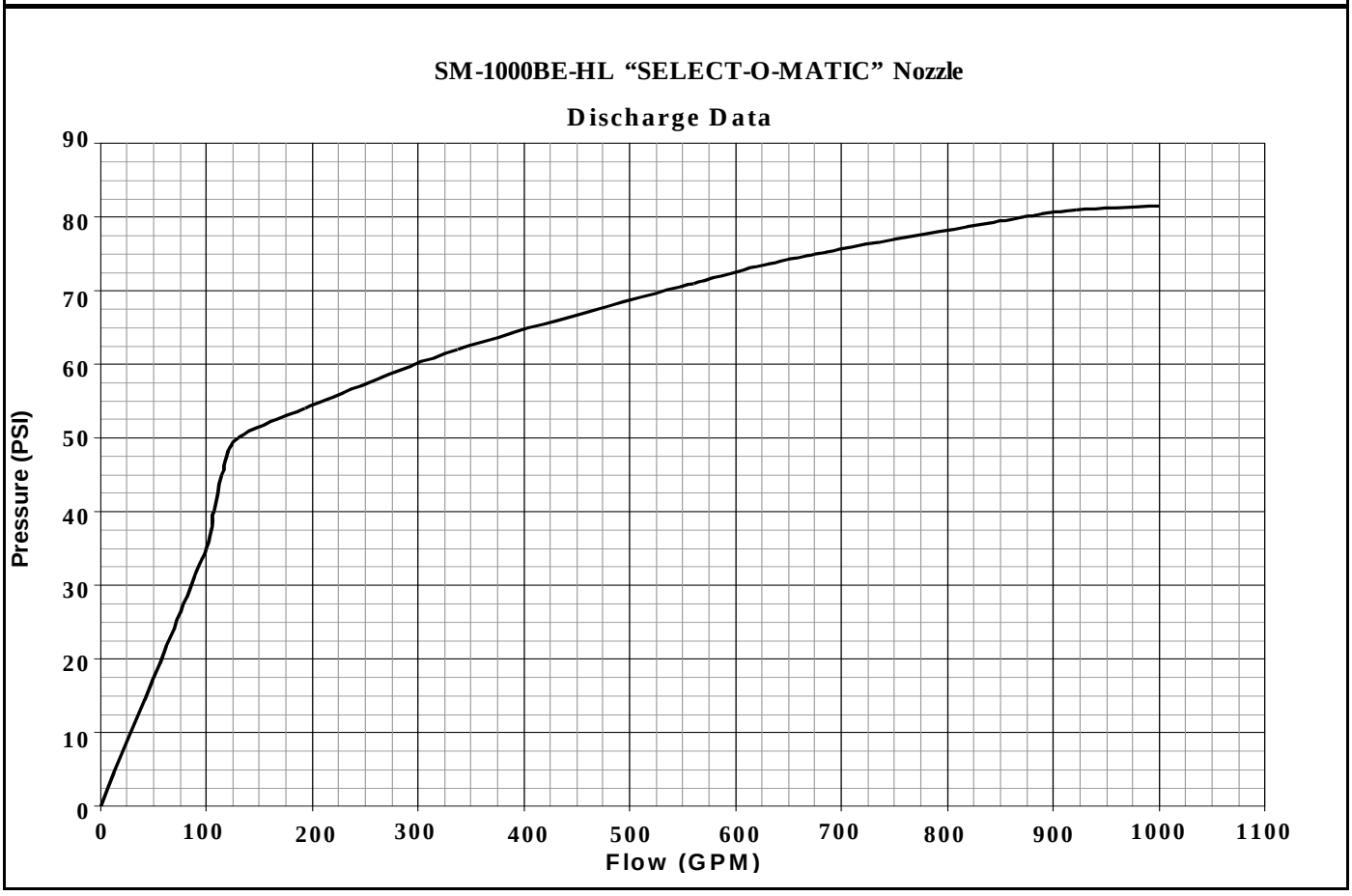



| Det | Part No. | Description | Qty |
|---|---|---|---|
| 1 | 65137000 | Screw – Mach. (5/16-18 x 5/8-Lg. Hex.) | 2 |
| 2 | 18357000 | Bracket – Junction Box | 1 |
| 3 | 65570001 | Spacer – Rubber (Adhesive Back) | 1 |
| 4 | 81491001 | Motor Cable Junction Box Assembly | 1 |
| 5 | 47484000 | Nut – Hex. (5/16-18 Thread) S/S | 2 |

