

A10VO Variable Displacement Piston Pump Technical Information Manual

The Drive & Control Company



A10VO PISTON PUMP MANUAL-MODULE 3A

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FEATURES

- High Efficiency through load sensing (= fuel savings)
- Maximum Pressure Control Built In
- Long Service Life
- Large Range of Flow Rates Available
- Low Noise Level
- Cast Iron Construction
- Standard Mounting Flange Dimensions
- Standard Drive Shaft Dimensions
- Direct Engine Mount or PTO Drive Capability

FUNCTIONAL PURPOSE

This pump is preferred over a fixed displacement (gear) pump. A fixed displacement pump delivers a set volume of oil for each revolution of its drive shaft. Any of this fluid flow that is not required, by the hydraulic system to do work, is sent back to the oil reservoir over a restriction. This oil flow times the pressure difference (between the system and the reservoir) is power that has been drawn from the engine and is now being turned into heat. The heat generated is a direct indication of fuel wasted and of unnecessary wear and tear on the hydraulic fluid, thus on the hydraulic system's mechanical components.

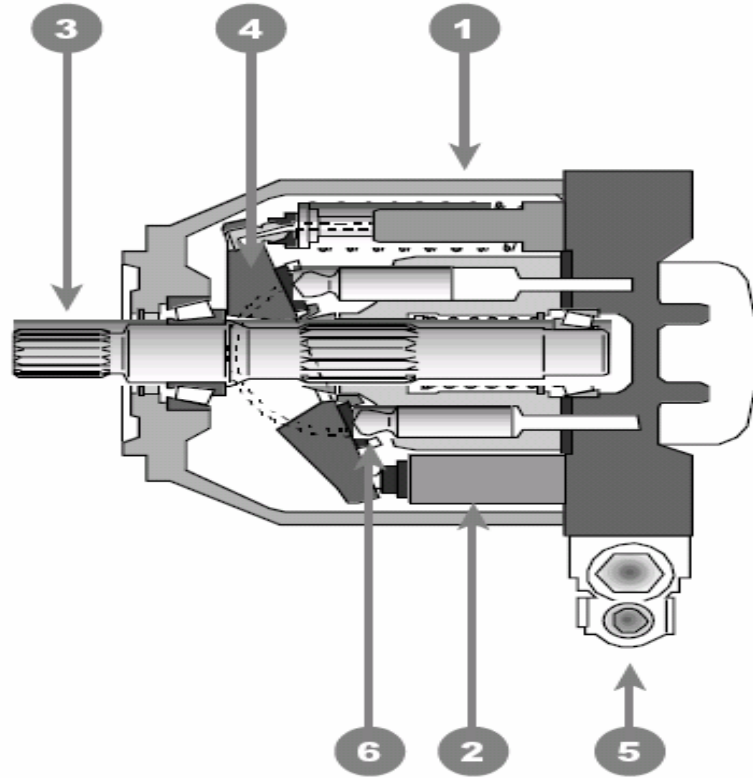
On the other hand, this variable displacement pump monitors (senses) by way of a small hydraulic line connecting it to the control valves – the power requirement (load) on your hydraulic system and provides just enough fluid flow and pressure to meet your system's immediate need. This means that the pump can be left running constantly and as your system's requirement changes the pump will simply adjust itself accordingly. By doing this, energy is not wasted away in the form of heat; translating into fuel savings for you and less wear and tear in your hydraulic system.

An adjustable pressure limit (up to 4100 PSI) is also built onto the pump. It operates by reducing the output flow – all the way to zero if necessary – keeping the pressure supply to your hydraulic system from ever going too high.

Different maximum displacements (sizes) with standard mounting flanges, are available to match the needs of your system. Also, various combinations of drive shafts (splined or keyed), rotation directions (left hand or right hand) and port locations (rear or side) can be chosen to facilitate your particular installation requirements (ie. direct engine mounting as well as transmission power take off mounting can be accommodated).

FUNCTIONAL PURPOSE CONTINUED

Variable displacement swash plate design piston pump.



1. Housing
2. Control Piston
3. Drive Shaft
4. Swash Plate
5. Control Valve Assembly
6. Pistons (x7)

DESCRIPTION

Axial piston pumps model A10V0 are swash plate design variable displacement pumps. As illustrated by the picture under functional purpose they basically consist of a housing (1), control pistons (2) located inside cylinder barrel, drive shaft (3), swash plate (4), a control valve assembly (5), and pistons (6)

This piston pump smoothly and continuously varies its displacement (volumetric output – size), by altering the angle of its swash plate. As your system operates, valves monitor the loads (pressures) on the actuators (cylinders and motors) and control the swash plate accordingly. The greater the angle of the swash plate, relative to the drive shaft, the further the pistons stroke in and out, therefore the greater the fluid flow.

