



Electric Operated Centro-Matic® Pump P653S  
24 VDC or 120/230 VAC, 50-60Hz



With Follower



Without Follower

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### Introduction

#### Explanation of Symbols Used

The following description standards are used in this manual:

##### Safety Instructions

Structure of safety instructions:

- Pictogram
- Signal words
- Danger text
- Danger notes
- How to avoid danger

The following pictograms are used in this manual and are combined with corresponding signal words:



- ATTENTION  
- CAUTION  
- WARNING



- ATTENTION  
- CAUTION  
- WARNING



- NOTE  
- IMPORTANT

The signal words give the seriousness of danger if the following text is not observed:

ATTENTION refers to faults or damages on machines.

CAUTION refers to bad damages and possible injuries.

WARNING refers to possible dangerous injuries.

NOTE indicates improved operation of the device.

IMPORTANT indicates special operating features of the device.

##### Example:



##### ATTENTION!

When making use of other than the tested spare parts, serious damage may affect your device.

Therefore, for the operation of your device always use original parts made by Lincoln Industrial.

Furthermore, you will find the following text symbols in this manual:

- Listing of applicable statements
  - Sub point of applicable statements
- 1. Determination of the number or sequence of contents
  - Procedural instruction

#### User's Responsibility

To ensure the safe operation of the unit, the user is responsible for the following:

1. The pump/system shall be operated only for the intended use (see next chapter "Safety Instructions") and its design shall neither be modified nor transformed.
2. The pump/system shall be operated only if it is in a proper functioning condition and if it is operated in accordance with the maintenance requirements.
3. The operating personnel must be familiar with this Owner Manual and the safety instructions mentioned within, and observe these carefully.

The correct installation and connection of tubes and hoses, if not specified by Lincoln Industrial, is the user's responsibility. Lincoln Industrial Technical Services will gladly assist you with any questions pertaining to the installation.

#### Environmental Protection

Waste (e.g. used oil, detergents, lubricants) must be disposed of in accordance with relevant environmental regulations.

#### Service

The personnel responsible for the handling of the pump/system must be suitably qualified. If required, Lincoln Industrial offers you full service in the form of advice, on-site installation assistance, training, etc. Please contact the Technical Service department for assistance.

In the event of inquiries pertaining to maintenance, repairs and spare parts, we require model specific data to enable Technical Services to clearly identify the components of your pump/system.

**Therefore, always indicate the part, model and series number.**

## Safety Instructions

### Appropriate Use

The electric Centro-Matic pump P653S has been designed for the automatic lubrication of commercial vehicles, industrial, construction and agricultural machines and wind power plants. The P653S pump has been designed for intermittent operation and is not suitable for continuous operation. The pump is capable of supplying lubricants up to NLGI # 2 grades. (see pages 32-34 for list of recommended greases).

### Misuse

Any use of the P653S pump that is not expressly mentioned in this User Manual will be regarded as misuse. If the P653S pump is used or operated in a manner other than specified, any claim for warranty or liability will be null and void.



### CAUTION !

If personal injury or material damage occurs as a result of inappropriate operation, (e.g. if the safety instructions are ignored or resulting from an incorrect installation of the P653S pump), no claims or legal actions may be taken against Lincoln Industrial

### Exclusion of Liability

The manufacturer of the P653S pump will not accept any liability for damages caused by:

- a lack of lubricant due to an irregular refilling of the pump
- the use of contaminated lubricants
- the use of greases which are not or only conditionally pumpable by P653S pump
- inadequate disposal of used or contaminated lubricants as well as of components that have been in touch with lubricant
- unauthorized modification of the system components
- the use of unapproved parts
- operation without adhering to the minimum pause time and respectively the maximum lubrication time (see chapter "Technical Data")

### Regulations for Prevention of Accidents

To prevent accidents, observe all city, state and federal safety regulation of the country in which the product will be used.

### General Safety Instructions

- Pump P653S is designed for safe operation.
- Incorrect use may result in bearing damage caused by poor or excessive lubrication.
- P653S pump with follower can be mounted vertically, horizontally or upside down.
- Pump without the follower should be mounted vertically upright only.
- Unauthorized modifications or changes to an installed system are not admissible. Any modification of the pump must be subject to prior authorization by manufacturer.
- Install the components of the P653S pump in such way that operator can always see the low-level position of the pump reservoir.
- Each time the reservoir has been refilled, make sure that no air has been trapped under the follower and pump is pumping lubricant.

### Operation, Maintenance and Repair



### WARNING!

Before carrying out any maintenance or repair on the P653S pump, make sure that all lubrication lines of the carrier unit are depressurized.

### Repair

Repair should only be performed by authorized and instructed personnel who are familiar with the instructions.

### Operation/Maintenance

Pumps P653S:

- Must be refilled at regular intervals with clean lubricant recommended by the manufacturer without air entrapments under follower plate.
- Operate automatically. However, a regular check (approx. every 2 days) should be made to ensure that lubricant is pumped to all lubrication points.

### Disposal

Dispose of used or contaminated lubricants as well as of parts that were in touch with lubricant according to the legal regulations pertaining to environmental protection. Make sure to observe the safety data sheets of the lubricants used.

### Operation, Maintenance, and Repair (continued)



#### **WARNING!**

Pump P653S must be installed by qualified personnel. The connection of the 120 VAC must be done according to the National Electrical code. **Before installing or working on the pump, disconnect and lock out the incoming power.**



#### **WARNING!**

Failure to observe the safety instructions, (e. g. touching electrically charged parts when the pump is opened, or improper handling of the pump P653S) may cause serious injury or death. If the values specified in the Technical Data are exceeded, the device may overheat. It may damage the pump P653S and thus impair the electric safety.

- Repairs should only be performed by authorized personnel who are familiar with the instructions.
- Defective printed circuit boards should be appropriately packed and returned to the factory.



#### **CAUTION!**

**Electric Voltage!**

In the case of pumps where grease is filled from top, the power supply must be switched off before the lubricant is filled in.



#### **CAUTION!**

Danger of injury in case of pumps being filled from the reservoir top: Never put your hand into the open reservoir while pump is running!



#### **ATTENTION!**

Risk of bursting if the reservoir is over-filled! When filling the reservoir by means of pumps with a large delivery volume do not exceed the max. filling mark.



#### **CAUTION!**

Do not use the pump in potentially explosive applications.

### Installation

- Any safety equipment already installed on the vehicle:
  - should not be modified or made ineffective;
  - should only be removed for the purpose of installing the system and must be replaced afterwards.
- Use only original Lincoln spare parts or parts approved by Lincoln.



#### **IMPORTANT**

Adhere to:

- the installation instructions of the vehicle manufacturer with regard to all drilling and welding procedures.
- the specified minimum distances between the holes and the upper/lower rim of the frame or between two holes.



#### **IMPORTANT**

Route supply lines professionally. Firmly bolt together any components that are subject to pressure.

### Installation and Maintenance of Hydraulic Hoses



#### **ATTENTION!**

Operational safety of the P653S pump can only be ensured in the case of a professional installation and maintenance of the hose lines. Make sure to observe the following recommendations!

#### **Lubrication hose lines**

- must never be subjected to torsion
- must be installed twist-free
- must not rub against metal components or edges
- are to undergo regular visual checks and must be exchanged in the case of wear (at the latest 2 years after installation)

**Pay attention to non-linear installations to allow for a larger bending radius as possible. Avoid kinks. In constricted installation conditions use pipe elbow unions to avoid the danger of kinking behind the hose socket. Use high pressure hydraulic hose for lubrication lines.**



## Description

### Pump with Follower Plate

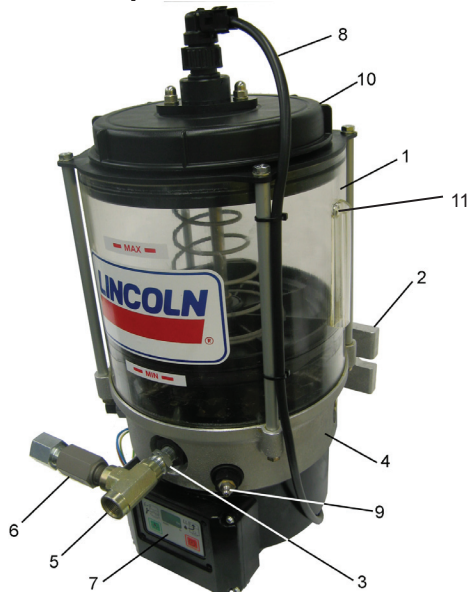


Fig. 1 Components of the P653S pump with follower

- |                           |                                  |
|---------------------------|----------------------------------|
| 1 - Reservoir             | 2 - Mounting plate               |
| 3 - Pump elements         | 4 - Pump housing                 |
| 5 - Pump outlet           | 6 - Relief valve                 |
| 7 - Keypad                | 8 - Low-level control connection |
| 9 - Refill Grease Fitting | 10 - Top Lid                     |
|                           | 11 - Vent Hole                   |

### Pump without Follower Plate



Fig. 2 Single-line pump P653S, No follower  
(Note: Low-level control see Fig. 15 & 16)

- |                           |                        |
|---------------------------|------------------------|
| 1 - Reservoir             | 2 - Mounting plate     |
| 3 - Pump elements         | 4 - Pump housing       |
| 5 - Pump outlet           | 6 - Relief valve       |
| 7 - Keypad                | 8 - Stirring paddle    |
| 9 - Refill Grease Fitting | 10 - Stationary paddle |
| 11 - Top Lid              |                        |

P653S pump is designed for single line (S) parallel Centro-Matic type lubrication systems. The pumps integrated design includes all necessary components to support Centro-Matic lubrication systems:

- controller to program and monitor lubrication cycle
- choice of internal pressure switch or internal pressure transducer
- internal vent valve
- three pumping elements connected together
- external pressure relief valve
- reservoir low-level control
- end of lubrication line pressure switch or pressure transducer choice
- contacts for remote monitoring
- 24 VDC or 120/230 VAC power supply option, etc.

Pump can supply adequate lubricant to bearings using SL-V, SL-V XL, SL-1, SL-32 and SL-33 injectors. Number of injectors should be based on output of the pump being 1.5 in<sup>3</sup>/minute.

Pump for 120/230 VAC power supply can be installed in any stationary industrial type of applications requiring lubrication for the same number of medium size bearings.

Pump basic model can be supplied with follower plate or without follower plate. Follower plate is recommended in stationary industrial type applications with heavy consistency greases (NLGI #1 and #2) and for pumps used at low temperatures applications in all installations.

\*Note: Installations using SL-32 and SL-33 Lincoln injectors can lubricate more than 35 bearings.

Typical Centro-Matic system schematic is shown on page 31.



**CAUTION!** Use only supply line hose and fittings that are appropriate for the programmed/ set system pressure.

### Pump P653S

- pumps greases up to NLGI 2 (per approved list) at temperatures from -40° F to 158°F (-40°C to 70°C)
- develop maximum pressure up to 3,500 psig (240 bar) with pressure switch and up 4,600 psig (317 bar) with pressure transducer.

### Reservoir sizes

- 4-l transparent plastic reservoir
- 8-l transparent plastic reservoir
- 15-l transparent plastic reservoir
- 20-l transparent plastic reservoir

### Electrical connection

- For industrial 120/230 VAC applications P653S pumps are provided with 4-pole square type connector. Electric cable is provided by installer.
- For mobile applications P653S pumps are equipped with an electric cable 32 ft. (10.0 m) and 7-pole bayonet type connector.

### Code example

### Pump model, basic

### Reservoir size and configuration

- 4 = 4L, transparent plastic
- 8 = 8L, transparent plastic
- 15 = 15L, transparent plastic
- 20 = 20L, transparent plastic

X = Grease pump

L = Low-level control

BO = Without follower

F = With follower

### Power supply

- 24 = 24 VDC
- AC = 110 - 240 V ; 50 - 60 Hz

### Electrical cord and connections

- 1A DC;
  - 33 ft. (10 m) cord, 7 conductors
- 2A DC;
  - 33 ft. (10 m) cord, 7 conductors
  - 33 ft. (10 m) cord, 4 conductors with bayonet plugs for external pressure switch or transducer
- 2A = AC;
  - 33 ft. (10 m) cord, 7 conductors
  - 4-pole square plug
- 2A1 = AC;
  - 7 poles bayonet plug
  - 4-pole square plug
- 3A = AC;
  - 33 ft. (10 m) cord, 7 conductors
  - 4-pole square plug,
  - 33 ft. (10 m) cord, 4 conductors with bayonet plugs for external pressure switch or transducer

### Pressure control, PCB setting

- AS01 - AS08 = Pressure switch (see jumper setting table)
- AS09 - AS16 = Pressure transducer (see jumper setting table)

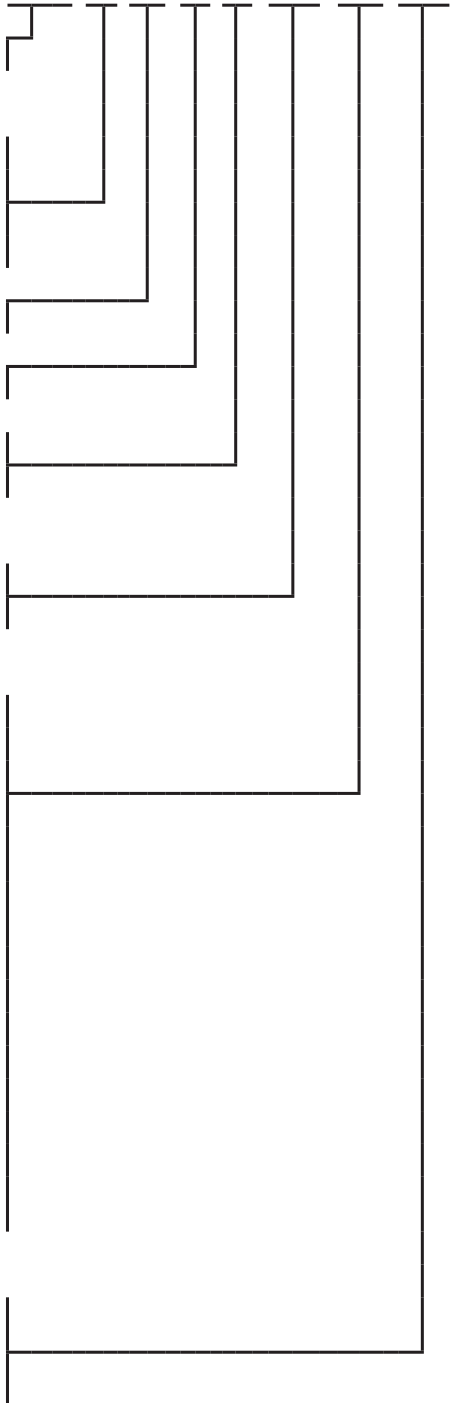
Example: P653S-4XLF-24-2A-AS06:

Pump consists of the following:

- 24 VDC grease pump with follower
- Four liter reservoir
- Low-level control
- Internal pressure switch
- 33 ft (10 m) power cord
- External pressure switch with 33 ft (10m) cord

### Identificaton code P653S pump

P653S - 4 X L F - 24 - 2A - AS06



## Jumper setting combinations - Centro-Matic pumps

Pump combinations			Application: Industrial (S) - o; Mobil (M) - x	Time (TC) or count control (CC); TC -o; CC - x	Number of pressure switches or transducers. o - one; x - two	Low-level control; NO- o; NC - x	F1 fault relay; (31) switch to ground - x	F2 fault relay; (31) switch to ground - x
			Jumper setting (plugged - x; unplugged - o)					
Pressure switch	AS01	Industrial (AC) (S)	o	o	o	x	x	x
	AS02		o	o	x	x	x	x
	AS03		o	o	o	o	x	x
	AS04		o	o	x	o	x	x
	AS05	Mobile (DC) (M)	x	o	o	x	x	x
	AS06		x	o	x	x	x	x
	AS07		x	o	o	o	x	x
	AS08		x	o	x	o	x	x
Pressure transducer	AS09	Industrial (AC) (S)	o	o	o	x	x	x
	AS10		o	o	x	x	x	x
	AS11		o	o	o	o	x	x
	AS12		o	o	x	o	x	x
	AS13	Mobile (DC) (M)	x	o	o	x	x	x
	AS14		x	o	x	x	x	x
	AS15		x	o	o	o	x	x
	AS16		x	o	x	o	x	x

An external pressure switch or external pressure transducer is included with the pumps that have the feature of external pressure monitoring. Also included is a 33 ft (10m) cord to connect the external monitoring device to the pump.



### Description of Operation

#### Pump Operation

##### Drive

- The pump housing consists of the following components: gear motor, final gear drive, three pumping elements connected together by internal passages and vent valve. Pump can be configured with internal pressure switch or transducer.
- The gear motor shaft is connected to the final stage gear drive. The final gear has incorporated eccentric and cam to drive the pumping elements and to control the internal vent valve (Fig. 4).
- Vent valve is a two way normally closed spring biased valve.
- Pressure switch is not adjustable and preset to 3,500 psig (240 bar).
- Pressure transducer is adjustable. Factory setting is 3,500 psig (240 bar). Pressure setting of the pressure transducer can be adjusted from 1,400 to 4,600 psig (96 to 317 bar) in 100 psig (6.9 bar) increments.

