# SRV-6K CE WITH VESSEL

SAFETY RELIEF VALVE TESTER

**OPERATING MANUAL** 

**ORIGINAL INSTRUCTIONS** 













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# **CE DOCUMENTATION**

# DECLARATION OF CONFORMITY



2006/42/EC Machinery Directive



Name of manufacturer or supplier

Climax Portable Machining and Welding Systems

Full postal address including country of origin

2712 E. Second St., Newberg, OR 97132, USA

**Description of product** 

SAFETY RELIEF VALVE TESTERS, MODEL 900

Name, type or model, batch or serial number

MODEL 900; P/N'S 88846, 88406, 88405, 88845

Standards used, including number, title, issue date and other relative documents

EN 349, EN 3744, EN 11201, EN 12100-1, EN 13849-1, EN 14121-1

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Declaration

I declare that as the Manufacturer, the above information in relation to the supply / manufacture of this product, is in conformity with the stated standards and other related documents following the provisions of the above Directives and their amendments.

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CE

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#### About this manual

CLIMAX provides the contents of this manual in good faith as a guideline to the operator. CLIMAX cannot guarantee that the information contained in this manual is correct for applications other than the application described in this manual. Product specifications are subject to change without notice.



# TABLE OF CONTENTS

Сна	PTER/SECTION PA	AGE
1 IN	TRODUCTION	1
1.1	How to use this manual	1
1.2	SAFETY ALERTS	1
1.3	GENERAL SAFETY PRECAUTIONS	2
1.4	MACHINE-SPECIFIC SAFETY PRECAUTIONS	3
1.5	RISK ASSESSMENT AND HAZARD MITIGATION	4
1.6	RISK ASSESSMENT CHECKLIST	5
1.7	LABELS	6
1.7	7.1 Label identification	6
	7.2 Label location	
2 0	VERVIEW	9
2.1	FEATURES AND COMPONENTS	9
2.2	Controls	. 10
2.3	DIMENSIONS	. 11
2.4	Specifications	. 13
2.5	TEMS REQUIRED BUT NOT SUPPLIED	. 13
3 SE	ETUP	-15
3.1	RECEIPT AND INSPECTION	. 15
3.2	LIFTING AND RIGGING	. 15
3.3	SECURING THE TEST STAND	. 16
3.3	3.1 Cement in place (option 1 – recommended)	. 16
3.3	3.2 Drill and anchor (option 2)	. 16
3.4	FILLING THE RESERVOIR AND LUBRICATOR	. 17
3.5	Installing utilities	. 17
3.5	5.1 Connecting air from the source	. 17
3.5	5.2 Connecting water from the source	. 17
3.5	5.3 High-pressure sources for testing	
	5.4 Tethering the hoses (DOT bottle, as applicable)	
	5.5 Connecting to vents or drains	
	CLAMPING PROCEDURE	
3.7	LEAK DETECTION FIXTURE AND BUBBLE JAR	
•	PERATION	
4.1	PRE-OPERATION CHECKS	_
	CONDUCTING AN AIR OR NITROGEN TEST	
	2.1 Test procedure	
	2.2 Adjusting the device under test	
	Conducting the device under test	
T.U	- XA (NI AAA HINA HILLIAN AA I ALIA VAA HILLIA HILAH AA A	. 40

# **TABLE OF CONTENTS (CONTINUED)**

Сна	PTER/SE	CTION	PAGE
4.	3.1 Tes	st procedure	26
4.	3.2 Adj	justing the device under test	26
4.4	Preparii	NG FOR THE TEST PIECE REMOVAL	27
4.5	RELEASIN	NG THE CLAMP	27
5 M	AINTENA	ANCE	29
5.1	MAINTEN	ANCE CHECKLIST	29
5.2	TROUBLE	SHOOTING	29
6 S	TORAGE	AND SHIPPING	31
6.1	STORAGE	<u> </u>	31
6.	1.1 Sh	ort-term storage	31
6.		ng-term storage	
6.2		S	
6.3		ISSIONING	
APP	ENDIX A	ASSEMBLY DRAWINGS	33
APP	ENDIX B	SCHEMATICS	47
ΔPP	ENDIX C	SDS	49



# LIST OF FIGURES

FIGURE	PAGE
1-1 Front console label location	7
1-2 Right side clamp label location	7
1-3 Back label location	8
1-4 Left label location	8
1-5 Reservoir label location (not visible when assembled)	8
2-1 Upper console controls	
2-2 Lower console controls	
2-3 Right side console controls	
2-4 Clamp console controls	
2-5 Dimensions	_
3-1 Securing the test stand	
3-2 Tethered hoses	
3-3 Seat leakage fixture and bubble jar	
3-4 Fixture size limitations	
4-1 Relief valve vent points	
4-2 Steps to close the table drain vent valve	
A-1 SRV-6K with Vessel front console assembly (P/N 88413)	
A-2 SRV-6K with Vessel clamp console assembly (P/N 88413)	
A-3 SRV-6K with Vessel plumbing assembly (P/N 88413)	
A-4 SRV-6K with Vessel plumbing label assembly (P/N 88413)	
A-5 SRV-6K with Vessel plumbing overview assembly (P/N 88413)	
A-6 SRV-6K with Vessel plumbing assembly parts list 1–50 (P/N 88413)	
A-7 SRV-6K with Vessel plumbing assembly parts list 51–100 (P/N 88413)	
A-8 SRV-6K with Vessel plumbing assembly parts list 101–150 (P/N 88413)	
A-9 SRV-6K with Vessel plumbing assembly parts list 151–200 (P/N 88413)	
A-10 Table top assembly parts list (P/N 88408)	
B-1 Schematic (P/N 88404)	
D 1 Continuit (1 /14 COTOT)	7/





# LIST OF TABLES

Table	PAGE
1-1 Risk assessment checklist before set-up	5
1-2 Risk assessment checklist after set-up	5
1-3 SRV-6K with Vessel labels	6
2-1 Specifications	13
3-1 Hydraulic load chart for flanged valves	20
3-2 Leak detection fixture valve ranges	22
5-1 Maintenance intervals and tasks	29
A-1 O-rings kit P/N 88891	





# 1 INTRODUCTION

#### IN THIS CHAPTER:

1.1	HOW TO USE THIS MANUAL		 	-	1
1.2	SAFETY ALERTS		 	-	1
1.3	GENERAL SAFETY PRECAUTIONS		 	-	2
1.4	MACHINE-SPECIFIC SAFETY PRECAUTIONS		 	-	3
1.5	RISK ASSESSMENT AND HAZARD MITIGATION		 	-	4
	RISK ASSESSMENT CHECKLIST				
1.7	LABELS		 	-	6
	1.7.1 LABEL IDENTIFICATION				
	1.7.2 LABEL LOCATION	Ξ.	 	_	7

### 1.1 How to use this manual

This manual describes information necessary for the setup, operation, maintenance, storage, shipping, and decommissioning of the SRV-6K with Vessel.

The first page of each chapter includes a summary of the chapter contents to help you locate specific information. The appendices contain supplemental product information to aid in setup, operation, and maintenance tasks.

Read this entire manual to familiarize yourself with the SRV-6K with Vessel before attempting to set it up or operate it.

## 1.2 SAFETY ALERTS

Pay careful attention to the safety alerts printed throughout this manual. Safety alerts will call your attention to specific hazardous situations that may be encountered when operating this machine.

Examples of safety alerts used in this manual are defined here<sup>1</sup>:



indicates a hazardous situation which, if not avoided, **WILL** result in death or severe injury.



indicates a hazardous situation which, if not avoided, **COULD** result in death or severe injury.

1. For more information on safety alerts, refer to ANSI/NEMA Z535.6-2011, Product safety Information in Product Manuals, Instructions, and Other Collateral Materials.

# **!** CAUTION

indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

# NOTICE

indicates a hazardous situation which, if not avoided, could result in property damage, equipment failure, or undesired work results.

## 1.3 GENERAL SAFETY PRECAUTIONS

CLIMAX leads the way in promoting the safe use of portable machine tools and valve testers. Safety is a joint effort. You, the end user, must do your part by being aware of your work environment and closely following the operating procedures and safety precautions contained in this manual, as well as your employer's safety guidelines.

Observe the following safety precautions when operating or working around the machine

- **Training** Before operating this or any machine tool, you should receive instruction from a qualified trainer. Contact CLIMAX for machine-specific training information.
- **Risk assessment –** Working with and around this machine poses risks to your safety. You, the end user, are responsible for conducting a risk assessment of each job site before setting up and operating this machine.
- **Intended use –** Use this machine in accordance with the instructions and precautions in this manual. Do not use this machine for any purpose other than its intended use as described in this manual.
- **Personal protective equipment –** Always wear appropriate personal protective gear when operating this or any other machine tool.
- **Work area** Keep the work area around the machine clear of clutter. Restrain cords and hoses connected to the machine. Keep other cords and hoses away from the work area.
- **Lifting** Many CLIMAX machine components are very heavy. Whenever possible, lift the machine or its components using proper hoisting equipment and rigging. Always use designated lifting points on the machine.
- **Lock-out/tag-out –** Lock-out and tag-out the machine before performing maintenance.
- **Moving parts** CLIMAX machines have numerous exposed moving parts and interfaces that can cause severe impact, pinching, cutting, and other injuries. Except for stationary operating controls, avoid contact with mov-



ing parts by hands or tools during machine operation. Remove gloves and secure hair, clothing, jewelry, and pocket items to prevent them from becoming entangled in moving parts.

### 1.4 MACHINE-SPECIFIC SAFETY PRECAUTIONS

- **Eye hazard** This machine produces metal chips during operation. Always wear eye protection when operating the machine.
- **Sound level –** This machine produces potentially harmful sound levels. Hearing protection is required when operating this machine or working around it.
- **Hazardous environments** Do not operate the machine in environments where potentially explosive materials, toxic chemicals, or radiation may be present.
- **Pressurization** Do not over-pressurize the valve test system beyond the limits described in this manual and on machine labels. Do not pressurize the system while the side panels are removed from the test console.
- **Test gauges** Do not use any gauge above its rating. Do not remove test gauges while the system is pressurized.
- **Utility service requirements –** Do not exceed the pressure ratings stated in this manual and on the machine labels.

#### 1.5 RISK ASSESSMENT AND HAZARD MITIGATION

To achieve the intended results and to promote safety, the operator must understand and follow the design intent, set-up, and operation practices that are unique to valve testers.

The operator must perform an overall review and on-site risk assessment of the intended application. Due to the unique nature of high-pressure valve testing, identifying one or more hazards that must be addressed is typical.

When performing the on-site risk assessment, it is important to consider the valve tester and the workpiece as a whole.



High-pressure valve testing may result in the sudden, unexpected release of stored energy with the potential to cause property damage or personnel injury. Potential hazards may include the possibility of high-velocity fluid escaping and high-energy projectile impact. The end-user must assess the application and install protective barrier devices, as appropriate.



### 1.6 RISK ASSESSMENT CHECKLIST

The following checklist is not intended to be an all inclusive list of things to watch out for when setting up and operating this valve testing machine. However, these checklists are typical of the types of risks the assembler and operator should consider. Use these checklists as part of your risk assessment:

TABLE 1-1. RISK ASSESSMENT CHECKLIST BEFORE SET-UP

Before set-up
I took note of all the warning labels on the machine.
I removed or mitigated all identified risks (such as tripping, cutting, crushing, entanglement, shearing, or falling objects).
I considered the need for personnel safety guarding and installed any necessary guards.
I considered the potential hazards that are inherent in high-pressure valve testing, including the possibility of high velocity fluid escape or workpiece fragmentation, and have installed appropriate protective barriers.
I read the machine assembly instructions (Section 3) and took inventory of all the items required but not supplied (Section 2.3).
I considered how this machine operates and identified the best placement for the controls, cabling, and the operator.
I evaluated and mitigated any other potential risks specific to my work area.

TABLE 1-2. RISK ASSESSMENT CHECKLIST AFTER SET-UP

After set-up
I checked that the machine is safely installed (according to Section 3).
I identified all possible pinch points, such as those caused by rotating parts, and informed the affected personnel.
I followed the required maintenance checklist (Section 5).
I checked that all affected personnel have the recommended personal protective equipment, as well as any site-required or regulatory equipment.
I checked that all affected personnel understand and are clear of the danger zone.
I evaluated and mitigated any other potential risks specific to my work area.

## 1.7 LABELS

#### 1.7.1 Label identification

The following warning and identification labels should be on your machine. If any are defaced or missing, contact CLIMAX immediately for replacements.

