
GARDNER DENVER®

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GD300Q

QUINTUPLEX

PLUNGER PUMP

MODEL
QAF
6" STROKE

OPERATING AND
SERVICE MANUAL

Gardner

Denver

**MAINTAIN PUMP RELIABILITY AND PERFORMANCE WITH
GENUINE GARDNER DENVER
PARTS AND SUPPORT SERVICES**

Gardner Denver® and OPI® genuine pump parts are manufactured to original tolerances and designed for optimum dependability. Design and material innovations are the result of years of experience with hundreds of different pump applications. Reliability in materials and quality assurance are incorporated in our genuine replacement parts.

Your authorized Gardner Denver and OPI distributor offers all the backup you'll need. A worldwide network of authorized distributors provides the finest product support in the pump industry.

Your local authorized distributor maintains a large inventory of genuine parts and he is backed up for emer-

gency parts by direct access to the Gardner Denver Machinery Inc. Master Distribution Center (MDC) in Memphis, Tennessee.

Your authorized distributor can support your Gardner Denver and OPI pump needs with these services:

1. Trained parts specialists to assist you in selecting the correct replacement parts.
2. Repair and maintenance kits designed with the necessary parts to simplify servicing your pump.

Authorized distributor service technicians are factory-trained and skilled in pump maintenance and repair. They are ready to respond and assist you by providing fast, expert maintenance and repair services.

For the location of your local authorized Gardner Denver and OPI distributor refer to the yellow pages of your phone directory or contact:

Distribution Center:
Gardner Denver Machinery Inc.
Master Distribution Center
5585 East Shelby Drive
Memphis, TN 38141
Phone: (901) 363-6100
Fax: (901) 363-1095

Factory:
Gardner Denver Machinery Inc.
1800 Gardner Expressway
Quincy, IL 62301
Phone: (217) 222-5400
Fax: (217) 224-7814

INSTRUCTIONS FOR ORDERING REPAIR PARTS

When ordering parts, specify Pump MODEL and SERIAL NUMBER (see nameplate on unit). The Serial Number is also stamped on top of the cylinder end of the frame (cradle area).

All orders for Parts should be placed with the nearest authorized distributor.

Where NOT specified, quantity of parts required per pump or unit is one (1); where more than one is required

per unit, quantity is indicated in parenthesis. **SPECIFY EXACTLY THE NUMBER OF PARTS REQUIRED.**

DO NOT ORDER BY SETS OR GROUPS.

To determine the Right Hand and Left Hand side of a pump, stand at the power end and look toward the fluid end. Right Hand and Left Hand are indicated in parenthesis following the part name, i.e. (RH) & (LH), when appropriate.

FOREWORD

Gardner Denver® and OPI® pumps are the result of advanced engineering and skilled manufacturing. To be assured of receiving maximum service from this machine the owner must exercise care in its operation and maintenance. This book is written to give the operator and maintenance department essential information for day-to-day operation, maintenance and adjustment. Careful adherence to these instructions will result in economical operation and minimum downtime.

DANGER

Danger is used to indicate the presence of a hazard which will cause severe personal injury, death, or substantial property damage if the warning is ignored.

WARNING

Warning is used to indicate the presence of a hazard which can cause severe personal injury, death, or substantial property damage if the warning is ignored.

CAUTION

Caution is used to indicate the presence of a hazard which will or can cause minor personal injury or property damage if the warning is ignored.

NOTICE

Notice is used to notify people of installation, operation or maintenance information which is important but not hazard-related.

TABLE OF CONTENTS

Maintain Pump Reliability and Performance with Genuine Gardner Denver Parts and Support Services i

Instructions For Ordering Repair Parts i

Foreword ii

Index iv

Section 1, Danger Notices 1

Section 2, Operating and Maintenance Instructions 7

Section 3, Service Instructions 9

Rebuilding Data 11

Running Clearances 11

Torque Specifications 12

**For Part List Refer to:
MANUAL 3-1-507**

INDEX

Bearings, Main	10	Lifting and Moving Equipment, Danger Notice	2
Covers and Guards, Danger Notice	2	Lubrication	7
Crankshaft	10	Lubricator	10
Crosshead & Connecting Rods	10	MAIN BEARINGS	10
DANGER NOTICES, SECTION 1	1	Moving and Lifting Equipment, Danger Notice	2
Danger Notices		New Pump, Starting	7
Covers and Guards	2	Operation	7
Equipment Moving and Lifting	2	Ordering Instructions, Repair Parts	i
Flammable, Hot, Cold or Corrosive Fluid Pumping	5	Packing	9
Hammer Lug Fasteners	1	Piping, Suction	7
High Pressure Liquid Jetting, Blasting and Cleaning	5	Plunger	9
Hydraulic	2	Pressurized Pump Systems, Danger Notice	3
Pressurized Pump Systems	3	Rebuilding Data	11
Valve Seat Pulling	2	Relief Valve	7
Wedge Puller	2	Repair Parts, Ordering Instructions	i
Equipment Moving and Lifting, Danger Notice	2	Running Clearances, Crankpin Bearing and Cross- head Frame	11
Flammable, Hot, Cold or Corrosive Fluid Pumping, Danger Notice	5	Sectional Views of "QAF" Plunger Pump	8
Fluid Cylinders	9	SERVICE INSTRUCTIONS, SECTION 3	9
Foreword	ii	Starting a New Pump	7
Hammer Lug Fasteners, Danger Notice	1	Torque	12
High Pressure Liquid Jetting, Blasting and Cleaning, Danger Notice	5	Valve, Relief	7
Hydraulic Puller, Danger Notice	2	Valve Seat Pulling, Danger Notice	2
Installation	7	Valves	9
INSTALLATION AND OPERATING INSTRUCTIONS, SECTION 2	7	Warranty	Last Page
		Wedge Puller, Danger Notice	2

SECTION 1

DANGER NOTICES

DANGER

Read and understand the following DANGER NOTICES before moving or operating the pump or any pump package unit equipment.