#### Lube Cycle/Pressurization

- The motor turns the cam (7) clockwise to start lubrication cycle. As soon as pump starts to operate, the display rotating segment is turning clockwise also (Fig. 20). Maximum time to build the preset pressure is 12 minutes. If pump does not build preset pressure, fault signal E1 or E2 will appear on the display.
- Vent valve (1) is normally closed and stays closed during lubrication cycle, preventing lubricant flow back to the reservoir (see Fig. 4).
- The output of three pump elements (4) (Fig. 3) is combined by internal passages.
- The eccentric drives the pump elements to pump the lubricant from the reservoir and build the line pressure.
- The cam (7) will keep the vent valve (1) closed.
- Supply line can be connected to any one of the pump element outlets. The remaining two pump elements outlets should be plugged.

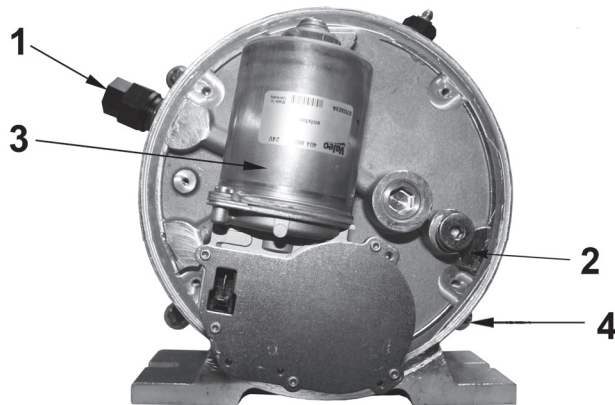


Fig. 3 Disassembled pump housing - view from the bottom

- |                     |   |
|---------------------|---|
| 1 - Venting element | 2 - Integrated pressure switch                      |
| 3 - Motor           | 4 - Pump elements with integrated lubrication lines |

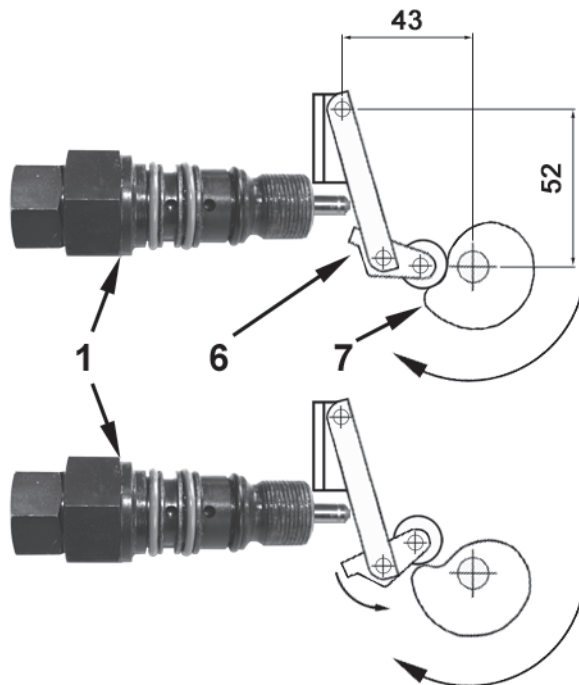


Fig. 4 Idle run of the switch joint on the venting element

- |   |
|---|
| 1 - Inactive venting element            |
| 6 - Switch joint                        |
| 7 - Cam (driven clockwise by the motor) |

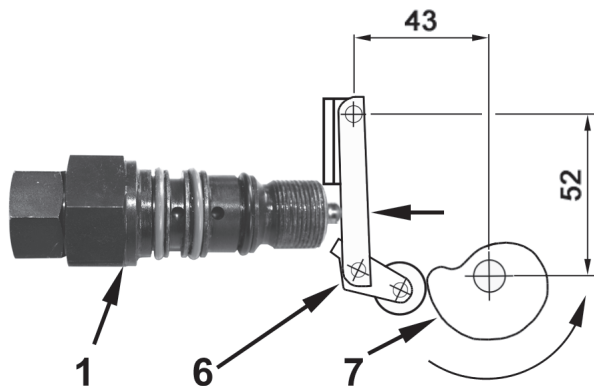


Fig. 6 Activated vent cycle diagram

- 1 - activated venting element
- 6 - activated vent lever
- 7 - cam (driven by the motor counterclockwise)

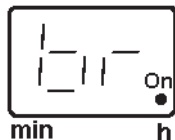


Fig. 7 Display during braking application of pump motor.



Fig. 8 Display during change of moving direction of pump motor.

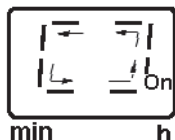


Fig. 9 Rotating segmented display during venting (counterclockwise)

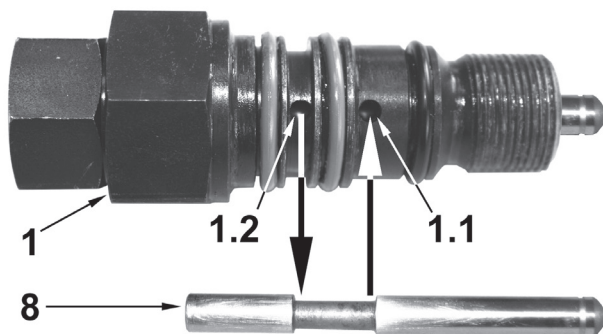


Fig. 10 Venting in the vent valve1 - Venting element

- 1.1 - inlet hole
- 1.2 - outlet hole
- 8 - plunger, venting

## Pump Element operation

The pump element (Fig. 13 and 14) is a single stroke spring biased pump. Motor drives the eccentric (1). Eccentric is in constant contact with the plunger (2).

Compression spring (3) is pushing plunger (2) to open lubricant passage to create vacuum to prime the pump with lubricant from the reservoir. Check valve (4) is closed to isolate the supply lines of the system.

Eccentric (1) is pushing the plunger (2) in opposite direction to pump lubricant, developing the operating pressure. Check valve (4) is open to pass the lubricant to supply lines.

The body of the pump element has a lateral outlet (5) (Fig. 12) for lubricant crossporting to the internal material passages to combine the outlet of all three pump elements.

Any one of the three elements can be used as a pump outlet. The remaining two elements should be closed with plug (A) (Fig. 12).

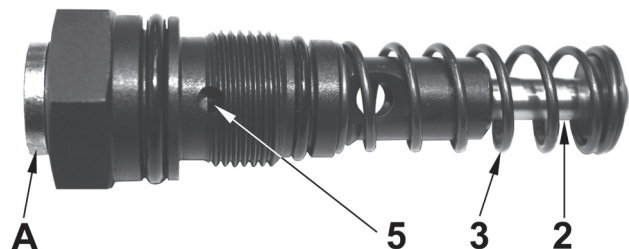


Fig. 12 Pump element Z7 for internal lubricant crossporting

- A - Closure plug (connection G 1/4" for main line)
- 2 - Piston
- 3 - Spring
- 5 - Lateral outlet for lubricant crossporting

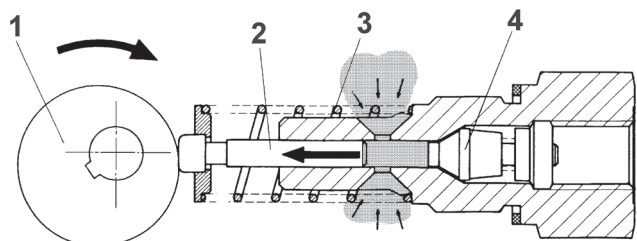


Fig. 13

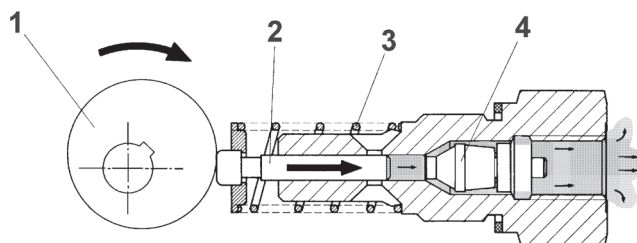


Fig. 14

**NOTE:** Use only pump elements designed for operation in the P653S pump. No other pump elements should be used. See the parts listing for the correct pump element part number.

### **Pressure Control/Hold Time/Vent Cycle**

#### **Pump with internal pressure switch only:**

Internal pressure switch will close at 3500 psig and open at 2600 psig.

After pump starts a lubrication cycle, motor stops when pressure at pump reaches preset pressure of 3,500 psig (240 bar). Pump will go through two holding periods, H1 and H2.

#### **Holding Time (H1)**

- Internal pressure switch must stay closed for 15 consecutive seconds before going to H2. If internal pressure switch opens during the 15 seconds, pump will restart and run until internal pressure switch closes.

#### **Holding Time (H2) - Will last for 30 seconds**

- At the end of 30 seconds, if the internal pressure switch is closed, the pump will begin a vent cycle.
- If at the end of the 30 seconds the internal pressure switch is open, the pump will restart and run until the internal pressure switch closes. When it closes a vent cycle will take place.
- If at the end of 30 seconds the internal pressure switch is closed, but during the H1 hold time the internal pressure switch did open, the pump will restart and pump for 2 seconds before a vent cycle begins.

#### **Possible Faults**

- E1 Fault – A failure to build pressure at the pump within the allotted 12 minutes of pumping time.
- E3 Fault – A failure to vent at the pump. The internal pressure switch has 10 seconds to open when the motor reverses to locate the vent position

#### **Pump with internal and external pressure switch:**

Internal pressure switch will close at 3500 psig and open at 2600 psig. The external pressure switch will close at 2500 psig and open at 1900 psig

After pump starts a lubrication cycle, motor stops when pressure at pump reaches preset pressure of 3,500 psig (240 bar). Pump can go through three holding periods, H1, H2 and H3.

#### **Holding Time (H1)**

- Internal pressure switch must stay closed for 15 consecutive seconds before going to H2. If the internal pressure switch opens during the 15 seconds, the pump will restart and run until the internal pressure switch closes.

#### **Holding Time (H2) - Will last for 30 seconds**

- At the end of H2, if the internal pressure switch is closed and the external pressure switch is closed, pump will begin a vent cycle.
- At the end of H2, if the internal pressure switch is open or both the internal and external pressure switches are open an H3 will appear on the display. Pump will turn on again and pump until the internal pressure switch is closed. When both the internal and external pressure switches are closed a vent cycle will take place.
- If at the end of H2 the internal pressure switch is closed but the external pressure switch is open, the pump will turn on for 2 seconds and then stop and wait until the external pressure switch closes. An H3 will appear on the display. When both the internal and external pressure switches are closed a vent cycle will take place.

#### **Holding Time (H3)**

- Holding time H3 will remain until both the internal and external pressure switches are closed and then a vent cycle will take place. If both pressure switches do not close within the allotted pumping time of 12 minutes, an alarm will occur. If the internal pressure switch opens during H3, it will repump until the internal pressure switch closes.

#### **Possible Faults**

- E1 Fault – A failure to build pressure at the pump within the allotted 12 minutes of pumping time.
- E2 Fault – A failure to build pressure at the end of the supply line.
- E3 Fault – A failure to vent at the pump. The internal pressure switch has 10 seconds to open when the motor reverses to locate the vent position.
- E4 Fault – A failure to vent at the end of the supply line. The external pressure switch must be open before the next lube cycle takes place.

## **Pump with internal pressure transducer only:**

The internal pressure transducer is factory set to close at 3500 psig (241 bar). The internal transducer can be adjusted from 1,400 psig to 4,600 psig (96 to 317 bar) using the key pad on the pump. The adjustment is in 100 psig (6.9 bar) increments. The internal pressure transducer is set to open at 900 psig (62 bar) below the point where it closed at.

After the pump starts a lubrication cycle, the motor stops when pressure at pump reaches the preset pressure. The pump will go through two holding periods, H1 and H2. The following will use the factory setting of 3500 psig (241 bar) and the opening pressure of 2600 psig (179 bar).

### **Holding Time (H1)**

- Internal pressure transducer must reach 3500 psig and stay above 2600 psig (179 bar) for 15 consecutive seconds before going to H2. If the internal pressure transducer drops below 2600 psig during the 15 seconds, the pump will restart and run until internal pressure transducer reaches 3500 psig (241 bar).

### **Holding Time (H2) - Will last for 30 seconds**

- At the end of 30 seconds, if the internal pressure transducer is above 2600 psig. (179 bar) the pump will begin a vent cycle.
- If at the end of the 30 seconds the internal pressure transducer is below 2600 psig (179 bar), the pump will restart and run until the internal pressure transducer reaches 3500 psig (241 bar). When this happens a vent cycle will take place.
- If at the end of 30 seconds the internal pressure transducer is above 2600 psig (179 bar), but during the H1 hold time the internal pressure transducer dropped below 2600 psi (179 bar), the pump will restart and pump for 2 seconds before a vent cycle begins.

### **Possible Faults**

- E1 Fault – A failure to build pressure at the pump within the allotted 12 minutes of pumping time.
- E3 Fault – A failure to vent at the pump. The internal pressure switch has 10 seconds to open when the motor reverses to locate the vent position.
- E3 Fault – A failure to vent at the pump. If at the end of the pause time the pressure of the internal pressure transducer has not dropped below 900 psig (62 bar) an E3 fault will occur.

## **Pump with internal and external pressure transducer:**

The internal pressure transducer is factory set to close at 3500 psig (240 bar). The internal transducer can be adjusted from 1,400 psig to 4,600 psig (96 to 317 bar) using the key pad on the controller. The adjustment is in 100 psig (6.9 bar) increments. The internal pressure transducer is set to open at 900 psig (62 bar) below the point where it closed at.

The external pressure transducer is set to close at 2500 psig (172 bar). The opening point of the external pressure transducer is adjustable from 200 psig to 1000 psig (14 to 69 bar). It is factory set to open at 900 psig.

After the pump starts a lubrication cycle, the motor stops when pressure at the pump reaches preset pressure of 3,500 psig (240 bar). The pump can go through three holding periods, H1, H2 and H3.

The following will use the factory settings for P7 and P8.

### **Holding Time (H1)**

- Internal pressure transducer must reach 3500 psig and stay above 2600 psig for 15 consecutive seconds before going to H2. If the internal pressure transducer drops below 2600 psig during the 15 seconds, the pump will restart and run until the internal pressure transducer reaches 3500 psig.

### **Holding Time (H2) - Will last for 30 seconds**

- At the end of H2, if the internal pressure transducer is above 2600 psig and the external pressure transducer has reached 2500 psig, the pump will begin a vent cycle.
- At the end of H2, if the internal pressure transducer is below 2600 psig, or both the internal pressure transducer is below 2600 psig and the external pressure transducer has not reached 2500 psig, an H3 will appear on the display. The pump will turn on again and pump until the internal pressure transducer has reached 3500 psig. When the internal pressure transducer is above 2600 psig and external pressure transducer has reached 2500 psig, a vent cycle will take place.
- If at the end of H2 the internal pressure transducer is above 2600 psi but the external pressure transducer has not reached 2500 psig, the pump will turn on for 2 seconds and then stop and wait until the external pressure transducer reaches 2500 psig. An H3 will appear on the display. When the internal pressure transducer is above 2600 psig and external pressure transducer has reached 2500 psig a vent cycle will take place.

### **Holding Time (H3)**

- Holding time H3 will remain until the internal pressure transducer is above 2600 psig and the external pressure transducer has reached 2500 psig, and then a vent cycle will take place. If both pressure transducers do not reach their preset settings within the allotted pumping time of 12 minutes an alarm will occur. If the internal pressure transducer drops below 2600 psig during H3 it will repump until the internal pressure transducer reaches 3500 psig.



### Possible Faults

- E1 Fault – A failure to build pressure at the pump within the allotted 12 minutes of pumping time.
- E2 Fault – A failure to build pressure at the end of the supply line.
- E3 Fault – A failure to vent at the pump. The internal pressure transducer has 10 seconds to drop below 2600 psig when the motor reverses to locate the vent position.
- E4 Fault – A failure to vent at the end of the supply line. The external pressure transducer has to drop below 900 psig before the next lube cycle takes place.

### © Venting Cycle

- After the pump completes the preset hold time and the pump maintains the specified pressure, the controller will initiate a vent cycle. The vent cycle will last for ten seconds.
- The motor will turn counterclockwise to engage and open the internal vent valve. The display's rotating segment is turning counter clockwise.
- The motor will stop in a position to hold the vent valve open. "Hr" will be displayed for the remainder of the 10 seconds.
- The cam (7) (Fig. 6) engages the vent lever (6) depressing the vent valve plunger (8) (Fig 10). This opens the valve passage of the supply line to the reservoir.
- Lubricant is flowing back to the reservoir venting pressure from the system. The valve stays open during pause time.

### Filling reservoir with grease

Use grease fitting (9) (Fig 1) to fill the reservoir. Filling reservoir for the first time is critical to the proper pump operation. Make sure no air is trapped under the follower plate. Grease should be in full contact with the surface of the follower. It's recommended to run the motor by initiating the lubrication cycle during the first reservoir fill. The stirring paddle of the running motor will help to evenly spread the grease under follower minimizing air pockets.