There are two control valves, located in a removable housing, bolted to the pump. The standard type of control used is referred as flow and pressure compensation, type DFR. A simple explanation of how this works is described in the next paragraph. We have limited the explanation to one short paragraph as a detailed explanation goes beyond the technical requirements of this Generic Manual.

The flow and pressure compensator control, also known as a load– sensing control, matches pump output flow and pressure to system demand. This control will automatically regulate the pump displacement to deliver the flow required to maintain a constant pressure drop across a valve spool or other flow limiting device. When there is no system demand, the pump stands by at zero flow and low pressure. When the system demands flow, the pump delivers only the flow required by the system, at a pressure required to move the load.

To protect the system from infinite load pressures, the pressure compensator section of the control will cause the pump to automatically de-stroke when the pre–adjusted maximum system pressure is reached.

SPECIFICATIONS

Pressure

The pressure range for the standard models used as outlined under standard models is 4,100 PSI maximum.

R.P.M .

NOTE: This figure is dependant on inlet conditions ensure you follow recommended installation guidelines as per commissioning instructions.

Maximum speed (flooded suction)

P/N 130985 (A10V028) = 3000 rpm

P/N 130272, 124691 and 117556 (A10V045) = 2600 rpm

P/N 103616 and 149312 (A10V071) = 2200 rpm

Case Drain

Ensure pump mounted with case drain at highest to location to ensure pump prime is not lost and remains adequately lubricated. Maximum permissible pressure of the case drain can be 7 PSI (0.5 bar) maximum, higher than inlet pressure or suction pressure. Yet case pressure no higher than 30 PSI (2 bar) absolute.

OPERATING CONDITIONS

Operating Viscosity

Operating viscosity range: For optimum efficiency and pump life, we recommend that the operating viscosity (at operating temperature) be selected in the range of $\sqrt{\text{opt}}$ = optimum operating viscosity 81...167 SUS (16...36 mm²/s) taking into consideration the reservoir temperature range.

Viscosity limits: The following values are valid for extreme operating conditions of short duration. $\sqrt{\text{min}}$ = 60 SUS (10 mm²/s) for short periods at max. permissible drainage oil temperature of 94° F (90°C) $\sqrt{\text{max}}$ = 4635 SUS (1000 mm²/s) for short periods upon cold start.

Recommended Filtration

In order to guarantee reliable function, both return and pressure filters should have 10 micron min

Inlet Conditions (Suction Line)

The suction line, pipe or hose, should be as short and straight as possible. The pipe section should be such that the negative pressure at the suction port never falls below 11.6PSI (abs.) (0,8 bar) and never rises above 29PSI (abs.) (2 bar). Make sure connection points are airtight and that hoses are sufficiently pressure resistant against external air pressure. Use plastic hoses with supporting mesh. Make sure there are no kinks in the hose when installing.