TABLE 1-3. SRV-6K WITH VESSEL LABELS

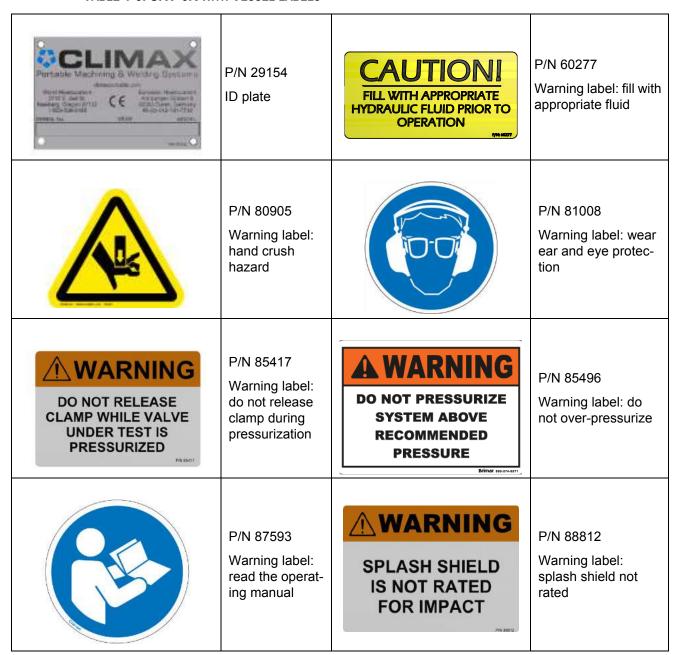
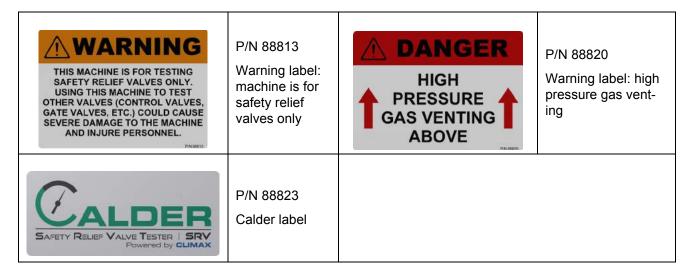




TABLE 1-3. SRV-6K WITH VESSEL LABELS



#### 1.7.2 Label location

The following figures display the location of the labels on each of the components of the SRV-6K with Vessel. For further identification of location placement, refer to the exploded views in Appendix A.

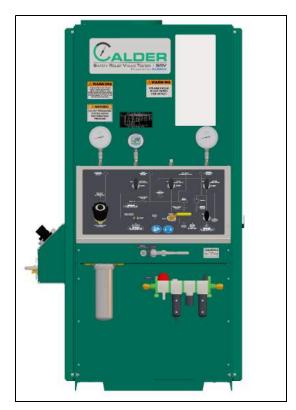


FIGURE 1-1. FRONT CONSOLE LABEL LOCATION

Label P/N: 29154, 81008, 85496, 87593, 88812, 88813, 88823



FIGURE 1-2. RIGHT SIDE CLAMP LABEL LOCATION

Label P/N: 80905, 88823



FIGURE 1-3. BACK LABEL LOCATION

Label P/N: 80905, 88820, 88823



FIGURE 1-5. RESERVOIR LABEL LOCATION (NOT VISIBLE WHEN ASSEMBLED)

Label P/N:60277



FIGURE 1-4. LEFT LABEL LOCATION

Label P/N: 80905, 85417, 87593, 88820, 88823



# 2 **OVERVIEW**

#### IN THIS CHAPTER:

2.1 FEATURES AND COMPONENTS	9
2.2 Controls	0
2.3 DIMENSIONS	1
2.4 Specifications	3
2.5 ITEMS REQUIRED BUT NOT SUPPLIED	3

## 2.1 FEATURES AND COMPONENTS

The SRV-6K with Vessel is a system designed to test and set safety relief valves using water or air.



This machine is for testing safety relief valves only. Using the machine to test other valves (control valves, gate valves, etc.) could cause severe damage to the machine and injure personnel.

Principal components of the SRV-6K with Vessel include:

**Test console** – this controls the test pressure of the valve being tested.

**Clamp fixture** – this holds the valve being tested and maintains a seal between the test equipment and the valve being tested.

**Seal plate adapters** – these are used to seal sizes not included on the base seal plate.

The following optional components are sold separately:

**DOT bottle assembly –** a high-pressure air reservoir.

**Compressor –** an air pressure source for the high-pressure test.

**Seat leakage fixtures** – these capture and measure leakage with a bubble jar (API 527 compliant).

The following maximum pressure limitations apply:

- Test pressure: 5,400 psi (372 bar) in nitrogenor water; 5,000 psi (345 bar) for air
- Clamp pressure: 9,600 psi (662 bar) in hydraulic

## 2.2 CONTROLS

The controls are all located on the control console and the clamp fixture console.

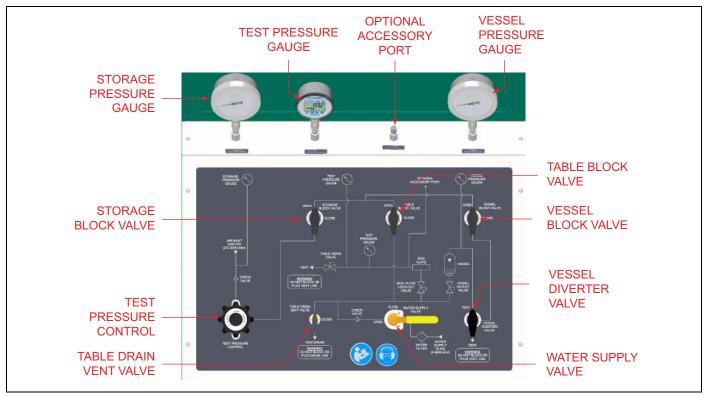


FIGURE 2-1. UPPER CONSOLE CONTROLS

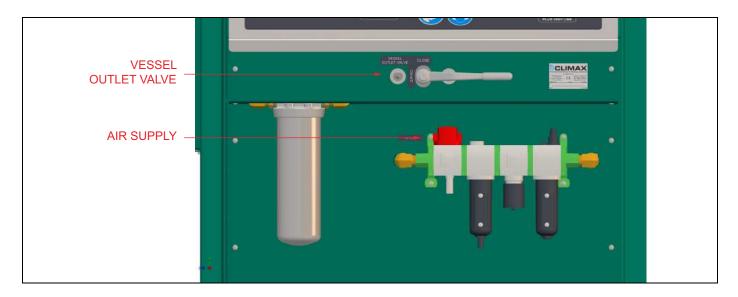




FIGURE 2-2. LOWER CONSOLE CONTROLS

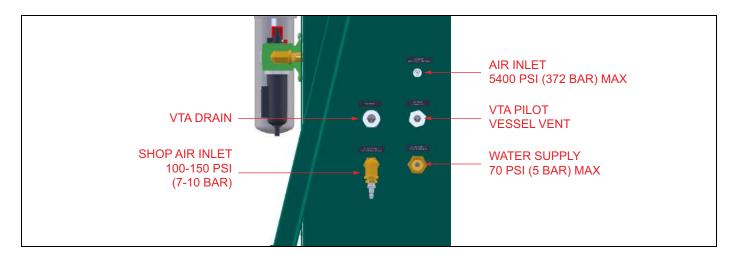


FIGURE 2-3. RIGHT SIDE CONSOLE CONTROLS

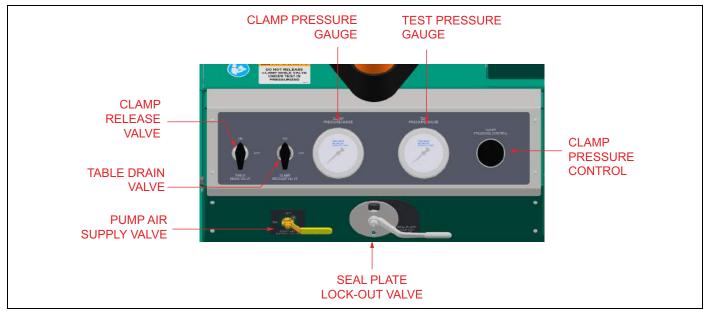
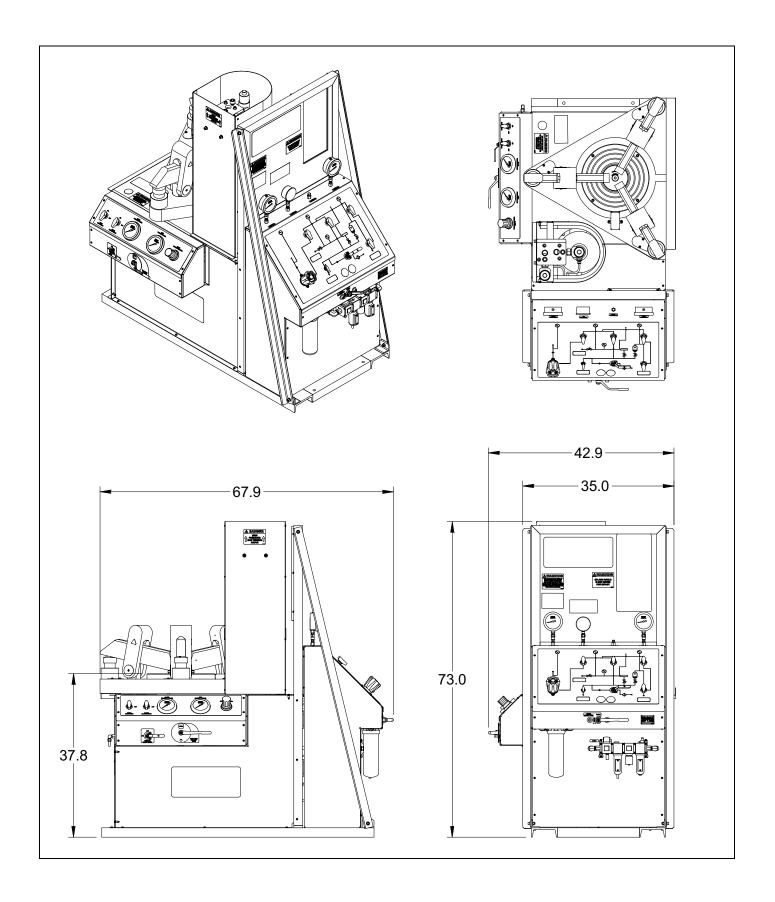


FIGURE 2-4. CLAMP CONSOLE CONTROLS

## 2.3 DIMENSIONS

Figure 2-5 shows the machine dimensions.



## 2.4 SPECIFICATIONS

TABLE 2-1. SPECIFICATIONS

Test media:	Water, air, nitrogen			
Maximum water test pressure:	5,400 psi (372 bar)			
Maximum air test pressure:	5,000 psi (372 bar)			
Maximum nitrogen test pressure:	5,400 psi (372 bar)			
Types of valves that can be tested:	Safety relief valves			
Shop air required:	100–150 psi at 40 scfm (6,9–10,3 bar at 1,1 m <sup>3</sup> /min)			
Water quick fill:	3 gpm (11,4 l/min) minimum			
Hydraulic ram force:	90 tons (81.6 tonnes)			
Approximate machine weight	2,500 lbs (1,134 kg)			
Approximate shipped weight	3,000 lbs (1,361 kg)			

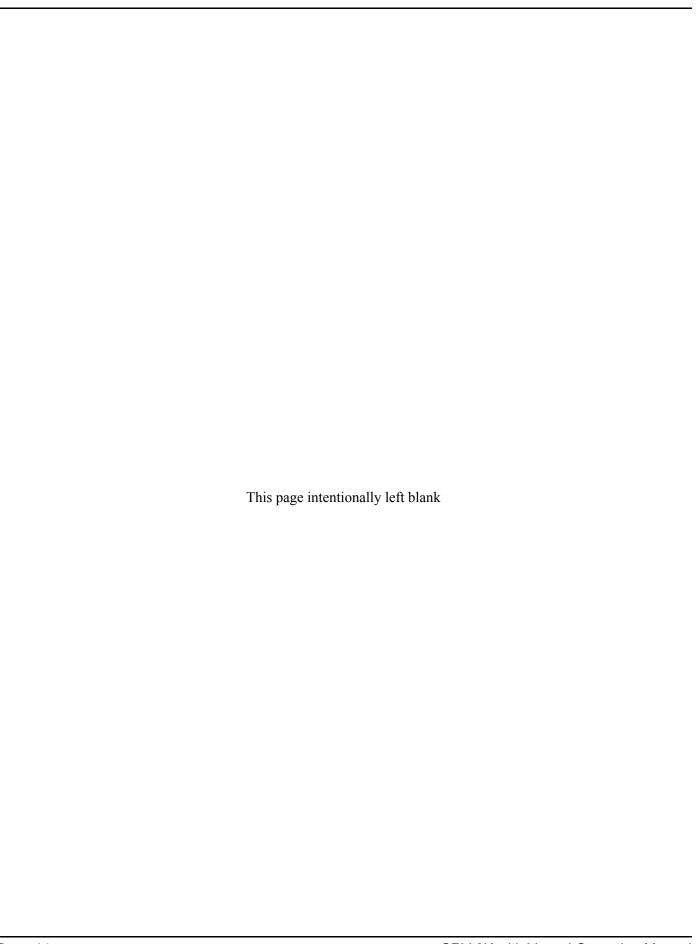


Do not use the machine in any application that exceeds these operating specifications. Failure to follow these guidelines could result in personnel injury and property damage, and will void the warranty.