### Air Expelling Procedures for Pumps with Follower

Disconnect the low-level square type bayonet plug 8 (Fig. 1) and unscrew the top lid (10) (Fig. 1) of the reservoir. Remove lid and spring from the pump. Start filling the pump. As soon as the grease level starts lifting the follower, stop filling and check for air trapped under the follower. Use a plastic wire tie to expel the air: push plastic tie between the follower seal and wall of the reservoir and push the follower with hand until it completely contacts the grease. Replace the lid and connect the low-level electric plug. Finish the filling of the reservoir.

### Stirring paddle

The stirring paddle (3) (Fig. 2) is attached to the motor and rotates during the lubrication cycle. The paddle is working grease in the reservoir to make it more pumpable and at the same time pushing the grease down into the housing and pumping elements to prevent cavitation.

### Low-level control

The pump model P653S is equipped with a low-level grease control as a standard feature.

### Pump with Follower Plate

Low-level control electromagnetic reed switch is located in the central rod of the reservoir. The switch is sealed and does not have any contact with grease.

The follower plate bushing has a magnet. As soon as the follower reaches the preset position at the bottom of the reservoir, a magnetic field will close the switch to indicate the low-level of the grease. The control panel display "LL" will be on. The pump can be operational for some time since there is a small amount of grease left under follower in the reservoir and pump housing. The pump should be refilled as soon as possible. Always refill the pump to the maximum of the reservoir capacity. The "LL" display should be "off" as soon as pump is refilled.



### Caution!

Make sure there is no air trapped under follower plate. Grease should be in full contact with surface of the follower. Use "Air Expelling Procedures" if necessary.

## WARNING

The follower spring is completely compressed if reservoir is full of grease. Exercise extreme caution removing the top of the pump.

© Indicates change



## Pump Without Follower Plate

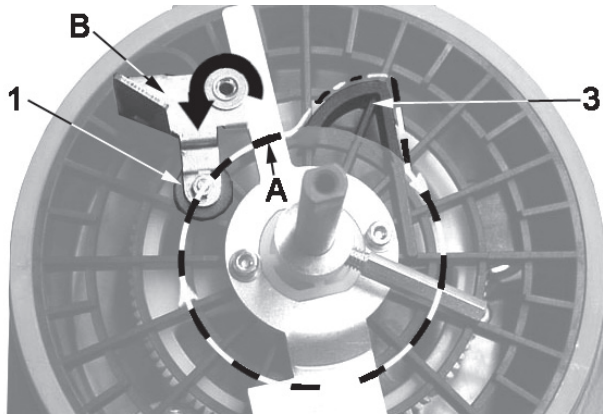


Figure 15 Switching parts of the low-level control for grease (when reservoir is filled).

- 1. Pivot bracket with round magnet
- 3. Control Cam
- A. Inner orbit of the round magnet
- B. Position of the pivot bracket (LL not activated)

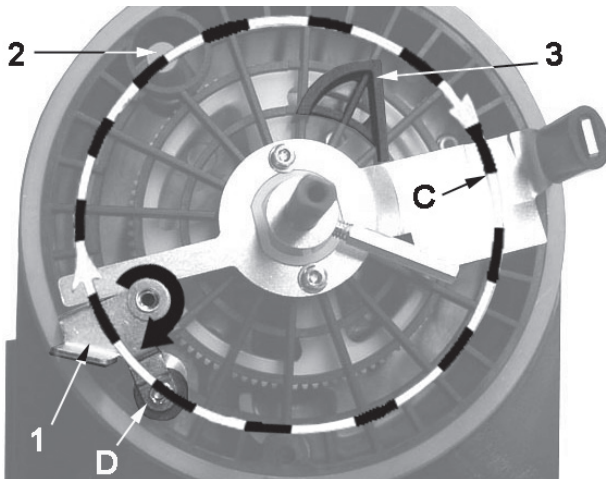


Figure 16 Switching parts of the low-level control for grease (when the reservoir is empty).

- 1. Pivot Bracket with round magnet.
- 2. Low-level Switch
- 3. Control Cam
- C. Outer orbit of the round magnet
- D. Position of the Pivot bracket (LL activated)

### Grease Reservoir Full of Grease - Fig. 15

- The stirring paddle rotates clockwise during the lubrication cycle.
- The pivot bracket of the stirring paddle (B) (Fig. 15) is completely submerged into grease and grease resistance to paddle rotation guides the bracket with round magnet 1 inward to orbit (A).
- Control Cam (3) (Fig. 15) guides the pivot bracket with magnet and outwards, in the direction of the reservoir wall. Since reservoir is full, grease resistance guides pivot bracket inward to orbit (A) as soon as bracket passes the cam (3).
- Magnet and low-level switch (2) (fig. 16) are not aligned and switch can not be activated.

**NOTE:** The above mentioned switching parts (1 to 3) (Fig. 15 & 16) must not be used with fluid grease or oil. In this case, use a float magnetic switch.

### Grease Reservoir Empty - Fig. 16

- Control cam (3) guides the pivot bracket with magnet (1) outward. Since there is no grease resistance, the bracket with magnet (1) will stay outward in the Orbit C.
- Magnet (1) will align with Low-level Switch and activate LL indicator on a pump display.

### Keypad and Display

#### Membrane Key Pad

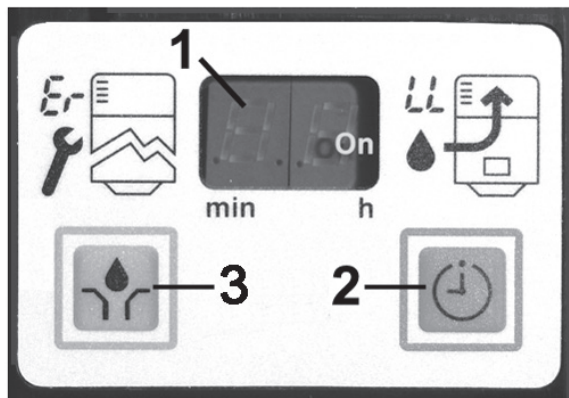


Fig. 17 P653S membrane key pad

#### Test Display of the Membrane Key Pad

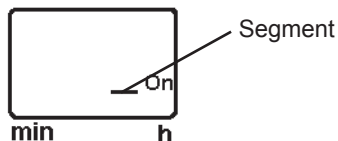
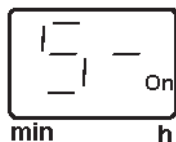


Fig. 18 Green segment right, power supply "on", ignition switch open ("off").

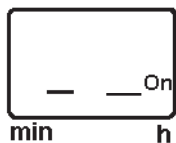


Fig. 19 Green segment left & right are "On"/ Ignition switch closed ("on").

© Indicates change

- 1 - Display
- 2 - Key for acknowledgment of fault indications and changing programming screens.
- 3 - Key for triggering an additional lubrication cycle and for changing programming values.

- A test display is made when voltage is applied: all segments and decimal points are illuminated for 2 seconds.



#### NOTE

EP will briefly appear after the display test. If EP remains on after the display test this indicates that the remote lube pushbutton is in the closed position or the keypad pushbutton is defective.

When power is applied to the pump the display will indicate if a pressure switch or pressure transducer is connected to the pump. The example indicates an internal pressure switch.

There are four possibilities:

- S- Internal pressure switch
- T- Internal pressure transducer
- TT Internal and external pressure transducer (must be connected)
- SS Internal and external pressure switch (must be connected)

#### Operating mode

- © • If there is only one segment on in the lower right-hand corner this indicates that the ignition switch is open. If the ignition switch is open and the right segment is flashing this indicates a fault condition. Closing the ignition switch the display will indicate what type of fault has occurred.
- © • If the ignition switch opens during a lubricating time the lube cycle will be completed.
- When switching on the ignition switch, the left-hand segment in the display window lights up (Fig. 19).
- During the lubricating time of the pump, a circulating illuminated segment appears in the display window of the membrane key pad (Fig. 20).
- If the power supply is interrupted during the pause time, the pause time continues at the point of interruption after switching power on again.
- If the power supply is interrupted during the lubricating time the operating time will start at the beginning after switching power on again.

## Keypad and Display

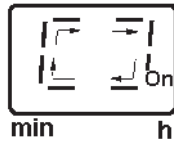


Fig. 20 Green circulating illuminated segment, lubricating time, pump is running.



Fig. 21 Display of a low-level indication

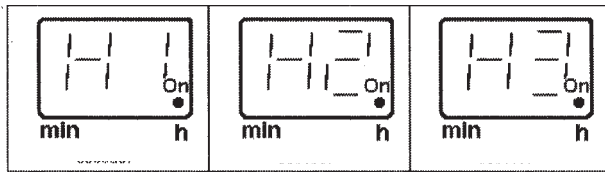


Fig. 22 Display of Holding Time

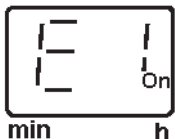


Fig. 23 Display of the malfunction E1, failure to build pressure at the pump.

### Low-level control

In the event of a low-level signal the display will flash LL.



### IMPORTANT

If a low-level signal occurs during the lubricating time, the current operating cycle will still be completed. However the pump does not switch on automatically any more. It can only be switched on again by a manual lube cycle. Furthermore, it is not possible to change to the programming mode while there is a low-level signal.

Display is indicating holding times when pump reaches preset pressure.

### Malfunctions

- If there is no feedback from the pressure switch or pressure transducer within 12 minutes of pumping time, the pump switches off immediately. One of the fault signals E1 to E4 (Error, Fig. 23 to 26) will be shown flashing in the display of the membrane key pad.



### IMPORTANT

If a malfunction is present, E1, E2, E3 or E4 will be flashing. The pump does not switch on automatically any longer. It can only be triggered via an additional lubrication cycle. Furthermore, a change to the programming mode is not possible while in alarm.

E1 fault is a failure to build pressure at the pump.

- If either the pressure switch or pressure transducer fails to actuate within 12 minutes of pumping this fault will occur.

### Keypad and Display



Fig. 24 Display of the malfunction E2, failure to build pressure at the end of the line.

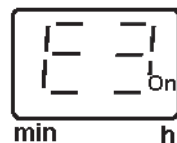


Fig. 25 Display of the malfunction E3, failure to vent at the pump.



Fig. 26 Display of the malfunction E4, failure to vent at the end of the line.

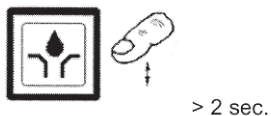


Fig. 27 Operator key to trigger an additional lubrication cycle



Fig. 28 Operator key to acknowledge a fault.

E2 fault is a failure to build pressure at the end of the supply line. You must use an external pressure switch or pressure transducer to detect this.

- If either the external pressure switch or pressure transducer fails to reach 2500 psi within 12 minutes of pumping this fault will occur.

E3 fault is a failure to vent at the pump.

- Failure of the internal pressure switch to open during the 10 seconds that the pump motor reverses to locate the vent position.
- Failure of the internal pressure transducer to drop 900 psi below the P7 parameter (P7 minus 900 psi) during the 10 seconds that the pump motor reverses to locate the vent position.
- If at the end of the pause time the internal pressure transducer has not dropped below 900 psi an E3 fault will occur.

E4 fault is a failure to vent at the end of the supply line. You must use an external pressure switch or pressure transducer to detect this.

- If at the end of the pause time the external pressure switch has not opened an E4 fault will occur.
- If at the end of the pause time the external pressure transducer has not dropped below the P8 parameter an E4 fault will occur.

To trigger an additional lubrication cycle via the pushbutton, press the button for 2 seconds.



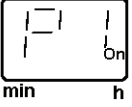
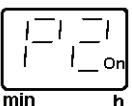





#### NOTE

Existing fault signals (Fig. 21 to 26) must be acknowledged before triggering an additional lubrication cycle.

#### To trigger additional lubrication cycles externally

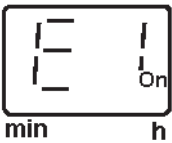

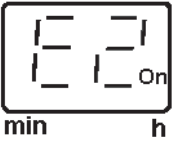





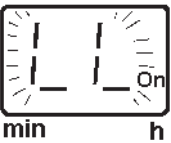

- **Press the pushbutton to trigger additional lubrication cycles externally. Press the pushbutton for 2 seconds.**
  - Mobile pump w/ignition switch open.....up to two times
  - Industrial pump w/machine switch open...unlimited

## Factory Settings For Parameters

Programming steps	Factory Setting	Description
	<b>01</b>	Pause time 0 to 59 hours
	<b>00</b>	Pause time 0 to 59 minutes
	<b>NO</b>	Output of both fault relays <b>no (normally open)</b> nc (normally closed)
	<b>o2</b>	Two options for signaling a fault <b>o1 (Option 1)</b> F1 relay contact a) Low-level fault will cause F1 contact to repeatedly open and close. b) Pressure fault will cause F1 contact to close and stay closed. F2 relay contact A low-level fault or a pressure fault will cause the F2 contact to close and stay closed. <b>o2 (Option 2)</b> F1 fault relay's contact will close on a low-level fault F2 fault relay's contact will close on a pressure fault Both of these contacts can be used for remote signaling.
	<b>SP</b>	Option to have the pump start with a pause time or a lube cycle. <b>SP – Pump starts with a pause time</b> SO – Pump starts with a lube cycle
	<b>35</b>	The P7 programming step will only appear if you have a pump that uses an internal pressure transducer. (Reading x 100) 35 x 100 = 3500 psi. 3500 psi is the maximum pressure that the pump will build. Adjustable from 1400 psi to 4600 psi in 100 psi increments.
	<b>09</b>	The P8 programming step will only appear if you have a pump that uses an external pressure transducer. (Reading x 100) 09 x 100 = 900 psi. 900 psi is where the external pressure transducer will open (VENT) adjustable from 200 psi to 1000 psi in 100 psi increments.



### Acknowledging a Fault

Display	Press
	
	
	
	
	

#### To acknowledge a malfunction:

- The flashing display changes into continuous light by pressing the button (acknowledging). By acknowledging the fault signal, the flashing E1, E2, E3, E4 or LL changes into permanent light.
- Messages which have been acknowledged but have not yet been remedied will flash again after the pump is switched off and on again.
- After fault has been acknowledged no more lube cycles will take place until a successful manual lube cycle has taken place.

## Programming the Pump

### Programming Mode: Pump with Pressure Switch

Key	Function
	Key for modifying the parameters in the programming step

Key	Function
	Key for switching to the next programming step



**IMPORTANT!** Pump Power must be on to start programming.

#### Step 1

**Display**



**Press**



Setting of Pause Time P1 (hours) and P2 (minutes).  
To access the programming mode, press both buttons at the same time > 4 seconds, so that "P1" appears in the display.

Programming options:

P1	Pause time:
P2	0 - 59 hours
Min. pause time	0 - 59 minutes
Max. pause time	4 minutes
	59 hours 59 minutes

**Display**

#### Step 2

**Display**

P1: Setting of hours

When releasing the two buttons, the currently set value appears.

Example.: factory-set value: ..... 1 hour  
"Hour" is indicated by a **dot** on the **right-hand side**.

**Display**



Press button.

Settings are made in one direction:..... 0, 1, 2, 3,....59 hours  
Button pressed once ..... increase by 1 hour  
Button pressed continuously ..... quick sequence  
Example:..... 12 hours

#### Step 3

**Display**



P2: Setting minutes

Press button, so that "P2" appears in the display.

When releasing the button, the currently set value appears (here the factory-set value: 0 minutes).

"Minute" is indicated by a **dot** on the **left-hand side**.

**Display**



Press button.

Settings are made in one direction:.... 0, 1, 2, 3, 4, 5, .... 59 min  
Button pressed once ..... increase by 1 minute  
Button pressed continuously ..... quick sequence  
Example:..... 30 minutes

**Display**

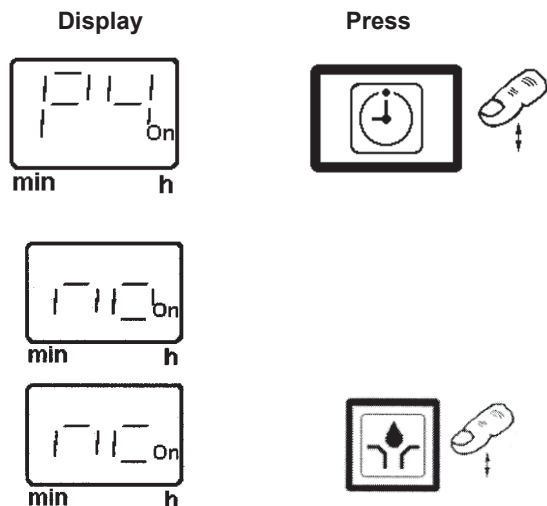


**IMPORTANT**

If "Hours" are set to "00", the display will show minimum pause time of 4 minutes.