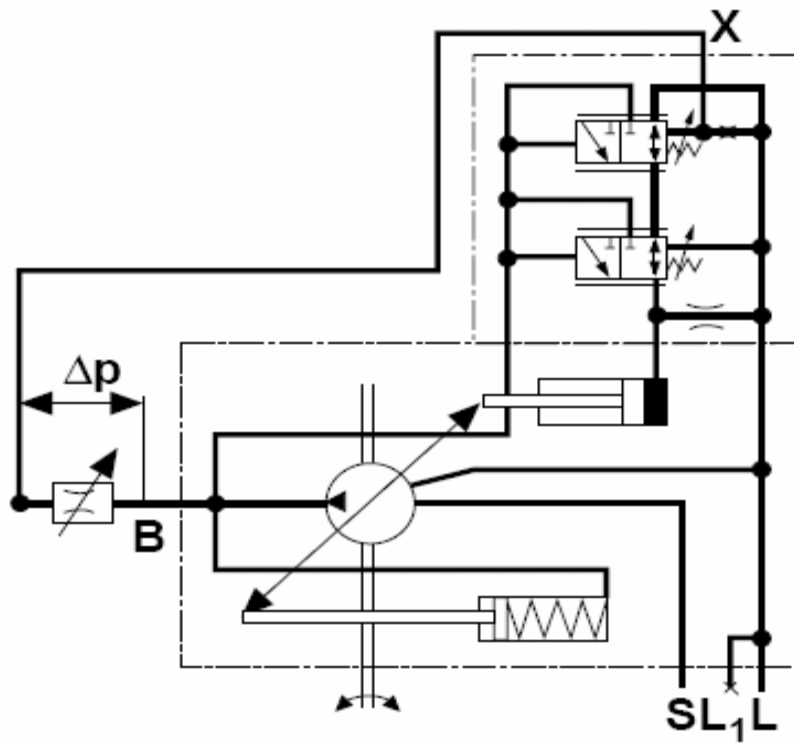
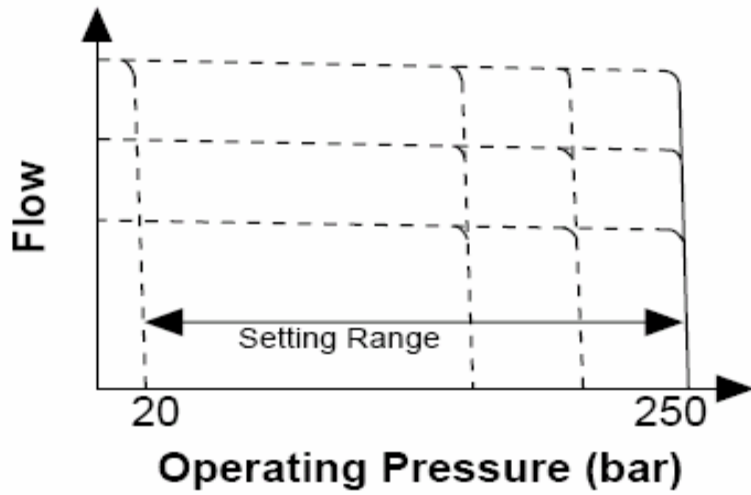
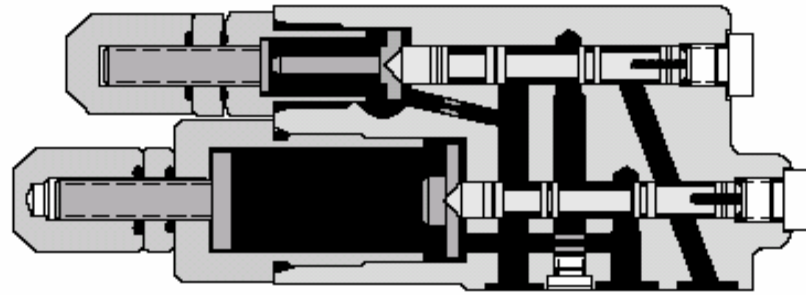
Leakage Line
(Case Drain)

Leakage lines should be laid out so that the housing always remains filled with oil and the ingress of air at the radial seal is prevented even during long periods of in-operation. The leakage line just always enter the tank (Reservoir) below the minimum oil level.

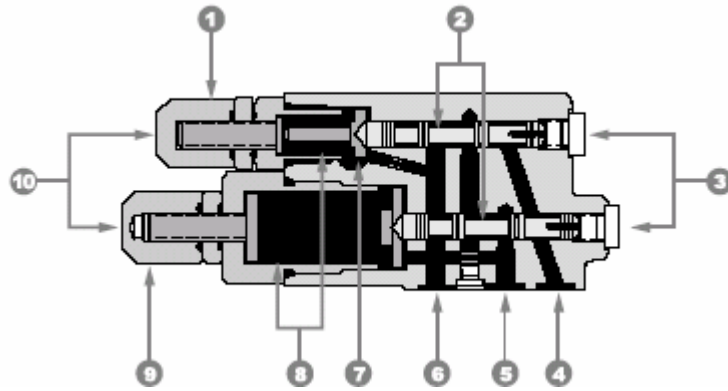
Direction of Rotation

Is always defined as viewed on the drive shaft and indicated by a directional arrow. It is not possible to change the direction of rotation of the drive without conversion of the pump.

DFR CONTROL



CONTROL VALVE ASSEMBLY



Identification Drawing

1. Flow regulation
2. Control valve spools
3. Gauge test port From the pump's output port
4. To the pump's control piston
5. To the pump's low pressure case then back to the reservoir
6. Connection to the load sensing shuttle valve system in the main control valves
7. Adjustable command springs
8. Pressure Regulation
9. Control valves and their adjustment screws

Pressure Regulation

Maximum system pressure setting. See module 2A Hydraulic Installation and Commissioning manual for instructions for testing maximum pressure setting. These detailed instructions will assist you when changing pressure setting. The pressure is set with the pressure setting screw.

1. Remove the cap nut with 17 mm external hexagon.
2. Undo the lock nut with 17 mm external hexagon.
3. Set the pressure range by turning the setting screw with hexagon socket head 4 mm.
4. Lock the setting screw with lock nut, external hexagon 17 mm. Turning the setting screw clockwise increases the pressure. Turning the setting screw counter-clockwise reduces the pressure. One turn of the setting screw corresponds to 50 bar pressure range 20 to 250 bar.
5. Screw on the cap nut with external hexagon 17 mm and tighten to a torque of $M_a = 8.5\text{Nm}$. (186 Inch/Lbs.)