## 2.5 ITEMS REQUIRED BUT NOT SUPPLIED

The following items are required but not supplied in your CLIMAX product kit:

- Shop air (100–150 psi [6,9–10,3 bar])
- Hydraulic fluid AW-32 or AW-46
- Air tool oil (general purpose, such as AW-32)
- Lock-out/tag-out device
- High-pressure storage device, such as a DOT bottle assembly (as applicable)
- Compressor for 5,400-psi (372 bar) pressurized gas (as applicable)





## 3 SETUP

#### IN THIS CHAPTER:

3.1 RECEIPT AND INSPECTION
3.2 LIFTING AND RIGGING
3.3 SECURING THE TEST STAND
3.3.1 CEMENT IN PLACE (OPTION 1 - RECOMMENDED)
3.3.2 DRILL AND ANCHOR (OPTION 2)
3.4 FILLING THE RESERVOIR AND LUBRICATOR
3.5 Installing utilities
3.5.1 CONNECTING AIR FROM THE SOURCE
3.5.2 Connecting water from the source
3.5.3 High-pressure sources for testing
3.5.4 TETHERING THE HOSES (DOT BOTTLE, AS APPLICABLE)
3.5.5 Connecting to vents or drains
3.6 CLAMPING PROCEDURE
3.7 Leak detection fixture and bubble jar21

This section describes the setup and assembly procedures for the SRV-6K with Vessel safety relief valve tester.

#### 3.1 RECEIPT AND INSPECTION

Your CLIMAX product was inspected and tested prior to shipment, and packaged for normal shipment conditions. CLIMAX does not guarantee the condition of your machine upon delivery.

When you receive your CLIMAX product, perform the following receipt checks:

- 1. Inspect the shipping containers for damage.
- 2. Check the contents of the shipping containers against the included invoice to make sure that all components have been shipped.
- 3. Inspect all components for damage.

Contact CLIMAX immediately to report damaged or missing components.



Keep the shipping container and all packing materials for future storage and shipping of the machine.

## 3.2 LIFTING AND RIGGING

Follow these lifting instructions for each component (as applicable):

**DOT bottle assembly –** Use the lifting points near the top, or lift at the bot-

tom skids with a forklift.

**Console/clamp fixture –** Lift at the bottom skids with a forklift.

**Compressor –** Refer to the manufacturer's manual.

#### 3.3 SECURING THE TEST STAND

The safety relief valve tester and DOT bottle assembly (if separately purchased) must be anchor-bolted to the floor before operation.



All units must be stabilized for the safety of the operator. The operator must determine what is necessary to provide a safe environment.

# **A** DANGER

Position the machine so that high-pressure venting (either from the machine or the safety relief valve under test) is not orientated towards personnel or nearby equipment. Failure to do so may result in machine damage or personnel severe injury or death.

#### 3.3.1 Cement in place (option 1 – recommended)

Cement the anchor bolts into the floor. The exposed threads of the anchor must protrude a minimum of two threads past the nut and washer. See Figure 3-1.

### 3.3.2 Drill and anchor (option 2)

Drill holes into the floor for an expanding type anchor sleeve. A .5" (12.7 mm) lag bolt will require a minimum of 1.5" (38.1 mm) thread engagement. See Figure 3-1.

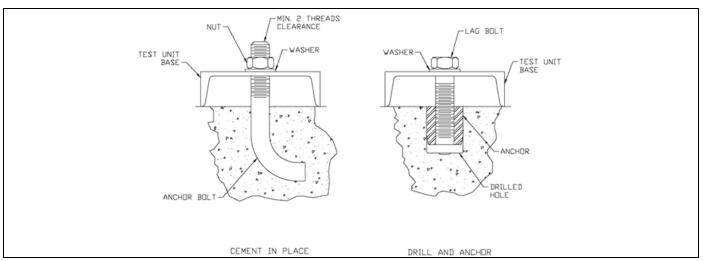


FIGURE 3-1. SECURING THE TEST STAND



#### 3.4 FILLING THE RESERVOIR AND LUBRICATOR

Do the following before operating:

- 1. Fill the reservoirs with hydraulic oil (AW-32 or AW-46) to half of the sight gauge.
- 2. Fill the lubricators with air tool oil (generic purpose, such as AW-32) and adjust the knob to set it to one drop per 25 strokes of the pump.



Operating the pump with insufficient lubrication will result in pump failure.

## 3.5 Installing utilities

#### 3.5.1 Connecting air from the source

Low-pressure air (100–150 psi [6,9–10,3 bar]) is the primary source of power in the clamping system. The consoles has an air filter with a 1/2" (13 mm) NPT air inlet.

Connect the shop air to the air filter at 100–150 psi (6,9–10,3 bar).

## 3.5.2 Connecting water from the source

One 3/4" (19 mm) NPT low-pressure water (70 psi [4,8 bar] maximum) inlet connection port is located on the right side of the console (see Figure 2-3 on page 11). Connect the shop water supply at this location.

#### 3.5.3 High-pressure sources for testing

The right side of the console has one 1/4" NPT (5,400 psi [372 bar] maximum) inlet connection port for testing. Connect the customer-supplied high-pressure air or gas at this location, or use a compressor or DOT bottle assembly (sold separately) at the high-pressure sources.



Exceeding the rated pressure for the inlet could result in machine damage or personnel injury.



The optional auxiliary port is plugged for shipment. Removing this plug while there is pressure in the system could result in severe personnel injury or death.

#### 3.5.4 Tethering the hoses (DOT bottle, as applicable)

Tether the following hose ends to prevent hose whip:

- Hose from compressor to DOT bottle assembly, both ends
- Hose from the DOT bottle assembly to the test console, both ends



If an air test hose needs replacement, only use a highpressure hose rated above 6,500 psi (484 bar). Refer to Appendix A for all

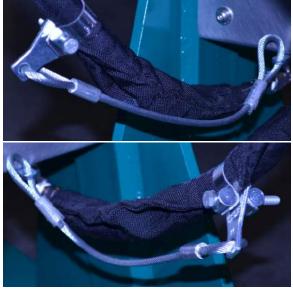


FIGURE 3-2. TETHERED HOSES

other components. Failure to follow these specifications could result in machine damage or personnel injury.

# NOTICE

Always use thread tape or thread lubricant/sealer when connecting any stainless steel fittings or components. Failure to do so will result in galling and permanently bonding the two pieces being connected.

### 3.5.5 Connecting to vents or drains

When connecting to the VTA PILOT VESSEL VENT, only use fittings and components rated to or above 6,000 psi (414 bar).

When connecting to the VTA DRAIN, only use fittings and components rated to or above 6,000 psi (414 bar).



Failure to utilize fittings and components with adequate pressure ratings could result in machine damage or personnel injury.

See Section 4 for details on the TABLE DRAIN/VENT VALVE.



#### 3.6 CLAMPING PROCEDURE

Do the following (refer to Figure 2-2 on page 11 and Figure 2-4 on page 11 as needed):

- 1. Check the integrity of the o-rings on the seal plates. Replace any damaged o-rings.
- 2. Check that the SEAL PLATE LOCK-OUT VALVE on the clamp fixture console is closed and locked to prevent accidental table pressurization during the clamping process.
- 3. Check that the VESSEL OUTLET VALVE on the control console is closed to prevent accidental table pressurization during the clamping process.
- 4. Place the test valve on the table and align the valve with the correct o-ring.

# **WARNING**

The relief port of the safety relief valve (that is, the device under test) should face away from the operator and any other personnel during the test. The splash shield is not rated for impact.

- 5. For a flanged valve, slide the clamp arms in until they securely engage with the flange. Use the extended clamp arm spacer blocks as needed.
- 6. On the clamp fixture console, close the CLAMP RELEASE VALVE.

#### TIP:

The Safety Interlock Switch reduces the likelihood of the clamps from releasing the device under test while the test system is under pressure or if there is a loss of shop air.

# **! WARNING**

Do not use the safety interlock in place of the primary handoperated controls. The safety interlock is only a secondary measure to the correct operating procedure. Some residual pressure (up to 75 psi [5.2 bar]) may remain in the device under test when the safety interlock disengages, which may cause a pressure release and personnel injury, if the CLAMP RELEASE VALVE is not closed. Always remove test pressure, vent the test circuit, and close the SEAL PLATE LOCK-OUT VALVE before opening the clamp release valve.

- 7. Check that the CLAMP PRESSURE CONTROL is turned counter-clockwise until it stops.
- 8. Open the PUMP AIR SUPPLY VALVE.

9. Turn the CLAMP PRESSURE CONTROL clockwise while monitoring the clamp pressure gauge until the correct pressure is achieved, as listed in Table 3-1.



Check Table 3-1 for recommended clamping pressures. Excess clamp pressures may damage the workpiece and machine and may result in serious personnel injury.

If the valve flange does not seal against the seal plate, refer to Section 5.2 on page 29 for troubleshooting before increasing the clamp pressure.

	REQUIRED CLAMPING PRESSURE, MODEL SRV-6K								
VALVE	MAXIMUM TEST PRESSURE PSI (BAR)*								
SIZE	O-RING	600 (41)	1,000 (69)	2,000 (138)	3,000 (207)	5,000 (345)	5,400 (372)		
OIZL		HY	DRAULIC PR	ESSURE RE	QUIRED TO	SEAL PSI (BA	R)		
3/4	2-319	300 (21)	300 (21)	500 (35)	800 (55)	1,300 (90)	1,400 (97)		
1	2-220	300 (21)	300 (21)	600 (41)	900 (62)	1,500 (103)	1,600 (110)		
1-1/2	2-227	400 (27)	600 (41)	1,200 (83)	1,800 (124)	2,900 (200)	3,200 (221)		
2	2-230	500 (35)	800 (55)	1,600 (110)	2,300 (159)	3,800 (262)	4,100 (283)		
3	2-238	800 (55)	1,300 (90)	2,600 (179)	3,900 (269)	6,500 (448)	7,100 (490)		
4	2-245	1,200 (83)	1,900 (131)	3,800 (262)	5,600 (386)	9,300 (641)			
6	2-363	2,200 (152)	3,700 (255)	7,300 (503)					
8	2-372	3,400 (234)	5,600 (386)						
10	2-379	4,500 (310)	7,400 (510)						
12	2-382	5,000 (345)	8,400 (579)	\ \ \ \					
	*THE OPERATOR IS RESPONSIBLE TO SELECT THE ACTUAL TEST								

\*THE OPERATOR IS RESPONSIBLE TO SELECT THE ACTUAL TEST PRESSURE THAT IS REQUIRED FOR THE FLANGED SAFETY RELIEF UNDER TEST. SEE OPERATING MANUAL.

TABLE 3-1. HYDRAULIC LOAD CHART FOR FLANGED VALVES



To minimize the risk of damage to the machine, workpiece, and personnel injury, use technical judgment and discretion when increasing the clamping pressure above the recommendations listed in Table 3-1.

Determine the correct hydraulic load by following these steps with Table 3-1:

- 1. Locate the size of the valve to be tested in the valve nominal diameter column (example: 4").
- 2. Choose the appropriate required test pressure in the header (example: 2,000 psi [138 bar]).



3. Identify the cell in the valve diameter row and clamp pressure column to find the hydraulic gauge pressure required to seal the valve being tested (example: 3,800 psi [262 bar]).

#### 3.7 LEAK DETECTION FIXTURE AND BUBBLE JAR

To mount the leak detection fixture (sold separately) to the device under test, do the following:

- 1. Clamp the seat leakage fixture to the outlet flange of the device under test, using the clamp arm knobs (handtight is sufficient).
- 2. Fill the bubble jar with water to the tube's scribe line.
- 3. While testing, use leak detection fluid (for example, soapy water) to check for leaks between the valve outlet flange and the leak detection fixture.

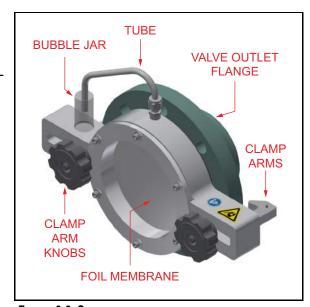


FIGURE 3-3. SEAT LEAKAGE FIXTURE AND BUBBLE JAR

## **↑ WARNING**

Each leakage fixture accommodates a range of nominal valve sizes (see Table 3-2 on page 22). It is critical that they be used in the applicable ranges so that "D" is greater than or equal to "d" (see Figure 3-4). Failure to do so could apply pressure to the fixture assembly upon relief valve release and potentially detach the assembly from the valve flange with

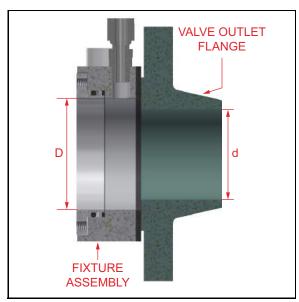


FIGURE 3-4. FIXTURE SIZE LIMITATIONS

great force. This could result in severe injury and equipment damage.

TABLE 3-2. LEAK DETECTION FIXTURE VALVE RANGES

Part Number	Nominal valve size range (150 and 300 ANSI class) in inch (mm)
89051	2–2.5" (51–64)
89065	3–3.5" (76–89)
89066	4–5" (102–127)
89067	6–8" (152–203)
89068	10–12" (254–305)

# NOTICE

The leak detection fixtures use a thin foil membrane that will rupture if the relief valve trips during leakage testing.



Do not stand in front of or near the leak detection fixtures during testing. If the relief valve trips, the foil membrane will rupture to release test pressure. Standing near the fixture when this happens could result in severe injury. Always wear ear and eye protection.