Reciprocating pumps are machines capable of producing high fluid pressures and flow rates and are designed to be used with proper care and caution by trained, experienced operators. **TO AVOID PERSONAL INJURY, DEATH AND/OR EQUIPMENT DAMAGE, READ AND THOROUGHLY UNDERSTAND THE FOLLOWING DANGER NOTICES PLUS THE ENTIRE OPERATING AND SERVICE MANUAL BEFORE ATTEMPTING TO MOVE OR OPERATE THE PUMP.** Contact a Gardner Denver Machinery service representative if you are unable to comply with any of the danger notices or procedures described in these documents.

Closely examine the data plate upon pump delivery to become thoroughly familiar with the operating limits for this pump model. **The pump must never be operated at speeds, pressures or horsepower exceeding the maximum values shown on the data plate or at speeds below the minimum shown. Failure to observe the operating limits shown on the data plate could result in personal injury, death, and/or equipment damage and will void the warranty.** Alterations to the pump, or application of the pump outside the data plate limits, must not be made without Gardner Denver Machinery written approval together with a new data plate, as dangerous operating conditions could result.

THE DANGER NOTICE AND DATA PLATES PROVIDED ON THE EQUIPMENT MUST NOT BE REMOVED, PAINTED OVER, HIDDEN OR DEFACED. They must be replaced if they become damaged or unreadable. Provisions should be made to have the following written danger notices plus the pump operating and service manual readily available to operators and maintenance personnel. In addition, copies of all pump system accessory component (e.g. pressure relief valve, pulsation dampener, suction stabilizer, engine, electric motor, etc.) operating and service manuals should be readily available for operator and maintenance personnel use. Read and follow all the precautions and instructions contained in these manuals. If any of these documents are lost or become illegible they must be replaced immediately. The danger notices plus the operating and service manuals should be

reread periodically by both operators and maintenance personnel to refresh their memories in safe procedures and practices.

Keep in mind that full operator attention and alertness are required when operating high pressure pumping equipment. Operators should not begin or continue operations when tired, distracted or under the influence of alcohol or any type of prescription or nonprescription drugs.

The timely replacement of expendable parts and any other worn or damaged parts can prevent equipment damage and possible injury. The original parts used in Gardner Denver pumps are designed and tested to exacting standards to provide high quality performance and durability. Your best insurance in maintaining these characteristics is to use genuine Gardner Denver replacement parts.

A broad range of danger notices are covered on these pages, however, they cannot substitute for training, experience and common sense in the safe operation of high pressure pumping equipment.

HAMMER LUG FASTENERS

DANGER

On pumps or pump package units equipped with hammer lug connectors and/or hammer lug valve covers the following precautions must be observed to avoid personal injury, death and/or equipment damage due to contact with the hammer, hammer bar, broken parts from the hammer, hammer bar or lugs or other objects propelled by hammer blows. When tightening or loosening hammer lug connectors and valve covers, operators or maintenance personnel should:

- Inspect the hammer, hammer lugs and hammer bar, if one is used, to insure they are all in good condition. Replace any of these parts which are cracked, damaged or badly worn.
- Wear safety shoes and goggles.
- Alert other personnel to move away from the area.
- Check to insure they have safe footing.
- Fully engage the hammer bar, if one is used, to prevent it from disengaging violently from the cover as a blow is struck.
- Wipe their hands and the hammer handle and maintain a firm grip on the handle to avoid los-

ing control of the hammer while swinging and striking.

- Carefully swing the hammer to avoid striking themselves, another person and objects other than the targeted lugs or hammer bar.
- Avoid swinging the hammer above shoulder height.

VALVE SEAT PULLING

DANGER

The following precautions must be observed by operators and maintenance personnel to avoid personal injury, death and/or equipment damage from contact with the puller, hammer, wedge or broken parts from these components when using either a hydraulic or wedge valve seat puller. Operators or maintenance personnel should:

Hydraulic Puller

- Wear safety shoes and goggles.
- Chain or tie the jack down as it will jump violently when the valve seat disengages from the valve deck.
- Check to insure the pressure applied by the hydraulic pump does not exceed the hydraulic ram maximum pressure rating.

Wedge Puller

- Grind off any mushroomed material from the wedge before use.
- Inspect the hammer and wedge to insure they are in good condition. Replace any of those parts which are cracked, damaged or badly worn.
- Wear safety shoes and goggles.
- Check to insure they have safe footing.
- Fully engage the wedge to prevent it from disengaging violently from the cover as a blow is struck.
- Wipe their hands and the hammer handle and maintain a firm grip on the handle to avoid losing control of the hammer while swinging and striking.
- Carefully swing the hammer to avoid striking themselves, another person and objects other than the targeted wedge.
- Avoid swinging the hammer above shoulder height.

COVERS AND GUARDS

DANGER

Personal injury, death, and/or equipment damage can result from contact with moving parts. All moving parts must be equipped with covers and guards. All covers and guards must be securely positioned at all times when the unit is in operation.

Covers and guards are intended to not only protect against personal injury or death, but to also protect the equipment from foreign object damage.

EQUIPMENT MOVING AND LIFTING

DANGER

Heavy equipment including pumps, pump package units and components should only be moved or lifted by trained, experienced operators, who are physically and mentally prepared to devote full attention and alertness to the moving and lifting operations. An operator should be fully aware of the use, capabilities, and condition of both the equipment being moved and the equipment being used to move it.

DANGER

Failure to follow safe and proper pump, pump package or component lifting or moving procedures can lead to personal injury, death and/or equipment damage from shifting, falling or other unexpected or uncontrolled equipment movements.

Make sure the hoist, lift truck, ropes, slings, spreader, or other lifting equipment you are using is in good condition and has a rated lifting capacity equal to or greater than the weight being lifted. Lifting devices must be checked frequently for condition and continued conformance to rated load capacity. They should then be tagged with the inspected capacity together with the date of inspection.

Fully assembled pumps and pump package units are heavy and should only be moved using the specified lifting lugs or attachments.