CONTROL VALVE ASSEMBLY CONTINUED

Flow Regulation (Standby Pressure)

As mentioned in Module 2A Hydraulic Installation and Commissioning. Manual this setting should not require adjustment. Although if the factory setting is incorrect (usually 200 PSI) or you wish to increase please review detailed instructions as below.

The flow is set at the flow setting screw.

1. Remove the cap nut with 13 mm external hexagon.
2. Undo the lock nut with 13 mm external hexagon.
3. Set the flow range by turning the setting screw with 3 mm hexagon socket.
4. Lock the setting screw with the lock nut, 13 mm external hexagon. Turning the setting screw clockwise increases the flow. Turning the setting screw counter-clockwise decreases the flow.
5. Screw on the cap nut with 13 mm external hexagon and tighten to a torque of $M_a = 8.5\text{Nm}$. (186 Inch/Lbs.)

PUMP PERFORMANCE TEST

A simple test can be performed to investigate condition of the variable displacement pump. Only initiate this test if system operation becomes sluggish or complaints of excessive noise with respect to pump operation.

Ensure vehicle or prime mover is turned off. Remove the case drain from the reservoir or simply disconnect line at pump housing. Select the easiest option then ensure adequate hose is available to insert into measuring bucket. Because of the many pump sizes available we suggest you contact your nearest Bosch Rexroth office for standard leakage rates for your specific pump. Upon receiving this information deadhead a valve function as outlined under Module 2A commissioning instructions. Allow unit to run for the desired time limit as specified by Bosch Rexroth. Measure the quantity of oil to confirm pump operation is okay. At this time a quick inspection of hydraulic oil is also recommended which may identify early signs of pump wear. If within desired rates reinstall case drain. If not please contact Bosch Rexroth for further assistance.

TEST EQUIPMENT

Gauge Test Port Kit

To assist in commissioning the A10V0 pump you may purchase a test kit that can be installed on the control valve as shown under Identification Drawing. Simply remove the plug and install the following parts before commencing pressure adjustments.

198400 - Test Kit Includes:

- 1 only P/N 101077 Adaptor Fitting
- 1 only P/N 002036 Threaded Connector
- 1 only P/N 001020 Capillary Hose
- 1 only P/N 003450 Direct Connector
- 1 only P/N 014386 Pressure Gauge (0–3000 PSI)

PORT SIZES

Model code 103616 and 149312

Reference: A10V071 Series 31

Suction Port = 2"SAE Flange

Pressure Port = 1" SAE Flange

Case Drain Port = SAE–10 (7/8–14)

Load Sense Port = SAE–4 (7/16–20)

Model Code 131006

Reference: A10V045 Series 31

Suction Port = 1 1/2" SAE

Flange Pressure Port = 1" SAE

Flange Case Drain Port = SAE–10 (7/8–14)

Load Sense Port = SAE–4 (7/16–20)

Model code 130272

Reference: A10V045 Series 52

Suction Port = Threaded 1 7/8–12

Pressure Port = Threaded 1 5/16–12

Case Drain Port = SAE–10 (7/8–14)

Load Sense Port = SAE–4 (7/16–20)

Model code 130985

Reference: A10V028 Series 31

Suction Port = 1 1/4 SAE Flange

Pressure Port = 3/4 SAE Flange

Case Drain Port = SAE–8 (3/4–16)

Load Sense Port = SAE–4 (7/16–20)

OPTIONAL ACCESSORIES

Low Oil Shut-Off Block



This block available for inline or direct mounting to pump will rescue

The hydraulic pump from catastrophic failure should the reservoir oil level become too low.

Intended for use on variable displacement piston pumps only.

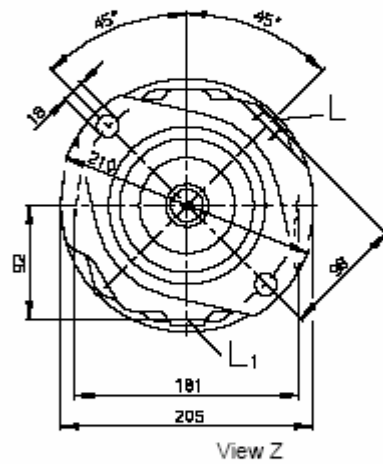
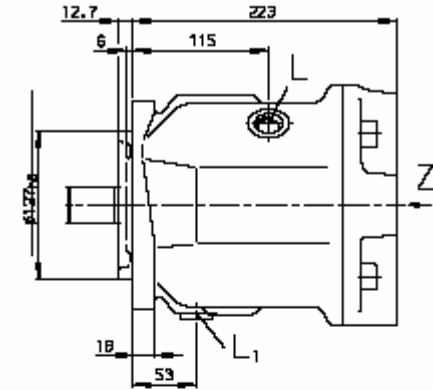
Please refer to Module #9 for more information on this unit.