# 4 OPERATION

#### IN THIS CHAPTER:

4.1 Pre-operation checks
4.2 CONDUCTING AN AIR OR NITROGEN TEST
4.2.1 Test procedure
4.2.2 ADJUSTING THE DEVICE UNDER TEST
4.3 CONDUCTING HYDROSTATIC OR WATER TEST
4.3.1 TEST PROCEDURE
4.3.2 ADJUSTING THE DEVICE UNDER TEST
4.4 Preparing for the test piece removal2
4.5 RELEASING THE CLAMP

### 4.1 PRE-OPERATION CHECKS

Refer to Figure 2-1 on page 10 as necessary.

Do the following checks before operating the machine:

- 1. Complete the risk assessment checklist in Table 1-2 on page 5.
- 2. Check that the work area is clear of non-essential personnel and equipment.
- 3. Check that the TEST PRESSURE GAUGES show 0 psi/bar (except for the storage gauge, which is the maximum psi/bar that the operator can achieve at test pressure).
- 4. Check that all valves, including the BLOCK VALVES, SEAL PLATE LOCK-OUT VALVE, VESSEL OUTLET VALVE, and TABLE DRAIN VALVE, are in the closed position and that the TEST PRESSURE control is turned counter-clockwise until it stops.
- 5. Check that the test piece is securely clamped on the clamping table, and at the correct clamping pressure according to Table 3-1. (See Section 3.6 on page 35.)

## NOTICE

Follow any pressure ratings indicated on the clamping arms. Exceeding the rated pressures could result in equipment damage.

# **WARNING**

High-pressure valve testing may result in the sudden, unexpected release of stored energy with the potential to cause property damage or personnel injury. Potential hazards may include the possibility of high-velocity fluid escaping and high-energy projectile impact. The end-user must assess the application and install protective barrier devices, as appropriate.

## NOTICE

This system has two relief valves (shown in Figure 4-1) that will vent high pressure air or nitrogen if the test pressure exceeds the rated pressures.

6. Check that the VESSEL DIVERTER VALVE is in the VENT position, and that the TABLE DRAIN/VENT VALVE is in the open (VENT/DRAIN) position.



FIGURE 4-1. RELIEF VALVE VENT POINTS

## 4.2 CONDUCTING AN AIR OR NITROGEN TEST

#### 4.2.1 Test procedure

# **NOTICE**

The internal 5-gallon vessel and system should be drained of water before conducting an air test. Failure to do so could result in a mixed water/air test medium that could contaminate the device under test and startle the operator during safety relief valve lift or leakage testing. See Section 4.4 for details.

Do the following for an air or nitrogen test:

1. Open the SEAL PLATE LOCK-OUT VALVE at the clamp fixture control panel.



2. Close the TABLE DRAIN/VENT VALVE (according to Figure 4-2 and the notice below) and the VESSEL BLOCK VALVE.

## NOTICE

In order to close the TABLE DRAIN VENT VALVE from the open (VENT/DRAIN) position (1), rotate the valve handle to PRE-CLOSE (2) and then to the CLOSE position (3), as shown in Figure 4-2.

3. Open the INLET/OUTLET VALVE for the supply hose at the pressure source (for example, the DOT bottle assembly or compressor).

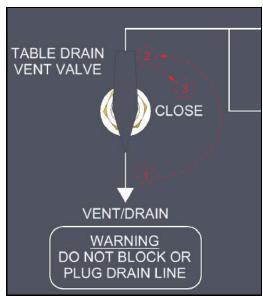


FIGURE 4-2. STEPS TO CLOSE THE TABLE DRAIN VENT VALVE

- 4. Open the STORAGE BLOCK VALVE and the TABLE BLOCK VALVE. (The TEST PRESSURE GAUGES should show 0 psi/bar.)
- 5. Check that the VESSEL OUTLET VALVE is closed.
- 6. Check that the TABLE DRAIN VALVE is closed at the clamp fixture control panel.
- 7. Set the VESSEL DIVERTER VALVE to VENT.
- 8. Turn the TEST PRESSURE CONTROL clockwise while monitoring the TEST PRESSURE gauge, until it reaches the desired test pressure. Increase pressure gradually.

## 4.2.2 Adjusting the device under test

If the safety relief valve (device under test) needs to be adjusted, do the following:

- 1. Rotate the TEST PRESSURE CONTROL counter-clockwise until it stops.
- 2. Open the TABLE DRAIN/VENT VALVE to vent out all remaining pressure within the system.
- 3. Close the BLOCK VALVES.
- 4. Check that both TEST PRESSURE GAUGES show 0 psi/bar.
- 5. Close and lock the SEAL PLATE LOCK-OUT VALVE at the clamp fixture.
- 6. Adjust the device under test as necessary.
- 7. Repeat Section 4.2.1 until no more adjustments are necessary.

## 4.3 CONDUCTING HYDROSTATIC OR WATER TEST

### 4.3.1 Test procedure

Do the following for a hydrostatic or water test:

- 1. Open the SEAL PLATE LOCK-OUT VALVE at the clamp fixture.
- 2. Open the VESSEL OUTLET VALVE.
- 3. Set the VESSEL DIVERTER VALVE to VENT.
- 4. Open the TABLE DRAIN VALVE.
- 5. Close the TABLE DRAIN/VENT VALVE (according to step 2 in Section 4.2.1 and Figure 4-2 on page 25).
- 6. Open the WATER SUPPLY VALVE and allow the system and device under test to fill with water.
- 7. When water begins to exit the TABLE without any bubbles, close the TABLE DRAIN VALVE, the WATER SUPPLY VALVE, and turn the VESSEL DIVERTER VALVE to TEST.
- 8. Open the STORAGE BLOCK VALVE and the VESSEL BLOCK VALVE.
- 9. Turn the TEST PRESSURE CONTROL clockwise while monitoring the TEST PRESSURE GAUGE, until it reaches the desired test pressure. Increase the pressure gradually.

## **NOTICE**

If the system is overfilled with water, it is possible for water to escape by spraying under the TEST PRESSURE CONTROL knob when lowering the system pressure with the test pressure control. This is a normal occurrence and does not adversely affect machine performance.

## 4.3.2 Adjusting the device under test

If the safety relief valve (device under test) needs to be adjusted, do the following:

- 1. Rotate the TEST PRESSURE CONTROL counter-clockwise until it stops.
- 2. Set the VESSEL DIVERTER VALVE to VENT, to vent out all pressure within the system.
- 3. Verify that the VESSEL BLOCK VALVE is open and that the VESSEL PRESSURE GAUGE and both TEST PRESSURE GAUGES show 0 psi/bar.
- 4. Close the BLOCK VALVES.
- 5. Close and lock the SEAL PLATE LOCK-OUT VALVE at the clamp fixture.
- 6. Open the TABLE DRAIN VALVE to drain water as needed, and close when finished.



## NOTICE

A pressure limiting valve is installed upstream of the table drain valve. Ensure test pressure gauge at clamp fixture shows zero psi/bar before draining. If test pressure is still present, the pressure limiting valve will shut and not reopen until all the test pressure has been drained.

- 7. Adjust the device under test as necessary.
- 8. Repeat Section 4.3.1 until no more adjustments are necessary.

## 4.4 Preparing for the test piece removal

When no more adjustments are necessary, do the following to remove the test piece:

- 1. Rotate the TEST PRESSURE CONTROL counter-clockwise until it stops.
- 2. Turn the VESSEL DIVERTER VALVE to vent to release all pressure within the system and inside the valves.
- 3. Verify that the VESSEL PRESSURE GAUGE and both TEST PRESSURE GAUGES show 0 psi/bar.
- 4. Open the TABLE DRAIN/VENT VALVE and TABLE DRAIN VALVE to drain any water from the system.
- 5. Keep the VESSEL DIVERTER VALVE in the VENT position.
- 6. Close the BLOCK VALVES.

After the tests, do the following:

- 1. Check that all valves are closed with two exceptions: the VESSEL DIVERTER VALVE (set to VENT) and the TABLE DRAIN/VENT VALVE (set to VENT/DRAIN).
- 2. Turn the TEST PRESSURE CONTROL counter-clockwise until it stops.
- 3. Lock the SEAL PLATE LOCK-OUT VALVE at the clamp fixture. See Figure 2-1 on page 10.

## 4.5 RELEASING THE CLAMP

To release the clamp, do the following:

1. Check that there is no residual pressure in the safety relief valve (that is, the device under test) as shown by both TEST PRESSURE GAUGES and that the SEAL PLATE LOCK-OUT VALVE is closed.

# **WARNING**

Always vent the system pressure, then close the SEAL PLATE LOCK-OUT VALVE at the clamp fixture before removing (unclamping) the valve being tested. A sudden release of pressure could cause personnel injury and damage to the workpiece.

- 2. Close the PUMP AIR SUPPLY VALVE.
- 3. Turn the CLAMP PRESSURE CONTROL counter-clockwise until it stops.
- 4. Open the CLAMP RELEASE VALVE.
- 5. When the clamp pressure gauge reads 0 psi/bar, slide the clamp arms back and remove the test valve. Refer to Figure 1-4 on page 8 and Figure 2-4 on page 11.

### TIP:

The Safety Interlock Switch reduces the likelihood of the clamps from releasing the device under test or if there is a loss of shop air while the test system is under pressure.



Do not use the safety interlock in place of the primary hand-operated controls. The safety interlock is only a secondary measure to the correct operating procedure. Some residual pressure (up to 75 psi [5,2 bar]) may remain in the device under test when the safety interlock disengages, which may cause a pressure release and personnel injury, if the CLAMP RELEASE VALVE is not closed. Always remove test pressure, vent the test circuit, and close the SEAL PLATE LOCK-OUT VALVE before opening the clamp release valve.



# **5 MAINTENANCE**

## **5.1** MAINTENANCE CHECKLIST

Table 5-1 lists maintenance intervals and their associated tasks.

TABLE 5-1. MAINTENANCE INTERVALS AND TASKS

Interval	Task	
Before each use	Inspect the testing unit, including all hose connections, inlet supply lines, and outlet lines.	
	Check the o-rings on the seal plates for cracks or nicks. Replace if necessary.	
During use	Check the lubricator to ensure one drip to every 25 strokes of the pump. Adjust as needed. Use air tool oil (general purpose, such as AW-32) for the lubricator.	
After each use	Wipe the component parts clean and dry to prevent corrosion.	
	Inspect mufflers for damage and plugging. Replace if any are clogged.	
Once a month	Check the oil level in the hydraulic clamp reservoir. The level should be half of the sight tube. Use Hydraulic Oil AW-46.	
As needed	Change the air filter element (Parker PN PS701P Kit 40 micron).	

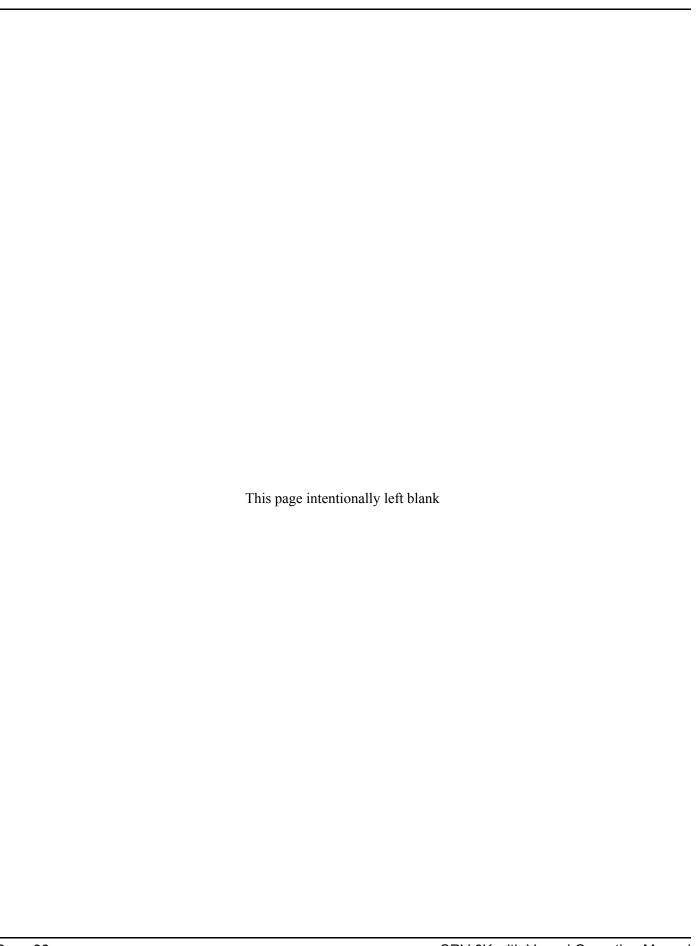
## 5.2 TROUBLESHOOTING

If unable to hold a seal, remove the valve and do the following:

- 1. Check for the correct minimum hydraulic gauge pressure required to seal, according to Table 3-1 on page 20.
- 2. Check for the correct test pressure, according to Table 3-1 on page 20.
- 3. Check that all clamp arms are making good contact with the flange. Adjust if necessary.
- 4. Check for any cracks or nicks in the O-rings and replace any damaged ones.
- 5. Check for any damage (such as gouges, scratches, dents) on the raised face of the valve and the seal plate on the test bench.
- 6. Check the seal plate and raised face for any debris. Clean both surfaces.



To minimize the risk of damage to the machine, workpiece, and personnel injury, use technical judgment and discretion when increasing the clamping pressure above the recommendations listed in Table 3-1 on page 20.





# **6 STORAGE AND SHIPPING**

## 

## 6.1 STORAGE

Proper storage of the safety relief valve tester will extend its usefulness and prevent undue damage.