Many individual components have lifting eyes or lugs which must not be used to lift assemblies, as they are designed to bear the weight of the component only.

Before lifting the individual component check to insure the lifting attachment is firmly secured to the component with undamaged, properly torqued fasteners, sound welds, or other secure attachments. Examine the lifting eyes, lugs, slots, holes or other projections to insure they are not cracked, otherwise damaged or badly worn. The repair of existing or addition of new welded lifting eyes, lugs or other projections should only be performed by experienced, qualified welders.

Package units should be lifted with spreaders connected to the lifting attachments normally built into the package unit support skid. Packages too large to lift fully assembled should be separated into smaller loads.

For these smaller loads the lifting devices should be fastened to the lifting attachments normally built into the individual motor, engine, pump or transmission/torque converter, or their separate support skids.

When lifting subassembled components, for example a suction stabilizer attached to suction piping or a discharge pulsation dampener attached to a strainer cross and piping, use special lifting slings designed to safely support the combined weight of the components.

If a crane or hoist is being used to lift large components or assemblies, one or more persons should assist the operator from the ground with guide lines attached to the equipment being moved to properly position it and prevent uncontrolled movement.

When you start to lift a pump, package unit, subassemblies or individual components and you observe the equipment is tilting, or appears unbalanced, lower the equipment and adjust the lifting device to eliminate these improper lifting conditions before proceeding to move the equipment.

It is poor practice and dangerous to allow the equipment to pass over or close to your body or limbs. Be prepared to move quickly out of danger if equipment starts to fall, slip or move unexpectedly toward you.

PRESSURIZED PUMP SYSTEMS

DANGER

Fluids under high pressure can possess sufficient energy to cause personal injury, death and/or equipment damage either through direct contact with escaping fluid streams or by contact with loose objects the pressurized fluid propels.

Operating a pump against a blocked or restricted discharge line can produce excessive pressures in the entire discharge system, which can damage or burst discharge system components.

DANGER

Never operate a pump without a properly sized pressure relief valve located in the flowing discharge line immediately adjacent to the pump discharge connection.

The relief valve should be placed in the flowing discharge line and not at the opposite end of the discharge manifold in a dead end connection. The dead end may become clogged with solid material carried in the fluid, which could prevent proper relief valve operation.

DANGER

Never place a shut-off valve or any other component between the pump discharge connection and the pressure relief valve.

Make sure the pressure relief valve is installed so any pressurized relief discharge from the valve is directed away from possible contact with people or equipment. The relief valve must be set to relieve at a pressure equal to or below the maximum pressure values shown on the pump data plate. However, if a component is used in the discharge system with a lower rated pressure capability than that listed on the pump data plate,

the pressure relief valve must be set to relieve at a pressure equal to or below the rated capability of the lowest rated component.

Before starting the pump every time, check to insure:

- The pressure relief valve is in good operating condition and has been set to the proper relief pressure.
- Any pipe line used to direct pressurized relief flow to another location, such as a collecting tank, is not blocked.
- The discharge system is not blocked and all the discharge line valves are open.

Check all fluid end discharge system components including pipe, connections, elbows, threads, fasteners, hoses, etc., at least once every six months to confirm their structural adequacy. With time, wear, corrosion and fatigue can reduce the strength of all components. Magnetic iron and steel components should be checked with magnetic particle or dye penetrate crack detection equipment. Nonmagnetic materials should be checked for cracks with dye penetrants. All metallic components should also be visually checked during these inspections for signs of corrosion. If a component shows evidence of cracking or loss of material due to corrosion it must be replaced with a new part.

Continually monitor suction and discharge hose assemblies when the pump is operating for leakage, kinking, abrasion, corrosion or any other signs of wear or damage.

Worn or damaged hose assemblies should be replaced immediately. At least every six months examine hose assemblies internally for cut or bulged tube, obstructions and cleanliness. For segment style fittings, be sure that the hose butts up against the nipple shoulder, the band and retaining ring are properly set and tight and the segments are properly spaced. Check for proper gap between nut and socket or hex and socket. Nuts should swivel freely. Check the layline of the hose to be sure that the assembly is not twisted. Cap the ends of the hose with plastic covers to keep them clean until they are tested or reinstalled on the pump unit. Following this visual examination, the hose assembly should be hydrostatically tested, on test stands having adequate guards to protect the operator, per the hose manufacturer's proof test procedure.

Fluid end component inspections should be performed more frequently than every six months if pressures above 2500 psi are used in the discharge system or if corrosive, flammable or hot (over 110° F) fluids are being pumped.

Proper stuffing box packing selection is important for safe pump operation. Contact a Gardner Denver Machinery service representative for assistance in selecting the proper packing before beginning operation.

Before starting the pump the first time and periodically thereafter check the pump, suction and discharge system fastener torques versus the values listed on page 12 to insure proper tightness. Over and under torquing can damage threaded pipes, connections and fasteners, which may lead to component damage and/or failure. Replace all components found to be damaged or defective. On pumps equipped with stuffing boxes, the gland must be engaged by at least three (3) threads to hold the discharge pressure of the pump.

 **DANGER**

Do not attempt to service, repair, adjust the plunger packing or otherwise work on the pump while the unit is operating. Shut off the pump drive motor or engine and relieve the fluid pressure in the pump suction and discharge systems before any work or investigation is performed on the pump or pump systems.

Block the crankshaft from turning and make certain that all pump drive motor or engine start switches or starter controls are clearly tagged with warnings not to start the pump while repair work is in process.

Whenever the pump is operating, continually monitor the entire suction, discharge and pump lubricating systems for leaks. Thoroughly investigate the cause for leakage and do not operate the pump until the cause of the leak has been corrected. Replace any parts which are found to be damaged or defective. When a gasketed joint is disassembled for any reason, discard the used gasket and replace it with a new, genuine Gardner Denver gasket before reassembling the joint.