### Programming Mode, continued

#### Step 4

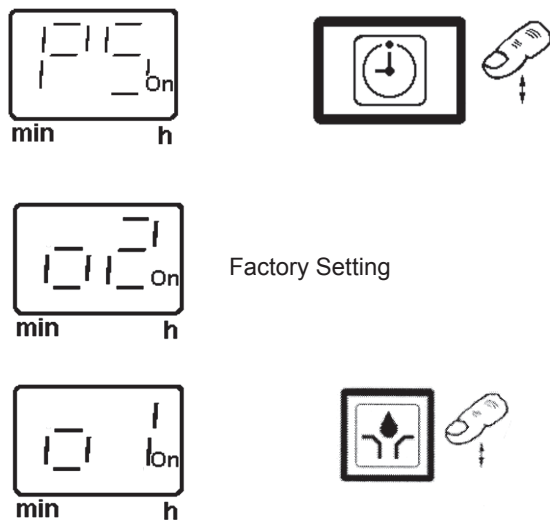


**P4: Programming of the output signal for both alarm relays. The default setting on the printed circuit board for the alarm contacts is switching to battery minus.**  
Press button so that "P4" appears in the display.

When releasing the button, the currently set value appears in the display (here the factory-set value NO, normally open contact). On a fault condition the alarm contact will close.

Press button.  
The external fault contact is modified by programming it as NC normally closed contact. On a fault condition the alarm contact will open.

#### Step 5



**P5: Two options for signaling a fault condition with alarm relays F1 and F2.**

**Press button so that "P5" appears in the display.**

o1 (Option 1) *P4 is set to the default of Normally Open.*

F1 relay contact

a) A low-level fault will cause the F1 contact to repeatedly open and close.

b) A pressure fault will cause the F1 contact to close and stay closed.

F2 relay contact

A low-level fault or a pressure fault will cause the F2 contact to close and stay closed.

o2 (Option 2) *P4 is set to the default of Normally Open.*

F1 fault relay's contact will close on a low-level fault and stay closed.

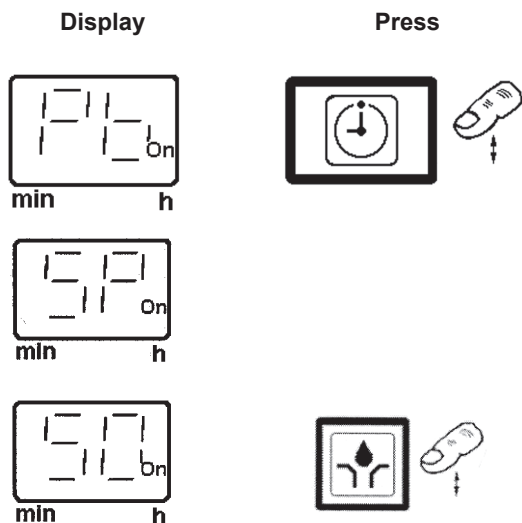
F2 fault relay's contact will close on a pressure fault and stay closed.

Both of these contacts can be used for remote signaling.

Press pushbutton to change to Option 1.

## Programming Mode, continued

### Step 6



**P6: Upon applying power to the pump you can program whether it starts with a pause time SP or starts with a lube cycle SO.**

Press button, so that "P6" appears in the display.

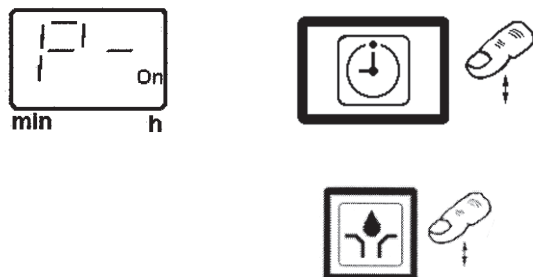
The currently set values appear as to whether the cycle is to start with the pause time or the lubricating time.

The default setting for the pump is set to start with a pause time **SP (Start Pause time)**.

Press button.

Each time the pump is switched on, it will start with the lubricating time **SO (Start Operation)**. After the first lubricating time the preset pause time will be valid.

### Step 7



### Completing the programming

Press button. "P -" is displayed.



#### IMPORTANT

Always carry out the programming completely in order to save the new values.

- Press this key (additional lubrication) to complete the programming and to save the entered parameters.



#### NOTE

If the button "additional lubrication" is not pressed within 30 seconds, the changed parameters will not be saved and the previous programming remains valid.

#### IMPORTANT

After completion of the programming, check the parameter settings in the operating mode once again.

Programming of the pump with pressure switch is complete.

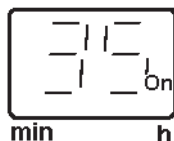
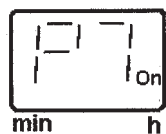
### Programming Mode: Pump with Pressure Transducer

Complete Steps 1 through 6 of Pump with Pressure switch

Display

Press

#### Step 7



#### IMPORTANT

The P7 programming will only appear if you have a pump that has an internal pressure transducer.

P7: Programs the setting of where the internal pressure transducer will close. This is the maximum pressure that the pump can reach. Factory setting is 3,500 psi.

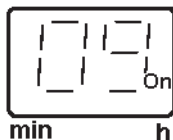
Press button to change value.

Reading x 100 = Transducer setting in psi

35 x 100 = 3500 psi.

This setting is adjustable from 1400 psi to 4600 psi in 100 psi increments.

#### Step 8



#### IMPORTANT

The P8 programming parameter will only appear if you have a pump that has an external pressure transducer connected.

P8: Programs the setting of where the external pressure transducer will open. The opening point (vent pressure) is adjustable from 200 psi to 1,000 psi in 100 psi increments. Factory set opening point (vent pressure) is 900 psi. The closing point of the external pressure transducer is fixed in software at 2500 psi.

Press button to change value.

Reading x 100 = Transducer setting in psi

9 x 100 = 900 psi.



## Programming Mode, continued

### Step 9



### Completing the programming

Press button. "P -" is displayed.



#### IMPORTANT

Always carry out the programming completely in order to save the new values.

- Press this key (additional lubrication) to complete the programming and to save the entered parameters.



#### NOTE

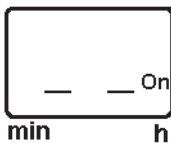
If the button "additional lubrication" is not pressed within 30 seconds, the changed parameters will not be saved and the previous programming remains valid.

#### IMPORTANT

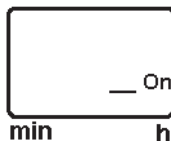
After completion of the programming, check the parameter settings in the review mode.

**Programming of the pump with pressure transducer is complete.**

### Review of the Pump Parameters



or



Press the button > 2 seconds.

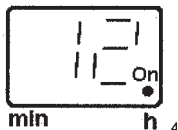


#### NOTE

The following display sequence is shown **once**. The change of display occurs every two seconds. Example of the pump set to lubricate each 12 hours 30 minutes and remaining pause time (rP) is 5 hours 10 minutes.

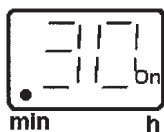


Pause Time



after one sec.

12 . (hours)



after one sec.

. 30 (minutes)



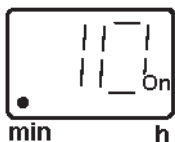
after one sec.

rP (remaining pause time)



after one sec.

5 . (hours)



after one sec.

. 10 (minutes)



Review of the Pump Parameters

Operating Mode

	after one sec.	NO	Both relay contacts are normally open
	after one sec.	o2	Option 2 - How F1 and F2 will signal a fault.
	after one sec.	SP	Pump starts with a pause time
	after one sec.		Will only appear if pump has an internal pressure transducer. Maximum pressure the pump will build.
	after one sec.		Indicates that the internal pressure transducer will close at 3500 psi.
	after one sec.		Will only appear if pump has an internal and external pressure transducer. Setting where external transducer will open.
	after one sec.		External pressure transducer will open at 900 psi.
			Indicates software version. The next two displays will indicate software version.
	or		Termination of the Reviewing of Parameters.

**Technical Data****Electrical data for DC pump**

Incoming voltage.....	24 vdc -20%/+30%
Maximum current.....	10 amps
External Fuse.....	10 amps (time delay)
Reverse polarity protection.....	Yes
© Current draw with ignition switch open.....	25ma

**Electrical data for AC pump**

Incoming voltage.....	100 to 240 vac
Maximum current.....	1.7 amps
Frequency.....	47 to 63 hz
Output from power supply.....	24 vdc @ 5 amps
External Fuse.....	3 amps (time delay)

**Common electrical data for DC and AC pumps**

Minimum pause time.....	4 min.
Maximum pause time.....	59 hrs 59 min.
Pause time increments.....	1 min. or 1 hour
Maximum pumping time.....	12 min.
Enclosure rating.....	IP 6K9K (NEMA 4X)
Rating for fault relay contact:	
Switching voltage.....	max. 230 vac/120 vac/24 vdc
Switching current.....	max. 1 amp inductive
Minimum switching current.....	.1 ma

**Pump P653S**

Operating pressure with:	
-pressure switch .....	3,500 psig (240 bar)
-pressure transducer.....	3,500 psig (240 bar)
	(transducer can be adjusted from 1,400 to 4,600 psig (96 to 317 bar)
End of line pressure switch setting.....	2,500 psig (172 bar)
	(not adjustable)
End of line pressure transducer setting.....	2,500 psig (172 bar)
	not adjustable.
End of the line transducer vent pressure is factory preset at 900 psi (62 bar). Pressure can be adjusted from 200 to 1,000 psig (14 to 70 bar) in 100 psig (7 bar) increments.	

- © Maximum distance using shielded wire for  
pressure transducer..... 98 ft (30m)

Operating temperature range for DC pumps.....	- 40 °F to + 158°F <sup>1)</sup> (- 40 °C to +70 °C) <sup>1)</sup>
--	---

Operating temperature range for AC pumps.....	32°F to 122° F <sup>1)</sup> (0° C to 50° C) <sup>1)</sup>
--	---

Number of outlets (see instructions).....	1
Lubricant .....	up to NLGI grade 2 <sup>1)</sup>
Output .....	1.5 in <sup>3</sup> /min <sup>2)</sup> (24.6 cm <sup>3</sup> /min)

Reservoir sizes, L.....	4, 8, 15 and 20
Lubricant line connection size...G ¼"	

**Pump elements K7**

Piston diameter .....	7 mm
Number of Pumping Elements.....	3
(connected together)	

**Tightening torques**

Install pump.....	13.3 ft-lb (18 Nm)
Electric motor on housing .....	8.8 ft-lb (12 Nm)
Pump element in housing .....	14.57 ft-lb (20 Nm)
Closure plug in housing .....	8.8 ft-lb (12 Nm)
Return line connector on housing .....	8.8 ft-lb (10-12 Nm)
Tie rods for 15 and 20 l reservoir .....	7.4 ft-lb (10 Nm)

**Weights**

15-l reservoir with 3 pump elements K7, without pressure relief  
valve, empty

Pump P653S without connecting cable.....	21.1 lb (9.6 kg)
Pump P653S version 1A .....	23.3 lb(10.6kg)
Pump P653S version 3A .....	24.6 lb (11.2 kg)

8-l reservoir, standard

Pump P653S without connecting cable.....	19.8 lb (9.0 kg)
Pump P653S version 1A.....	21.1 lb (9.6 kg)
Pump P653S version 3A.....	24.6 lb (10.6 kg)

4-l reservoir, standard

Pump P653S without connecting cable.....	19.1 lb (8.7 kg)
Pump P653S version 1A.....	21.3 lb (9.7 kg)
Pump P653S version 3A.....	23.1 lb (10.5 kg)

The weights above include the following equipment:

Pump kit with three pump elements, pressure relief valve,  
grease filling (1.5 kg)

Packing (cardboard box)

Attaching parts

Operating Instructions

**Installation**

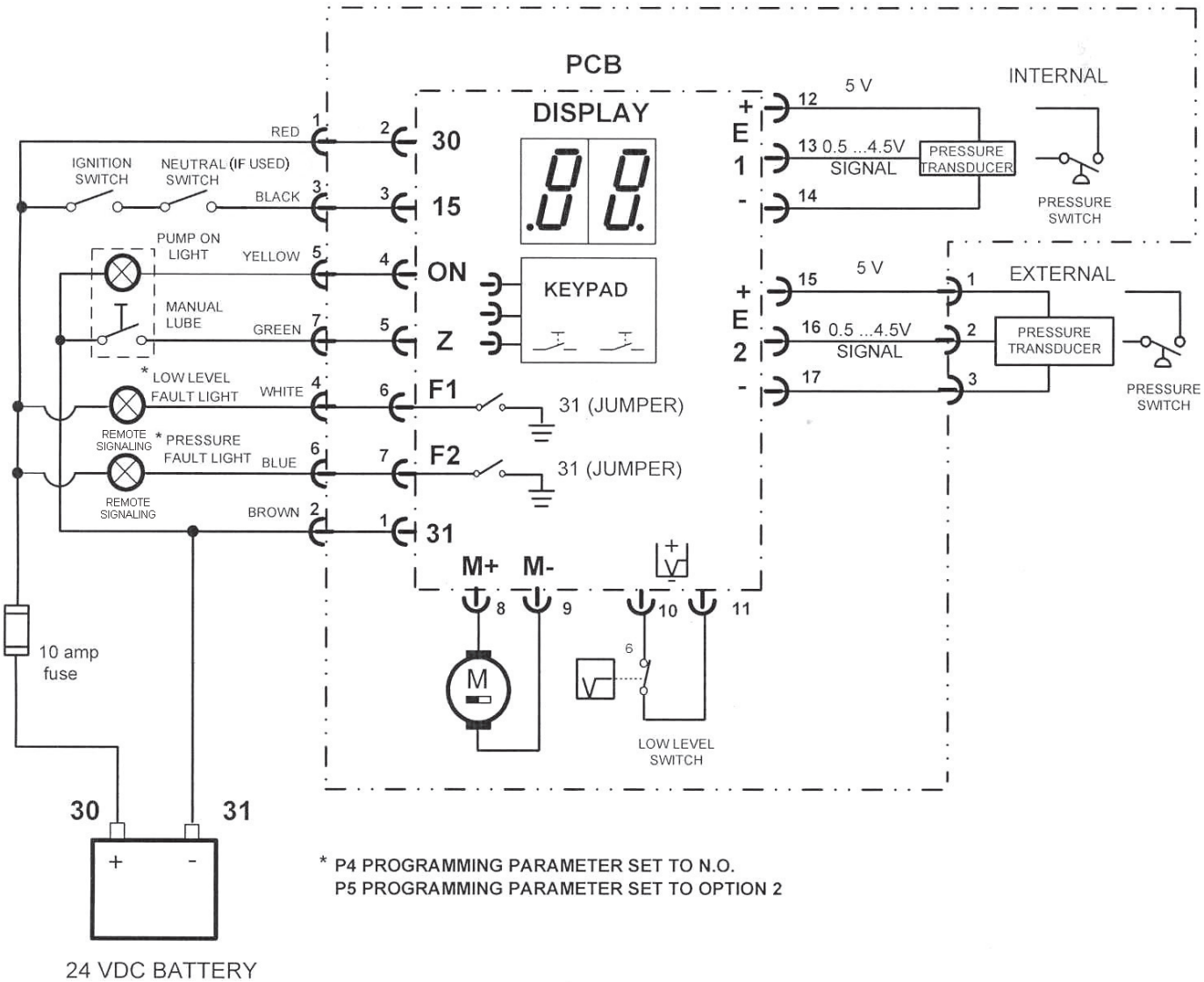
- Use only high pressure 5,000 psig minimum hydraulic  
hose for supply lines.
- Use only hose connection fittings that are appropriate for  
the programmed/pre-set system pressure.

Note #1: See the list of the approved and recommended lubricants.  
Contact Lincoln if lubricant is not in the list.