Before storing, do the following:

- 1. Clean and dry the machine.
- 2. Drain the hydraulic fluid and air tool oil.

Store the safety relief valve tester in its original shipping container. Keep all packing materials for repackaging the machine.

### 6.1.1 Short-term storage

Do the following for short-term storage (three months or less):

- 1. Remove the tooling.
- 2. Remove the hoses.
- 3. Cap the ports.
- 4. Remove o-rings in the seal plate.
- 5. Remove the workpiece from the machine.
- 6. Spray all unpainted surfaces with LPS-2 to prevent corrosion.
- 7. Store the safety relief valve tester in its original shipping box.

## 6.1.2 Long-term storage

Do the following for long-term storage (longer than three months):

- 1. Follow the short-term storage instructions, but use LPS-3 instead of LPS-2.
- 2. Add a desiccant pouch to the shipping container. Replace according to manufacturer instructions.
- 3. Store the shipping container in an environment out of direct sunlight with temperature < 70°F (21°C) and humidity < 50%.

## 6.2 SHIPPING

Before shipping, remove the hydraulic and air tool oil fluids.

## 6.3 DECOMMISSIONING

To decommission the safety relief valve tester prior to disposal, remove the air tool oil and hydraulic fluid before dismantling machine components. Refer to Appendix A for component assembly information.



# APPENDIX A ASSEMBLY DRAWINGS

## Drawing list

FIGURE A-1. SRV-6K WITH VESSEL FRONT CONSOLE ASSEMBLY (P/N 88413)	- 34
FIGURE A-2. SRV-6K WITH VESSEL CLAMP CONSOLE ASSEMBLY (P/N 88413)	- 35
FIGURE A-3. SRV-6K WITH VESSEL PLUMBING ASSEMBLY (P/N 88413)	- 36
FIGURE A-4. SRV-6K WITH VESSEL PLUMBING LABEL ASSEMBLY (P/N 88413)	- 37
FIGURE A-5. SRV-6K WITH VESSEL PLUMBING OVERVIEW ASSEMBLY (P/N 88413)	- 38
FIGURE A-6. SRV-6K WITH VESSEL PLUMBING ASSEMBLY PARTS LIST 1-50 (P/N 88413)	- 39
FIGURE A-7. SRV-6K WITH VESSEL PLUMBING ASSEMBLY PARTS LIST 51-100 (P/N 88413)	- 40
FIGURE A-8. SRV-6K WITH VESSEL PLUMBING ASSEMBLY PARTS LIST 101-150 (P/N 88413)	- 41
FIGURE A-9. SRV-6K WITH VESSEL PLUMBING ASSEMBLY PARTS LIST 151–200 (P/N 88413)	- 42
FIGURE A-10. TABLE TOP ASSEMBLY (P/N 88408)	- 43
FIGURE A-11. TABLE TOP ASSEMBLY PARTS LIST (P/N 88408)	- 44
Table A-1. O-rings kit P/N 88891	- 45

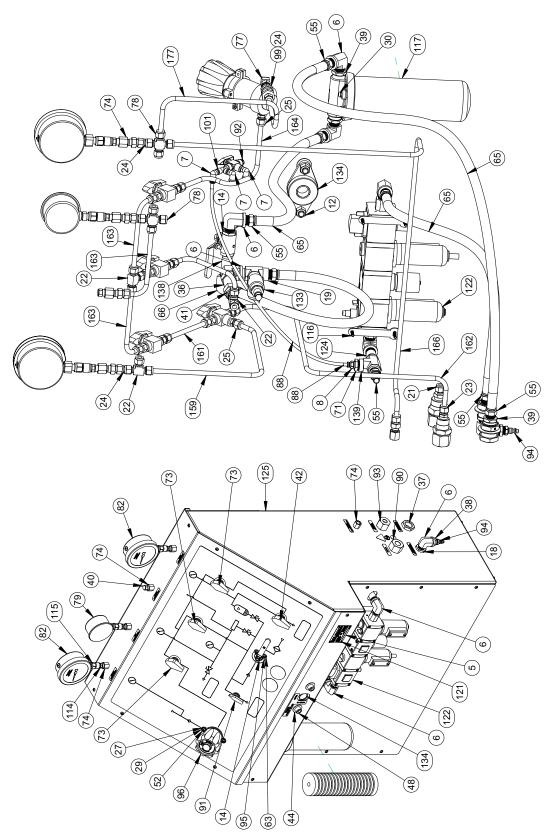


FIGURE A-1. SRV-6K WITH VESSEL FRONT CONSOLE ASSEMBLY (P/N 88413)



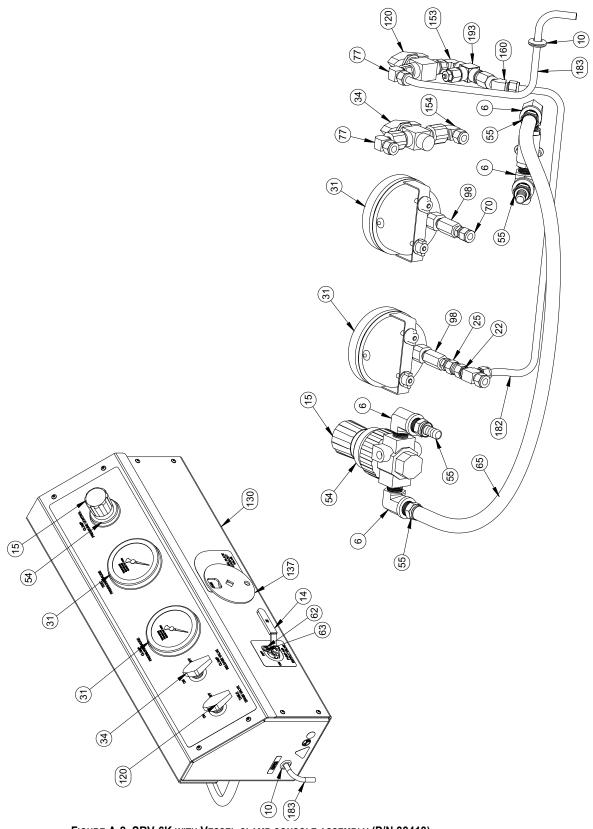


FIGURE A-2. SRV-6K WITH VESSEL CLAMP CONSOLE ASSEMBLY (P/N 88413)

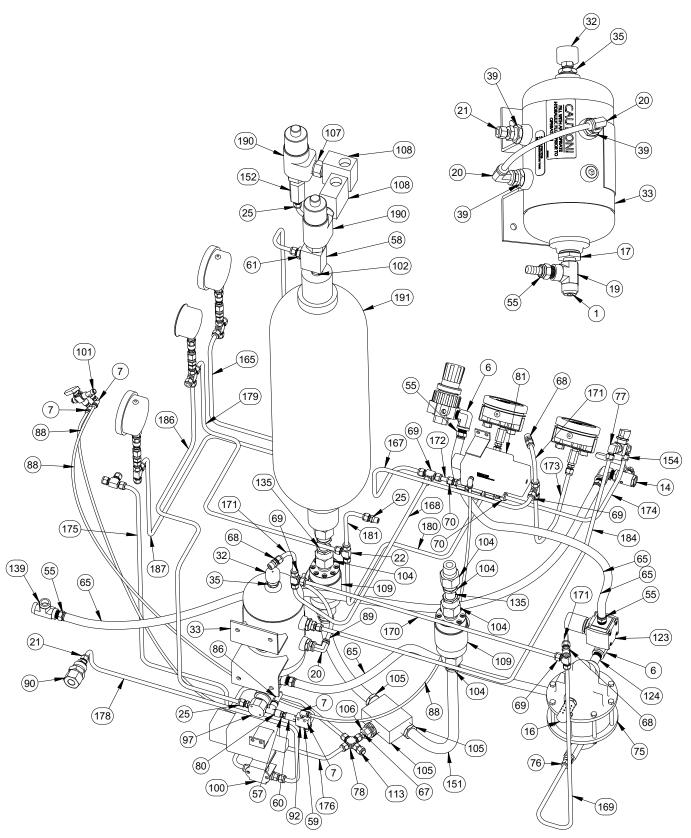


FIGURE A-3. SRV-6K WITH VESSEL PLUMBING ASSEMBLY (P/N 88413)



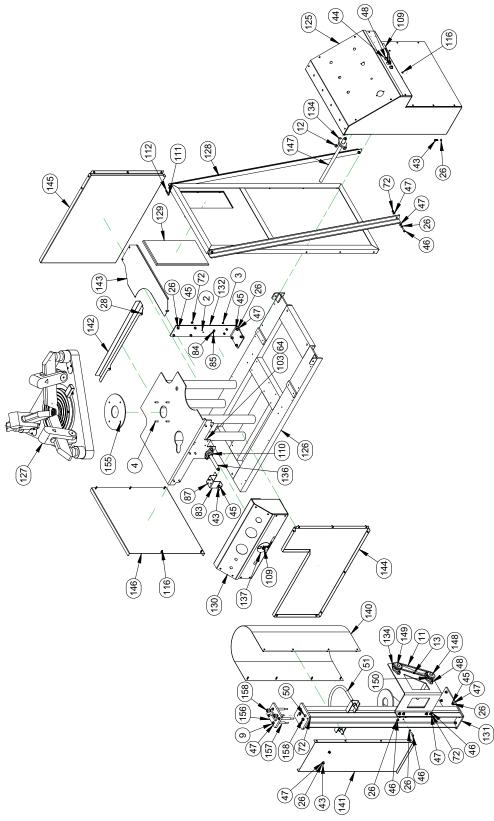


FIGURE A-4. SRV-6K WITH VESSEL PLUMBING LABEL ASSEMBLY (P/N 88413)

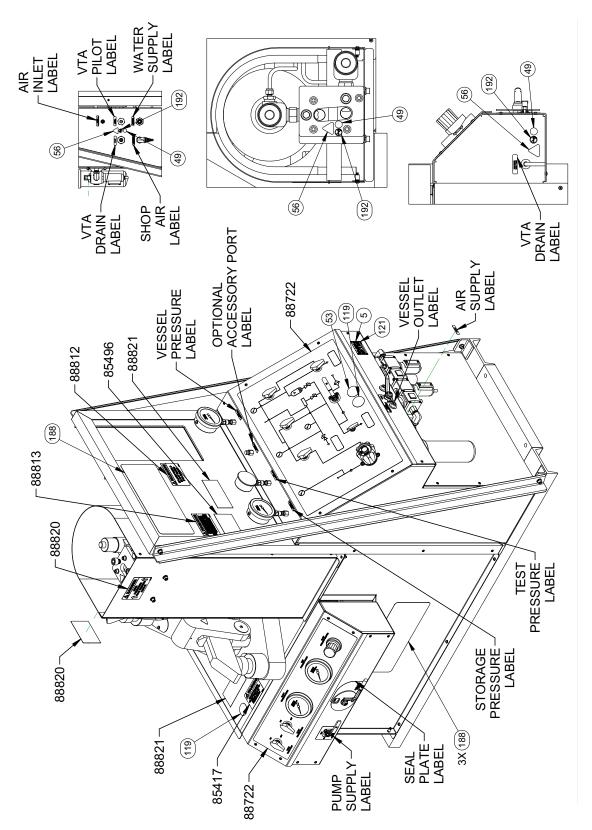


FIGURE A-5. SRV-6K WITH VESSEL PLUMBING OVERVIEW ASSEMBLY (P/N 88413)