Due to the high working pressures contained by the fluid cylinder, discharge manifold and discharge piping, welding on these components is not recommended. If welding on the discharge system cannot be avoided, only experienced, qualified welders should be used. In addition, the welded part should be hydrostatically proof tested in the shop with water or hydraulic fluid to one and one half times maximum discharge system working pressure, with no observable fluid leakage, before the part is reinstalled in the pump system.

In summary, high pressure fluid streams can possess

sufficient energy to cause personal injury, death and/or equipment damage. These results can occur either through direct contact with the fluid stream or by contact with loose objects the fluid stream has propelled, if the pump system is improperly used, or if the fluid is misdirected, or allowed to escape from defective or improperly maintained equipment.

FLAMMABLE, HOT, COLD OR CORROSIVE FLUID PUMPING

DANGER

Extreme caution must be exercised by trained and experienced operators when flammable, hot, cold or corrosive fluids are being pumped, in order to avoid personal injury, death and/or equipment damage due to explosion, fire, burn, extreme cold or chemical attack.

Never operate a pump which is pumping hydrocarbons or other flammable, hot, cold, or corrosive fluids when any part of the pump, suction system or discharge system is leaking. Stop the pump immediately if any leakage, other than a few drops per minute of packing weepage, is observed. Keep all flame, sparks, or hot objects away from any part of the pump, suction system, or discharge system. Shield the pump, suction system and discharge system to prevent any flammable, hot, cold or corrosive fluid leakage from dripping or spraying on any components, flame, sparks, hot objects or people. Inspect the plungers, packing, gaskets and seals for fluid leakage frequently and replace all worn or leaking parts.

Selection of the proper gaskets, seals and stuffing box packing is even more critical when flammable, hot, cold or corrosive fluids are being pumped than when other, inherently less dangerous fluids are used. Contact a Gardner Denver Machinery service representative for assistance in selecting the proper gaskets, seals and packing before beginning operation.

Since some packing weepage into the cradle area is inevitable, the drain at the bottom of the cradle must be connected to a drain line which conducts the fluid leakage to a collection container located in a protected area. The entire drain system and container must be constructed of materials resistant to attack from the pumped fluid or from explosion or fire of the pumped fluid. **Heavy duty cradle covers must be securely fastened in the proper position on the pump at all**

times when the pump is operating. If the pumped fluid releases harmful, explosive or flammable vapors the covers must be vented to conduct the fumes away from the pump unit to a nonhazardous area.

Before beginning pumping operations or starting the pump power source (whether an engine or electric motor) check the atmosphere all around the pumping site for the presence of flammable or explosive vapors. Do not begin operation and stop ongoing operation if flammable or explosive vapors are detected. Hot surfaces, sparks, electric current or engine exhaust could ignite flammable or explosive vapors. Each engine used as a power source on pumping units where flammable or explosive vapors could form should be equipped with an air inlet shut-off. If flammable or explosive vapors are present in the pumping site atmosphere, an engine could continue to run on these vapors even after the engine fuel line is shut-off if an air inlet shut-off is not used.

In addition, on pumping units used where flammable or explosive vapors could form, all electric motors used as power sources must be of explosion proof construction and all electrical components and wiring must meet the current National Electrical Code for explosive atmospheres.

These precautions must be taken to avoid possible personal injury, death and/or equipment damage from explosion, fire or burns.

HIGH PRESSURE LIQUID JETTING, BLASTING AND CLEANING

DANGER

Extreme caution must be exercised if any type of wand, gun, nozzle or any other pressure and flow directing device is attached to the pump discharge system for use in jetting, blasting, cleaning, etc. This type of equipment must be used with utmost care by trained, experienced operators. High pressure fluid streams can either by direct contact or by propelling loose objects, cause serious personal injury or death to the operators and/or other persons.

Pressure or flow directing devices often receive pressurized flow through flexible hoses, which can burst if

they are kinked, cut, abraded or are otherwise worn, damaged or pressured above their rated capacity. Protect the hose and connections from damage by people, objects and vehicles. A broken, cut or otherwise burst hose can release pressurized fluid which may cause personal injury, death and/or equipment damage.

High pressure fluid from hand held or hand directed pressure and flow directing devices may overpower an operator's ability to control or direct the device, which could lead to personal injury, death and/or equipment damage. The operator must brace against the backward thrust of a hand held device. In addition, a safety harness or safety net must be used when working in an area where the operator could be injured in a fall. Stand to the side of any tubing or container being sprayed to avoid back spray and never operate a hand held device above shoulder level.

Never direct the pressurized fluid stream at yourself or any other person, control valves, the pump, pump drive, suction or discharge systems. The pressurized stream can cause serious personal injury or death and can also change valve or control settings which could dangerously increase the delivery pressure to the pressure and flow directing device.

When operating a pressure and flow directing device, use only equipment which automatically shuts off flow when an operator releases hand or foot pressure on the pressurized flow trigger control to prevent injury if the operator is overpowered or becomes disabled.

Check to insure this automatic shut-off equipment is operating properly before every use and never circumvent the automatic shut-off for any reason or by any means when operating the equipment.

When operating any type of high pressure liquid jetting, blasting or cleaning devices the operators must always wear protective clothing including, but not limited to, a hard hat with full face visor, heavy duty rain coat and pants, boots with nonskid sole and safety toe, rubber gloves with rough grip surface and ear noise protection.

Full operator attention and alertness are required when operating this equipment to avoid personal injury, death and/or equipment damage. The operators should take frequent rest breaks and cease operations when they become tired or distracted.

Before the equipment is started, the work area must be inspected and properly prepared to avoid personal injury, death and/or damage to equipment. Make sure the work area is checked for hazardous fumes, has adequate ventilation for engine exhaust and sufficient drainage for released fluid. Check the work area for electrical equipment, connections, outlets, fixtures, or lines. If any are present they must be made water tight

and the electrical power to these devices must be shut off to avoid electrical shocks from fluid contact. The work area should be clearly marked and roped off to keep unauthorized people and vehicles from entering. Remove all loose parts, tools and equipment from the work area before beginning operation.