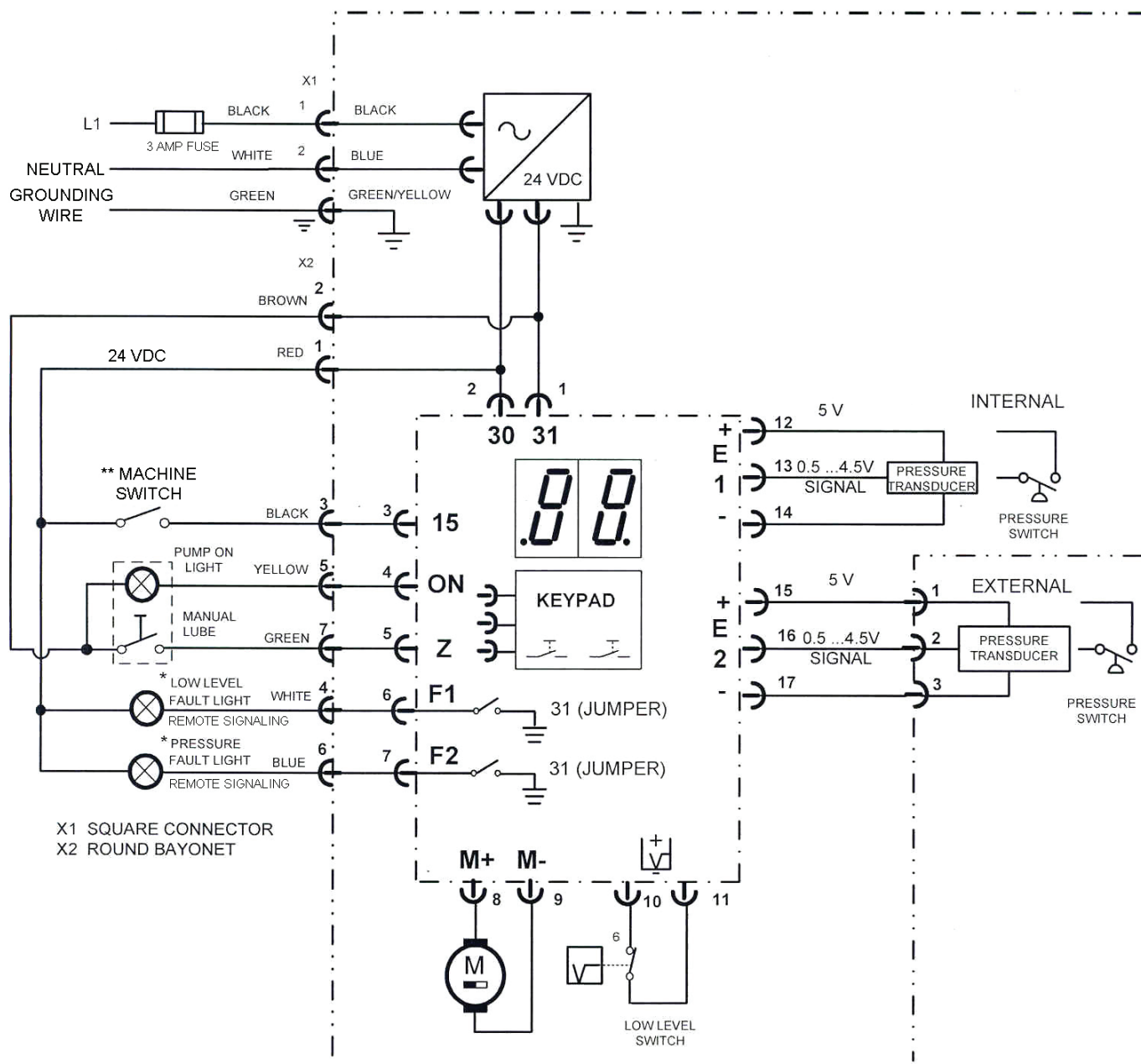
Note #2: The lubricant output is measured at + 70 °F (+ 21 °C) and  
backpressure 1,450 psig (100 bar). Different pressures, temperature  
and grease can change the output results.

© Indicates change

CONNECTIONS FOR 24 VDC 653 PUMP



### CONNECTIONS FOR 110-230 VAC 50/60 Hz 653 PUMP

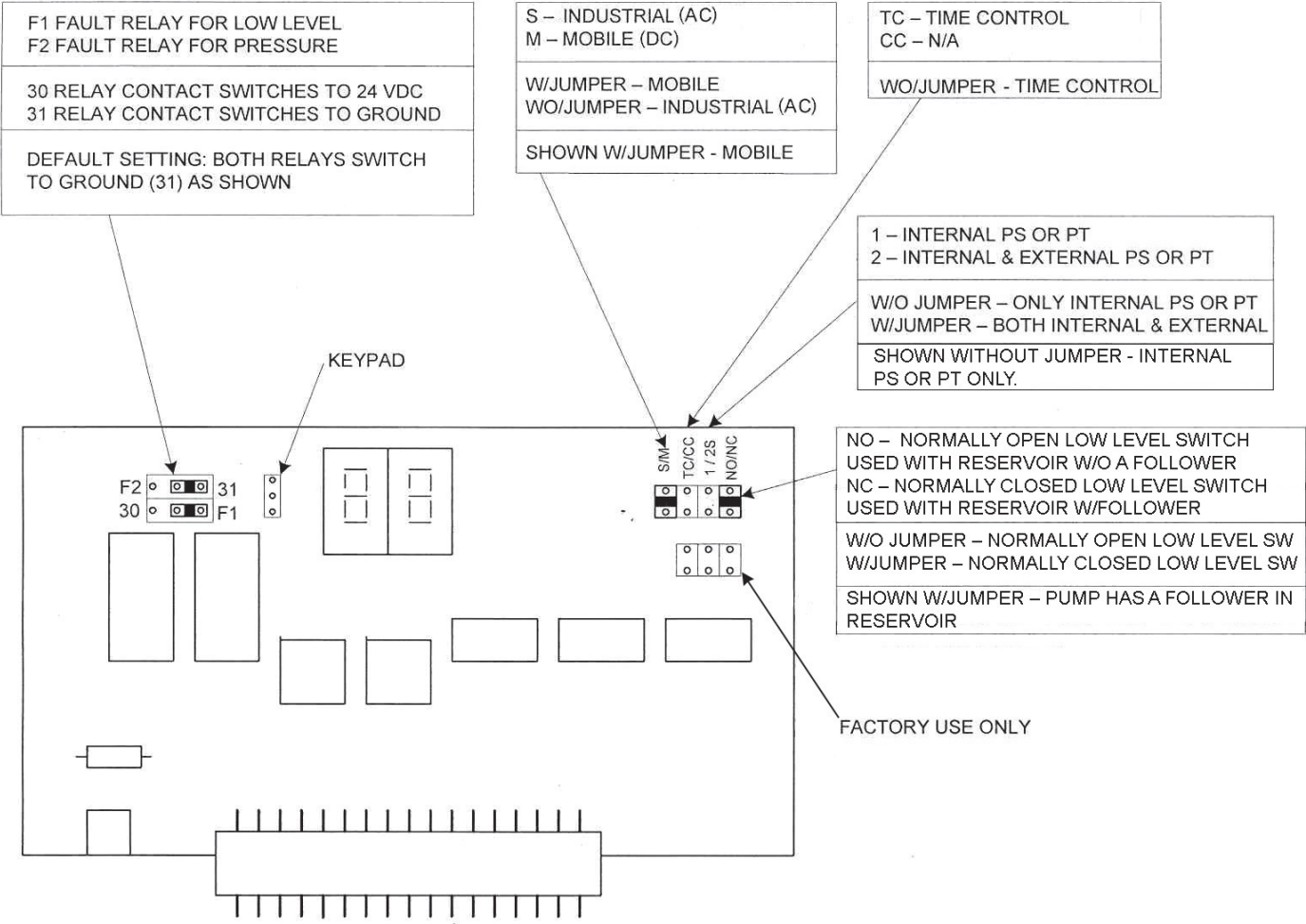


\* P4 PROGRAMMING PARAMETER SET TO N.O.  
P5 PROGRAMMING PARAMETER SET TO OPTION 2

\*\* Must connect red and black wires together if no machine switch is used.  
You can also use a special 7 conductor bayonet plug (P/N 664-34550-1).

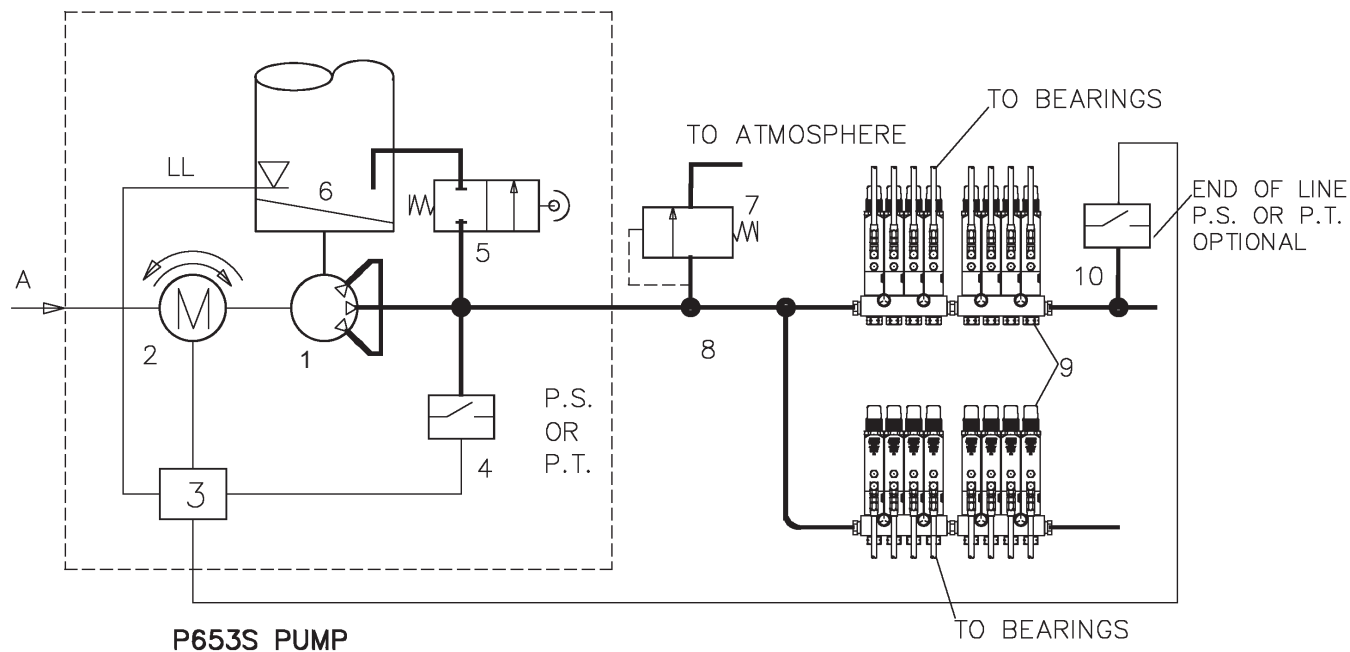


JUMPER SETTINGS FOR 653 PUMP PCB





### Centro-Matic System Schematic with P653S Pump



- 1 - PUMPING HOUSING ( 3 PUMP ELEMENTS)
- 2 - MOTOR
- 3 - CONTROLLER, KEY BOARD WITH DISPLAY
- 4 - INTERNAL PRESSURE SWITCH (P.S.) OR PRESSURE TRANSDUCER (P.T.)
- 5 - INTERNAL VENT VALVE
- 6 - RESERVOIR WITH Low-level CONTROL
- 7 - PRESSURE RELIEF, 5,000 PSI (350 BAR) EXTERNAL
- 8 - HIGH PRESSURE SUPPLY LINE
- 9 - INJECTORS, SL-V, SL-1, OR SL-32, SL-33, and SL-V XL INJECTORS
- 10 - PRESSURE SWITCH (P.S.) OR PRESSURE TRANSDUCER (P.T.), EXTERNAL, OPTIONAL.
- A - POWER SUPPLY (24 VDC OR 120 VAC, OPTIONAL)

Note: For proper operation of the Centro-Matic systems, vent pressure before next lubrication cycle at the end of line should be:

- below 900 psig (62 bar) for SL-V and SL-V XL type of injectors
- below 600 psig (41 bar) for SL-1 type of injectors
- below 200 psig (13.8 bar) for SL-32/33 type of injectors.

## Lincoln List of Lubricants



### IMPORTANT

Absolute cleanliness is essential when handling lubricants. Impurities will remain suspended in the lubricant and cannot settle. This will result in damage to the lubrication system and thus to the bearing.

The Centro-Matic pump can dispense commercial greases up to NLGI grade 2 at specified operating temperature range.

The **proven lubricants** (see following tables) have been tested by Lincoln with regard to their pumpability and venting behavior. Lincoln can recommend them for an application up to the indicated **minimum delivery temperature** in Centro-Matic lubrication systems. During the tests these lubricants did not cause any damage due to incompatibility with the material used by Lincoln.

The lubricants Lincoln recommends on the basis of the manufacturer's data sheet (see following tables) can be used in Lincoln's lubrication systems up to the indicated **minimum delivery temperature**.

Grease pumpability and venting behavior depend on ambient temperature range of the application, and may be different for the same NLGI grade of grease. This refers in particular to greases with more than 3% graphite. Lincoln can test the grease and develop recommendations for specific applications.



### IMPORTANT

The manufacturer of the centralized lubrication system can accept no liability for:

- damages due to the use of greases that are not or only conditionally pumpable in centralized lubrication systems.
- damages on parts of the centralized lubrication system caused by chemical or biological changes of the lubricant used.
- damages due to the incompatibility with other materials.

The liability is limited to pumpable lubricants in centralized lubrication systems.



### IMPORTANT

Consult Lincoln or Lincoln Distributor/Representative before using lubricants with solid additives.

## Proven Lubricants

Manufacturer	Designation	Thickener	Min. Operating Temp.
CATERPILLAR	Moly Ultra 5 NLGI #1	CA-Complex	10° F (-12° C)
CATERPILLAR	Arctic Platinum NLGI #0	CA-Complex Synthetic Base Oil	-40° F (-40° C)
CATERPILLAR	Auto-Lube NLGI #1	Ca-Complex	10° F (-12° C)
FUCHS-LUBRITECH	Stabil Eco EP2	Li/Ca	-13° F (-25° C)
FUCHS	Gleitmo 585	Li	-40° F (-40° C)
FUCHS	Renocal FN 745	Ca-12-OH-stearat	-13° F (-25° C)
FUCHS	Renoral FN3	Ca	-4° F (-20° C)
FUCI-IS	Renolit LZR 2 t I	Li	-4° F (-20° C)
FUCHS	Renolit HLT 2	Li	-13° F (-25° C)
MOBIL	Mobilith SHC 100	Li-complex	-13° F (-25° C)
SHELL	Retinax EPL 2	Li-12-OH-stearat	14° F (-10° C)
SHELL	Retinax CSZ	Li/Ca	-31° F (-35° C)

### Lincoln List of Lubricants, continued



#### IMPORTANT

Consult Lincoln or Lincoln Distributor/Representative before using lubricants with solid additives.

#### Lubricant recommendations based on the manufacturer's data sheet

Manufacturer	Designation	Thickener	Min. delivery temperature
AGIP	F1 Grease 24	Ca	-15 °C
ARAL	Multipurpose grease	Li-12-OH-stearat	-15 °C
ARAL	Multipurpose grease ZS 1/2	Li/Ca	-20 °C
AVIA	Avialith 2 EP	Li-12-OH-stearat	-15 °C
BP	Energrease LC 2	Li-complex	-15 to -10 °C
BP	Energrease MP-MG 2	Ca-complex	-5 °C
CASTROL / TRIBOL	Molub Alloy 6780	Li-12-OH-stearat	-30 to -25 °C
CASTROL	CLS - Grease	Li/Ca	-25 °C
CASTROL	Olista Longtime 2	Li	-20 °C
CASTROL	Optimol Olit 2 EP	Li	-20 °C
DEA	Glissando 20	Li-12-OH-stearat	-15 to -10 °C
ESSO	Ronex Extra Duty 2	Li-complex	5 °C
ESSO	Ronex MP2	Li-complex	-5 °C
ESSO	Beacon EP2	Li	-5 °C
ESSO	Cazar K2	Ca	-15 °C
FIAT LUBRIFICANTI	Comar 2	Li	-25 °C
KLÜBER	Centoplex 1 DL	Li/Ca	-20 °C
KLÜBER	Isoflex NBU 15	Ba	-25 °C
KLÜBER	Klüberplex BEM 34-132	Ca-complex	-20 °C
KLUEBER	Klüberplex BEM 41-141	Li-complex	-25 °C
KLÜBER	Petamo GHY 133 N	Polycarbamide	-15 °C
MOBIL	Mobilgrease XHP 221	Li-complex	-10 °C
MOBIL	Mobilgrease XHP 461	Li-complex	-10 °C
MOBIL	Mobilgrease XHP 222	Li-complex	-5 °C
MOBIL	Mobilith SHC 220	Li-complex	-20 °C
SHELL	Alvania EP(LF) 1	Li-12-OH-stearat	-15°C +/- 5°C
SHELL	Alvania EP(LF) 2	Li-12-OH-stearat	-10°C +/- 5°C
SHELL	Alvania RL2	Li-12-OH-stearat	-15°C +/- 5°C
SHELL	Malleus GL	Gel	GL205 -20 °C, GL300 -10 °C GL400 0 °C, GL500 +5 °C
SHELL	Retinax CS	Li	-20 °C
SHELL	Retinax LX 2	Li	-5°C +/- 5°C
SHELL	Retinax HDX 2	Li/Ca	-10°C +/- 5°C
TEXACO	Premium RB	Li	-20 °C
TOTAL	Ceran AD	Ca-complex	-15 °C
TOTAL	Ceran LT	Ca-complex	-20 °C
TOTAL	Ceran WR2	Ca-complex	-10 °C
ZELLER & GMELIN	Divinol Lithogrease G 421	Li-complex	-15 °C

## Lincoln List of Lubricants, continued



### IMPORTANT

Consult Lincoln or Lincoln Distributor/Representative before using lubricants with solid additives.