ITEM	QTY	P/N:	DESCRIPTION	SCHEMATIC ID			
1	1	12579	TG PLUG 1/2 NPTM SOCKET				
2	2	13695	SCREW 10-32 X 1/2 SHCS SS				
3	4	13904	NUT 5/16-18 STDN STAINLESS STEEL				
4	4	13907	REW 3/8-16 X 1-1/2 SHCS STAINLESS				
5	1	29154	TE SERIAL YEAR MODEL CE 2.0 X 3.0				
6	13	35692	FTG ELBOW 1/2 NPTM X 1/2 NPTF ST 90 DEG BRASS				
7	7	48648	FTG ELBOW 1/8 NPTM X 1/4 TUBE PRESTOLOK				
8	1	51263	FTG ADAPTER 1/4 NPTM X 1/4 TUBE F PRESTOLOCK NICKEL PLATED				
9	4	66159	SCREW 3/8-16 X 6 SHCS ZINC PLATED				
10	1	67634	GROMMET 1/2 ID X 1 OD				
11	33	67663	ROLLER CHAIN #35 SINGLE 3/8 P .20 DIA				
12	8	68976	NUT 1/2-13 NYLON INSERT ZINC PLATED GRADE 5				
13	1	70218	LINK #35 CHAIN CONNECTING				
14	2	77389	BALL VALVE 1/2 NPT FEMALE 160 PSI	V8, V11			
15	1	77394	REGULATOR AIR 1/2 NPT 125 PSI	PRV4			
16	1	77399	HIGH FLOW MUFFLER 3/4 NPTM COMPACT				
17	1	77403	STRAINER OIL 1 NPTM X 1/2 NPTF	F3			
18	1	77421	FTG BULKHEAD 1/2 NPTF BRASS				
19	2	77422	FTG TEE 1/2 NPTM X 1/2 NPTF MALE RUN TEE BRASS	T1			
20	2	77459	FTG ELBOW 1/2 NPTM X 3/8 TUBE PRESTOLOC SWIVEL 90 DEG BRASS				
21	2	77460	FTG CONNECTOR 1/2 NPTM X 3/8 TUBE				
22	5	77461	FTG TUBE TEE UNION 3/8 TUBE				
23	1	77489	FTG CONNECTOR 3/8NPTM X 3/8 TUBE				
24	6	77492	FTG CONNECTOR PORT 3/8 TUBE				
25	6	77493	FTG CONNECTOR 1/4 NPTM X 3/8 TUBE SS				
26	55	77523	WASHER 3/8 LOCK SS				
27	2	77544	WASHER 1/4 FLTW SS				
28	11	77557	SCREW 1/4-20 X 1/2 BHCS SS				
29	19	77558	WASHER 1/4 LOCK SS				
30	4	77602	SCREW 1/4-20 X 3/8 BHCS SS				
31	2	77652	GAUGE PRESSURE 4 DIA 0-10000 PSI 1/4 NPTM LOWER BACK MOUNT	G4, G5			
32	1	77787	FILLER BREATHER 3/8 NPTM	F2			
33	1	77788	RESERVOIR HYDRAULIC 1 GAL	12			
34	1	77792	VALVE BALL 2 WAY 1/4 NPTF 10000 PSI	V13			
35	1	77797	FTG BUSHING BRASS 3/4 NPTM X 3/8 NPTF	V 13			
36	1	77871		CV2			
37	1	77872	FTG CHECK VALVE 10 KSI 1/2 NPTF FTG BULKHEAD 3/4 NPT BRASS	CV2			
38	1	77876					
39	6	77877	FTG BUSHING 1/2 NPTM X 3/8 NPTF BRASS				
			FTG BUSHING BRASS 3/4 NPTM X 1/2 NPTF FTG PLUG 1/4 NPTM				
40	1	77902					
41	1	77915	FTG MALE ADAPTER 1/2 NPTM X 3/8 TUBE	1/2			
42	1	77916	BALL VALVE 3 WAY 3/8" TUBE 6000 PSI	V3			
43	12	77979	SCREW 3/8-16 X 3/4 SHCS SS				
44	8	78415	WASHER 1/2 FLTW SS				
45	21	78427	SCREW 3/8-16 X 1 SHCS SS				
46	12	78526	SCREW 3/8-16 X 1 1/4 SHCS SS				
47	36	78672	WASHER 3/8 FLTW SS				
48	8	79103	SCREW 1/2-13 X 1-1/4 SHCS SS				
49	3	79328	LABEL WARNING - CONSULT OPERATOR'S MANUAL GRAPHIC .75 DIA				
50	1	79520	SPACER AL 3/8 ID X 3/4 OD X 3/8				
51	1	79977	U-BOLT(RUBBER SLEEVE) FOR 10" PIPE 3/4-10 THREAD				
52	2	80952	SCREW 1/4-20 X 3/4 BHCS SS				

FIGURE A-6. SRV-6K WITH VESSEL PLUMBING ASSEMBLY PARTS LIST 1–50 (P/N 88413)

ITEN4	OTV	D/NI.	DESCRIPTION	COLIEMATIC
ITEM	QTY	P/N:	DESCRIPTION	SCHEMATIC II
53	1	81008	LABEL WEAR HEARING AND EYE PROTECTION 2.0 DIA	
54	1	81787	MOUNT NUT REGULATOR PANEL	
55	16	81917	FTG BARB 1/2 NPTM X 1/2 HOSE SWIVEL BRASS	
56	3	82144	LABEL WARNING - GENERAL DANGER GRAPHIC 1.30 X 1.13	
57	1	82411	FTG BRASS REDUCING HEX NIPPLE 1/4 MNPT X 1/8 MNPT	
58	1	82450	FTG HP TEE 10KSI 3/4 FNPT	
59	1	82455	VALVE PUSH BUTTON AIR N/O 1/8 FNPT	PRS1
60	1	82456	AIR PILOT OPERATOR 1/8 FNPT	
61	1	82476	FTG TUBE CONNECTOR 3/4 NPTM X 3/8 TUBE	
62	2	82641	SCREW 10-24 X 1/4 SHCS SS	
63	4	82685	WASHER #10 FLTW SS	
64	4	82687	WASHER 5/16 FLTW SS	
65	286	82847	HOSE LOW PRESSURE PUSH LOK 1/2 ID	
66	1	82871	FTG BRASS FEMALE ELBOW 1/2 NPT	
67	1	82873	FTG, TUBE MALE ADAPTER, 3/8" TUBE X 1/4" MNPT	
68	3	83092	FTG CONNECTOR 3/8NPTM X 3/8 TUBE SUPER DUPLEX	
69	4	83094	FTG TUBE TEE UNION 3/8 TUBE SUPER DUPLEX	
70	3	83105	FTG TUBE CONNECTOR 1/4 NPTM X 3/8 TUBE SUPER DUPLEX	
71	1	83135	FTG BUSHING 1/2 NPTM x 1/4 NPTF BRASS	
72	26	83159	NUT 3/8-16 HEX SS	
73	3	83371	VALVE BALL 2-WAY 6 KSI 3/8 TUBE SS	V1, V2, V4
74	5	83373	FTG BULKHEAD 1/4 NPTF X 3/8 TUBE	V 1, V 2, V 7
75	1	83521	PUMP AIR DRIVEN 10,000 PSI OIL SERVICE	P1
76	1	83671	FTG CONNECTOR 1/2 NPTM X 3/8 TUBE SUPER DUPLEX	11
77	3	83801	TUBE MALE ELBOW 3/8 TUBE X 1/4 MNPT	
78	3	84083	FTG UNION CROSS 3/8 TUBE	
79	1	84517	GAUGE DIGITAL PRESSURE PEEK HOLD 1/4 NPTM 10KSI	G2
80	1	84571		G2
			FTG TEE 1/4" NPT STREET BRASS	1/40
81	1	84602	VALVE BALL AIR ACTUATED 10KSI 1/4 NPTF NORMALLY CLOSED	V12
82	2	84812	GAUGE PRESSURE 4 INCH DIA 6000 PSI GLYCERIN FILLED 1/4 MNPT BOTTOM	G1, G3
00		0.1050	MOUNT	
83	1	84859	PUMP BRACKET BLACK	
84	8	84970	WASHER 5/16 LOCW SS	
85	4	84985	SCREW 5/16-18 X 7/8 SHCS SS	
86	1	85240	VALVE PRESSURE RELIEF AIR 120 PSI 1/4 NPTM	R3
87	2	85271	SCREW 3/8-24 X 3/4 SHCS SS	
88	145	85288	TUBING 1/4 OD X .170 ID POLYETHELYNE	
89	8	85289	TUBING 3/8 OD X 1/4 ID POLYETHELYNE	1
90	1	85318	FTG BULKHEAD 1/2 NPTF 15000 PSI	
91	1	85337	BALL VALVE DIVERTING 3 PORT 1500 PSI 1/8 NPTF PORTS	V9
92	2	85338	VENT BREATHER 1/8 NPTM	
93	1	85407	FTG BULKHEAD 3/8 NPTF X 3/8 NPTF 15000 PSI SS	
94	1	85411	FTG QUICK COUPLER 1/4B MALE X 3/8 NPTM AIR INDUSTRIAL-SHAPE	
95	2	85457	SCREW 10-24 X 3/8 SHCS SS	
96	1	85478	REGULATOR SELF VENT 6 KSI BRASS 1/4 NPT	PRV1
97	1	85550	REGULATOR PRESSURE REDUCING PRE-SETTABLE 80-140 PSI 2 PORTS 1/4 NPTF	PRV3
98	2	85922	COUPLING MEDIUM PRESSURE 1/4 FNPT	
99	1	85931	FTG, CHECK VALVE, 6000 PSI, 3/8" TUBE	CV1
100	1	85943	VALVE BALL AIR ACTUATED 6KSI 3/8 TUBE 1/8 FNPT PILOT PORT NORMALLY OPEN	V10
	1	85946	FTG TEE BRASS 1/8 MNPT X 1/8 FNPT X 1/8 FNPT	<del> </del>

FIGURE A-7. SRV-6K WITH VESSEL PLUMBING ASSEMBLY PARTS LIST 51–100 (P/N 88413)



ITEM	QTY	P/N:	DESCRIPTION	SCHEMATIC ID
102	1	85968	FTG NIPPLE 3/4 NPTM X 3/4 NPTM SS	00.12.11.11.110.12
103	4	85973	SCREW 5/16-18 X 1/2 SHCS SS	
104	6	85986	FTG HP ADAPTER 1 NPTM X 1 MEDIUM PRESSURE W/ COLLAR AND GLAND	
105	1	86000	FTG, MP TEE, 20KSI, 1" OD MP TUBE	
106	1	86006	FTG ADAPTER MEDIUM PRESSURE 1/4 FNPT X 1" M.P. MALE	
107	2	86008	FTG HP ADAPTER 1 NPTM X 1 NPTM 10000 PSI	
108	2	86042	FTG HP ELBOW 10KSI 1 FNPT	
109	2	86060	BALL VALVE 6KSI .88" BORE 1" NPTF	V5, V6
110	3	86066	SHAFT COLLAR ALUMINUM SEAL PLATE VALVE	·
111	6	86075	NUT 1/4-20 X 1/4 ACON SS	
112	6	86129	SCREW 1/4-20 X 5/8 BHCS SS	
113	1	86524	FTG PLUG 3/8" TUBE SS	
114	3	87040	FTG TEST POINT 10 KSI 1/4 NPTM - M12 X 1.5 SS W/SS COVER	
115	3	87041	FTG TEST POINT GAUGE ADAPTER 10 KSI 1/4 NPTF - M12 X 1.5 FEMALE SS	
115		07041	THE TEST FORM GAGGE ADAI TER TORIO 1/4 WITH THE WITE X 1.31 EWINEE GO	
116	26	87231	SCREW 10-32 X 1 BHSCS FLANGED SS316	
117	1	87236	FILTER ASSY 3/4 NPTF 9-3/4 CTG LENGTH SS HOUSING	F1
118	1	87436	FILTER CARTRIDGE WATER 9-3/4" LONG 125 MICRON	1 1
119	2	87593	LABEL WARNING - CONSULT OPERATORS MANUAL 2.0 DIA	
120	1	87668	VALVE BALL 2 WAY 1/4 NPTF 6000 PSI	V7
121	4	87775	RIVET BLIND 1/8 DIA SS 316	VI
122	1	87836	ASSY AIR PREP UNIT & LUBRICATOR USV	E2 C5 L1 PC1 V
122	'	0/030	ASSTAIR PREP UNIT & LUBRICATUR USV	F2,G5,L1,RG1,V
123	1	87838	REGULATOR 1/2 NPTF 7-125 PSIG W/BRACKET & PANEL NUT	PRV2
_	2			111112
124		88033	FTG NIPPLE 1/2 NPTM X 2-1/2 BRASS	
125	1	88373	CONSOLE SRV TEST SYSTEM	
126	1	88407	WELDMENT CLAMP FIXTURE 3-ARM AND SKID FRAME	04.00.00
127	1	88408	ASSY TABLE TOP SEAL PLATES 3 ARM CLAMP SRV 3K & 6K	C1, C2, C3
128	1	88466	WELDMENT FRAME WINDOW SHIELD	
129	1	88467	SHEET HYGARD BR750 21.25" X 11.25"	
130	1	88480	CONSOLE SECONDARY SRV TEST SYSTEM	
131	1	88481	WELDMENT VESSEL MOUNT	
132	1	88482	BRACKET HYDRAULIC RESERVOIR MOUNT	
133	1	88485	RELIEF VALVE 25-175 PSI 1/2 NPTM INLET X 1/2 NPTF OUTLET BRONZE	R2
134	4	88487	BEARING BRONZE ALUMINUM FLANGE MOUNTED 1" SHAFT	
135	2	88488	FTG NIPPLE MEDIUM PRESSURE 1 MP X 6 LG	
136	1	88489	SHAFT EXTENSION 1" DIA SEAL PLATE VALVE	
137	1	88491	BRACKET LOCKOUT SEAL PLATE VALVE	
138	1	88521	FTG NIPPLE 1/2 NPTM X 3 BRASS	
139	1	88522	FTG TEE 1/2 NPTF UNION BRASS	
140	1	88698	ENCLOSURE BARRIER A	
141	1	88699	ENCLOSURE BARRIER B	
142	1	88700	CHANNEL FLUID CATCH	
143	1	88701	ENCLOSURE BARRIER C	
144	1	88702	ENCLOSURE BARRIER D	
145	1	88703	ENCLOSURE BARRIER E	
146	1	88704	ENCLOSURE BARRIER F	
147	1	88705	SHAFT EXTENSION 1" DIA VESSEL VALVE A	
148	1	88714	SHAFT EXTENSION 1" DIA VESSEL VALVE B	
149	2	88716	SPROCKET 3/8 PITCH #35 CHAIN 23 TOOTH 1 IN BORE	
150	4	88717	WASHER 1.015 ID X 1.75 OD X .098 T FLTW SS	

FIGURE A-8. SRV-6K WITH VESSEL PLUMBING ASSEMBLY PARTS LIST 101–150 (P/N 88413)