All pressure containing devices including wands, nozzles, guns, hoses, connections, etc., should be regularly checked for condition. These components should all be tagged with their tested pressure capabilities together with the date testing was performed. **Always be aware of the pressure level in the system and never connect any equipment to the system which has a rated or tested pressure capability below the system operating pressure.** The equipment must be shut down and the system pressure released before changing or disconnecting wands, nozzles, guns, hoses, connections or any other pressurized system components.

All pressure containing devices including wands, nozzles, guns, connections, etc., plus all automatic shut-off, pressure and control equipment should be treated with care. Protect them from damage by people, objects and vehicles. **Never** lay them in dirt, mud, ice or other loose material which could plug the fluid opening or interfere with their operation. **Never** use the wand, nozzle, gun, etc. to pry loose material off items being cleaned.

Before starting operation in a cold environment, check to make sure there is no ice in the fluid system and repeat this inspection each time before operation is restarted.

Before purchasing wands, nozzles, guns, connections, and hose, etc., manufacturers of these components should be contacted for detailed information on the design and safety features incorporated in their products. After careful study of various manufacturers products, we recommend that **only** those wands, nozzles, guns, connections and hose, etc., be considered for purchase that you judge to offer the highest quality of design, construction and safety, since these components are among the most critical to the safe operation of high pressure liquid jetting, blasting and cleaning equipment.

After you have selected and purchased these components, follow the manufacturer's instructions completely in their use.

In summary, high pressure jetting, blasting and cleaning are inherently dangerous, as the pressures and flow rates needed to remove scale, clean, etc. are sufficient to cause personal injury, death and/or equipment damage resulting from, but not limited to, any of the conditions described in the above Danger Notices.

SECTION 2 OPERATING AND MAINTENANCE INSTRUCTIONS

FOR GARDNER DENVER QAF QUINTUPLEX PLUNGER PUMPS

LOCATION – Pump should be set level. The drive should be accurately aligned. Pump should be placed as close to the supply as possible to keep the suction line short and direct. Pump must have a positive suction, 10–feet (3–meter) head minimum of water at ambient temperature. Maximum permissible temperature fluid handled is 200° F (93.3° C).

SUCTION PIPING – Suction pipe should be the full size of the suction opening. If for any reason the suction line is of greater length than usual, the next larger size should be used. Suction line will reduce the capacity of the pump and cause a fluid hammer or knock. If it is necessary to have bends in the suction line they should have long radius sweeps. Suction conditions should be approved to assure most satisfactory operation of pump. For minimum head requirements, see above paragraph.

RELIEF VALVE – The pump must be protected from excess pressure by a relief safety valve. This valve should be installed near the pump, preferably in the opening provided for it in the discharge manifold. Never install a shutoff valve in the line between the safety valve and the pump cylinder. The relief valve should be set to operate at approximately 1–1/4 times the discharge pressure.

STARTING A NEW PUMP – Pumps are shipped from the factory **without oil** in the crankcase. The frame end plate should be removed and the power end examined and cleaned if necessary. The pump may have been in storage for some time and as a consequence dirt or moisture may have entered the crankcase. Drain all water accumulated in the bottom of the crankcase. All nuts and screws should be tightened (see page 12 for torque data). Fill crankcase with oil of proper grade to the proper level. Quantity on the nameplate indicates the approximate oil requirement.

Pump should be started slowly but not run below minimum recommended speed. Pump should be operated for several hours with practically no discharge pressure. Check oil level as it may be necessary to add a small quantity of oil to compensate for that adhering to the walls of the crankcase and the moving parts. The pump may then gradually be brought up to full speed

and full working pressure. Watch for undue heating or abnormal noise in the working parts. Check all joints in the suction line to be sure there are no air leaks. Check for abnormal vibration caused by improper suction conditions. Be sure stuffing box packings are properly lubricated.

LUBRICATION – The crankshaft, crossheads and main shaft bearings are lubricated by oil in the crankcase. Use Engine Oil API Service Classification “SC”. For ambient temperatures below 40° F (4.4° C) use SAE 10 or SAE 20; above 40° F (4.4° C), use SAE 30 or SAE 40. Essential additives for the above oils are rust, foam and oxidation inhibitors. An oil trough is provided to deliver oil thrown off of crankshaft to reservoir over crosshead guides.