### Biodegradable lubricants

Proven lubricants:

Manufacturer	Designation	Thickener	min. delivery temperature
ARAL	Aralub BAB EP 2	Li/Ca	-25 °C
BP	Biogrease EP 2	Li/Ca	-25 °C
FUCHS-LUBRITECH	Stabyl ECO EP 2	Li/Ca	-25 °C

Lubricant recommendations based on the manufacturer's data sheet:

Manufacturer	Designation	Thickener	min. delivery temperature
AUTOL	Top Bio 2000	Ca	-25 °C
AVIA	Biogrease 1	Li	up to 0 °C
DEA	Dolon E 2	Li	-15 °C
FUCHS	Plantogel 2 S	Li/Ca	-15 °C
KLÜBER	Klüberbio M72-82	Polycarbamide	-20 °C

### Lubricants for the food & beverage industry

Lubricant recommendations based on the manufacturer's data sheet:

Manufacturer	Designation	Thickener	min. delivery temperature
ARAL EURAL	Grease EPF 2	Al-complex	-5°C
BREMER & LEGUIL	Rivolta F.L.G 4 – 2	Al-complex	-20 °C
ELKALUB	GLS 364	organic thickener	-10 °C
ELKALUB	GLS 367/N2	inorganic thickener	-5°C
ELKALUB	GLS 380/N1	Al-complex	-10 °C
ELKALUB	GLS 380/N2	Al-complex	-5°C
FUCHS	Renolit G 7 FG 1	Bentonite	-5°C
FUCHS-LUBRITECH	Gleitmo 585 M (KTW-drinking water release)	Li	-10 °C
INTERFLON	Fin Food Grease EP	Al-complex	-5°C
KLUEBER	Paraliq GA 343	Al-complex	-10 °C
KLUEBER	Kluebersynth UH1 14-151	Al-complex	-20 °C
MOBIL	Mobilgrease FM 462	Al-complex	-15 °C
Nordischer Maschinenbau BAADER	Special grease GLS 380/N3	Al-complex	-5°C
OKS	470	Li-12-OH-stearat	-15 °C
OPTIMOL	Obeen UF 1	Al-complex	-15 °C
OPTIMOL	Obeen UF 2	Al-complex	-10 °C
RHENUS NORPLEX	AFD 2	Al-complex	-5°C
RHENUS NORPLEX	AFP 2	Al-complex	-5°C
RHENUS NORPLEX	AFS 2	Al-complex	-25 °C
RHENUS NORPLEX	AFW 2	Al-complex	-5°C
SHELL	Cassida Grease EPS 1	Al-complex	-15 °C
SHELL	Cassida Grease EPS 2	Al-complex	-10 °C
TOTAL	Lubriplate FGL 2	Al-complex	-5°C
TRIBOL MOLUB-ALLOY	FoodProof 823-2 FM	Al-complex	-15 °C
TRIBOL MOLUB-ALLOY	9830 high-temperature grease	PTFE	0°C

### Dimensions: 4-liter reservoir

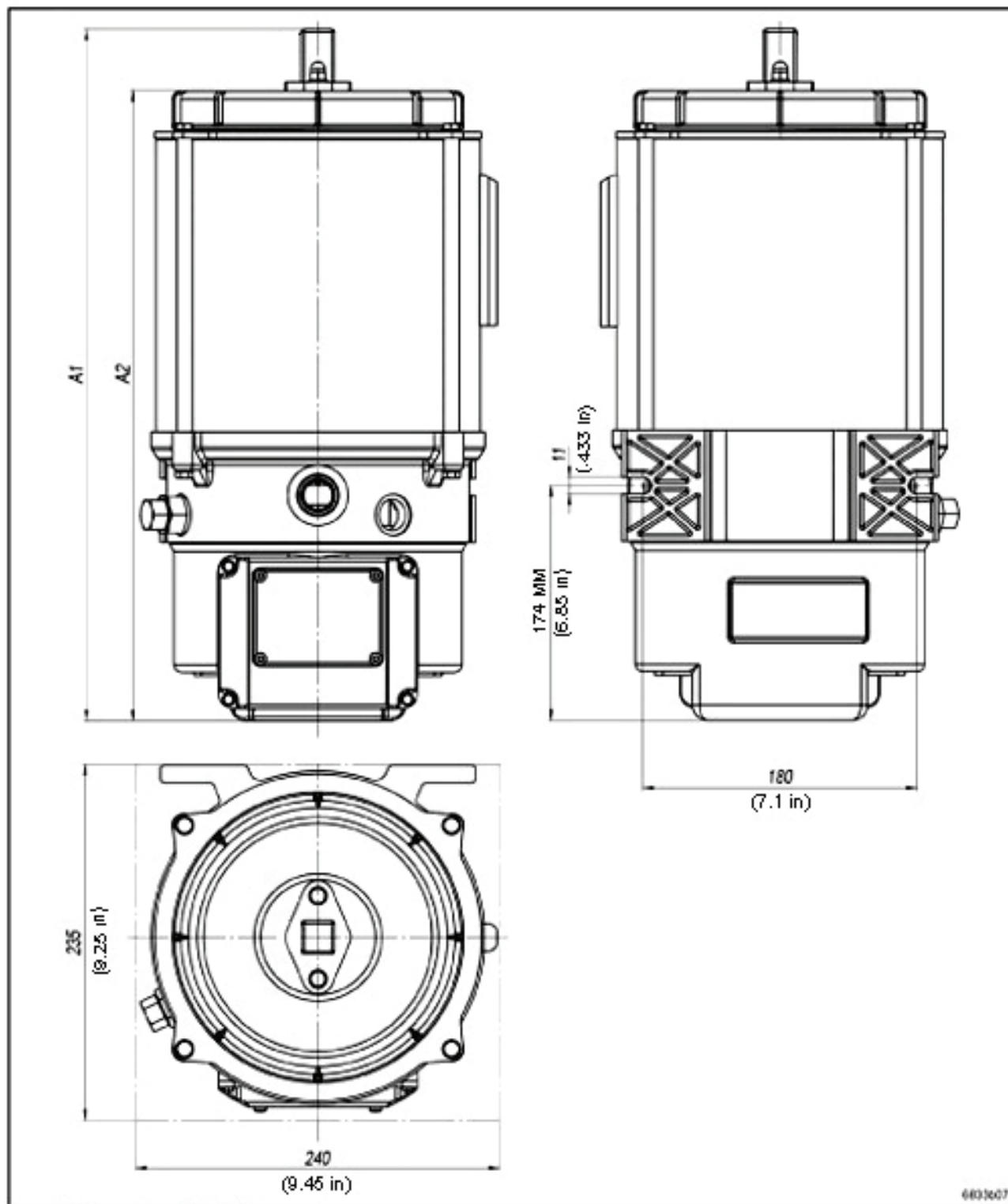


Fig. 45 Dimensions P653S, 4-liter reservoir

Reservoir with follower plates: A1 = 509mm (20 in.)  
Reservoir with stirring paddle: A2 = 467 mm (18.4 in.)

Dimensions: 8-liter reservoir

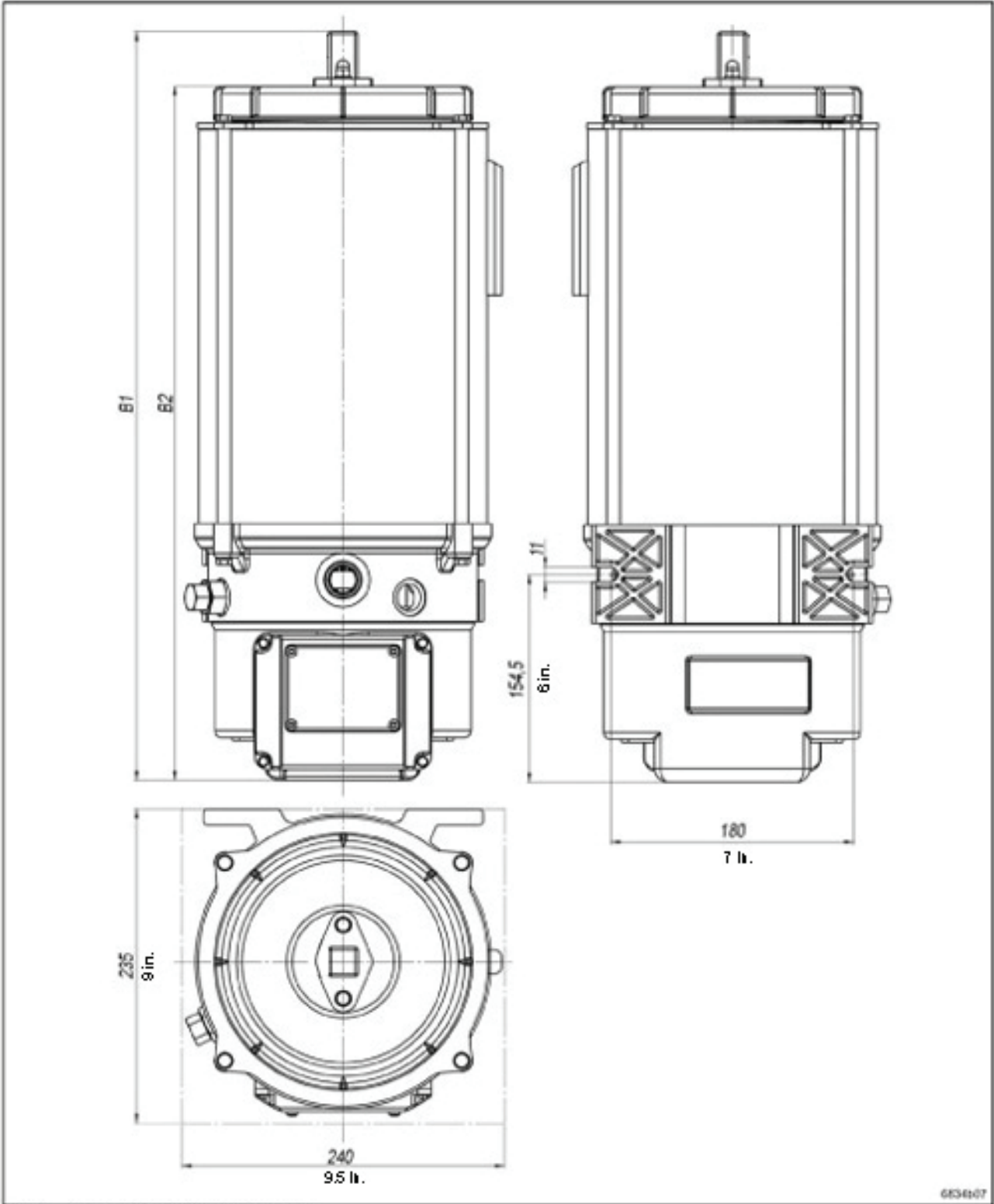


Fig. 46 Dimensions P653S, 8-liter reservoir

Reservoir with follower plates: B1 = 557mm (22 in.)  
Reservoir with stirring paddle: B2 = 515 mm (20 in.)



### Dimensions: 15-liter reservoir

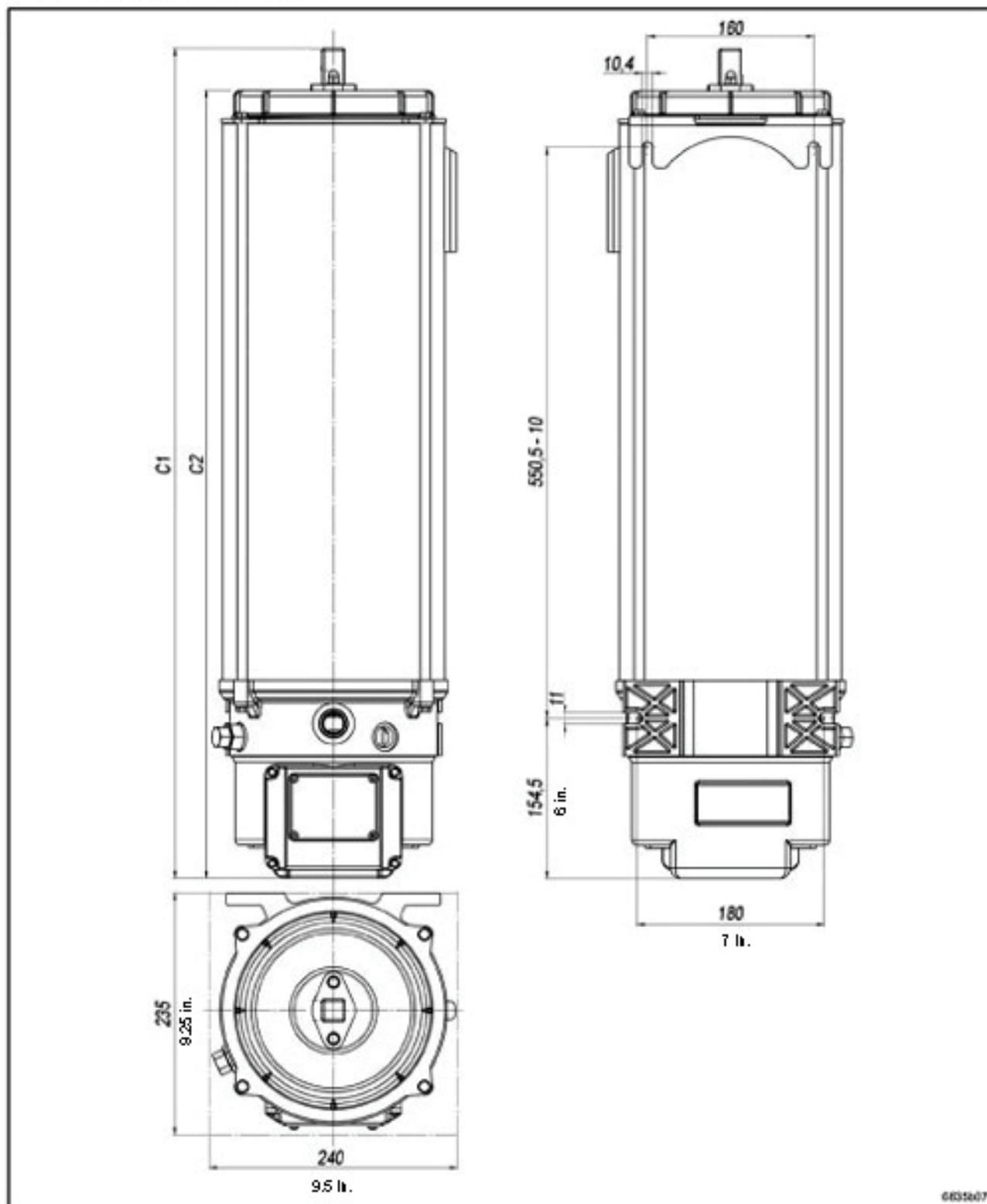


Fig. 47 Dimensions P653S, 15-liter reservoir

Reservoir with follower plates: C1 = 800mm (31 in.)

Reservoir with stirring paddle: C2 = 758 mm (30 in.)

## Dimensions: 20 Liter Reservoir

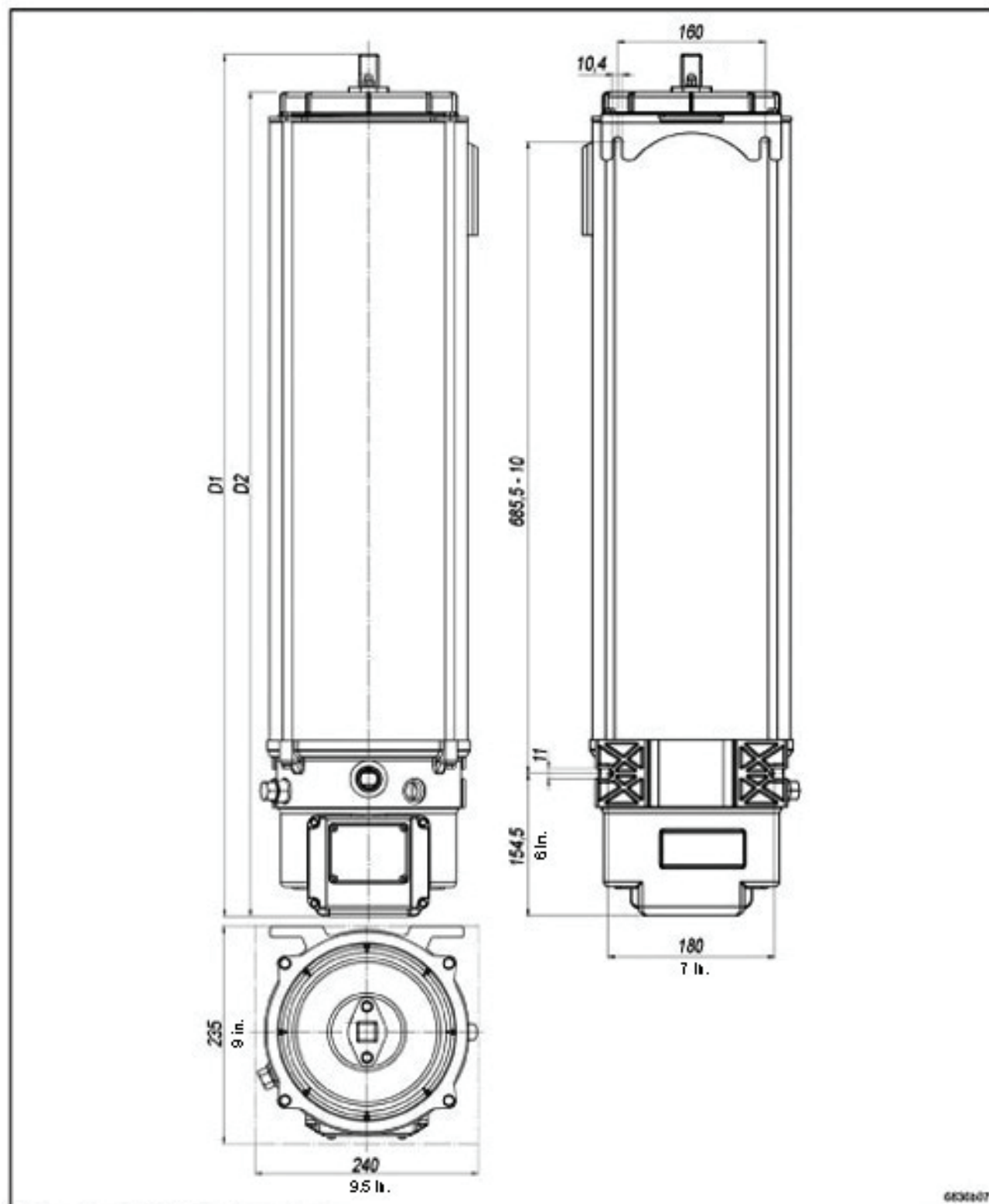


Fig. 48 Dimensions P 653, 20-liter reservoir

Reservoir with Follower Plate: D1 = 935 mm (37 in.)  
 Reservoir with Stirring Paddle: D2 = 893 mm (35 in.)