ITE	071	D.**	PARTS LIST	00115111515				
ITEM	QTY	P/N:	DESCRIPTION	SCHEMATIC II				
151	1	88720	TUBING SET 1 OD X .688 ID SS 316					
152	1	88733	FTG ADAPTER 10000 PSI 3/4 NPTF X 1/4 NPTF					
153	1	88735	1/4 NPTM X 1/4 NPTM SS ELBOW					
154	1	88737	FTG ELBOW 1/4 NPTM X 3/8 TUBE 90 DEG SUPER DUPLEX					
155	1	88753	PLATE SPACER TABLE TOP					
156	1	88765	RELIEF VALVE ASSY BRACKET					
157	4	88769	RELIEF VALVE CLAMP SPACER					
158	4	88770	SCREW 3/4-16 X 1-1/2 SHCS SS 18-8					
159	1	88778	TUBE 3/8 SRV 1					
160	1	88779	FTG ELBOW 1/4 NPTM X 3/8 TUBE 45 DEG					
161	1	88780	TUBE 3/8 SRV 2					
162	1	88781	TUBE 3/8 SRV 3					
163	3	88782	TUBE 3/8 SRV 4					
164	1	88783	TUBE 3/8 SRV 5					
165	1	88784	TUBE 3/8 SRV 6					
166	1	88785	TUBE 3/8 SRV 7					
167	1	88786	TUBE 3/8 SRV 8 SUPER DUPLEX					
168	1	88787	TUBE 3/8 SRV 9 SUPER DUPLEX					
169	1	88788	TUBE 3/8 SRV 10 SUPER DUPLEX					
170	1	88789	TUBE 3/8 SRV 11 SUPER DUPLEX					
171	3	88790	TUBE 3/8 SRV 12 SUPER DUPLEX					
172	1	88791	TUBE 3/8 SRV 13 SUPER DUPLEX					
173	1	88792	TUBE 3/8 SRV 14 SUPER DUPLEX					
174	1	88793	TUBE 3/8 SRV 15 SUPER DUPLEX					
175	1	88794	TUBE 3/8 SRV 16					
176	1	88795	TUBE 3/8 SRV 17					
177	1	88796	TUBE 3/8 SRV 18					
178	1	88797	TUBE 3/8 SRV 19					
179	1	88798	TUBE 3/8 SRV 20					
180	1	88799	TUBE 3/8 SRV 21					
181	1	88800	TUBE 3/8 SRV 22					
182	1	88801	TUBE 3/8 SRV 23					
183	1	88802	TUBE 3/8 SRV 24					
184	1	88803	TUBE 3/8 SRV 25					
185	1	88804	TUBE 3/8 SRV 26					
186	1	88805	TUBE 3/8 SRV 27					
187	1	88806	TUBE 3/8 SRV 28					
188	4	88823	LABEL CALDER SRV-6K SYSTEM 16 X 7					
189	1	88890	KIT - LABEL SRV 6K US STANDARD					
190	2	88986	VALVE PRESSURE RELIEF SET @ 6000 PSI, 3/4 MNPT INLET, 1 FNPT OUTLET, CE	R1, R4				
190		00300	CERTIFIED	171, 174				
191	1	89330	VESSEL 6 KSI 5 GAL (CE CERTIFIED) - SEE ADDITIONAL INFORMATION					
192	3	89548	LABEL DO NOT PLUG / BLOCK PORT					
193	1	89820	VALVE PRESSURE LIMITING 8 KSI MAX IN 10-150 PSI OUT 1/4 NPT SS	PLV1				

FIGURE A-9. SRV-6K WITH VESSEL PLUMBING ASSEMBLY PARTS LIST 151–200 (P/N 88413)



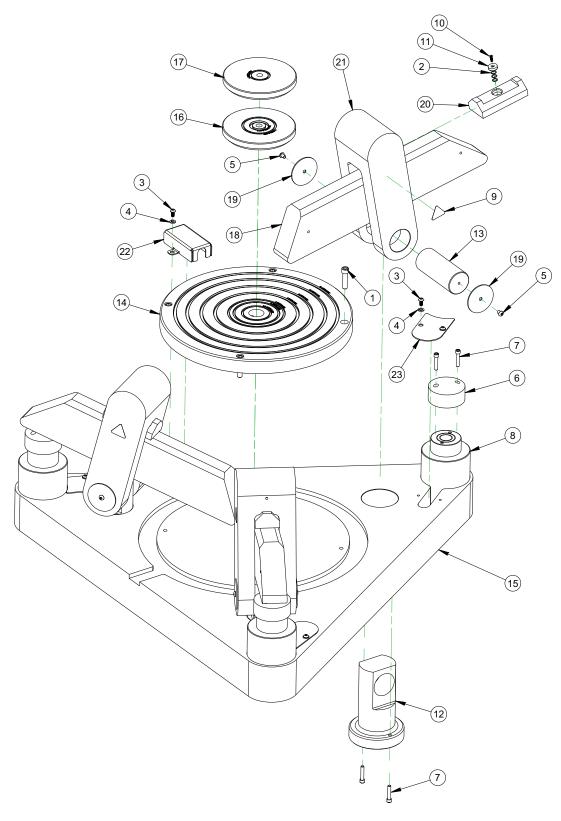


FIGURE A-10. TABLE TOP ASSEMBLY (P/N 88408)

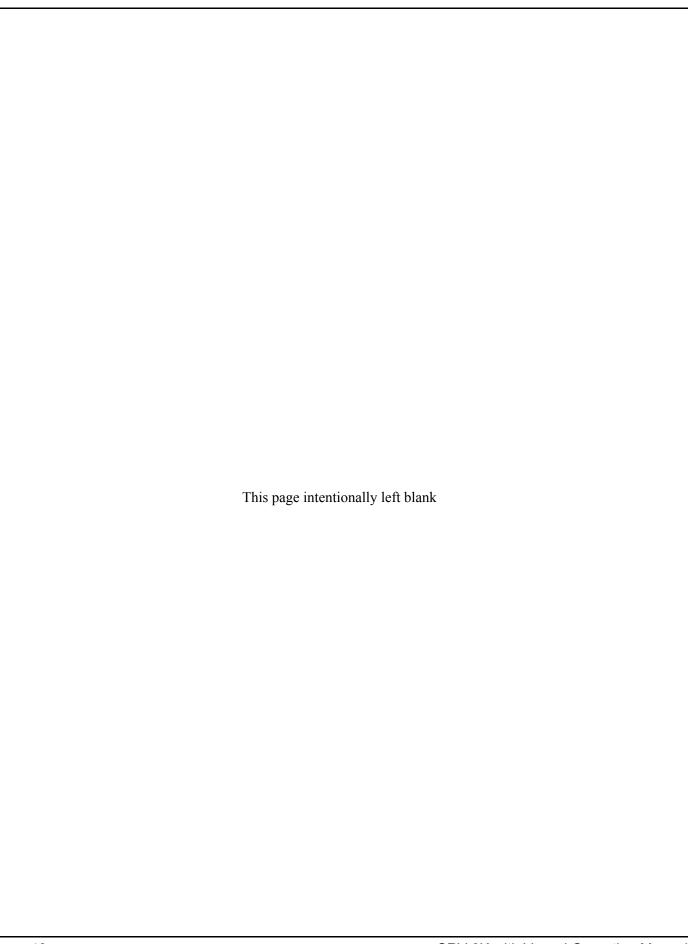
			PARTS LIST
ITEM	QTY	P/N:	DESCRIPTION
1	4	13907	SCREW 3/8-16 X 1-1/2 SHCS STAINLESS
2	12	67175	WASHER SHIM .313 ID .438 OD .010 THK
3	8	77557	SCREW 1/4-20 X 1/2 BHCS SS
4	8	77558	WASHER 1/4 LOCK SS
5	6	77602	SCREW 1/4-20 X 3/8 BHCS SS
6	3	79723	SPACER RAM
7	12	79724	SCREW 1/4-20 X 1-1/4 SHCS SS
8	3	80246	RAM 30 TON 2-7/16 STROKE SPRING RETURN
9	6	80905	LABEL WARNING - HAND CRUSH / FORCE FROM ABOVE GRAPHIC 1.13 TALL TRIANGLE YELLOW
10	3	86154	SCREW 8-32 X 1/2 FHSCS SS T15 TORX
11	3	86159	MAGNET 3/4" DIA X 1/4" THICK 15 LBS MAX PULL
12	3	88440	POST BASE PIN
13	3	88441	CLAMP ARM POST PIN
14	1	88442	SEAL PLATE 1-1/2"-12" MODEL 900
15	1	88443	CLAMP ARM FIXTURE MAIN PLATE
16	1	88569	ADAPTER SEAL PLATE 3/4" & 2"
17	1	88570	ADAPTER SEAL PLATE 1"
18	3	88715	EXTENDED ARM CLAMP 45° & 60°
19	6	88738	OVERSIZED WASHER 1/4 X 2.5 OD SS 316
20	3	88744	EXTENDED CLAMP ARM SPACER BLOCK
21	3	88745	CLAMP ARM POST SOLID
22	1	88751	COVER TUBING TABLE TOP A
23	3	88752	COVER TUBING TABLE TOP B
24	1	88891	(NOT SHOWN) KIT - SEAL PLATE O-RING SRV 3K & 6K
25	3	88907	(NOT SHOWN) EXTENDED CLAMP ARM LANYARD KIT

FIGURE A-11. TABLE TOP ASSEMBLY PARTS LIST (P/N 88408)



TABLE A-1. O-RINGS KIT P/N 88891

Part number	Description			
77587	O-RING 1-3/8 ID X 1-5/8 OD X 1/8 W NITRILE 90 DUROMETER (2-220)	2		
77588	O-RING 2-1/2 ID X 2-3/4 OD X 1/8 W NITRILE 90 DUROMETER (2-230)	2		
78458	O-RING 8-3/4 ID X 9-1/8 OD X 3/16 W NITRILE 90 DUROMETER (2-372)	2		
78513	O-RING 11 ID X 11-3/8 OD X 3/16 W NITRILE 90 DUROMETER (2-379)	2		
78514	O-RING 13 ID X 13-3/8 OD X 3/16 W NITRILE 90 DUROMETER (2-382)	2		
79771	O-RING 1 ID X 1-1/4 OD X 1/8 W NITRILE 90 DUROMETER (2-214)	4		
83005	O-RING 2-1/16 ID X 2-3/8 OD X 1/8 W NITRILE 90 DUROMETER (2-227)	2		
83898	O-RING 1-1/16 ID X1-7/16 OD X 3/16 W NITRILE 90 DUROMETER (2-319)	2		
88826	O-RING 3-1/2 ID X 3-3/4 OD X 1/8 W NITRILE 90 DUROMETER (2-238)	2		
88827	O-RING 4-3/8 ID X 4-5/8 OD X 1/8 W NITRILE 90 DUROMETER (2-245)	2		
88828	O-RING 6-1/2 ID X 6-7/8 OD X 3/16 W NITRILE 90 DUROMETER (2-363)	2		





# APPENDIX B SCHEMATICS

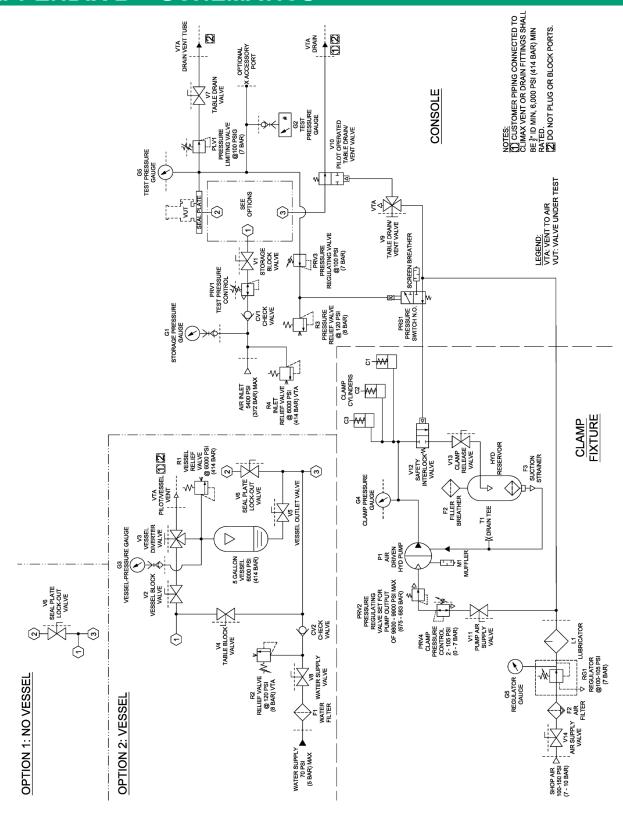
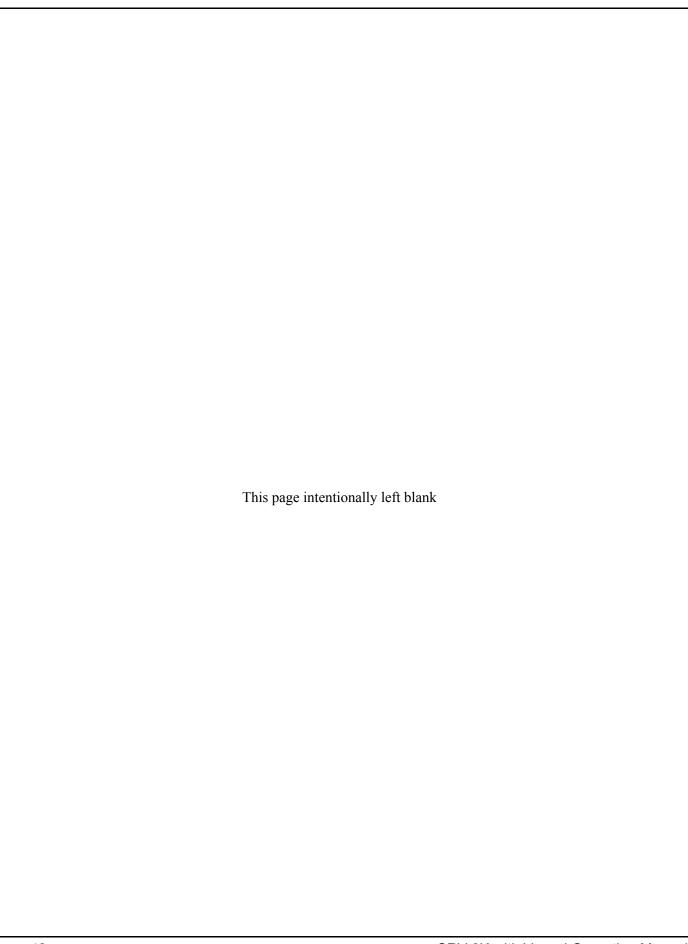