**Motor Cable Junction Box & Bracket Assembly**
**Part Number 81493001**
**Illustration 12**

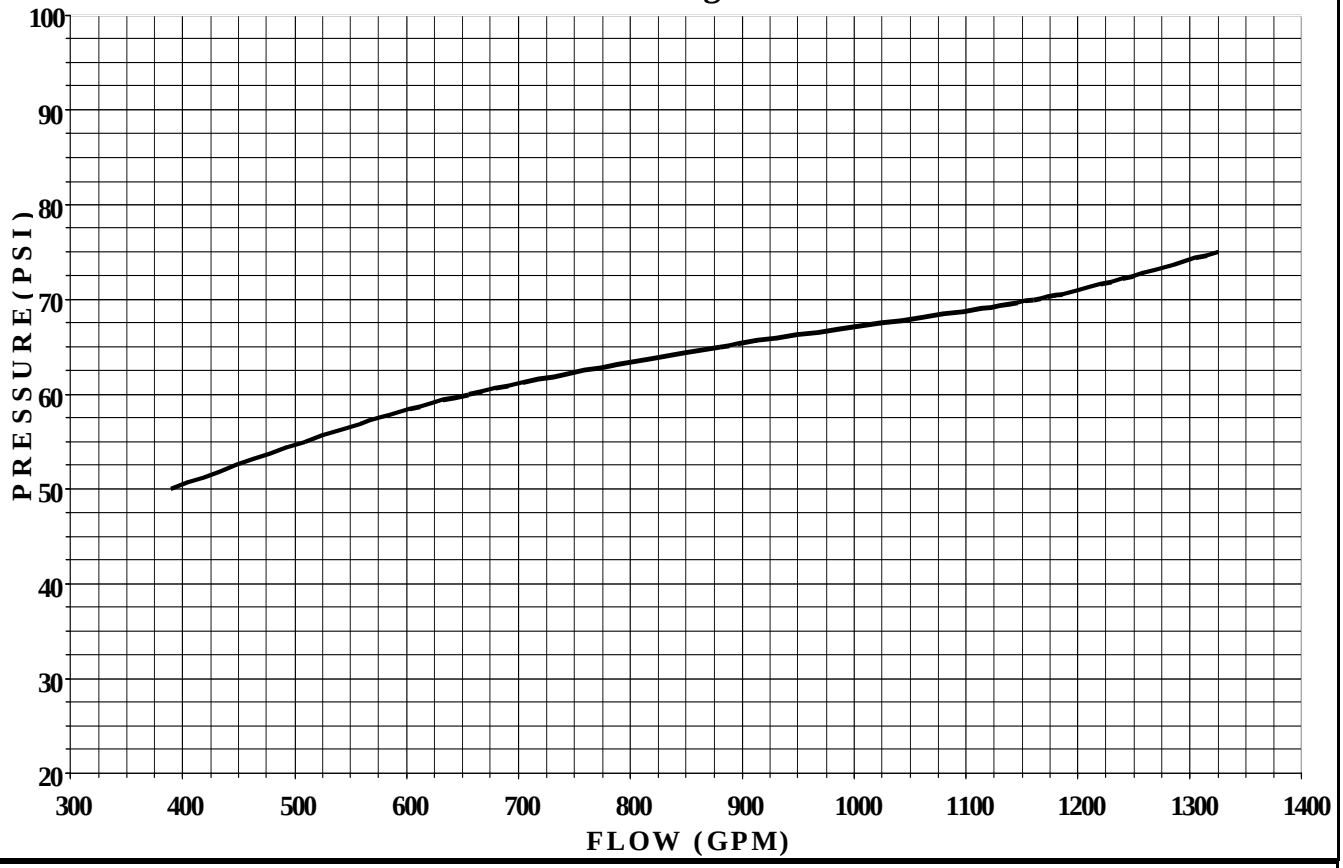
# IX. MONITOR & NOZZLE HYDRAULIC DATA



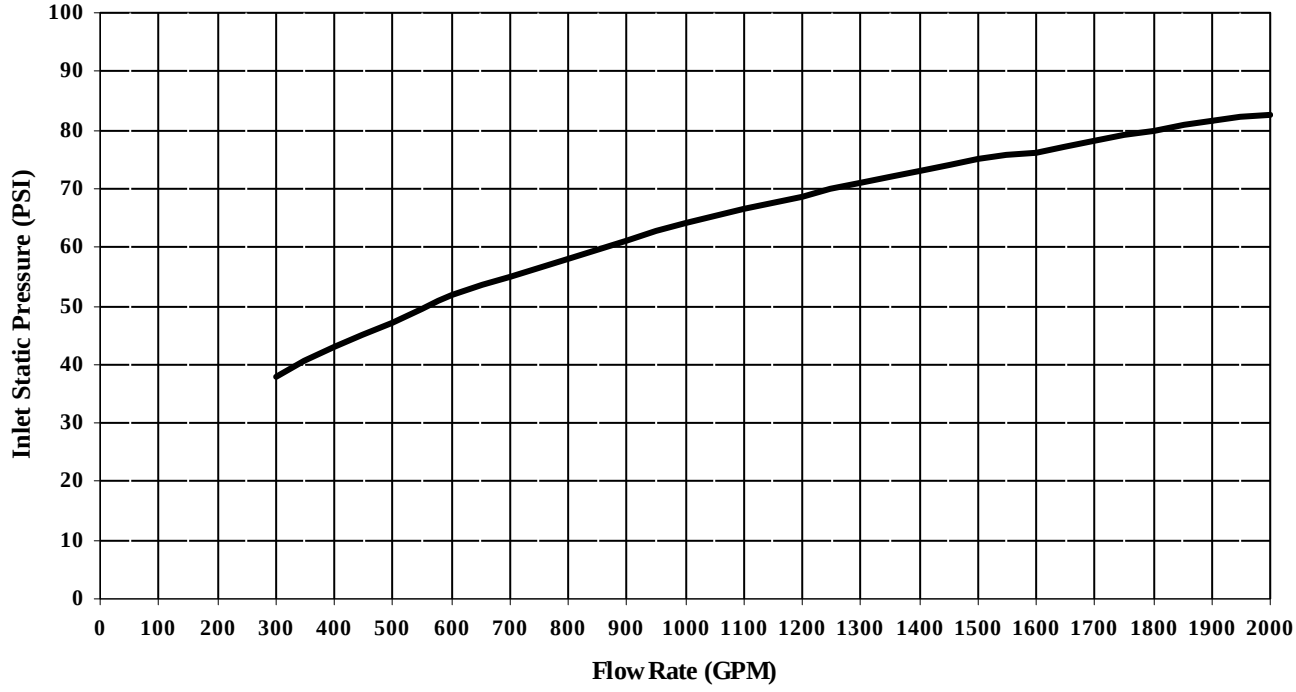
## SM-1250BE-HL "SELECT-O-MATIC" Nozzle

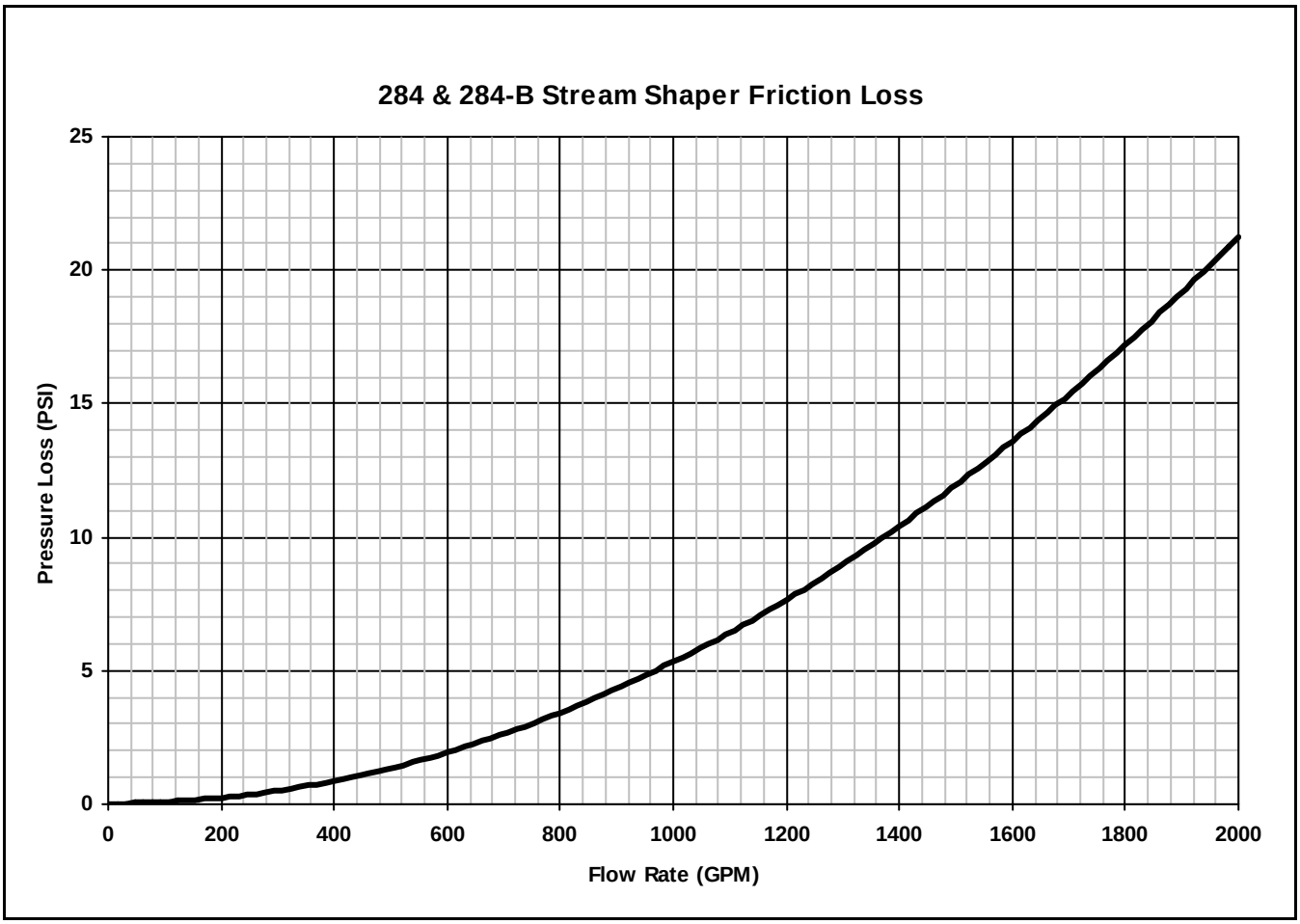
### Discharge Data




## SM-2000BE-HL

### Discharge Performance




284 & 284-B Stream Shaper Friction Loss
Pressure Loss (PSI)
25
20
15
10
5
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Flow Rate (GPM)

## Notes:

### Control System Drawings Included with Instructions

| Drawing Number | Description | |
|---|---|---|
| | | |
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# Elkhart Brass Mfg. Co. Inc.

## Elkhart, Indiana, USA


**Shipping address**

1302 West Beardsley Ave.
Elkhart, Indiana 46514

**Mailing address**

P.O. Box 1127
Elkhart, Indiana 46515

Phone: (574) 295-8330
(800) 346-0250
Fax: (574) 293-9914

Web Site: www.elkhartbrass.com
e-mail: info@elkhartbrass.com