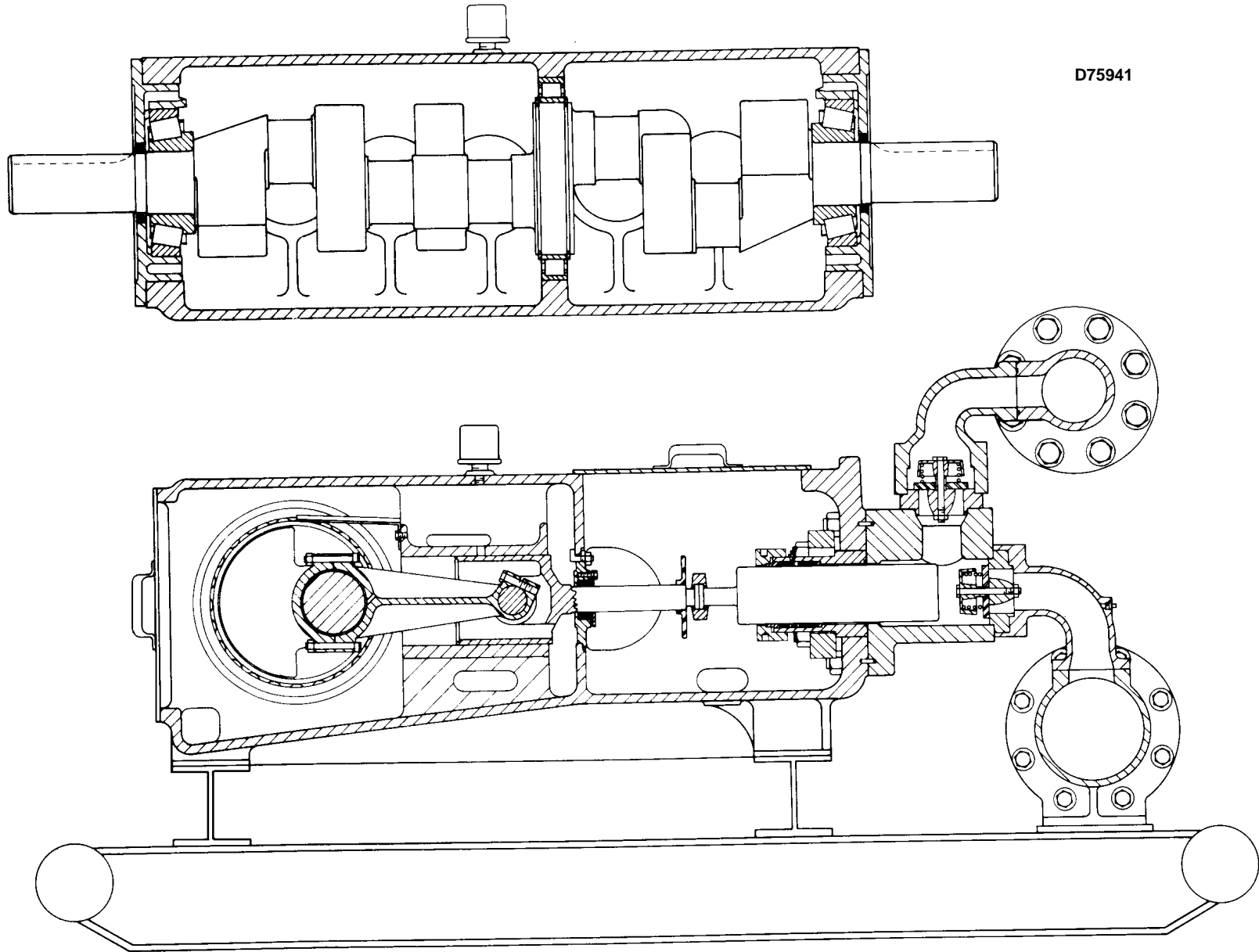
Oil must be added as required to maintain the level to the high level mark on the gauge. Add oil through the opening where the breather is located. The breather is held in place by threads – remove by rotating to the left. Keep tightly in place while the pump is in operation.

The time between oil changes depends upon local or operating conditions. Ordinarily, if the crankcase is kept closed, it should not be necessary to change oil more often than once in 1000 working hours. Oil should be changed if found to be dirty, or if it contains any contamination or water.

If pump is stored or is shut down for an extended period and if oil regularly used does not contain an additive for rust preventive, drain the oil from crankcase and add an oil base rust preventive, then turn pump over a few times to coat working parts. This will protect the power end parts against damage by rust. Before the pump is again placed in operation, drain crankcase and fill with new oil.

OPERATION – The pump must not be operated at speeds exceeding rated speed on the name plate or below the minimum speed of 175 RPM. Horsepower and pressures given in bulletins must not be exceeded.

The pump must be driven in the direction indicated by arrows on the frame, that is, crankshaft must rotate over towards crossheads to assure proper lubrication.



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SECTIONAL VIEWS OF "QAF" QUINTUPLEX PLUNGER PUMP

SECTION 3

SERVICE INSTRUCTIONS

FLUID CYLINDERS – Fluid cylinders for low and medium pressure service are individual aluminum–bronze castings. Fluid cylinder is held to frame by four studs. All cylinders are positioned by roll–pins in the frame. Correct torque load required to tighten cylinder stud nuts is 900 foot–pounds (1220 newton–meters) for all cylinders.

Fluid cylinders for high pressure service consist of two different types. The first type is individual block steel cylinders. Each fluid cylinder is held in place by four studs. The second type is a one piece cast aluminum–bronze cylinder. The one–piece cylinder is held to the frame by 20 studs. All cylinders are positioned by roll–pins in the frame. Correct torque load required to tighten cylinder stud nuts is 900 foot–pounds (1220 newton–meters) for all cylinders.

VALVES – Valves should be examined occasionally for wear or damage that may prevent the valve from operating properly. All valves are clamped in place by the suction and discharge elbows which connect the fluid cylinder to the manifolds. The valves are removed for examination by removing these elbows and tapping the valve lightly with a hammer – no pullers are required.

Standard equipment valves are Gardner Denver aluminum–bronze Delrin disc type. The valve plate, springs and retainer are fastened to the seat by a screw and nut.

After valves have been removed, clean each port and check for irregularities or foreign matter.

A new valve as taken from the carton should be cleaned thoroughly and wiped dry with a clean cloth. Check seating surface to be sure it has not been accidentally damaged in handling. Check torque on the screw and nut holding assembly together. Torque the 3/8 inch fastener to 15 foot–pounds (20 newton–meters) and the 1/2 inch fastener to 20 foot–pounds (27 newton–meters). Install new O–rings in valve and place valve assembly in cylinder pilot. Install suction elbow and discharge elbows. Torque the elbow to cylinder nuts to 900 foot–pounds (1200 newton–meters). Torque the suction elbow to manifold screws to 75 foot–pounds (14 newton–meters). For low and medium pressure service, torque the discharge elbow to manifold screws to 260 foot–pounds (49 newton–meters). For high pressure service, torque the discharge elbow to manifold screws to 600 foot–pounds (813 newton meters).

PLUNGER – Plunger material is hard–faced steel.

To remove plunger, remove coupling which holds the plunger to the crosshead. Remove the four nuts holding the stuffing box to cylinder and lift the plunger and

stuffing box assembly through top opening in the frame.

To assemble, reverse the above procedure. Be sure the gasket is in the gasket groove in stuffing box with chamfered edge out. Tighten the stuffing box nuts evenly and equally to a torque of 600 foot–pounds (813 newton–meters).

Tighten coupling screw to a torque of 30 foot–pounds (41 newton–meters).

Plungers 2–1/4 inches and larger can be removed without disturbing the packing by removing the suction elbow and suction valve and pulling the plunger through the cylinder.