UNIT DIMENSIONS A10V071

(Without control valves)

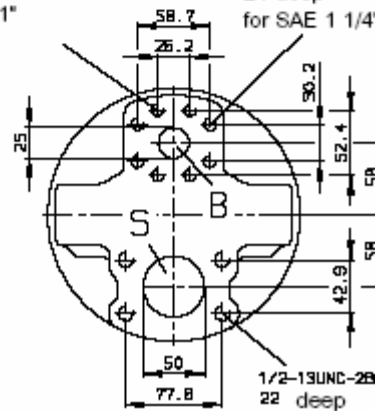
Model Code
1 2 2 0 9 5 and 1 2 2 0 9 6

Flange 127-2
(SAE C; 2-hole)



Fixing thread
3/8-16UNC-2B; 18 deep
for SAE 1"

Fixing thread
7/16-14UNC-; 24 deep
for SAE 1 1/4"

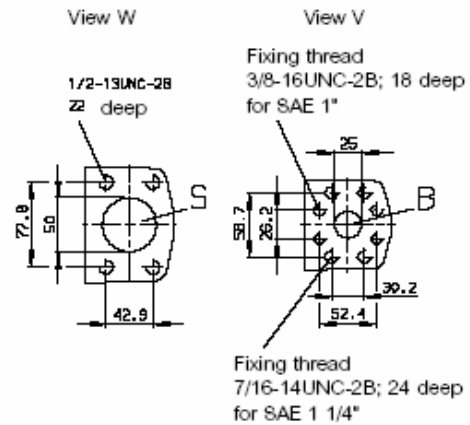
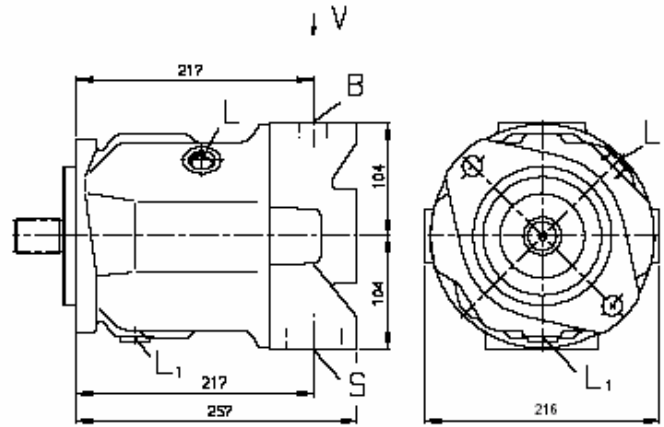


1 Millimeter = 0.03937 Inches

UNIT DIMENSIONS A10V071

(Without control valves)

Model Code
1 2 2 0 9 5 and 1 2 2 0 9 6

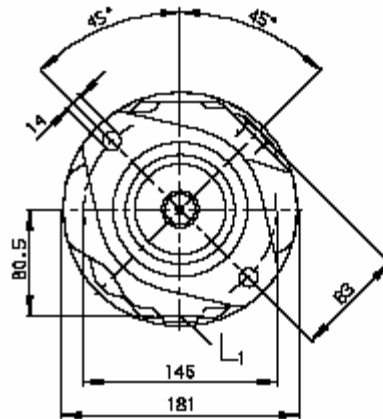
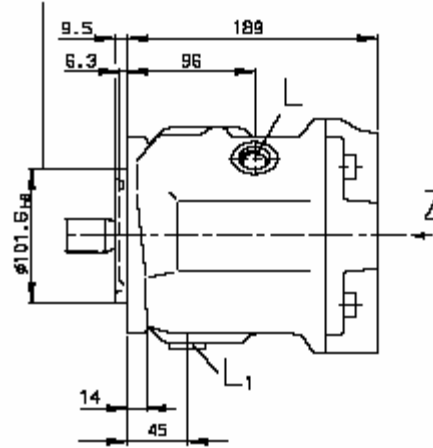


1 Millimeter = 0.03937 Inches

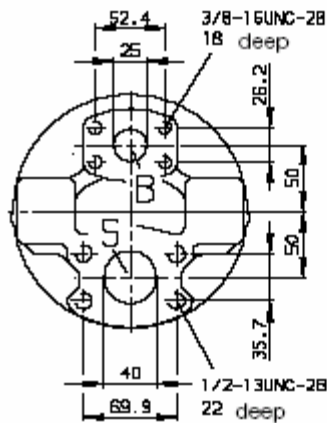
UNIT DIMENSIONS A10V045

A 1 0 V 0 4 5
 (Without control
 valves)
 Model Code
 1 1 7 5 5 6 and 1 2 4 6 9 1