### Refill and Maintenance



**Caution!** First time filling of the reservoir with grease is very critical for proper pump operation. The pump may be shipped with a small amount of Fuchs Renocol FN 745/LINCOLN grease used for final testing and inspection. The grease thickener is Ca-12-OH-stearat. Check compatibility of the Renocol FN 745/LINCOLN with the grease you are going to use and remove the test grease if necessary.

#### **Pump with follower plate:**

Use grease fitting (9) (Fig. 1) to fill or refill reservoir. Make sure no air is trapped under the follower plate. Grease should be in full contact with the surface of the follower. It's recommended to run the motor by initiating the lube cycle during the first fill of the reservoir. The stirring paddle of the running motor will help to evenly distribute grease under follower minimizing air pockets. The reservoir has a vent hole (11) (Fig.1). Fill grease to the maximum follower position until follower seal will slightly cross the vent hole. If air is still trapped under the follower, add some more grease to expel air through the vent hole.

#### **Pump without follower plate:**

Use the same grease fitting (9) (Fig. 1) to fill or refill reservoir. It's recommended to run the motor by initiating the lube cycle during the first fill of the reservoir. The stirring paddle of the running motor will help to evenly distribute grease in the reservoir minimizing air pockets.

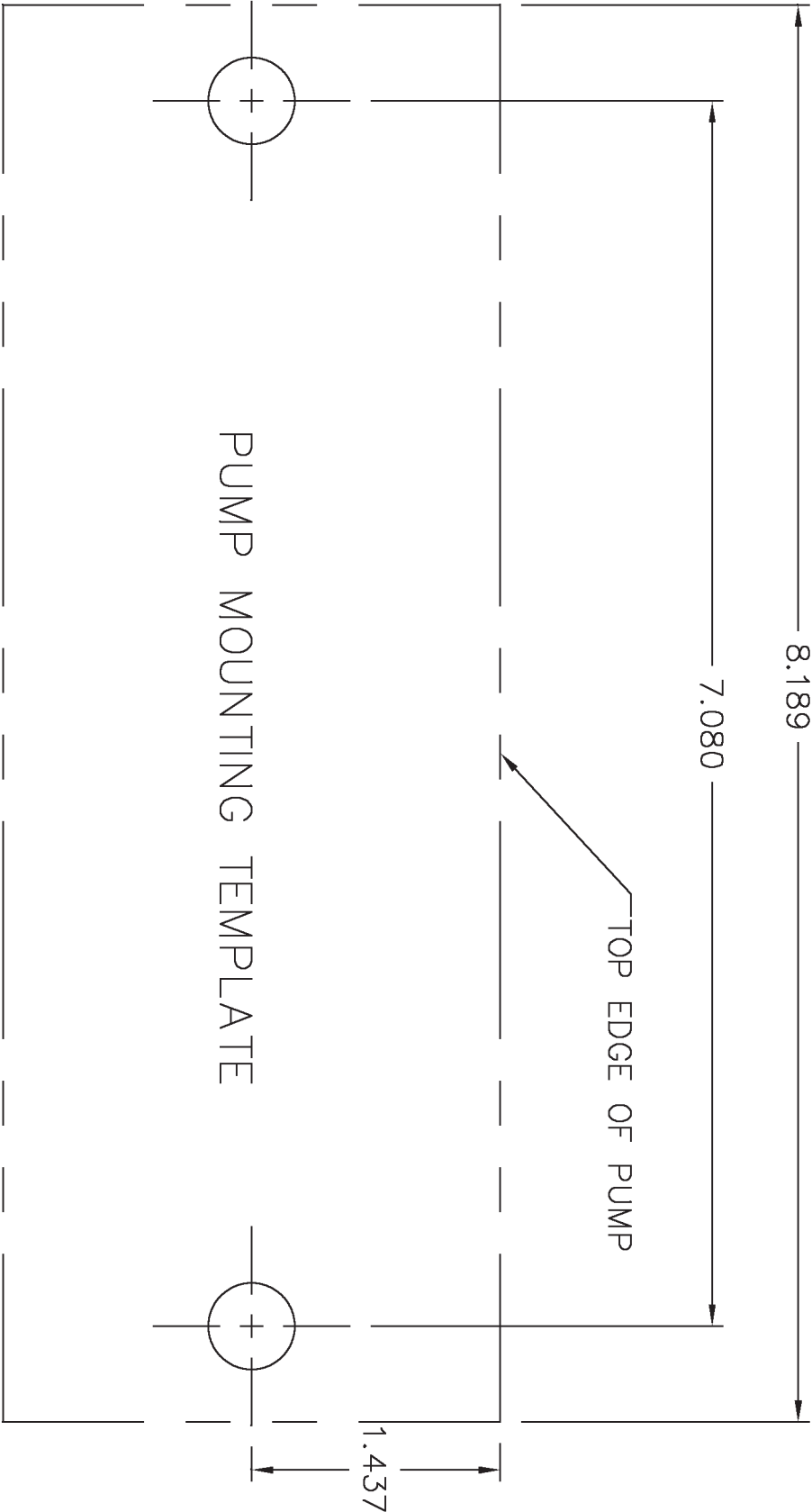
To speed up filling or refilling of the pump, grease fitting can be replaced with 1/8" swivel connection to attach a hose from a larger output filling pump.



**Caution!** There is a risk of reservoir bursting if overfilled. When filling the reservoir with large output fill or refill pump, do not exceed the maximum fill mark.

#### **Pump cleaning:**

Use petroleum or benzene based cleaning solutions. Do not use tri-, perchloroethylene or similar solvents. Do not use polar organics such as alcohol, methyl alcohol, acetone or similar solvents.



---

**Troubleshooting****Mode of failure**

Pump motor does not run. No green right corner segment lit on display (Fig. 18 page 15).

Pump does not deliver lubricant but runs if manual lube switch 3 (Fig. 17 page 15) is pushed. No green left corner segment lit on display (Fig. 19 page 15).

"LL" display is flashing. Reservoir is almost empty.

"E1" display is flashing. Pump failed to develop internal pressure in 12 minutes.

"E2" display is flashing. Pump failed to develop pressure at the end of the line (pump with external pressure switch or pressure transducer)

"E3" display is flashing. Pump failed to vent at the pump.

"E4" display is flashing. Pump failed to vent at the end of the line (pump with external pressure switch or pressure transducer).

Grease is coming out of the pressure relief valve (6) (Fig.1).

**Solution**

Check power supply and fuses.

Connect "ignition" or "machine" switch per electrical schematic on pages 28 and 29.

Pump with follower - refill reservoir. Pump without follower - refill reservoir and push switch (3) (Fig 17) to initiate manual lube cycle.

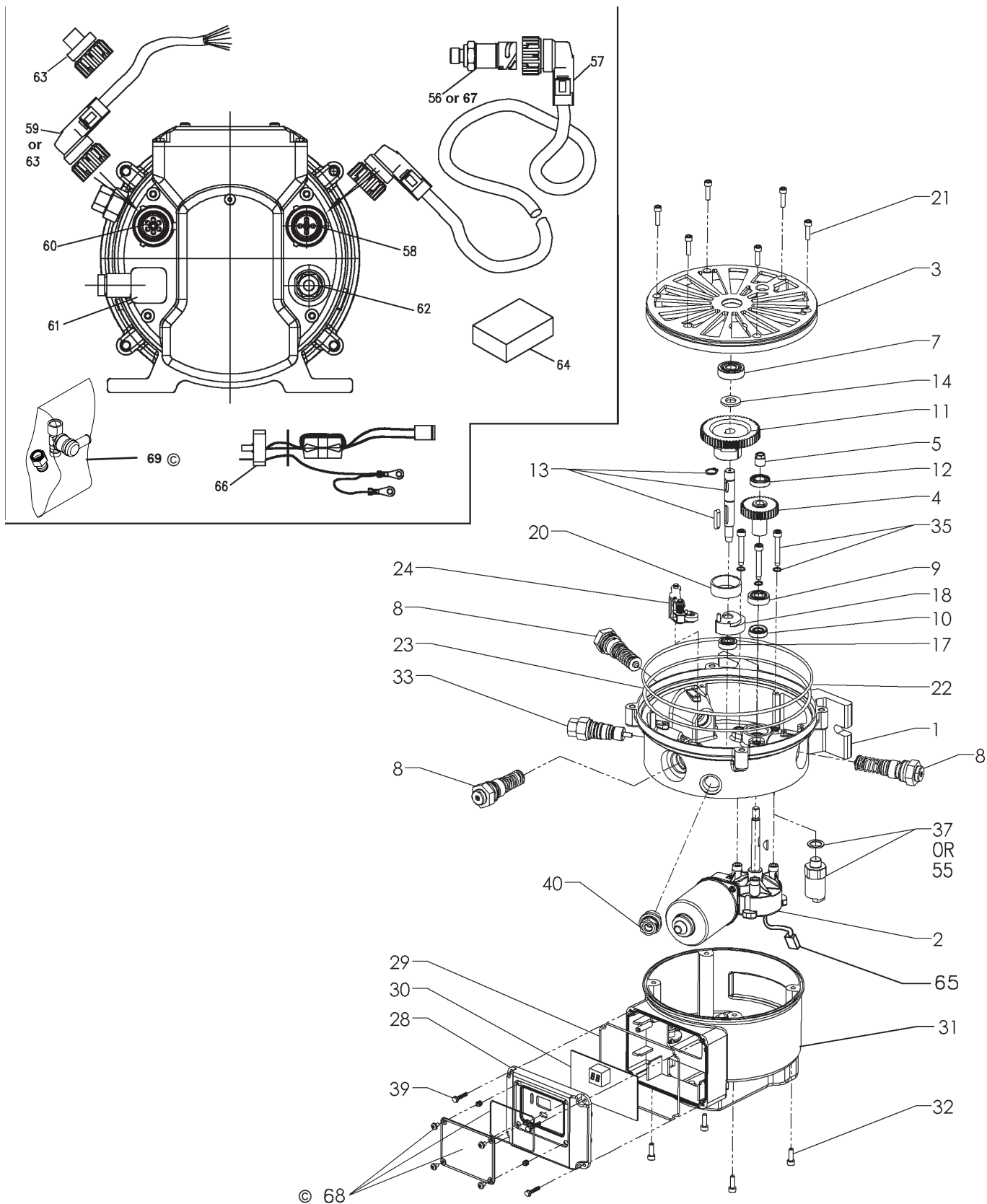
Push switch (2) (Fig 17) to acknowledge the fault. Initiate manual lube cycle. Investigate and correct possible causes - air pockets, broken line, connections leakage, worn pumping element, failed internal pressure switch or pressure transducer. Initiate manual lube cycle.

Push switch (2) (Fig 17) to acknowledge the fault. Initiate manual lube cycle. Investigate and correct possible causes - air pockets in lubrication line, connections leakage, grease consistency changed with low temperatures, failed end of line pressure switch or pressure transducer.

Push switch (2) (Fig 17) to acknowledge the fault. Initiate manual lube cycle. Investigate and correct possible causes - pump eccentric did not stop in a proper position, vent valve failed

Push switch (2) (Fig 17) to acknowledge the fault. Initiate manual lube cycle. Investigate and correct possible causes - restriction in lubrication line, grease consistency changed with low temperature, failed end of line pressure transducer or pressure switch.

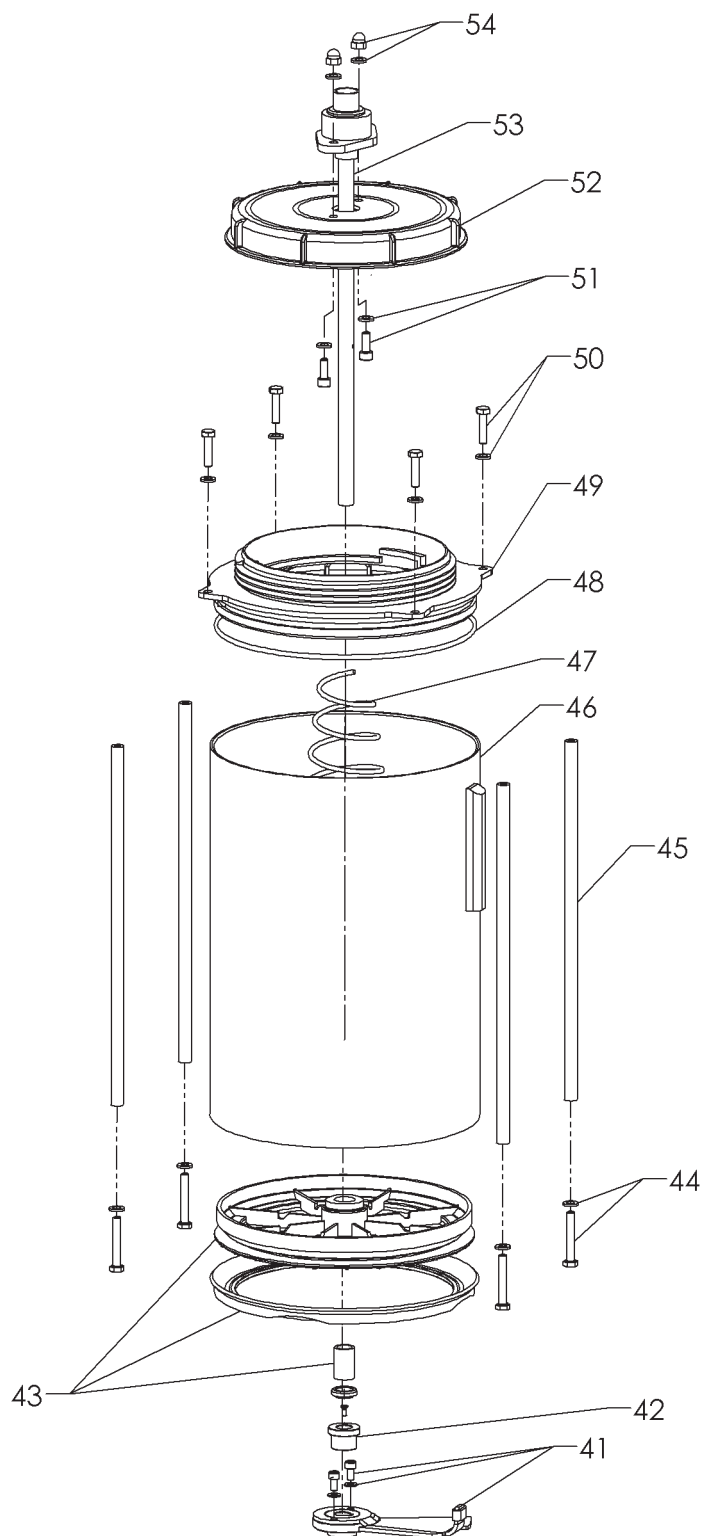
Check and adjust setting of the pressure transducer or failed pressure switch.