PACKING – Stuffing boxes are packed with a nonadjustable type packing. The gland must always be tightened as far as possible with the lock pin to hold pressure of pump. Keep lock pins in place in gland hole to prevent rotation.

Always install a complete set of packing when renewing the packing. Clean the inside of stuffing box thoroughly; and be sure junk ring, spacer and bushing are clean and free of nicks and burrs. Install junk ring in bottom of stuffing box. Coat each packing ring with a light oil – do not use grease – and install in stuffing box. Be sure the lips of sealing rings face the pressure, or toward the fluid end.

Install lantern spacer, oil packing and gland bushing. Tighten gland with lock pin provided. Operate pump two or three hours under pressure and tighten gland as much as possible to prevent any movement of packing.

Check and tighten glands, if necessary, each day for the first two or three days while pump is operating under pressure until packing is seated. Keep thoroughly tight at all times by USING LOCK PIN FURNISHED WITH PUMP. Do not use a cheater. Keep lock pins in place to prevent glands from backing loose.

Use multipurpose grease NLGI Grade No. 2 by adding at fitting twice daily. Do not overgrease as overheating will result on oil seal packing.

If a force–feed lubricator is used, deliver three (3) drops of engine oil API Service Classification “SC” SAE 30 per minute to each plunger.

The oil stop head is equipped with two (2) oil seals. When installing, oil thoroughly and install both with lips of seals toward oil side. Install gland and tighten two nuts to retain oil seals. Use care to prevent damage to lip. No adjustment is necessary.

CRANKSHAFT – To remove crankshaft, drain oil, remove sheave, frame end plate, oil stop heads, connecting rod caps and bearing end plates from both sides. Push connecting rods and crossheads toward fluid end to clear crankshaft. The crankshaft must be supported when removing bearing end plates to avoid damaging the bearings.

The outer main bearings are tapered roller bearings and the cups remain in the end plates as they are removed. The center bearing is a straight roller bearing. The inner race is shrunk on the crankshaft. Support crankshaft on a rope sling and remove crankshaft including bearing cones and rollers from either side of pump.

CROSSHEAD & CONNECTING RODS – Crosshead and connecting rods can be removed through the back of the frame after crankshaft is removed. Remove the plunger clamp and oil stop head, then remove connecting rod. The crosshead pin is held in connecting rod by a clamp screw. When replacing clamp screw, tighten to proper torque of 87 foot-pounds (117newton-meters).

Crosshead pin bushings are in crosshead. If new bushings are installed in crossheads, be sure oil holes line up with oil holes in crossheads. If bushings do not have oil hole, drill 1/8" (3.175mm) through, one hole each bushing, after assembly to insure proper lubrication. Ream bushing to fit crosshead pin if necessary. Crank-pin bearings are steel backed babbitt lined precision type and can be easily removed from connecting rod by rotating out after cap is removed. When replacing bearing, be sure projection on bearing fits into the corresponding recess in the rod and cap with the correct connecting rod. They are marked. Correct torque load required for connecting rod cap nut is 75 foot-pounds (102 newton-meters).

Install crossheads, connecting rods and crankshaft in the REVERSE order of above. Be sure each part is returned to its original position, with oil holes and grooves

to the top. Connecting rods and caps are identified by numbers. To insure proper lubrication of bearing end plates must be installed with the oil trough at the TOP. Be sure bearing end plates are located with the word "top" in the uppermost position. Use care in sliding the bearing end plate oil seal over the crankshaft to prevent damage to the lip of the seal. It is preferable to use special tool or shim stock over crankshaft when installing end plate seal. Lip of seal faces in toward the crankcase. Wear sleeves are pressed on the crankshaft and provide a running surface for the seals.

When installing new wear sleeve, and installing tool should be used to be certain that sleeve is started squarely over shaft and is not damaged while being driven into position. Locate new sleeve in exact position of old sleeve. Be sure that the oil trough is in proper position, and just barely clears the counterweights on the crankshaft. Be sure rubber baffles are on crosshead extensions.

MAIN BEARINGS – Outer main bearings are tapered roller type, center main bearing is straight roller type. End clearance for outer main bearings is adjusted by the addition or removal of shims located on the end plates. End clearance for outer bearings should be .012" (.304mm) total. Clearance on center bearing is not adjustable, but should be .005" (.127mm) when measured with feeler gauge between race and roller.

LUBRICATOR – A force-feed lubricator is available, as optional equipment, to supply oil to the five stuffing box packings. Lubricator is mounted on a bracket over the frame and is driven by V-belt drive off the crankshaft extension. Oil is delivered to the tapped opening in each stuffing box through steel tubing.

Lubricator is equipped with a check valve at each outlet connection. Use engine oil, API Service Classification "SC" SAE 30. Set to deliver three (3) drops per minute to each stuffing box. Flow can be controlled by rotating adjusting screw on top of lubricator as required. Increase flow if packing tends to heat up.

REBUILDING DATA

PUMP STROKE	6 Inches	152.4mm
Crankpin Diameter	4.998/4.999	126.949/126.975
Crankpin Width	3.504/3.515	89.002/89.281
Crankshaft Diameter at Outer Main Bearing	5.0020/5.0025	127.0508/127.0635
Crankshaft Diameter at Center Main Bearing	12.0026/12.0014	304.8660/304.8355
Distance Between Main Bearings	48.410/48.400	1229.614/1229.360
Bore in Housing for Main Bearing	11.625/11.626s	295.275/295.300
Bore in Frame for Main Bearing	15.9969/15.9981	406.3212/406.3517
Connecting Rod Centers	14.00	355.600
Bore in Connecting Rod for Crosshead Pin	2.383/2.385	60.5282/60.5790
Bore in Connecting Rod for Insert	2.224/5.225	132.690/132.715
Crosshead Pin Diameter	2.3830/2.3835	60.5282/60.5409
Crosshead Pin Bushing Bore (Honed)	2.3845/2.3850	60.5663/60.5790
Bore in Crosshead for Bushing	2.749/2.750	69.825/69.850