Flange 101-2
 (SAE B; 2-hole)
 SAE J744 OCT 83



View Z

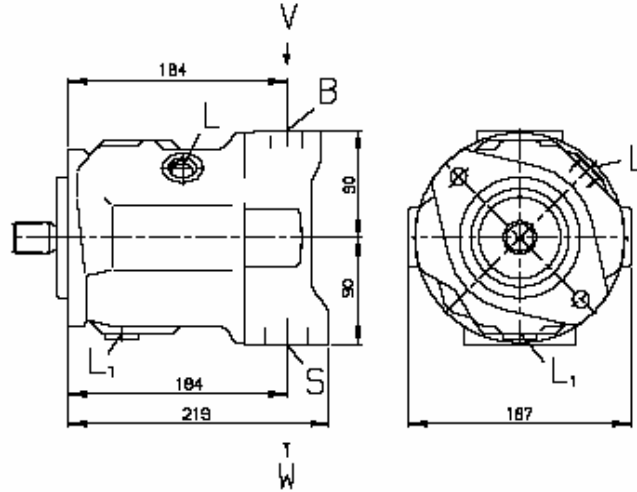


1 Millimeter = 0.03937 Inches

UNIT DIMENSIONS A10V045

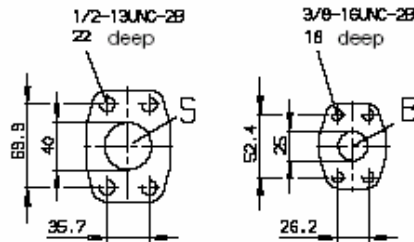
(Without control
valves)

Model Code
1 175 56 and 1 246 91



View W

View V



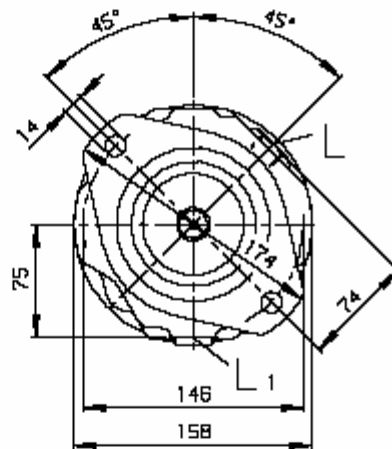
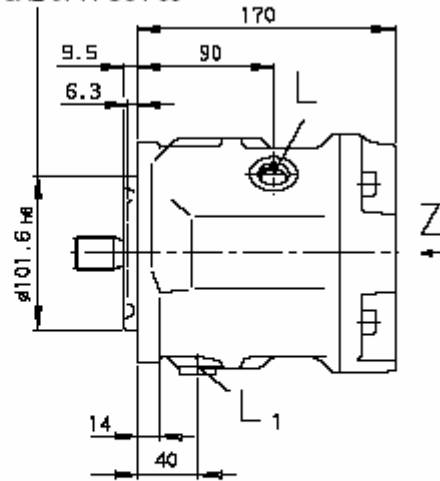
1 Millimeter = 0.03937 Inches

UNIT DIMENSIONS A10V028

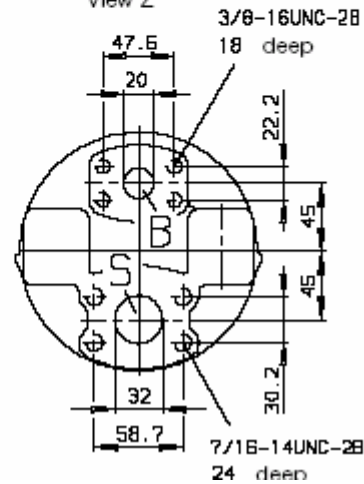
(Without control valves)