FIGURE B-1. SCHEMATIC (P/N 88404)





# APPENDIX C SDS

Safety	/ Data	Sheet	list
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Conoco AW 32 and 46 Unax ......50

(MSDS: 722330) Page 1 of 7



# MATERIAL SAFETY DATA SHEET 76 Unax AW 32, 46, 68

#### 1. PRODUCT AND COMPANY IDENTIFICATION

**Product Name:** 76 Unax AW 32, 46, 68

**Product Code:** 4641032000, 4642046000, 4643068000

Synonyms: 76 Unax AW 32

76 Unax AW 46 76 Unax AW 68

Industrial oil

Chemical Family: Petroleum hydrocarbon

Responsible Party: 76 Lubricants

A Division of ConocoPhillips 600 N. Dairy Ashford Houston, TX 77079-1175

For Additional MSDSs 800-762-0942 Technical Information: 800-435-7761

The intended use of this product is indicated above. If any additional use is known, please contact us at the Technical Information number listed.

#### **EMERGENCY OVERVIEW**

24 Hour Emergency Telephone Numbers:

Spill, Leak, Fire or Accident California Poison Control System: (800) 356-3129

Call CHEMTREC

Intended Use:

North America: (800)424-9300 Others: (703)527-3887 (collect)

Health Hazards/Precautionary Measures: Avoid contact with eyes, skin and clothing. Wash thoroughly after

handling.

Physical Hazards/Precautionary Measures: Keep away from all sources of ignition.

**Appearance:** Clear and bright

Physical form: Liquid

Odor: Mild petroleum

NFPA Hazard Class: HMIS Hazard Class

Health:1 (Slight)Health:1 (Slight)Flammability:1 (Slight)Flammability:1 (Slight)Reactivity:0 (Least)Physical Hazard:0 (Least)

#### 2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS % WEIGHT EXPOSURE GUIDELINE

<u>Limits</u> <u>Agency</u> <u>Type</u>

Zinc Compound <1 Not Established

CAS# Proprietary



(MSDS: 722330) Page 2 of 7

OTHER COMPONENTS	% WEIGHT	EXPOSURE GUIDELINE		
		Limits	<u>Agency</u>	Type
Lubricant Base Oil (Petroleum) CAS# Various	>99	(See: Oil Mist,	If Generated	)
Additives CAS# Proprietary	<1	Not Established	l	

REFERENCE	EXPOSURE GUIDELINE			
	<u>Limits</u>	<u>Agency</u>	<u>Type</u>	
Oil Mist, If Generated CAS# None	5 mg/m3 10 mg/m3 5 mg/m3 2500 mg/m3 5 mg/m3	ACGIH ACGIH OSHA NIOSH NOHSC	TWA STEL TWA IDLH TWA	

The base oil for this product can be a mixture of any of the following highly refined petroleum streams: CAS 64741-88-4; CAS 64741-89-5; CAS 64741-96-4; CAS 64741-97-5; CAS 64742-01-4; CAS 64742-52-5; CAS 64742-53-6; CAS 64742-54-7; CAS 64742-55-8; CAS 64742-56-9; CAS 64742-57-0; CAS 64742-62-7; CAS 64742-63-8; CAS 64742-65-0; CAS 72623-85-9; CAS 72623-86-0; CAS 72623-87-1

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

1%=10,000 PPM.

All components are listed on the TSCA inventory.

#### 3. HAZARDS IDENTIFICATION

#### **Potential Health Effects:**

Eye: Contact may cause mild eye irritation including stinging, watering, and redness.

**Skin:** Contact may cause mild skin irritation including redness, and a burning sensation. Prolonged or repeated contact can worsen irritation by causing drying and cracking of the skin leading to dermatitis (inflammation). No harmful effects from skin absorption are expected.

**Inhalation (Breathing):** No information available. Studies by other exposure routes suggest a low degree of toxicity by inhalation.

Ingestion (Swallowing): No harmful effects expected from ingestion.

**Signs and Symptoms:** Effects of overexposure may include irritation of the nose and throat, irritation of the digestive tract, nausea and diarrhea.

**Cancer:** Inadequate evidence available to evaluate the cancer hazard of this material. See Section 11 for carcinogenicity information of individual components, if any.

Target Organs: No data available for this material.

**Developmental:** No data available for this material.

(MSDS: 722330) Page 3 of 7

Pre-Existing Medical Conditions: Conditions aggravated by exposure may include skin

disorders.

#### 4. FIRST AID MEASURES

**Eye:** If irritation or redness develops, move victim away from exposure and into fresh air. Flush eyes with clean water. If symptoms persist, seek medical attention.

**Skin:** Wipe material from skin and remove contaminated shoes and clothing. Cleanse affected area(s) thoroughly by washing with mild soap and water and, if necessary, a waterless skin cleanser. If irritation or redness develops and persists, seek medical attention.

Inhalation (Breathing): If respiratory symptoms develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

**Ingestion (Swallowing):** First aid is not normally required; however, if swallowed and symptoms develop, seek medical attention.

Note To Physicians: High-pressure hydrocarbon injection injuries may produce substantial necrosis of underlying tissue despite an innocuous appearing external wound. Often these injuries require extensive emergency surgical debridement and all injuries should be evaluated by a specialist in order to assess the extent of injury.

#### 5. FIRE FIGHTING MEASURES

Flammable Properties: Flash Point: >384°F/>196°C (COC)

OSHA Flammability Class: Not applicable

LEL/UEL%: No Data

Autoignition Temperature: No Data

**Unusual Fire & Explosion Hazards:** This material may burn, but will not ignite readily. If container is not properly cooled, it can rupture in the heat of a fire.

**Extinguishing Media:** Dry chemical, carbon dioxide, foam, or water spray is recommended. Water or foam may cause frothing of materials heated above 212°F. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.

**Fire Fighting Instructions:** For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by DOT, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Move undamaged containers from immediate hazard area if it can be done with minimal risk.

Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done with minimal risk. Avoid spreading burning liquid with water used for cooling purposes.

#### 6. ACCIDENTAL RELEASE MEASURES

This material may burn, but will not ignite readily. Keep all sources of ignition away from spill/release. Stay upwind and away from spill/release. Notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Wear appropriate protective equipment including respiratory protection as conditions warrant (see Section 8).



(MSDS: 722330) Page 4 of 7

Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Dike far ahead of spill for later recovery or disposal. Spilled material may be absorbed into an appropriate absorbent material.

Notify fire authorities and appropriate federal, state, and local agencies. Immediate cleanup of any spill is recommended. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, notify the National Response Center (phone number 800-424-8802).

#### 7. HANDLING AND STORAGE

**Handling:** Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits (see Sections 2 and 8).

Do not wear contaminated clothing or shoes. Use good personal hygiene practices.

High pressure injection of hydrocarbon fuels, hydraulic oils or greases under the skin may have serious consequences even though no symptoms or injury may be apparent. This can happen accidentally when using high pressure equipment such as high pressure grease guns, fuel injection apparatus or from pinhole leaks in tubing of high pressure hydraulic oil equipment.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1 and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

**Storage:** Keep container(s) tightly closed. Use and store this material in cool, dry, well-ventilated areas away from heat and all sources of ignition. Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

#### 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**Engineering controls:** If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits (see Section 2), additional engineering controls may be required.

#### Personal Protective Equipment (PPE):

**Respiratory:** A NIOSH certified air purifying respirator with a Type 95 (R or P) particulate filter may be used under conditions where airborne concentrations are expected to exceed exposure limits (see Section 2).

Protection provided by air purifying respirators is limited (see manufacturer's respirator selection guide). Use a NIOSH approved self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode if there is potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection. A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use.

**Skin:** The use of gloves impervious to the specific material handled is advised to prevent skin contact and possible irritation (see manufacturers literature for information on permeability).

**Eye/Face:** Approved eye protection to safeguard against potential eye contact, irritation, or injury is recommended. Depending on conditions of use, a face shield may be necessary.

(MSDS: 722330) Page 5 of 7

Other Protective Equipment: A source of clean water should be available in the work area for flushing eyes and skin. Impervious clothing should be worn as needed.

Suggestions for the use of specific protective materials are based on readily available published data. Users should check with specific manufacturers to confirm the performance of their products.

#### 9. PHYSICAL AND CHEMICAL PROPERTIES

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm).

Appearance: Clear and bright Physical State: Liquid Odor: Mild petroleum

pH: Not applicable

Vapor Pressure (mm Hg): <1 Vapor Density (air=1): >1 Boiling Point/Range: No Data

Freezing/Melting Point: <-27°F / <-33°C

Solubility in Water: Negligible Specific Gravity: 0.855-0.871 Percent Volatile: Negligible

Evaporation Rate (nBuAc=1): Negligible

Viscosity: 22-68 cSt @ 40°C / 4.3-8.7 cSt @ 100°C

Bulk Density: 7.13-7.26 lb/gal Flash Point: >384°F / >196°C (COC) Flammable/Explosive Limits (%): No Data

#### 10. STABILITY AND REACTIVITY

**Stability:** Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

Conditions To Avoid: Extended exposure to high temperatures can cause decomposition.

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidizing

agents.

Hazardous Decomposition Products: Combustion can yield carbon, nitrogen, sulfur,

phosphorus, and zinc oxides.

Hazardous Polymerization: Will not occur.

#### 11. TOXICOLOGICAL INFORMATION

#### Lubricant Base Oil (Petroleum) (CAS# Various)

**Carcinogenicity:** The petroleum base oils contained in this product have been highly refined by a variety of processes including solvent extraction, hydrotreating, and dewaxing to remove aromatics and improve performance characteristics. None of the oils used are listed as a carcinogen by NTP, IARC, or OSHA.

#### 12. ECOLOGICAL INFORMATION

Not evaluated at this time



(MSDS: 722330) Page 6 of 7

#### 13. DISPOSAL CONSIDERATIONS

This material under most intended uses would become used oil due to contamination by physical or chemical impurities. RECYCLE ALL USED OIL. While being recycled, used oil is regulated by 40 CFR 279. Use resulting in chemical or physical change or contamination may also subject it to regulation as hazardous waste. Under federal regulations, used oil is a solid waste managed under 40 CFR 279. However, in California, used oil is managed as hazardous waste until tested to show it is not hazardous. Consult state and local regulations regarding the proper handling of used oil. In the case of used oil, the intent to discard it may cause the used oil to be regulated as hazardous waste.

Contents should be completely used and containers emptied prior to discard. Rinsate may be considered a RCRA hazardous waste and must be disposed of with care and in compliance with federal, state and local regulations. Large empty containers, such as drums, should be returned to the distributor or a drum reconditioner. To assure proper disposal of small empty containers, consult with state and local regulations and disposal authorities.

#### 14. TRANSPORT INFORMATION

**DOT Shipping Description:** Not classified as hazardous

#### 15. REGULATORY INFORMATION

#### EPA SARA 311/312 (Title III Hazard Categories):

Acute Health: No Chronic Health: No Fire Hazard: No Pressure Hazard: No Reactive Hazard: No

#### SARA 313 and 40 CFR 372:

This material contains the following chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372:

ComponentCAS NumberWeight %Zinc CompoundProprietary<1</td>

#### **California Proposition 65:**

**Warning:** This material contains the following chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm, and are subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

--None Known--

#### Carcinogen Identification:

This material has not been identified as a carcinogen by NTP, IARC, or OSHA. See Section 11 for carcinogenicity information of individual components, if any.

#### **EPA (CERCLA) Reportable Quantity:**

--None--

#### Canada - Domestic Substances List: Listed

#### WHMIS Class:

Not regulated

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

#### 16. OTHER INFORMATION

Issue Date: 02/06/03

(MSDS: 722330) Page 7 of 7

Previous Issue Date: 01/01/02

Product Code: 4641032000, 4642046000, 4643068000

Revised Sections: New Format Previous Product Code: 4641032000

MSDS Number: 722330

Status: Final

#### **Disclaimer of Expressed and Implied Warranties:**

The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