RUNNING CLEARANCES

Crankpin Bearing .....	.0012/.0056	.0305/.1422
Crankpin Bearing Width Clearance .....	.007/.023	.178/.584
Crosshead Pin to Bushing .....	.010/.0023	.0254/.0508
Main Bearing End Clearance .....	.010/.015	.254/.381
Center Main Bearing .....	.0019/.0097	.048/.246
Crosshead to Frame .....	.005/.009	.127/.229

TORQUE SPECIFICATIONS**foot-pounds****newton-meters**

Cylinder to Frame Stud Nuts –

Low Pressure Cylinder	900	1200
Medium Pressure Cylinder	900	1200
High Pressure Cylinder	900	1200

Stuffing Box Stud Nuts –

Low Pressure Cylinder	600	813
Medium Pressure Cylinder	600	813
High Pressure Cylinder	600	813

Elbow to Cylinder Stud Nuts –

Low Pressure Cylinder	900	1220
Medium Pressure Cylinder	900	1220
High Pressure Cylinder	900	1220

Elbow to Suction Manifold Screws –

Low Pressure Cylinder	75	102
Medium Pressure Cylinder	75	102
High Pressure Cylinder	75	102

Elbow to Discharge Manifold Screws –

Low Pressure Cylinder	260	352
Medium Pressure Cylinder	260	352
High Pressure Cylinder	600	813

Connecting Rod Bolt Nuts 75 102

Connecting Rod Clamp Screw 87 118

Valve Assembly Screws –

Low Pressure Cylinder	20	27
Medium Pressure Cylinder	20	27
High Pressure Cylinder	15	20

Coupling Screws 30 41

GENERAL PROVISIONS AND LIMITATIONS

Gardner Denver Machinery Inc. (the "Company") warrants to each original retail purchaser ("Purchaser") of its new products from the Company or its authorized distributor that such products are, at the time of delivery to the Purchaser, made with good material and workmanship. No warranty is made with respect to:

1. Any product which has been repaired or altered in such a way, in the Company's judgment, as to affect the product adversely.
2. Any product which has, in the Company's judgment, been subject to negligence, accident, improper storage, or improper installation or application.
3. Any product which has not been operated or maintained in accordance with the recommendations of the Company.
4. Components or accessories manufactured, warranted and serviced by others.
5. Any reconditioned or prior owned product.

Claims for items described in (4) above should be submitted directly to the manufacturer.

WARRANTY PERIOD

The Company's obligation under this warranty is limited to repairing or, at its option, replacing, during normal business hours at an authorized service facility of the Company, any part which in its judgment proved not to be as warranted within the applicable Warranty Period as follows.

Except for the products or components listed below, the Warranty Period for all products is 1,250 hours of operation or three (3) months after start-up, not to exceed 120 days after delivery to Purchaser, whichever occurs first. The exceptions are as follows:

1. Power end is warranted for twelve (12) months from date of start-up or eighteen (18) months from date of delivery to the Purchaser, whichever occurs first.
2. Forged steel fluid cylinder is warranted for 90 days from date of installation.
3. Expendable fluid end parts, including, but not limited to, valves, valve parts, packing, liners and pistons, are not covered by this warranty due to variable abrasive nature of material pumped.

LABOR TRANSPORTATION AND INSPECTION

The Company will provide labor, by Company representative or authorized service personnel, for repair or replacement of any product or part thereof which in the Company's judgment is proved not to be as warranted.

Labor shall be limited to the amount specified in the Company's labor rate schedule.

Labor costs in excess of the Company rate schedules caused by, but not limited to, location or inaccessibility of the equipment, or labor provided by unauthorized service personnel is not provided for by this warranty.

All costs of transportation of product or parts claimed not to be as warranted and, of repaired or replacement parts to or from such service facility shall be borne by the Purchaser. The Company may require the return of any part claimed not to be as warranted to one of its facilities as designated by the Company, transportation prepaid by the Purchaser, to establish a claim under this warranty.

Replacement parts provided under the terms of this warranty are warranted for the remainder of the Warranty Period of the product upon which installed to the same extent as if such parts were original components.

WARRANTY REGISTRATION VALIDATION

A warranty registration form is provided with each machine. The form must be completed by the Purchaser and mailed within ten days after machine start-up to validate the warranty.

DISCLAIMER

THE FOREGOING WARRANTY IS EXCLUSIVE AND IT IS EXPRESSLY AGREED THAT, EXCEPT AS TO TITLE, THE COMPANY MAKES NO OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY.

THE REMEDY PROVIDED UNDER THIS WARRANTY SHALL BE THE SOLE, EXCLUSIVE AND ONLY REMEDY AVAILABLE TO PURCHASER AND IN NO CASE SHALL THE COMPANY BE SUBJECT TO ANY OTHER OBLIGATIONS OR LIABILITIES. UNDER NO CIRCUMSTANCES SHALL THE COMPANY BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, EXPENSES, LOSSES OR DELAYS HOWSOEVER CAUSED.

No statement, representation, agreement, or understanding, oral or written, made by any agent, distributor, representative, or employee of the Company which is not contained in this Warranty will be binding upon the Company unless made in writing and executed by an officer of the Company.

This warranty shall not be effective as to any claim which is not presented within 30 days after the date upon which the product is claimed not to have been as warranted. Any action for breach of this warranty must be commenced within one year after the date upon which the cause of action occurred.

Any adjustment made pursuant to this warranty shall not be construed as an admission by the Company that any product was not as warranted.

Gardner

Denver

For additional information contact your local representative or Gardner Denver Machinery Inc., Customer Service Department, 1800 Gardner Expressway, Quincy, Illinois 62301
Telephone: (800) 682-9868 FAX: (217) 224-7814



Sales and Service in all major cities.

For parts information, contact Gardner Denver, Master Distribution Center, Memphis, TN
Telephone: (800) 245-4946 FAX: (901) 542-6159

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