Model Code
1 2 6 0 6 8

Flange 101-2
(SAE B; 2-hole)
SAE J744 OCT 83



View Z



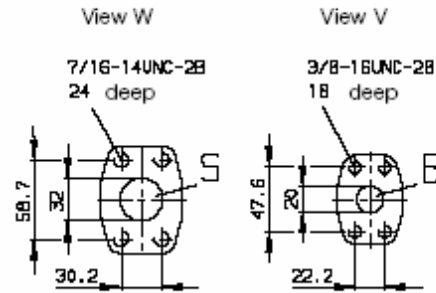
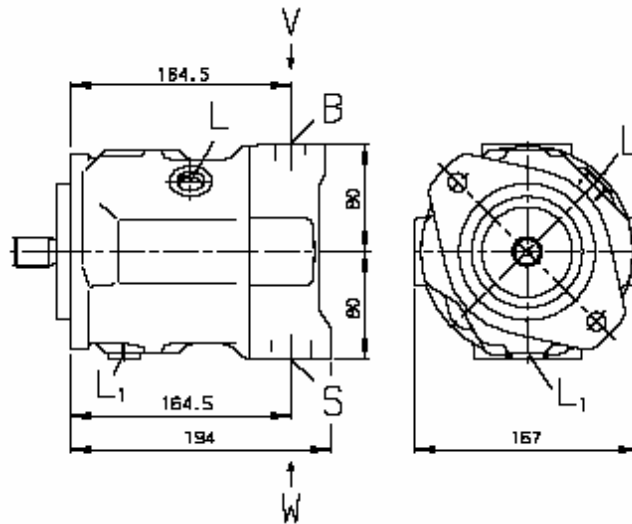
1 Millimeter = 0.03937 Inches

COMPLEREX™

UNIT DIMENSIONS A10V028

(Without control
valves)

Model Code
1 2 6 0 6 8



1 Millimeter = 0.03937 Inches

UNIT DIMENSIONS A10V071,45,28

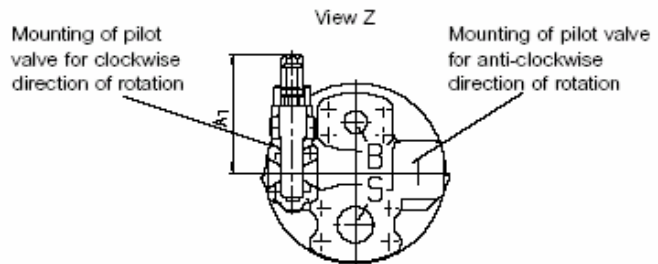
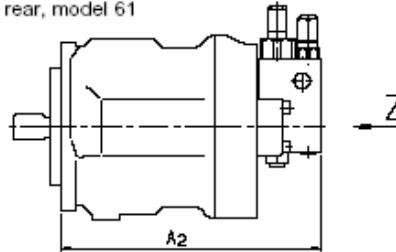
(With control valves)

Model Codes
 1 2 2 0 9 5
 1 2 2 0 9 6
 1 1 7 5 5 6
 1 2 4 6 9 1
 1 2 6 0 6 8

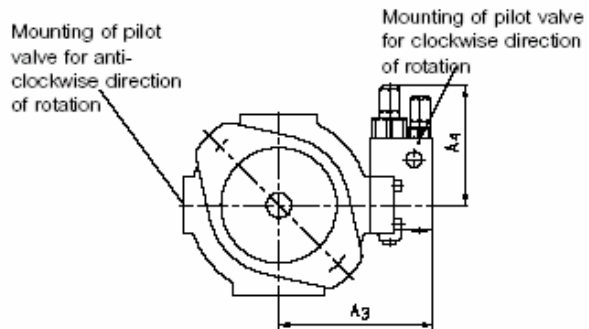
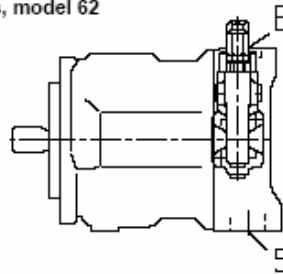
Size	Model 61		Model 62	
	A ₁	A ₂	A ₁	A ₂
28	107.5	225	104.5	136
45	104.5	244	104.5	146
71	104.5	278	104.5	160
100	104.5	344	104.5	165