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**Pump with Follower**





**Pump with Follower**

# Electric Operated Centro-Matic Pump P653S

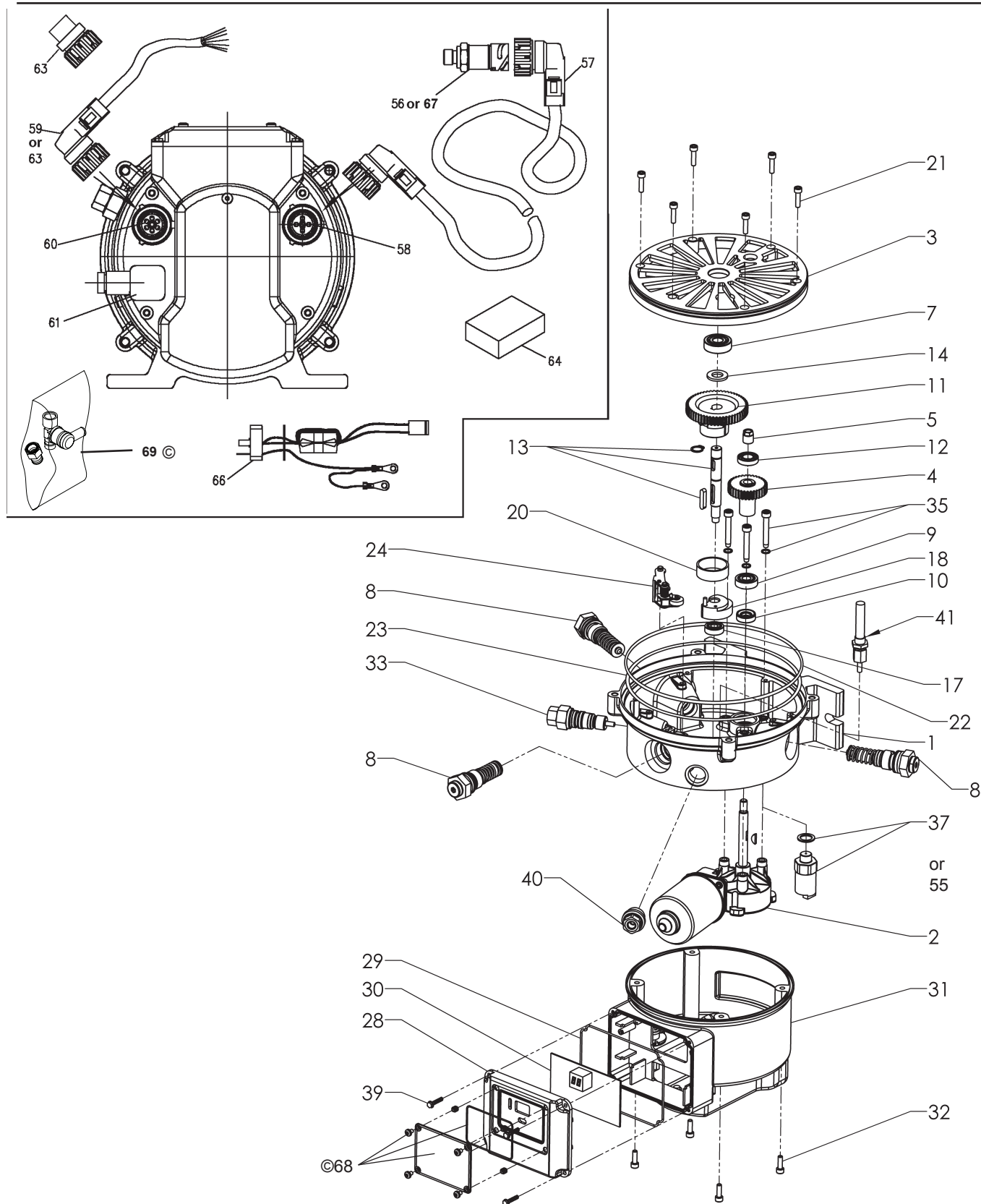


## P653S PUMP with follower (housing and reservoir)

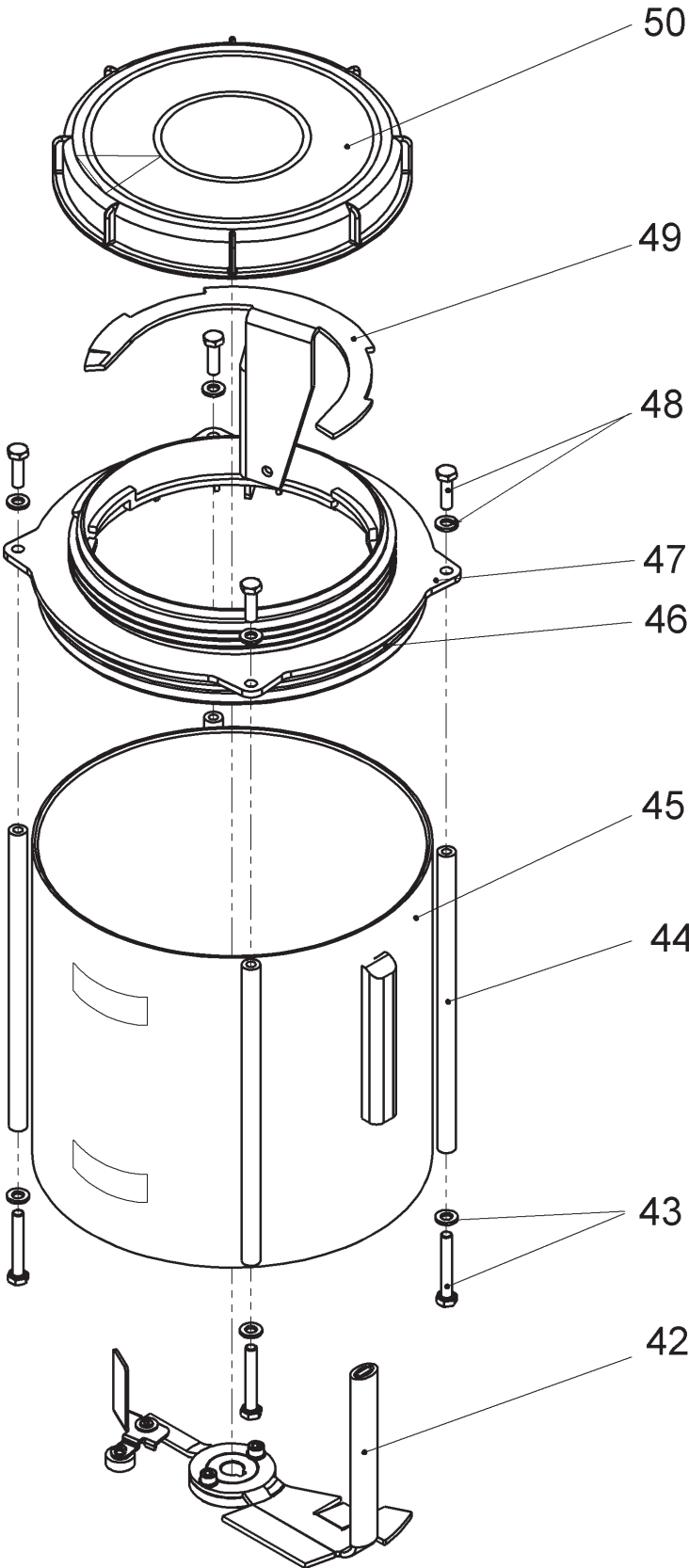
Item #	Part Number	Description	QTY	Item #	Part Number	Description	QTY
1	316-16444-1©	HOUSING	1		445-71528-1	SUPPORT SLEEVE, 15L RESERVOIR	4
2	275702	MOTOR, DRIVE 24VDC	1		445-71536-1	SUPPORT SLEEVE, 20L RESERVOIR	4
3	445-71524-1	INTERMEDIATE BOTTOM	1	46	545-33045-1	RESERVOIR, 4L W/VENT TUBE AND LABELS	1
4	275557	PINION GEAR, DRIVE	1		545-33044-1	RESERVOIR, 8L W/VENT TUBE AND LABELS	1
5	445-71527-1	THREADED SLEEVE	1		545-33041-1	RESERVOIR, 15L W/VENT TUBE AND LABELS	1
7	250-10683-1	BEARING D12/24X 6	1		545-33043-1	RESERVOIR, 20L W/VENT TUBE AND LABELS	1
8	645-77196-1	PUMP ELEMENT, Z7 SERVICE KIT	3	47	300-19860-1	SPRING, FOLLOWER, FOR 4L AND 8L RESERVOIR	1
9	250-14009-7	BEARING D10/26X 8	1		300-16288-1	SPRING, FOLLOWER, FOR 15L AND 20L RESERVOIR	1
10	220-12231-3	SEAL, RADIAL BA 75FKM 10X22X 7	1	48	219-10684-6	O-RING 72NBR 180.000 X 4.00	1
11	275558	GEAR, ECCENTRIC	1	49	445-71532-1	INSERT, RESERVOIR	1
12	250-14064-6	BEARING d12/32x10	1	50	200-13022-7	SCREW, HEX, 8.8 M6x20C	4
13	445-71266-1	SHAFT F.DRIVE with RETAINING RING AND KEY	1	51	201-12019-9	SCREW, SOCKET HEX, 8.8 M6x16C	2
14	209-13011-9	WASHER ST 12 C -200HV	1	52	444-70113-1	COVER, RESERVOIR	1
17	250-14064-7	BEARING D 8/22X 7	1	53	234-10693-6	CONTACT ROD, 4L RESERVOIR	1
18	445-71253-1	CAM, RELIEF UNIT	1		234-10693-7	CONTACT ROD, 8L RESERVOIR	1
20	444-24439-1	PRESS RING	1		234-10693-8	CONTACT ROD, 15L RESERVOIR	1
21	201-12016-8	SCREW, SOCK,HEX. 8.8 M 5X 20C	6		234-10693-9	CONTACT ROD, 20L RESERVOIR	1
22	219-10684-6	O-RING 72NBR 180,00X4,00	1	54	207-12247-2	NUT, CAP WITH WASHER 209-13011-5	2
23	219-10390-3	O-RING 72NBR 195,00x3,00	1	55	234-10663-6	PRESSURE TRANSDUCER WITH SEAL RING 209-12158-6	1
24	545-32906-1	ROCKER ARM, ASS'Y, RELIEF UNIT	1	56	234-10825-3	EXTERNAL PRESSURE TRANSDUCER	1
25		NOT USED	1	57	664-34550-7©	CABLE ASSY,10M.4/4 POLE	1
26		NOT USED	1	58	664-34550-6	CONNECTOR FOR EXTERNAL PRESSURE SWITCH/TRANSDUCER	1
27		NOT USED	4	59	664-34428-3	CABLE ASSY,10M,7/7 POLE (SHIELED©)	1
28©	545-33602-1	HOUSING FR. COVER W/SEALED KEYBOARD	1	60	664-34569-1	CONECTOR FOR SIGNAL CABLE 7 POLES (AC PUMP)	1
29	445-72277-1	PROFILE PACKING	1		664-34303-7	CONECTOR FOR SIGNAL CABLE 7 POLES (DC PUMP)	1
30	236-10655-3S©	PRINTED CIRCUIT BOARD*	1	61	236-13277-9	AC POWER CABLE PLUG	1
31	275666	COVER, HOUSING	1	62	664-34517-6	LOW LEVEL CONTROL SWITCH CABLE (4L RESERVOIR)	1
32	201-12016-6	SCREW, SOCK, HEX. 8.8 M 5X 16C	4		664-34517-7	LOW LEVEL CONTROL SWITCH CABLE (8L RESERVOIR)	1
33	545-33042-1	RELIEF ELEMENT	1		664-34517-5	LOW LEVEL CONTROL SWITCH CABLE (15L RESERVOIR)	1
35	206-13710-6	SCREW,6.0x40Z WITH SEAL 220-14101-1	3		664-34517-8	LOW LEVEL CONTROL SWITCH CABLE (20L RESERVOIR)	1
37	234-10723-8	PRESSURE SWITCH WITH SEAL RING 209-12158-6	1	63	664-34550-1©	PLUG, 7 POLE JUMPER	1
39	206-13796-9	SCREW W/WASHER	4	64	275906	POWER SUPPLY	1
40	304-19619-1	ADAPTER M22x1.5 W/GREASE FITTING 251-14045-9	1	65	664-34428-1	MOTOR CONNECTOR	1
41	545-33031-1	STIRING PADDLE ASSE'Y	1	66	664-34569-2	INTERNAL CABLE FOR AC PUMP	1
42	445-71267-1	BUSHING	1	67	234-10825-4	EXTERNAL PRESSURE SWITCH	1
43	544-33307-1	FOLLOWER PLATE ASS'Y	1	68©	545-34361-6	PROTECTIVE COVER KIT	1
44	200-12000-3	SCREW, HEX, 8.8 M6x40C	4	69©	624-77150-1	VALVE SVTE - 400 - R 1/4 + NIP. S2520 -1/4 I. BAG	1
45	445-71543-1	SUPPORT SLEEVE, 4L RESERVOIR	4	-	271249	HORIZONTAL MOUNTING BRACKET	1
	445-71542-1	SUPPORT SLEEVE, 8L RESERVOIR	4	-	226-14105-5	ADAPTER S2520-1/4-1/4-25	1

\* When replacing Printed Circuit Board 236-10655-3S©, special attention must be given to the jumper settings. The replacement Printed Circuit Boards are shipped with a standard factory setting. For your pump to work properly, the replacement Printed Circuit Board jumper settings must duplicate the original Printed Circuit Board.

© Indicates change



**PUMP WITHOUT FOLLOWER**



PUMP WITHOUT FOLLOWER



# Electric Operated Centro-Matic Pump P653S

## P653S Pump without Follower (Housing and Reservoir)

Item #	Part Number	Description	QTY	Item #	Part Number	Description	QTY
1	316-16445-1	HOUSING	1	41	234-10423-6	PROXIMITY SWITCH	1
2	275702	MOTOR, DRIVE 24VDC	1	42	545-33093-1	STIRING PADDLE ASSE'Y	1
3	445-71524-1	INTERMEDIATE BOTTOM	1	43	200-12000-3	SCREW, HEX, 8.8 M6x40C	4
4	275557	PINION GEAR, DRIVE	1	44	445-71543-1	SUPPORT SLEEVE, 4L RESERVOIR	4
5	445-71527-1	THREADED SLEEVE	1		445-71542-1	SUPPORT SLEEVE, 8L RESERVOIR	4
7	250-10683-1	BEARING D12/24X 6	1		445-71528-1	SUPPORT SLEEVE, 15L RESERVOIR**	4
8	645-77196-1©	PUMP ELEMENT, Z7 SERVICE KIT	3		445-71536-1	SUPPORT SLEEVE, 20L RESERVOIR**	4
9	250-14009-7	BEARING D10/26X 8	1	45	545-33045-1	RESERVOIR, 4L W/VENT TUBE AND LABELS	1
10	220-12231-3	SEAL, RADIAL BA 75FKM 10X22X 7	1		545-33044-1	RESERVOIR, 8L W/VENT TUBE AND LABELS	1
11	275558	GEAR, ECCENTRIC	1		545-33041-1	RESERVOIR, 15L W/VENT TUBE AND LABELS***	1
12	250-14064-6	BEARING d12/32x10	1		545-33043-1	RESERVOIR, 20L W/VENT TUBE AND LABELS***	1
13	445-71266-1	SHAFT F.DRIVE with RETAINING RING AND KEY	1	46	219-10684-6	O-RING 72NBR 180.000 X 4.00	1
14	209-13011-9	WASHER ST 12 C -200HV	1	47	445-71532-1	INSERT, RESERVOIR	1
17	250-14064-7	BEARING D 8/22X 7	1	48	200-13022-7	SCREW, HEX, 8.8 M6x20C	4
18	445-71253-1	CAM, RELIEF UNIT	1	49	444-70490-1	FIXED PADDLE	1
20	444-24439-1	PRESS RING	1	50	444-70641-1	COVER, RESERVOIR	1
21	201-12016-8	SCREW, SOCK,HEX. 8.8 M 5X 20C	6	55	234-10663-6	PRESSURE TRANSDUCER WITH SEAL RING©	1
22	219-10684-6	O-RING 72NBR 180,00X4,00	1	56	234-10825-3	EXTERNAL PRESSURE TRANSDUCER	1
23	219-10390-3	O-RING 72NBR 195,00x3,00	1	57	664-34550-7©	CABLE ASSY,10M,4/4 POLE (SHIELDED©)	1
24	545-32906-1	ROCKER ARM, ASS'Y, RELIEF UNIT	1	58	664-34550-6	CONNECTOR FOR EXTERNAL PRESSURE SWITCH/TRANSDUCER	1
25		NOT USED	1				
26		NOT USED	1	59	664-34428-3	CABLE ASSY,10M,7/7 POLE	1
27		NOT USED	4	60	664-34569-1	CONECTOR FOR SIGNAL CABLE 7 POLES (AC PUMP)	1
28©	545-33602-1	HOUSING FR. COVER W/SEALED KEYBOARD	1		664-34303-7	CONECTOR FOR SIGNAL CABLE 7 POLES (DC PUMP)	1
29	445-72277-1	PROFILE PACKING	1	61	236-13277-9	AC POWER CABLE PLUG	1
30	236-10655-3S©	PRINTED CIRCUIT BOARD 24 V*	1	63	664-34550-1©	PLUG, 7 POLE JUMPER	1
31	275666	COVER, HOUSING	1	64	275906	POWER SUPPLY	1
32	201-12016-6	SCREW, SOCK, HEX. 8.8 M 5X 16C	4	66	664-34569-2	INTERNAL CABLE FOR AC PUMP	1
33	545-33042-1	RELIEF ELEMENT	1	67	234-10825-4	EXTERNAL PRESSURE SWITCH	1
35	206-13710-6	SCREW,6.0x40Z WITH SEAL 220-14101-1	3	68©	545-34361-6	PROTECTIVE COVER KIT	1
37	234-10723-8	PRESSURE SWITCH WITH SEAL RING 209-12158-6	1	69©	624-77150-1	VALVE SVTE - 400 - R1/4 + NIP. S2520 - 1/4 I. BAG	1
39	206-13796-9	SCREW W/WASHER	4	-	271249	HORIZONTAL MOUNTING BRACKET	1
40	304-19619-1	ADAPTER M22x1.5 W/GREASE FITTING 251-14045-9	1	-	226-14105-5	ADAPTER S2520-1/4-1/4-25	1

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\*\* Components available in kit to convert 4 and 8 liter to 15 liter - part # 276764.

\*\*\* Components available in kit to convert 4 and 8 liter to 20 liter - part # 276765.