1 millimeter = 0.03937 inches

Sizes 28 to 100,
 Service ports at
 rear, model 61



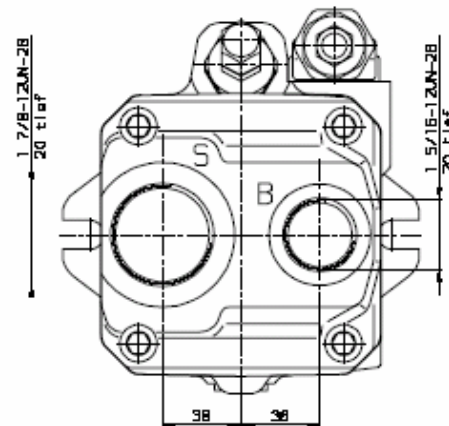
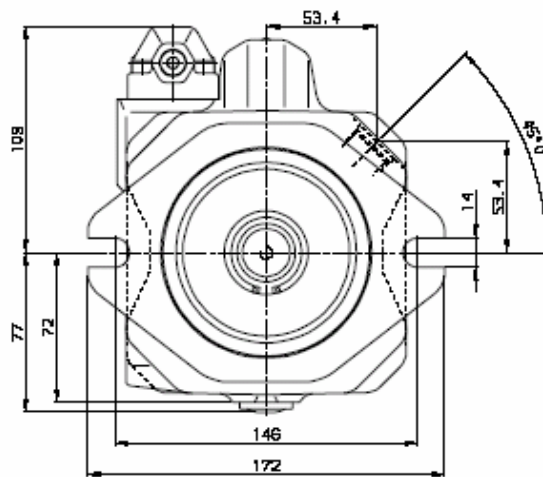
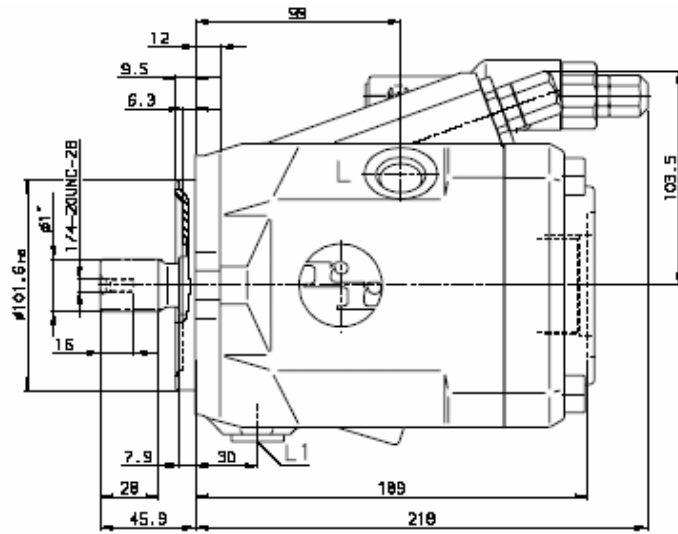
Sizes 28 to 100,
 service ports on
 sides, model 62



UNIT DIMENSIONS A10V045 SERIES50

**UNIT DIMENSIONS
A 1 0 V 0 4 5 S E R I E S 5 0**
(With control valves)

Model Codes
1 3 0 2 7 2



1 Millimeter = 0.03937 Inches

STANDARD MODELS USED

Part Number	Model Code and Description	Common Usage
103616	A10V071DFR/31L-PKC92N00 4.3 IN3/REV = 36 GPM @ 2000 RPM left hand rotation side ports / 1 1/4" keyed shaft	Large Trucks Front Mounted
149312	A10V071DFR/31R-PKC91N00 4.3 IN3/REV = 36 GPM @ 2000 RPM right hand rotation rear ports / 1 1/4" keyed shaft	Large Trucks P.T.O. Mounted
131006	A10V045DFR/31L-PKC62N00 2.74 IN3/REV = 23 GPM @ 2000 RPM left hand rotation side ports / 1" keyed shaft	Medium Trucks Front Mounted
131019	A10V045DFR/31R-PKC62N00 2.74 IN3/REV = 23 GPM @ 2000 RPM right hand rotation side ports / 1" keyed shaft	Medium Trucks (1 ton)
130272	A10V045DFR/51R-PUC64N00 2.74 IN3/REV = 23 GPM @ 2000 RPM right hand rotation rear ports / 7/8" x 13 tooth splined shaft	Medium Trucks P.T.O. Mounted
130985	A10V028DFR/31R-PKC61N00 1.71 IN3/REV = 15 GPM @ 2000 RPM right hand rotation rear ports / 7/8" keyed shaft	Small Trucks (1 ton)

NOTE: These pumps are also available in many other configurations and sizes. If your needs cannot be met by a pump on this list, please contact your nearest Bosch Rexroth location for assistance.

STANDARD SPARE PARTS

Replacement Pump Control Valve

For all models as listed in this section P/N 024356

Replacement Seal Kits

Model Code	Repair Kit P/N
Ref: P/N 103616 and 1149312 Model # A10V071 Series 31	P/N 110178
Ref: P/N 131006 and 131019 Model # A10V045 Series 31	P/N 110183
Ref: P/N 130272 Model # A10V045 Series 51	P/N 024052
Ref: P/N 130985 Model # A10V028 Series 31	P/N 110182

NOTE: For additional spare parts and repair information please contact your nearest Bosch Rexroth location for assistance.

Split Flanges

Model Code	Pressure	Suction
Ref: P/N 103616 and 149312 Model # A10V071 Series 31	SF-20-30 P/N 004070	SF-32-30 P/N 003885
Ref: P/N 131006 and 131019 Model # A10V045 Series 31	SF-16-30 P/N 004167	SF-24-30 P/N 003796
Ref: P/N 130985 Model # A10V028 Series 31	SF-12-30 P/N 003561	SF-20-30 P/N 004070